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Preface

The present period of medical history is characterized by definite development of the medical sciences. There is probably not a field that has not contributed distinct and exact data toward the evolvement of the practice of the healing art. The prosecution of sanitary knowledge has been noteworthy. The far better understanding of infective processes and the significance of immunology has fairly revolutionized certain practices. The appreciation of the importance of the endocrine organs in their relationship to the entire bodily economy has changed the viewpoint of many disorders. The far better understanding of the functions of the digestive tract due to more definite diagnostic methods has been of great value. These are a few of the present landmarks that have virtually changed the conception of certain physiological processes and contributed precise methods to the treatment of many disorders.

Medical history shows that it is vouchsafed to but very few individuals to discover and contribute such far-reaching discoveries as Dr. Still has made. As time reveals the many brilliant workers in the scientific field the importance of Dr. Still's great work is enhanced. A clearer understanding of anatomical completeness and intactness, and the consequent significance of adjustment in order that physiological unity may be asserted through the inherent properties of the organism, is apparently foreshadowed by the many converging lines of medical development.

It is fitting that at this time these coworkers, in Clinical Osteopathy, should compile, evaluate and rewrite the present understanding of the medical sciences as they apply to therapeutics. The osteopathic profession is very much in need of such a work; it fills a distinct requirement.

We believe that the profession will take sufficient interest in this work so that it will be constructively criticised and much valuable data supplied by both teachers and practitioners of osteopathy in order that future editions will still better reflect the combined experience of the profession. Unquestionably every practitioner of experience can aid most substantially and definitely

in adding to the value of Clinical Osteopathy, and for this reason we bespeak the earnest coöperation of every member of the profession.

Possibly some time in the future a new nosology will be evolved, for many disorders, based upon the innervation, vascular supply, and chemical coördination of a region, as suggested in the writings of Dr. Still. In many ways this would harmonize with the osteopathic concept of anatomical completeness and physiological unification, and thus would simplify and render more effective etiologic diagnosis and the fundamentals of pathology.

Far too frequently the relative importance of history taking, anatomical findings, and laboratory data are not sufficiently emphasized in the individual case. Each one of these is an important and indispensable link to the solution of a diseased condition. Neglect one part and the practitioner is distinctly handicapped in securing a clear understanding of the condition presented to him. The written word can assist him comparatively little in the individual case. Almost beyond everything else in practice rests the individuation of a diseased condition. Ability and efficiency in practice, to a marked extent, depends upon the evaluation of the various factors presented, based of course upon definite fundamentals, but nevertheless interpreted in accordance with a distinct appreciation of the individual vital organism.

Probably in no other practice than the osteopathic does personal therapeutic ability count for so much. Osteopathy exemplifies a distinct advance of the knowledge of the healing art, based primarily upon the etiologic diagnosis of many disorders, and as a consequence technical efficiency is dependent upon a high degree of skill and extended experience. This is something that cannot possibly be learned from text-books but demands the careful and painstaking instruction of sympathetic teachers, over a considerable period of time.

CARL P. McCONNELL.

Publisher's Announcement

This book is the first of a series being prepared under the auspices of the Education Department of the A. T. Still Research Institute, by the coöperation of osteopathic practitioners and teachers in osteopathic colleges. The material for this volume was gathered from many sources, including osteopathic publications, reports of lectures and clinics from national, state and local associations, several thousands of case reports from the Pacific College clinics and laboratories and correspondence and consultation with several hundred osteopathic physicians. The writings of Dr. A. T. Still were constantly consulted. Other books frequently quoted include "Practice of Osteopathy," by McConnell and Teall; "Practice of Osteopathy," by Chas. Hazzard; "Principles of Osteopathy," by Guy D. Hulett; "Principles of Osteopathy," by D. L. Tasker; and "Public Sanitation and Other Papers," by Clement A. Whiting.

The names of those whose contributions and criticisms have made this work possible are given. While the greatest care has been taken to include all who have helped in this work, it may be possible that some have been inadvertently omitted. In a general way, everyone who has ever written upon osteopathic subjects, or who has given lectures, has helped to some extent in this work.

Other books are being prepared in about the same way, upon other subjects and with other editors. It is urgently desired that with the advancement of osteopathic thought, there may be advancement of osteopathic literature.

Publication Bureau,
THE A. T. STILL RESEARCH INSTITUTE.

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PART I DISEASES OF THE DIGESTIVE SYSTEM

GENERAL DISCUSSION

The adequate treatment of diseases of the digestive system rests upon a knowledge of the function, circulation and innervation of this long tube which traverses the body.

For convenience, this alimentary tube may be divided into three chief groups which differ from each other in many respects. First, the mouth with the salivary glands, the pharynx, and the esophagus; Second, the stomach, small intestine, liver and pancreas; Third, the colon, sigmoid and rectum.

In the first group we have the mouth, salivary glands, pharynx and esophagus. All of these tissues are well supplied with arterial blood and have very free venous and lymph drainage. The blood vessels are innervated by vasomotor nerves from the cranial and upper cervical sympathetic ganglia, which receive their stimulation from the centers in the medulla, chiefly by way of the seventh cranial nerves; and from the first to the fourth thoracic spinal segments by way of the gray rami and the sympathetic chain. These nerve centers are somewhat affected by impulses from the emotional centers, but their chief control is through sensory nerves of the same and neighboring segments. Bony lesions of the mandible, hyoid, occiput, atlas, axis, other cervical vertebræ, the first and second ribs and the clavicle are efficient causes for disturbed function of the nerve centers which control the secretion, circulation and nutrition of the mouth, tonsils, salivary glands and pharynx and esophagus. Such lesions lower resistance to infection, increase and perpetuate the effects of traumatic or toxic influences and hinder recovery in practically all forms of diseases of the organs mentioned. The food remains in the mouth, pharynx and esophagus so short a time that only very marked or constant dietetic errors cause injury.

In the second group—the stomach and small intestine, the liver and the pancreas—is found a set of organs which also has a double innervation. The vagus carries motor and secretory impulses to these organs by way of the solar plexus. Probably some vasomotor fibers derived from the lateral chain of sympathetic ganglia may be carried by way of the vagus. Certainly the splanchnic nerves which are derived from the sixth to the twelfth thoracic segments carry nerve fibers which are distributed in a somewhat segmental manner to this part of the digestive tube.

All of these organs receive sensory innervation, both by the splanchnic and the vagus nerves. Bony lesions of the occiput, atlas and axis are responsible for certain functional gastric disturbances, and lesions of the spinal column and the ribs, especially from the fifth to the tenth thoracic, result in circulatory, secretory and trophic disturbances of the stomach, small intestine, liver and pancreas.

Variations from the normal quality and quantity of food may have marked effects upon these organs. So long does the food stay in the stomach and in the small intestine and so profoundly is the chemistry of the food modified by the digestive secretions of this part of the alimentary tract and by bacterial action that we must recognize very clearly the influence of dietetic errors in the etiology of diseases affecting these organs.

The fact that gastric activity is speedily and profoundly modified by emotional disturbances is demonstrated by such frequent experiences that probably no one has failed to appreciate it either in his own or his neighbor's life. It is also true that sudden pain, as for example from sciatica or toothache, affects the digestive activity.

When bony lesions of the occiput, upper cervical and mid-thoracic spinal column, the ribs or the mandible are present, or when there is any lack of normal mobility of the articular surfaces in these areas, the gastro-enteric centers either fail to receive their normal stimulation or they are acted upon by irritating streams of sensory impulses. The normal nerve control of the stomach is thus interfered with in much the same way as might occur if constant emotional disturbances were present. Under such circumstances even normal food may provoke an attack of gastritis or enteritis while dietetic errors, for which the normal protective mechanisms of the body should be entirely adequate, may bring about digestive disturbances out of all proportion to the apparently trivial cause.

Since many of the products of digestion are carried through the liver this organ also is subject to the adverse influences of improperly chosen or imperfectly digested foods. It is not yet shown whether the quality of the food stuffs exercises any abnormal influence over the pancreas or not.

The third group, the colon, sigmoid and rectum, has its chief innervation from the lumbar and sacral nerves. These nerve centers may be profoundly affected by sensory nerve impulses reaching them from the articular surfaces of the lumbar vertebræ, the sacrum, the innominates and the hip joints as well as from the abdominal viscera. The arterial supply of the lower part of the alimentary tract is plentiful and the anastomosis is very free. The veins are large with free anastomoses but the return flow of venous blood is liable to be impeded by slight or profound hepatic dis-

turbances and this column of blood is always subject to the adverse influence of gravitation. The structural circulatory relations predispose to the formation of hemorrhoids and diminished resistance of the rectum and its neighboring tissues.

During this part of its passage through the alimentary canal the food stuff undergoes little change. The walls are not profoundly affected by abnormalities in diet except as these result in too great or too little quantities of waste material, or as the strength of the body may be influenced from the standpoint of nutrition. The colon itself is subject to pressure from too long retention of the fecal mass and certain structural perversions, leading to its ptosis and to the effects of much ill-judged treatment for constipation.

These considerations lead to the view that the more common digestive diseases are always complex in etiology; that in dealing with any of these cases we have to take into consideration not only the habits of eating, the quality and quantity of food, the manner in which the food is prepared and served and eaten, the habitual emotional state of the patient at meal time, but also the structural relationships of the entire body.

"Formerly in many confusing conditions of the gastrointestinal tract, diagnosis could only be made by the aid of an explorative laparotomy. The need for many of these has been removed by modern Roentgenology.

"The information gained by careful study of the gastrointestinal tract when containing the 'bismuth meal' or enema, or under air or gas inflation, can often be secured in no other way. A positive diagnosis can be made of strictures or diverticulæ, the tone, motility and patency throughout the tract. The fluoroscope shows position, size, shape, capacity, motility and functioning of the stomach and its gateways, as well as the presence or absence of ulcers, with their resulting constrictions or carcinoma with its typical infiltration. Definite location of pathology can usually be obtained throughout the tract. The amount and character of the waves of peristalsis can be seen and studied as carefully as can the pupillary reflex or the radial pulse. Serial plates enable one to know the length of time that is required for different portions of the tract to empty themselves. Thus stasis from any cause, as adhesions, deformity of structure, lack of muscular tone, or ileus is located and its cause often disclosed. The 'geography' of the colon is of much importance in many cases; its course, diameter, permeability and motility are definitely shown by the X-Ray. Distention of the sigmoid flexure is often demonstrated, giving a cause for remote symptoms due to pressure irritation or to toxin absorption.

"Thus the X-Ray is one of the most valuable and complete aids to diagnosis of conditions of the gastrointestinal tract to which the modern physician has recourse."—E. R. Hoskins and M. L. Burns.

CHAPTER I
DISEASES OF THE MOUTH AND THE SALIVARY
GLANDS

STOMATITIS

This is an inflammation of the mouth and its associated structures, due to irritants, either mechanical, thermal or chemical, infection by fungi or bacteria, and accompanied by feverishness, discomfort or pain and other symptoms dependent upon the structural changes and the variety. In all forms reflex muscular contractions and hypersensitive areas are found around the angle of the jaw and the upper cervical region, both anterior and posterior.

Lesions of the hyoid, mandible, and cervical vertebræ are predisposing factors in the infections, or may be secondary. These lesions, as well as the reflex muscular contractions mentioned, may tend to delay recovery from the effects of either mechanical, thermal, chemical or infectious irritants.

ACUTE CATARRHAL STOMATITIS

(Simple stomatitis; erythematous stomatitis; catarrh of the mouth)

This is due to irritants of any kind. In poorly nourished children it is associated with dentition and gastrointestinal disorders; in adults with the abuse of tobacco or it may be caused by chemical and thermal irritants. It occurs constantly with indigestion and the specific fevers.

Diagnosis. It is marked by superficial redness, heat and swelling, dryness followed by increased secretion, and by swelling of the papillae of the tongue.

Feverishness is most noticeable in children. Discomfort particularly in mastication may be very annoying.

Treatment. Irritating factors must be removed. Food and drinks must be lukewarm or cool. In severe cases only liquid food can be given, and this should be taken through a bent glass tube or a straw. The mouth must be washed at frequent intervals with distilled or boiled water, or with mild solutions of boric acid, salt, etc.—anything which is non-irritating and gives a sensation of comfort and cleanliness.

Reflex muscular contractions should be relieved. Bony lesions especially of the hyoid, mandible, clavicle, and the cervical ver-

tebræ are to be corrected if possible without causing too great discomfort. If the corrective measures are very painful, it is better to delay that work until the acute stage has passed.

When the stomatitis is part of an acute infectious disease, the treatment for that disease is part of the treatment for the stomatitis. When mal-nutrition is present, the stomatitis usually persists or recurs until the general health is improved. In ordinary cases, the duration is about a week.

APHTHOUS STOMATITIS

(Follicular or vesicular stomatitis; croupous stomatitis; "canker" sore mouth)

This is due to various causes—in children, to poor nourishment and uncleanliness, indigestion and fever; in women, sometimes to menstrual periods, pregnancy and the puerperium, and in men to protracted spleens, and to general ill-health.

Diagnosis. The appearance is characteristic. To the features of the catarrhal form is added the formation of small, grayish or yellowish white spots, either simple or in clusters. At first vesicular, these later become ulcers of a dull opaque appearance bounded by a bright red hyperemic zone. They are found upon the lips, the tongue or upon the cheeks.

There is soreness of the mouth, increased secretion, heavy breath, and the symptoms of the associated disease. These ulcers heal rapidly when the constitutional condition is improved.

Treatment. The treatment of catarrhal stomatitis should be given, and to this added careful washing of the ulcers, preferably with mild boric acid solution. The gastric condition should be investigated, and appropriate treatment initiated for whatever gastric disorders may be found.

Prognosis. The ulcers disappear with remarkable speed when the cause of the stomatitis is removed; but they persist and recur obstinately unless the source of the trouble is removed.

MEMBRANOUS STOMATITIS

(Croupous stomatitis)

This is a disease which resembles that just mentioned, except that instead of the formation of small ulcers, there is a dense grayish membrane over the mucous surface. It is sometimes diphtheritic (see diphtheria) and sometimes results from streptococcic, gonorrhoeal, or other infection. It may be present in the new-born, from gonorrhoeal infection; or from syphilis. The treatment is that of the infectious agent, plus that of aphthous stomatitis. The prognosis is rarely good.

ULCERATIVE STOMATITIS

(Diphtheritic or fetid stomatitis; putrid sore mouth; gingivitis ulcerosa)

This is an acute affection, often epidemic.

Etiology. The disease results from defective sanitary conditions; poor nourishment; from exhausting diseases as diabetes, scurvy; poisoning from mercury, lead, phosphorus, or copper.

Diagnosis. The first changes appear in the gums around the roots of the teeth. The tissues are at first red, swollen, and edematous with warty projections, and the inflammation spreading along the line of the gums. Later, the parts become pale, spongy and friable, bleeding at the slightest touch, and eventually becoming necrotic. The ulceration may extend to the lips and cheeks, and may penetrate deeply to the bones. The teeth may fall out. The saliva is increased in amount and is acid in reaction; the breath is foul; mastication is difficult; the submaxillary glands are enlarged. The constitutional symptoms may be severe in children, occasionally resulting in death in debilitated subjects.

Treatment. This must be energetic. The ulcers must be washed with mild antiseptics frequently; a mildly alkaline solution is best. The food must be liquid, and must be taken through a glass tube, which must be kept well sterilized. The general condition of the patient must determine the quality of the food; in cases with symptoms of scurvy the juices of fresh vegetables must be given; in patients who are starved, broths, digested foods, etc., may be freely given.

Energetic stimulating treatment to the mid-thoracic region is indicated. The ribs should be raised carefully, avoiding too great tension upon the viscera. The gastro-intestinal symptoms must be met as they appear. (See diarrhoeas of children.)

Prognosis. If the tissue destruction is not marked, a good outlook follows proper treatment. In later cases, loss of the teeth, injury to the soft parts, and sometimes necrosis of the mandible may follow. The constitutional disease gives the more grave prognosis.

PARASITIC STOMATITIS

(Thrush; sprue; white mouth; soor; muguet; mycotic stomatitis)

Thrush is due to the *saccharomyces* or *oidium albicans*. Predisposing causes are bottle-fed infants, debilitated adults, use of starchy and milk foods with imperfect cleansing of the mouth, catarrhal stomatitis.

Diagnosis. The disease first appears upon the tongue and inner sides of the cheeks as a diffuse reddening of the mucosa and the

formation of a glistening, slimy, somewhat adhesive exudate of grayish appearance. Small whitish dots next appear and stand out prominently upon the red hyperemic background. These patches tend to coalesce to form a membrane which when removed leaves a greatly reddened and often eroded mucosa, the membrane quickly reappearing. The growth of the fungus begins in the epithelial layer and extends to the deeper structures. Severe cases may include the palate, lips, pharynx, or esophagus, rarely the internal organs.

The mouth is usually dry, tender and painful. There is debility and gastric disturbance. The membrane can be readily removed, usually leaving an intact mucosa beneath.

The fungus is easily recognized by microscopic examination of a scraping.

Treatment. Food should be stopped for a few feedings, and plenty of water given. The mouth should be washed with cotton or gauze, in warm alkaline solutions. Cleanliness after recovery is important. The reflex muscular contractions should be relieved, even in very young babies. Rarely, vertebral lesions are found; these must be corrected.

Prognosis. Recovery is to be expected within a few days.

MERCURIAL STOMATITIS

(Ptyalism)

This is due to the use of mercurial preparations medicinally or to handling of mercury as in certain occupations. The gums are swollen, red and sore, the salivary glands are enlarged and painful with greatly increased secretion.

There is a metallic taste in the mouth, tenderness upon shutting the teeth and fetid breath, mastication is difficult, the tongue is swollen, tender to the touch and covered with a heavy, creamy coating. If the case is severe, the teeth are lost, ulcers form, and rarely necrosis of the jaw occurs.

The duration is from two to four weeks.

Treatment. The first consideration is to stop the mercurial poisoning. The occupation should be changed if necessary. Out-of-door life is important. As rapid elimination of the poison as is possible should be secured by promoting activity of all excretory organs and assisting this by hot or Turkish baths. The stomatitis is only a sign of the general poisoning.

Prognosis. If the use of mercury is stopped, and the tissue destruction is not too great, recovery is complete. In more serious cases, the teeth are loosened, and may fall out.

GANGRENOUS STOMATITIS

(Noma; cancrum oris; cancer aquaticus or water cancer)

Etiology. It is usually due to very insanitary conditions but may occur during convalescence from the acute fevers, measles, scarlatina, typhoid and pneumonia, especially in children between two and twelve years.

Diagnosis. It begins with the formation of a livid, swollen patch, usually unilateral, in the buccal mucosa, near the angle of the mouth or in the gums. Small blisters form, the tissues present a grayish-yellow inflammatory infiltration that quickly becomes gangrenous, spreads rapidly until the whole thickness of the cheek is converted into a reddish-black necrotic mass which may penetrate so as to involve the bones of the nose and jaw. The structures in the neighborhood are infiltrated and edematous. Septic infection of the whole system usually sets in with a fatal result.

The constitutional symptoms are great, fever irregular (103° to 104° F.) rapid pulse, delirium, diarrhea, and prostration. The breath has a peculiar penetrating and intolerably offensive odor. Aspiration (septic) pneumonia, gangrene of the female genitalia, and colitis are common complications.

Treatment. The disease does not occur in children who have proper care. When it is found, the only treatment is symptomatic and constitutional, according to conditions found in each case. Antiseptic washes are to be used.

Prognosis. The duration is from seven to fourteen days, when death is to be expected. In the rare cases of recovery considerable deformity is unavoidable.

CHRONIC STOMATITIS

Is caused by chronic irritation due to smoking or by syphilis.

Diagnosis. The mucous membrane is infiltrated, lymph-follicles are enlarged, the epithelium is thickened and keratinized. Grayish or bluish-white flattened plaques are seen on the tongue and inner sides of the lips and cheeks. This condition may afford a starting point for carcinoma. The disease causes few symptoms, mainly irritative. The diagnosis rests upon the appearance of the mouth and the history of irritative factors.

Treatment. The irritating factors must be absolutely removed. The food must be non-irritating, smooth or liquid in consistency. Muscular contractions, especially around the angles of the jaws, and under the tongue must be relieved. Bony lesions must be corrected wherever found. Upper thoracic lesions are almost invariable. Clavicles and upper ribs are often at fault.

Prognosis. With persistent treatment, recovery may be almost or quite complete. More often hardened areas are left. The danger of beginning carcinoma must be recognized, as in leucoplakia buccalis. (q.v.)

OTHER DISEASES OF THE MOUTH

The mouth is subject to various congenital deformities as tongue-tie, hare-lip, and cleft-palate, all of which are relieved to a greater or less extent by surgical measures.

The structures of the mouth are subject to diseases which may be a part of the general process or remain localized.

Syphilis, tuberculosis, actinomycosis, leprosy and glanders of the mouth are described in connection with the general discussion of these diseases.

TUMORS. The most common malignant tumor is the epithelioma. "Smoker's cancer" may be mentioned; also the cancer due to use of the betel nut.

Ranula are small retention cysts of the mucous glands.

The most common of the benign tumors are fibroids and papillae.

The treatment of all these is surgical; and the value of surgery depends upon an early diagnosis.

RIGA'S DISEASE. This is a strange local ulcer appearing near the frenum of the tongue. It is endemic and epidemic in Italy, but not seen in this country except among new arrivals. It is most frequent in teething infants.

THE TONGUE

Since the nerves which control the tongue include vasomotor, secretory, sensory, and somatic motor elements, and since these have extremely intricate central relationships, the tongue is one of the important diagnostic structures of the body. Its appearance, control, and sensations are all important in diagnosis, under certain circumstances.

Pain from other organs is rarely referred to the tongue, but it is not at all rare for diseased conditions of the anterior part of the tongue to be associated with pain in the chin. Injury to the lateral area may cause pain under the jaw or around the hyoid bone, causing the patient to complain of a "stiff neck." When the tongue lesion is placed on the posterior area the pain may be in the sub-occipital region, and intense muscular contractions in that area may mislead in the search for a diagnosis.

FETOR ORIS. This is a common affection resulting from digestive troubles, local mouth conditions, all forms of stomatitis and pyorrhea alveolaris, tonsillar diseases, caries of the teeth, respiratory diseases from the nose to lungs, and certain constitutional diseases.

Treatment. The underlying conditions must be found before a permanent relief can be gained, and these carefully treated by correction of structural derangements, correction of diet and general hygiene, and insistence upon a strict regime of oral antisepsis.

COATINGS OF THE TONGUE. The appearance of the tongue is useful in diagnosis. The fur or coating is due to accumulated epithelium,

fungi, and food particles. It is uniformly seen in febrile diseases, gastro-intestinal disorders, naso-pharyngeal affections, and is not unusual in apparently good health.

Unilateral furring results from some disturbance of the second and third branches of the fifth nerve.

Circumscribed furring usually points to some local trouble.

White coating of fungi, bacteria, and desquamated epithelium arises from nerve irritation; disturbed circulation and innervation prevent normal formation and removal of the epithelium, and opportunity is thus afforded for the growth of fungi.

A flabby, swollen, indented tongue, covered with an even yellow, pasty fur is seen in catarrhal gastritis or gastro-duodenitis and in heavy smokers and drinkers. It occurs also in continued fever of some length.

A dry, brown, fissured tongue stained with bile is found in the low fevers, such as typhoid and dysentery.

A black tongue is observed in malignant fevers.

A bluish-black tongue is occasionally seen in Addison's disease.

A red, beefy tongue is seen in diabetes and wasting diseases.

The strawberry tongue, white with red points, is especially characteristic of scarlet fever.

A trembling tongue is seen in paresis and similar nervous diseases and in alcoholism and asthenic fevers.

GLOSSITIS

Glossitis is an acute or chronic inflammation of the parenchyma of the tongue, usually due to injury, and characterized by great swelling, redness, and pain with difficult functioning.

It is due to direct injury as biting the tongue, erosion by the teeth, contact with boiling liquids or other irritants, corrosive poisons, the stings of insects, and other forms of trauma.

Subluxations of the atlas, axis, and other cervical vertebræ, the first rib, the inferior maxillary or the hyoid bone, and muscular lesions of the cervical and upper costal muscles affect the circulation through the tongue, and in this way slight injuries cause more serious inflammations; recovery is delayed by the same lesions.

The **superficial form** is catarrhal and results in denudation of the surface and is constantly present in febrile conditions.

The **deep form** consists of hyperemia, infiltration with leucocytes with perhaps atrophy and degeneration of the muscle fibers following, or abscesses may arise from pyogenic infection.

Diagnosis. The tongue is swollen, painful and hardened. Increased flow of saliva; difficult mastication, deglutition and speech; fever with its constitutional disturbances, and suppuration may occur. Reflex contractions of the muscles of mastication and deglutition are usually present. Hypersensitive areas are found around the mandibular articulation and in the neighborhood of the third cervical vertebræ.

Treatment. Relaxation of all the cervical muscles especially the deep ones and those at the angle of the jaw, correction of any deviations found either in the vertebræ or the ribs or the

hyoid are indicated. If pus has formed, incision is necessary. Heat applied at the angle of the jaw may give relief during the intervals of treatment. Tracheotomy may be necessary to prevent suffocation.

Prognosis. With early treatment recovery is to be expected. Convalescence is slow. The purulent form is serious. Gangrene is more frequent than spontaneous resolution. Death may occur from suffocation.

GEOGRAPHICAL TONGUE

(Eczema of the tongue)

This is an inflammation of the tongue with desquamation of the superficial epithelium. The central portions of the round patches heal, which cause the tongue to resemble a map. Itching and heat may cause much annoyance. It is of unknown etiology; occurs in infants and children, not infrequently in adults, and is liable to relapse.

Treatment. The treatment is based upon the conditions as found on examination. Lesions responsible for the disturbed circulation include those already named in connection with glossitis. These are to be corrected when present. The condition of the digestive tract as a whole is to be investigated, and appropriate treatment initiated for whatever variations from the normal are found.

The food must be nonirritating and liquid. Strict milk diet has been useful in some instances. An examination of the blood will often give useful information concerning the requirements of the body.

Prognosis. Relapse is frequent. Recovery from each attack is to be expected, under proper care, but may be considerably delayed.

LEUCOPLAKIA BUCCALIS

(Ichthyosis lingualis; buccal psoriasis; smoker's tongue; leuco-keratosis mucosae oris)

This is a most obstinate chronic inflammation of the tongue, probably due to syphilis, with thickening of the squamous epithelium and the formation of firm, often white or pearly glistening plaques, occurring most commonly in heavy smokers. The lingual papillæ may be hypertrophied. It occurs in three varieties: (1) small, white slightly raised, even papillomatous spots (lingual corns); (2) a diffuse, thin, bluish-white or opaque white coating of the tongue, which is patchy and is most often seen upon the dorsum and sides; (3) diffuse oral leucoplakia involving the whole oral cavity and its mucosa. The edges of the patches are favorite localities for beginning cancer of the mouth.

Treatment. Surgery is advised when the patches are localized. Smoking should be discontinued. All irritating foods and drinks should be avoided. The removal of whatever lesions may be found interfering with the circulation may be tried.

Prognosis. The hardened areas can hardly be expected to disappear, except after long cessation of the irritating factors. Patients who have subjected the tongue to such treatment as is necessary to cause the disease, are hardly apt to endure the restriction necessary for recovery. The edges of the plaques are a constant irritant to the neighboring epithelium, and cancers often begin in these tissues. Patients in whose families cancer has appeared should be warned of this danger, and taught to avoid further irritation of the tongue.

DISEASES OF THE LIPS

The lips are the location of a few primary affections and a number of secondary ones. They are often involved in ordinary cutaneous diseases such as lupus, eczema, tinea, circinata, psoriasis, urticaria, tuberculosis rarely, and occasionally syphilis. The possibility of chancre of the lips must not be forgotten.

Acute Catarrhal Cheilitis. The commonest affection of the lips is that which is called "chapping." This is a mild catarrhal inflammation, usually caused by the action of very dry or cold air upon the lips. It may be very severe in those who are exposed to the air from the desert or winter in a rigorous climate. The thickened epithelium is detached in shreds leaving the upper layers painful, bleeding, and the seat of subsequent inflammations. Picking at these shreds of skin makes the condition much worse. The fissures may be so deep as to cause great pain and considerable disfigurement.

The tendency toward chapping of the lips is noted in persons whose general nutrition is lessened in any way and also in those who suffer from lesions of the first and second thoracic vertebra.

The treatment of chapped lips includes their protection with some nonirritating oily material. Warm applications may be gratefully received. Patients who have a tendency to chapped lips upon slight exposure should receive examination into the predisposing factors present, and the removal of these if possible.

Herpes Labialis (Herpes facialis) is a disease of the lips present in fevers, especially in those included as "bad colds." The small vesicles which first appear may become infected with pyogenic bacteria, and develop into quite large and very painful ulcers. They may occur frequently, with no recognizable cause, in persons who are poorly nourished or exposed to improper climatic conditions. The treatment consists in protection with any mild and

pleasant oily or gelatinous material, the removal of the systemic conditions, and such other corrective measures as may be found indicated on examination.

PERLECHE is a serious disease of the lips, not frequently present in this country. It is present usually in children whose sanitary surroundings are not good. The inflammation begins at both corners of the mouth and extends to the middle line. The epithelium becomes whitened, softened and easily detached. The hyperemia and inflammation lead the child constantly to lick its lips, hence the name. A streptococcus infection is always present and the disease is transmitted from one child to another by the use of common drinking vessels, towels, etc. The most important factor in treatment is cleanliness. Corrective work in the upper cervical and upper thoracic region and such other treatment as is indicated by the general health of the child facilitate speedy recovery.

THE TEETH

It has long been the tendency to consider the well-being of the teeth from the standpoint of local conditions in the mouth alone, and to consider diseases of the teeth from the standpoint of the dentist alone. This general attitude is not quite justified by the facts in the case. The teeth are well supplied with nerves, both sensory and vasomotor. It is probable that trophic nerves are distributed to the teeth also. So far as the effects produced as the result of bony lesions of the cervical and upper thoracic spinal segments there is no reason to exclude the teeth from the laws which govern other tissues of the oral cavity. Injury to the teeth produces reflex muscular contractions of the muscles of mastication and of the deep spinal muscles of the upper thoracic segments. These reflex contractions, especially if they are associated with bony lesions of the upper thoracic vertebræ, increase the painfulness of the injury and lessen the resistance of the buccal membranes to infection.

In all cases of pain associated with the teeth, especially that which persists for hours or days, vigorous treatment for the correction of lesions of the mandible and hyoid, the relaxation of the muscles already mentioned, and the establishment of better circulation around the mandible and the jaw will greatly relieve the pain and prevent much of the painful after-effects of such dental surgery as may be indicated in each case.

Pyorrhœa Alveolaris is a chronic pyogenic inflammation of the gums, around the sockets of the teeth, due to a specific amœba. Secondary infections with pyogenic bacteria are probably invariable. The collections of pus present in this disease may serve as a constant infection of the body. Many vague symptoms, and many cases of articular and other inflammations may be traced to pyorrhœa alveolaris and to abscesses at the roots of teeth. The microscopic examination of the fresh pus on a warm stage or a warm slide in a warm room gives the diagnosis of pyorrhœa. In doubtful cases an X-ray examination of the jaws is indicated.

The patient should be referred to a dental surgeon for local treatment. The correction of lesions as found permits more rapid recovery.

Abscesses of the Teeth and Alveolar Processes. These have been too long held as of merely dental interest. Recent studies of disease have indicated the presence of pus at the roots of the teeth in very many cases of toxemia, supposed to be autogenic, of vague symptoms of systemic infections, as well as in articular diseases.

The X-ray is of inestimable importance in these cases, and every patient who suffers from vague symptoms of toxemia should have X-ray plates made of the mandible and the maxillary bones. The ordinary dental examination of the teeth is often inefficient in these cases.

Treatment. The patient should be referred to a dental surgeon for treatment. The pus must be evacuated, and the tooth pulled or filled according to the local conditions.

DISTURBANCES OF SALIVARY SECRETION

The activities of the salivary glands may be profoundly modified by nervous disturbances, poisons, or circulatory changes. Two opposite conditions may be found.

Hypersecretion (Ptyalism). This is an abnormal increase in the amount of saliva. It may be merely uncomfortable or may amount to several quarts in a day's time. Almost any stomatitis, many nervous states, gestation or menstruation may be associated with some ptyalism. Mercury, arsenic, iodine, copper, silver, and some other metallic poisons; pilocarpine, tobacco, muscarine and certain other organic poisons, may cause marked ptyalism. It is present also in diseases associated with nausea. Bony lesions do not often cause sufficient hypersecretion to result in discomfort, though these may increase the effects of other etiological factors.

Hyposecretion (Xerostomia, aptyalism, dry mouth). This is a diminution in the amount of saliva, and may result in serious buccal disease. The dry, red, glazed mouth and tongue, sometimes fissured, is characteristic and is very painful. Eating and speaking are alike painful, sometimes impossible while the condition exists. It is sometimes present to a slight extent in acute coryza, but in its characteristic form is found as a neurosis, more often in women. It is probably due to functional disturbance of the salivary center in the medulla.

Treatment. Recovery from both hypersecretion and hyposecretion depends upon the discovery and removal of the causes of the conditions. Drugs must be stopped; occupational causes must be eliminated; disturbed structural relations must be corrected.

Muscular tension in the neck and around the jaw should be removed; the application of hot compresses or of ice bags may relieve the symptoms for a time.

ACUTE PAROTITIS

(Symptomatic parotitis; parotid bubo)

The pyogenic bacteria, the infectious agents of typhoid, syphilis, cholera, or any of the acute fevers or exanthemata, may gain entrance into the salivary glands and set up an acute inflammatory process. Mild infection leads to increased secretion and, later, more or less fibrous induration and perhaps stenosis of the ducts. Sialoliths may be formed. The secretion may accumulate behind the stenosis and a cyst of considerable size be formed. Pyogenic infections may cause suppuration with destruction of tissue.

Reflex muscular contractions cause difficulty in mastication. The jaws may be set so firmly as to suggest beginning trismus. Hypersensitive areas involve most of the tissues around the neck and the jaws. The mastoid process is often painful to the touch.

Injury to the pelvic or abdominal organs is sometimes followed by acute parotitis; recovery is usually uneventful, so far as the salivary glands are concerned.

Bony lesions affect the secretion and the circulation of the salivary glands; in order of frequency the mandible, hyoid, atlas occiput, axis, and the upper thoracic vertebræ and ribs and the clavicle have been reported in connection with acute parotitis.

Treatment. The atlas and axis seem to be most important from the structural standpoint. "The gland involved is generally on the side of the transverse process which is most anterior" (McConnell). "Pushing the surrounding tissues toward the affected glands, exerting no pressure directly upon them, reestablishes lymph drainage" (Emery). Other lesions often found include the upper cervical and the upper thoracic vertebræ, the upper ribs and the clavicle. These bony, and all muscular and ligamentous lesions, should be corrected wherever found.

Prognosis. If the causes can be removed, recovery is to be expected. When there has been much increase in the interstitial connective tissues, the gland may not return to its original size.

EPIDEMIC PAROTITIS

(Mumps). See Acute Infectious Diseases

CHRONIC PAROTITIS

(Mikulicz's disease)

This occurs when any agent irritating to the salivary glands is long continued. Probably the bony lesions mentioned in con-

nection with acute parotitis are more frequently important etiologically in chronic than in the acute diseases of these glands. The place of the bony lesion is found in its influence in predisposing to infection, and in delaying recovery. Mercury poisoning is an important factor in the chronic parotitis found in certain syphilitic cases. The use of calomel is of less importance in non-syphilitic cases than formerly. After mumps and other forms of acute parotitis a chronic inflammation may persist. Lead poisoning, chronic nephritis, and certain obscure gastro-intestinal diseases may cause chronic parotitis. Diseases of the ovaries and the testicles are sometimes associated with mild chronic parotitis. Inflammation of the lachrymal glands is a frequent complication.

The treatment is that of the causative factors. Mercury must be stopped, if it is being used as a drug or if it is an occupation-poisoning. The same is true of lead. Bony lesions are to be corrected as speedily as is possible under the circumstances. The treatment for acute parotitis is useful, especially in sub-acute cases.

Prognosis. Increase in the interstitial tissues is usually marked, and the gland can hardly be expected to return to its original size, especially if the disease is of long standing. Symptomatic recovery is usually secured, if the treatment is vigorously prosecuted.

OTHER ABNORMALITIES

The salivary glands are rarely the seat of neoplasms. The only treatment is surgical, when treatment is required at all.

Glass blowers and those who play on wind instruments may suffer from distension of Steno's duct and even of the parotid gland with air. If disturbing symptoms are present the condition can be removed by catheterization. Change of occupation may be necessary.

CHAPTER II

DISEASES OF THE ESOPHAGUS

INFLAMMATIONS

Esophagitis or inflammation of the esophagus may be acute or chronic, and may be either primary or secondary.

Acute Esophagitis arises from intense mechanical, thermal or chemical irritants; as a secondary complication of the specific fevers; toward the end in wasting diseases; in infants as a purely catarrhal type often without apparent cause; and from local disease.

Congestion of the mucosa and exfoliation of the superficial epithelium occurs. The normally scanty secretion is increased. Shallow erosions result, situated mostly on the tops of the longitudinal folds. These, healing, leave small scars.

Phlegmonous or diffuse suppurative esophagitis may be traumatic, may be due to foreign bodies or corrosive substances, with subsequent infection. It occurs more commonly by extension from the pharynx, stomach, periesophageal lymph nodes, vertebral column or the cricoid cartilage.

This form begins as a purulent infiltration of the submucosa, leading to localized or diffused collections of pus, the mucosa is reddened and undermined and fistulous openings are formed. The surrounding tissues are sometimes involved and the abscess may discharge into the larynx, trachea, rarely into the pleura and mediastinum.

Pustular. The papules of smallpox in the mucosa may rupture, forming ulcers.

Membranous. This is not uncommon in variola, measles, scarlatina, typhoid and typhus, pyemia, cholera, chronic Bright's disease, pneumonia, tuberculosis, and the gastro-intestinal catarrh of infants. The fibrinous deposit is rarely generalized, but is usually confined to the tops of the folds. Ulceration may occur with stenosis of the lumen from cicatricial contraction. True diphtheria of the esophagus is rare.

Exfoliative. (*Esophagitis dессicans superficialis.*) The etiology is not clear; in some cases is due to corrosives but usually occurs in neurotic individuals. The desquamation of the lining epithelium takes place in large flakes or as a complete cylinder.

Corrosive Esophagitis is due to corrosive poisons, chiefly acids and alkalis, as concentrated lye, carbolic and sulphuric acids. It is a necrosing inflammation resulting in serious contracture of the lumen if the patient survives.

Catarrhal may follow the acute form; may arise above a stricture, or may be the result of excessive alcoholism. The mucosa resembles that of chronic catarrhal inflammations elsewhere. Papillomatous or polypoid growths may occur, and leukoplakia may be present. The tenacious mucus or mucopus, the thickened muscular wall, and sometimes superficial ulcerations are the usual findings.

Follicular. The mucous glands are involved, the lumina are obstructed and there is excessive secretion, which leads to dilatation of the

glands and ducts into small cysts. There is round-celled infiltration around the glands which may result in abscess formation.

Diagnosis. The principal manifestations of these inflammations are: a dull pain under the sternum, difficult swallowing, tenderness over the cervical portion, and a copious mucoid secretion which is regurgitated or passes into the stomach. Cicatricial changes eventually lead to obstruction.

In the chronic form, in alcoholics, there is morning vomiting of esophageal mucus, sometimes mixed with the contents of the stomach. If the vomitus is only from the esophagus, the reaction is alkaline, but if gastric contents are present it is acid.

Foreign bodies may cause more or less complete obstruction and lead to phlegmonous inflammation or even to perforation.

Treatment. The treatment of all forms includes the relief of the underlying condition if the disease is secondary; correction of the cervical vertebræ which might interfere with the vagus; attention to the first to fifth thoracic; raising and spreading the ribs, especially at the sternal ends.

The diet must be absolutely non-irritating and liquid. It may be advisable to employ rectal feeding for a few days.

CARCINOMA OF THE ESOPHAGUS

This is the most important new growth and may be either primary or secondary, occurring most frequently in males between 50 and 60 years, particularly in smokers and drinkers.

Diagnosis. The symptoms are progressive dysphagia, and great pain which may become so extreme that emaciation occurs rapidly. Regurgitation may take place at once or be deferred for ten or fifteen minutes, according to the location and the amount of dilatation. The ejected material may be mixed with blood and cancerous fragments. The cervical glands are frequently enlarged and may give the first indication of the trouble. The X-ray will give information as to position and extent of involvement.

For diagnosis it is important to exclude external pressure from an aneurysm or tumor; to exclude cicatricial stricture and foreign bodies; and, lastly, to pass the sound with the greatest possible care. Auscultation on the left side of the spine may detect altered esophageal murmur.

Treatment. The patient may be made more comfortable by thorough treatment from the occiput to the eleventh dorsal. Rectal feeding or gavage may be necessary from the first, but should be postponed as long as there is not severe pain. Gastrostomy may prolong the patient's life in more comfort than without it.

Prognosis. The case is hopeless, patients dying in from six months to a year from asthenia or from sudden perforation.

ALTERATIONS IN THE LUMEN OF THE ESOPHAGUS

The alterations comprise two forms—stenosis or stricture, and dilatation.

Stenosis may be developmental or acquired.

The extrinsic causes are pressure from enlarged glands, aneurysms, and tumors of the lungs, pleura, or mediastinum.

The intrinsic causes include all forms of local inflammations, phlegmon, growths of thrush or tissue, cicatricial contraction of the wall from trauma, corrosives, syphilis, diphtheria, and foreign bodies.

Diagnosis. The symptoms depend upon the position and the degree of narrowing present. There is slowly increasing dysphagia which is common to all sites. Regurgitation of food is the most common symptom; if the stricture is high, the food may be returned immediately, if low after a slightly longer interval. Pain and emaciation follow when the narrowing is great. After all intra-thoracic diseases are excluded, the passage of an esophageal bougie determines the position and the degree. The X-ray may give an absolute diagnosis.

Treatment. If mal-adjustments are found affecting the innervation and the blood supply of the esophagus, see what correction will do for the case. If the cause is from cicatricial tissue, the passage of a bougie to secure progressive dilatation may effect relief. If the stricture is impassable, gastrostomy is the only means possible.

Prognosis. The prognosis is unfavorable except in cases of cicatricial contraction.

Spasmodic Stricture or Esophagismus occurs in neurotic individuals, especially young women, and also in elderly men, especially if hypochondriac.

Diagnosis. The trouble commences suddenly, usually during a meal, the food is retarded for some time, then either passes on to the stomach or is returned. It is attended by severe pain and retching. There is little emaciation.

On passing the sound, stricture may be found at different sites on different days, or it may be passed with ease at times. In some individuals the sound can always be passed without difficulty.

Treatment. The main treatment is that of the neurotic condition. Some specific lesion, especially in the upper thoracic region, may be found that has produced this particular attack. When the lesion is corrected the spasm disappears. Psycho-analysis is useful in hysterical cases.

As a last resort, passage of a full sized bougie two or three times a week may be necessary.

Dilatation or Diverticulum of the Esophagus occurs from pressure from within the lumen or from traction from inflammatory conditions outside of the tube, or may be congenital. The X-ray may give information as to the location and extent of the change in the lumen or the size, location and shape of diverticulum.

The most common symptom is regurgitation of the food.

Treatment. The causal condition must be cared for first. Surgery is a last resort.

Cardiospasm is a spasm of the circular muscle fibers at the cardiac orifice of the stomach. It causes a sensation of discomfort immediately after swallowing, and leads to dilatation of the esophagus. Since section of the vagus causes the condition, in cats, (Cannon) it seems probable that inhibitory influences acting on the vagus center might be responsible. At autopsy these muscle fibers are found hypertrophied. Rather rarely the condition is associated with ulcer or cancer of the stomach.

Treatment. Correction of lesions affecting the vagal or the splanchnic centers may give relief. Gradual and careful dilating with special instruments has been successful.

FOREIGN BODIES IN THE ESOPHAGUS

Coins, needles, pins, bits of metal, bones from fish and other foods, and many other foreign substances are often swallowed by accident or otherwise, and become lodged in the esophagus.

The history of the case should lead to an X-ray examination and thus the recognition of the exact location of the body. Its removal can be secured under the fluoroscope, if necessary.

After such an operation the food should be bland and liquid. The treatment advised for acute esophagitis should then be employed.

CHAPTER III

NEUROSES OF THE STOMACH

The neuroses are those disturbances of gastric functions which depend primarily upon disturbances in the nervous control of the organ, but which are not associated with recognizable structural changes in the gastric walls. These are classified briefly in the following outline; the description of each is given but the etiology and the treatment are given for all, since these factors are practically identical for all classes of neurosis.

Care in diagnosis is especially urged when gastric neurosis is suspected, since organic disease of the stomach may simulate nervous disease, and an error in diagnosis may cause fatal delay in efficient treatment for organic disease.

The neuroses include variations in secretion, sensation, and motion.

The **secretory** neuroses include those variations in the gastric juice due to disturbed nervous control, and not associated with organic disease of the stomach.

Hyperchlorhydria (hyperacidity) is a condition in which the gastric juice from the fasting stomach or after a test meal contains greater than the normal percentage of hydrochloric acid. It is doubtful whether a truly hyper-acid juice is ever secreted; variations in the dilution and in the combining substances, mucus, etc., present in the stomach probably cause the symptoms as found. These include a vague discomfort or burning pain, with weight and pressure in the epigastrium, perhaps with acid eructations, regurgitation and pyrosis, sometimes nausea and vomiting. Severe headache and vertigo are common. There is often a sinking feeling before meals. The pain lasts from one to three hours, and is relieved by vomiting or by taking some proteid food or an alkali. It is usually remittent, returning upon grief or worry, or without obvious cause, and finally becomes continuous. The bowels are constipated.

The usual physical examination discloses a moderate diffuse epigastric tenderness, with perhaps a slight dilatation.

Gastric Analysis: After Ewald's meal (one hour after), an excess of free HCl; three to four hours after a Leube-Rigel meal, the meat is digested but the starches remain unchanged.

Hypochlorhydria (anacidity; subacidity; achylia gastrica nervosa), is a diminution or absence of HCl, common in gastric cancer, pernicious anemia, and in atrophic gastritis, occurring not infrequently as a neurosis in hysteria, neurasthenia, and tabes dorsalis.

The symptoms begin with a sense of fullness and oppression after meals which may last all day, flatulence, headache, drowsiness, constipation, with the tongue pale, broad, flabby, and indented by the teeth.

The gastric analysis shows total acidity about 4; HCl and often the ferments absent; mucus absent; lactic acid absent except in traces.

Hypersecretion is an excessive secretion of hydrochloric acid and gastric juice in the fasting stomach, and is of two forms, periodic or intermittent (gastroxynis) and the continuous or chronic form.

Gastroxynis. The patient is apparently well when he is seized with a sensation of epigastric uneasiness which develops into pain and is followed by nausea which is persistent. Vomiting of a large amount of very acid gastric juice ultimately tinged with bile occurs. This may be ejected at intervals of a few hours. The throat may become raw and sore. The attack as a whole lasts from one to three hours, terminating abruptly, but tends to recur at varying intervals. If the attacks recur one upon another, the condition merges into the continuous form. The paroxysms occur most often at night or in the early morning. *Tabes dorsalis* should be strongly suspected.

Continuous Hypersecretion. The early symptoms are those of either hyperchlorhydria or gastroxynis. The epigastric pain becomes habitual after meals, vomiting of an acid fluid, at first occasionally, becoming once or more daily, commonly after breakfast. The condition may be associated with pyloric stenosis or gastrectasis. Gastric analysis: An abnormally large amount of acid gastric juice free from fragments of food is obtained from the fasting stomach.

The sensory neuroses include pain and variations in the normal gastric sensations, not due to organic disease of the stomach. The "nervous dyspepsia" of older writers was chiefly sensory.

Gastralgia is a paroxysmal gastric pain which may be a pure neurosis or may occur as a symptom of organic trouble in gastric ulcer, cancer, or in gastric crises of *tabes*. The pain is relieved by taking food and is most apt to occur when the stomach is empty. The attack is frequently preceded by slight nausea, or epigastric pressure, salivation, faintness, vertigo, or headache. Shortly afterward, a severe and agonizing pain begins in the epigastrium, radiates to the back, and along the costal margins especially to the left, extending in some cases to the scapula and entire abdomen. The face is pale and anxious, the hands and feet cold, the skin cool and wet, and the body curved forward with the abdomen hollow. The attack lasts from a few minutes to several hours.

Pressure with the flat of the hand is often grateful during an attack. There is a slight tenderness in the epigastrium. Gastric analysis shows the HCl often in excess.

Paroxysmal Bulimia (Hyperorexia) is a condition seen in hysteria, neurasthenia, migraine, epilepsy, exophthalmic goitre, and cerebral tumors. It is characterized by sudden attacks of burning epigastric pain, faintness, headache, and excessive hunger, especially at night, the paroxysm being often relieved by taking food.

Anorexia Nervosa. Death may be due to this absolute loss of appetite, which is very extreme, the sight of food exciting a spasm. It occurs as an hysterical manifestation in girls of 15 to 20 years. The patient is restless, takes to bed, emaciation is progressive and frequently reaches an extreme degree, the skin becomes dry and brawny, contractures of the lower extremities may develop, and death has been recorded.

Gastric Hyperesthesia. This is a condition in which a sense of pressure, burning, fullness or weight, or gnawing pain, with tenderness in the epigastrium, occurs during the process of digestion. The gastric analysis shows a normal gastric juice and digestion.

The motor neuroses include variations in the tone of the gastric wall and variations in the peristaltic waves, not due to organic disease.

Supermotility (hyperkinesis) is an increase in the normal motor activity of the stomach, and causes a too early discharge of the ingesta into the duodenum. It is best recognized by the radiograph or fluoroscopic examination, which also indicates the presence or absence of ulcer.

Nervous Vomiting occurs in children and adults. The stomach contents are ejected without preliminary nausea and straining; this usually takes

place shortly after eating and at irregular intervals. The general health is unimpaired. Primary periodic vomiting may occur as a neurosis in otherwise perfectly healthy persons, especially women while menstruating. The condition is associated with deficient tone of the muscular ring around the cardiac opening, and appears to be due to defective vagal innervation.

Peristaltic unrest (*tormina ventriculi*) is an annoying condition seen after eating in which the peristaltic movements are hyperactive, causing loud borborygmi, gurgling, and splashing. These are intensified by emotion, and may extend to the intestines. The condition is a frequent symptom of hysteria or neurasthenia.

Nervous eructations (*aerophagia*) is characterized by annoying belchings of air which has been swallowed. It continues for hours or days, or occurs in paroxysms which are excited by emotion. Hysterical women and children or neurasthenic patients are most often so affected. Anxiety, palpitation, epigastric fullness and distress may attend the paroxysms.

Rumination (*merycismus*) is a rare condition occurring especially in the feeble-minded, or idiotic or insane, in which the patient regurgitates the food and chews the cud.

Spasm of the pylorus may cause retention of the food in the stomach beyond the normal limit. It is probably associated with variations in secretion.

Etiology. Rarely a gastric neurosis is due to a single factor. The predisposing causes include a neurotic inheritance; unhygienic conditions such as poor ventilation, worry or over-work, improper foods or improper habits of eating; unpleasant surroundings at meal time, and especially eating under the influence of haste or excitement or with a sense of disgust at the appearance of the food, the service, or any other factor which causes annoyance; imperfect mastication due to habit, bad teeth, or pyorrhea, or the habitual use of cathartics.

Vertebral, rib, or other bony lesions are probably the most important causes of gastric neuroses. These may act for many years as irritating factors before the onset of recognizable symptoms; in such cases questioning usually elicits slight gastric symptoms which have been long present. The lesions involving the mid-thoracic region, especially with rotation, are most common. The fifth to the ninth thoracic vertebræ are almost invariably found rigid, and usually the spinous processes of these are approximated. Cervical lesions are practically constant. G. W. Bumpus gives lesions of the ensiform process an important place in the etiology of gastric neuroses. Reflex muscular contractions affect the regions just mentioned, and also the muscles of the anterior neck region. Hypersensitiveness is usually widespread and varies from day to day in the same individual. Often the tissues near the vertebral subluxations are analgesic; in such cases the correction of the lesions is often followed by the appearance of considerable pain. This may last for some days, and the patient should be warned of this possibility.

Among the less frequent causes of gastric neuroses may be mentioned eye strain, nasal polyps, hard ear wax, adenoids, organic

disease of the pelvic organs in both sexes (especially of the rectum, ovaries, or testes), and other causes of nervous irritation.

Repressions of old emotional storms, especially of disgust, are sometimes important in etiology. This can only be certainly determined by the use of psycho-analysis, carefully adapted to the individual needs.

Diagnosis. The diagnosis of the gastric neuroses can only be made after all organic diseases have been ruled out. The blood and urine show only the characteristics of the neurotic diathesis with signs of malnutrition, if this be present. The X-ray is often the only method of distinguishing an organic from a nervous gastric disorder. Gastric analysis shows the distinctive secretory disturbances, but in most cases does not determine whether this is due to nervous or to organic changes. The recognition of the underlying neurosis should not be considered of too great importance, since neurotic individuals are certainly not less subject to organic diseases than are those nervously sound, and in many instances a neurosis is itself due to a previously existing gastric disease. Even after all care has been taken in diagnosis, cases supposed to be neurotic may develop cancerous cachexia or a fatal hemorrhage from ulcer; on the other hand, cases in which a fatal outcome from cancer is expected may recover apparently perfect health.

When organic disease has been recognized, the presence of an associated neurosis may be important in magnifying and complicating the symptoms. For this reason, the treatment advised for the neuroses may often be employed with excellent palliative effects, even in the most serious organic gastric disease.

Treatment. The treatment includes the removal of every etiological factor possible. The correction of structural lesions must be secured with the least possible irritation, as a rule, though in long standing cases with hyposecretion and akinesis the use of energetic and rather stimulating methods in the necessary corrective manipulations gives excellent results. In the cases with hyperkinesis and hypersecretion, especially with considerable pain at times, the manipulations required for correction should be given in a slow and gradual way, carefully avoiding any jerky or sudden methods. Some exceptions are found to these rules, but in general it is best to secure corrections very gently in those cases in which the normal activities and sensations are increased, and to employ more energetic and stimulating methods when the normal activities seem to be diminished.

Carefully graded exercises are useful, both for the direct and for the psychological effect.

Thorough inhibition of the splanchnics and the application of hot packs are beneficial in gastralgia.

Properly fitted corsets may give relief in neurotic women. In cases in which vagal functions seem at fault (vomiting, nausea, and others) the patient should eat while lying in bed, or in a semi-reclining position, so that the head is supported by pillows, with no weight upon the neck.

The dietetic requirements are varied. It is often best to advise that each meal consist of a single article of food. Very often, for the first few days, the patient may be allowed any one article he chooses, at each meal, and only one. From his account of symptoms during these few days, and the effect produced upon his digestion, the permanent dietetic instructions may be safely determined. Often five or even seven small meals are better than two or three ordinary meals. Exclusive milk diet may be useful.

Perhaps more important than the actual quality of food, in purely nervous disturbances, is the manner of eating. Leisurely habits, a calm mental state, and eating in a quiet clean place, of food that appears clean and attractive, is sometimes the most important requisite to recovery.

A glass of hot water half an hour before meals, or upon arising in the morning, or just before retiring at night, all give relief in some cases. Half an hour of rest, lying upon the right side, relieves the symptoms in many patients. Every case is a law to itself.

In some cases the use of psycho-analytic methods is advisable. It is usually best to delay this until structural corrections have been made and relief of symptoms is still delayed.

In hyperchlorhydria, an exclusive meat diet is often recommended.

In hypochlorhydria, a light, easily digested, mixed diet is best.

In hyperæsthesia, rectal feeding is sometimes necessary.

In hypersecretion, lavage is useful.

In atony, the meals must be small and frequent and the fluids limited; if with dilatation, lavage is useful.

Prognosis. In all neuroses the prospect of life is good, perhaps even better than for normal individuals; the average neurotic takes excellent care of himself. Recovery is usually slow, with many recurrences. If a patient has a fairly good heredity, and is willing to obey instructions and to submit to the treatment for the correction of the lesions, permanent recovery may be expected. Unfortunately, such patients usually cease being treated when the symptoms subside, and bony lesions are allowed to persist. Recurrences are almost inevitable if the underlying lesions are not corrected, or if the original causes of the neurosis persist or recur.

CHAPTER IV

ORGANIC GASTRIC DISEASES

ACUTE CATARRHAL GASTRITIS

(Simple gastritis; gastric fever; bilious fever; acute indigestion; subacute gastritis; acute dyspepsia; acute catarrh of the stomach)

Acute catarrhal gastritis is an inflammation of the stomach which may be infectious or toxic in origin, or may occur as a complication of other diseases, and is characterized by distress and tenderness of the stomach, severe epigastric pain, vomiting and slight constitutional disturbances.

Etiology. The exciting causes are: ingestion of unripe fruits, decomposed animal substances, irritant poisons, the abuse of alcohol, tea, coffee, etc. The predisposing causes are lesions of the spine from the fourth to ninth or the ribs, injury or irritation of the vagi, especially the right, or sudden strain or blow affecting the mid-thoracic spinal column. Even wholesome food, taken during extreme fatigue, or when serious emotional disturbance is present, may precipitate an attack of acute gastritis.

Pathology. The mucosa shows the usual inflammatory changes of an inflamed mucous membrane. The various epithelial cells of the numerous glands may become highly granular, undergo mucoid degeneration or desquamate. There may be minute extravasations of blood, hemorrhagic erosions, pustules, or aphthous patches. The submucosa is infiltrated and the whole wall may be congested. The pyloric region is usually affected.

A false membrane may be found in diphtheria, pneumonia and typhus; pustules in smallpox and multiple abscesses in pyemia.

Diagnosis. The onset is sudden in severe cases, with epigastric pain passing through to the back, accompanied by deep diffuse tenderness; the tongue is furred, the breath heavy; there is vomiting at first of the stomach contents of undigested food, then viscid mucus, and finally, bilious matter or blood-streaked material. There is slight fever with marked prostration; flashes of heat with sensations of burning in the palms of the hands and the soles of the feet may be present. In mild cases, the symptoms may be only abdominal distress, nausea, tongue heavily coated, and eructations ending in vomiting, which brings relief. There is either constipation or diarrhea.

Reflex muscular contractions in the midthoracic region are constant, whether preëxisting lesions had been recognizable or not. This spinal area is hypersensitive and the tissues have a stiffened, pasty feeling on palpation.

The region of the stomach is hypersensitive to pressure. When a strictly localized area of tenderness over the pyloric region persists a gastric ulcer should be suspected.

Gastric analysis shows deficiency of HCl, excess of the organic acids, mucus, and remnants of undigested food. Yeast may be present.

Acute gastritis may complicate and mask a number of other gastrointestinal and systemic diseases. Care should be taken to differentiate from general infections, gall-stone attacks, peritonitis, appendicitis, gastric crises of tabes dorsalis, pregnancy, early stages of ileus, and ulcer in dependent area of stomach in ptosis. The X-ray is often necessary for diagnosis.

Physical Examination. The spinal and costal lesions are as varied as are the cases, including entire spinal column flat and abnormally rigid; slight double curves crossing at the sixth dorsal and involving the whole spinal column; a rotation of the fourth to eighth dorsal with spines to the left; depression of the ribs from the fifth to tenth; various combinations of lesions.

"Contractions, coupled with soreness of the spinal muscles between fourth and eighth dorsal is almost a positive sign of dyspepsia in some form. Perhaps the most common vertebral lesion is a right lateral condition of one or more vertebræ between the fourth and eighth dorsal, though an anterior condition of one or more vertebræ in this region is a very common finding, and in about nine-tenths of the cases is due to a posterior lumbar. Rib lesions also are very common. A twisting or dropping down in the mid-axillary line of the fifth to eighth left ribs is often found in dyspepsia. This lesion may be independent of, or due to, spinal lesion. Other bony lesions affecting the digestion directly or reflexly may be found from the occiput to the coccyx."

—F. HUDSON.

Treatment. The correction of whatever irregularities are found in the structural relations is the most important factor and the treatments should be continued until the lesions are corrected and the hypersensitive areas are gone. The patient should be advised to keep as quiet as possible, although rest in bed is not imperative.

Diet. Until the symptoms have disappeared, no food should be allowed. Cool water may be given freely; hot water is given if the hunger is annoying. A little lemon juice or grape juice may be permitted when the patient finds the water alone distasteful. The abdomen should be palpated in all cases, and when fecal matter or accumulations of gas are recognized the colon should be washed in clear water or normal salt solution. Copious drinking of very hot water may relieve the vomiting and secure a more complete removal of the offending gastric contents.

Relief can sometimes be given by inhibition in the suboccipital triangles, or over the course of the vagus in the neck; this sometimes increases the nausea and should then be discontinued, if relief does not become evident in two minutes or so. Slow,

steady pressure, gradually increasing, should be given upon the area between the transverse processes of the fifth to the seventh thoracic vertebræ. An ice bag over the pit of the stomach or over the spinal column in the mid-thoracic region gives relief. Flatulency may be a very distressing symptom. Quick movements, increasing the flexibility of the entire lower thoracic spinal column, raises the blood pressure and facilitates the absorption of the gas. A hot water bottle may exert soothing and comfortable warm pressure over the pit of the stomach. Patients with gas in the stomach, at any time, should be carefully watched to prevent air-swallowing. This act, which seems to be almost instinctive, adds to the misery and prolongs the attack.

When toxic substances are present in the food taken or as the result of fermentative or putrefactive process, and are absorbed into the blood stream rapidly, the effect upon the system may be profoundly depressing. The phenomena usually associated with surgical collapse may be present. The treatment must be energetic and careful if the most rapid recovery is to be secured. The drinking of quantities of hot water is useful in promoting the elimination of the toxins from the body. Very free colonic irrigation serves the same purpose. The rather heavy, energetic treatment which increases the mobility of the spinal and costal articulations is also efficient. The ribs should be well raised. Care should be taken to avoid reflex muscular contractions, especially in the suboccipital and cervical areas.

Prognosis. In mild cases, the duration is from a few days to a week, terminating in recovery, although the strength may not be restored for some time. In the severer cases, the acute symptoms usually subside in from a day to four days under osteopathic treatment, and complete recovery may be expected within a week or two. The prognosis in the toxic form is very grave; many perish from the shock; others, later, from exhaustion and starvation incident to the destructive changes. Those who recover are nearly always affected with chronic gastric disturbances.

Sequelæ. Each acute attack predisposes to later attacks, and the condition of chronic inflammation may ensue. The reflex muscular contractions may be responsible for abnormal spinal and costal structural states, which also increase the danger of subsequent attacks, and of the chronic state of inflammation.

ACUTE PHLEGMONOUS GASTRITIS (abscess of the stomach). This is a rare condition, in which pyogenic bacteria invade the walls of the stomach, forming localized abscesses, or burrowing between the layers of the stomach walls. Practically the entire gastric wall may become converted into masses of pus, divided by strips and layers of the original tissues, now infiltrated and degenerated.

The diagnosis rests upon the high fever, severe pain, chills, and other symptoms of pyogenic invasion. Leucocytosis is present, and may help in diagnosis in doubtful cases. The vomiting of pus makes the diagnosis clear.

It seems probable that small abscesses may drain spontaneously into the stomach, and recovery may occur. The burrowing type probably is invariably fatal. When the abscess is localized, surgery may help, though the prognosis is bad under all circumstances.

CHRONIC GASTRITIS

(Chronic catarrh of the stomach; chronic dyspepsia; drunkard's dyspepsia)

Chronic gastritis is a chronic inflammatory disease of the stomach, characterized by increased secretion of mucus, usually diminished gastric juice and degenerative changes in mucosa and muscularis.

Etiology. The causes of the disease are numerous, as is to be expected from its functional and structural relationships. It is more often found in men than in women, as is evident from the list of causes of the disease. Repeated acute attacks of gastritis may result in chronic inflammation. Both primary and secondary forms of the disease are recognized, in both of which the bony lesion is variably important in etiology. Primary chronic gastritis may result from irregular or hasty eating, worry or other emotional disturbances, especially at mealtime, and constant dietetic errors, which include too great proportions of fat and of carbohydrates; too much tea, coffee, alcohol or ice water, or the multitude of soda-fountain drinks; insufficient chewing; highly spiced and highly salted foods; the use of tobacco, and other bad habits. The secondary form is due to other pre-existing disease, as syphilis, nephritis, gout, anemia, chlorosis, diabetes, and others; local causes, cancer, ulcer, etc.; disturbances of the portal circulation, with or without cardiac disease or cirrhosis. Swallowing infected sputum or saliva, as in pulmonary tuberculosis, pyorrhea alveolaris, etc., may be responsible for the inflammation. Tight lacing is not now a common cause.

The most important bony lesions are those of the fourth to the ninth vertebræ and the corresponding ribs, lesions of the cervical region and of the first and second ribs and the clavicles. These act, probably through the related nerve centers, upon the stomach, affecting its secretions, muscular movements, nutrition, and circulation.

Pathology. Three states of chronic gastritis are usually considered in dealing with its pathology. These are probably to a great extent different stages in the same process, though it seems that in some individuals the picture is typical of one or another form from beginning to the end. The simplest and most tractable and probably the earliest pathological change in chronic gastritis is that which is best characterized by the expression, "simple catarrhal." In this type an increased amount of mucin is secreted. This is mixed with the food which is taken, and may be vomited or may pass on into the intestine and be digested. It forms a thick, more or less tenacious, membrane upon the surface of the gastric mucosa. This protects the mucous membrane from the stimulating influence of the food which is taken and also is itself an irritation to the underlying mucosa, preventing secretion and delaying muscular action. The mucous membrane may be grayish in color and usually shows small hemorrhagic areas, especially near the pylorus. The granular elements show various stages of mucous and fatty degeneration; erosion may occur in patches. Proliferation of the mucous glands is abundant. The mucosa may be thickened,

or may be thinned, through degeneration and erosion. The overgrowth of the sub-mucous connective tissue, with or without its subsequent contraction, throws the mucous membrane itself into irregular folds and ridges. Atypical branching of the tubules is frequently noticed.

Hypertrophic Gastritis, sclerosis of the stomach or cirrhosis ventriculi, is characterized by the presence of the changes in the mucous membrane already described, to which is added considerable overgrowth of the muscular and connective tissue walls of the stomach. The walls may become so thick and the contraction of the newly-formed connective tissue so profound, that the lumen of the stomach is greatly diminished. This hypertrophy is usually most marked around the pyloric orifice, thus giving rise to the condition called hypertrophic stenosis. This intense multiplication of the muscular and connective tissues lessens the elasticity of the mucous layer of the stomach, interferes with the circulation of the blood, and probably exerts more or less of a pressure effect upon the nerve plexus and nerve endings. As the result of this, the atrophy of the glandular elements is almost certain to occur.

Atrophic Gastritis, phthisis ventriculi, represents the terminal stage of chronic gastritis. The atrophic change may be the most conspicuous feature from the beginning, or it may follow the pathological steps which have just been enumerated. The surface of the stomach is smooth, glistening, grayish, like a thin sheet of connective tissue. Here and there small areas made up of remnants of the gastric mucosa may be discerned. Pigmented areas, the result of old hemorrhages, may be found. In the muscular wall, ridges of the hypertrophied muscle and connective tissue may remain; especially around the pyloric region considerable thickening may be present. But generally speaking, the stomach is left in the form of a thin, smooth, dry, inelastic bag which forms no secretion, originates no sensory impulses, nor is capable of reacting to any nervous stimulation.

Diagnosis. In the simple catarrhal form the symptoms are most varied. The appetite is capricious, there is little thirst, but the patient craves much fluid with his meals. After eating there is epigastric distress, oppression, sense of fullness, pyrosis occasionally, pain varying at different times, and these signs are associated with tenderness. The frequent eructations of gas may be foul or odorless, there is belching, and well-marked tympanitic distention of the abdomen. Vomiting, preceded by nausea, is rather frequent but irregular, the most characteristic being that in which the mucus is vomited in the morning on arising. Constipation is usually present but may alternate with diarrhea.

The tongue shows swollen papillæ, indented margins, red at its tip and edges. A bad taste of a dry, pasty, or salty character, especially in the morning on arising, and salivation often occurs. Palpitation of the heart is not uncommon. The "stomach cough" is due to a chronic pharyngitis which is often present. The nervous symptoms include headache, vertigo, disturbed or dreaming sleep, depression of spirits, yawning, drowsiness and a feeling of languor. In late stages, especially in the atrophic form, the symptoms and blood count may simulate pernicious anemia.

The spinal region is hypersensitive, especially just before an exacerbation. The sublaxations include rotations anywhere from

the third to ninth dorsal vertebræ; flat spine, with any sort of individual lesions; double curves, crossing between the fifth and seventh dorsal; elevated or depressed ribs, corresponding to the vertebral lesions or sometimes a general dropping; more rarely, lesions of the first to third, or around the seventh cervical vertebræ affecting the vagi. Spinal rigidity is marked in all cases.

The urine is usually highly colored with a heavy deposit of urates, and calcium oxalate crystals are found.

The blood shows poor nutrition and frequently the eosinophiles are increased.

In **Simple Gastritis**, after Ewald's test meal, the HCl is diminished or absent, lactic and acetic acids are found, pepsin and rennin always present and an excess of mucus mixed with the food remnants. The fasting stomach contains a little slimy mucus and sometimes cells from the glands. Röntgenological examination is of value.

In **Hypertrophic Gastritis**, after the Ewald meal, HCl, pepsin and rennin are absent. The fasting stomach is empty. The motor function of the stomach may not be much disturbed or there may be hypermotility.

Treatment. Persistent and continued treatment to secure correction of any irregularities of the spinal or rib structures, and securing increased mobility of each articulation is essential.

Diet. Correction of the diet is absolutely necessary. Increased drinking of water, either hot or cold, is usually necessary. Regular meals of well-cooked, well-balanced food, thoroughly masticated, with such variations as the case demands, will materially assist recovery. A single article of food at each meal is sometimes well digested. The bowels must receive careful attention. Corrective and systematic exercises may be necessary to tone up the abdominal musculature. Washing out the stomach is sometimes necessary when vomiting persists or when there is much mucus. Drinking a half to a pint of hot water from a half to an hour before meals and especially before breakfast may be a substitute for the usual method of washing. Teeth and tonsils should receive attention.

Prognosis. If the condition is secondary the recovery depends upon the curability of the primary disease. In primary cases of the catarrhal forms recovery may be expected only in patients willing to coöperate in following out all dietetic and hygienic advice and having treatment regularly. Supervision with treatment as indicated should be continued for at least six months.

In the hypertrophic form a symptomatic recovery is possible. In the atrophic form a comfortable life depends upon the maintenance of hygienic conditions.

GASTRIC AND DUODENAL ULCER

(Perforating ulcer; peptic ulcer)

Peptic ulcer is a gradually destroying lesion of the stomach or the duodenum, never below the bile papillæ (that is, in parts not exposed to the gastric juice). The ulcer is usually single. Rarely, two, or even several, may occur at the same time or in succession.

Etiology. The predisposing causes are: age, young women from 15 to 30 years, men toward middle life (recent surgical statistics increase the percentages of men); extensive superficial burns; overwork; poor food; anemia; chlorosis; lesions of the spine in the splanchnic area; (the sixth thoracic especially); disturbed circulation from any cause.

The immediate factors are not well understood, but include disturbed circulation and erosion of these areas through the digestive action of the gastric juice. Disturbed motility (spasm of the muscularis mucosæ) deranged innervation, circulatory involvement and infections and toxins are perhaps all possible factors in the pathogenesis.

Site. The solitary ulcer is most frequently found on the posterior wall near to, or involving, the lesser curvature and in the neighborhood of the pylorus. Acute ulcers may be found in the middle region, or at the cardiac end, but the cardiac orifice is rarely implicated. Ulcers may sometimes be situated upon the anterior wall and are then very liable to perforate. Duodenal ulcers are now known to be much more frequently present than was formerly supposed.

Pathology. The acute form is small, sharply punched out, and the edges are clear cut and soft, the floor smooth and the serous coat not thickened.

The chronic form, the typical ulcer, is round or oval, extending more or less into the wall of the viscus; has a characteristic funnel shape, the edges being terraced, more or less sharply cut, and gradually narrowing to the base. In very chronic cases, the edges may be rounded and the whole wall thickened with marked vascularity in the margins and base.

The floor is formed by the submucosa, the muscular coat or the serous coat, which may be thickened and adherent to other organs.

In healing, if the mucosa is alone involved, a smooth scar is left; but if the deeper structures were involved, cicatricial contraction may cause serious changes, a narrowing of the pyloric orifice, dilatation of the stomach or hour-glass contraction.

Perforation may occur with subsequent peritonitis; adhesions may form between the walls of the stomach and other organs so that the ulcer may burrow into them; gastro-duodenal fistula may form; perforation may occur into the pleura, or into the lesser peritoneum, giving rise to subphrenic abscess.

Hemorrhage may arise from the erosion of a large blood vessel. **Healing** occurs by the formation of scar tissue.

Diagnosis. There is no disease or condition which may have such characteristic symptoms, or which may be more ill-defined. The proportion of autopsies in which ulcers are found is much

greater than would be expected from the small number of cases in which the disease is recognized ante mortem.

Pain and tenderness over the epigastrium are constant. The pain is rendered worse by eating or by firm pressure, when the ulcer is located near the cardiac end of the stomach, but is relieved by taking food or drink when the ulcer is near the pylorus or in the duodenum. This pain varies with the location of the ulcer, is constant and well defined, and is accompanied by cutaneous sensitiveness or hyperalgesia extending further to the left. The upper belly of the left rectus muscle is frequently contracted.

The reflex area of spinal hypersensitiveness varies slightly, but is usually found between the sixth and the ninth thoracic spinous or transverse processes.

Vomiting may occur soon after eating or more frequently after an hour or so, and usually gives relief.

Hematemesis may be slight or copious, and may be directly fatal. Melæna, or passage of blood by the bowel, is present in about ten per cent of cases.

The appetite is good but the patient may be afraid to eat, lest pain is set up. The tongue is clean and may be pale and flabby.

The vertebral lesions may be anywhere in the splanchnic area, but those from the fifth to the ninth seem especially frequent. There may be lesions of the cervical region. The anterior ends of the eighth to the tenth ribs are usually subluxated.

There is usually found a circumscribed tenderness, or a tender spot, to the left of the eleventh or twelfth dorsal vertebræ. In old ulcers a distinct induration may often be felt near the pylorus. The X-ray gives exact information in a surprisingly large number of cases.

The Blood shows a chloro-anemia which may be 1,000,000 or less per cmm.

Gastric Analysis shows excess of free HCl (hyperchlorhydria). Increase of organic acids is rare, but may be present in old standing cases with dilatation. The stomach tube must be used with care. Blood is frequently found; sometimes there may be shreds of tissue or isolated cells from the edges of the ulcer. When the condition is coexistent with cancer, as often occurs, the vomitus presents very contradictory findings.

Duodenal Ulcer. Three symptoms form an almost pathognomonic picture; "hunger pain," pain coming on two to four hours after food and often at night, relieved by food, and situated in the right hypochondrium; tenderness in the right hypochondrium with rigidity of the right rectus muscle; repeated attacks of melæna, not accompanied by hematemesis, the stools being dark and tarry; history of digestive disturbances.

Treatment. Structural corrective work must be done until the spine and its associated structures are in normal adjustment, paying particular attention to the area of the sixth dorsal. The pain may be lessened by deep steady pressure through the splanchnic area. The vomiting is best relieved by thorough relaxation followed by deep steady pressure in the region of the fourth and fifth dorsals on the right side. Be specially careful in giving direct treatment or in palpating over the abdomen. Absolute rest in bed must be insisted upon for at least a month.

The diet at first should be very restricted. Rectal feeding, or none, should be given for a few days, in moderately severe attacks. Small amounts of very bland, easily digested, and moderately warm food may then be given at stated intervals. It may consist of milk or buttermilk or milk-gruel, of wheat flour or arrowroot, or if milk is not well borne, of egg albumen, or Leube's beef solution. "Milk surely has a specific action on the disease when hyperchlorhydria is present, as it usually is. The excessive quantity of acid is all used up in the digestion of the milk, so being removed from contact with the stomach walls in this physiological way, it is powerless to increase or perpetuate the trouble."—R. F. Weeks.

Lavage is useful when there is a complicating catarrhal gastritis, or for the removal of improper foods.

In active hemorrhage, ice bags over the abdomen, rectal feeding, and later hypodermoclysis may be used according to the case. Surgical interference is indicated in a chronic indurated ulcer; in mechanical interference with the passage of the gastric contents; in recurring hemorrhage; in perforation, very speedily.

Prognosis. Guardedly favorable, depending upon the patient, the severity of the symptoms, and the duration. **Complications** include hemorrhage and perforation. **Sequelæ** include stenosis from cicatrization. The relation of cancer to ulcer must not be forgotten.

CANCER OF THE STOMACH

By far the most important of all the neoplasms of the stomach are the cancers. Some variation is noted as to the relative frequency of certain types, but the scirrhus and the colloid types occupy first place. Squamous epithelioma is occasionally found near the cardiac orifice; it probably originates in the epithelium of the esophagus, or from cells which belong to that structure. Sarcoma is rare; it is not to be distinguished from carcinoma except by autopsy or surgery.

Etiology. The true causes of cancer are yet unknown. There seems no doubt that almost any constant irritation may be an important factor. In some individuals inflammatory reproduction

of cells does not cease at a reparative stage, but continues on into the formation of malign growths. In acute and chronic gastritis, gastric ulcer, and trauma due to swallowing injurious objects, the stomach is certainly provided with sufficient causes of irritation. In its embryonic development considerable rearrangement of the cell masses is necessary; from the standpoint of Cohnheim's theory it is to be expected that gastric cancers should be relatively frequent, one-half of all cases. There is considerable evidence in favor of the view that an inheritance of possible cancer follows Mendel's law, being a recessive characteristic. Cancer is everywhere most frequent in late middle life and early old age. Rarely cases are seen in children, even at birth.

Gastric cancer is much more frequent among men than women.

Later statistics indicate constantly more closely the relationship between gastric ulcer and gastric cancer—the cancer arising from the edge of the ulcer. When the cell-multiplication characteristic of gastric ulcer and of catarrhal and hypertrophic gastritis is remembered, it seems surprising that this relationship has not long been recognized. Alcoholism is present in a large proportion of cancer cases. The place of tuberculosis, worry, and direct trauma is very uncertain.

The place of bony lesions in the etiology of cancer is still doubtful. Since these seem to affect the vasomotor control, the secretory activity, and the muscular activity, it would seem, *a priori*, that these might be responsible, at least indirectly, for the irritation which seems one factor in cancer growth. In some instances, it seems that nervous impulses may initiate cell reproduction, and it is thus possible that abnormal nerve impulses may be responsible for the constant and unbridled overgrowth; or it may be that failure of the normal controlling impulses is responsible for the continued multiplication of the cells.

In any event, the maintenance of a correct circulation and innervation for the stomach must be the best thing for resistance to disease and for recovery from injury.

Site. The growth may be situated at either orifice or in the wall, the pylorus first in frequency, then the lesser curvature and next the cardia. The carcinoma may infiltrate all the coats and invade the neighboring organs, the dilated lymphatic vessels of the serous coat being filled with the carcinoma cells. The retro-peritoneal, inguinal, thoracic, supraclavicular lymph glands become involved. Metastasis may take place through the blood vessels.

Diagnosis. Early diagnosis is difficult. When gastric ulcer becomes associated with diminished hydrochloric acid or its total lack, cancer should be strongly suspected. When men or women past forty become subject to gastric symptoms for which no adequate cause can be found, the diagnosis of cancer is probable.

The most satisfactory information comes from the study of a series of X-ray plates. Exploratory laparotomy may be indicated. The general symptoms are, loss of weight and strength; the skin is often of a yellow or lemon tint which with the emaciation gives the cachectic appearance; mild fever; indicanuria, edema, especially of the ankles, and constipation or diarrhea.

The functional symptoms include anorexia and nausea, though the appetite may remain good. Vomiting may occur early or late, varying with the case, and being more frequent when the orifices are involved. Hemorrhage in some cases is the first symptom. It is rarely profuse. Usually there is a slight oozing which when mixed with the stomach secretions produces the "coffee-ground" appearance of the vomitus. Pain is variable, most commonly in the epigastrium, and may be of a burning, dragging, gnawing character. It is not much relieved by vomiting; is aggravated by taking food, and is accompanied by marked tenderness of the epigastrium on pressure. It is most marked between the nipple line and the umbilicus in front, and between the fifth and twelfth ribs in the back. Lesions may be found anywhere from the fourth to the ninth dorsal vertebræ and in the corresponding ribs. These seem to be due to reflex muscular contractions. The ribs in general may be much depressed; neck lesions may be found. Bony and muscular lesions are probably secondary.

The tumor may be felt, is motile, changing with respiration, and is painful on palpation. The percussion note over the tumor is often flat.

The urine may be unchanged; it usually contains increased indican. An anemia simulating the primary pernicious type is sometimes present. The red cell count is always low, sometimes dropping progressively until death; the color index is usually below normal; nucleated reds are rare, and a leucocytosis is present, but varies greatly. Atypical cells are abundant.

Gastric analysis. The danger of perforation by a stomach tube in the hands of any but an expert—perhaps, even then—must not be forgotten. The vomitus and the washings should be examined frequently in suspected cases.

Probably the most important finding is the diminished or lacking hydrochloric acid. This condition may be present also in atrophic and in nervous gastritis, in carcinoma of the duodenum or pancreas, in pernicious anemia, and in other more easily recognized conditions. It is also true that there may be increased hydrochloric under certain circumstances, with cancer; as, for example, when a cancer arises from the edge of an ulcer. The low hydrochloric seems to be due to the presence of some combining agent, probably from the cancer cells themselves. Lactic acid is present only when there is a deficiency of hydrochloric. The growth of

the Oppler-Boas bacillus occurs only in the presence of lactic and the absence of hydrochloric acid. This gives it place in diagnosis.

Blood and pus are fairly constant findings. Often the examination of centrifugalized washings will show some of the cancer cells. These may be found in shreds large enough for frozen or paraffin section, and the diagnosis can then be made with accuracy. More often the cells are found in small groups; if these show irregular karyokinetic figures the diagnosis of malignant neoplasm is justified.

Complications. Secondary growths are common, especially of the liver and the lymph glands, especially one at the posterior border of the sterno-mastoid muscle. Perforation may cause sudden death.

Treatment. Early diagnosis is difficult and very important. Early surgical treatment offers the best hope of recovery. Palliative treatment is necessary in most cases. A good deal of the pain may be relieved by careful spinal treatment using such measures as are indicated in the particular case.

A milk diet or milk with other easily digested foods is advisable. Lavage may be necessary to control vomiting and excessive fermentation. The bowels must be kept normal. Enemas and rectal feeding are useful.

The pain can be controlled for a time by ice bags, etc. When the diagnosis of inoperable carcinoma, or recurrent carcinoma has been made, the patient should be kept comfortable though at the expense of a few days of life. So the use of cocaine, opium, and other analgesics is fully indicated. Toward the last it is sometimes necessary to use chloroform. The use of drugs should be postponed until the hopelessness of the case is evident.

Prognosis. Early surgery may give a good prognosis. Otherwise death is to be expected in about six months after the disease is recognized. The scirrhus type presents a somewhat slower progress than other forms.

GASTRIC DILATATION

(Gastrectasis; pyloric obstruction; pyloric stenosis)

Gastrectasis is an abnormal increase in the size of the cavity of the stomach and may be from nonobstructive or obstructive causes. The normal stomach contracts when empty; a relaxed stomach, after food has passed from it, is atonic; it may be dilated or may become dilated at any time.

Etiology. The nonobstructive causes are due to atony of the muscular coat whether as the result of repeated overdistention with food, of constitutional diseases, as anemia, acute fevers or

chronic gastritis, or of defective innervation from lesions in the splanchnic region, general weakness from flat, ragged, rigid spines or those with curvatures. The rigid spine, with slight posterior curve, involving the tenth thoracic to the second lumbar vertebræ, is a very frequent etiological factor.

Obstructive dilatation is caused by stenosis of the pylorus from cicatrizing ulcer or from cancer; by pressure of the duodenum or contracture after duodenal ulcer; abdominal tumors; by contraction of pylorus; by adhesions in chronic gastritis.

In acute dilatation the predisposing factors are operation under general anæsthesia; severe and prolonged disease; indiscretions in diet; disease or deformity of the spine; traumatism. Direct causes are primary paresis of the gastric musculature, or obstruction to the onward flow of the gastric contents, especially to obstructions just below the bile papillæ of the duodenum, or at the point where the duodenum passes beneath the insertion of the mesentery.

Diagnosis. The symptoms occur at irregular intervals; pain may be several hours after eating; at the end of the day; or several days may intervene between attacks. There is diffuse burning epigastric pain relieved by vomiting which the patients often excite. The pain is most marked at night. Flatulence and constipation are common. The tongue is pale and furred, or red, smooth and shiny; or soft and flabby. There is loss of strength and flesh and the respiration and circulation are both affected. The patient is irritable, depressed, more or less melancholy and subject to vertigo.

In acute paralytic distention due to blows or operations upon the abdomen, the symptoms appear suddenly, the surrounding organs are interfered with, and collapse follows. At first there is some belching but the patient is soon unable to move the gas and suffers extreme discomfort, palpitation, and dyspnea. Vomiting is persistent and excessive, occurring at once or later. There are the same physical signs as in the chronic form.

The spine may be ragged, rigid, or flat or have slight curves. Individual lesions may be found anywhere in the splanchnic region. Less often lesions of the upper thoracic are found; sometimes lesions of the cervical vertebræ. When the central connections of the vagal and the splanchnic centers are remembered, it is evident that the lesions affecting gastric innervation may be very widely distributed.

When dilatation is marked, there may be seen abnormal prominence of the whole epigastric region. The outline of the greater curvature and sometimes the lesser may be visible. By forcibly stroking the epigastrium, peristaltic movements of the stomach

may be set up. In the atonic form, there is absence of peristaltic waves. A pyloric tumor may sometimes be felt on palpation.

The actual size of the stomach may be determined by artificial distention with fluid or gas, the greater curvature can then be percussed out. Succussion or clapotage can be heard at a time when the stomach should be empty.

By the passage of a hard sound, the depth can be determined. If over sixty centimeters from the mouth, there is some degree of dilatation.

The use of the bismuth meal and the X-ray will determine the size, activity and position of the stomach.

Gastric Analysis. The vomitus is larger in quantity than normal; is excessively sour, early due to excess of HCl and later to lack of HCl and an excess of organic acids; contains fragments of partially digested food, and microscopically shows the presence of the bacillus acidi lactici, bacillus butyricus, and the sarcina ventriculi. On standing, the stomach contents separate into three layers; the upper, frothy and containing mucus and fermenting food; the middle layer, clear and watery; the lower, finely divided and consisting of more or less completely digested food. In great dilatation, there is bacterial fermentation owing to the delay of the stomach contents.

Treatment. The correction of the spinal and rib lesions as found as well as the correction of any structural perversions that may be found anywhere in the body, is of first importance. Direct manipulation of the stomach through the relaxed abdominal wall is useful—this initiates contraction of the gastric muscle, as may be seen by watching the abdomen. The patient should be taught to do this night and morning. Thus the muscle is strengthened. Care must be used to avoid overfatigue. In the corrective treatment, the brisk, energetic methods should be chosen. If the manipulation slightly increases the blood pressure, it is probably more efficient than if the blood pressure decreases as the result of the treatment.

Many cases present a picture of general enteroptosis. In addition to the abdominal findings there is a stooped, slumped posture, round shoulders, ewe neck, depressed lower ribs, etc. Setting-up exercises, drawing the abdomen up and in, while at the same time slowly forcing respiration in order to develop the muscles thus used will, if persisted in, prove of great benefit. Then treatment of the viscera in the knee-chest position is of added value.

If it is possible to put the patient to bed, with quiet and comfortable surroundings, good nursing, and treatment every day, his recovery will be much more rapid. This should be continued until some diminution in the size of the organ occurs; he is then allowed to be up, to have a little more liberty in diet, and to have

the treatments at intervals of two, three, and finally, seven or fourteen days. He must return for examination at intervals for two years or more, if he is to avoid a recurrence of the trouble.

The intestinal condition should receive the attention required in each individual patient. No purgatives should be permitted; enemas may be used if necessary.

Lavage may be useful in removing the products of fermentation, as a palliative measure. It is less harmful to the stomach than the retention of this irritative material, but will not long be necessary, if the correct treatment otherwise is given.

Diet. Only small amounts of food, and very small amounts of water or other liquids, should be permitted at any one time; the intervals should be long enough to allow the stomach to become empty. Foods which ferment are to be denied; this includes chiefly the sweets, starches and fats. Beef is the favorite food; this is usually well liked, leads to increased gastric secretion and activity, and gives a sense of well-being that is comforting. Broths in small amounts; fruit juices, vegetable juices may be allowed at long intervals. The dry diet may be used; this is simply the giving of perfectly dry food, which must be chewed a long time before it can be swallowed. Very small amounts of food thus satisfy the appetite, and the nervous effect of a feeling of satiety is good.

An abdominal bandage is sometimes of benefit. A corset which exerts a very slight pressure upon the distended organ, and which supports it, may give much relief, especially to patients who must be on their feet much of the time.

In most obstructive cases surgery is the best thing that can be done. Gastroenterostomy or gastro-plication are most frequently needed. Other operations may be required.

In certain acute dilatations, if conditions permit, actually standing the patient upon his head for a few moments may give immediate and distinct relief. (This is, no doubt, due to the relief of the duodenum from pressure as it passes beneath the insertion of the mesentery.)

When the cause of the obstruction can be removed, the prognosis is good for recovery; after the surgical intervention, the treatment already advised should be instituted, with suitable modifications, according to individual needs.

Prognosis. Depends entirely upon the causative disease; but the treatment will require months rather than weeks of time, in mild cases.

Atonic cases often recover completely within a few months. If the original causes of the disease, indiscretions in food or drink, tight lacing, etc., are again permitted, further dilatation is to be

expected. If the spinal conditions are permitted to recur, the same thing is probable. Patients who have once suffered from dilatation may undergo exacerbations as the result of suddenly produced bony lesions, strains of the spinal column, or extreme fatigue. Too long continued standing is provocative of recurrences. Emotional states, especially depressive, are apt to result in relaxation of the gastric, as well as of other visceral muscles.

In obstructive cases, especially those due to post-ulcerative cicatrice, marked variations in the condition of the patient may lead to unbased cheerfulness in the prognosis; this is to be avoided under all conditions. After surgical relief of obstructions, recovery is not apt to be uneventful, though the treatment as indicated above prevents interruptions in convalescence to a marked extent. In those cases in which the obstruction cannot be relieved, considerable palliation is to be expected as the result of the treatment indicated.

The stomach once dilated probably is always more liable to dilatation than one which has retained its tone; therefore, the risk of later attacks should teach patients to avoid very carefully the things which originally caused, or which might cause, the gastric weakness or the subsequent distension.

CHAPTER V

DISEASES OF THE INTESTINES

The nomenclature of the diseases of the intestines is so confusing that an adequate arrangement is difficult. To find the same disease described under the same name by different authors is rare. The anatomical arrangement conforms best with the pathology but in some instances has been hard to follow. To classify according to symptomatology does not seem logical.

THE SYMPTOM DIARRHEA

Diarrhea is a symptom of intestinal inflammation of some kind consisting of frequent alvine discharges, the character of which indicates somewhat the seat of the lesion.

Lienteric stools contain considerable undigested food and point to inflammation of the stomach and upper bowel.

Mucous stools are those in which a large quantity of mucus is present and indicate inflammation in the lower bowel.

Watery or serous stools occur in nervous and colliquative diarrheas, enteritis, cholera, and similar affections.

Green stools are due to an excess of bile, chlorophyll, or bacillus pyocyaneus.

Fatty stools are produced by the ingestion of large quantities of fatty foods, by pancreatic diseases, and by the absence of bile.

Purulent stools arise from ulcerations along the intestinal tract or the rupture of adjacent abscesses into the bowel.

Black stools may be due to the presence of blood from hemorrhage high up in the bowel, to bismuth, charcoal or tannate of iron, etc., taken as medicine, or berries eaten freely.

Red stools result from the presence of fresh blood, or the administration of medicine containing hematoxylin.

Bloody stools (melana) result from hemorrhage from any portion of the digestive tract from whatever cause, infective, inflammatory, or traumatic.

Parasites or their eggs may be found in the stools.

INTESTINAL NEUROSES

Two classes of intestinal neuroses are to be recognized—those due to organic nervous disease, and those due to functional dis-

turbance of the nerve centers. The second class is of etiological importance in almost if not all of the organic intestinal diseases, either directly (abnormal innervation), or indirectly (abnormal vasomotor control, abnormal function of distant organs—liver, heart, etc.). In the second class also are to be included the hysteric and neurasthenic states and neuralgias.

The neuroses may be secretory, motor, or sensory.

The sensory disturbances are usually associated with disturbances of secretion and motion, since the action of the secretory, vasomotor and visceromotor centers depends to a certain extent upon sensory stimulation.

Enteralgia (Neuralgia of the intestines) is most often found in hysterical patients; it may occur in the neurasthenic, or as a referred irritation from pelvic, hepatic or renal disease, or from bony lesions, usually of the innominate or sacrum. The attacks most often follow great fatigue or emotional storms. It is most frequent in poorly nourished patients. (See Neuralgia.) Hypogastric neuralgia is the term sometimes applied to enteralgia located around the coccyx or the perineum. It is accompanied by an irresistible desire to go to stool, but defecation is impossible. The pain is intense, often leading to unconsciousness.

The diagnosis rests upon the absence of every organic disease characterized by pain in the intestinal region, and the presence of the nervous disease or the neurotic state. The treatment is that of neuralgia. (q. v.) Careful inhibitory treatment over the sacral foramina will frequently give relief.

Intestinal Anesthesia involves the sensory nerves of the anal region, chiefly. This leads to neglect of defecation, and ultimately to constipation. In organic nervous disease, retained motor power of the membranes with lost sensitiveness leads to involuntary and often spasmodic defecation.

Nervous Diarrhea is characterized by frequent stools which show no abnormal characteristics other than that they may be rather softer than usual. Occasionally there may be diarrhea in the morning, with no trouble during the rest of the day or the night. No great pain, tenesmus or griping is present, and the nutrition is not noticeably impaired. Such attacks are frequent in neurotic individuals after excitements, shock, fatigue, etc. Any calamity—an earthquake, for example—is apt to be followed by many such cases. Care should be taken to differentiate possible achylia, Grave's disease and tabes dorsalis.

Enterospasm is a spasm of the circular muscles of the intestines; it may be so great as to cause occlusion, or only enough to diminish the size of the canal. The diagnosis is sometimes difficult and cases in which total occlusion has been produced in this manner have

been subjected to laparotomy. The tension usually subsides under anesthesia, returning with consciousness.

Experimentally, such spasms become more severe with ordinary stimulation, such as manipulation, salt crystals, heat or cold.

When the diagnosis has been made, the correct treatment is simply the correction of the bony lesions, followed by complete rest of the digestive tract as well as of the entire body. Relaxation should take place within a day, or two days at most. In some cases careful inhibitory work over the spastic area will give relief.

Nervous Constipation. In hysterical subjects, especially, constipation may be purely a neurosis. Involuntary or reflex movements, such as sneezing, etc., may then precipitate involuntary defecation. Probably most of these hysterical patients suffer from repressed emotions of disgust, and are best treated either by psycho-analytic methods, or by a frank discussion of the physiological needs of the body, with such methods of reëducation as seem best adapted to the mental needs of the patient.

The secretory neuroses include deficient secretion, one of the causative factors in constipation, or excessive secretion, which is associated with mucous colic.

Mucous Colic (Colitis colica; enteritis membranacea; tubular diarrhea; myxoneurosis intestinalis; sometimes called also mucous colitis). This is a neurosis affecting the large intestine, and characterized by the secretion of large quantities of mucus, and its passage with tenesmus and colicky pains. Nervous depression during an attack is common.

Etiology. It is chiefly found in neurotic women and girls. Direct irritation of the rectum is responsible in some cases. It is found in men who ride much on horseback or on the bicycle or motorcycle. Hardened scybala may cause attacks. Attacks are usually precipitated by emotional shocks, fright, etc., in typical neurotic patients. Bony lesions include chiefly the lumbo-sacral regions; less commonly the innominates and the mid-lumbar spinal column. Visceroptosis is frequent.

Diagnosis. The diagnosis rests upon the symptoms as given, and the passage of long ribbons or threads of mucus, sometimes resembling a cast; this is found to be mucus and not a true membrane by microscopical and chemical examination. In the intervals between the attacks no symptoms are present; rectal examination, X-ray, etc., give no evidence of organic disease, although care should be taken that the colitis is not secondary or symptomatic of chronic appendicitis, cholecystitis or chronic intestinal obstruction.

Treatment. The treatment is that of the underlying neurosis. Correction of the bony lesions is most important. Irrigation of the colon gives relief. Rest, good hygiene, sometimes change of cli-

mate, are all very useful. Place patient in the knee-chest position and carefully elevate sigmoid. Direct treatment over the bowel, especially the lower colon, is effective. Do not treat directly if there is ulceration. If spastic condition is marked the constipation will be increased.

The diet is important. As a rule do not prescribe a bland one. Give plenty of milk and cream, butter and bacon, coarse vegetables and fruits. Thoroughly masticated skins and seeds materially help in removing the mucus.

Prognosis is good, though recovery may be slow. Patients with local rectal irritations recover at once, on the removal of the irritating agents. Recurrences are to be expected, if the original cause is allowed to persist.

COLIC

This term is rather loosely employed with reference to abdominal pain which is remittent or intermittent, and is associated with muscular tension. The pain is very often extremely severe, and this, with the apparent collapse, often renders an immediate diagnosis impossible.

The first necessity is relief of pain, after which a more exact diagnosis can be made. This relief may be secured by the application of heat; by pressure upon the pit of the stomach or around the spinal regions of most contracted muscles; by drinking warm liquids; by warm enemas; by compelled long, slow respirations, etc. With even partial relief of the pain, diagnosis may become evident.

Intestinal colic, uncomplicated, is indicated by little or no vomiting; some sweating, mild degree of collapse or none; no pyrexia; pain is diminished on pressure, or application of heat; free abdominal movements with respiration; slow pulse or only slight increase in rate; patient not rigid in position; history of constipation or of improper food or of emotional storm or of some other efficient cause, or of previous attacks.

Inflammatory diseases of the intestines may give rise to this symptom. This is indicated by rise of temperature (above 100° F.), rapid pulse, diarrhea, pain increased on pressure or application of heat; abdominal muscles rigid during respiratory movements; position of patient rigid, varying according to location of inflammatory process; local symptoms, etc. In peritonitis and adhesions localized in movable parts the pain is usually in the region of the umbilicus; if localized in fixed parts, the pain is usually in the region affected.

Perforation is indicated by severe collapse, history of possible causes of perforation, etc. Intestinal obstruction gives repeated

vomiting which becomes fecal; gastric crises in locomotor ataxia and other nervous diseases give pupillary and other symptoms.

In children the referred pain in Pott's disease and appendicitis may simulate colic.

Colic of the ileo-cecal region has been described in connection with the passage of large, hard material through that valve, or its retention in that region. Adhesions may be a causative factor. The diagnosis is suspected upon the occurrence of colicky pain in the right iliac fossa, without fever, with sudden termination and no recurrence. The diagnosis is verified upon the appearance, a few hours later, of the hard material in the feces. (The delay in the colon may be several days or more than a week.)

Renal colic. The passage of renal calculi may simulate colic. The pain radiates downward, to the labia in the female or the testicle and penis in the male, to the thigh in either; frequent voiding of small amounts of urine, which contains blood and kidney epithelium make the diagnosis certain; the X-ray may give the exact diagnosis. In tubercular kidney the passage of masses of pus and coagulated blood may cause renal colic.

Pancreatic colic is very rare and probably impossible of definite ante mortem diagnosis without exploratory incision. Intense jaundice and large gall bladder due to the occlusion of the ductus choledochus by the pancreatic stone, or to the swollen and inflamed duct in pancreatitis, confuse the diagnosis with biliary colic. Pigmentation of the skin with wasting may lead to a suspicion of the disease, which is further justified by the finding of undigested fat and starch particles in the feces; a large and very pale, offensive stool is characteristic.

Biliary colic, due to the passage of gall stones through the duct, is usually easily recognized. Vomiting, sweating, shivering and signs of collapse, the expression of terrible anxiety and pain, with the location of the pain over the gall bladder, and darting into the right shoulder, render the diagnosis easy, as a rule. Deep tenderness over the gall-bladder is very suggestive. When the stone occludes the duct the jaundice may be very severe. After an attack the feces should be strained and washed, until the stone is found and examined. X-ray plates, especially stereoscopic, are helpful.

Lead colic. This form of colic may be recognized by the presence of the blue line around the gums; the history of working in paint, in lead mines, etc., or of drinking water or beer which has stood in lead pipes; by the associated nervous symptoms, such as wrist-drop, and by the lack of fever, the rapid anemia and the mucous hemorrhages; urinalysis shows mild nephritis findings.

The blood shows secondary anemia plus basophilic granules in the erythrocytes. Pressure relieves the pain.

INTESTINAL COLIC

(Enteralgia; tormina; gripes)

Intestinal colic is a spasmodic contraction of the muscular layer of the intestines occurring as a symptom of several intestinal diseases and also alone. It is characterized by acute paroxysmal pain near the umbilicus which is relieved by pressure and is associated with feeble heart action.

Etiology. Constipation, the presence of undigested food, abnormal amounts of bile in the intestinal tract, structural lesions of the intestinal wall, lead poisoning, various diseases, and reflex impulses are all causative. Lesions of the splanchnic area, interfering with the normal control of the muscular activity of the intestines and secretions of the mucous membranes are also of utmost importance in the etiology.

Diagnosis. Paroxysmal pain of a tearing, cutting, pressing, twisting, pinching, or bearing down character, centering around the umbilicus, is the main symptom. The abdomen is tense and pressure relieves the pain. In severe attacks the surface is cold, the features pinched, the pulse small and hard, and there may be nausea, vomiting and tenesmus. Constipation is usual. The duration is from a few minutes to several hours, often with intermissions and usually terminating by the discharge of flatus.

Muscular contractions may be found along the spine corresponding to the area involved. There may be a definite subluxation either of the vertebræ or ribs which may bear a causative relation. The abdomen is tense but not painful on palpation.

Treatment. As soon as the attack appears, hot moist compresses or a hot water bottle may give relief—this may precede the arrival of the physician. Relief of the acute pain is the first essential. Muscular contractions will be found in the spinal areas corresponding to the intestinal area affected; commonly the eighth to the eleventh thoracic for the small intestine and the second to the fourth lumbar for the large intestine. Deep, steady pressure, gradually increasing, over these muscles and near the spinal processes of the corresponding vertebræ will give relief; a hot pad over the same area may prevent subsequent contraction. In any case, the treatment is best applied to the areas of reflex muscular contraction. (The higher the area affected, the longer time is usually required for relief, under ordinary medical treatment. Little difference is noted under osteopathic care.) When the muscular contractions have disappeared, bony lesions in the same area are fre-

quently found. Correction of these facilitates more rapid recovery and helps to prevent recurrence of the attack.

If the abdominal muscles are contracted or if the intestinal contractions are palpable a gentle manipulation of these contracted areas is indicated. If possible utilize the knee-chest position and carefully locate and release the tissues about the tender area. Deep, steady pressure over the solar plexus may relieve the pain, promote normal peristalsis, and thus the elimination of gas and feces. Raising the ribs increases the rapidity of the circulation, raises the blood pressure and thus helps in carrying away carbon dioxide from the intestines to the lungs and thus from the body. If conditions permit, abstinence from all food for two or three days, with plenty of hot water to drink, will release the spinal rigidity so that adjustment is comparatively easy. Regulation of the diet and correction of bad habits is essential to permanent recovery.

Prognosis. Recovery is to be expected, with proper treatment, in a few minutes to a few hours. Recurrence is to be expected if the original causes persist or recur. Important in prophylaxis are the correction of bony lesions; the removal of low blood pressure; the modification of diet; and the establishment of normal bowel habits.

CONSTIPATION

(Costiveness; intestinal torpor)

Constipation is the retention of feces in the colon for a longer time than is normal to the individual, resulting in abnormally dry, hard feces, usually voided at irregular and considerable intervals.

Etiology. The causes are dietetic, habitual and nervous, local, and constitutional.

The dietetic errors include: Diets of too concentrated foods, or of too little quantities, which fail to give normal mechanical stimulus; diets of too great preponderance of waste material and of too great abundance, thus dilating the colon; and those containing too little water.

Habitual and nervous errors include: Failure to defecate at proper intervals, especially at the natural stimulus; use of drugs; abnormal control of the nerve centers, due especially to bony lesions of the innominates, sacrum, coccyx, and the lumbar vertebrae; to frequent jarring, as of cars, etc., and to hysteria and the neurasthenic states.

Local disturbances of the muscles of the cecum, colon, sigmoid and rectum and of those of defecation, and local disturbances of sensation of the rectal and anal region may be due to wrong position at stool (the modern toilet seat is abominable); the pressure of clothing; atony with or without visceroptosis; deficiency

of the digestive secretions and of mucus; stenosis, due to cicatrices or to contractions of the sphincters; hemorrhoids, fissures, ulcerations or coccygodynia. Local obstructions may be due to tumors, uterine malposition, pregnancy, enlarged prostrate or others.

Constitutional causes include certain anemias, acute fevers, and cerebral affections.

There may be hypertrophy of the muscular coat of the descending colon or there may be small ulcers in the cecum; there may be thinning of the walls and dilatation of the whole colon. Enteroposis is frequent. The sigmoid may be congenitally longer and more tortuous than normal. Intestinal atony and intestinal spasm are frequent. Spasticity, inflammation and adhesions of the sigmoid area are common causes.

Diagnosis. The main symptoms are diminution in the frequency of the bowel movements; the feces are of undue hardness; there is need for great straining at stool; defecation may be painful. The local symptoms are: Sensation of fullness and weight in the rectum or in the abdomen; spurious diarrhea or diarrhea of constipation with some pain, tormina, or tenesmus but not giving relief to the fullness; pain in the left groin and down the left thigh and in the back.

The general symptoms are many times lacking. Debility, lassitude, fetid breath, impaired digestion, vertigo, variable appetite, furred tongue, flatulence, depression and mental torpor may occur. Dilatation and ulceration of the colon, piles and hemorrhoids may ensue. The colon may be outlined by palpation, being filled with a "doughy-feeling" mass. The abdomen is distended. The diagnosis is to be made carefully; sometimes only a purgative-habit is present; occasionally the patient only supposes himself constipated on account of some personal idiosyncrasy. Careful examination is necessary to determine the actual condition present and to elicit as much information concerning the habits as possible. Constipation is more often a symptom than an actual disease.

The X-ray is invaluable. Barium or bismuth enemas show the size, position and activity of the colon, sigmoid, and rectum.

Treatment. Purgative medicines must be stopped absolutely.

The correction of structural mal-adjustments is of prime importance. Dorso-lumbar rigidity must be relieved. Corrective treatments should be given briskly, thus restoring something of normal stimulation to the inactive nerve centers of the dorso-lumbar spinal segments. However, if spinal adjustment is specific and immediate normalization of nerve impulses will shortly be forthcoming. Treatment of the ileo-cecal and sigmoid areas while the patient is in the knee-chest position is effective. The lower ribs should be raised; this may be associated with forced respiratory movements, to advantage. Lesions should be corrected, wherever they

occur; indirectly, distant lesions may be efficient etiological factors in constipation or diarrhea.

A regular habit of going to stool must be taught. Beside going at a certain fixed hour each day, the patient must remain a sufficiently long time to allow a thorough evacuation. A small warm water enema may be used to start the fecal column when necessary. Using a stool under the feet of a sufficient height to bring the knees well up above the plane of the iliac crests, helps make the lines of pressure exerted by the accessory respiratory muscles in the expulsion more nearly normal. The pressure is thrown upon the descending fecal column rather than upon the fundus of the uterus or upon the prostatic region.

"The intelligent treatment of constipation is no exception to the rule and depends upon diagnosis, and, of course, will vary somewhat according to the case. I very seldom see a case oftener than twice a week, many cases only once a week. All osteopathic lesions that could in any way be contributing factors are given appropriate treatment. If faulty posture has contributed to these conditions, the patient's attention is called to the fact, and his or her coöperation requested. I assure myself that my women patients are wearing properly fitted corsets and that they know how to put them on."—E. C. Bond.

Dietetic errors as found must be corrected. In some cases, a bulky diet is advisable with many vegetables and fruits. In these cases exclude all meats; this will change the intestinal flora. Two to four tablespoonfuls of flax seeds per day, swallowed without mastication, will carry considerable moisture to lower bowel. Paraffin oil by mouth softens the fecal mass. Water must be used sufficiently to produce a normal quantity of the digestive juices, at least two quarts each day. Systematic exercises are necessary to a recovery. Walking is the best as it brings all muscles into play. Various games and gymnasium exercises are good. Special exercises should be planned for each patient.

The immediate evacuation of large masses of fecal material, long retained, and dry in the colon, is not usually wisely attempted. Cleansing the lower bowel by warm normal saline enemas is indicated. The container should not be more than two feet above the body, so the water can flow without great pressure. Only small amounts should be used at any one time, to prevent distention. When the first water has been ejected, another small quantity may be used, and so on until the rectum is fairly well cleansed. The next day the performance is repeated, and so on until the colon appears empty of the offending material. When the water is irritating, or when it fails to properly soften the fecal masses, warm oil or bland solutions of soap, glycerine or molasses may be used. The oil may be permitted to remain over night or for several hours in the sigmoid. Care should be taken to avoid fatigue.

Uterine mal-positions should be corrected. Tumors, enlarged prostate, and other local obstructions must receive such treatment

as is indicated on examination. Piles and hemorrhoids may require surgical care. Sometimes palliative treatment is useful.

The following treatment for hemorrhoids is given by Dr. Ella D. Still: "Find and treat cause for constipation; next, replace coccyx; last, straighten up rectal tissues. Put patient in genu-pectoral position, introduce finger and gently push the tissue up, having the patient inhale deeply during the time. I carefully dilate sphincters, first introducing one and then later two fingers. All this should be gently done, otherwise the parts are irritated. Particularly in bleeding hemorrhoids, have the patient wash out the lower bowel each time after defecation, for the parts must be kept clean. Use only a small amount of water, never more than a pint."

"In considering hemorrhoids one must recognize that there are those that may be successfully treated by non-surgical methods. Those responding to such treatment are what are termed simple hemorrhoids where vessels are dilated but no great tissue change has taken place, the causes for which may be located anywhere from liver to rectal sphincters. These cases demand thorough examination as cures cannot be expected unless *cause* is removed.

"When there are bony lesions I find the innominate and sacro-coccygeal most common. In women, where displaced pelvic organs are the cause of trouble, treatment must be directed to that area. Constipation must be relieved and rectal sphincters dilated. In nearly every case there is more or less prolapsing of rectal tissues which I straighten out by first placing patient in Sims position while I carefully dilate rectal sphincters. Then have patient assume genu-pectoral position while I gently push up on rectal walls, thereby lifting the hemorrhoidal veins.

"The postural treatment may be used by patients daily to good effect."—Ella D. Still.

In order to prevent hemorrhoids and piles, and to delay the progress of these conditions after they have been initiated, the use of warm water or oil to soften the fecal mass should be employed daily, until no longer necessary. The use of small quantities of water for this purpose is no more abnormal than is the use of soap and water for cleaning the skin of the surface of the body, or the use of oils for softening any kind of dirt which might have dried upon the skin. The need for this procedure should be temporary, as the correct treatment should bring normally soft fecal masses to the rectum. Remember that in ulceration and marked spastic states manipulation of the bowels is contraindicated.

It is important to know when to advise surgery in these cases, and when to endeavor to relieve conditions by palliative measures.

"So long as the veins retain their tonicity and there are no thrombosed areas or the vein walls have not thickened to any great degree or the hemorrhage is not too profuse, osteopathy will cure almost every case if the doctor who has the patient in charge will insist upon a thorough course of treatment. As a rule, when the hemorrhage is profuse and frequent, when the vein walls are thickened with or without much prolapse or when the piles are very painful, surgery has its place and can cure most of these cases. Many of them require, however, a combination of surgery and osteopathy to effect a cure, for constipation and portal circulatory disturbances must be cleared up before one can be positive that the condition will not recur."—S. L. Taylor.

Prognosis. The outlook is favorable for recovery but the course is likely to be prolonged. As complications and sequelæ, are to be

mentioned hemorrhoids, impaction, anal fissures, and ulceration of the colon or rectum.

INTESTINAL AUTOINTOXICATION

(Chronic intestinal stasis; Rigg's disease)

Intestinal autointoxication is a condition due to the retention and absorption of toxins produced in the intestinal tract, and characterized by vertigo and headache, furred tongue, foul breath, anorexia, stomatitis, and symptoms of kidney, liver and bowel inactivity without organic disease of these organs.

Etiology. The causes of the condition are not well understood. The formation of toxic substances by the membrane of the upper intestinal tract has been experimentally demonstrated. Ileal stasis, enteroptosis and adhesions are other causes; these conditions can best be recognized by a study of X-ray plates, usually with barium or bismuth meals. Dietetic errors, constipation, lesions involving the lower thoracic and upper lumbar spinal column and the lower ribs, and a generally depressed state of the nervous system are considered causative factors. Deficient water intake, and deficient oxygen supply are certainly often important in etiology.

"The dietetic errors frequently include too high proteid intake. Any diet which is unbalanced may cause the condition; food-faddists of any type are very subject to the trouble. Disturbed relations of the various groups of intestinal flora, and of these with the digestive secretions, have been considered causative. A lack of the bacilli coli communis has been considered responsible, and attempts made to treat the disease by giving cultures of this organism in alkali-soluble capsules. Sour milk and cultures of lactic acid bacilli have also been used, according to the Metchnikoff theories. Recent investigations show a toxic element in the succus entericus, which, injected into the bodies of animals, cause the symptoms of autointoxication of the intestinal type. The absorption of the albumoses and the leucomaines give at least a part of the symptoms observed; these are products of proteid digestion which are not normally absorbed as such."

"In sixteen years' experience the writer has yet to find a case of chronic intestinal stasis without a related spinal lesion, demonstrated either as flaccid or tensed muscles and ligaments or bony maladjustments. And they always related to that area of the spine between the sixth dorsal and second lumbar. We have considerable laboratory proof that such spinal lesions have a detrimental effect upon intestinal function, and an abundance of clinical proof that the removal of such lesion almost invariably results in partial or complete cure."
—J. J. Pearce.

The mental depression is associated with flabby muscles, much after the fashion of the melancholia patient. The effect of the toxin upon the cerebral centers is not to be denied, yet there seems much evidence in favor of the view that the deficient nervous activity is also a cause of the intestinal state. The undoubted value of psycho-analysis in some of these cases is also indicative of the place of cerebral activity in the control of intestinal functions. The symptoms of autointoxication which so often follow depressing emotional states is well known. All of these variable etiological factors show that the control of intestinal activity is either a much more complicated affair than has been supposed, or that the true cause of intestinal autointoxication has not yet been discovered.

The autopsy findings include evidences of toxemia, affecting many organs. The intestines may be overfilled, in segments or generally; ulcers may sometimes be found in the small intestine.

Diagnosis. Only after every organic disease, anaphylaxis, intestinal infection and food poisoning with similar symptoms have been eliminated is a diagnosis of intestinal autointoxication justifiable. A too facile and faulty diagnosis of this condition may permit organic disease to progress to an incurable stage.

The symptoms are widely distributed. Constipation usually alternates with diarrhea, while the anorexia, nausea, foul breath, furred tongue persist with little or no remission. Flabby muscles, sallow skin, and emaciation are constant. Vague sensory disturbances, such as fleeting pains, rheumatic-like aching, formication, alternations of heat, cold, and prickly sensations, skin lesions, visual disturbances, tinnitus, and disturbances in taste and smell, are variably found. Vertigo and headache, sometimes resembling migraine, palpitation, cold hands and feet and varying blood pressure are characteristic. Insomnia alternates with bad dreams in some cases, while in others sleep is abnormally profound and of many hours' duration. Apathy and despondency may approach melancholia. Disturbed function of many organs of the body may be caused by the toxemia and the nervous reflexes, and organic disease may supervene.

The **physical examination** must be thorough, in order to eliminate organic disease. The thyroid gland is often slightly enlarged. The tongue is furred, the breath foul and often sweetish. There may be a hemic murmur, and the cardiac sounds are weak. Slight rales may be heard on taking unusually long breath. Slight or no gastric dilatation is to be found. The liver is slightly enlarged, and is found slightly lower than usual, under the depressed ribs. The spleen is sometimes enlarged. (Both liver and spleen may be tender and may ache like "ague cake," which has often led to faulty diagnosis of malaria.) Abdominal tenderness is usually present, not well localized, and varying daily.

The skin and underlying tissues are tender on palpation around the neck and shoulders, especially near the suboccipital regions, the tips of the shoulders, and the neighborhood of the transverse processes of the cervical vertebræ. The cervical muscles are hypersensitive, a condition much resembling torticollis may be present. An area of tension with tenderness is found in the neighborhood of the fifth to the eighth thoracic spines, extending outward over the heads of the ribs. This is usually the upper limit of a spinal maladjustment extending to the second lumbar vertebra or lower. Through this area the spinal column is unduly rigid, and the tissues are apt to be more or less analgesic and sometimes anesthetic. Rarely hyperalgesia is present through this area. Innominate

lesions and lumbo-sacral lesions may be present, and may be the primary cause of the dorso-lumbar lesions.

The urine shows excess of indican, the conjugated sulphates, and sometimes acetone. Albumin and casts and renal epithelium may suggest nephritis; the celerity with which the condition clears up proves the disturbance functional. There may be lessened sugar tolerance; small amount of sweets being followed by glycosuria; this, with the acetone and aromatic urinary content may suggest diabetes; here, also, the transient nature of the findings gives the diagnosis.

The blood shows the effect of the toxins. Atypical forms are found in each class of blood cells. Both red and white cells are often fractured. Eosinophilia may be marked; amphophiles and basophiles are occasionally found. Nuclei may be extruded; nuclear masses may be plentiful.

A teaspoonful of powdered charcoal should be given, with food, and the time recorded. The first appearance of a black color in the feces should be recorded, and then the time when the black color disappears from the feces be recorded. This gives the time relations of the intestinal passage. The X-ray is much more exact.

Treatment. This must be based upon the factors found important in the etiology of each case. Special attention should always be given to the ascending colon and the sigmoid.

Bony lesions must be corrected. The required corrective treatments should be given briskly, in such a manner as to stimulate the sensory nerve endings in the articular tissues and the deeper muscular layers along the spinal column and around the heads of the ribs. The ribs should be raised and held for the space of one to three long, slow breaths. Nearly all corrective treatment usually indicated in this condition may be given in such a way as to compel forced and deep respiratory movements; these are excellent.

The patient should be taught correct posture, such exercises as his individual peculiarities demand, and correct breathing habits.

When investigation indicates repressed emotional states, some of the methods used in psycho-analysis are indicated.

Purgatives must be absolutely discontinued. The colon should be kept clean by enemas; this constant removal of passages from the small intestine, with very much increased water drinking, are all that the ileum and jejunum require in the way of laxative treatments, provided adhesions are not present.

"Latterly I have been using bowel irrigations in these cases—with or without fasting—varying in frequency from once in two days to three times each day. Six to fourteen quarts of water are used; if there is colitis, as is usual, the water is slightly soapy. In all these cases the great essential is the adjustment work in the dorsal or lumbar areas. Fasting and irrigation are necessary for anything like rapid recovery. Results are very gratifying."—G. W. Riley.

After a fast, a rigid milk diet, or rigid fruit diet, or some other rigid diet chiefly of water and associated with rest and other indicated treatment, should be given until the toxic symptoms abate. The juice of lemons, limes, grape fruit and pineapple greatly diluted are excellent.

After the body seems clean, the return to a mixed diet must be made cautiously. Whatever class of food has been taken in excessive amounts before and during the onset of the toxic symptoms, should now be almost or quite omitted from the diet for a long time. The patient must never return to an unbalanced diet. Probably he will need more cellulose and raw foods, and more liquid, than do normal persons for months or years after the attack, in order to prevent recurrence.

With return to mixed diet, an attempt must be made to increase the fat and the muscular tone of the body. Systematic exercises, both mental and physical, are important. Since the condition is often of slow development and itself causes mental depression, the reëducation of the patient is a necessary element in promoting the most rapid recovery.

Prognosis and Sequelæ. The toxemia predisposes to certain functional and organic diseases. Hysteria and the neurasthenic states, anemia, arterio-sclerosis, interstitial nephritis and cirrhosis of the liver, may be mentioned, to say nothing of the effects upon the life of the patient of the mental habit of apathy and torpor. With suitable treatment and reëducation, many of these after-effects can be avoided. Recovery is to be expected as long as the intestinal autointoxication remains uncomplicated by organic disease, provided the patient is obedient to the instructions and is willing to receive the treatment indicated for the weeks or months necessary to complete restoration to correct bodily structure and cellular metabolism.

CHAPTER VI

DISEASES OF THE INTESTINES—(Continued)

GASTRO-ENTEROPTOSIS

(Glenard's disease; asthenia generalis; splanchnoptosis; visceroptosis; visceral prolapse)

This is unfortunately a rather common condition. It is a downward displacement of the stomach and intestines, usually including the stomach and the colon, often the small intestines, the right kidney and the spleen. The colon frequently hangs into the true pelvis; the pyloric end of the stomach may also be found in the true pelvis.

Etiology. The causes are congenital and acquired. Imperfect development of the supporting ligaments and of the muscular walls of the viscera and of the abdomen, with or without a general bodily weakness associated with a tendency to kyphosis, are the most common congenital causes. Of the acquired causes, two chief classes may be recognized: weakness of the muscles and ligaments, and increased weight of the viscera.

Weakness of the supporting tissues has as its chief, or as a contributing cause, some abnormal spinal condition, either a kyphosis, which may act mechanically or as a bony lesion, or the less conspicuous sUBLUXATIONS. Faulty postures act in the same way. These practically always include a rigidity of the lower thoracic or the dorso-lumbar spinal column and a dropping of the lower ribs, with lessened mobility of the lower chest wall. Congenital absence of the tenth costal cartilages is frequent. The upper chest is depressed, the shoulders thrown forward, the neck anterior, the diaphragm weakened, and its central tendon shortened. Other causes of weakened tissues are improper clothing, especially tight or ill-fitting corsets; repeated pregnancies or hydramnios; ascites; sudden loss of too great fat, and urgent muscular strain, such as heavy lifting, etc. Certain constitutional diseases, as chlorosis, tuberculosis, or any other mal-nutrition may so weaken the tissues as to permit prolapse. Neurasthenics, epileptics, and others with obscure nervous diseases suffer almost constantly from enteroptosis. It is not always easy to determine whether the ptosis is a cause or a result of the neurosis, or whether both neurosis and ptosis are due to some preëxisting cause.

The causes of too great visceral weight are many: constipation; dilatation of the stomach and of the colon; congestion of the liver and of the spleen or tumors of any of the viscera. **Chronic**

inflammatory processes may add to the weight of the viscera and weaken the supporting tissues at the same time.

Diagnosis. The main symptoms are abdominal distention, pain after eating, eructations of gas, anorexia, various nervous phenomena, weakness, constipation, and in some cases the symptoms of intestinal stasis. There are symptoms of a more or less marked neurasthenia in young persons. The condition may be present in an extreme degree without causing any symptoms in some persons, especially in women after repeated pregnancies.

The spine shows some lesion from the seventh thoracic to the third lumbar vertebræ. Rigidity is almost constant. A general posterior curve, more rarely an anterior curve, is present. The lower ribs are always depressed. There may be considerable tenderness of the lumbar muscles. Superficial muscles often are atonic, while the small deep spinal muscles are irregularly contracted.

In the standing position, the abdomen protrudes and the upper part sinks in; when lying, the abdomen shows a lateral extension. Palpation often finds a ridge lying across the abdomen, and aortic pulsation is frequently seen and felt.

The X-ray gives very clear-cut information as to the extent of the ptosis. By this means it has been found that many of the intestinal disturbances are associated with varying degrees of ptosis, and that the amount of perversion is much greater than was formerly supposed.

The urine is usually loaded with indican, and various related substances resulting from putrefaction may be present.

The blood shows the effects of toxic influences. The red cells are variously deformed and are sometimes granular; the eosinophiles are slightly increased; the polymorphonuclears are usually not increased, but show various atypical characteristics—irregular staining reactions, vacuolization of protoplasm and nucleus, tendency to fracture, and to extrusion of the nuclei. On the warm stage the white cells move sluggishly and cease moving quickly.

In middle-aged and young persons the blood pressure is usually lower than normal; no doubt the inefficiency of the circulation is one factor which, by adding to the weight of the organs, causes the ptosis. On the other hand, the ptosis, by disturbing the pressure relations of the large veins, in itself tends to the accumulation of blood in the mesenteric vessels. It is probable that the low blood pressure is both a cause and an effect of the ptosis.

When the lower half of the abdomen is supported by the hands or by a wide belt, great relief is felt. (Glenard's belt test.)

Treatment. Correction of the vertebral, costal and innominate subluxations is of first importance. General abdominal manipulations are sometimes indicated. Manual raising of the colon may be useful; a proper support should then be arranged for temporary

relief. Treatments should be given every day or every two days for one or two weeks, then once or twice each week until lesions are fairly well corrected. After this, the patient should return for examination and whatever treatment may be found to be needed once each month or two months, for a year, if possible.

There are several **diets** recommended. The all-cellulose diet of salad vegetables and the more fibrous of the cooked vegetables, with bran bread, aims to produce bulk and thus to increase peristalsis. Thin patients receive increased amounts of fats, must rest after meals, and be made to gain in weight. Obese persons must be reduced (see obesity).

The farinaceous diet aims to diminish the bulk of the food residue as much as possible. The low proteid diet is given in order to reduce putrefaction.

Systematic exercises are required to strengthen the weakened abdominal and other muscles and establish correct posture with correct habits of breathing. Having the patient remain in the knee-chest or Trendelenburg position as much as possible, assists in keeping the colon in place. The left lateral, or Sims' position, is more comfortable, and should be made the habitual posture for sleep and rest.

"The following exercises are especially beneficial in visceroptosis:

"1. Walking on the hands and feet with the knees stiff. This is a rather awkward movement to master at first and resembles the ambling gait of a bear. Its advantage is very evident in that the hips are so much higher than the shoulders. This permits the viscera to fall upward and forward and utilizes gravity to help correct the condition it has assisted to produce.

"2. The patient lies on the back and with the hands on the hips, elevates the legs to a perpendicular position. The shoulders, or rather the dorsal spine instead of the hips, are made to support the column. With the legs in this position, a twisting motion is then made at the waist.

"3. Again in the recumbent position, the legs are raised to a perpendicular position first, and finally the body is flexed until the feet touch the floor back of the patient's head. The object of all of these movements is very evident. They change the position of the viscera, tend to loosen any adhesions that might be present and place them temporarily at least in a more normal position."—W. S. Nicholl.

"I instruct him to pull the abdomen up and in, every night and morning after retiring and before arising, when lying flat upon the back with the knees flexed, by placing his hands in the iliac fossæ and raising the viscera. The assistance of forced exhalation will aid materially. This exercise should be kept up for four or five minutes or until the patient is fatigued. Then at other times various exercises, such as bending forward and sidewise, may be used.

"In our opinion, an exercise of greatest aid is the one of forced exhalation. Have the patient stand erect, breathing normally, then pucker the lips and exhale gradually and forcefully for as long a period as possible; this brings the forced muscles of exhalation into use and domes the diaphragm, giving greater upper abdominal space. When exhalation is taking place, have him forcefully elevate and retract abdomen. This exercise, if carried out several times a day and faithfully continued for weeks, will have a pronounced effect in replacing and toning the viscera."—McConnell.

Mechanical supports may act beneficially by establishing more correct habits of breathing and posture, and by holding the colon in place. These give the patient a sense of relief, and this is a constant reminder for him to elevate and retract the abdomen. Success is dependent upon the patient's coöperation. Various corsets and supports are on the market but a cotton binder answers very well. They may be fitted before a fluoroscope.

The elimination of drug habits is one of the important factors in treatment. So many of these patients have been habitually taking cathartics, and have so great a horror of being left without them, that this is sometimes one of the hardest things to do in the way of treatment—while it is at the same time one of the most important.

Prognosis. This depends upon the possibility of removing the causes of the condition, upon the patient's coöperation in the way of diet, exercise, etc., and in the avoidance of purgative drugs. The spinal and lower rib lesions being corrected, and the patient giving even moderate obedience to the instructions, the prognosis is good for practically a normal abdomen, when there has been no actual destruction of the supporting tissues. When the injury is too great, or when old age or congenital weaknesses of the patient prevent a good prognosis, a suitable support must be worn indefinitely.

ACUTE DILATATION

(Enteroplegia)

Acute dilatation is an expanded portion of the intestine due to acute obstruction or some cause producing a local paresis, or to a congenital weakness; producing sometimes an obstinate constipation and in other cases a gaseous distention with pain and colic.

Etiology. Acute obstruction, either from foreign bodies, adhesions, volvulus, or hernia is the most frequent cause. Of the general causes may be mentioned local or systemic infection; gastro-intestinal paralysis due to toxins circulating in the blood stream; trauma, as blows on the abdomen or falls; general anæsthesia; nervous influences; prolonged handling of the intestines or their exposure to the air during abdominal operations.

Diagnosis. The symptoms and treatment are those of acute obstruction and are considered under that head.

Gaseous distention of the intestinal tract may cause serious embarrassment of the heart and lungs.

CONGENITAL IDIOPATHIC DILATATION OF THE COLON

(Hirschsprung's disease)

This is an anatomical anomaly of congenital origin leading to a looping of the colon. Muscular aplasia leads to dilatation and valve formation.

Diagnosis. The condition may not become manifest until adult years. There is an obstinate constipation with now and then attacks of diarrhea when enormous quantities of feces are voided. There is a history of a distended

abdomen from early infancy. The abdomen may become enormously distended. The patient becomes emaciated and the abdominal veins are dilated. The recti muscles may be separated. There is no abdominal pain or tenderness and vomiting is rare. Borborygmus is often very loud. The urine shows increased indican.

The treatment is usually surgical. Relief is dependent upon the physician's ability to establish fairly free elimination. This condition does not cause death, but renders the patient more susceptible to infections and the ill-nourished condition indicates a grave prognosis.

CHRONIC DILATATION

Chronic dilatation begins insidiously from partial obstruction of the lumen from cicatrizing processes of the walls, new growths, compression or traction from without as of tumors, healing peritonitis, or coils of intestine loaded with feces. The symptoms and treatment are those of chronic partial obstruction.

ACUTE INTESTINAL OBSTRUCTION

(Intestinal stricture; intestinal occlusion; ileus)

Acute obstruction is the condition resulting from various causes whereby peristalsis cannot move the fecal mass beyond a certain point; the main symptoms are about the same in all forms, varying somewhat according to the location and other conditions present in different cases.

The causes are grouped under eight heads, namely:

1. Accumulations within the bowel of hardened feces (fecal impaction), or foreign bodies of various sorts which have accidentally been swallowed, or gall-stones.

2. Strictures which are the result of cancer, ulceration, cicatrices or spasm. Congenital stricture is rare. Atresia ani is its most frequent representative, though congenital strictures are found almost at any point of the intestinal tract.

3. Pressure against the bowel from peritoneal adhesions, tumors, or abnormal growths.

4. Strangulations due to the slipping of the bowel or omentum through the openings of the various forms of hernia.

5. Invagination or intussusception when one portion of the bowel slips over another part, most common in children.

6. Twisting, rotation or volvulus.

7. Paralytic obstruction is due to paralysis of the intestinal muscle; the fecal mass accumulates and dilates this portion, thus causing the obstruction. It may result from inflammations, from the handling of the bowel during abdominal operations, or from toxins, as in uremia, typhoid or pneumonia; or from referred irritation, as in renal colic, gall-stones, inflammation of the testes, injury to the spinal column.

8. Spasmodic contraction of the circular muscle fibers may simulate ileus. It has been produced experimentally in anesthetic

tized animals by suddenly produced bony lesions, by handling the intestine, and by the application of heat, electricity or chemical irritants directly to the intestinal wall.

Of these strangulation is the most frequent in adults; volvulus in children. Meckel's diverticulum is a remnant of the omphalo-mesenteric duct, an embryonic structure which should be atrophied in very early life. When it persists, as occasionally happens, it usually has its peripheral (navel) end free, but sometimes this remains attached to the abdominal wall, making a loop through which the intestine may pass and become strangulated. Loops of intestine may also pass between adhesions of various classes, as those at the site of old inflammatory processes; or around the pedicle or a tumor, or into peritoneal pouches in a number of different ways.

Hernia is the condition which occurs when a loop of intestine passes into any opening or pouch—in external hernia the intestine protrudes without the abdominal wall; in internal hernia the loop passes into any of the narrow passes already mentioned, or others of similar relationships.

At any time, a hernia may become strangulated. In such a case the diagnosis is easy for external hernia, obviously, but may be extremely difficult in internal hernia.

The cause of death in acute total obstruction seems to be the presence of some poisonous substance elaborated in the small intestine, and normally passed into the lumen of the bowel. In total obstruction, this substance is absorbed into the blood, and the whole body poisoned. When even slight intestinal movements occur, this poisoning does not appear, even though the retention may appear to be complete. When no defecation occurs for two weeks or even more, from other causes, the symptoms may be comparatively slight; but when there is total obstruction for as many days the symptoms are severe and death seems to be at the door; life is rarely maintained more than a week after the condition is recognized, unless relief is secured. The higher the obstruction, the more speedily death occurs.

Diagnosis. The symptoms are almost pathognomonic.

Pain sets in abruptly; it is usually intense, at first paroxysmal, then becoming continuous; it is located in the middle line above the umbilicus if the obstruction is in the small intestine; and descends into the hypogastrium if the large intestine is involved. Constipation is absolute, though feces may be passed or removed by enemas from the bowel below the obstruction. Vomiting is first of the stomach contents, later of bile-stained material, finally of brownish fluid with a fecal odor. Abdominal distention is uniform unless the obstruction is high up but the flanks do not bulge. Paroxysmal peristaltic movements are visible through the abdominal wall around the umbilicus if the obstruction is in the small intestine; if low in the colon, peristalsis is seen along its line, the waves moving from right to left.

Tumor may sometimes be felt in malignant stricture. In intussusception, a sausage-shaped tumor may be found in the right iliac fossa or in the line of the colon.

Occasionally in infants the obstruction and the ileo-colic valve may be felt upon rectal examination. Blood may be passed by bowel and tenesmus is often marked. The general symptoms are those of collapse, indicated by pinched face, cold sweat, small

rapid pulse, dry tongue, scanty urine, great thirst, and either normal or subnormal temperature. Death from asthenia or peritonitis occurs from the third to the sixth day if relief is not secured.

The blood changes are marked. Leucocytes rise rapidly to about 16,000 per c.mm. when the bowel is partially obstructed; to 20,000 with complete occlusion. When the leucocytes rise to over 20,000 within first 24 hours, the chances are in favor of gangrene. Leucocytosis of more than 80,000 has been reported.

The X-ray gives accurate information concerning the location of the obstruction, and often of the nature of the lesion.

Examinations per rectum et vaginam and the exploration of hernial orifices may give useful information. Fecal vomiting occurs earlier in the higher obstruction.

Large injections of water may determine the capacity of the colon and hence something of the site. This is best given in the knee-chest position, the Sims position, or with the patient's hips elevated and the thighs flexed upon the abdomen. Such an injection may straighten out intestinal distortions or help to push a tumor, etc., into better position, thus removing, temporarily at least, the obstruction.

Treatment. Some therapeutic methods are common to all forms of obstruction; others depend upon the nature of the obstruction.

A few cases will respond to very careful work with the patient in the knee-chest position.

It is always best to have an experienced surgeon in consultation if possible.

In all cases purgative or emetic or analgesic drugs are absolutely contraindicated. Death may be hastened, or recovery prevented after the removal of the cause of the obstruction, by the early use of the so-called "home remedies," which may include almost anything from castor to croton oil and blue mass. Enemas should be used to cleanse the lower bowel. Ice in the mouth relieves thirst; the water should not be swallowed. Heat over the abdomen relaxes the muscular walls, relieves pain, and sometimes gives sleep and rest. Gastric lavage may be used freely.

Such spinal treatments as are indicated on examination often give marked relief. Reflex muscular contractions are found in the areas of spinal muscles which are in closest central connection with the sensory nerves from the intestinal areas of greatest irritation, but do not necessarily refer to the area of obstruction. The relaxation of these muscles gives comfort. After the removal of the cause the spinal treatment hastens recovery.

In surgical cases, the earlier the operation the better the prognosis. It is very necessary to save time in such cases, even at the expense of some weariness to the patient.

Other methods of treatment apply chiefly to special forms of obstruction.

Fecal impaction is diagnosed from the other obstructions by the gradual onset, the absence of hernias, and the presence of an irregular "doughy" mass following the line of the colon.

Treatment. Stop all purgatives—most of these patients are in the habit of using them. If the rectum cannot be cleansed by enemas, the rectal scoop or manual removal must be used. If the mass is higher, enemas of warm oil will help soften the mass so it can be removed by using plain warm water, or soap suds. In some cases, surgery may be necessary. Avoid manipulation until the masses have been softened; the dry, hard, adherent masses may injure the intestinal walls.

The **prognosis** is favorable for recovery. Recurrence is to be expected unless the original cause is removed.

Strangulated hernia is the form most often found needing urgent relief. The predisposing causes are sudden, heavy lifting; constipation, and rapid fat formation.

The symptoms are sudden pain in and around the hernia; violent and colicky pains around the umbilicus; the tumor becomes larger, is tender, painful and dull on percussion and without impulse on coughing; the intestinal wall becomes edematous; uncontrollable vomiting comes on early; prostration increases to collapse; the pains become more violent; the pulse is small, irregular, rapid and may be very weak; the temperature is normal or subnormal (sometimes a slight fever is present at first); and the Hippocratic facies is characteristic. When gangrene begins, the vomiting ceases, pain abates, hiccoughs appear, the pulse becomes very frequent, feeble, and intermittent; collapse deepens and delirium is common.

Treatment. The first thing is to attempt reduction. Put the patient upon his back with the hips elevated, the thighs flexed upon the abdomen, rotate the leg upon the affected side slightly inward to relax the tissues around the inguinal rings. Apply taxis or gentle manipulation using such methods as the location indicates to replace the bowel (or omentum). Reduction is evidenced by the sudden slip from the hand or an audible gurgle as the loop enters the abdomen. Taxis must never be employed in cases of great acuteness; in cases where the strangulation has existed for several days; in cases known to have been previously irreducible; in cases with stercoraceous vomiting, or in cases with inflamed or gangrenous hernia. If taxis fails, operate as speedily as possible, first trying reduction under ether.

After reduction, put the patient to bed; apply a pad and bandage; allow no food until vomiting ceases, allowing a little hot

water for 24 hours, and keep on liquid food for several days. At the end of the first week begin to give solid food.

If the bowels do not move after four or five days, a small enema may be gently given. This may be repeated daily until defecation occurs normally and the regular diet is permitted.

Before leaving the bed, a truss should be fitted. The best treatment for hernia is surgical repair, unless there is some contra-indication.

Prognosis. The prognosis must be guarded until the normal digestion has been reëstablished.

In **intussusception** a history of purgation, diarrhea or other form of intestinal irritation, or of precedent symptoms indicating ulcers or polyps will probably be found. The patient is usually a child.

Occasionally the invaginated portion may be sloughed off, the upper edge of the rings adhere, and the patient may recover spontaneously by this natural surgery. Such a termination must be very rare, however. The slipping of the ileum into the colon is perhaps the most common location.

Treatment. The patient should be placed in the Trendelenburg, the Sims, or the knee-chest position. Warm oil or soapy water should be slowly injected into the rectum, under low pressure, while gentle manipulations are given over the abdomen. An assistant may give deep, steady pressure over the spinal regions of greatest muscular tension; this lessens the pain of the manipulations. If there is difficulty in securing the reduction, the pressure of the injecting oil or water is increased, hot cloths applied over the abdomen around the site of the manipulations, and the position of the patient changed. After reduction has been secured, the patient should be kept in bed on a liquid diet, for several days.

If reduction is impossible, surgical aid should be secured speedily—certainly within twenty-four hours if possible. The longer the operation is delayed the less hopeful is the prognosis.

Vovulus is a condition thought to be caused by excessive peristalsis caused by unequal filling of the coils or by contusions especially acting upon intestines with an abnormally long mesentery, thus producing a more or less completely obstructed bowel by a twist or kink about its long axis. One half of the cases occur in the sigmoid flexure. Males between thirty and forty years are most often affected.

Treatment. Direct treatment to the affected area is here indicated but it must be carefully done. Spinal treatment controls the blood and nerve supply, lessens the pain, and tends to establish a normal peristalsis and secretion throughout the intestinal region.

Surgery is immediately necessary unless the condition can be removed within a few hours.

The **prognosis** is grave, as in all forms of obstruction. Recoveries occur.

Strictures are almost invariably surgical, and are speedily fatal unless removed. Occasionally such conditions can be temporarily relieved by manipulation and enemas, but these methods are rarely of permanent value. The removal of the injured section of the intestine is the usual surgical procedure. The prognosis in all cases depends upon the nature of the cause.

Peritoneal adhesions are sometimes stretched by manipulations applied directly over the adherent bands, thus relieving the tension. It is necessary to use great care, lest inflammatory reaction and the adhesions be thereby increased. In such cases treatment must be continued at rather long intervals for months, in order to prevent recurrences. When the condition is complicated by tumors, these may or may not be removed, according to the benignancy, location, and size of the tumor in each case, and the physical condition of the patient.

Paretic Obstruction. When a segment of the intestinal wall has become paralyzed the best treatment is rest. Daily enemas for the removal of the lower feces, sometimes rectal feeding, gastric lavage, alternate hot and cold applications to the abdominal wall, and the spinal corrections indicated on examination, give best results. If the symptoms do not abate, the removal of the injured segment of the intestine is indicated.

Prognosis. In all cases of intestinal obstruction the prognosis must be guarded, not only for recovery from the acute attack but also for recurrence.

Chronic obstruction is that condition of gradually increasing closure of the intestinal canal most commonly due to malignant growths. Gradually increasing and hardening fecal masses, and the slow contraction of cicatricial bands are also etiological factors. Enteroliths and foreign bodies are rarely causes of chronic obstruction.

Diagnosis. There is a history of gradually increasing constipation alternating with diarrhea perhaps, abdominal pain and distention and general failure of the health. There may be recurrent threatenings of acute obstruction until finally there is complete occlusion, symptoms of acute obstruction, and death.

The feces are narrowed in character, of pipe-stem shape, flattened like a tapeworm, or composed of small, rounded masses like sheep's dung, frequently smeared on the surface with blood and pus. Portions of tumors are sometimes found.

Abdominal palpation and inspection, with the rectal and vaginal examinations, may locate the growth, adhesive bands, or fecal masses.

X-ray, after giving bismuth or other suitable enemas, shows the place of interference; the nature of the cause of the occlusion may often be inferred from the X-ray plate.

Treatment. Most thorough and careful examination must be made to determine the location of the growth. Surgery offers the best hope for permanent relief. If non-operable, careful regulation of the diet, with enemas and spinal work to alleviate the pain, is palliative. Fecal concretions must be softened, sometimes by days of successive oil, saline, and soap enemas.

Adhesive bands may sometimes be benefited by stretching. Injury to the intestines must be avoided. Surgery for these is of dubious value; if the bands can be cut without the formation of later adhesions, this leads to permanent recovery from the condition. Unfortunately, such operations are too often followed by the formation of other bands, perhaps more harmful.

Prognosis. This depends upon the possibility of removing the obstruction. If this cannot be removed, death is quickly inevitable; if the obstruction can be removed completely, recovery is speedy and practically complete. Between these extremes lie all gradations of prognosis.

INTESTINAL TUMORS. Carcinoma is the most important intestinal neoplasm. The symptoms are those of chronic obstruction, with cachexia. Rarely the obstruction may first appear in the acute form; in other cases the first symptoms are those of perforation.

Rectal tumors may be either adenoma or epithelioma. They are often branched and of delicate structure, so that masses of the growth may be passed with the feces; bleeding is apt to occur.

In the duodenum, the ileo-cecal region, and the rectum polypoid growths may occur. These probably originate from shreds left from old inflammatory areas; they are composed chiefly of mucous glands in a connective tissue network. Their growth may result in various types of obstruction. When they are so attached as to act like a ball valve, the resulting symptoms may be most confusing. In the sigmoid area the symptoms may be those of a spastic colitis. Care should be taken to avoid confusing colitis and a possible diverticulum.

Connective tissue tumors usually grow into the peritoneal cavity, and cause little or no disturbance. Rarely, tumors either within or without the intestinal cavity may cause irregular symptoms of intestinal irritation, with colicky pains and griping, but with no evidences of organic disease. Such cases are apt to be diagnosed as intestinal neuroses.

Many of these are recognized or suspected only post mortem. Those which cause occlusion can be treated surgically if at all.

CHAPTER VII

ENTERITIS OF CHILDREN

The intestinal inflammations of children have practically always a more or less pronounced "nervous" basis; rarely a purely "nervous" diarrhea is present, and this does not result in true enteritis unless the imperfectly digested food acts as an inflammatory agent. Considering the nervous element always present, three classes of acute infantile enteritis are to be recognized: irritative, fermental, and infectious. These differ in etiology, diagnosis and treatment.

The possibility that vomiting and diarrhea may be symptoms of disease of the central nervous system or of the kidneys must not be forgotten. The examination of the pupils and of the various reflexes should eliminate the first; the microscopical examination and chemical tests of the urine should eliminate the second possibility.

ACUTE IRRITATIVE ENTERITIS OF CHILDREN

(Nervous indigestion; intestinal intoxication; acute dyspeptic diarrhea)

This is a catarrhal enteritis in children, due to improper intestinal content, and characterized by vomiting, colic, and diarrhea. This form is usually comparatively mild and is self-limiting. The diarrhea and vomiting eliminate the offending material, and recovery usually occurs spontaneously within two days. When the etiological factors persist, and in certain other circumstances, the disease passes into more serious forms.

Etiology. The predisposing causes include poor nutrition and habitual use of improper foods; teething; insanitary surroundings; previous attacks; climatic changes; nervous irritability, due to bad inheritance and to the presence of irritable mothers and other adults. Bony lesions, including the spinal column from the mid-thoracic to the coccyx, may be either primary or secondary. The lower thoracic and lumbar area are most often involved. Lower rib lesions are usually secondary.

Exciting causes include the use of improper food, food given at improper times, or of too great quantity; sudden change of diet; sudden change in temperature; emotional storms; fatigue; loss of sleep—anything which disturbs either the quality of the intestinal contents or the physiological balance of the intestinal nerve centers. An important factor often neglected is the spinal shock resulting from the falls and strains to which children learning to walk and those playing with one another are especially subject.

Diagnosis. The trouble begins abruptly with nausea and vomiting several hours or days after the disturbing diet. Rumbling noises in the abdomen usually precede the evacuations and considerable gas is passed. There are colicky pains, moderate tympanites, and diarrhea. The child is irritable, sleeps poorly, and convulsions may occur. The fever is rarely high, 102° to 105° F. in infants, 103° F. in older children. The pulse is rapid and prostration is marked in the very young or weak child. Stools are four to twelve or more in twenty-four hours, at first normal in color and odor for the diet used and the age of the child. Later they are liquid in character and contain undigested whitish masses. No blood or excessive mucus is present in the early stages unless there had been extreme irritation in the diet. There is no persistent fever, no toxemia. The child does not look sick. In prolonged cases there may be seen excessive mucus and flecks of blood due to a subsequent colitis. Convulsions may precede or accompany the diarrhea.

Treatment. This depends much upon the age of the patient but the general principles are the same. Empty the bowels as soon as possible by enema and gentle manipulation. Gastric lavage is useful during the early stages or if vomiting persists.

Withhold food, giving boiled water, whey, or albumen water for thirst, one to four teaspoonfuls at a time for an infant and at short intervals. If possible, give as much boiled water, or other liquid as mentioned, as would have been given of both food and water during the same period of health. If cool water causes vomiting, give it quite warm, as much as can be taken, in order to serve as lavage if not retained. It must be remembered that the diarrhea removes very large amounts of water from the circulation; this must be restored as rapidly as possible.

When water is persistently refused, the enema may serve. After the colon seems emptied of fecal material, a quarter to half pint of normal salt solution may be injected, and this will be retained for some time, especially if the buttocks are raised slightly. A variable amount of this water will be absorbed into the general circulation.

Frequent bathing for cleanliness and the reduction of temperature is necessary. A tub at 100° F. gradually reduced, is the best, using gentle friction during the five to twenty minutes of the bath. Fresh air is essential; as soon as the child can be moved, take him to the seashore or any place where he can have the best food and air.

The clothing should consist of a single loose garment. The child should be protected from sudden changes of the temperature by suitable coverings. Napkins should be removed as soon as

soiled, taken from the room and placed in a disinfecting solution or burned. Absolute cleanliness of the buttocks and genitalia with the free use of some absorbent powder as starch and boric acid will prevent excoriations.

Marked tension and hypersensitiveness in the spinal areas, especially through the mid-thoracic and lower thoracic region are constant; these recur, and must be relieved as frequently. Bony lesions may result from these reflex contractions. Correction of such perversions as they are found hastens recovery and lessens the danger of recurrences under slight provocation.

Convalescence is usually rapid in uncomplicated cases. Care is necessary to prevent too sudden a return to ordinary diet.

"In breast-fed babies, give boiled water during the period of withholding food. Then resume breast feeding and dilute by giving immediately before nursing a mixture of one teaspoonful each of boiled water and lime water. Allow nursing five minutes first time, ten minutes the second time, and then back to normal. In bottle-fed babies, withhold food twenty-four to forty-eight hours, then return to former diet, if it had previously agreed with it, by giving at first one fourth strength, then one half, then full strength feeding. If there is any indication of an ileo-colitis present, as excessive mucus and flecks of blood, give a daily irrigation of the colon."—J. H. Long.

"Some nervous children have convulsions. When these occur, wrap them in blankets wrung out of hot water or dip the child into tub of hot water with cold cloth on head. However, osteopathic treatment to cervical region usually takes care of this condition, unless in very severe cases.

"One of the most trying symptoms in these simple diarrheas is colic and griping pains. It is my experience that no method of treatment so quickly relieves it as osteopathic treatment to spine from eighth to tenth dorsal and gentle deep pressure over solar plexus. A hot water bottle may be applied to abdomen and epigastrium following treatment."—Nettie M. Hurd.

For older children the diet is much like that of infants at first. Later, meat broths, eggs, dried bread and milk may be given cautiously. Cereals, vegetables and fruit should usually be withheld for some time. The fruit and vegetable juices may then be given, and the regular normal diet resumed within a week or ten days.

Prognosis. In infants all diarrheas should be regarded with suspicion, though the simple forms usually pass away, as in older children, within a few days. Each attack predisposes to later attacks, more severe, with less marked causes. During an attack the child is more than usually susceptible to infections, especially of the intestinal tract.

Prophylaxis. The education of mothers in regard to the feeding and care of infants and older children, proper milk inspection and the enforcement of sanitary laws, and the occasional osteopathic examination of children would practically remove these forms of enteritis from the world.

ACUTE FERMENTAL ENTERITIS OF CHILDREN

(Choleric form diarrhea; summer complaint; cholera infantum)

Fermental enteritis is an acute inflammation of the stomach and intestines, characterized by severe colic, vomiting, purging, early high fever of short duration and marked prostration.

Etiology. Hot weather, especially with high humidity; too warm clothing; teething; improper food, especially bad milk, bad meat, or foods unsuitable for babies; and imperfect hygiene in general, are predisposing factors. Bony lesions are more variable than in the simpler diarrheas. Lesions of the cervical vertebrae are rather more frequent.

The exciting causes are usually dietetic errors. Sometimes no efficient exciting cause can be found; these cases usually occur in children whose hygienic and dietetic conditions are bad.

"To understand the condition present it is necessary to recall the kinds of bacteria normally present in the intestines and their actions. We find present in the intestines, first, the obligate fermentative organisms which live in a carbohydrate media and form products which are nontoxic; second, the obligate putrefactive organisms, which must have a proteid media in which to live and in the absence of which they soon die out. They act upon the proteids, splitting them, and form products which are toxic; third, the facultative fermentative organisms, which are normally present and as long as there is a carbo-hydrate media present they will live on it and the products formed are nontoxic, but when the carbo-hydrates are deficient, or when there are abnormal conditions present in the intestines they act upon the proteids and produce toxic substances. In cases where there is simply indigestion, or under influence of a change in the digestive powers, or abnormal chemical contents, or by feeding excessive proteids, the obligate fermentative organisms are inhibited in their growth and the facultative fermentative bacteria then act upon the proteids and produce substances toxic. This type of diarrhea is the most fatal and in some cases the toxemia is overwhelming, the child dying within the first twenty-four hours."—J. H. Long.

Diagnosis. The onset may be sudden or preceded by intestinal disturbance, then vomiting and purging occur with severe abdominal pain and high fever, 102° to 106° F. (the temperature should be taken by rectum as the body surface is cold). The pulse is rapid (130 to 160) and feeble; intense thirst may be a marked feature; distressing retching follows, and rapid wasting may be apparent within a few hours. The appearance is noticeable and characteristic. The body shrinks; the eyes are sunken and partly closed; the mouth partly open; the lips are dry, cracked, and bleeding; and the skin a peculiar ashy pallor. At first the child is irritable and restless, but soon becomes semi-comatose; the pulse becomes more and more rapid and feeble; the body-surface cold and clammy. The tongue is found heavily coated. The spinal muscles are found heavily contracted. There may be bony mal-adjustments. The stools are, at first, fecal, brown or yellow and very offensive, soon becoming thin, alkaline, serous, or watery and leaving a faint

greenish or yellowish stain on the napkin. They number from ten to thirty a day and possess a musty odor. The urine is diminished or suppressed. The pupils contract but are unresponsive to light; the stupor deepens; the fingers are clutched; there may be convulsions; the head may be retracted; respirations may be of the Cheyne-Stokes type; these last form the "hydreencephaloid" symptoms.

The termination may be by death from profound exhaustion or convulsions. In recovery, the symptoms gradually diminish and the disease passes into a slow, tedious convalescence.

Treatment. Careful and thorough spinal manipulation, relaxing and correcting as is indicated in the individual case, assists in eliminating the poisons and in restoring the normal functions. Empty the stomach and bowels by washing the stomach and by irrigating the bowels. Supply fluid to the blood if necessary, to make up for the very great drain of the discharges, by subcutaneous injection of at least a half pint of warm normal saline solution every twelve hours. If the case is not so serious, the Murphy "drop" may be sufficient.

Reduce the temperature by tepid sponging and by the ice cap to the head. Deep, steady pressure in the suboccipital fossa may reduce the temperature. Colonic flushing with cool water may be useful. If the temperature is subnormal, the hot water bottle, stupes, and fomentations are indicated.

Treat the various symptoms as they arise. For the abdominal pain, deep, steady pressure in the lower thoracic spinal area is indicated. Hot fomentations may help when applied to the stomach and abdomen. The early denial of all food is best. Barley water may be given in small quantity every hour to relieve the thirst. Very warm water sometimes relieves the vomiting.

The lactic-acid diet depends upon the bacteriology of the disease as given above. Skimmed milk is acted upon by any of the lactic-acid bacilli in a warm room for twenty-four hours; the "buttermilk" thus formed is fed to the child according to age, at intervals of two to four hours. Three to eight ounces are given at each feeding. This method gives very good results, in the experience of certain physicians. In any case, return to the ordinary diet must be cautiously made.

Change of air is one of the usual recommendations.

The child must be guarded from nervous excitement for several weeks after an attack.

Prognosis. The condition is grave in all cases. Death or convalescence or a change to a less acute form usually occurs in from one to four days. Recurrence has a graver prognosis.

ACUTE INFECTIOUS ENTERITIS OF CHILDREN

(Catarrhal ileo-colitis; ulcerative enteritis or entero-colitis; follicular enteritis; inflammatory diarrhea)

Infectious enteritis affects the lower portion of the ileum and involves the colon also; it occurs usually in children under two years of age, and is characterized by vomiting, persistent and irregular fever, and marked prostration. Blood and quantities of mucus appear early in the stools.

Etiology. The predisposing causes are hot weather, debility due to teething, and improper feeding. The usual bony lesions include chiefly the lumbar spine, especially a rigidity of this area. The spinal condition is certainly an important predisposing factor.

The exciting causes are the pyogenic cocci or the bacillus dysenteriae of the Shiga or Flexner type.

The pathological changes are found in the epithelium of the mucosa of the ileum and colon, the infiltration of which may be so great as to affect the submucosa with the production of necrosis and the formation of ulcers.

Diagnosis. In mild cases there is a diarrhea of greenish, offensive stools which may contain undigested casein in curds like "chopped spinach," numbering from fifteen to thirty in twenty-four hours; abdominal pain causing great restlessness and irritability; fever of slight degree; and vomiting. The tongue is furred and moist at first, later becoming red and dry.

In cases of moderate severity the onset is sudden, often with vomiting, abdominal pain, and fever, 102° to 104° F. at first; later, 99° to 102° F.; and frequent, thin, green or yellow stools which are partly fecal and partly undigested food. Later, the discharges contain mucus and blood, rarely in clots and usually streaking the mucus. The stools are almost odorless. The appetite is lost and the tongue is coated. Prolapsus ani is frequent. There is considerable prostration and marked loss of weight. The convalescence is slow and begins about a week after the onset of the disease.

In severer cases the symptoms suggest bacterial intoxication. Vomiting and diarrhea are urgent; the abdomen distended or hollow, and very tender; the temperature 104° to 105° F.; wasting is rapid, and collapse and coma may cause death in a few days.

Treatment. "Relaxation of the contracted muscles by strong deep pressure brings to our assistance the normal inhibitory function of the splanchnics. Gentle springing of the spine also seems to help in freeing the contraction. A general spinal treatment is indicated in these bowel conditions, as the whole vasomotor system is deranged as evidenced by the cold face, chest, abdomen and extremities, hot back and congested mesenteric vessels. Of course,

the spinal bony lesion must be corrected, but just when in the course of the disease it is wise to attempt this, I believe depends on the vitality of the child and the severity of the condition. * * *

"Sometimes I place the child on its chest on my lap or on its bed and extend the legs, gently pressing on spine, moving pressure on spine, moving pressure with each elevation of the legs with some lateral bending of the spine at the same time. * * * The Old Doctor says take the child in your lap and have him throw his arms over your shoulder, then begin at the fifth lumbar and adjust from the fifth lumbar to the occiput, remembering that it is a child you are handling and knowing well that it requires but little force to adjust and loosen up the entire spine."—Nettie M. Hurd.

Raising the lower ribs, holding them for the time of one breath, is helpful. With the child held by the right arm around the upper part of the body, the left hand may raise the child's right ribs; then, with the left arm holding the child's body, the right hand may raise the left ribs. Spinal treatment may be given with the child in the same position. It is sometimes possible to give such treatments standing, when the child would cry and struggle if the attempt is made to hold him upon the lap. Every effort must be made to prevent struggling; the nervous effects may be profoundly depressing. In a few cases, if the pathology permits, deep but very careful work over the abdomen is effective.

Diet. All milk foods, of whatever kind, must be stopped at once. Barley water, rice water, may be given in the amounts and at the times of the usual feeding. A small amount of chicken or other broth may be added to make these palatable, if necessary. Sugar is permissible also; indeed, sugar is often advised in order to give the necessary fuel for the needs of the body, thus preventing too great loss of weight from the high fever. As convalescence progresses, the return to ordinary diet must be cautiously made, watching the effect of each change and keeping the bodily structure of the child always under close supervision.

Let the child wear a single, loose garment. Napkins or pads of soft cloth should be placed under the buttocks, and these removed as often as soiled; sores are apt to occur if cleanliness is not constant. The soiled cloths should be burned or else immediately dropped into some antiseptic solution, to be boiled later, before being used again. Since the fecal material contains the infectious agents, the utmost care must be used to prevent reinfection of the child, or the infection of others.

A flannel band or pad over the abdomen is often advised. Warmth is usually required; a small hot water bottle over the abdomen may relieve the pain. Hot stupes may give more speedy relief, carefully avoiding chill in changing.

For several months after such an attack the fats must be kept down to a minimum. Olive oil may sometimes be used when milk fats are not well handled.

Colon irrigation is useful. When there is profuse diarrhea this washes out the irritating material, cleans the membrane, and permits more rapid recovery. The normal salt solution should be quite warm—105° to 110° F.—and should be thoroughly given at least once. If no good effects are noted, or if the child struggles and cries when the procedure is properly carried out, it need not be repeated. Usually this warm irrigation diminishes the pain and the peristalsis, and gives opportunity for several hours' rest. Too frequent use of the enema or irrigation is to be avoided—twice a day is the most that is allowable, except in exceptional cases. There is no reason for attempting to insert the tube a long distance—the reversed peristalsis carries the fluid well around to the cecal region, and sometimes into the small intestines, through the relaxed ileo-cecal valve.

When the irritation of the colon is profound, as when much blood and mucus, and violent straining, are noted, thin boiled starch solutions may be injected. Thin flaxseed solution is also used. These act as a mechanical protection to the wall of the colon, and are very soothing in most cases. The old-fashioned starch-and-*laudanum* mixture is dangerous, on account of the possibility of the absorption of the *laudanum*.

Gastric lavage may be necessary if the vomiting is severe, especially during the first few days. It should not be used unless there is reason to believe that irritating substances are still present in the stomach. The washing that is secured by the vomiting of considerable amounts of water, or of the food substitutes already mentioned is usually sufficient.

After the temperature returns to the normal, the diarrhea ceases, and the feces appear normal, a more rapid convalescence is secured by a change of climate. Perhaps this is partly due to the lessened risk of reinfection, but it is also partly due to the tonic influence of the change. Especially a change from sea or lakeside to mountains, or from inland towns to the sea, greatly facilitate recovery.

Prognosis. The usual duration of the disease is ten to fifteen days. Vigorous children in good surroundings nearly always recover promptly; weak children, those who are teething and those placed in unhygienic surroundings, give rather a gloomy prospect. Good nursing with the treatment as indicated should lead to recovery in all uncomplicated cases.

Sequelæ. After an attack, the lumbar spinal column is left more rigid than normal; no doubt this is partly the reason why

each attack lessens the resistance to later attacks of this as well as of other forms of enteritis.

CHRONIC ENTERO-COLITIS OF CHILDREN

(Chronic enteritis; chronic intestinal indigestion; chronic ileo-colitis)

Chronic entero-colitis is a disease involving the lower ileum and the colon, associated with varying inflammatory derangement of the other parts of the digestive tract, and characterized by mal-nutrition, nervous instability and alternating constipation and diarrhea.

Etiology. It follows repeated attacks of acute enteritis, and is chiefly due to bad food, imperfect hygiene, and changeable, especially hot and humid, climates. Bony lesions of the dorso-lumbar region are important factors.

The children are always thin, pale, sallow, anemic, with dark rings around the eyes and mouth. The abdomen is large and protuberant—this is partly due to the anterior lumbar spine so often present. Flatulence is usual. The bowels are usually constipated, with pale stools, lumpy, very foul in odor. Attacks of diarrhea occur, with large, thin, gray or brown stools, frothy, foul, and frequently containing fragments of undigested food. Considerable quantities of mucus and sometimes a little blood may be passed.

The appetite is whimsical; the tongue may or may not be coated; the breath may or may not be foul.

The nervous symptoms vary from a general irritability to seizures resembling petit mal. Convulsions may be epileptoid. The child is easily fatigued, cross, irritable, and emotional to an unnatural degree. Sleep is disturbed, night terrors are frequent; grinding of the teeth during sleep is characteristic. Convulsions may occur during the diarrheal attacks.

There may be fever, 99° to 105.5° F., from toxic causes.

The lumbar spine is rigid and usually anterior; posterior lesions of the dorso-lumbar region are sometimes present. Anterior lower thoracic is often associated with the posterior lumbar condition. Lesions involving the cervical region have been reported. Coccyx lesions may also be found.

Cervical lesions are more common in children in whom the nervous symptoms are most pronounced.

Diagnosis. This condition may be distinguished from true epilepsy by the character of the attacks, which are rarely typically epileptical; from kidney disease, by urinalysis; from intestinal parasites by the character of the stools; and from the ordinary diseases of mal-nutrition, by the lack of skeletal changes and the history of the case. It is often associated with rickets, marasmus,

epilepsy and kidney disease, in which cases diagnosis presents difficulties.

Treatment. This is hygienic, dietetic and corrective. The correction of the bony lesions as found, with increased mobility of the ribs and the lumbar spine, usually gives better appetite, better sleep and better digestion. The clothing must be light and loose, and not too warm; chilling of the body must be prevented. Much open air is necessary; a change of climate is advisable if this is possible.

Daily **massage** once a day is helpful; the mother should be taught to do this. If some oily substance is provided, with instructions to "rub in" a given quantity, the massage is more comfortable and a definite end is provided. A cool bath daily, with warm baths for cleanliness and when the nervous symptoms are more pronounced is advisable. All baths should be followed by a good rub-down.

Diet. For young infants, good breast milk is most important. If this is impossible, artificial foods must be tried, one after another, until a suitable food is found. Starches are to be absolutely forbidden; thoroughly dextrinized foods in which practically no starch is present may sometimes be allowed.

White of egg beaten in water and strained; peptonized milk; toast water; beef juice; scraped beef or mutton, lightly broiled; buttermilk and junket may be given to suitable ages of children. The juice of fresh fruit, especially oranges, should be given one hour before the meal, once a day.

After two months of improvement, stale bread, cut thin and dried until crisp, may be given in small quantity and with no butter. Broths of mutton, beef, or chicken may replace a milk feeding occasionally. A little vegetable juice should be added.

After three or four months of improvement, green vegetables, preferably spinach, stewed celery, etc., may be added once a day.

After two or three months more of gain, thoroughly cooked rice or macaroni may be given twice weekly. With this diet, the child can get along comfortably for a year or so and no larger variety given until all symptoms have disappeared for some time.

Free water drinking is to be encouraged.

The nursing is a very important factor. Enemas are to be given according to the bowel conditions, varying with the needs of the patient. Too much irrigation of the colon is irritating, yet the presence of irritant feces must not be permitted. Hospital nursing gives better results than home care, unless the latter is unusually good.

Prognosis. Recovery is always very slow, though marked improvement usually follows the first two or three treatments and change in diet. The prognosis is better where the diet and the

hygiene have been very bad, and when pronounced bony lesions can be found, unless the child has lost too much strength before treatment is begun.

Sequelæ. When the patient can be kept under observation until recovery is complete no sequelæ are to be expected. When abnormal conditions of the cervical or lumbar vertebræ are allowed to remain, recurrence of the enteritis and a tendency to gastro-intestinal disease may remain throughout life. A tendency to nervous disorders probably results partly from the absorption of the poisons and partly from persistent cervical lesions.

Prophylaxis. Better education of mothers along hygienic lines; more frequent examination of children's physical condition; better hygiene and sanitation everywhere, must ultimately eliminate the disease.

CELIAC AFFECTION

(Diarrhea alba; diarrhea chylosa)

The coeliac affection is a peculiar disease of children marked by pale, loose, offensive stools, progressive emaciation and ultimately proving fatal.

Pathology. Ulcers have been found in the intestine. Little is known of the intestinal state.

Etiology. It affects children from one to five years and is not associated with either tuberculosis or other hereditary disease. *Filaria sanguinis hominis* has been found in the feces in a few cases.

Diagnosis. The symptoms begin insidiously with progressive wasting and pallor, the belly becomes doughy and inelastic, there is often flatulence, fever is not often present, and the disease is lingering. The stools are pale, loose, gruel-like, bulky, not watery, frothy, and extremely offensive.

Examination of the stools, urine, and blood for evidences of filaria should be made.

Treatment. No cases have been reported by osteopathic physicians. Symptomatic treatment according to conditions as found is indicated. Careful study should be made in each case, and the treatment determined from the results of this study.

Prognosis. Fatal, usually in a few days, according to medical reports.

CHAPTER VIII

INTESTINAL INFLAMMATIONS OF ADULTS

ACUTE ENTERITIS

(Intestinal catarrh; muco-enteritis; inflammation of the bowels; duodenitis; jejunitis; ileitis; colitis; catarrhal enteritis; acute diarrhea; acute entero-colitis of adults)

This is a catarrhal inflammation involving the mucous membrane of all or any part of the intestine, characterized by diarrhea and abdominal pain, without tenesmus.

The localizing terms, duodenitis, jejunitis, and ileitis, etc., have little practical value for they are of difficult diagnosis. Duodenitis is usually associated with gastritis; when abdominal pain and tenderness on palpation, gastritis, and constipation occur, duodenitis may be suspected; when the swelling of the membrane closes the bile duct, and jaundice is present, the diagnosis of duodenitis is fairly certain. In ileitis the colon is usually affected also, and the symptoms of colitis appear. Undigested food remnants, the absence of symptoms of colitis, formed stools containing flecks of mucus, point to jejunitis. Unchanged bile, flecks of mucus often bile-stained and intermingled with the rather solid feces, point to a wide inflammation of the small intestine.

Reflex muscular contractions along the spinal column help in localizing the disease—from duodenitis with its reflexes as high as the fifth or sixth thoracic spines, to colitis, with its reflex muscular contractions involving chiefly the lumbar region, and proctitis, involving the lumbar and sacral segments, there is a fairly constant representation of the segmental innervation of the intestinal tract in the spinal musculature.

Etiology. The causes may be structural or environmental. The structural causes include weakened resistance, and the presence of bony lesions, especially of the dorso-lumbar spinal column. Lesions as high as the fifth thoracic vertebra affect the upper part of the tract, and lesions of the lumbar vertebræ, innominates and sacrum affect the colon and rectum. These lesions predispose to disease of the intestinal tract, and there may be further localizing factors in the character of the exciting causes. Sudden strains affecting these spinal areas may be the exciting cause of an acute enteritis which is very closely localized according to the segmental innervation of the intestinal walls.

The environmental causes include sudden changes in temperature; dietetic errors, such as improper foods, spoiled foods, very cold drinks, hasty eating, especially when tired or emotionally excited; bacterial toxins; drugs, such as mercury, arsenic, morphine in some individuals, purgatives, alcohol.

Diagnosis. The chief symptoms are: griping, and colicky pains, followed by diarrhea (four to twenty or more stools in twenty-four hours); borborygmi; nausea, anorexia, slight or no fever, and

weakness depending upon the diarrhea. Thirst is often severe. Oliguria depends upon the diarrhea.

The feces show undigested food; epithelial debris; mucus flecks which are bile-stained and intermingled with the fecal masses; bile pigments; triple phosphates, and various micro-organisms. When the colon is not involved, the fecal masses may be formed and solid. With the occurrence of colitis the feces are thin and very offensive, sometimes containing blood and large masses of mucus, approaching the dysenteric character.

Reflex muscular contractions are constant; the spinal and abdominal muscles affected give information as to the locality of the greatest irritation.

There is some tympanites, not often pronounced. The tongue is furred and dry. Splenic enlargement may be found, which subsides with recovery. When there is marked prostration, headache, high temperature, pain in the joints, a specific infection should be suspected.

Sometimes what seems to be a simple acute enteritis leads rapidly to symptoms of overwhelming toxemia, collapse and death. This is due either to malignant disease, before unsuspected; perforation; complications, such as cardiac disease, arterio-sclerosis, nephritis, or diabetes; or to the presence of specific micro-organisms.

Treatment. Rest in bed is absolutely necessary. Spinal relaxation of the contracted muscles, correction of the lesions present in the individual case, and regulation of the circulation is indicated. The diarrhea usually stops spontaneously when the irritant has been expelled. But if it continues after a reasonable time has elapsed warm enemas should be given to wash away the remnants of irritating materials. Deep steady pressure at the second lumbar vertebra may check the peristalsis and give rest.

Hot fomentations to the abdomen are useful. Very careful work over the abdomen may be beneficial. The diet must be absolutely restricted to hot water or thin malted milk until the symptoms show decided improvement.

In sigmoiditis and proctitis the tenesmus and colicky pains can usually be controlled by relaxing, inhibiting and stretching the sacral and lumbar spinal tissues.

Prognosis. The outlook is usually good. The duration is from three to ten days, according to the severity of the case. The disease may pass into the chronic form if the etiological factors are not removed.

Prophylaxis. Public hygiene requires the utmost carefulness in regard to the cleanliness of the water and milk supply. Individual prophylaxis consists in carefulness of the diet in the summer and autumn, that the food is unspoiled in any manner, that dairy products are clean and sweet, and that fruit is ripe and not decayed.

Maintenance of correct spinal relations is important in prophylaxis.

CROUPOUS ENTERITIS

(Membranous enteritis)

Croupous enteritis is an inflammation of the intestinal membrane, characterized by tenderness, paroxysmal pains, moderate fever, and the discharge of membranous shreds or casts in the stools.

Etiology. The condition may be terminal, in the final stages of chronic constitutional diseases, or it may occur secondarily, in the acute infectious diseases. Certain poisons, as mercury, lead and arsenic; or the mechanical irritation of impacted feces, gall-stones, or intestinal "sand" may cause the condition.

Diagnosis. The condition may not be recognized ante mortem, or it may present fairly typical symptoms. Paroxysms are usually preceded by various neurotic symptoms. There are feverishness, soreness, tenderness, and distention of the abdomen, spasmodic colicky pains around the umbilicus; these symptoms continue for a day or two and are then followed by diarrhea, pain, tenesmus, with the appearance of mucus, shreds of membrane, or cylindrical casts of the bowel, and sometimes blood.

Treatment. Palliative treatment includes that indicated in acute catarrhal enteritis, until the underlying causes can be found, and, if possible, removed. The diet must be urgently restricted; the liquids taken should be diminished until the symptoms disappear. The condition is always serious, and the patient must receive careful nursing.

Prognosis. In the acute infections, not otherwise serious, recovery is to be expected. In cases with history of long constitutional disease, the prognosis is very grave; not rarely croupous enteritis initiates the terminal stages of such diseases.

ULCERATIVE ENTERITIS

The intestine is subject to many forms of ulceration, the following of which may be mentioned: enteric and dysenteric forms, duodenal ulcer, catarrhal and follicular ulcers. These have already been described under their respective heads. Specific ulcers may occur in syphilis and in tuberculosis.

Syphilitic ulcers occur most frequently in the rectum and mostly in women. They are due to the growth of gummata in the submucosa and the gradual onset of a hard fibrous stricture, easily distinguished from cancer.

Tuberculosis affects principally the ileum, cecum, and colon. The ulcers are irregular, their long diameter in the circumference of the bowel, their edges infiltrated and undermined, involving the submucosa and the muscular coats. They may perforate the bowel. Cicatrization may cause stricture.

Symptoms. The main symptoms are periodic pain, alternating constipation and diarrhea, and slowly advancing stricture. An elongated, hard, and tender tumor-like mass may be found in the right iliac fossa. It is localized and removable by operation.

Treatment. The systemic treatment is most important.

PHLEGMONOUS ENTERITIS. (Abscess of the bowels.) This is due to pyogenic infection of the intestinal membrane after it has been injured by strangulated hernia, total obstruction of any kind, interference with the circulation, or by trauma. It is rarely found below the duodenum. Diagnosis is difficult; often impossible ante mortem.

When the diagnosis can be made, the early evacuation of the pus is important. Deep, steady pressure over the spinal areas of reflex muscular contraction, application of heat or cold to the abdomen may relieve the pain. Sometimes the pus evacuates into the intestine, and recovery occurs spontaneously. There is great danger of rupture into the peritoneum, when death is usually inevitable.

CHOLERA MORBUS

(Cholera nostras; sporadic cholera; English cholera)

Cholera morbus is an acute inflammation of the mucosa of the stomach and intestines, of sudden onset, and marked by violent abdominal pain, incessant vomiting and purging, cold surfaces, rapid, feeble pulse, and spasmodic contractions of the abdominal and leg muscles with prostration.

Etiology. It is more common in children, but is not rare in adults. The exciting cause is probably microbic. The specific organism has not been isolated. The predisposing causes are unripe and decomposing fruit and vegetables, and hot weather with high humidity and sudden changes.

Diagnosis. There is sudden onset with vomiting and purging, very severe and paroxysmal pain in the upper abdomen, the surface is cold and covered with a clammy sweat, severe muscular cramps, and pulse small and feeble. There is intense thirst. Collapse may occur. The vomitus at first consists of the stomach contents, then bile, and later, water and greenish-colored fluid bitter to the taste. The stools are frequent and often continuous and resemble the Asiatic cholera "rice-water stools" in character.

Treatment. If the violent vomiting and purging have not already cleared out the offending material, the stomach should be washed and enemas given.

Deep, steady pressure applied from the ninth to twelfth thoracic vertebræ helps quiet the sensory nerves from this area. Often pressure over the solar plexus through the abdominal wall will produce the same result. If there is any sign of collapse, apply heat to the abdomen after giving the above treatment.

Correction of any bony or muscular lesions found protects the patient against further attacks.

If the cramps are in the legs, deep, steady pressure over the sacrum will usually relieve them. Carefully elevate the viscera. No food should be given until the acute symptoms have disappeared. After the pain has subsided, especially if the blood pressure is low, corrective treatment given briskly permits the most speedy return to normal tonicity of the affected viscera. Increased mobility of the lower thoracic spinal region, and raising of the lower ribs is usually indicated.

Prognosis. Recovery is usual although death may occur within two days of onset. The mild cases recover spontaneously in a few days. The severer cases persist for a week or more and under medical treatment are followed by a tedious convalescence. With osteopathic treatment the course of the disease is usually shortened, convalescence is less tedious, recovery is complete, and the frequent sequelæ due to the use of severe drugs, as well as to the disease itself, are not encountered.

ACUTE COLITIS

(Acute dysentery; ulcerative colitis; bloody flux)

This is an acute inflammation of the mucous membranes of the large intestine caused by irritating foods, bad hygiene, impure water, and the cachectic state, and characterized by fever, tormina, tenesmus, and frequent mucous and bloody stools.

Diagnosis. The disease begins gradually with diarrhea, anorexia, nausea, and very slight fever. These symptoms may continue for three or four days when there is pain on pressure along the course of the transverse and descending colon, colicky pains about the umbilicus, burning pain in the rectum with tenesmus especially when the bowels move and for a short time afterward.

The stools vary from five to twenty in twenty-four hours. For the first day or two the stools contain more or less fecal matter, soon changing to a grayish, tough, transparent mucus containing more or less blood and pus. During the tormina, pain and vomiting may occur. The urine is scanty and high-colored.

Treatment. As considerable muscular contraction is found in the lower dorsal and lumbar even to the coccygeal regions, the relaxation of these areas is indicated with the correction of any deviations found. Interosseous rotations are commonly found between the second and the fourth lumbar, which, if adjusted, will usually give quick relief. Careful, deep treatment of the abdomen is sometimes effective. As soon as possible the irritating material should be removed from the bowel, by enemas and by careful, gentle raising of the colon. Food should be withheld until convalescence begins when the most easily digested with the least residue

can be given. If the patient becomes much weakened, malted milk, broths or albumen water may be given.

Prognosis. Recovery is to be expected in about a week, in patients not already weakened by other causes. Convalescence may be tedious and wasting rather marked. Aged patients, and those weakened from any cause, may die in the second or third week, or may linger for a longer time, with either recovery or death. Perforation and hemorrhage rarely occur. Recurrences are to be expected, if dietetic errors are permitted.

APPENDICITIS

(Perityphlitic abscess; suppurative appendicitis; typhlitis; skolikoiditis; scolecitis; pericecal abscess; iliac abscess; paratyphlitis)

The symptoms of typhlitis are identical with those of appendicitis, hence the term is here included, although this inflammation may occur as a separate disease.

Appendicitis is inflammation of the vermiform appendix of the cecum; characterized by pain in the right iliac fossa, tenderness at McBurney's point, rigidity of the right rectus muscle, and general symptoms of nausea, vomiting, constipation, and fever.

Etiology. Appendicitis is due to infection by the bacillus coli, pyogenic cocci, or bacillus proteus upon an abraded surface caused by some irritant from the food, or fecal concretions, or due to perverted blood and nerve supply resulting from subluxated lower ribs or the vertebræ from the tenth thoracic to the third lumbar. A number of cases will respond immediately when the lumbar lesions are adjusted. Muscular overstrain; indiscretions in diet and habits; age, from fifteen to thirty, are predisposing factors.

Although the possibility of infection of the appendix from the ovary might be expected to increase the relative number of cases of appendicitis occurring in women, and although women's dress is such as might be expected to favor diseases of the appendix, as of other abdominal viscera, yet about three times as many appendix cases occur in men as in women. This is probably due to the better circulation of the blood and the better lymph drainage in women, by way of the ovarian relations. This consideration shows the tremendous importance of proper circulation and drainage in the prevention and cure of diseases of the appendix, and leads to a better understanding of the importance of correct osteopathic treatment in this disease.

The pathologic anatomy is described when the kinds of inflammation are mentioned: catarrhal, which may become chronic or produce a fibrous appendix; phlegmonous; ulcerative; or gangrenous.

Diagnosis. The attack may be ushered in with several days of digestive disturbance and colicky pains or may appear suddenly, particularly after a full meal. The most characteristic symptoms are as follows: Pain is at first over the whole abdomen but is soon localized in the right iliac fossa. Tenderness is soon present, usually greatest at McBurney's point. Rigidity of the right rectus muscle is often replaced in two to three days by an oval tumor about the size of a hen's egg. The patient assumes a characteristic posture, lying on his back with the right leg drawn up. Elevation of temperature is typical, 102° to 104° F.; a fulminating type may succumb before much fever appears. The gangrenous type usually has a normal or subnormal temperature. General symptoms of furred tongue, constipation, vomiting which varies and is not excessive and not fecal, and a full and strong pulse are present in typical cases.

If the attack is light, the pain, tenderness, and fever lessen about the third day and the illness is over in about a week, followed by complete recovery. Recurrent attacks vary from rare ones to those rapidly repeated. Chronic appendicitis may follow acute attacks.

If recovery does not begin before the sixth day, a local abscess is probably forming. The fever continues or increases, becoming of a septic type; the swelling is larger, harder and more tender; but fluctuation is rarely obtainable. The general symptoms become more severe. The abscess may rupture and produce a diffuse peritonitis; or may be walled off and rupture into the intestine, vagina, the lumbar region, liver, or around the kidney, or they may become very well walled off by adhesions and set up only a localized peritonitis. Perforation into the peritoneum from either ulceration or gangrene is indicated by a sudden fall in temperature, the other symptoms remaining grave, followed by collapse, or signs of general peritonitis.

The lower ribs are nearly always found depressed, in some cases so much so that the floating ribs seem to ride the ilium. The tenth thoracic to third lumbar vertebral lesions are constant. The tenth and eleventh ribs on the right side are especially to be examined. There may be some interference with the vagi. The cervical muscles are often contracted. The clavicles and first ribs may be subluxated.

The percussion note is changed in comparison with the opposite side and changes during the course of the disease, being of a dull tympanitic tone or a distinct area of dullness.

The urine is febrile in character with large quantities of indican. The blood shows leucocytosis. A leucocyte count of 20,000 is high and indicates an acute appendicitis, with pus, gangrene, or peritonitis. In old cases there is moderate leucocytosis although a normal count may be present in a walled-off abscess. The

erythrocytes are not changed except in cases of long standing abscess when there is anemia.

Care must be taken to differentiate acute enteritis, mucous colitis, intestinal obstruction, cholecystitis, renal colic, salpingitis, typhoid fever, malaria, ectopic gestation, and lead poisoning.

PSEUDO-APPENDICITIS. This term is applied by J. F. McNary to a condition found simulating appendicitis. The twelfth dorsal, the twelfth rib, and muscles attached to it, and the sub-costal nerve are the seat of irritation; the rectus muscle is relaxed; by grasping the abdominal wall over the cecum with pressure, pain is produced; but, bearing down upon the cecum, pain is not produced; the appendix is not diseased, though the cecum may be impacted, and elevated temperature, accelerated pulse, nausea, and constipation may be present.

Treatment. Absolute rest in bed, when symptoms resembling those of appendicitis occur, is the only safe procedure. If further examination gives another diagnosis, no harm is done by the rest, in any case.

As soon as is possible, a blood examination should be made; this is for the sake of securing correct data for later study, as well as for the useful information thus secured at the time.

It is generally recognized that surgery is contra-indicated during the time of beginning abscess. (The "early operation" is performed before abscess formation occurs—first to third day, for example.) After pus begins to be formed, no surgery should be attempted until the abscess becomes circumscribed; many surgeons prefer then to await recovery from the acute attack. Before the third day, the propriety of surgery is doubtful, since the diagnosis is usually doubtful. From the first to the third day, if surgery is not performed, and from the third day until recovery or the appearance of more serious symptoms, gives the time for the use of nonsurgical measures.

Any case of appendicitis is potentially surgical. It should be a routine procedure to have everything in readiness for surgery at a moment's notice. If a conservative surgeon can be seen in consultation this is the best possible thing; the opinion of the surgeon who has his knife always ready is of no value. Surgery should not be employed when the case is complicated with certain constitutional diseases, diabetes, nephritis or cardiac disease, nor during the early stages of pus formation.

Rapid leucocytosis indicates pus formation, and should lead to great care; surgery may be suddenly necessary.

Sudden rise of temperature indicates increasing inflammatory process; sudden drop in temperature may indicate gangrene or rupture of an abscess. Rigor and chilling, profuse sweating, diarrhea, vomiting, collapse, may be associated with rupture of the pus into the abdomen or elsewhere. Relief of the pain may indicate gangrene, especially when the constitutional symptoms remain serious.

"Colitis follows appendectomy more frequently than other abdominal operation. The explanation is that the appendicitis is seldom localized in the appendix but is complicated by colitis, or rather, the colitis is complicated by the appendicitis. In such case, removal of the appendix aggravates rather than alleviates. A conclusion to be drawn is, to carefully palpate the colon in appendicitis cases and reserve diagnosis, prognosis and the advising of an operation until it can be definitely determined as to the location, extent and degree of the disease. The formation of pus is an indication requiring immediate evacuation.

"If good surgical advantages are available and the case begins with considerable virulence and a surgeon can be had within the first twenty-four hours, it is in all probability best to operate; but if the case begins slowly or no good hospital advantages are available, or if the case is not seen until some forty-eight hours have elapsed after the onset, in all probability it is strictly an osteopathic case and should not be touched by surgery. Some advocate waiting in all instances until pus is formed before operative procedure is resorted to. This is rather a dangerous attitude to take, for I have seen hundreds of cases operated and have operated upon a great many myself and I have never seen a case die except it was a pus case. Every clean case recovered from the operation."—S. L. Taylor.

Without disturbing the patient more than very slightly, it is possible to secure thorough relaxation of the tissues found contracted along the spinal column and through the cervical region. If the clavicles and upper ribs are subluxated, these may be corrected. The vertebræ should be examined, and the possibility of intervertebral movement secured throughout. Deep, steady pressure may relieve the pain of the corrective treatment. All manipulations should be very gently given, in order to prevent sending irritating sensory impulses into the spinal or bulbar nerve centers.

Having eliminated the presence of pus, by physical examination, symptoms, and the lack of leucocytosis, local manipulation can be given. The patient is turned upon the right side, or in the right lateral position, or semiprone, and the tissues around the cecal region lifted and gently drawn upward. The tissues may also be grasped very gently, and pushed toward the painful area. The patient may lie in this position for a time, if comfortable; changing position gives better circulation and drainage, generally. But this performance is absolutely contraindicated if there is the least possibility of pus formation. Such treatment, given during an early stage of pus formation, might lead to serious, even fatal, results.

Treatments should be given from once to three times each day, during the first week; from three times to once a week during improvement and convalescence. Too speedy cessation of treatment may permit recurrence or a chronic condition; also the persistence of bony lesions which may lead to other gastro-intestinal disorders, later.

In the beginning, the colon should be cleansed thoroughly. This is to be done by enemas of water, salt solution, warm olive or other oil. It is necessary simply to wash the colon. Absolutely

nothing irritating should be used for this purpose, either as enema or as purgative medicines. The use of purgative medicines is doubtless responsible for many fatalities, and increases the necessity for surgery. Members of the family must be obedient in this respect—too often purgative medicines are given disobediently.

Do not permit opiates to be given.

No food is to be given. Water is supplied through the enemas; this is absorbed from the mucous membrane. The mouth may be often washed with cool water; a very little lemon juice or pineapple juice may be comfortable, but cool water is usually most grateful. After the danger of pus formation has passed, small amounts of liquids may be permitted, and the return to normal foods made very slowly. A week or more of fasting, followed by a week or two of liquid diet (milk, fruit and vegetable juices, albumen water and broths) leaves the patient with greater strength and opportunity for more rapid recovery than the dangerous use of greater range of diet. When the lack of food seems to cause much feeling of weakness, rectal feeding may be resorted to; rubbing the limbs with oils gives a pleasant sense of increased strength, and while it is not probable that any absorption occurs, yet patients feel better for this massage. Any nurse can do this work over the limbs several times a day, if necessary.

Heat and cold relieve the pain considerably. Hot water bottles should be partly filled and the air forced out, in order to make them light in weight and not noisy. An electric pad is very convenient, but must usually be watched to prevent burning; these are sometimes supplied with a safety device which makes them self-regulating, but even then they should be watched. Hot compresses may relieve when dry heat is useless. Mustard plasters may relieve the pain, but they must not be allowed to injure the skin. Blisters are probably best omitted.

For cold, ice bags, made light in weight, are probably best. A water bag containing a small amount of cold water, often replaced, may be most comfortable. Cloths wet in icy water may be used, but this is difficult to manage at home. A large ice bag, suspended so that it barely touches the skin but exerts no weight, is perhaps the most pleasant way of applying cold.

A small sand-bag, either hot or cold, placed under the dorso-lumbar spinal column, gives relief in some cases. Either heat or cold, applied to the spinal region of most marked muscular tension or of greatest sensitiveness, exerts a reflex effect upon the pain in the abdomen.

Sometimes the skin over the appendix has been blistered, or burned by "home remedies"; in such cases heat or cold may be applied over the spinal areas, or over the lower ribs, or around the groin with great relief.

"Spinal treatment depends upon location of reflex muscular contractions and painful areas; should be given once to three times each day at first, until pain diminishes, which should be in one to three days."—R. D. Emery.

"In all cases of appendicitis, there is much contraction in the right side, in the muscles of the lumbar region, and in the muscles of the abdomen, which will draw the right iliac, and the right innominate, so that there will appear to be an innominate lesion, and when the irritation is relieved, the innominate lesion will disappear."—T. L. Ray.

Prognosis. In non-suppurative cases, either with or without surgery, recovery is the rule. In suppurative cases, with surgery, the mortality varies.

There is great liability to recurrences. To prevent such, the most careful attention must be given to the diet, to exercises to prevent constipation, to all means of promoting good circulation and drainage of the entire abdomen by having thorough treatment to keep the blood and nerve supply in the best possible condition.

Sequelæ. Repeated attacks result in increased adhesions, obliteration of the appendix and ultimate recovery; but in any one attack, abscess or peritonitis may occur; or the mass of adhesions cause poor circulation and impaired function of the bowels; or a train of ill-health with ill-defined digestive disorders.

The removal of the appendix in such cases is a matter requiring consideration, since it is difficult, even with the fluoroscope, to know the extent and nature of the old adhesions, or whether the new adhesions, resulting from the removal of the appendix, will be greater or less than those already present.

CHRONIC ENTERO-COLITIS OF ADULTS

(Chronic diarrhea; mucous colitis; chronic colitis)

This is not a very common disease, in its noninfectious form. It is usually the sequence of repeated attacks of acute enterocolitis or of the constant effects of bony lesions or irritants.

The **symptoms** are those of intermittent or remittent diarrhea, with stools covered with mucus, or followed by strings or masses of mucus, both during the diarrheal attacks and in the intervals. This passing of mucous stools in the intervals of the attacks is the most trustworthy diagnostic symptom. Sometimes in the exacerbations rather large amounts of blood may be passed, more rarely shreds of membrane. Gripping and colicky pains may be associated with the diarrheal passages.

Chronic colitis of a rather persistent type has been found due to the constant use of irritating enemas. For example, the use of strong salt solution, water with large amounts of impure or alkali-bearing soaps, very hot or very cold water, and solutions of Epsom and other purgative salts, are often used. It is a not

unusual practice for patients to work for the elimination of the mucus, under the idea that relief is thus obtained.

The treatment and prognosis depend upon the causes of the irritation. When these factors can be eliminated, recovery is usually speedy.

Strong corrective treatment, given through the lower thoracic and upper lumbar region, securing increased mobility of each articulation of vertebra and ribs, raising the ribs thoroughly, and such other corrections as may be indicated in each case, usually relieves the attacks. With continued treatment, recovery is often complete.

Dietetic error should be corrected; no food should be given during an acute attack.

Chronic Dysentery, see Acute Infectious Diseases.

PROCTITIS

(Catarrh of the rectum; dysentery; rectitis)

Proctitis is an inflammation, usually catarrhal, of the mucous membrane of the rectum and anus, characterized by pain, tenesmus, and frequent stools of hardened feces or of mucus, pus and blood.

The causes are constipation, improper use of enemas and habitual use of purgatives, diseases of the liver, hemorrhoids, sitting upon the damp ground or cold places, and lesions in the lumbosacral, sacral or coccygeal regions of the spine.

Diagnosis. There is a sudden onset with chill, general malaise, slight fever, pain and discomfort, increasing to a burning pain in the rectum which radiates to the adjacent parts, a sense of fullness and weight in the rectum, the passage of hardened feces, later mucus, muco-pus, or blood; tenesmus; the bladder may be irritable; the mucous membrane may prolapse, and general symptoms of headache, and nausea appear. The patient usually prefers the recumbent position. In severe cases, strangury and vesical tenesmus may complicate the case. Peritonitis and hepatic abscess may occur.

If the case is protracted, proctitis and fistulas may develop. If proctitis supervenes, it is indicated by a thin fecal discharge at first, then followed by mucus tinged with blood. Ulceration soon follows. The parts are hot, dry, swollen, and digital examination is very painful. Later, the parts are slimy and the mucous membrane is covered with tenacious mucus and pus. If abscess is present, there will be a fluctuating mass which may show externally or may be felt by rectal touch. The use of the rectal speculum is contra-indicated in acute, nonsurgical cases.

The spinal examination shows contractions of the muscles of the back from the lower lumbar to the tip of the coccyx. Bony

lesions are detected with difficulty on account of these intense muscular contractions.

Treatment. The first indication is to remove the irritating intestinal contents by enema of cool water; if the case is seen early; if later, warm water is more comfortable. Warm oil may be soothing. The patient must not be permitted to lie upon his back.

Attention should be given to the sigmoid area to see that it is thoroughly elevated. As soon as lesions can be recognized and corrected, this should be done. Correction of lumbar and innominate lesions, after recovery from the acute attack, may prevent recurrence.

Patients must be guarded against sitting in cold places, straining at stool, or standing for too long periods for some months after an acute attack. Injurious habits must be corrected; these include the habitual use of dilators, irritant enemas, suppositories and other improper methods for the relief of constipation.

The pain is lessened by thorough relaxation throughout the lower part of the back and buttocks. This also favors a better circulation through the parts. Careful attention must also be given to the liver.

The diet must be restricted. If periproctitis and suppuration supervene, or are present when the case is first seen, early incision is indicated with subsequent drainage.

Prognosis. Usually good with proper treatment. Chronic proctitis, abscesses or fistulæ may result from neglect.

CHAPTER IX

DISEASES OF THE LIVER

ANOMALIES OF THE LIVER

The anomalies in the shape and position of the liver must not be forgotten; in making a diagnosis of disease of this organ one is sometimes confused by the presence of these anomalies. Malformations may be either congenital or acquired. Those very rare cases in which the liver is found upon the left side of the body, while the stomach and spleen are upon the right side, usually have only to be examined to become definitely diagnosed. Congenital absence of one or more of the lobes, or, rather more commonly, an increased number of lobes of the liver, may cloud a diagnosis under certain circumstances.

Tight lacing may cause an almost complete separation of part of the right lobe from the rest of the liver. This condition is becoming less rare on account of present saner fashions in corsets.

As the result of the abnormal lengthening of the suspensory ligament of the liver, or as the result of bands from adhesions and old inflammatory processes, the liver may be lower than normal. Occasionally the liver seems to be in an anomalous position on account of spinal curvature, especially when in marked kyphosis. The liver may be displaced upward by the pregnant uterus, abdominal tumors or cysts, or by considerable quantity of gas in the intestines or in the peritoneal cavity. Ascites or fat may push the liver upward or somewhat forward toward the right side.

The liver may be pressed downward by emphysema, pleurisy with effusion, mediastinal tumors or hypertrophied heart.

JAUNDICE

(Icterus)

This is a name applied to a group of symptoms arising from the presence of bile in the circulating blood, and is clinically manifested by a yellow or greenish-yellow tint of the skin and mucous membranes and by pruritus.

There are two classes of symptoms:

Absence of bile from the intestines interferes with perfect assimilation of fat, delays absorption, and slows peristalsis, thus permitting putrefactive changes in the intestinal contents and the production of toxemic symptoms. The feces are pale.

Circulation of bile within the blood produces toxic effects, both upon the nerve cells and upon muscular fibres, with consequently impaired heart action, slowness of the pulse, depression of spirits and mental torpidity; various tissues and secretions become bile-stained.

Etiology. Obstructive jaundice is caused by foreign bodies within the duct, such as gall-stones, hydatids, or distomata; or by foreign bodies from the intestine, inflammation of the duodenum

or mucosa of the duct or by stricture or obliteration of the duct, or by tumors, fecal accumulations, or pregnancy.

Non-obstructive jaundice may be caused by poisons in the blood interfering with the normal metamorphosis of bile (toxic jaundice), as in various fevers; animal poisons as snake venom; chemical poisons as phosphorus, mercury, arsenic, or toluylenediamin; chloroform or ether; or by poisons of obscure infective origins, acute yellow atrophy of the liver and Weil's disease (epidemic jaundice).

Diagnosis. The most conspicuous symptom is icterus or tinting of the skin, conjunctivæ, mucous membranes, and secretions; the color varying from a lemon-yellow to a deep greenish-black (black jaundice); the urine and sweat are tinted while the saliva, milk, and sputum usually escape. Xanthopsia (yellow vision) is sometimes present. Gastric disturbances may precede the jaundice. Flatulence, nausea, and often complete anorexia are common. Constipation often alternates with diarrhea; the feces are pale, intensely fetid and pasty. The pulse is slower than normal, occasionally twenty per minute. Respirations may fall to ten per minute. Extravasations of blood and hemorrhages may occur from the mucous surfaces or into the skin. The coagulability of the blood is diminished.

Among the cerebral symptoms may be noted marked depression of spirits, melancholia and, in the grave cases, coma which may end in death. Itching of the skin may be most distressing. The urine contains bile pigments and bile acids. The blood may show slight or marked changes. Fragmentation of all cells is common. In catarrhal jaundice, there may be slight leucocytosis at the onset. The plasma of the blood is bile stained. The coagulation time is slow. In toxic jaundice, the red cells are sometimes increased; the hemoglobin is somewhat reduced; and the leucocytes are normal or increased. In severe cases, there is hemoglobinemia and many "blood shadows" are to be found. Leucocytes show the effects of the toxin.

Hereditary Icterus. The jaundice is slight, the stools are not clay-colored; splenic enlargement is marked; the general health is not much impaired. In another group of cases, there is enlargement of the liver and spleen and marked constitutional disturbance, with only slight jaundice.

Icterus Neonatorum. This form of jaundice occurs among the new-born and may be mild or severe in type.

The mild type appears on the second or third day and lasts from seven to fourteen days, presenting few symptoms beside the jaundice and the pale stools. Nothing more than the ordinary hygienic care of the infant is needed. It is possibly due to the large

destruction of red corpuscles which takes place in the first few days after birth, or to the patency of the ductus venosus, allowing the portal blood to mix with the systemic blood.

The severe form is due to congenital absence of the hepatic duct, congenital syphilitic hepatitis, or phlebitis of the umbilical vein. It is invariably fatal.

Treatment of Jaundice. Find the cause and remove it if possible. (See Gall-stones.) Correct subluxations of the vertebræ and ribs from the fifth dorsal to the first lumbar. The bowels must be kept active by treatment and exercise. The diet should be light, and easily digested, consisting of fruit, vegetables and milk.

The itching, if not relieved by the treatment, may be alleviated by warm baths. Carbolic lotion (1:40) may be used in severe cases.

Prognosis. The outlook depends upon the cause of the jaundice. In acute yellow atrophy (q. v.) a fatal termination is to be expected; this is also the case in the jaundice due to malignant neoplasms. Nearly all living cells are injured by bile; they recover their normal function, if at all, only after the removal of the bile from their vicinity. Nervous symptoms often persist for some weeks after the skin becomes clear, and these are apt to recur on fatigue or indigestion for several months after other symptoms of jaundice have disappeared.

HYPEREMIA OF THE LIVER

(Congestion of the liver; torpid liver; biliousness)

This is characterized by an abnormal fullness of the vessels of the liver with consequent enlargement, slowness of the digestive and mental functions, and slight jaundice.

Etiology. Active hyperemia is caused by too great heat; habitual constipation; excesses in eating and drinking; use of alcoholic and malt liquors; and in females, by arrested menstrual period. It is sometimes a complication of the acute infections. Bony lesions of the sixth to the eleventh thoracic vertebræ and the sixth to the twelfth ribs are important in etiology. Passive hyperemia is due to cardiac and pulmonary disease.

Pathology. The liver is enlarged in all directions and is abnormally full of blood. In cases due to obstructive diseases of the heart and lungs, it presents the "nutmeg liver" appearance. The dilated radicles of the hepatic veins with pallor of the neighboring parts of the lobule are noted. Long-continued congestion leads to atrophic degeneration or to cyanotic induration.

Diagnosis. The symptoms of active hyperemia include malaise, aching of the limbs, very slight fever, headache, mental depression, coated tongue, anorexia, nausea and sometimes vomiting, constipation and flatulence, a feeling of weight and soreness in the liver

area with a dull pain extending to the right shoulder. The liver is uniformly enlarged and tender, the complexion is muddy and there may be slight jaundice.

In passive hyperemia the symptoms are much like the above but less severe. The onset is gradual and gastrointestinal catarrh is common. In addition, there are the symptoms of the causal disease. If the hyperemia is due to incompetency of the tricuspid valve, the whole organ may pulsate.

Treatment. Thorough direct manipulation to the liver by raising and spreading the ribs facilitates drainage. All subluxations which might bear a causal relation to disturbances of the hepatic circulation must be corrected. A scanty diet of easily digested foods with an absence of sugars and fats, as far as possible, is usually best. If the pain is severe, hot applications may be used over the liver region, or a heating compress may be applied. The bowel action must not be permitted to become sluggish.

The passive form requires, in addition, the treatment of the primary disease.

Prognosis. An attack of active hyperemia usually lasts about a week, ending in recovery. If a constant repetition of attacks occurs, atrophic degeneration is usual. The prognosis in passive hyperemia depends entirely upon the nature and curability of the primary disease.

ACUTE YELLOW ATROPHY

(Icterus gravis; acute or general parenchymatous hepatitis; hemorrhagic icterus; malignant or infectious jaundice)

An acute, general inflammation of the hepatic cells resulting in their rapid disintegration and characterized by decreased size of the liver, deep jaundice, hemorrhages and profound cerebral symptoms.

Etiology. The disease is apparently due to some toxic agent circulating in the blood. It occurs most frequently in young pregnant women from the third to the sixth month of gestation. Among the other causes are: Infectious diseases, preëxisting disease of the liver, alcoholic and venereal excesses, syphilis, poisoning by phosphorus, arsenic, or antimony, and sometimes fright or profound mental emotion. Chloroform anesthesia is usually considered doubtful. In one P. C. O. clinic patient this seemed to be the only cause.

Pathology. The early hyperemia of the hepatic cells with a grayish exudation between the lobules soon produces a soft, friable organ of a dull yellow color; the cells rapidly disappear and are replaced by fat globules; yellow and red atrophic patches are found, while granules of pigment and crystals of leucin and tyrosin are seen microscopically; the whole organ is reduced in size and weight, the peritoneal covering being loose and wrinkled. The spleen,

kidneys, heart, and muscles undergo parenchymatous degeneration and show bile-staining.

Diagnosis. The prodromal symptoms are mental and bodily depression, constipation, gastrointestinal catarrh, tenderness of the liver region, quickened pulse, headache, and slight jaundice with moderate itching. These may continue from one to three weeks.

The confirmed stage is indicated by deepened jaundice, usually rapid pulse, persistent headache, and insomnia, persistent vomiting, cerebral symptoms, and trembling of the muscles. As a rule, there is no fever, though it may be severe, perhaps to 106° F. The tongue is dry and coated. Delirium and convulsions, abdominal pain, hemorrhages from mucous surfaces and into the skin, "coffee-ground" vomit, tarry or pale stools, all follow rapidly. Pregnant women abort, often with severe hemorrhage; this does not interfere with the course of the disease to its fatal termination. The typhoid state ushers in the end which may come within a week or may be prolonged for two or three weeks.

The area of liver dullness diminishes rapidly and may ultimately disappear. There is pitting in the epigastrium; the spleen is enlarged. The spinal tissues are extremely hypersensitive; the usual palliative manipulations were absolutely inefficient in one P. C. O. clinic case.

Urine shows diminished quantity; strongly acid reaction; normal solids diminished; leucin, tyrosin and other abnormal nitrogenous compounds are usually present. The albuminuria, casts and renal epithelium are due to the associated nephritis.

Moderate leucocytosis with blood otherwise normal is recorded. Usually all blood cells show the effects of the poison; erythrocytes are vacuolated and often fragmented; lymphocytes contain granules, have aberrant nuclear forms, and irregular protoplasmic outlines; the neutrophiles are most profoundly modified, having eccentric or extruded nuclei, vacuolated protoplasm and nuclei, ragged outlines, and other signs of the effects of some intense poison.

Treatment. Palliative measures are indicated. The ice cap may relieve the convulsions or delirium. Subcutaneous injections of normal salt or the use of the Murphy drop method may relieve the toxemia. Correction of the lesions as found, raising of the lower ribs should be a part of the treatment. Careful study of every patient should be made, in the hope of securing knowledge that leads to better prophylactic and therapeutic methods than we now possess. Pregnant women with history of individual or family tendency to hepatic disturbances should be very closely watched.

Prognosis. Typical cases always terminate fatally; atypical cases, in whom the tissue destruction is absent or slight, may recover, after long and tedious illness. Pregnant women abort, which does not affect the prognosis.

INTERSTITIAL HEPATITIS

(Cirrhosis of the liver; sclerosis of the liver)

Interstitial hepatitis is a chronic inflammatory disease of the liver characterized by overgrowth of its connective tissues, and symptoms referable to the effects produced upon the liver cells and the bile capillaries by this pressure. Three classes are recognized which vary slightly in pathology and in symptoms but whose treatment and prognosis are very much alike.

When the portal circulation becomes obstructed, a collateral circulation is established by way of anastomosis between the branches of the portal vein and the systemic veins. The anastomoses which are most frequently efficient are those between the gastric and the esophageal veins; the veins of the intestines and the retro-peritoneal veins; the portal vein with the epigastric (hence the *caput medusæ*), and the superior hemorrhoidal of the inferior mesenteric vein with the inferior and middle hemorrhoids of the internal iliac vein. These anastomotic veins become greatly dilated in the presence of hepatic cirrhosis and the circulation thus established may be so efficient in some cases that practically no symptoms are produced. The *caput medusæ*, the dilated superficial abdominal veins and the hemorrhoids usually lead to a suspicion of the hepatic obstruction. Several types of interstitial hepatitis are recognized.

ALCOHOLIC CIRRHOSIS

(Laennec's cirrhosis; drunkard's liver; gin drinker's liver; hobnailed liver; nutmeg liver; portal-cirrhosis; atrophic cirrhosis; multilocular cirrhosis)

In this form of cirrhosis the multiplication of the connective tissue originates around the branches of the portal vein. The capsule of the liver is much thickened, the surface is rough and presents the "hobnailed" appearance. As the names indicate, the condition is chiefly due to prolonged alcoholism, though heredity and syphilis are certainly important etiological factors; the overuse of highly seasoned foods is also considered causative in rare instances.

Diagnosis. The onset is usually gradual. Catarrhal disturbances of the stomach and the intestines with morning vomiting, nausea, anorexia and acid eructations usually lead to a diagnosis of chronic gastritis in the early stages. Epistaxis may be a rather early symptom; hemorrhoids, a sense of weight or aching in the liver region or under the right shoulder occur when the portal circulation becomes too greatly impeded. Hematemesis and tarry stools depend upon the damming back of the blood in the portal vein; fever is rare; the pulse is small and rapid; emaciation and pallor may be marked or may be masked by the distention of the

vessels in the skin which is characteristic of the alcoholic habit. The skin is usually of a sallow or putty-like color; the flatulent distention of the abdomen may be associated with ascites; jaundice occurs rather late in the disease, if at all, and is rarely pronounced; nervous symptoms rarely appear before the terminal stages, with the onset of stupor or noisy delirium. These symptoms usually terminate within a few hours or a few days in deep coma, which in turn terminates by death from exhaustion, anemia, or heart failure.

The liver dullness is enlarged at first; later, it is markedly diminished. The "hobnails" may be felt on palpation in a very thin patient; the splenic dullness is enlarged, and "caput medusæ" is present.

The urine is scanty, high-colored, of increased density, loaded with urates; the urea is diminished, and blood and other pigments may be present. The blood examination gives little aid; early, there is no change in the red cells; later, there is slight anemia. The leucocytes are normal or low or a moderate leucocytosis may be present. The blood cells may show the effects of the toxemia.

Treatment. Structural perversions should be corrected, if the condition of the patient permits—if the disease has not already passed the earlier stages. Raising the ribs is especially good.

Alcohol is to be entirely discontinued; tobacco, spices, tea and coffee are best denied. Excess of meat is harmful. Probably an entire milk diet is best for some days, or until the digestive tract is fairly clean. Otherwise, the diet should preferably be chiefly cellulose—especially green vegetables and fresh fruits. Fats and sugars are contra-indicated.

When ascites is present, dry diet, with absolutely no salt, is advised. Water may be taken in very tiny sips, either hot or cold, or bits of ice may be left to melt in the mouth. Massage and rubbing keep the skin in as good shape as can be; the action of the kidneys is to be watched.

Prognosis. Recovery is not to be expected. If the collateral circulation is well established, the atrophy not marked, and the patient willing to live temperately, serious symptoms may not arise for a considerable time. In far-advanced cases, the outlook is grave. Some cases live two to four years; usually about a year after dropsy occurs.

BILIARY CIRRHOSIS

In this disease the cirrhosis is the result of a chronic inflammation of the bile ducts. It may originate from cholecystitis and invade the liver by extension from the bile capillaries.

The symptoms are those of chronic cholecystitis followed by a slowly progressive cirrhosis of the hypertrophic type. Within a

few months the apparent hypertrophy is followed by an atrophy and the future course of the disease as well as the treatment is very much like that in alcoholic cirrhosis.

Bronzed Diabetes is a rare disease, characterized by bronzing of the skin, marked glycosuria, biliary cirrhosis of the liver, rapid cachexia and death. The supra-renals and the pancreas are also cirrhotic. The diagnosis rests upon the bronzing, glycosuria and enlarged, cirrhotic liver. No treatment is of any avail.

HYPERTROPHIC CIRRHOSIS

(Hanot's disease; unilobular cirrhosis)

This form of cirrhosis is characterized by the embryonic type of the growth of connective tissue and the very marked round cell infiltration of the new growth. Atrophy occurs rarely if ever in this form; the hyperplasia may be extremely marked.

Etiology. This disease is very rare. It mostly affects young adults and children. Several members of the same family are frequently affected. It has no connection with alcoholism. The causative agent is unknown, but there seems to be some toxin which reaches the liver by the general circulation.

Diagnosis. The onset is gradual. Jaundice is very early and becomes very severe. Hepatic, splenic, and gastro-intestinal symptoms are at first usually slight and increase in severity. Periodic attacks of severe abdominal pain with nausea and vomiting are frequent. Fever, sometimes to 104° F., may accompany the painful attacks. The symptoms of obstruction of the portal vein do not occur until late in the disease. The course of the disease is slow; death results after several years from toxemia or as the result of complications. The urine contains bile but is otherwise fairly normal. The feces sometimes are normal in color, sometimes pale and are sometimes extremely dark from an excess of bile; this variation is diagnostic. The blood shows a slight leucocytosis, and some signs of secondary anemia. Nervous symptoms are severe and variable.

The symptoms are those of atrophic cirrhosis—the ascites requiring many tapings. Jaundice is not often present.

Treatment. It is of prime importance that the circulation be normalized, if at all possible, by corrective work from the fifth to twelfth dorsal vertebræ. The rib articulations must also be carefully examined and all mal-adjustments found; these must be corrected.

At first, the diet should be restricted to milk, but as the patient becomes better, other light, non-irritating, nourishing foods may be used. Fatty and saccharine foods should be avoided. When there is ascites, a dry diet without salt may be tried. The bowels and

the skin function must be kept active, and the kidneys watched carefully. A quiet, out-door life is best. If all other measures fail, tapping may be used for relief of ascites, or Southey's tubes may be used.

Prognosis. The outlook is unfavorable. The course is slow but it is ultimately fatal.

ABSCESS OF THE LIVER

(Acute purulent hepatitis; parenchymatous hepatitis; suppurative hepatitis)

This is a diffuse or circumscribed inflammation of the liver cells, due to infection by the pyogenic bacteria, and resulting in suppuration. The abscesses may be multiple or single. The disease is characterized clinically by irregular fever, hepatic tenderness and aching, and symptoms of deranged gastro-intestinal and hepatic functions.

Etiology. Staphylococci, streptococci, typhoid bacilli, or any other of the usual pyogenic or pathogenic bacteria are direct or indirect agents. These reach the liver by way of the systemic or the portal blood, by extension from neighboring viscera, including the lungs, by perforation of the diaphragm, or by way of the bile ducts. Appendicitis, cholangitis, phlebitis, cholelithiasis, may give origin to the infection. When the infection is carried by the portal vein, the abscesses are usually multiple.

Bony lesions of the mid-thoracic region and the corresponding ribs seem to lower the resistance to infections, in general, and also to interfere reflexly with the nervous and circulatory mechanism of the liver.

Diagnosis. There are irregular intermittent or remittent fever, chills and sweats; obstinate vomiting and other gastro-intestinal disturbances; constipation with light colored stools; muddy complexion with sometimes slight jaundice; irritability of the nervous system; melancholia; anemia; leucocytosis; and general symptoms of pyemia or, in marked cases, typhoid symptoms. Pain is variable and often referred to the back, shoulders or other regions. Dull aching over the liver may be noticed.

Locally, the hepatic enlargement is upward, sometimes with circumscribed bulging with pain, tenderness and fluctuation. It frequently ruptures through the diaphragm into the lung, causing empyema.

When the abscess tends to burst externally, the skin over it is hot, red, tender, swollen, and edematous.

Blood. During the acute process, leucocytosis may reach 15,000 or even 50,000; later, the count is lower. Occasionally, especially in asthenic persons, normal or subnormal white cell counts may be found. The red cells and the hemoglobin are lowered slightly.

Urine shows the characteristics of abscess formation; sometimes an increase of the bile pigments and a diminished uric acid relative to the urea. When nephritis is present, the urinary changes due to this condition are also present.

LARGE SOLITARY ABSCESS. Hepatic abscess is due to the presence of the amoeba histolytica more frequently than is perhaps suspected. The diagnosis of this condition must rest upon the history of the case. The leucocyte count in the amoebic abscess is rarely higher than 14,000. The amoebæ may be demonstrated in the pus if a warm stage is used. Vaughn reports one case of a negro man suffering from an amoebic abscess of the liver from whom eight liters of pus were drawn at operation. The man ultimately made a reasonably good recovery. This form may be latent and run a course without definite symptoms; death may occur suddenly from rupture. When there are symptoms, the temperature is elevated and of an intermittent or septic type and decidedly irregular. There is profuse sweating particularly when the patient is asleep.

Treatment. Exploratory aspiration should be performed; the region where the enlargement is greatest is the point of election. If not at the point of election, the next best places are: either the lowest interspace in the anterior axillary line; or the seventh interspace in the mid-axillary line.

After this, or when surgery is contra-indicated for any reason, the treatment of the splanchnic and vagus regions, according to conditions as found, gives much relief and hastens recovery. No food or only limited amounts of liquids should be permitted. Cool sponging relieves the fever. Ice bags over the liver relieve the pain.

Prognosis. In traumatic and amoebic abscesses when the pus can be evacuated early, a favorable termination may be expected. In pyemic and other forms, a fatal result is to be expected, though recovery may occur.

HEPATIC CANCER

(Carcinoma of the liver)

Cancer of the liver is most common in late middle life—35 to 55 years. The primary causes are heredity, traumatism, irritation from various causes as gall-stones, and chronic intestinal stasis. The primary form is very rare, and most common in men. It is nearly always secondary; this is most common in women, as metastasis from uterine or mammary cancer.

Diagnosis. The symptoms are due to increased size of the liver; pressure on the ducts or terminal portal vessels; and the general effects of cancer—cachexia.

These symptoms include a history of dyspepsia, flatulence and constipation. There are hepatic pain, weight and fullness, increased on pressure; increasing emaciation; jaundice; ascites; occasionally intense hemorrhages; attacks of local peritonitis; malignant

cachexia; anemia; and edema of the feet and legs. Fever may be present towards the close of the disease. In melano-sarcoma, pigmented nodules in the skin may be found; these are pathognomonic. Intermittent pain is due to increased size of the organ and to inflammation of the capsule.

Hepatic dullness is increased. The liver is indurated, irregular in outline, nodulated, sometimes with umbilication of the nodules, is painful on palpation, and the superficial veins of the abdomen are enlarged.

The diagnosis is made by the physical findings; the clinical symptoms, and by the X-ray examination.

Treatment. Palliative treatment alone is indicated. The gentle springing of the thoracic spine, relaxation of the reflex muscular contractions, and thorough treatment of the cervical and sub-occipital regions, often give relief. In the terminal stages opiates are often necessary.

Prognosis. Death occurs in three to fifteen months, rarely two years, after the condition is recognizable.

HYDATID CYST OF THE LIVER

(Echinococcus of the liver)

Hydatid cyst of the liver is due to invasion and subsequent development of the embryos of the taenia echinococcus, which are accidentally ingested with food and drink. The cysts are single or multiple, and most frequently invade the right lobe. The larvæ find their way from the stomach and intestines into the portal circulation and thus reach the liver. They lodge and lose their hooklets, developing into a cyst. The cyst wall contains two layers, the inner of which is the germinal layer from which the daughter-cysts develop. The irritation gives rise to the outer layer of connective tissue.

The cyst contains a clear, non-albuminous fluid, of low specific gravity, rich in chlorides, containing the larvæ, hooklets, and daughter-cysts. It grows slowly and, on the death of the parasite, may undergo inspissation and calcification, or suppuration.

Diagnosis. Unless the cyst is large, there are usually no symptoms. There may be a sense of fullness in the hepatic area. Occasionally, jaundice, pain, dyspnea, fever, and pyemic symptoms are present. Reflex muscular contractions are rarely present before rupture or suppuration occur.

The liver is painlessly, irregularly enlarged; fluctuation may be detected in some cases. If the cyst is near the surface, placing one hand over the tumor, and tapping it lightly with the fingers of the other hand will elicit a vibrating or trembling movement (hydatid fremitus or thrill).

Aspiration should always be performed, as the presence of a few hooklets is diagnostic.

Suppuration and rupture are the most common terminations.

Treatment. Incision and evacuation of the contents is the best method. Aspiration may be used, but one is not certain of getting all the infecting material.

After this has been done, the gentle relaxation of the reflex muscular contractions, followed, after healing of the surgical wound, by the correction of

such spinal and rib lesions as may be found on examination, hastens complete recovery of health and lessens the danger of subsequent hepatitis.

Recovery is to be expected in uncomplicated cases. If there has been infection by pyogenic bacteria, or when the vitality of the patient is low for any reason, recovery may be delayed or impossible.

AMYLOID LIVER

(Waxy, lardaceous, scrofulous, or albuminous liver)

Etiology. Among the causes is prolonged suppuration of tuberculous disease either of the bones or the lungs; next in frequency are the cases associated with syphilis. It is seen in coxalgia, rachitis, cancer, leukemia, and certain infectious diseases. The deposit begins in the arterioles and capillaries and spreads to the fibrous tissue and parenchyma. Other viscera are affected.

Diagnosis. There are no characteristic symptoms. Pain is absent. Disorders of digestion, diarrhea, emaciation, and anemia are common. The hepatic dullness is enormously increased and there is prominence of the liver area. On palpation, the liver is firm, smooth on the surface, not tender, the edges rounded or sharp and hard. The urine is increased in amount, pale, albuminous and contains amyloid casts when the kidneys are involved. The treatment and prognosis are those of the primary disease.

FATTY LIVER

Two conditions are included under this head: fatty infiltration, or excessive accumulations of fat-globules in the hepatic cells; and fatty degeneration, in which the cell protoplasm is partially replaced by fat. The first is most common in obesity and in conditions in which the oxidation processes are interfered with, as in cancerous, syphilitic or malarial cachexia, primary or severe secondary anemias, and phthisis. The second is more often the result of bacterial or other toxins, as the acute infections, alcoholism; poisoning by phosphorus, chloroform, and other chemicals; and in combination with such other diseases as cirrhosis, amyloid disease, passive congestion, pernicious anemia, chronic dysentery, etc.; it is sometimes found in pregnancy.

Diagnosis. Any symptoms present are due to the causative disease. Pallor is marked; the face may be swollen; and the ankles may be slightly edematous. The liver is uniformly and sometimes markedly enlarged; is somewhat soft, regular in outline, and with rounded edges. The stools are pale but bile is not absent.

The urine is albuminous, abundant and of moderate specific gravity. The urinary and blood changes may show the primary disease.

The treatment and prognosis are those of the primary disease.

CHAPTER X

DISEASES OF THE GALL-BLADDER AND BILE DUCTS

CHOLANGITIS

(Angiocholitis; catarrhal jaundice; catarrh of the bile-ducts; hepatogenous jaundice; duodeno-cholangitis)

Acute cholangitis is inflammation of the lower end of the common duct, associated with catarrh of the stomach and duodenum and produced by the same causes; clinically marked by jaundice.

Etiology. The main predisposing causes are: excesses in eating and drinking; exposure; debauch; physical fatigue; passive hepatic congestion; and certain infectious diseases.

Lesions of the right lower ribs, and of the sixth to the tenth thoracic vertebræ are usually present. Cervical lesions are less constant.

Diagnosis. Sometimes the yellow tint of the skin is the first symptom noticed. Often, it begins with epigastric distress, nausea, perhaps vomiting, looseness of the bowels, and slight feverishness, sometimes to 101° or 102° F.

In three to five days, the skin and sclera become yellow, never bronzed; the fever disappears; the skin becomes harsh, dry, and itchy; the bowels constipated, the stools whitish or clay-colored and accompanied by much flatus and colicky pains. Jaundice may be marked, the skin cold; the heart action and respiration slow; the mind torpid and greatly depressed; if much pain is present, some complicating factor should be suspected. The depression, discoloration, and bowel condition persist for one or two weeks after the more acute symptoms disappear. The liver and spleen are slightly enlarged.

Tenderness may be manifested on pressure over the bile-duct area, at the end of the ninth costal cartilage. The urine is heavy and dark, loaded with urates and containing bile pigments and bile acids.

Leucocytosis is moderate. Both red and white cells may show the effects of toxic influences.

Treatment. Attention must be paid to any subluxations which may interfere with a good blood supply to the part affected. The ninth thoracic vertebra, the right tenth rib, and neighboring tissues should receive careful attention.

The gastro-intestinal condition must be treated according to the findings in each patient.

The diet should be carefully regulated, especially as to quantity. Fruit and vegetable juices, diluted with hot or cold water, are good. Irrigation of the colon with cool water (80°-90° F.) has been advised. The stools must be carefully watched.

Prognosis. If there are no complications recovery occurs in from two weeks to several months. When the condition persists longer than three months, more serious trouble should be suspected.

CHRONIC CATARRHAL CHOLANGITIS

Chronic catarrhal cholangitis may occur as a sequel to an acute attack of cholangitis. The common duct may be completely or only partly obstructed. With complete obstruction of the common duct the bile passages are greatly dilated; there is usually dilatation of the gall-bladder and of the ducts within the liver; the contents of the ducts and the gall-bladder are a clear, colorless, usually sterile mucus. These patients are the subjects of chronic jaundice without fever.

With incomplete obstruction of the common duct there is either pressure on the duct or gall-stones in the common duct or in the ampulla of Vater; the bile passages are not much dilated and the contents are bile-stained turbid mucus. There may be a "ball-valve" obstruction. This form is associated with the so-called hepatic intermittent fever (103° to 105° F.) with recurring attacks of chills, fever, and sweating.

The treatment is practically that of cholelithiasis.

SUPPURATIVE CHOLANGITIS

(Purulent angiocholitis)

Suppurative cholangitis usually involves the common duct, and is characterized by septic phenomena. The usual cause is gall-stones in the common duct. Cancer, lumbricoides, or other foreign bodies occasionally are causative.

Diagnosis. There is a history of attacks of biliary colic, then a period with no attacks, then later attacks of temporary jaundice, a recent one being followed by chill, fever, jaundice varying in intensity, slight or severe pain, progressive emaciation and loss of strength. There may be nausea and vomiting, or "intermittent hepatic fever." There is a smooth, tender, moderate enlargement of the liver, with tenderness over the gall-bladder or in the epigastrium.

There is "a tender area in the region of the twelfth dorsal vertebra, two or three centimeters from the median line."—Boas.

Treatment. Surgery is indicated. Cholecystectomy with free and prolonged drainage, any gall-stones found being removed, is

the preferred method. The later treatment is practically that of cholelithiasis (q. v.).

Prognosis. The condition is always grave and is generally fatal, unless operation is early performed. Spontaneous evacuation into the intestine may occur. Rupture into the peritoneum is more probable, when speedy death is to be expected.

CHOLECYSTITIS

(Acute infectious cholecystitis)

Cholecystitis is an acute inflammation of the gall-bladder. It may be catarrhal, membranous, suppurative, phlegmonous, or gangrenous in type. The inflammation is usually due to bacterial infection by extension from neighboring parts, and it is characterized by fever, tenderness and pain in the right hypochondrium near the end of the ninth costal cartilage.

Etiology. The organisms most commonly found are those of the colon group, bacillus typhosus, pyogenic cocci, and the pneumococcus. Parasites and calculi in the gall-bladder occasionally act as causes.

Subluxations of the vertebræ from the fifth to twelfth dorsal and the lower four ribs play a part in lowering the resistance to pathogenic bacteria. Lesions of the right tenth, eleventh and twelfth ribs are especially important.

The gall-bladder is distended and the cystic duct often closed by swelling of its mucous membrane.

Diagnosis. The onset is abrupt and severe, with increased temperature and pulse rate, severe paroxysmal pain and extreme tenderness in the right hypochondrium at the ninth costal cartilage (sometimes referred to some other location). Vomiting is common; prostration is usually well marked or severe; jaundice is present or absent; there may be obstinate constipation. If pus forms, the whole condition becomes septic, and perforation may occur. In the phlegmonous form, besides the usual symptoms, there is high temperature with extreme prostration, and the rapid development of the typhoid state. Peritonitis rapidly ensues.

A tender tumor composed of the gall-bladder may be palpated. Spasm of the right rectus muscle is usually present.

Urinary changes are those usual in febrile states. With occlusion of the duct, the bile pigments and salts appear in the urine.

Leucocytosis is invariably marked—20,000 to 30,000.

The condition may be confused with appendicitis, congestion of the liver, syphilis of the liver, single or multiple abscesses of the liver, pyelophlebitis, subphrenic abscess, pancreatic disease,

perforation of gastric or duodenal ulcer, intestinal obstruction, and uremia.

Treatment. This is palliative and surgical.

Correction of subluxations of whatever character found, which result in lowered tissue resistance, and which interfere with arterial and venous exchange in the affected part, are essential factors of treatment. In surgical cases this corrective work should follow the healing of the wound.

The diet must be restricted to water during the attack. Return to ordinary food should be gradual.

Hot applications over the liver area lessen the pain.

Prognosis. Mild cases terminate in recovery. Suppurative cases are unfavorable, tending toward a fatal termination.

Among the sequelæ may be mentioned serous distention and empyema of the gall-bladder and chronic cholecystitis.

GALL-STONES

(Cholelithiasis; biliary or hepatic calculi; biliary or hepatic colic)

Gall-stones are concretions of material which has been deposited from the bile; this is most often cholesterin, and usually a nidus of bacteria or mucin is present. Gall-stones may be either single or multiple.

Etiology. The predisposing causes are excessive eating, especially of the carbohydrates, tight lacing, sedentary occupation, insufficient exercise, constipation, typhoid and other infections, enteroptosis, and many other conditions favoring stagnation of the bile. Pregnancy seems to have an influence, as 90% of cases are in women who have borne children.

Subluxations of the lower four ribs and the corresponding vertebræ produce conditions which result in lessened peristalsis and disturbed circulation and secretion, thus causing a mild and chronic catarrh of the mucosa of the gall-bladder and the smaller bile ducts.

They are formed around a nucleus of epithelial, mucoid, or more frequently, bacterial character. The bacteria are those of the colon group, especially the bacillus coli, and the bacillus typhosus; rarely the less virulent of the pyogenic organisms are thus found.

The calculi may be single or multiple. When single, they are usually ovoid in shape; if composed of pure cholesterin, they are light, glistening, with a granulated surface. More commonly, they are multiple and faceted from pressure of their opposing surfaces.

In composition, ordinary gall-stones consist chiefly of cholesterin arranged in laminae, with a nucleus of bile-pigment. They also contain salts of calcium and magnesium. Externally, they may be yellow or brown and have a greasy surface when fresh. The number varies from one to several hundreds.

Diagnosis. Symptoms of chronic catarrhal cholecystitis or cholangitis often precede recognizable symptoms of gall-stones.

These include constipation and other gastro-intestinal symptoms, uneasy sensations in the epigastrium or right hypochondrium, deep-seated tenderness over the gall-bladder, sallowness of the skin, slight yellowing of the conjunctivae. The scanty urine is rich in uric acid and later contains bile. If the stones pass into the bowel without pain, the symptoms disappear temporarily.

Diagnosis by the X-ray is usually satisfactory. Calcium stones show plainly; cholesterin stones rarely cast a shadow, but the evidences of inflammation are evident, so the diagnosis becomes evident. Stereoscopic views give much clearer definition in these cases.

Biliary colic gives rise to the following main symptoms: Sudden and excruciating pain, usually paroxysmal, beginning in the epigastrium or right hypochondrium; often with a palpably enlarged gall-bladder. This pain is due partly to the slow progress in the cystic duct (when the stone must take a rotary course), partly to the acute inflammation accompanying the attack; and partly to the stretching and distention of the gall-bladder by the retained secretions.

Shivering, profuse sweating, great feebleness of the pulse, and symptoms of collapse are frequent. The temperature may be normal or subnormal. Slight fever is due to concomitant acute cholecystitis.

Reflex vomiting often gives some relief. Jaundice, arising sometimes in a few hours, sometimes several days, after the onset of the pain, and persisting for a few days after the pain is relieved, is due to the stone lodging in the common duct.

The attack lasts from three to twelve hours but a rapid succession of attacks may keep the patient in almost continuous pain for several days. The pain ends suddenly when the stone slips into the bowel but tenderness and prostration continue for several days.

The feces should be examined carefully for the calculi. Serious complications may arise from rupture of the duct with fatal peritonitis; fatal syncope; convulsions; or impacted gall-stones.

Impacted Gall-Stones. Instead of passing into the duodenum, the stone may remain in the gall-bladder or be impacted in the cystic duct or the common duct. If in the cystic duct the resulting dropsy of the gall-bladder can be felt as a smooth, movable, ovoid tumor beneath the ninth costal cartilage. When the obstruction is chronic, the contents of the tumor are clear mucus. Gall-stone crepitus may be perceived.

Cholecystitis, simple or suppurative, may occur, the latter (empyema of the gall-bladder) being the most common. Atrophy of the gall-bladder may be a sequel.

If the stone is impacted in the common duct permanent jaundice follows; there is the persistent or intermittent presence of bile

in stool; fever and enlargement of the spleen. If the obstruction is partial, so that the stone acts like a ball-valve, the jaundice varies in intensity, there are recurrent attacks of colic with the so-called hepatic intermittent fever (rigors, pyrexia, sweating). The jaundice deepens with each attack.

Calculus in the gall-bladder sometimes causes acute cholecystitis, or leads to ulceration with the establishment of a biliary fistula opening into the duodenum, colon, or other hollow viscus, or occasionally on the skin. A large stone passing through such an opening may cause obstruction of the bowel.

On examination is found tenderness and rigidity at the ninth costal cartilage which may extend over the abdomen; contractions and hypersensitive areas along the spine from the sixth to the tenth dorsal are constant.

Urine. There is albumin with red blood cells. As soon as a stone is passed the patient may pass a large quantity of clear, pale urine. When jaundice is present, bile elements are found.

Blood. There is a mild leucocytosis during an attack. The coagulation time may be slow and should be tested before any operation upon the gall-bladder, or in the presence of jaundice.

Treatment. "A careful physical examination from the point of the ninth costal cartilage along a line passing through a point about one inch to the right of the umbilicus should be made with the patient lying upon his back and with knees flexed to relax the abdominal structures. The fingers of the operator must be laid flat, and if necessary, the right hand may be reinforced by the left. The pressure must be light, yet firm. If there should be any accumulation whatever in the duct a light pressure will reveal a tender spot. The feeling at this spot will vary in intensity from a dull pain to a sharp pricking, lancinating sensation. As the patient expresses: 'It feels as though you had a tack on the end of your fingers.' With careful manipulation along the course of the duct the concretion is gradually moved along and passed through the ductus communis choledochus into the intestine where it can do no more harm."—Jenette H. Bolles.

Preventive measures after an attack are most important. Correction of bony lesions as found is the most essential factor in prophylaxis. Regular systematic exercise, avoidance of tight belts and corsets, and better posture all are efficient aids.

"If after a faithful attempt to cure and our efforts are not rewarded, then many of these cases should be operated and the gall-bladder drained. If the attacks of simple gall-bladder disease are accompanied by high temperature and chills which indicate the presence of infection, the case has already passed into the domain of surgery and should be operated at once. Should the pain be paroxysmal, excruciating and accompanied by jaundice, the case has passed the borderline of conservative therapy and should be operated. The conscientious physician avoids the radical agency of therapy studiously when he is in

doubt as to the appropriateness of its application in that particular case; but when he is convinced it is the right thing to do, he summons it to his aid at once and assumes his due measure of responsibility. The mere presence of gall-stones in the gall-bladder is no particular indication for an operation. Surgery should be commanded only when the stones give trouble by inducing infection or when manipulative measures do not enable them to pass. Fortunately for the patient some twenty-five per cent of the cases of gall-stones in the gall-bladder do not produce any symptoms whatsoever."—S. L. Taylor.

"To relieve the pain, inhibition in the splanchnic area, especially at the ninth and tenth, also apply heat to the splanchnic area and over the region of the gall-bladder to hasten relaxation. Gentle manipulations over the region of the gall-bladder and ducts may help considerably. Of course you cannot get your fingers on the ducts and push the stone through, but manipulations over the gall-bladder may, if the bladder is full of bile, cause the stone to be pushed into the duct and passed. Then give good, vigorous treatment to the lower dorsal and upper lumbar regions for a few minutes, allow the patient to rest several minutes and again repeat until the pain is reduced by the stone passing or dropping back into the bladder. The spinal and abdominal muscles must be thoroughly relaxed."—J. E. Derck.

The control of the diet is most important. The patient must avoid excess in eating, keeping the fats and carbohydrates at the lowest limit necessary to keep the body nourished. Water drinking must be encouraged.

Recurrent attacks and complications which do not yield to treatment may call for cholecystotomy or cholecystectomy as may be indicated. The indications for operation are: repeated attacks of biliary colic; the presence of a distended gall-bladder with severe and resistant attacks of pain and fever; gall-stone impaction in the common duct.

Among the *sequelæ* are biliary fistulæ and obstruction of the bowels by gall-stones. Malignancy may follow the repeated irritation.

Prognosis. Uncomplicated cases terminate in recovery. Ulceration, suppuration, or perforation may be fatal.

CANCER OF THE GALL-BLADDER AND OF THE BILE DUCTS

Cancer may affect either the gall-bladder or the bile ducts and in about 85% of the cases follows gall-stones. About 75% are in women. It may begin either at the fundus or near the neck of the gall-bladder. The liver may be affected secondarily, in which case the progress of the disease is rapid. Secondary growths are not common.

Diagnosis. The pain is severe and often paroxysmal, with persistence and tenderness on pressure in the intervals between attacks.

When the gall-bladder is affected, jaundice usually occurs rather late. If the bile ducts are implicated, it is present from the

first and becomes progressively deeper, the pain being absent or slight. Cachexia, progressive emaciation, and profound anemia are present.

The tumor is firm, hard, nodular, and very tender on pressure. If the growth involves the gall-bladder, it extends diagonally downward and inward toward the umbilicus; if the bile ducts are involved, it may be felt as a smooth, ovoid swelling below the ninth costal cartilage.

Treatment. Is palliative at best. Surgery may stay the progress for a time. Deep, steady pressure over the spinal areas of greatest reflex contraction and frequent and thorough treatment of the cervical tissues may give great relief. At the last, opiates are often necessary for the relief of the pain.

Prognosis. Death is not as speedy as in cancer of the liver, but is inevitable, under our present methods of diagnosis. If early diagnosis could be made, as, for example, at an operation for gall-stones, no doubt early surgical intervention could give fairly good prognosis. After opiates or other analgesic drugs become necessary, these add complicating discomforts and themselves make the prognosis more gloomy. Life may, however, be prolonged and be made endurable by the use of these, during the last weeks of the disease.

Prophylaxis. Since so large a proportion of these cancers follow gall-stones, tight lacing, and rib lesions, the prevention of this triad is important.

CHAPTER XI

DISEASES OF THE PANCREAS

GENERAL DISCUSSION

Diseases of the pancreas are rather rarely reported. This is partly due to the protected location of this gland, and partly to the difficulties in diagnosis, when pancreatic disease does occur. The pancreas pours its secretion into the duodenum through a rather long and tortuous duct; infectious agents do not readily reach the gland from the intestine. Slight variations in either its internal or its external secretion do not cause any recognizable variations in the digestion of the food, nor in carbohydrate metabolism. The nervous relations of the pancreas are practically the same as those of the liver and the upper intestinal tract. For this reason, reflex muscular contractions and hypersensitive areas do not give help in diagnosis. With more efficient methods of diagnosis no doubt many obscure cases will be recognized as due to pancreatic disease. At the present time, no functional pancreatic diseases are recognized.

HEMORRHAGE INTO THE PANCREAS

This usually occurs in individuals over forty years of age, but seemingly bears no relation to work or rest. Chronic alcoholism is a predisposing factor in some cases.

Diagnosis. Slight hemorrhages may cause no recognizable disturbance and only be found post-mortem.

Hemorrhage is characterized by the sudden onset, usually during perfect health, of a severe, sharp or colicky pain in the upper abdomen, accompanied by nausea and obstinate vomiting. The patient becomes depressed, restless, and anxious, with a cold, sweating skin. The pulse is small and rapid, becoming later running and imperceptible. The temperature is normal or subnormal. The abdomen rapidly becomes distended and tender over its upper portion. Collapse, syncope, and death usually supervene within twenty-four hours.

Treatment. Palliative measures are indicated, as in shock. The diagnosis becoming apparent, exploratory laparotomy may show some reparable injury. Without surgical intervention, death is inevitable when the hemorrhage is large enough to provoke recognizable symptoms.

ACUTE PANCREATITIS

Acute pancreatitis is an acute inflammation of the pancreas, either hemorrhagic, gangrenous, or suppurative in character, affecting primarily the fibrous and fatty interstitial tissues, due to extension of disease from the duodenum or to traumatism, and characterized by sudden severe abdominal pain and vomiting, fatty stools, abdominal distention in the upper left quadrant, and rapidly supervening symptoms of collapse.

Etiology. The disease occurs in overfat males after forty-five years, especially those suffering from gastro-intestinal disorders, infectious cholecystitis, cholelithiasis, and infectious fevers; or occurs from traumatism, especially blows in the middle of the back. Alcoholism and chronic mercurialism predispose to the disease.

Diagnosis. There is a sudden onset with intense abdominal pain and tenderness in the epigastrium, nausea, and vomiting with severe retching. Premonitory pain around the gall-bladder has been reported. The upper left quadrant of the abdomen becomes distended and tympanitic. The temperature is subnormal at first, later moderate fever may be ushered in with a chill. Constipation, dyspnea, jaundice, delirium and hiccough with symptoms of collapse rapidly follow. The patient succumbs, as a rule, within four days.

If there are chills, fever, marked abdominal distention, tenderness, and tympany with jaundice, collapse following the pain or vomiting, it indicates a termination by gangrene.

If there are irregular fever, irregular vomiting, jaundice, and constipation, the indications are that suppuration is in progress and will terminate by death within one to four weeks; or by becoming chronic, the course lasting several months or a year.

The spine may show muscular contractions and sublaxations along the lower dorsal and upper lumbar region. The upper left quadrant of the abdomen is distended and tympanitic; tender points due to fat necrosis may be found scattered over the abdomen.

The fat-splitting ferment may be found in the urine, and the ethereal sulphates are reduced. Albuminuria is frequent. The feces contain much fat.

The condition is difficult to distinguish from intestinal obstruction, perforation of the stomach, acute toxic gastritis, and biliary colic.

Treatment. Palliation of the symptoms is all that can be done in most cases. Exploratory laparotomy is sometimes indicated.

Prognosis. Death usually occurs in from two days to four weeks.

CHRONIC PANCREATITIS

Chronic pancreatitis is a condition of interstitial overgrowth producing increased size and density, compression of the secreting structure, pigmentary deposits, and calculi in the ducts, and marked clinically by fatty stools, jaundice, dyspepsia, and loss of weight.

Etiology. Arteriosclerosis, alcoholism, and syphilis are predisposing causes. Among the exciting factors may be mentioned obstruction of the pancreatic duct, extension of disease from chronic gastro-duodenitis or catarrh of the bile passages, and diabetes. Lesions of the eighth to the tenth vertebræ and ribs modify the circulation of the pancreas.

The anatomic changes are of two forms, interlobular and inter-acinar. The latter invades the islands of Langerhans. Cysts and calculi may be formed in the ducts.

Diagnosis. The main symptoms are paroxysmal pain, abdominal distention, indigestion, loss of weight, diarrhea with fatty stools, irregular fever, and jaundice.

The distended abdomen may be found tender in the upper part. There may be albuminuria, glycosuria in various combinations, and the ethereal sulphates in the urine are reduced.

The stools contain much fat, are often clay-colored, and have a large muscle fiber content when meat is eaten. The X-ray may help in diagnosis by excluding certain gastro-intestinal diseases.

Treatment. If calculi or gall-stones are the cause, operation is indicated. Alcoholic, syphilitic and arterio-sclerotic cases should receive suitable treatment for these conditions. In all cases, treatment for the correction of the bony lesions as found, is indicated.

Prognosis. The course of the disease is very slow. The appearance of glycosuria makes the outlook grave.

PANCREATIC CYSTS

Pancreatic cysts are usually retention cysts, due to closure of duct of Wirsung by concretions, tumors, or cicatrices, and may result from the encapsulation of extravasated blood, echinococcus disease, malignant tumors, or may be congenital.

Trauma and inflammation are important factors of etiology.

Diagnosis. The main symptom is progressive enlargement of the left portion of the epigastrium between the costal cartilages and the median line. The general symptoms of abdominal pain, digestive disturbances, emaciation, constipation, recurring intestinal hemorrhages, with pressure symptoms of jaundice, ascites, or dyspnea, occur only when the tumor is of some considerable size and are dependent upon the location to a considerable degree.

The complexion is peculiar. The skin has a dirty yellowish or earthy hue. Inflation of the stomach and colon shows that the tumor lies behind them. It is found to be globular, resisting, inelastic, nonfluctuant, dull to percussion, and may displace other organs and structures.

On aspiration, the fluid found is reddish or dark brown color; contains blood or blood coloring matters; cell detritus; fat granules; and sometimes cholesterin; its consistency is usually mucoid, rarely thin; of alkaline reaction; specific gravity is 1010 to 1020; the pancreatic ferments are present in variable number and proportions. The most important test to be made is for the digestion of fibrin and albumin.

Glycosuria and albuminuria are usually present. Feces contain considerable fat.

Treatment. After the withdrawal of the characteristic fluid by aspiration, exploratory incision is indicated. Recovery is to be expected in the absence of complications.

CANCER OF THE PANCREAS

Cancer of the pancreas occurs as a primary form, usually of the scirrhus variety, affecting first the head of the pancreas, and is characterized clinically by dull epigastric pain, intense, persistent jaundice, tumor formation, clay-colored, greasy stools, various pressure symptoms, and very rapid wasting and cachexia. Secondary cancer is more rare.

Etiology. Men are more often affected; the disease is most apt to appear after the age of forty.

Diagnosis. The symptoms are suggestive; other methods of examination are very unsatisfactory. X-ray sometimes helps in the diagnosis. The symptoms include: obstinate chronic or recurring gastritis, with atypical symptoms and gastric findings; progressive cachexia; dull, obstinate epigastric pain; sometimes nocturnal paroxysms of extremely severe pain, with vomiting and diarrhea, sometimes associated with intercurrent constipation. Intense and persistent jaundice may be due to pressure upon the bile duct. Pressure upon the portal vein may be responsible for ascites; pressure upon the thoracic duct may cause chylous ascites and chyluria; this may simulate certain tropical diseases. Pressure upon the vena cava may cause edema of the legs and abdomen. Pressure upon the duodenum may cause signs of acute intestinal obstruction; less degree of pressure may cause gastrectasis. Aortic pulsation is readily transmitted.

The stools are apt to be greasy and clay-colored. Undigested meat may be found in the nondiarrheic stools. Various tests for the efficiency of the pancreas have been described; these are based upon the relative digestibility of different food materials by the digestive juices. Glycosuria may be present. Other urinary and blood findings are about as in cancer elsewhere in the body. In emaciated patients the tumor may be felt.

Metastasis to the liver and spleen are frequent; to other organs, occasionally.

Treatment. Only palliative treatment is possible. Relaxation of the reflex muscular contractions, with or without correction of

the bony lesions, gives relief, and prolongs comfortable existence to a certain extent. These cancers are inoperable by the time the diagnosis is possible.

Prognosis. Very rarely early diagnosis and removal of the cancer are possible; life may be prolonged even though recurrences are to be expected. When the metastases in the liver give the first recognizable symptoms, as is often the case, death is not long delayed. Palliative measures are usually even more inefficient in these cases than in other cancers of the upper abdominal region.

PANCREATIC CALCULI

(Pancreatic lithiasis)

Pancreatic calculi are multiple, pea-sized, inspissated particles of altered pancreatic secretion around which concretions of calcium carbonate and phosphate have been laid and are found in the pancreatic duct, and its branches. Inflammations of the gland, or influences which caused altered secretions, are factors of etiology.

They are often unattended by symptoms being found only at autopsy. When symptoms arise, usually resulting from closure of the ducts, or passage of the stones, the condition resembles biliary colic. Glycosuria, fatty stools, and the passage of the calculi by bowel may lead to correct diagnosis. X-ray examination is usually decisive.

The methods given for biliary colic are to be used during the passage of stones. Surgical removal may be indicated after careful study of X-ray plates.

CHAPTER XII

DISEASES OF THE PERITONEUM

GENERAL DISCUSSION

The peritoneum is subject to diseases which originate elsewhere—as in perforation, extension of inflammation, metastases of malignant growths, and other conditions of similar nature. The visceral layer of peritoneum is almost or quite devoid of sensory nerves; the parietal layer is plentifully supplied with sensory nerves. This accounts for the observed fact that inflammatory processes limited to the visceral layer cause little or no pain, and usually no recognizable reflex muscular contractions, whereas comparatively slight involvement of the parietal layer causes severe pain and marked reflex muscular contractions in the lower thoracic and lumbar spinal muscles, as well as in the abdominal muscles. It must not be forgotten that the intestinal tract is fairly well supplied with sensory nerves, and that intestinal inflammations do produce pain and reflex contractions.

The vasomotor nerves of the peritoneum have not been well studied. The blood supply to the peritoneum itself is not especially abundant, though many large vessels pass through its folds. The endothelial layer of cells acts as a secretory membrane, and the factors which modify this secretion have not yet been well studied. Variations in this secretion seem to be due to variations in the circulation, yet circulatory phenomena do not seem to account for all the variations in the formation of the peritoneal fluid.

ASCITES

(Peritoneal dropsy; hydroperitoneum)

Ascites or dropsy of the peritoneum is a symptom of some condition which causes an increased transudation of fluid into the peritoneal cavity. It is characterized by a distended abdomen, fluctuation, dullness on percussion, displacement of organs and dyspnea, plus the symptoms of its cause.

Etiology. Local causes are: Portal obstruction, either within or outside of the liver, as cirrhosis and congestion; neoplasms of the liver and pancreas; thrombosis of the portal vein; chronic peritonitis, simple, malignant, or tuberculous. It may be secondary to malignant disease in connection with the intestine and other abdominal organs. Among the general causes are renal, cardiac, or respiratory disease or anemia.

Diagnosis. Enlargement of the abdomen is most marked in the flanks when the patient is lying on his back; the skin is tense and shiny with dilated superficial veins on the surface. The umbilicus is prominent. Fluctuation and a thrill transmitted to the examining hand laid flat upon one flank when the opposite flank is tapped by the finger are characteristic. Percussion yields a dull note which alters when the patient changes position.

The general symptoms include constipation, scanty urination, and embarrassed respiration and cardiac action.

In noninflammatory cases the ascitic fluid is light yellow or straw-colored; specific gravity, 1010 to 1015, contains albumin, 2.5 per cent or less. In peritonitis, the fluid has a specific gravity of 1018 or more and 4.5 per cent and over of albumin.

In chylous ascites, the fluid is turbid and milky, exhibiting oil globules. In malignant ascites, it is often dark from blood, and cancer cells may be found under the microscope. The fluid in tuberculosis may also be hemorrhagic.

Treatment. The main treatment is that of the primary disease. Osteopathic work in the lower dorsal and lumbar regions is urgently indicated. Improve the general health by all means at command.

The bowels and kidneys must be kept active by the usual methods. Sweating may relieve the condition.

A dry diet is best. The amount of fluids taken into the body is to be carefully determined for each patient.

If the symptoms of pressure or dyspnea are at all severe, the fluid may be evacuated by Southey's tubes or by aspiration. Paracentesis may be repeated many times, if asepsis is observed. The abdomen must be supported by bandages, gradually tightened during the removal of the fluid, as its sudden removal causes the vessels to become engorged with blood.

Prognosis. If the ascites is due to organic disease the prospect is unfavorable. In peritoneal cases the outlook is more favorable. In the rare idiopathic cases recovery is the rule within a few weeks.

ACUTE PERITONITIS

(Inflammation of the peritoneum)

Acute peritonitis is an acute inflammation of the peritoneum. It is rarely primary, usually secondary to pathological changes of the abdominal, pelvic, or thoracic viscera.

Etiology. The main causes of peritonitis are bacterial infection; extension of inflammation from neighboring organs, especially the pelvic organs; strangulations of the bowel; penetrating wounds; severe injuries to the dorsal or lumbar spine and to

the lower three or four ribs; cold and exposure; and those cases occurring secondary to perforation of an abdominal viscus. Almost any of the pathogenic organisms may be involved. *Bacillus coli communis*, tubercle bacillus, gonococcus, pneumococcus, bacillus typhosis, anthrax, and the streptococcus, staphylococcus and indeed any pyogenic bacteria may be found, either alone or in various combinations. Amebic infection may occur.

Pathology. The typical changes are: Hyperemia with loss of luster, most marked where the intestinal coils are not in close contact with one another; followed by fibrinous exudation, giving a more or less shaggy appearance; effusion of fluid which may be highly fibrinous and coagulate easily, forming extensive adhesions or may become purulent.

Acute Localized Peritonitis may be appendicular or pelvic, originating in the Fallopian tubes or uterus, or may implicate the cavity of the lesser peritoneum (subphrenic peritonitis). Pulmonary or pleuritic abscess may penetrate the diaphragm. It may follow direct injury, but usually is due to disease of some abdominal organ, most commonly resulting from perforation of a gastric ulcer. Local signs are usually associated with hectic fever, sweating, rigors, and emaciation.

Diagnosis. The symptoms of acute general peritonitis are most characteristic. Great pain and tenderness over the abdomen is constant; the tenderness may be so marked that the slightest touch causes exquisite agony. The abdomen is tense, rigid and tympanitic. Respiration is shallow and thoracic, 30 to 40 per minute. Pulse is wiry and incompressible, 100 to 150 per minute. The temperature is usually 101° to 103° F., rarely rising suddenly to higher points. Rarely a subnormal temperature is found. The face is pale, pinched, and anxious in expression. Constipation is common; rarely there are diarrheal attacks. There is persistent vomiting of greenish fluid after the stomach contents and the contents of the duodenum have been passed. Hiccoughs may be very annoying. The tongue is usually small and red. Moderate uniform abdominal distention; increased resistance, absence of visible peristalsis, and later, dullness in the flanks from fluid effusion are constant.

In perforative peritonitis, the abdomen may be tympanitic all over, the hepatic and splenic flexures being completely obliterated. Partial obliteration of the hepatic dullness may be due to meteorism. Spasm of the muscle overlying the primary inflammatory focus is a valuable indication of the source of infection.

The muscles of the dorsal and lumbar regions are found to be tensely contracted. Various subluxations may be found; these are probably accidental or secondary.

The urine is scanty, highly colored, containing an excess of indican.

Treatment. Absolute rest and good nursing are essential. Deep, steady pressure in the dorsal and lumbar spinal regions will relieve some of the pain. Relaxation of the spinal and cervical

muscles will lessen the amount of reflex irritation. The bowels must be cleaned out and kept active.

To further alleviate the pain, local applications of either heat or cold may be used. With much shock or collapse, an intravenous or subcutaneous injection of normal saline may be used with good result.

"Gastric lavage should be used to control vomiting; no food or water is to be given by mouth until the acute condition is mitigated. Proctoclysis should be continued in severe cases, intermittent in milder ones. In the presence of septic material in the peritoneal cavity, surgery is imperative. Nutrient enemas may be employed."—C. A. Champlain.

Diet. If there is much vomiting, ice may be given. Either an absolute fast, in well-nourished patients or peptonized milk, light gruels, albumen water, or beef juice in very small amounts for asthenic cases, is advisable.

If there is reason to suspect perforation, strangulation, or other operable disease, speedy surgery is indicated. Exploratory laparotomy is often justifiable.

The **prognosis** depends on the cause; perforation may be fatal within a few hours, the prospect of recovery is in reverse ratio to the amount of delay in operating; septic cases are usually fatal within a week; if the process is localized, the outlook is more favorable.

SUBPHRENIC PERITONITIS

Subphrenic peritonitis is inflammation of the peritoneum covering the right and left lobes of the liver, or the lesser cavity of the peritoneum, together with that of the adjacent portions of the diaphragm. It is usually suppurative.

Etiology. The main causes are: Perforation of a gastric ulcer; upward extension of appendicitis; perforation of the duodenal ulcer; extension of pneumonic infection; perforation of an empyema through the diaphragm; malignant disease of the stomach and liver; rupture of hepatic, perinephritic, or pancreatic abscess; diseases of the gall-bladder; trauma.

Diagnosis. The onset is abrupt, especially if due to perforation of an ulcer, with severe epigastric or hypochondriac pain and tenderness, vomiting of bile-stained, sometimes bloody fluid; rapid, embarrassed or painful respiration. Soon after, indications of sepsis supervene. Later, the abscess may perforate into the pleural cavity through the diaphragm, and establish a communication with the bronchus producing a severe, paroxysmal cough and profuse purulent expectoration.

The physical signs are often extremely perplexing. When on the right side, there may be visible bulging, deficient motility in the right hypochondrium, the liver being pushed downward, and

with an apparent vertical and upward increase of hepatic dullness to, perhaps, the fourth rib. If the abscess contains air, there will be a tympanitic zone between the liver dullness and the pulmonic resonance. Change of position of the patient alters the line of dullness. Succussion sounds may be elicited.

When the abscess is in the lesser peritoneal cavity the signs are found upon the left side. If it contains a large quantity of pus, a tumor may be found in the left hypochondrium, epigastrium, or the umbilical region. The colon invariably lies below the tumor and never in front of or above it.

The diagnosis is made mainly by the physical signs, coupled with the history. The earliest symptom is upper abdominal pain of severe character, and vomiting.

In suspected cases, aspiration should be done in the seventh or eighth interspace in the midaxillary line.

If the fluid flows more freely during inspiration, the indications are that it is the subphrenic abscess, because the intra-abdominal pressure is increased during inspiration.

Treatment. Prompt drainage, followed by rest and the treatment for local peritonitis should give fair prognosis for recovery.

CHRONIC PERITONITIS

Chronic peritonitis is a chronic inflammation of the peritoneum. It may be simple, tuberculous, or malignant, producing changes in the thickness of the peritoneum, shortening of the mesentery and omentum, diminishing the caliber of the bowel and producing many adhesions. It may be local or general.

Chronic Local Peritonitis most commonly affects the capsule of the liver or spleen (perihepatitis or perisplenitis) where it may sometimes be recognized by a rubbing sound upon auscultation. It less commonly affects the intestinal peritoneum, appendix, and the pelvic organs. In either case, it causes adhesions which, in connection with the intestine, may form bands which lead to obstruction or give rise to more or less constant and severe colicky pain.

Chronic Diffuse Peritonitis is associated with cirrhosis of the liver, chronic Bright's disease, chronic alcoholism, and syphilis. It sometimes follows an acute attack, and may form a part of a general serositis in which the pleuræ and the pericardium also suffer.

Pathology. The peritoneum is greatly thickened; the mesentery and omentum are shortened; the caliber of the bowel is diminished; there are numerous adhesions; and effusion may be moderate in amount, the fluid being divided by adhesions into separate compartments; or it may be extensive, the fluid being free in the abdominal cavity.

Diagnosis. The symptoms are often obscure and indefinite. There may be vague abdominal discomfort, burning sensations, colicky pains, and either constipation or diarrhea. There may be a slight, irregular fever. Loss of flesh and strength are noticeable and there is more or less ascites or one or more collections of fluid. There may be some abdominal distention. The omentum may be rolled and puckered into a transverse cylindrical mass between the stomach and the colon.

Treatment. Removal of the cause, if possible, is the first consideration. Then, attention to the general health, strengthening the resistance by stimulation of the liver, and correction of the sublaxations found in each patient. The nutritional areas need special attention.

If there is much fluid, which persists, then repeated tapplings are called for.

Very slow and gentle abdominal manipulations are helpful. Any structural conditions which interfere with the circulation should be corrected. Carefully graded exercises, especially those which include "hand and foot" walking, give excellent results. These factors are to be avoided during an acute attack or an exacerbation of a chronic process.

CANCER OF THE PERITONEUM

(Malignant peritonitis)

Cancer of the peritoneum is nearly always secondary to cancer of the stomach, liver, or pelvic organs.

The peritoneal surface is studded with cancerous nodules which tend to cause it to pucker; the intestine may be narrowed.

Diagnosis. The most frequent symptom is chronic ascites with progressive emaciation. On palpation the tender nodules may be felt through the wasted abdominal walls. Secondary nodules and indurated masses are common about the umbilicus. There may be enlarged inguinal glands. The aspirated fluid is usually hemorrhagic and contains the cell groups of Foulis. Carcinoma occurs usually after middle life, with marked cachexia and induration around the umbilicus.

Treatment. Only palliative treatment is possible. These cases are inoperable in practically every instance in which diagnosis is possible.

Opiates may become necessary before death; their use should not be begun too early, nor should suffering be permitted when the hopelessness of the condition is recognized.

PART II

DISEASES OF THE CIRCULATORY SYSTEM

GENERAL DISCUSSION

The heart is subject to the effects produced upon the circulation of the blood both through variations in its nervous control and through variations in the resistance offered to the expelling force of the systole. The manner in which the nervous mechanism may be deranged is best understood by reference to physiological relationships of the cardiac nerve centers.

The vagus nerve carries inhibitory impulses to the cardiac ganglia. It carries sensory fibers which may reflexly affect the heart's action, and also the tension of the blood vessels over the body, especially of the splanchnic region.

The white rami of the upper thoracic region carry impulses which increase the speed and the force of the heart's beat to the superior and the middle cervical sympathetic ganglia. The gray fibers from these ganglia join the vagi and are carried with them to the heart, where they are distributed to the muscle fibers. The same pathway which carries the augmentor and accelerator impulses to the heart carries also, probably, impulses which influence the size of the cardiac blood vessels. This matter is not proved. Also, viscerosensory nerves are carried from the heart; upward with the vagi, and thence in the path of the cardiac accelerators, to the heart center in the upper thoracic segments.

Both the vagus center and the upper thoracic centers are controlled by a general heart center in the medulla, which may or may not be identical with the vagus center.

The heart may be diseased by the following conditions: abnormal pressure in the blood vessels; poisonous substances in the blood stream and starvation through poor blood; local infection; abnormal positions of the first to the fifth thoracic vertebræ and ribs; and muscular tension in the cervical region, of such a nature as to press the pulsating carotid more closely against the vagus fibers; abnormal sensory impulses carried to the centers from other parts of the body, usually viscera innervated by the vagus.

The diagnosis of many obscure cardiac conditions is often very much facilitated by the aid of the Roentgen ray. Relative increases in size, shape, and density are shown positively. Abnormalities of position and sometimes the adhesions causing them can be determined in no other way as accurately. Stereoscopic radiographs are especially valuable in conjunction with the fluoroscopic examination.

CHAPTER XIII

DISEASES OF THE PERICARDIUM

ACUTE PERICARDITIS

(Acute plastic or dry pericarditis; acute fibrinous pericarditis)

Acute pericarditis is an inflammation of one or both layers of the outer covering of the heart.

Etiology. The exciting causes are rheumatism and gout, eruptive fevers; pneumonia; septicemia and pyemia from whatever cause; tuberculosis, nephritis, and extension of disease processes from neighboring parts.

Subluxations of the fourth and fifth thoracic vertebræ, the first to fifth ribs, the clavicles, the atlas and axis, are found very constantly in pericarditis. The reflex muscular contractions involve most constantly the third, fourth and fifth thoracic and the upper cervical segments. The lesions mentioned must be considered important etiological factors.

Pathology. In fibrinous pericarditis, the usual form, there is hyperemia with loss of luster. The exudation of fibrin gives the pericardial surfaces a peculiar shaggy or "bread and butter" appearance. The process often stops at this stage, constituting the plastic form. In pericarditis with effusion, the serous or sero-fibrinous fluid may amount to two litres. This type is most frequently associated with acute rheumatism, tonsillitis, tuberculosis, and septicemia. The absorption of the exudate may result in slight or extensive adhesions which may permanently hinder the cardiac action.

Suppurative pericarditis is due to pyogenic infection as in pyemic or local processes and the fluid is generally purulent from the beginning. Hemorrhagic effusion is generally due to tuberculosis or malignant disease. In nearly all cases the myocardium shares in the inflammation.

Diagnosis is difficult, especially in fat people. The subjective symptoms are often obscure and are masked by the preëxisting disease. In the plastic form, there may be no symptoms or at most precordial distress or pain most marked at the xiphoid cartilage. In pericarditis with effusion, the presence of the fluid may cause the pain above mentioned; moderate fever, 101° to 103° F. or exacerbation of an already existing fever, often irregular, at the onset of pericardial complications; rapid heart action with feeble irregular pulse; pressure symptoms; dyspnea, dysphagia; irritative cough; aphonia; hiccough; nausea and vomiting; distention of the veins of the neck and duskiess of the face. There may be great restlessness, melancholia, delirium, or acute mania, and more rarely the pulsus paradoxus. Absorption is usually rapid but the heart may remain irritable for a long time. In purulent

pericarditis the diagnostic points are the same as in the fibrinous form with the addition of septic phenomena. The only positive evidence is by exploratory puncture.

More rarely, the onset of pericarditis is indicated by rigors, remittent fever, frequently nausea and vomiting, precordial distress and tenderness, acute shooting pains, increased respirations and a dry, suppressed cough, increased cardiac action, sometimes violent palpitation; this lasts a few hours to a day or two. In children, the onset is often insidious and may precede any obvious signs of rheumatism.

The physical signs are more important than the subjective symptoms for diagnosis.

Before the effusion of fluid the excited cardiac action with precordial friction fremitus is evident. The fremitus becomes less pronounced as the effusion increases but is rarely entirely absent until complete resolution takes place.

The characteristic "to-and-fro" friction rub may cause scratching, grating, or "new leather" creaking; is both systolic and diastolic; has its point of maximum intensity in the third or fourth interspace along the sternum and this varies with the position of the patient; is localized although it extends more or less over the whole cardiac surface; seems near to the ear, is modified by the pressure of the stethoscope, position of the patient, and by respiratory movement.

During the stage of effusion, no friction sounds are present. The heart sounds are muffled and feeble.

Inspection shows precordial prominence with widening and bulging of the lower intercostal spaces, most marked in the fourth interspace over the right ventricle and increased when the patient leans forward. The bulging increases with the effusion. When there is a large amount of effusion, the clavicle is elevated with bulging of the left retroclavicular space so that the first rib can be palpated to the sternum. The cardiac impulse may be feeble or absent. Tenderness may be present. The apex beat is displaced, according to the amount and location of the effusion. The cardiac dullness is increased vertically and laterally.

Many "signs" are described, but the exceptions are many, and their recognition more difficult than is a diagnosis based upon a recognition of the actual condition present in each case.

Reflex muscular contractions usually appear first in the region of the third and fourth inter-spinous areas. These increase in area, until almost the entire interscapular region is involved. Sometimes only the deeper spinal layers are contracted; more often the superficial layers also, and the intercostals, especially of the left side, are contracted and hypersensitive. The relief of these reflex contractions gives comfort, and this is diagnostic of pericarditis as distinguished from endocarditis.

Treatment. Absolute mental and physical rest in bed to relieve the heart of all work possible is essential. Slow the heart action by deep, steady pressure through the cervical and upper dorsal areas especially at the fourth and fifth dorsal on the left side. Correct any subluxations found. Pay particular attention to the atlas and the structures along the course of the vagus. The ribs and clavicle must be carefully attended to and the intercostal muscles relaxed. Relax the diaphragm. Deep, steady pressure at the fourth, fifth and sixth cervical areas quiets the heart action for some hours. The pain about the heart is relieved by the general treatment but if especially severe, deep, steady pressure at the first, second, and third cervical and the fourth, fifth, and sixth dorsal areas is indicated. Dyspnea is allayed by the treatment as outlined and by raising the ribs. When the pulse becomes weak and cyanosis occurs, stimulation of the heart and lungs is required, but this does not occur unless conditions are very unfavorable. In the early stages an ice bag to the precordium will aid in giving much relief.

Liquid diet, principally milk, is usually given at first. Later other light nutritious food may be added. Dry food is sometimes advised.

Free elimination with the bowels, kidneys, and skin active must be secured to promote absorption of the fluid after the acute stage subsides and the elimination of the poisonous waste products.

If the effusion is very great, producing urgent cardiac symptoms, paracentesis or incision may need to be performed. Drainage is necessary in purulent cases.

Prognosis. This depends upon the cause. In simple sero-fibrinous types the outlook is good for recovery in one to three weeks. The greater the amount of fluid, the more grave is the prognosis. Permanent damage may result from complication with endocarditis or myocarditis or from the formation of extensive adhesions. In purulent or hemorrhagic pericarditis the prognosis is grave. Pericarditis complicating pneumonia or renal disease is often fatal. Relapses are not infrequent.

Sequelæ. Greater or less degree of adhesion occurs in most cases. These adhesions may lead to hypertrophy, or may merely add to the cardiac difficulty in later pathological states.

CHRONIC ADHESIVE PERICARDITIS

(Adherent pericardium)

Chronic adhesive pericarditis in any degree may result from acute pericarditis, varying with the amount of effusion. If there are simply adhesions between the visceral and parietal layers usually there are no recognizable symptoms. When the inflam-

mation becomes more chronic and extends to the mediastinum and pleura, the parietal pericardium may become adherent to the pleura and chest wall. It is more often found in young people. The subjective and objective symptoms are interdependent.

Diagnosis. The precordia is prominent. There is an indrawing of the interspaces, at the time of the ventricular systole, most marked at the apex and synchronous with the systolic shock. There is also a systolic retraction of the left back in the region of the eleventh and twelfth ribs.

Diaphragm Phenomena of Broadbent. There is a visible systolic tug communicated through the diaphragm to its points of attachment, the seventh or eighth rib in the left parasternal line and on the left side behind the eleventh and twelfth ribs. The apex is displaced outward and the area of impulse is increased, both due to the cardiac hypertrophy. The apex is fixed, not changing with the different positions of the patient. The impulse is undulatory, wavy and in the apex region. Diastolic rebound of the chest wall is characteristic of pericardial adhesions. **Friedreich's Sign**—(the collapse of the cervical veins during diastole) and **pulsus paradoxus**—(the pulse becoming smaller at the end of inspiration) are characteristic. The area of cardiac dullness is increased, usually upward even to the first interspace; this is not modified by respiration.

When the membrane over the right ventricle is most affected, there may be very marked systemic disturbances. The hepatic engorgement may simulate cirrhosis of the liver—pseudo-cirrhosis—there may be gastro-intestinal disturbances which cloud the diagnosis greatly. When the pericardium over the left ventricle is most affected, pulmonary disturbances—dyspnea, cough, etc., may be so marked as to simulate pulmonary disease.

PERICARDITIS CALLOSA. This is a form of chronic pericarditis which appears insidiously during childhood. It is very hard to recognize before death, but should be suspected in children with symptoms of hepatic cirrhosis, edema or ascites, full jugulars, or cyanosis. The treatment is that of pericarditis in adults, when the condition is recognized. Its prevention depends upon care during convalescence from the acute fevers, and upon the maintenance of a suitable diet and hygienic regime for children; rheumatic tendencies are perhaps especially to be avoided. Bony lesions of etiological importance include those affecting the cardiac centers, and these should be corrected by very gentle movements, avoiding any undue irritation of the nerve endings of the affected articular surfaces. Recovery is rare; even when death is delayed the heart rarely regains full functional activity.

Treatment. In most cases no particular treatment is needed for chronic pericarditis since the heart adapts itself to the conditions as found and no particular symptoms are produced. When the condition is recognizable treatment may be necessary. It must be remembered that the adhesions may embarrass the heart's

action to such an extent as to lead to hypertrophy or to disturbances of the circulation. These adhesions are connective tissue and are more or less completely covered by a secreting and endothelial membrane. If attempts are made to stretch or to break these adhesions the irritation upon this membrane may set up an acute exacerbation and a chronic inflammation. For this reason great care is necessary in giving treatments or exercises which might throw tension upon the pericardial and mediastinal tissues. In order to relieve the cardiac embarrassment the following procedures may be modified to suit individual cases: The ribs should be raised and held spread apart while the patient takes a long breath. This should be done with the patient lying upon the side, then upon the back and then upon the face in order that the influence of gravity may be allowed to act from as many different directions as possible. The lower ribs may be pulled out while the patient lies upon his back or side with the knees drawn up in such a way as to relax the abdominal muscles. This may be done with the patient in the knee-chest position.

Exercises in moderation are also helpful. The patient may be taught to breathe slowly and deeply while the arms are extended strongly upwards, outwards and downwards; while he is in the knee-chest position lying upon the right side, the left side, the face and the back. All of these exercises and manipulations tend to bring gradual and gentle tension upon the pericardial adhesions and also to facilitate the cardiac hypertrophy. The hygienic conditions are those indicated in any condition requiring cardiac hypertrophy. The general health should be kept as good as possible and all structural, infectious, and environmental causes for diminished vitality should be removed.

When the adhesions seem limited to the region of the apex, and are very strong, embarrassing the heart's action seriously, their surgical section may be considered.

HYDROPERICARDIUM. Pericardial dropsy is an accumulation of water in the pericardial sac without inflammation, occurring always secondary to cardiac or renal disease, pneumothorax, pressure of an aneurysm, mediastinal tumors, or diseased cardiac veins, clinically marked by pressure symptoms, precordial distress, disturbed cardiac action, dyspnea, dry cough, and dysphagia, and the physical signs, those of effusion without any friction sound ever being present.

The fluid varies from an ounce to one or two pints, is clear, yellowish or straw-colored, and alkaline in reaction.

The diagnosis is made by the history and by aspiration of the fluid. The treatment is that of the underlying cause. If the cardiac action is greatly embarrassed, paracentesis may be performed.

HEMOPERICARDIUM. Hemopericardium is found in rupture of aneurysm of the first part of the aorta, of the cardiac wall, of the coronary arteries, and in rupture and wounds of the heart.

Death usually follows before there is time for the production of symptoms other than those of rapid heart failure due to compression.

PNEUMOPERICARDIUM. (Air in the pericardium.) Rarely wounds, fistulæ, gas-producing bacteria, may result in the presence of atmospheric air or carbon-dioxid in the pericardial sac. The symptoms are those of pericarditis, purulent or with effusion. A tympanitic note over the heart, which changes with the position of the patient; splashing, "water wheel" sounds, synchronous with the pulse, make the diagnosis fairly positive.

The treatment is the same as for purulent pericarditis, with which it is usually associated. The prognosis is always very grave, and death is to be expected within a very few days.

CHRONIC POLYSEROSITIS (Pick's disease). In this rather rare disease the serous membranes become thickened through the proliferation of the cells of their connective tissue framework. The pericardium becomes greatly thickened, and its layers adherent. The pleura and peritoneum undergo similar changes; the splenic and hepatic capsules are greatly thickened, with symptoms of cirrhosis of both organs. The cardiac symptoms are usually first noticed and most conspicuous.

Treatment is limited to palliative measures. Such spinal corrections as are indicated on examination facilitates the best circulation and elimination possible under the circumstances. Paracentesis may be indicated, if the ascites becomes annoying.

Prognosis. These patients may live for years, with varying discomfort. Recovery is probably impossible. Death is usually due to some intercurrent disease, as pneumonia.

CHAPTER XIV DISEASES OF THE MYOCARDIUM

ACUTE MYOCARDITIS

(Acute interstitial myocarditis; carditis; abscesses of the heart)

Acute myocarditis is rapid degeneration of the cardiac muscle or an extension of a septic pericarditis or endocarditis usually occurring in connection with the infectious fevers, clinically characterized by the sudden appearance of cardiac failure and usually quickly fatal. Rarely the infectious agent is introduced into the heart by trauma.

Diagnosis. During convalescence from some acute disease, or after the occurrence of pericarditis, dyspnea, sighing, syncope and precordial oppression occur; the pulse becomes rapid and weak, but rarely irregular; the face is pale; the hands cold, and other signs of depressed circulation are noted; occasionally collapse and coma follow; the heart sounds are feeble, sometimes the first sound is accentuated, the cardiac impulse and the apex beat may be imperceptible.

Treatment. This depends upon the conditions as found on examination. Absolute rest, physical and mental, is indicated. Even turning in bed, or lifting an arm, or slight excitement, may be immediately fatal. Very gentle, steady pressure near the spines of the tenth thoracic to the second lumbar vertebræ relieves the cardiac strain; this should be repeated two or three times each day.

The most important therapeutic consideration is **prevention**. During the course of the infectious fevers, or in any pyemic process, the condition of the heart should be watched carefully; any violent exertion during convalescence is to be avoided. The correction of the bony lesions associated with the cardiac nerve centers should be a routine procedure in all acute fevers, pneumonia, the puerperal state, rheumatism, or other conditions liable to affect the heart in any way.

Prognosis. The disease is usually rapidly fatal; death is to be expected in a few hours to six days after the first symptoms are noticed.

CHRONIC INTERSTITIAL MYOCARDITIS

(Fibrous myocarditis; fibroid heart; chronic carditis; cardiosclerosis)

Chronic interstitial myocarditis is a slowly developing change in the heart musculature due to hyperplasia and induration of

the connective tissues. It is characterized by more or less dyspnea on exertion, tachycardia or bradycardia, precordial distress and pain, and symptoms of anemia of various organs. It often presents no symptoms.

Etiology. The conditions responsible for general arterio-sclerosis may also be responsible for interstitial myocarditis. The inorganic poisons such as phosphorus, lead or mercury; the overuse of stimulating foods and drinks, especially alcohol; and the organic toxins of syphilis, gout, rheumatism, malaria, diabetes, nephritis, carcinoma, and so on, are all important etiological factors. Bony lesions are indirectly responsible through causing increased blood pressure or preventing the proper elimination of the products of katabolism.

Pathology. This condition bears a direct relation to the arteries throughout the body and especially to the coronary arteries. The primary changes in the coronary arteries may be either acute or chronic arteritis, atheroma, or endarteritis obliterans of syphilitic origin, both forms being factors in causing thrombosis of a large branch. Embolism of the coronary artery results in sudden death.

The heart is enlarged and dilated, the structural changes being either diffused or localized in the walls of the left ventricle, the papillary muscles and the septum.

Diagnosis. The symptoms are nearly all cardiac in character.

Heart-tire is out of all proportion to other evidences of old age. It is indicated by breathlessness on exertion, slight cyanosis, puffiness or edema of the ankles and weakness out of proportion to the appearance of the patient. Cerebral symptoms include giddiness, vertigo, syncope, insomnia, pseudo-epileptic attacks on rising from the recumbent position, pseudo-apoplexy, rarely mania, delusional attacks, or dementia. Dry hacking cough; dyspepsia and constipation; scanty albuminous urine and dropsy indicate the generally impaired circulation.

Tachycardia, 150 to 180 per minute, may be a terminal cardiac sign of myocarditis. Bradycardia is much more frequent, between 30 and 50 per minute, and may be associated with Stokes-Adams syndrome, rarely with angina or severe arrhythmia. Death results from syncope. Arrhythmia with feeble pulse may be the only clinical symptom. Anginal attacks vary from great distress to true angina. (See Angina pectoris.) There is a sallow, pallid complexion, and evidences of premature age as shown by hair, baggy eyelids and abundance of wrinkles.

The examination of the heart shows a feeble impulse at times scarcely felt, the apex beat not palpable or displaced to left; area of absolute dullness increased; dilated hypertrophy. The sounds are feeble, the first sound more or less valvular. There is a characteristic irregularity of force and rhythm. Murmurs are frequent and due to valve lesions. There may be gallop rhythm or reduplication of the systolic sounds best heard at fourth rib in parasternal

line and more marked in the recumbent position and after exercise. Added signs are found when hypertrophy or dilation become marked.

The arteries are palpable, tortuous vessels with thick walls and high tension; the temporal artery is prominent and the arcus senilis is often present. Blood pressure is increased.

Exercise has little effect upon functional disturbances, but increases the pain, dyspnea, cardiac disturbances when the myocardium is degenerated.

Treatment. There is no remedy for the fibroid change, but the fibrosis may be held in check and the symptoms met or prevented by improving nutrition, preventing constipation, guarding against any mental strain or physical exertion, by diet, and by careful systematic treatment.

The removal of every factor responsible for abnormally high blood pressure or for the retention of the toxic products of metabolism may prevent the more rapid course of the disease. The symptoms may be treated as they arise. Stimulation of the accelerators in the upper dorsal and the sympathetics in the cervical region increase the strength of beat and tone of the heart muscle. The heart must be watched very carefully during this treatment, and for some hours afterward. The palpitation, dyspnea, arrhythmia, and depressed circulation are relieved by raising the ribs, and by long, slow, gentle movements of the lower thoracic spinal column. Inhibition of the splanchnics is often useful. For pseudo-apoplexy, the patient is placed recumbent with the head slightly raised, and the whole spine treated with careful relaxation and correction, paying particular attention to the cervical area. The blood pressure may be equalized by deep, steady pressure to the splanchnics and to the solar plexus direct. All secretions must be kept active. Pay attention to the kidney area.

Diet must be generous and of easily digested foods. Little or no tea or coffee must be given. Tobacco and alcohol are absolutely forbidden. The patient should lie down several hours during the day. Exercise must be carefully gauged by the effect upon the pulse, blood pressure, and the cardiac signs. The following may be used, beginning with the first and, as followed by improvement, each advance may be taken: (a) massage; (b) resistance movements; (c) moderate walking on the level; (d) light gymnastics.

The Nauheim treatment may be of benefit but must be given very carefully and in selected cases.

After improvement, the patient should return for osteopathic examination every few months. A little occasional attention may be of very great value in prolonging a comfortable life.

Prognosis. This is largely determined by the habits of the patient. The disease is incurable but the patient may live fairly

comfortably for many years if he will observe due care. This is one of the most common causes of heart failure in the course of acute pneumonia, typhoid fever, and from overexertion.

Prevention is important. The paragraphs on etiology and treatment suggest the best methods for avoiding the disease.

FATTY DEGENERATION

Fatty degeneration of the heart is a change of the cardiac muscle fibers, the transverse striæ being replaced by granules or globules of fat. It is clinically characterized by feeble cardiac action, venous stasis, and dyspnea.

Etiology. It is a disease of elderly people and follows those diseases which induce fatty changes, as carcinoma; tuberculosis; chronic gout; prolonged anemia; kidney diseases; prolonged administration of chemical poisons as arsenic, phosphorus or alcohol; lack of out-door exercise; and chronic intestinal toxemia. It may follow fatty infiltration.

Diagnosis. The symptoms are often obscure. There may be coldness of the feet, drowsiness after meals, dyspnea on exertion, syncopal or even epileptiform attacks. Angina pectoris may occur. Cheyne-Stokes breathing, sighing or oscillating respiration may cause fright. Cardiac asthma and arcus senilis are sometimes present.

The physical signs include a weak, irregular cardiac impulse; cardiac dullness normal or very moderately enlarged, first sound feeble, toneless, and almost inaudible; second sound normal or weak; pulse often remarkably slow, compressible, sometimes irregular. It is associated with atheromatous changes in the vessels.

Diagnosis is rarely more than probable. It is to be distinguished from fibroid degeneration.

Treatment. The removal of the etiological factors is important, when this is possible. The treatment outlined for chronic myocarditis should be adapted to the needs of each individual patient. A quiet life is imperative. Errors in diet must be avoided.

Prognosis. Recovery is not to be expected, and death may occur at any time, from cardiac paralysis, rupture of the heart, or exhaustion. Life may be prolonged and made more comfortable by correct hygiene and such treatment as is indicated by the condition of the patient.

FATTY INFILTRATION

Fatty infiltration myocarditis is an excess of fat between the muscle fibers and around the heart. It is associated with general obesity and evidences of cardiac weakness.

Diagnosis. There are no symptoms until the muscle fibers are so weakened that dilatation occurs with its particular signs. The heart sounds are weak and muffled; a murmur may be present at the apex and the pulse is feeble and regular; these conditions exist for years. Diagnosis is made by the presence of obesity and the evidences of cardiac weakness, without signs of other cardiac disease.

Treatment. In this case much can be done if the heart muscle has not been too badly weakened. The main object is to reduce the fat. (See Obesity.) The treatment for chronic myocarditis may be adapted to the condition of the patient.

Prognosis. In young people the prospect is good for symptomatic recovery, though such persons must be careful not to allow too great increase in the body fat, during their remaining life. Elderly persons must be careful not to reduce weight too rapidly; such individuals may suffer serious cardiac symptoms, even death, as the result of rapid loss of weight. If the fatty deposit is continued, or if the patient refuses obedience to hygienic laws, permanent injury to the cardiac muscle follows. Sudden death may occur from rupture, or with symptoms of heart block.

DILATATION OF THE HEART

(Cardiac dilatation)

Dilatation of the heart is an increase in the size of one or more of its cavities without hypertrophy. It is characterized by feebleness of the circulation, terminating in venous stasis, cyanosis, edema, and exhaustion, and is most typically seen in the broken compensation of aortic and mitral regurgitation.

Etiology. It is due to causes which directly affect the myocardium as bacterial toxins, chemical poisons or prolonged pyrexia. Increased pressure within the walls, emotion, shock, and physical exertion, especially running or bicycling uphill, mountain climbing, etc., cause sudden or acute dilatation. In those of feeble resistance slight causes are effective. It sometimes seems to be idiopathic. It occurs secondarily in chronic valvular lesions, chronic bronchitis, chronic interstitial nephritis, alcoholism, and syphilis. Among the predisposing causes are fatty and fibroid degenerations of the muscle, and inadequate nutrition.

Diagnosis. The general symptoms are referable to enfeebled circulation; feeble pulse, headache aggravated by the upright position, attacks of syncope, cough, dyspnea, jaundice, dyspepsia, constipation, scanty often albuminous urine, mental dullness, vertigo often relieved by copious epistaxis, and finally dropsy beginning in the lower extremities. If these changes take place slowly, it is termed "gradual failure of compensation."

The precordial throbbing and extended, wavy impulse; the small, weak, irregular pulse; the increased dullness of square outline, the diminution or loss of the muscular element of the first sound, should make the diagnosis apparent. In general, if there are no valvular lesions, the cardiac sounds are weaker, the systolic sounds sharper, short, and of high pitch. The X-ray shows large "thin" heart-shadow with characteristic shape distorted according to cavity involved.

Treatment. The object of treatment is to secure hypertrophy, if possible. Correction of the subluxations is important, especially those affecting the cardiac and vasomotor centers. Active elimination by all emunctories must be maintained. The diet must be liberal and as nutritious as the patient can assimilate. Digestive disturbances must be avoided. Rest from business, excitement, and physical strain is essential. There are various systems of exercise devised, among which may be mentioned: Swedish or Ling plan of passive exercise and massage, Schott movements against limited resistance, and Oertel's climbing method.

Prognosis. The outlook depends upon the amount of hypertrophy to be secured. Otherwise the prognosis is very unfavorable, death resulting sooner or later from exhaustion or from cardiac paralysis.

CARDIAC HYPERTROPHY

(Hypertrophy of the heart)

Cardiac hypertrophy is an increase in the number and size of muscle cells of the heart, induced by overwork of the heart from whatever cause and characterized by forcible cardiac impulse and accelerated circulation.

Etiology. Among the predisposing causes are: valvular and especially aortic lesions; adherent pericardium; diseases of the lungs; increased peripheral resistance as a result of arteriosclerosis or chronic interstitial inflammations; aneurysm of the aorta; overexertion of the healthy heart (athletic heart); long-continued stimulation due to the neuroses, exophthalmic goitre, or the long-continued use of large quantities of tea, coffee, or tobacco.

Pathology. The hypertrophy is usually limited to the ventricles, the left side being more commonly involved. The auricles have not so much muscular tissue and so dilate more readily than hypertrophy. The shape is altered. If the left ventricle is chiefly involved, the heart is elongated and the cavity dilated; if the right ventricle is the more implicated, it is widened transversely and the apex blunted; if both ventricles, the shape becomes globular. From increase in weight, the heart may drop back when the patient is recumbent, but on sitting or standing it sinks lower in the chest and to the left causing more or less prominence of the abdomen.

The varieties are (1) simple hypertrophy which is a simple increase in the thickness of the cardiac walls; and (2) eccentric or dilated hypertrophy which is increase in the walls with dilatation of one or more cavities.

Diagnosis. If the hypertrophy is only sufficient to compensate for defects, there are no symptoms. The degree of hypertrophy depends largely upon the age of the patient. If it is disproportionate to the obstacle, there is increased and forcible cardiac action, precordial discomfort, headache, dizziness on exertion, tinnitus aurium, flushes, flashes of light, dyspnea on exertion, congestion of the face and eyes, dry cough, epistaxis, restless nights, and more or less jerking of the limbs.

When the hypertrophy is concomitant with general arteriosclerosis, the arteries become full and the pulse firm and bounding, the carotids and superficial arteries pulsate markedly so that the patient complains of throbbing sensations.

If the disease began early in life, there is bulging of the precordium; if after adult life, fullness and prominence with a distinct impulse is seen. The cardiac impulse is felt one or two interspaces lower and to the left, stronger, slower, more or less diffused and forcible, more "heaving," than normal. The apex beat may be felt in the sixth, seventh, or eighth interspaces even three inches outside of the mid-mammary line. The pulse is full, strong, regular, and of increased tension. It is modified according to the valvular lesions present.

The increased area of dullness extends vertically and transversely to left of sternum; if the right ventricle involved, dullness is increased to right of sternum. X-ray shows enlarged "thickened" shadow.

If there are no valvular changes, the first sound is loud, prolonged, of low pitch, and of a somewhat dull or metallic quality. The second sound is strongly accentuated, clear and loud. Associated valvular disease causes varying murmurs.

The sequelæ of left ventricular hypertrophy are cerebral hemorrhage, miliary cerebral aneurysms, fatty degeneration or cardiac dilatation.

Hypertrophy of the Right Ventricle is due to chronic valvular lesions of right or left heart, or pulmonary diseases as emphysema and cirrhosis. Bulging over the lower part of sternum and occasionally over the sixth and seventh left costal cartilages is present. Epigastric pulsation may be seen in third and fourth interspaces to right of sternum. The radial pulse is of small volume. The cardiac dullness is moderately increased transversely and to the right.

There is accentuation of the second pulmonic sound due to increased tension of the pulmonary artery. Reduplication of the second cardiac sound may occur.

Auricular Hypertrophy is always combined with dilatation. In the left auricle the signs are few and indefinite; dullness to left of sternum, in the second and third interspaces with a presystolic

impulse or wave in the second space. This is inferred, if mitral stenosis or regurgitation is present. In the right auricle, hypertrophy is always with dilatation and is secondary to incompetency or stenosis of the tricuspid valve and associated with right ventricular hypertrophy and dilatation. The main signs are: dullness in the third and fourth interspaces to right of sternum, with often a presystolic wave in same area, systolic jugular pulsation and evidences of venous engorgement.

Treatment. Remove the cause if possible. If excessive, lessen the force and number of cardiac pulsations by deep steady pressure at the third and fourth dorsal vertebræ, correcting any lesions present. Note the position of first ribs, clavicles, and lower ribs. Correct the habits of the patient, according to conditions as found. All active exertion should be restricted and the recumbent position assumed several hours during the day if possible. The diet must be carefully regulated, nutritious, yet all kinds of stimulating foods interdicted.

Prognosis. The outlook depends upon the original cause. If the hypertrophy is compensatory for valvular lesions, the duration and comfort of life may not be affected. Further hypertrophy can usually be prevented by active and persistent treatment, unless the original cause increases in severity.

CARDIAC MISPLACEMENTS. These may be congenital or acquired. Transposition of the heart may be associated with transposition of the abdominal viscera or it may exist alone. Transposition does not in the least interfere with perfectly normal function; it is rarely recognized ante mortem and no treatment whatever is possible or necessary.

The position of the heart may be changed by variations in the position or the structure of other thoracic viscera. The right lung may be destroyed by abscess or otherwise and the left lung may increase in size to such an extent as to pull the heart well over to the right side.

Rarely a weakness of the suspensory tissues permits the heart to change its position when changing position of the body of the patient. This possibility must be kept in mind when making a diagnosis of cardiac hypertrophy and dilatation. The diagnosis rests upon finding the different locations of the cardiac dullness when the patient assumes different positions. Roentgen ray gives valuable geography and is positive.

INJURIES OF THE HEART

Although very trivial injuries to the heart usually result in death, yet it occasionally happens that recovery occurs from wounds of considerable size. In addition to bullet and stab wounds and other gross trauma, a number of cases have been reported in which the heart has been invaded by needles and other sharp objects. In several cases a needle has been found embedded in scar tissue in the wall of the heart, sometimes with a part of its length projecting into the ventricle. Surgical repair of the injured heart is possible.

CARDIAC NEOPLASMS

It is very rare that the heart or its membranes are the seat of new growths of any kind. The diagnosis is frequently impossible ante mortem, although it occasionally happens that metastatic growths may be expected. The vegetations upon the valves of the heart are not to be considered in any sense as neoplasms.

Increase in the cardiac dullness with a weak heart beat and other signs of cardiac embarrassment, together with cachexia and other systemic indications, may give the diagnosis, especially if the cardiac neoplasm is secondary to recognized malignancy elsewhere. No treatment is of any value and death is speedy, in all cases in which any cardiac symptoms are present.

CARDIAC ANEURYSM

Aneurysm of the wall of the heart may occur as the result of disease of the coronary vessels, myocardial degeneration or sudden increase in blood pressure in a heart whose walls are weakened. The sac may be barely perceptible or it may be as large as the patient's head. Attempt at repair is made by the coagulation of the blood in the sac and the organization of the clot. The condition is not usually recognized before death and the only treatment is that of the predisposing causes.

Aneurysm of the valves may occur in endocarditis. The sac may be of considerable size without producing any recognized symptom.

If aneurysm of the wall of the heart or of another large vessel becomes ruptured sudden death occurs.

DISEASED CORONARY ARTERIES

The symptoms associated with disease of the coronary arteries and to a certain extent of the vessels of Thebesius are fairly typical. Any of the ordinary degenerations affecting the walls of blood vessels may be seen in the branches of the coronary arteries and when any of these pathological changes result in the occlusion of any of the arterial twigs an infarct is produced whose after history may follow either of two definite paths. Coronary arteries are terminal and there is very slight opportunity for overlapping of areas of distribution. When the circulation is partially supplied and perhaps under certain other conditions the muscle cells undergo gradual atrophy and there is a multiplication of the connective tissue elements throughout the infarct area, the condition resembles a little mass of scar tissue in the middle of the cardiac muscle. This condition is known as the white infarct, and when a number of such accidents occur the heart assumes the mottled

appearance which sometimes receives the name of "marble heart." Under other circumstances the cardiac muscle undergoes softening and may be absorbed; in any of these cases the wall of the heart is greatly weakened.

At the time of the occlusion of the vessels the patient suffers very severe pain in the precordium and the symptoms of angina pectoris may occur. At other times there is a dizziness or perhaps syncope. The symptoms depend upon the size of the arteries occluded.

The condition terminates by sudden death. Sometimes the wall of the heart ruptures, more frequently on the anterior aspect of the left ventricle, and sometimes the occlusion of one of the larger branches of one of the coronary arteries produces death.

Treatment. At the time of the shock the patient should rest for several hours or several days in bed. He must avoid sudden exertion, violent emotion, excitement and all the conditions which ordinarily raise blood pressure.

The prophylaxis is far more important. It consists in avoiding all of those factors which cause arteriosclerosis or myocarditis.

ANGINA PECTORIS

(Breast-pang; stenocardia; neuralgia of the heart)

Angina pectoris is an affection characterized by sudden attacks of agonizing pain in the cardiac region and a sense of impending death.

Etiology. The predisposing causes include all conditions which interfere with the nutrition of the walls of the heart, particularly in men past middle life; among these nutritive influences being mentioned affections of the cardiac ganglia and plexuses. Syphilitic aortitis is a factor in men under thirty-five years. Spinal luxations which have been found in these cases are those of the atlas, the cervical region and the upper dorsal area. Lesions of the fourth thoracic are reported in connection with coronary spasm.

The exciting causes are sudden strain, over-distended stomach, powerful emotional disturbances, gout, diabetes, and influenza.

Disturbance of the coronary circulation is the one factor to be considered. This is due to some obstructive lesion in the typical case. Spasm of the coronary arteries produces exactly the same symptoms, and is not to be differentiated from the effects of obstructive lesion, in most cases. Probably functional spasm is associated with the true obstructive lesion very often; there is no doubt that functional spasm predisposes to coronary disease and thus to obstruction.

Diagnosis. There is a sudden seizure with acute intensely agonizing pain with a sense of constriction across the chest or of

suffocation, the patient stops whatever he is doing, grasps something if handy, and stands perfectly still. The terrible feeling of anxiety and anguish is shown in the face. The pain is most marked at the lower end of the sternum, radiates into the neck and down the left arm, more rarely into the right arm. It follows the course of the ulnar nerve. There is referred pain in the region of the fifth, sixth, and seventh, even the eighth and ninth dorsal vertebrae and also pain in the cervical region. Muscles in this region are tense and hypersensitive. The respiration is very shallow and difficult although there is no obstruction to the entrance of air into the lungs. The face is very pale, even gray, with no cyanosis. The whole body is covered with a cold sweat. The pulse may show increased tension. The attack may last a few seconds to many minutes, leaving the patient prostrated. An excessive flow of urine follows the attack. It may terminate fatally at the first attack or may recur at intervals, the first being mild and those following increasing in severity.

Some cases present all the symptoms except pain (*angina sine dolore*). Other cases are associated with coldness and pallor of the extremities (*angina pectoris vasomotoria*), the pain being comparatively slight.

Angina vera is most common in men past middle life; is often brought on by exertion; is rarely nocturnal or periodic; is not associated with other symptoms; the pain is agonizing and attended by a sense of constriction, and is of short duration. The patient presents an attitude of silence and immobility; arteriosclerosis is present and the prognosis is grave; attacks often proving fatal.

Pseudo-angina is hysterical. It is most common in women of any age from childhood, attacks are spontaneous, often periodical and nocturnal, and associated with other hysterical symptoms. The pain is less severe, with a sense of distention instead of constriction, duration is one or more hours, is attended by agitation and activity, and is never fatal.

Treatment. The patient should be put to bed as soon as an attack seems impending. The first object is to relieve the pain by raising the left lower ribs over the cardiac area, pressure being made at the same time over the upper three dorsal transverse processes. Apply deep steady pressure to the vagus in the neck and relax the precordial intercostal tissues. If the attack is exceedingly severe or continued for some time, a few whiffs of chloroform may be necessary to secure relaxation. An ice bag over the heart usually gives relief; hot applications are more effective in occasional cases.

Interval treatment. Careful attention to the general nutrition and elimination is necessary to improve the nutrition of the heart muscle. Cases with spasm of the coronary arteries due to lesions of

the fourth or other thoracic vertebræ are apt to recover after correction of the lesion. If the condition has not been too long present, recovery is complete; in cases of long standing recovery may be slower, or the changes in the vessel walls may not permit complete recovery, though the symptoms are greatly relieved. This correction is best made during the intervals of the attacks—the shock of sudden correction is apt to perpetuate the attack if attempts are made at that time.

In obstructive cases, the effects of the associated spasm are not to be neglected, so that the same corrective measures are indicated, whether there is or is not reason to infer a true obstructive angina. Passive exercises and general massage may be gently given by the nurse.

A strict milk diet may be necessary at first until the general nutrition is improved and toxins removed. The general diet should include plenty of fresh vegetables and fruits, eggs, dairy products, lean meat in great moderation, and plenty of pure drinking water unless other symptoms indicate water restriction. Tobacco, alcohol, tea and coffee are to be forbidden. Rest in bed for some weeks is sometimes useful. Mental and muscular overstrain are to be avoided in all cases. Cold baths are dangerous, but hot ones are useful. Hot foot-baths on retiring may give full night's sleep. The bowels should receive careful attention. Strenuous enemas are harmful. Purgative drugs should be absolutely forbidden.

The prognosis is fairly good for recovery from the attack but is ultimately fatal in organic cases. Cases due to spasm of the vessels often recover, apparently completely.

CHAPTER XV

THE CARDIAC NEUROSES

It is often extremely difficult to draw the line between those cardiac symptoms due to nervous disturbances and those due to organic or mechanical causes. Purely neurotic heart action is usually associated with disturbed vasomotor activity. Probably every case of organic disease of the heart or blood vessels is complicated by more or less marked disturbances in the nervous control of the cardiac and vascular muscles.

Etiology. The etiology of the cardiac neuroses depends upon those factors which modify the action of the heart centers in the medulla and in the upper thoracic spinal cord or over the nerve trunks and ganglia by means of which nerve impulses are transmitted to the heart. The place of the bony lesions has already been mentioned.

Neurotic inheritance is usually present and the stigmata of hysteria are frequently found. The use of alcohol, tobacco, tea, coffee, or of excessive meat or starch eating are etiological factors of varying importance. Emotional disturbances beyond the normal limits are responsible for the palpitation especially.

Diagnosis. The diagnosis of the cardiac neuroses must be made by the exclusion of all organic diseases, not only of the heart and blood vessels, but also of other organs capable of affecting the heart. The ductless glands, the kidneys, the blood itself, the liver, the stomach, the pelvic organs, must also be carefully examined before the diagnosis of a cardiac neurosis can safely be made.

Treatment. The treatment has already been indicated by what has been said of the etiology. The character of the bony lesions as found upon the examination of each patient is by far the most important factor in uncomplicated cases. Increased nutrition of the body, and especially better circulation through the spinal cord and the lower brain centers, are also important. Complete rest is often necessary for the acute attacks. In patients with hysteric or neurasthenic symptoms the treatment suitable for these diseases must be employed.

Prognosis. In uncomplicated cases the prognosis for speedy recovery is very good indeed, provided suitable treatment is given.

Without treatment the life of the patient is not in danger but his comfort and efficiency are considerably lessened by the disturbed heart action. Whether these functional disturbances may lead to

organic diseases of the heart later in life is a question which is not yet answered; a priori, it is to be supposed that the effects of functional disturbances might predispose to organic disease.

Palpitation of the heart is characterized by increased force of the heart beat which causes uncomfortable sensations in the cardiac region, often throbbing in the temples, the throat and abdomen. It is more frequently associated with bony lesions of the upper cervical region although lesions in the interscapular spinal column are not rare. Digestive disturbances may be exciting causes.

BRADYCARDIA

(Unusually slow heart beat)

Extremely low pulse, 35 to 50, may be found in persons who are otherwise normal. Purely functional bradycardia must be distinguished from the slow pulse which is present in certain forms of cardiac hypertrophy and especially in diseases characterized by the presence of toxic substances in the blood stream. Jaundice and toxemia from the absorption of the toxic productions of intestinal putrefaction are especially to be noticed in this connection. The bony lesions usually found in the purely functional bradycardia include especially those of the second to the fourth thoracic vertebræ and the regions associated with these. Upper rib lesions and upper cervical lesions are occasionally found in these cases.

Treatment. Bradycardia due to nervous disturbance, bony lesions, and the milder forms of toxemia can be relieved by pressure upon the vagus nerve in the neck, or by stimulating movements applied to the tissues near the third and fourth thoracic spinous processes and to the deeper spinal muscles of these segments.

For relief of attacks, the patient should be given warm or hot drinks, hot applications to the abdomen and limbs, and all constricting clothing should be removed. Correction of the bony lesions as found should be thorough, both for the effect upon the heart itself, and for the relief of the underlying toxemia, nerve reflexes, and other causative factors which may be present. Stimulating manipulations to the mid-thoracic region and the suboccipital triangles may relieve the attack.

TACHYCARDIA

(Unusually rapid heart beat)

This may be present as an individual idiosyncrasy, as a cardiac neurosis, in exophthalmic goiter, or as a symptom of disease of the heart muscle. Not rarely a pulse of 100 to 140 may be found in individuals apparently in perfect health. The speed may be due

to shortened rest period or to increased rapidity of the entire cardiac cycle. In **polysystole**, the interval between the first and second sounds is normal, while the rest period is shortened. In **embryocardia**, the interval between the first and second sounds, and also the rest period, are shortened.

If tachycardia can be relieved by stimulating the vagus nerve in the neck, or by steady pressure over the suboccipital triangles, or near the spinous processes of the third and fourth thoracic vertebræ, it is of extracardiac origin—which may include exophthalmic goiter, the effects of bony lesions, or other cardiac neurosis. If these manipulations do not modify the pulse rate, after thorough testing, the heart muscle is probably diseased. In some cases of exophthalmic goiter, also, it is not possible to affect the heart by these manipulations.

Treatment. Correction of the lesions of the third and fourth thoracic vertebræ and the associated ribs, and of the cervical vertebræ, the first, second, fifth and sixth ribs, especially on the left side, when these are found, is of importance. In reflex or systemic nervous cardiac disturbances, the relief of the cause of the neurosis is of primary importance. For the attacks, the patient should be taught to lie with the head low, take a full breath, and hold the glottis closed to the limit of comfortable endurance. Compressing the abdomen gives relief. Pressure upon the tissues near the third and fourth vertebræ is palliative.

ARRHYTHMIA

(Arrhythmia cordis; irregularity of the pulse)

Normally, the contraction of the heart originates at the sino-auricular node, at the mouth of the superior vena cava, is conducted to the auricle, and hence to the ventricle by way of the auriculo-ventricular bundle (bundle of His or Gaskell's ridge). Under conditions of abnormal stimulation, contractions may originate in the auriculo-ventricular node in the wall of the right ventricle near the coronary sinus; or in the auriculo-ventricular bundle on the ventricular side of the node; or in the auricular tissue itself.

Etiology. The main causes are valvular and myocardial diseases; rheumatism and chorea; long-continued excessive use of tobacco, tea, or coffee; flatulent dyspepsia; the nervous conditions of neurasthenia, hysteria, and melancholia, or of organic disease of the nervous system.

Subluxations especially at the anterior ends of the first to the fifth ribs, or the fourth and fifth dorsal vertebræ may irritate the heart and cause a simple arrhythmia.

There are several types of irregularity.

Sinus Irregularity begins at the sino-auricular node. The beats are irregular, equal in size, but with a variable diastolic period.

Extra-Systole is the commonest form. There is premature contraction of the auricle or ventricle or both, independent of the sinus rhythm. The sinus stimulation then occurs during the refractory period and the diastole is prolonged until the next sinus stimulation is due. This accounts for many cases of intermission, *pulsus bigeminus* or *trigeminus* and *delirium cordis*.

Auricular Fibrillation is a condition in which the auricular muscle fibers contract rapidly and inco-ordinately producing an arrhythmia with no regularity or sequence. A ventricular venous pulse can be seen in the neck. The condition is especially frequent in mitral stenosis and in the senile heart. Irregularity occurs when there is a failure in the conducting power of the primitive bundle, the ventricular systole being occasionally omitted.

"Pulsus Alternans shows itself by a comparatively regular alternation of strong and weak beats. It needs be but briefly considered here, as it can rarely be determined except by instrumental means. When recognized it is generally accepted as an ill omen. As a prognostic sign it compares with such others as albuminuric retinitis, signifying that but a brief period of life can be expected."—M. W. Peck.

It is due to depression or failure of the contractile power of the ventricle. Many intermissions are functional and may be habitual and unrecognized.

The treatment and prognosis depend upon the cause of the arrhythmia and not upon its severity. Organic disease with almost unrecognizable symptoms may occasion speedy death; functional arrhythmia which is very severe may be followed by perfect recovery under suitable treatment of the causes.

STOKES-ADAMS DISEASE

(Heart block)

This is the term applied to the effect produced by diseases of the muscular bundle of His.

Pathology. The bundle of His which transmits the impulse from the auricles to the ventricles is composed of muscular tissue which retains embryonic characteristics throughout life, it is therefore somewhat more easily subject to disease than is the rest of the heart muscle. When it undergoes degeneration, the contraction wave arising around the roots of the great veins in the auricles passes with difficulty to the ventricular walls; for this reason the auricles may beat twice or even three or four times to every single ventricular systole. The condition is most easily recognized by the jugular pulsation.

Diagnosis. Simultaneous tracings taken of the jugular and radial pulsations usually give the diagnosis without question.

Treatment. The cause of the cardiac degeneration should be removed if this is possible. Stimulating foods and drinks, overwork and emotional strain must be avoided, all structural causes of cardiac malfunction must be removed. Rest in bed at the time of the exacerbations is necessary.

Prognosis. The prognosis is grave for all cases of Stokes-Adams disease, usually death is imminent when the diagnosis is made.

Congenital heart-block is a rare condition, probably due to the imperfect development of the bundle of His. It is recognized by the history of congenital defect; the missed ventricular beats associated with rhythmical jugular pulsation, and the absence of findings diagnostic of other cardiac defects. In one case recorded (P. C. O. Clinic) development or compensation occurred, so that at least a symptomatic recovery prevented further symptoms.

CARDIAC ASTHMA. These attacks are characteristic and apt to come on in the early morning hours. The patient is suddenly seized with dyspnea; the respirations are labored, not much increased in frequency but the distress is extreme; rattling sounds come from fluid in the bronchi; clear fluid pours from the mouth or is easily discharged; if death is near, it is discharged with difficulty, if at all. The patient sits upright with pallid face, sweat-covered forehead, and cold pallid hands. The temperature is subnormal, the blood pressure low, the pulse is rapid, thready, irregular and often scarcely perceptible at the wrist, the patient being in a state of profound shock. The heart sounds are heard only as a confused jumble with irregular or ineffectual systoles, the lung sounds overshadowing the cardiac. In the interval after recovery from attack the patient will remain fairly free from dyspnea. The pulmonary edema present is usually due to impairment of the pneumogastric nerve. The cause is not known. It is often associated with chronic nephritis.

With this form, death usually results within a year although patients have lived several years.

CHAPTER XVI

DISEASES OF THE ENDOCARDIUM

ACUTE FIBRINOUS ENDOCARDITIS

(Exudative endocarditis; valvulitis; endocarditis verrucosa)

Acute fibrinous endocarditis is an inflammation of the lining membrane of the cavity of the heart, the valves being the most commonly affected. It is characterized by the formation of fibrous nodulations upon the surface called vegetations; the clinical symptoms may be practically negative. Murmurs variously placed upon the cardiac cycle give the diagnosis.

Etiology. It is rarely primary. Secondarily, it is found most commonly in acute rheumatism, also in chorea, tonsillitis, scarlet fever, pneumonia, phthisis, kidney diseases, and occasionally in gonorrhoea, in the cachexias and in sublaxations affecting the cardiac centers. *Pyorrhoea alveolaris* may be important.

Pathology. Cloudiness is followed by edematous thickening of the valvular endocardium, superficial erosions and the formation of small granulations, deposit of layers of fibrin, blood corpuscles, and a few organisms. The whole process results in the formation of small friable warty outgrowths—vegetations. These are most marked one or two millimeters from the free borders at the line of contact of the leaflets. In the course of time, they are transformed into fibrous tissue. The myocardium is always involved. The vegetations are upon the side of the valve opposed to the blood stream; at the aortic valve they project into the ventricle; at the mitral, into the auricle.

The location is significant. Congenital endocarditis attacks the right side of the heart; simple endocarditis attacks the left side; malignant endocarditis attacks both sides, but more often and more severely the left side.

Diagnosis. The subjective symptoms are usually negative or vague, since in most fevers the heart is somewhat dilated and a murmur may be present without endocarditis. In severe cases, there may be irregular, rapid, feeble pulse, faintness, pallor, increased perspiration, dyspnea, precordial pains, throbbing carotids. Later the pulse becomes less frequent and more or less venous stasis and pulmonary congestion appear. Usually a sharp rise in temperature in the course of the primary disease without other causes, leads to observation of the heart. Reflex contractions of the deeper spinal muscles of the second to the fifth thoracic segments may be found occasionally, but are not always present. Their occurrence probably depends upon an associated myocarditis.

The most reliable physical sign is the development of a roughened murmur, like soft blowing, with the first sound into a well-

marked systolic mitral murmur, during rheumatism or acute fevers. It may change in character from day to day or be accentuated; the second sound may be reduplicated at apex and accentuated. Reduplication and accentuation of the pulmonic second sound is frequent. The new sound may disappear at first when the patient is sitting but later it persists. There is more or less dilatation and cardiac irregularity. All cardiac signs may be latent.

Complications. As the vegetations are very friable, they may become detached. These emboli produce additional symptoms according to the location of the end-artery in which they lodge.

Embolism of the kidneys is marked by sudden deep-seated lumbar pain, albuminuria, even hematuria. Embolism of the brain is shown by sudden palsies, convulsions, aphasia, or sudden disturbances of consciousness. Embolism of the spleen usually causes sharp pain and tenderness in the splenic region. Embolism of the skin shows in petechial or purpuric spots. Embolism of the lungs is known by local pain, hemoptysis, possibly localized dullness, bronchial breathing and rales.

Treatment. Prevention of endocarditis in patients with the primary diseases is important, and consists in guarding them from cold and undue exertion. The correction of any lesion found in the cervical and upper five dorsal vertebræ and the ribs at their anterior and posterior articulations, relaxation of contracted muscles, raising and spreading the ribs, and deep steady pressure in the sub-occipital fossa to lower the fever and quiet the heart, are some of the measures indicated. Cold over the cardiac area aids in keeping cardiac action slower.

Absolute bodily and mental rest for weeks or months is necessary. The diet should be light and liquid. The bowels and kidneys must be kept active to eliminate the waste metabolic products.

Prognosis. Simple endocarditis without complications is not dangerous to life. The affected valve usually remains damaged and later becomes the seat of chronic endocarditis.

ACUTE AORTITIS. This disease is usually associated with acute endocarditis with which it is usually confused in diagnosis. It is due to any of the infectious diseases, to alcohol, syphilis, rheumatism, etc. The pain occurs at a somewhat higher level than is the case in endocarditis. The palpitation may be very severe but symptoms may resemble those of angina pectoris. The treatment is the same as that of endocarditis; recovery is usually to be expected so far as the aortitis is concerned.

MALIGNANT OR ULCERATIVE ENDOCARDITIS

The malignant form may be primary although it is more frequently secondary to septic processes, usually in connection with a suppurating external wound, puerperal sepsis, acute necrosis, or

gonorrhoea, which may be latent. It often attacks the valves which are the seat of chronic inflammation.

Pathology. The initial changes are similar to the simple form but ulcerations may completely replace the vegetations. The vegetations when present are larger and fungating; the underlying tissues are necrotic, show loss of substance and round-celled infiltration and contain masses of bacteria. When the vegetations become detached, they form septic emboli giving rise to metastatic abscesses. Ulcerative process causes great destruction of the valves and may even lead to perforation of the curtain. If the vegetation touches the mural endocardium, the part touched becomes affected by contact.

Diagnosis. The patient is, and appears, extremely ill. Local symptoms may be entirely lacking, and cardiac disturbance may be unsuspected until death occurs. In the "**typhoid**," the most frequent type, the symptoms include varying degrees of vomiting and diarrhoea, pain in the hepatic or the splenic region; dimness of vision; hematuria and albuminuria; irregular chills and fever (sometimes to 106° F.); ecchymoses and sweating; and the "typhoid state."

The "**cardiac type**" (recurring malignant endocarditis) is characterized by recurring attacks of septic endocarditis in a heart with valvular lesions. This condition should not be confused with the simpler attacks of recurring simple endocarditis.

The "**cerebral type**" symptoms are practically those of cerebral meningitis.

The physical signs are similar to those of the simple form. Variations from day to day in the character of the murmurs seem to be more frequent. Leucocytosis is usually, but not always present; there may be blood changes indicative of the primary disease. Local infection should be sought for as the heart disease is often due to a latent gonococcus infection.

The treatment is similar to that of simple endocarditis. Removal of the sources of infection is a major consideration. The excretion of the poisons formed must be aided by every possible means. Stimulation of the liver aids bowel elimination and raises the opsonic index. To increase the comfort of the patient and delay death is the most that can be expected.

Prognosis. Cases grafted upon an existing cardiac disease may last for several months; complete recovery is not to be expected. Death may occur at any time, or being delayed, may result from intercurrent disease.

CHRONIC ENDOCARDITIS

(Sclerotic endocarditis; interstitial endocarditis)

This is frequently limited to the valvular endocardium, though the mural form is by no means rare. It produces various forms of valvular defects, according to the various etiological and localizing

factors present. It may be chronic from the beginning, or may result from the acute form.

Etiology. Primarily, the disease results from syphilis, malaria, rheumatism, lead, alcohol, and other infections and poisons; or from arteriosclerosis, interstitial nephritis, muscular strain, and such mechanical agencies. Hereditary and congenital defects are to be considered. Secondary chronic endocarditis is associated with rheumatism and tonsillitis, most frequently; and with chorea, pneumonia, and the exanthematous fevers.

Pathology. The left heart is far more commonly affected, the valvular more often than the mural membrane. The myocardium usually is also affected to some extent in the latter case especially.

There is sclerosis of the valves, with formation of small firm nodular prominences, and of yellowish opaque, fatty patches, often deposition of calcium salts, the cusps may be adhered or rigid and curled, and the chordæ tendineæ are shortened and thickened or adhered.

As a result of the changes mentioned, the valves become variously thickened and adherent. The contraction of the chordæ tendineæ modify the structural changes. Thus is produced the "funnel mitral," the "buttonhole mitral," the "annular mitral," etc. The term "chronic endocarditis" should be limited to those cases in which there is a progressive inflammation, and not be applied to valvular lesions in which no further change is occurring.

Diagnosis. The location of the most serious changes is usually determined by the recognition of the valves most affected; mural endocarditis can only be strongly suspected when symptoms of cardiac distress follow acute endocarditis. The symptoms are mostly those of a slowly increasing valvular defect, with increasing hypertrophy which seems hardly able to compensate for the defect. Mild leucocytosis is present in nearly every case. Mild secondary anemia is to be expected. Other blood findings, and the urinary findings, depend upon the effects produced by the circulatory disturbance on other organs, and this depends upon the valve most seriously affected.

Reflex muscular contractions are not present, or are negligible, so long as the inflammation is limited to the endocardium. Pericardial and myocardial inflammations may complicate the endocarditis, and thus reflex contractions be produced in the deep spinal muscles innervated from the second to the fourth thoracic segments. The intercostals are not usually affected unless the pericardium is inflamed also.

Treatment. First, is to be considered the prophylaxis. Patients with conditions ordinarily considered etiologic factors in endocarditis should be guarded against further heart disturbances. Patients recovering from rheumatism, tonsillitis, pneumonia, or the exanthematous fevers should be watched, and not permitted to sit up, or after leaving bed, to undertake any strenuous exercise until the heart is well strengthened and the nerve centers have regained their normal activity. Correction of the lesions affecting the heart

centers, if any are found, is important. Lesions affecting the action of kidneys or liver or intestinal tract may permit toxemia—this must be guarded against in all cases.

The treatment of acute endocarditis, as already given, may also be considered prophylactic for the chronic type. When chronic endocarditis is recognized, the treatment depends to some extent upon the extent and the location of the valvular injury. There are certain factors that are applicable to all lesions. These include properly graded rest and exercise; suitable diet, according to the patient's needs, and his digestion and elimination; and the maintenance of correct structural conditions of the body.

Prognosis. The outlook is doubtful, so long as the endocarditis persists. After inflammation ceases, the nature of the valvular lesions permits a more or less hopeful prognosis according to the conditions as found. In the mural type the injury to the myocardium may be serious; this is not easily determined. The possibility of mural injury should be kept in mind in every case in which the cardiac embarrassment presents unusual features. (See also valvular lesions.)

VALVULAR LESIONS

Injury to the valves of the heart varies from changes so light as to cause no recognizable symptoms, to those so severe as to result in sudden death.

Etiology. Congenital weakness may permit a sudden rise in blood pressure, due to muscular strain, emotional storms, or other causes, to rupture a valve not previously diseased. Such conditions are rarely found. In practically every case injury to a valve is primarily due to inflammation. Rheumatism, tonsillitis, pyorrhea, chorea, the infectious fevers, are the most common causes of endocarditis, with resulting valvular lesion; the cardiac valves may share the effects produced upon the circulatory system by the presence of poisonous substances in the blood stream, such as are present in alcoholism, autointoxication of any type, syphilis, etc., or to poisoning by lead, mercury, and other drugs, or as the result of chronic infections in the body anywhere. Overwork, too little exercise, too little fresh air, too much food and faulty food, and all the unhygienic habits usually considered causative of arteriosclerosis and of acute and chronic endocarditis are also causative of valvular lesions.

Diagnosis. According to the structural changes produced, each valve may present three variations in normal action; narrowed orifice, causing stenosis (obstruction); imperfect closure, permitting regurgitation (incompetency, insufficiency), or the valves may

close imperfectly over the narrowed orifice, causing symptoms of both states.

The diagnosis of the different valves must be considered separately; the treatment of valvular lesions will be considered together, since many factors are alike in all cases.

MITRAL REGURGITATION

This is the most frequent form of valvular lesion. The contraction and narrowing of the leaves of the valves, with or without contraction of the chordæ tendineæ, results in a reflex of blood into the right auricle. This, becoming distended, hypertrophies. Ventricular hypertrophy results from the associated muscular activity. If the left auricle is unable to overcome the back flow, it dilates, the lungs become congested, and the right ventricle hypertrophies. The somewhat congested condition with embarrassed action of the right heart, engorgement of the lesser circulation and congestion of the systemic veins may exist for several years but gradually leads to tricuspid incompetency, cyanotic induration and anasarca.

Diagnosis. The first symptom noticed is shortness of breath on exertion or on going up stairs. Disturbed compensation is marked by dyspnea, cyanosis, palpitation, frequent attacks of bronchitis due to pulmonary congestion, hemoptysis, and persistent cough with blood-stained sputum containing alveolar cells and pigmented granules. Cardiac "sleep start" is a disturbing feature—just as the patient falls asleep, he wakes gasping for breath and feeling as if the heart were stopping. There may be a sense of emptiness or cardiac distress, the pain not usually being severe. The face is pale and pinched, the lips and ears dusky, the cheek capillaries are enlarged, the fingers are clubbed, especially in children.

In a child or in older persons in whom the lesion has dated from childhood there is often visible precordial bulging. The apex beat is at first forcible, diffuse and heaving; as compensation fails it becomes feeble or unrecognizable; it is displaced to the sixth intercostal space to the left of nipple line. Thrill is rare. The pulse is at first full, regular, small and soft (low tension). After broken compensation, it becomes irregular, no two beats of equal force or volume.

The area of cardiac dullness is increased transversely and vertically. A blowing murmur, systolic in time, heard loudest at apex, propagated to axilla and under the angle of the scapula, modifies or replaces the valve sound. If the murmur is loud it may be heard at the back close to left side of spine, or in the left axilla, or just beneath the angle of the left scapula. The second

pulmonic sound is markedly accentuated particularly in the pulmonary area. The recumbent position makes this murmur clearer.

The urine is scanty and albuminous, with tube casts and sometimes blood corpuscles.

The sphygmogram shows a wavy irregular line, with occasional normal waves among irregular waves of low and variable amplitude.

Prognosis. No ill effects result as long as compensation can be maintained. There are apt to be many short attacks of apparently failing compensation, from which the patient easily recovers, with rest and other suitable treatment (q. v.). When compensation fails, pulmonary congestion may lead to death. Pneumonia or other pulmonary disease is apt to be fatal, at any time. Dropsy or exhaustion may be the immediate cause of death. Sudden death is less frequent than in other valve lesions.

MITRAL STENOSIS

This lesion is usually associated with mitral regurgitation. Hypertrophy of the left auricle is more marked than in regurgitation alone.

Diagnosis. During compensation (which may last for years) there are no symptoms. When compensation fails, there is a small, rapid, irregular, feeble pulse, dyspnea, cough, signs of pulmonary engorgement, bronchorrhea, frequently hemoptysis, followed by dilatation of the right heart, with general venous stasis, liver greatly enlarged, and death.

Any time during the duration of the lesion, vegetations may loosen and enter the general circulation. If these emboli reach the brain, aphasia, hemiplegia, or other symptoms of cerebral embolism may occur.

The enlarged auricle may press upon the recurrent laryngeal nerve and cause paralysis of the vocal cord of the same side. During hypertrophy of the left auricle an undulatory impulse is seen over its area, with bulging over the lower part of the sternum and fifth and sixth costal cartilages. This is most marked in children. There is a thrill or fremitus rough and grating in quality, presystolic in time, terminating in a sharp sudden shock, synchronous with the cardiac impulse, felt best during expiration and in a limited area to the left of the sternum in fourth and fifth interspaces within the nipple line. During dilatation, the cardiac impulse is diffused, feeble and irregular, left near the xiphoid cartilage. During compensation, the pulse is slow, regular, small, and of good tension. If the orifice is much narrowed, it is small, weak, and irregular in force and rhythm. If compensation fails, and the right heart is dilated, it is rapid, weak, small in size and

irregular in force and rhythm. The systemic arterial blood pressure is lowered because the whole volume of blood cannot be sent out. There is an increased area of cardiac dullness on the right side of sternum and along left margin as the hypertrophy is on the right side. It may even extend up to the second rib. A rough blowing vibratory, sometimes rasping or purring murmur, high in pitch, is heard in the mitral area, to the inner side of the apex beat or along the left sternal margin, presystolic in time, running up to the first sound in which it abruptly ends, synchronous with the thrill. The first sound is short and clear and abrupt. The second pulmonic sound is accentuated. In the later stages, when the narrowing becomes considerable, a mid-diastolic murmur may appear occupying the whole of diastole. The second sound may disappear. As compensation fails, the murmur may disappear, leaving only a flapping or snappy first sound at the apex of a gallop rhythm. The sphygmographic tracing is an irregular line, with somewhat shorter waves than in regurgitation alone. Normal ascents and descents are less frequent, and the irregularity is more marked than in the first lesion.

Prognosis. The outlook is about the same as in mitral regurgitation. Cerebral emboli are apt to occur. Pregnancy and the puerperium are thought to be detrimental, but many women go through repeated pregnancies without rupturing compensation.

AORTIC REGURGITATION

This is the lesion of athletic and able-bodied, vigorous men, and stands next in frequency to mitral regurgitation. The orifices are more or less dilated resulting in the non-closure of the aortic valves, allowing a part of the blood to flow back into the left ventricle. This causes overfilling of the ventricle, hence dilatation of its cavity. The muscle hypertrophies to compensate which may cause the heart to attain an enormous size, the "cor bovinum" of the old writers.

Diagnosis. The earliest signs are due to cerebral anemia, headache, dizziness, flashes of light, feeling of faintness on sudden rising, these followed by congestion of the face and eyes, tinnitus aurium, and insomnia. Precordial pain is usually present and may be severe, often with anginoid attacks. True angina pectoris is more often associated with this than with other valvular lesions. On the slightest failure of compensation, the cardiac action becomes excessive and distressing, palpitation on slight exertion causing anxiety and fear in the patient. There is gradual or rapid appearance of dyspnea, increased on exertion, cyanosis, hepatic enlargement, renal congestion with scanty, albuminous urine and edema of the feet. Ascites is rare. **Mental disturbances** are fre-

quent. Cases of neurasthenia in athletic persons, and of suicide during apparently vigorous health, are more often due to this lesion than is generally recognized. Syncope is frequent. Secondary anemia may be marked; the red count may be lower than 3,000,000 per cu. m m.

The cardiac impulse is forcible, displaced downward and to the left, pulsation far beyond normal apex to sixth or seventh interspace in left anterior axillary line and accompanied by a characteristic jerking. A diastolic thrill may be felt over the base of the heart and adjacent to the large vessels. The apex beat is found in the seventh or eighth interspace in anterior axillary line. The pulse is rapid and characterized by a sudden rise and a sudden fall producing a peculiar kicking sensation to the finger—"water-hammer" or Corrigan's pulse. There may be retardation of the pulse so that there is an appreciable interval between the heart beat and the radial pulse. The sphygmographic tracing is characterized by sharply rising anacrotic wave, to great height; the katarotic wave drops with a needle point; the dicrotic is very sharply marked. With failing compensation or the development of other valve lesions, the line becomes variably irregular. Capillary pulse is well-marked in the finger nails or in the lips as an alternate flushing and paling. Pulsation in peripheral vessels is more common in this than in other forms.

There is increase of cardiac dullness downward and to the left, occasionally upward and to the left of the sternum from hypertrophy of the left auricle, and associated with massive hypertrophy. A soft blowing prolonged murmur, of low pitch, and a churning or rushing character, is heard in the aortic area, most distinct at junction of sternum and fourth left costal cartilage, diastolic in time, and transmitted down the sternum and toward the apex. It may modify or replace the second sound which is usually absent. Auscultation over the carotid artery may reveal the second sound when it is not found at the aortic cartilage. This indicates a small amount of regurgitation, hence a better prognosis. Double murmurs may be heard on auscultation over the carotids and subclavians.

The persistent and uniformly high systolic blood pressure with the low diastolic pressure, gives high pulse pressure; this is pathognomonic.

AORTIC STENOSIS

This is chiefly a disease of advanced life, associated with arteriosclerosis. There is usually simply a slow sclerotic change in the valves, usually with some regurgitation. Hypertrophy of the left ventricle follows the gradually diminishing orifice.

Diagnosis. There are no noticeable symptoms as long as the hypertrophy keeps pace with the stenosis. Later, syncope, vertigo,

headache and insomnia or bad dreams occur. Anemia is present; emboli may lead to serious complications. The apex beat is slow, heaving, forcible, displaced to the left according to the hypertrophy. A marked thrill at the base of the heart and of maximum force in the aortic area is felt. In no other condition is there such an intense thrill. The pulse is small, hard, slow (*pulsus tardus*), often interrupted, and the tension often increased depending upon the obstruction and degree of hypertrophy. The *sphygmogram* shows a blunt ascent, often with a notch near the summit; a plateau marks the height of the anacrotic wave. The *katacrotic* wave descends slowly, and the *dicrotic* wave is rarely visible. The base line may be prolonged. The area of dullness is never as wide as in aortic regurgitation. The first sound is replaced by a harsh, loud, rasping, sometimes whistling or often musical murmur, heard best in the aortic area at junction of the second right costal cartilage with the sternum. It is systolic in time, and transmitted into the carotids. When associated with aortic regurgitation, there is a double or see-saw murmur. There are other murmurs in this area not due to stenosis; the hemic murmur has a soft bruit; calcareous plates in the aorta or on a cusp produces a sound very similar to the stenotic murmur.

The prognosis is comparatively favorable, as hypertrophy is usually of good degree and easily maintained with a quiet life. When the stenosis is solitary, it is often due to atheroma, with danger of cerebral hemorrhage.

TRICUSPID REGURGITATION

The general symptoms are due to retarded pulmonary circulation and visceral congestion, marked as follows: In the lungs, as dyspnea, bronchitis, or pulmonary edema; in the digestive tract by dyspepsia, hematemesis, ascites and slight hepatic enlargement, tenderness and icterus; in the kidneys by scanty high-colored urine, varying amounts of albumin, few hyaline casts, isolated red blood cells and general dropsy and uremia; in subcutaneous tissues by edema beginning in the feet and ankles and extending upward, and in grave cases by ascites, hydropericardium or hydrothorax.

Jugular pulse-wave is observed more often in the right than in the left vein. The cardiac impulse is feeble and extends downward. The rhythmical expansile liver pulsation is best obtained by laying one hand over the fifth and sixth costal cartilages and the other hand over the lower border of the liver in the mid-axillary line. The jugular vein, when obstructed by the palpating finger, fills up from below during systole. There is hypertrophy of the right ventricle. A soft blowing murmur, low in pitch, systolic in time, is heard distinctly over the xiphoid cartilage, or the head of fourth rib to right of sternum, and within an inch of the

apex, thus limiting the area of transmission. The second pulmonary sound is weak. There may be either a single or a double sound in the crural or other large superficial veins. The pulse is markedly irregular.

The prognosis is always grave. Each case must be considered on its own merits.

TRICUSPID STENOSIS

This is a rare congenital or acquired affection occurring secondary to disease of the left heart or associated with acute endocarditis. Clinically, cyanosis of the face and lips is commonly seen, this becoming pronounced when dropsy occurs. The physical signs are transverse enlargement of the heart, particularly the right side; a presystolic murmur heard at the base of the ensiform cartilage, and a presystolic thrill. Dilatation of the auricles soon follows with venous stasis, and venous pulsations as in tricuspid regurgitation, with which it is usually associated.

The prognosis is always very unfavorable; death is usually imminent when the diagnosis is made.

THE PULMONARY VALVES

Murmurs heard in the region of the pulmonary valves are extremely common, but lesions of the valves are exceedingly rare. It is often called the "area of auscultatory romance," of Balfour.

A systolic murmur is heard in healthy, thin-chested individuals, particularly children, during expiration and in the recumbent position; with rapid heart action as in fevers or after exertion; in most anemic states. These functional, anemic, or hemic murmurs are always at the base of the heart; always systolic; not transmitted away from heart; soft in character; low in pitch; variable in intensity, now heard, now absent.

PULMONARY STENOSIS is the commonest of the congenital murmurs and may be associated with constriction of the pulmonary artery; patulous foramen ovale; patulous ductus Botalli or its stricture; imperfection of the ventricular septum.

Hypertrophy of the right ventricle may follow and establish compensation. The child is weak, markedly cyanosed, with flabby tissues, soft bones, and a generally poorly nourished condition. The physical signs are marked enlargement of the right ventricle, a loud systolic murmur with a thrill heard best to left of sternum in the second interspace and not transmitted to the vessels. The second pulmonic sound is weak or absent or replaced by a diastolic murmur.

The prognosis is unfavorable, the little patients dying in a few days to a few months. Sometimes, compensation is established so that they live longer but they are always weakly.

PULMONARY REGURGITATION is a rare affection usually of congenital malformation; the changes are similar to those of aortic insufficiency.

The general symptoms are referable to dilatation of the right heart and consequent pulmonary congestion. Suffocative attacks are marked. On examination, the cardiac dullness extends to the right of the sternum, a loud blowing diastolic murmur is heard most distinctly at the junction of the third left costal cartilage and the sternum, transmitted down the sternum. Death occurs from dropsy and exhaustion.

Treatment of Valvular Lesions. Functional recovery is to be expected—this is due to compensatory hypertrophy of the myocardium. This is to be secured only when the conditions which control the action of the heart are normal—or approximately so. Modification of the heart's rate and force to meet varying physiological states depends upon normal activity of the cardiac nerve centers and upon the maintenance of fairly normal blood and blood pressure. In order that the most speedy and perfect compensation can be secured, all factors that might interfere with the normal activities of the heart centers must be removed. This includes lesions of the upper thoracic and cervical spine, the clavicles, and the upper ribs; all factors which raise the blood pressure unduly must be removed; this includes lesions of the lower thoracic spine, especially; all strenuous exercise, all emotional storms and all causes of gastric disturbances or flatulence. All factors which diminish the nutritive qualities of the blood, or which add to its toxic elements, must be removed. This includes the use of alcohol or tobacco, the overuse of meats and carbohydrates, any dietetic errors, constipation, and lesions which might interfere with the activities of skin, kidneys, lungs, liver, or any other of the organs concerned in nutrition or elimination. Relief may be given by raising the lower ribs and elevating the abdominal viscera. Forced expiration, with contraction of the diaphragm, may give relief.

In case of pain or sudden dilatation with cyanosis, cold locally over the heart is indicated, such as an ice bag, Leiter's coil, or compresses kept cold. Insomnia is often relieved by a cup of hot gruel or a tepid bath at bed time. Massage to limbs at bed time may encourage sleep. The condition of the heart and respiration must be noted, and the blood pressure variations watched constantly at first; each patient presents more or less peculiar idiosyncrasies.

"In giving a summation of the osteopathic treatment for heart conditions in general we must aim to reduce the work of the heart to the minimum. The disturbed circulation must be controlled by careful attention to the vaso-motor nerves at the various centers along the spine. Treatment must be given to correct any lesion found in the ribs or vertebræ from the first to the tenth dorsal. See that the tenth cranial nerves are not obstructed anywhere along their course. The ribs must be spread, the sternum raised and the chest expanded to the utmost to give the lungs free action. The importance of the lung is often overlooked in the treatment of heart troubles. We must obtain the maximum amount of oxygen to nourish the blood. Relax the muscles all along the line. Remove the lesions of the cervical area, and free up the cervical ganglia of the sympathetic chain. A general treatment to quiet the patient may be indicated. Remember the possibility of a reflex irritation at some remote point. The excretory organs must be kept active and a proper diet ordered.

"It is difficult to outline with exactness the treatment for a given heart lesion on account of the varied causes that may contribute to the condition. In general, look for all the causes and remove them as far as possible. Try to lessen the work of the heart and aim to build up compensation by giving the heart good nourishment for its work."—L. J. Bingham.

"The existence of the lesions as found is held to interfere with the progress of the compensatory hypertrophy.

"The treatment of these cases includes the correction of whatever bony lesions are found which might interfere, (a) with the innervation of the heart, (b) with the nutrition of the body, (c) with the maintenance of a normal blood pressure. The correction of any abnormal habits of eating, sleeping, resting, etc., which may be present is held to be an important part of the osteopathic treatment, as is also the cessation of whatever drugs the patient may have been using. Usually the drugs are stopped at once, but sometimes, when the patient is very weak and nervous, the drug-habit is stopped gradually. In every case recorded the drug has been discontinued within the week."—P. C. O. Clinic Report.

"The treatment of valvular lesions in general and mitral lesions in particular, is not confined to the lesions at the valves, but concerns the resulting complications. The symptoms of cardiac lesions do not manifest themselves until the heart muscle is worn out, when compensation is lost. . . .

"The fact that most cases recover compensation under proper treatment and the heart muscle is able to do its work fairly well, even after it had been apparently completely exhausted, is evidence that the weakness was not due to degeneration, but to fatigue. . . . First, we must have absolute rest in bed to relieve the heart of all unnecessary labor; second, daily osteopathic treatment practically the whole length of the spine; in the cervical and upper dorsal regions to improve the tone of the cardiac muscle and the tone of the peripheral arterioles; in the middle dorsal, for a tonic effect upon the lung tissues and the great splanchnics, and to increase the action of the sweat glands; in the lower dorsal, for a diuretic effect upon the kidneys; in the lumbar region, for the bowels. . . .

"The diet should be confined to milk and milk products, both for nourishment and for its diuretic effect. . . . After compensation has been successfully reestablished, the patient should be kept under observation for at least a year, and the same hygienic and dietetic rules laid down for the stage of compensation must be strictly adhered to."—C. J. Muttart.

The prognosis of any cardiac valve lesion depends upon the efficiency of compensation. This in turn is dependent upon several factors. In children under ten years, the outlook is grave, although sudden death is rare. Lesions acquired during puberty are more apt to be permanently compensated. Women bear valvular disease better than men.

To justify a favorable prognosis, several factors must be present; a good general health, good habits, the existence of no exceptional liability to rheumatism or catarrh, that the origin of the valve lesion is independent of the degenerations, the existence of the valve lesion without any change for over three years, the ventricles acting with moderate frequency and general regularity, the presence of sound arteries, and freedom from pulmonary, hepatic, or renal congestion.

CHAPTER XVII

DISEASES OF THE BLOOD VESSELS

GENERAL DISCUSSION

The lining of the arteries, veins and heart is continuous and practically identical. Through this channel, with its lining membrane of a single layer of endothelial cells the blood flows with constantly varying pressure and carrying varying combinations of food and of waste materials.

The walls of the blood vessels are nourished by the vaso-vasorum; these are controlled by vasomotor nerves, as are other tissues of the body. The muscular walls of the vessels are also controlled by nerves which vary their caliber. Both these sets of nerves carry impulses from nerve centers; these, like other nerve centers, are influenced by the impulses reaching them over sensory nerves, and from related centers in other parts of the nervous system. Thus, bony lesions affect the nutrition and the functional activities of the vascular walls. The blood vessels are nourished by the blood, as are all other tissues of the body. Thus, they are subject to the toxic and nutritional variations in the blood. They carry the blood under pressure, and so are liable to injury from improper changes in this pressure. These three factors—variations in nervous control, variations in the quality of the blood, and variations in the pressure of the blood, are the factors which make up the etiology of diseases of the blood vessels and which also determine the methods most efficient in securing recovery from these conditions.

The practical aspect of this question is of great importance. In the first place, the etiological value of the bony lesion in causing disturbances in the pressure of the blood must be recognized. Slight malpositions of vertebræ and ribs, or other forms of peripheral irritation anywhere, may affect the chief vasomotor centers, or the subsidiary centers in the cord or medulla. If, as the result of these lesions, or of other factors, the blood pressure falls too low, the nutrition of the entire body may be affected; this malnutrition, with the associated accumulation of more or less toxic waste products of metabolism, predisposes to vascular disease no less than does the abnormally high blood pressure which may be due to bony lesions as well as to the causes given for arteriosclerosis in general.

The **treatment** of diseases of the blood vessels depends upon the removal of these factors—those which interfere with normal

nervous control; those which interfere with the normal pressure or the normal flow of the blood, and those which interfere with the normal quality of the blood in the vessels.

ARTERIOSCLEROSIS

(Arterio-capillary fibrosis; atheroma; endarteritis chronica deformans; arterial sclerosis)

Arteriosclerosis is a rigid condition of the arteries produced by fibrous thickening of their walls; it is associated with fibrous changes in other organs and is marked clinically by hypertension and functional disturbances dependent upon the location and extent of the fibrosis.

Etiology. The hardening of the connective tissues, especially of the arteries, in old age is so constantly observed in man and the higher animals, that it may be considered a factor in normal living. Among the factors producing this hardening prematurely, may be included heredity; poisons such as lead, mercury, alcohol, drugs; syphilis, nephritis, malaria, rheumatism, gout, diabetes, and other diseases with toxic characters; the products of intestinal putrefaction and fermentation, especially indol and related substances; and the continued high blood pressure due to overeating and drinking, excitement, worry, too great and frequent muscular effort, etc. It is seen that these causes fall into two groups—the toxic and the mechanical.

The spinal column is invariably rigid, especially in the lower thoracic region. This abnormal rigidity may be due in part to the hardening and rigidity of all tissues not kept supple by use, but it is certainly an important causative factor. Rigid thorax is common. Lateral curves are less frequent than slightly posterior positions, or the "ramrod" spine.

"Where the sclerosis has attacked the upper limbs, the most frequent lesions have been from the third to the fifth dorsal vertebræ, and as has been the case of an unequal blood pressure, the lesions were rotations of those vertebræ. In two incidents, bi-lateral sclerosis of the radials existed without apparent involvement of other palpable arteries. The lesion was of an impacted anterior nature extending from the second to fifth dorsal.

"Cases exhibiting unequal tortuosity of the facial and temporal arteries, in my experience, have invariably shown lesions of the second, third and fourth cervical vertebræ and likewise, invariably these have been rotations toward the sclerosed side.

"There is another type of sclerosis common to osteopathic practice, the etiology of which is apparently auto-intoxication."—F. C. Farmer.

Pathology. The aorta is first in frequency of disease, next come the coronary arteries. The cerebral, temporal, radial, brachial, ulnar, femoral are found affected in the order named. The change seems to begin in the intima, with slightly raised thickenings, due to multiplication of the endothelial cells. This condition is called "atheroma" or "gruel-tumor" on account of its consistency. The media and adventitia undergo inflammatory changes as a result

of the pressure or toxins, muscle fibers are absorbed, and the connective tissue overgrowth results in the formation of thick, weak, inelastic walls. The atheroma may soften and the wall of the vessel become perforated, or may dilate greatly, with the formation of an aneurysm. Calcification may occur in the areas affected most by the disturbed circulation.

Diagnosis. The symptoms are hypertension of the pulse, hypertrophy of the left ventricle, accentuation of the second sound in the aortic area, and thickening of the peripheral vessels. Early there may be a prolonged first sound. The arterial walls are palpated by obliterating the pulse when they appear like cords under the finger. Sometimes irregular thickenings or the edges of calcareous plates in the walls can be palpated. Arteriosclerosis may be advanced in the aorta and other great vessels without symptoms. Later stages are marked by rigidity, visibility, and tortuosity of the peripheral arteries. When the heart is failing, the sounds are feeble, often irregular and intermittent. Among the general symptoms of arteriosclerosis are periods of mental lassitude, irritability with headache occurring after mental or physical excitement, digestive disturbance, momentary attacks of dizziness accompanied by nausea and followed by profuse sweating and temporary weakness. Insomnia, loss of memory, melancholia, fear, show gradual loss of mental vigor and bodily tone.

Sclerosis of the renal arteries produces urinary changes and the arteriosclerotic kidney, sometimes chronic interstitial nephritis. When the cerebral arteries are involved, there may be transient attacks of hemiplegia or monoplegia or aphasia with recovery within twenty-four hours and recurrences later; aneurysm, rupture or thrombosis with their attendant phenomena. Sclerosis of the coronary arteries is a factor in producing narrowing, thrombosis, angina pectoris, or aneurysm of the heart. When the arteries of the extremities are affected thrombosis and senile gangrene or intermittent claudication or lameness (crural angina) may occur.

Urinary changes are characteristic. There is intermittent albuminuria, urea and nitrogen are normal, uric acid is low, xanthin bases are increased, sediment is scanty and hard to find, casts are rare, and uric acid and calcium oxalate crystals are common.

The blood pressure is increased. There may be only a constant slight raise of 20 to 30 mm. of Hg. above normal or it may run high; 160 to 180 mm. of Hg. is Faught's average.

Treatment. Increasing the mobility of the dorsal spine and of the chest with elevation of the ribs is indicated. Whatever luxations are present should be corrected. Elimination by every avenue is to be stimulated. Renal efficiency is to be maintained by careful work on the renal splanchnics, diet, and hygienic regulations. Direct abdominal work assists in equalizing the circulation and lowers the blood pressure.

"Judgment must be used in attempting to correct faulty blood pressure as well as other conditions. Relaxing treatment must not be adopted merely on the strength of sphygmomanometer readings; a thick vessel with a comparatively low reading, say 135, may require to have its tone raised, while a thinner-walled vessel, with a reading of 125, may advantageously have its tone lowered.

"The chief difficulty, it seems to me, is that most people confuse arterio-sclerosis with high manometric readings. A manometer measures the resistance of an artery to outside pressure, which is often due to hypertonicity of the vessel, itself in turn due to some form of auto-intoxication. The high reading is not necessarily due to arterio-sclerosis."—C. M. Bancroft.

The corrective movements indicated in these cases should be given slowly and gently. No increased sensory stimulation should be sent into the centers from the articular surfaces. The lesions must be corrected without stimulating the nerve centers. Directions as to hygienic measures must be given with due regard to the pressure changes liable to occur. With care, the blood pressure may be kept within reasonable limits even while considerable corrective work is being done. Careful watching of the pulse may prevent undue rise of blood pressure in the aged and arterio-sclerotic. The same considerations are important in outlining the treatment and the hygienic advice for patients with cardiac lesions, aneurysms, and all conditions in which a rise of blood pressure is harmful or dangerous.

An exclusive milk diet is often of service in reducing a dangerous hypertension. Loss of strength is to be avoided. In obese cases reduction of weight must be gradual. Fruit and vegetables with the milk products should be freely used. Meat and starch are to be kept low. Sodium chloride, spices, tobacco, alcoholic drinks, are to be omitted or greatly moderated. If any particular food advised is found to cause renal irritation it must be stopped. A water intake of about 1500 cc.—3 pints—is best in most cases.

A quiet life is best, but the patient must not be unhappy. Baths must not be of extreme temperatures either hot or cold. Warm baths and sponging daily are of the best use. Exercise should be taken regularly, moderate out-door sorts being best. Too sudden changes in altitude are not advisable, nor residence above 3,000 feet suitable. An even climate is desirable.

Prognosis. Structural changes can be prevented but not removed. If the case is recognized early before renal changes are apparent, diet, hygiene, and a general lower plane of living instituted, the promise of a comfortable life for many years may be made. The condition is not favorable for recovery but not incompatible with life. In the later stages, some circulatory accident is apt to occur on slight provocation. These include apoplexy and sudden death.

PHLEBOSCLEROSIS

(Sclerosis of the veins)

This condition may accompany arterio-sclerosis, hepatic sclerosis, or mitral lesions. The pathology and treatment are those of arterio-sclerosis. It is not

often diagnosed *anté-mortem*. The treatment consists in relieving the high venous blood pressure and usually in the increased elimination of toxic substances from the blood stream.

ANEURYSM

An aneurysm is a persistent localized dilatation of an artery. It may be fusiform, saccular or cylindrical in form; it is called axial when the entire circumference of the artery is affected; peripheral when only one side forms the sac. Miliary aneurysms are so called from their small size; they are found on the cerebral arteries. A false aneurysm is produced when rupture of the arterial coat, usually very small, permits the blood to escape into the perivascular tissues. The connective tissues, with the coagulation of the blood and the organization of this clot, form a sac which may become very strong. A dissecting aneurysm is formed when the blood penetrates into space between the arterial coats, separating them. This blood may coagulate and organize with no further harm. Aneurysmal varix is formed when an arterio-venous connection is made through the rupture of weakened arterial wall into an adjacent vein. When this connection is made through an intervening sac, the structure is called a varicose aneurysm.

Etiology. There are two main causes; damage to the vessel wall from arteriosclerosis particularly when of syphilitic origin, or from causes acting from without the vessel; and increased vascular strain as a result of laborious occupations. Among the more general causes are toxemias and conditions affecting the innervation of the vessels from spinal or other subluxations. It is a disease especially frequent in middle life.

Diagnosis. In terminal arteries, serious symptoms may be produced by aneurysm even of small vessels; otherwise no recognizable symptoms are apt to follow unless the affected vessel is an arterial trunk. Tumor, pulsation, systolic murmurs audible over the dilatation, pain, pressure symptoms, and the results of the impaired circulation are the symptoms most commonly present. Other symptoms occur, according to the location of the aneurysm. The X-ray gives accurate information concerning thoracic aneurysm.

Aneurysm of the Aortic Arch. This is the most common form. The onset is gradual with arteriosclerosis and generally failing health. Pain, dyspnea and cough may vary in degree and be either constant or intermittent. The tumor may produce visible bulging with pulsation. Corrigan's sign—expansile pulsation—with thrill and diastolic shock, tracheal tugging, and tenderness over the affected area, may be found. When the aneurysm is in

the transverse arch or in the subclavian artery the pulse and blood pressure vary in the right and left carotid or radial arteries.

The abnormal area of dullness with increased resistance is often evident. Over the tumor there is a murmur or bruit synchronous with the first sound, louder than systole, lower in pitch, and of a blowing character. When the aortic valves are intact, the aortic sound will be markedly accentuated.

Thoracic Aorta. This is most frequent among men who are prematurely aged or engaged in occupations which tend to increase normal aortic strain; syphilis is the most constant factor and septic emboli and traumatism are worthy of mention. The symptoms are due to pressure, and depend upon the direction of protrusion. They may include dysphagia; dyspnea, "aneurysmal asthma"; alterations of the voice, as stridor, aphonia, "leopard growl," "goose cough," "gander cough"; hemoptysis; severe hiccough; dilatation or contraction of the pupils, unilateral or bilateral; pallor or flushing of the face, unilateral or bilateral; cardiac irregularity; vomiting, nausea; edema of the arms and face, sometimes unilateral; and other symptoms due to pressure upon nerves or vessels. When the thoracic duct is involved fatty stools and rapid emaciation may veil the diagnosis. Erosion of the bodies of the vertebræ and pressure upon the cord cause severe boring pain, followed by paraplegia and death.

The expansile pulsation, systolic thrill and diastolic shock are found above the third costal cartilage. Tracheal tugging may be present. Percussion adds a dull flat note over the tumor with increased resistance. The apex beat is displaced.

Sometimes differences are found in the radial pulses or the pulse may be retarded in the vessels beyond the aneurysm.

Over the dull area a ringing accentuated second sound and a systolic bruit are characteristic.

Descending Thoracic Aorta. When beyond the arch, aneurysm is often latent. In other cases, there is pain in the back from erosion of the vertebræ, sometimes dysphagia, and occasionally a pulsatile tumor is found to the left of the spine.

Abdominal Aorta. This occurs most commonly near the coeliac axis; it may grow upward and push the diaphragm before it, or backward and erode the vertebræ. Characteristic dull boring pain and neuralgias are thus produced.

Palpation reveals a definite tumor with aneurysmal characteristics. The bruit is heard to the left of the median line and the femoral pulse is retarded. Compression paraplegia, embolism of the superior mesenteric artery, complete obliteration of the lumen or rupture lead to death. Diagnosis of aneurysms must be made from mediastinal tumors, pulsating emphysema necessitatis, aortic

insufficiency, cardiac displacements by other thoracic conditions, neurotic pulsation of the aorta, and abdominal tumors.

Aneurysm of the Pulmonary Artery is rarely diagnosed from thoracic aneurysm. It is rare, and is caused by phthisis, mitral disease, emphysema, or other causes of obstruction to the pulmonary circulation.

Aneurysm of the Splenic Artery is rarely recognized. The symptoms include deep-seated abdominal pain, hematemesis, sometimes hepatic disturbances. A pulsating tumor with systolic murmur, may lead to a diagnosis. Gastric ulcer or gastric cancer may be confused with this aneurysm.

Aneurysm of the Hepatic Artery is very rare. Severe pain, vomiting, hematemesis and jaundice are present.

Aneurysm of the Mesenteric Arteries cause pain and vague intestinal disturbances. They are apt to rupture into the peritoneal cavity, causing sudden death. Ante-mortem diagnosis is practically impossible.

Miliary Aneurysms of the Renal and the Cerebral Vessels are not infrequent. They may produce no symptoms, or various vague pressure symptoms.

The **Treatment of Aneurysm** depends largely upon the location. Every manipulation must be very carefully considered as there is no way of estimating the strength of the aneurysmal wall. Relaxation of the contracted spinal muscles, and very careful treatment to tone up the general nutrition, secure elimination and quiet the circulation are some of the measures necessary. Absolute rest of body and mind is essential when the tumor is marked. The diet must be nourishing but limited and the liquids reduced to a minimum. Alcohol and its allies are strictly prohibited.

Rest in bed, ice over the affected area, long, steady pressure over the tissues near the tenth to the twelfth thoracic spines may relieve the pain and lower the blood pressure. The symptoms are to be treated as they occur; much relief can often be secured by careful treatment according to the spinal conditions as found on examination each day.

If the blood pressure can be kept rather low, the coagulation of the blood is hastened and the danger of embolism lessened. The restoration of normal nerve stimulation to the injured arterial walls may cause increased tone and a tendency to recovery. This is best secured by spinal treatment.

Very low liquid intake lowers the blood volume and increases its viscosity. The free use of gelatine is supposed to increase the coagulation of the blood. The "pressure treatment" of abdominal aneurysm has been of value in selected cases; steady, increasing pressure over the proximal portion of the dilatation for twenty-

four hours beginning under anesthesia is the method usually followed.

Surgical treatment should be considered. In selected cases the injured artery may be repaired very efficiently. Each patient requires special consideration as to the technique to be employed.

Prognosis. Recovery may occur in the smaller arteries, in the dissecting aneurysms, and sometimes in the peripheral sacular forms, through thrombosis or occlusion. In terminal arteries, the infarct thus formed may cause serious symptoms or death. The danger of embolism during the formation and organization of clot must be remembered; this danger is slightly lessened by preventing sudden variations in the blood pressure or in the position of the body. The outlook is always grave, and sudden death may occur from rupture, embolism, pressure upon vital organs, nerves, or from disease in distant organs resulting from the circulatory disturbance.

VARICOSE VEINS AND HEMORRHOIDS

(Phlebectasia; varix; varicosities)

Veins which lose their elasticity and become permanently dilated from the pressure of the blood within them are called varicose. The condition is characterized clinically chiefly by pressure symptoms. When the venous walls break down, or when the nutrition of surrounding tissues become lessened by the disturbed circulation, varicose ulcers are apt to occur. These are usually very indolent, obstinate and not particularly painful unless nerve trunks are involved.

Etiology. Phlebitis and phlebosclerosis weaken the vessel walls, and thus predispose to varicosities. The most important factor is an impediment to the onward flow of venous blood. Veins which have no valves, and those subjected to the effects of gravity are most apt to be affected; this places the largest number of varicosities in the legs and the rectum. Women suffer more than men; probably partly on account of dress; partly the puerperal state, and partly lack of exercise. Cardiac and hepatic disease especially delay the flow of blood and lead to hemorrhoids as well as to varicosities of the legs.

Bony lesions affecting the centers controlling the vessels affected must be considered important in etiology. This is especially found to be true in hemorrhoids.

Hemorrhoids are dilated hemorrhoidal veins. Especially when the portal circulation is obstructed, collateral circulation is apt to be reestablished partly by means of the relations of the hemorrhoidal veins with the vena cava. Thus the veins are subjected to greatly increased pressure, and hemorrhoids result.

Internal hemorrhoids—those which do not protrude beyond the external sphincter—are more painful and more urgent causes of the neuroses than are the external—those which do protrude beyond the sphincter.

The passage of feces over the tumors usually erodes the membranes; these areas become infected with tubercle bacilli or other bacteria, and varying degrees of fistulous and burrowing abscesses result. Very obstinate and serious tissue destruction may thus be initiated. The condition is much worse when the fecal masses are hard and dry and when defecation is attended with straining. The relation of constipation (q. v.) to hemorrhoids is evident.

The rupture of the veins into the surrounding subcutaneous tissues may be followed by the coagulation and organization of the blood, and the formation of nodular masses of scar tissue which may be responsible for serious nervous disturbances. Or the hemorrhagic blood may become infected, and thus abscesses of varying extent may result.

The treatment of dilated veins includes the correction of the causative factors, when this is possible. Hemorrhoids require relief of the constipation, and the use of such oil or water enemas as are necessary to secure very soft feces and easy defecation. The hepatic and cardiac diseases must receive suitable treatment. Uterine mal-positions, neoplasms, and enlarged prostates must receive suitable care. Rest in bed is most helpful.

Patients must not sit to rest when the recumbent position is possible; they must not stand for long times under any circumstances. Correction of the coccygeal, sacral, innominate and lumbar lesions is very important. Unduly contracted sphincters should be treated by very slow and easy dilatation. Pain is to be avoided as much as possible in this work.

VARICOSE ULCERS

These result from the breaking down of the tissues in the neighborhood of a varicose vein—this may or may not be associated with rupture of the vein. The tissue injury is marked, and the constant pressure exerted by the varicosity makes such ulcers chronic and resistant to the usual therapeutic measures.

Treatment. Correction of innominate and lumbar lesions is of first importance. Leg movements which facilitate the flow of blood upward should be frequently given, even if no apparent tension exists around the groin. All tissues around Poupart's ligament and the sciatic notch must be watched and kept relaxed. The ulcer itself is not to be handled, though very careful crowding of the surrounding tissues toward the ulcer, thus filling it with fresh blood and lymph which is immediately drained away when the

pressure is again relieved, is helpful. The patient should lie down several times during the day, even if he can only rest for a few minutes this relief of the tension is useful. The use of the elastic stocking or of elastic bandages depends upon the individual conditions. If the patient is able to spend considerable time lying down, or to remain in bed most of the day, the most rapid recovery occurs with no pressure upon the leg at all. If he must be on his feet for long intervals, some support is usually required.

In all cases, the correction of whatever structural conditions may be found, which could interfere either directly or indirectly with the circulation or with the nervous control of the legs, is a very important factor in the treatment of the varicose veins as well as of the varicose ulcers.

EPISTAXIS

(Nose bleed)

Bleeding at the nose may occur as the only symptom in any one of a number of distinct diseases. Wounds of the nasal mucosa do not usually present any difficulty in diagnosis. Nasal polyps, ulcers, or merely hyperemia of the mucous membrane may be responsible for the condition. The latter factor is no doubt associated with bony lesions in the upper cervical or the upper thoracic region. Fracture of the base of the skull usually produces rather obstinate nasal hemorrhage. Influenza, syphilis and a number of other infectious diseases may so act upon the blood as to prevent coagulation; for this reason children who are liable to attacks of nose bleed upon slight provocation should be very carefully protected. Hemophilia, pernicious anemia and leukemia may show as the first symptom an attack of nose bleed. Vicarious menstruation should be mentioned. Changes in atmospheric pressure, especially rapid ascent of a mountain or other rapid elevation, may cause nose bleed. Nose bleed may be symptomatic of high blood pressure.

Treatment. For the relief of the attack an ice bag or a cloth wet in cold water may be placed around the neck. The nose may be packed in obstinate cases; this is rather to be avoided if possible. Steady pressure in the suboccipital region lowers the general blood pressure; steady pressure over the region of the eighth to the tenth transverse processes dilates the splanchnic vessels, and mechanically draws the blood from the head region. During the intervals, in habitual cases, the cause of the weakness should be found and removed, if possible. The prognosis depends upon the cause of the bleeding.

PART III

DISEASES OF THE RESPIRATORY TRACT

GENERAL DISCUSSION

Certain structural peculiarities determine the character of the diseases to which the respiratory tract is subject. The air should, normally, pass into the lungs by way of the nasal passages. These are tortuous and are lined with a moist ciliated epithelium. Thus the air is cleaned, warmed and moistened before reaching the more delicate tissues of the lungs.

In the upper respiratory tract the mucous membrane is attached rather loosely to the underlying bones. It is highly vascular and the blood vessels are controlled from the vasomotor centers in the upper thoracic spinal column, by way of the cervical and cranial sympathetics. The lymph-flow depends upon the circulation. The nutrition of all these tissues is controlled by the same nerve mechanism.

Bacteria and dust are usually expelled through the action of the cilia and of the secretions. Infectious agents may, however, gain entrance by way of injuries, or as the result of impeded circulatory conditions. Bony lesions of the cervical and upper dorsal region are important factors in modifying the circulation and lowering the resistance to infection.

"The nerve mechanisms in the respiratory field, from their complexity and comparatively close relations to grosser structures, are more susceptible to lesion, and will show greater pathological effects from lesion of slight degree, than perhaps any other part of the body. The cranial and upper spinal nerves, cervical and dorsal, are affected by slight derangement of vertebræ or ribs or their muscular or ligamentous attachments. The sympathetic chain lies in close relation to the anterior aspect of the lateral spinous processes, and the heads of the ribs, and in the dorsal region is bound down by the pleura to the spinous processes and to the heads of the ribs. Nearly all these nerves contain fibers of vasomotor function, which are rather widely distributed in a sort of 'cross-reference' manner. . . . A lesion at any point may affect any one of a number of structures, or a given pathological condition may be due to lesion at any one of several points."—C. M. T. Hulett.

"The lungs receive vasomotor impulses by way of the following structures: The white rami communicantes leaving the cord with the second to the fifth dorsal nerves (probably chiefly the third and fourth), then through the lateral chain of sympathetics to the cervical ganglia, in one of which a relay is made; then by gray fibers to the vagus, with which they are carried to the pulmonary plexus. Vaso-constrictor impulses may be increased reflexly by the stimulation of sensory nerves ending in the tissues near the second to the fifth dorsal spines. Vaso-constrictor impulses may be decreased by lessening the sensory impulses by steady pressure upon the same tissues.

"Osteopathic inhibition imitates the condition produced by the bony lesion and the muscular contraction; hence the influence of these in producing chronic pulmonary congestion."—Pearl A. Bliss.

The nervous control of the circulation through the upper lobes of the lungs is from the second to the fourth spinal segments and for the lower lobes, from the third to the fifth. Diseases affecting the upper lobes of the lungs give reflex muscular contractions of the upper thoracic segments, while diseases of the lower lobes give reflex muscular contractions involving the fourth to the seventh thoracic segments. A certain degree of localization of the injured area may be made in this way.

The circulation through the lungs is profoundly modified by variations in the systemic blood pressure. When any great area of the systemic arterial system is dilated, as for example, the splanchnics, the lungs are left comparatively ischemic. The place of abdominal congestions in modifying the circulation and the nutrition of the lungs is thus evident.

The activities of the respiratory center are modified by variations in the circulating blood and by emotional states. Both these factors may be important etiological factors under certain conditions. The turgidity of the nasal membranes during the influence of emotions is well known, and, under repeated or constant emotional excitement, may become effective in promoting mouth-breathing, with resulting irritation of the lower respiratory tract and various disturbances of the nasal membranes. Whenever respiratory variations are noticed, an investigation of the habits of the patient, especially of those habits usually associated with emotional stress, should be carefully made, and treatment of such cases should include the correction of bad habits as well as of faulty bodily structure.

CHAPTER XVIII DISEASES OF THE NOSE

ACUTE RHINITIS

(Acute nasal catarrh; acute coryza; "cold in the head")

Acute rhinitis is an acute catarrhal inflammation of the nasal mucous membranes characterized by headache, slight fever, sneezing, and dryness of nasal membranes, followed by abundant secretion.

Etiology. The most common etiological factor is muscular contractions along the spine. These may be caused by cold draughts on the back of the neck, gastro-intestinal irritation, etc., or by subluxations of the upper cervical, third to seventh dorsal, or the lumbo-sacral vertebræ. Infection by the micrococcus catarrhalis is responsible for epidemics. Staphylococcus or streptococcus or both, may be present. It must be remembered that the symptoms of acute rhinitis occur in the initial stages of certain other acute infectious diseases.

Diagnosis. The condition is preceded by lassitude, weariness, more or less headache, and sneezing, these followed by chilliness, then slight fever, 100° to 101° F., and dryness of the nares. This stage is followed by abundant watery saline secretion from the nostrils and a sense of fullness in the nose, which may be momentarily relieved by blowing the nose.

The anterior nares are red and the eyes are suffused. Later, the discharge becomes purulent. The voice is peculiar, nasal and muffled. When the attack is nearing recovery, hard crusts form on the septum and turbinates and are expelled with difficulty. The complications vary in intensity. Labial, more rarely nasal, herpes may occasion considerable discomfort. Extension of the inflammation to the accessory sinuses and adjacent tissues is frequent. If to the frontal, ethmoidal, or sphenoidal sinuses, there is severe headache; if to the antrum of Highmore, tenderness over the cheeks; if to the Eustachian tubes and middle ear, temporary deafness results; if to the pharynx or larynx, cough results. Conjunctivitis is less frequent. Chronic rhinitis is apt to follow repeated attacks.

Treatment. Correct lesions of the cervical spinal column especially; correct mandibular lesions. Careful work over the superior cervical glands promotes drainage. Stimulating treatment over the branches of the fifth nerve, springing the mandible, and pressure over the upper part of the nose, suddenly relieved, are all

useful palliative measures. In some cases of streptococcus infection the treatment may be tedious.

If the accessory sinuses become infected expert consultation may be required, though many cases clear up by careful osteopathic treatment.

"Secure temporary relief from the general contractions in the spinal musculature. For this, the familiar 'Dana bend' may answer or any forcible hyperflexion of the spine carefully and gradually applied. * * * Relax general spinal contractions; treat regional contraction apparently involved; relieve the head congestion by securing relaxation of the supra- and infra-hyoid muscles; treat upper cervical articulations; avoid sudden force; leave no contractions; vary the order of procedure if any one contraction group fails to relax. If a muscle is hurt or an important irritable lesion is overlooked, failure is usual."—J. A. MacDonald.

A few meals omitted, a fruit or milk or very restricted diet, plenty of hot drinks to promote diaphoresis and cleansing of the bowels, out-door life, moderate exercise, plenty of sunshine promote speedy recovery and prevent relapse.

Prognosis. If taken early, one treatment often suffices to relieve the condition and complete recovery follows within a short time. In very young infants, loss of flesh and strength may follow from inability to nurse.

CHRONIC RHINITIS

(Chronic coryza; chronic nasal catarrh)

Chronic rhinitis is chronic inflammation of the nasal mucosa producing structural changes and characterized by a feeling of fullness in the nose, "hawking," and the discharge of a thick muco-purulent secretion.

Etiology. Repeated attacks of the acute form; continued inhalation of irritating vapors or dust; chronic subluxations of the cervical and upper dorsal vertebræ, the ribs, and the mandible are the most frequent causes.

Diagnosis. Three forms are recognized, which are often three stages in the progress of the disease in one person.

Simple chronic catarrh is an early stage marked by liability to "take cold," when the mucous membrane speedily becomes congested and swollen. Occasionally stenosis follows, and an overabundant thick secretion. If it persists, it develops into the second stage, **hypertrophic rhinitis**. In this form the lower turbinates are swollen and enlarged, there is a constant "hawking" to remove the thick secretion, and the patient becomes more or less a mouth-breather. The pharyngeal and adenoid tissues may become coincidentally affected (**naso-pharyngeal catarrh**). The voice becomes nasal and varying degrees of deafness occur.

Atrophic rhinitis may follow the hypertrophic, but is not necessarily a sequence. The mucosa is shrunken and atrophic pro-

ducing an abnormal roominess in the nasal cavity. Crusts of disgusting odor (*ozena*) are frequently present. In any of these forms, sudden change in the weather is liable to cause an acute exacerbation. Rhinoscopic examination shows the characteristic structure of the membranes.

Treatment. "There are two principles of treatment in catarrhal conditions: First, removal of the cause of overgrowth of tissue and overstimulation of function. Second, the institution of measures to absorb some part, if possible, of the excessive connective tissue already formed, and to restore normal function to such cells of higher type as have not suffered irreparable injury. The hygiene of the individual demands careful attention. This includes the closest investigation of the habits of relaxation, bathing, sleeping and dress. Sexual perversions are to be considered, bearing in mind the reflexes from an adherent clitoris or prepuce. Elimination must be carefully watched and the kidneys, liver, pancreas, and intestines may have much to tell.

"The first hint of diabetes or Bright's disease may be given by the dry, scratchy feel of the mucous membrane of the throat. * * * Relaxation can be maintained by aid of either hot or cold compresses or warm bottles, while wet packs of various temperatures and full baths are often useful to promote elimination. Local douches of normal salines are indicated at times, especially in ozenic and atrophic conditions with crust formations. Their use is rarely justified in acute, non-purulent discharges. * * * Copious drinks of water, either hot or cold, sometimes distilled and often acidulated, are indicated for eliminative reasons. Fruit juices are also helpful.

"To control the negative pressure conditions, conservative surgery must be employed when indicated.

"After the correction of all abnormal physical relations and the application of such remedial measures as are indicated in each case, the next step is the education of the patient in correct habits of sitting, standing, walking, and breathing, with prescription of special exercises for the correction of weak structural conditions."
—Mary S. Crosswell.

Prognosis. Recovery is to be expected in the simple catarrhal form. Symptomatic recovery may occur in the hypertrophic and atrophic forms, though very often the pathological tissues remain a source of irritation through life. The disease does not seem to shorten life, but it very materially lessens the comfort and efficiency of the patient, and it is an important cause of deafness.

NASAL POLYPS. These are pedunculated tumors which grow from the nasal membranes, and restrict the air passages. They are called fibrous, mucous or serous, according to the preponderance of connective tissue, serum, or mucous secretion within their sacs.

The membranes of the nasal passage are rather loosely bound to the underlying bones, are highly vascular, and both the membranes and the vessels are freely supplied with sensory and sympathetic nerves. Disturbed innervation or nutrition of the membranes or vessel walls permits an overfilling of the lymph spaces and the blood vessels; these factors are due to repeated attacks of rhinitis; the inhalation of irritating gases or dust; and especially to bony or other lesions of the mandibular, hyoid or cervical areas. When there is a loss of tone of either vessels or membrane, the weight and the negative pressure thus established permit further dropping, the loosened membrane fills constantly, and this weight acts as further irritant. Whether the tumor merely fills with lymph and blood serum, or whether mucous cells are plentifully included in the affected tissue, or whether the connective tissue cells, having excellent opportunity, unduly multiply, is due to structural relations of the particular areas affected.

When the polyp has become recognizable, its surgical removal is indicated. If this is all that is done, later growths are very apt to appear. But if the factors responsible for the growth are removed—bony lesions, especially—the growth of successive crops of polyps should be prevented. After any polyp has been removed, osteopathic treatment for the removal of lesions as found should follow immediately, and the patient should be examined at intervals for a year or more, in order that further injury to the membrane may be avoided.

RED NOSE. The nose is subject to considerable variation in circulation. Sometimes the dilatation of the blood vessels; especially near the end of the nose, causes great annoyance to the patient. Normally, the nose is rather paler than the rest of the face, even during blushing. The most common cause of red nose is the use of alcohol; and this fact, which is generally recognized, is responsible for much of the discomfort that attends the presence of red nose in temperate individuals.

Other common causes of red nose include: gout; nephritis; sexual disturbances; over eating of any one article of diet, as sweets, starches, meats, pastries; the use of excessive amounts of spices, tea, coffee, tobacco, and "soft drinks," especially of the sweet varieties; chronic rhinitis, and certain local affections, as eczema, etc. Occasionally no cause can be found, though the nose is as red and rough as in habitual alcoholics.

The place of the bony lesion in these cases has been found important in a few cases. The structural changes associated with red nose are so profound, however, that the correction of the lesions is effectual in leading to relief of the condition only in mild cases.

The treatment consists in the removal of the causative factors, for the most part. Local applications of soothing ointment and very mild astringents may give some relief. It is necessary to avoid anything irritative, lest the later condition be worse than the first.

HAY FEVER

(Rose or June cold; autumnal catarrh)

Hay fever is an affection of the upper air passages due to the effects, probably toxic or anaphylactic, of certain pollens acting upon a hypersensitive mucous membrane, characterized by sneezing, increased lachrymation, headache, and a watery nasal discharge.

Etiology. It seems to be a neurotic idiosyncrasy manifested as a morbid sensitiveness of the nasal mucosa to the action of the pollen of grasses and of certain plants, sometimes of dust. Subluxations and contractions are found from the atlas to the fifth

dorsal vertebræ and the upper three ribs, and clavicle. Local disease of the nasal membrane may be responsible.

Diagnosis. The condition begins as an ordinary cold; sneezing is very frequent; there is more or less headache and distress; the patient becomes low-spirited; cough is common; the eyes are watery, with itching and smarting especially at the inner canthus; asthmatic attacks are common and may alternate with the hay fever. Taste, smell, and hearing are impaired. An attack usually lasts four to six weeks.

Treatment. The care of each individual must be based upon the results of personal study. Probably no two people are affected in exactly the same way, nor is the etiology the same in any great number of cases. The etiological factors must be removed as found, if recovery is to be permanent. Correction of the cervical and upper thoracic bony lesions results in recovery in certain individuals; removal of nasal deformities is necessary when these exist; some cases are essentially neurotic, and the treatment must be dependent upon the constitutional findings; in every case it is necessary to find the essential cause of the neurosis, if possible. There are many people who can only be sent to a pollen-free locality every year. Relief of the attack may be secured very often, by special manipulations.

"Treatment consisted in traction to left for freeing right nasal artery and traction to right to free left artery. This gave local relief, though I have regarded freeing tension around axis and atlas as the curative treatment."—Ella R. Gilmour.

"I firmly believe the typical case will never fail in responding to the vasomotor reflex existing between the tenth dorsal and the Schneiderian membrane. This reflex I excite by having the patient lie on stomach on table, and exerting deep steady pressure over tenth dorsal spinous process (straddling process with end of thumb, and first finger flexed at first distal joint)."—A. M. Smith.

"While treating hay fever this season, I found that fifty per cent of the attacks could be arrested by soft palate manipulation alone; and in those cases which did not respond, the condition was immediately relieved by a dilatation of the epi-naris, with the intra-nasal technique. . . . However, both of the local treatments were supported by a daily normal saline irrigation of the nasopharynx, and the adjustment of the osteopathic lesions."—J. D. Edwards.

J. Deason reports excellent results from nasal irrigation with hot 1% solution of salt, borax and soda, 3-2-1, beginning at 108° F. and raising to 117° or even higher. One to five quarts of water should be used at each irrigation, and a non-irritant lubricant, as chondrus jelly, applied after the irrigation.

"Digital treatment of post-nasal region through pharynx is good. Pressure over terminals of fifth and other sensory nerves—one finger in nares, thumb on outside—controls attacks."—J. Deason.

Prognosis. When the treatment can be begun before the symptoms have appeared, the prognosis is good for prevention. After the characteristic symptoms have appeared, relief may be secured. In very obstinate cases, change of climate for one or two summers may be necessary. Persistent treatment in the intervening months should result in obviating this need.

CHAPTER XIX ADENOIDS AND TONSILS

ACUTE TONSILLITIS

(Acute amygdalitis; follicular tonsillitis; parenchymatous tonsillitis; herpetic tonsillitis)

This is an acute inflammation of one or both tonsils, affecting variously the tonsillar layers, and resulting in more or less permanent injury to the tonsil affected. The inflammation is of a simple parenchymatous type with marked congestion of the glands, hyperplasia of the lymphoid elements, exudation and desquamation of the epithelium.

Etiology. Predisposing causes are lesions of the cervical vertebræ, either as a constant condition or the result of trauma. Mouth breathing and malnutrition of any kind lower resistance to infection. Exciting factors are pyogenic bacteria, exposure to cold, and trauma.

Diagnosis. The onset is usually sudden, with chilliness or chill, fever (102° to 103° F.), full frequent pulse, headache, often frontal, tongue coated, breath fetid; throat, hot and dry. The glands at the angle of the jaw are enlarged and there is pain on moving the jaw or swallowing. Reflex contractions affect especially the hyoid group of muscles, the anterior cervical group, and the upper thoracic spinal muscles. The skin of the neck and over the angles of the jaw, as well as the tissues associated with the muscles named, are hypersensitive to pressure and to cold.

Inspection reveals the tonsils greatly swollen and red, covered with a creamy mucopus, or, in the **follicular form**, the surface is covered with yellowish rounded masses of secretion protruding from the mouths of the follicles.

In some cases the tonsil may be covered with a dirty-yellow membrane which strips off readily. The fever usually subsides by crisis on the third or fourth day and resolution takes place. Occasionally sequelæ follow as pneumonic or rheumatic fever, acute nephritis, endocarditis, pericarditis, and otitis media.

Cultures should be made to distinguish this disease from diphtheria. In **herpetic tonsillitis**, vesicles appear on the surface of the tonsil. The pain is very severe, and the constitutional symptoms are intense, apparently out of proportion to the local lesions.

Leucocytosis is usually present in all forms of tonsillitis.

Treatment. "Adjust the inferior maxillary bone. See that the structures between it and the upper cervical vertebræ are

set free on both sides of the neck. * * * Adjust whatever slight irregularities you find in the cervical and upper dorsal regions. Bring your clavicles well up and forward. Look carefully to your upper four ribs, and see that they are perfectly adjusted to your sternum and spine. Free the hyoid bone from any contracted muscles which could bind it. * * * Then go to the lumbar region and treat there to open up the excretories. See that the lumbar vertebræ are in line, and that the floating ribs are well up and in their proper place. Do all your work in the neck region from the outside."—A. T. Still.

"The first effort at treatment was directed to the relaxation of cervical and dorsal musculature; then gentle, careful effort was made to secure movement at fifth cervical.

"Next, light local treatment was given to each tonsil. Besides removing obstruction to the lymphatics and other vessels, the local treatment forced from the crypts considerable of the muco-purulent material, patient clearing throat after each attempt. Each tonsil was treated in this way three times. A cold compress was placed around the throat and patient was advised to gargle with hot normal salt solution several times during the night, if awake; he was directed to take all the water he wanted, but no food. . . . Instructions were given for colon irrigation, patient afterward saying that considerable black, offensive smelling feces was passed. Urine was normal. . . . Later, more normal motion was secured at points of bony lesions; patient felt very well. . . . The local treatment to the tonsils with the removal of infectious material lodged in the crypts, is important. Treatment to the lesions present was very light and non-irritating."

"In all acute infections such as tonsillitis, I pay very close attention to the lower dorsal region, with a view to normalizing the vaso-motor control to the adrenal bodies, believing as I do that the liberation of their secretion greatly augments the auto-protective forces of the body. I am thoroughly convinced that tonsillitis both acute and chronic is often secondary to diseased teeth and gums. The lymphatics from the teeth and peri-dental structures drain by way of the tonsils."—E. C. Bond.

"It is a mistake to think that strenuous manipulative measures are necessary in relieving tonsillary conditions. We have to do with a tissue condition sensitive and inflamed, contra-indicating rough manipulative measures, and it is remarkable how nicely the soft cervical tissues can be handled if no strong irritation is produced while treating. It is not uncommon to reduce the congestion within a few moments' time sufficiently for the patient to be able to swallow with some degree of comfort.

"It is well to remember that the tonsil is a lymphatic structure and should not be directly treated as a rule. If so, with the greatest care. It is not always the tonsil that we feel on palpation, but the lymphatic glands and tissues over the tonsil. A careful correction of maxillary, cervical and dorsal lesions is sufficient, as a rule, to reduce the congestion, although gentle treatment is sometimes beneficial over the tonsil."—F. P. Millard.

Prognosis. Recovery is the rule, unless complications arise. To prevent recurrence, the patient must be instructed in general hygiene, and if he feels the slightest indication of trouble to immediately see his osteopathic physician. Each attack increases the danger of permanent injury to the tonsil.

PERITONSILLAR ABSCESS

(Quinsy)

Sometimes an attack beginning as acute tonsillitis takes a severer form. The uvula, soft palate, and parts around the tonsil appear edematous, swallowing is excessively painful, articulation is difficult, and the voice is nasal. The constitutional symptoms are more severe than in the simple form. In from two to six days; fluctuation can be felt, usually in the soft palate. Quinsy is probably due to the presence of a more malignant infectious agent than simple tonsillitis.

Treatment. In addition to the treatment given under acute tonsillitis, incision may be made with a curved bistoury guarded nearly to the point, making the incision from above downward parallel with the anterior pillar. If this is not done the patient suffers longer and the abscess ruptures anteriorly or toward the tonsil, with immediate relief of the symptoms and gradual recovery.

In rare cases, if the swelling produces symptoms of suffocation, excision or tracheotomy may have to be done.

CHRONIC TONSILLITIS AND ADENOIDS

(Hypertrophy of the tonsils; aprosexia; naso-pharyngeal obstruction; mouth-breathing)

This is a chronic inflammation of the tonsils and related lymphoid tissues, characterized by hypertrophy of the tissues affected, and symptoms referable both to mechanical obstruction of the respiratory passages and to the toxic effects of infection.

Etiology. The condition is most frequent before and during puberty; in boys more often than in girls; in children with tubercular or syphilitic ancestry; in those who live under insanitary conditions, especially those kept within doors; and in those subject to recurrent acute tonsillitis. Upper thoracic lesions are practically invariably present; lesions of atlas and axis are usually present. Other lesions often found include the first and second ribs, the clavicle, the hyoid and mandible, and vertebræ from occiput to mid-thoracic. This widespread area of probable etiological relationships is due to the peculiar vasomotor innervation of the tonsils.

Pathology. Both tonsils are usually involved. There may be increase in the lymphoid elements with or without increase in the stroma; distension of the crypts with plugs of cheesy yellowish material of peculiar offensive odor—Dittrich's plugs. The latter may become infiltrated with lime salts, thus forming concretions.

Associated with hypertrophied tonsils is usually an overgrowth of the pharyngeal lymphoid tissue. This may be papillomatous with a lymphoid

parenchyma, may appear as masses from a small pea to an almond in size, or may be sessile or pedunculated. The tissue is reddish in color, of moderate firmness, contains numerous blood vessels, and is most abundant over the vault of the pharynx in line with the fossa of the Eustachian tube, or the masses may lie posteriorly in the fossa of Rosenmüller, or upon parts parallel to the posterior wall of the pharynx.

Diagnosis. Chronic tonsillitis with adenoids is responsible for "mouth-breathing." This appears at first at night; the child is restless, awakes with "night terrors," and snores often. A short dry cough may be present, due partly to the nervous irritation and partly to the effects of the mouth-breathed air upon the respiratory passages. Recurrent bronchitis, pharyngitis, laryngitis, stuttering, asthma, digestive difficulties and various functional nervous disturbances may be the more or less direct results of chronic tonsillitis and adenoid growths. Such children have lowered resistance to infectious diseases.

The face of the mouth breather is characteristic. The open mouth and the loose hanging jaw give an expression of stupidity which may or may not be deserved. The lips are usually thick and dry; the nose is broad, the nostrils have diminished opening, and the edges look paler and somewhat waxy. The "pigeon-breast" or "chicken-breast" may be present. A thick voice, often hoarse, slight constant headache, slight or pronounced deafness, and some mental torpor are constant in those who have been mouth-breathers for any length of time.

These symptoms should lead to an examination of the patient. The diagnosis is made upon palpation and inspection, by means of which the enlarged tonsils and the adenoid masses in the nasopharynx are evident.

Treatment. Adenoids are abnormal, and should be removed whenever they are large enough to interfere with respiration. Tonsils are useful organs, and should be saved if possible. Often badly hypertrophied tonsils return to practically normal size after the removal of adenoids, and other indicated treatment given. When the tonsils are filled with pus, being practically destroyed already, or when they do not yield to careful treatment, interfering with respiration and being the seat of constant infectious processes, they should be removed by clean and complete surgery.

"The restoration of the normal blood supply and perfect drainage to and from the organs lessens the liability to contract colds or to the recurrence of the acute form of disease known as tonsillitis."—A. T. Still.

To secure this end, the neck and upper thoracic areas must be kept perfectly adjusted, the ribs normal in articulation at both ends and kept raised as much as can be secured. Every effort must be made to secure the coöperation of the child in taking prescribed exercises. Lifting the large tonsils and giving a very gentle circular motion at the same time assists in draining them. Care must

be taken not to touch the pharynx, as gagging will result. The hand and fingers are to be surgically clean; a finger cot is most easily sterilized, but it lessens touch sense.

After the adenoids have been removed, and after respiratory interferences due to enlarged tonsils have disappeared, there may still be difficulty in overcoming the mouth-breathing habit. Systematic breathing exercises are good to facilitate the return to the normal nose breathing. Exercises that retract and elevate the soft palate are beneficial; also forced expiratory exercises that affect the entire respiratory tract. Various mechanical appliances are now on the market for holding the mouth closed at night. These are annoying and should be used only as a last resort. Much living in the open, both during day and night, is of great value in securing the normal respiratory habits. It should be remembered that diseased tonsils are probably a frequent source of infections elsewhere in the body.

"The conclusions were that the adenoids present in the epipharynx of the child was the prime factor in the production of deviated septa, hypertrophied and other ways diseased turbinates and all forms of nasal blocking, also for acute and chronic catarrhal changes in the ear with all their sequelae, for enlarged tonsils and cervical glands; and, secondarily, by reason of the chronic inflammation induced throughout the entire area of mucous membranes of the head and throat, with the resultant lowered tissue resistance that the adenoid was responsible for the greater proportion of the exanthemata of childhood.

"Secondly, that the adenoid, in many, if not all instances, was the result of vasomotor perversion due to osteopathic lesions in upper dorsal and cervical regions occurring either in utero or during the first few years of life, and not due, as generally stated, to syphilis or lymphoid overgrowth following toxemia of various infectious diseases."—Mary S. Crowell.

"Briefly, enlarged tonsils are operative when they really contain an abscess, the operation simply consisting in lancing. They are also operative if chronically or at frequent intervals enlarged, and when osteopathic treatment has failed to reduce them. In this case clipping or guillotining is usually sufficient.

"In the very worst cases I enucleate, but in most cases I am perfectly satisfied with the lesser operation as it usually leaves them two good tonsils that do get smaller and still have good functions, while the dissection operation robs them entirely of the tonsils. The tonsil is a normal organ while adenoids, which I remove entirely, are abnormal.

"In those few cases where cutting off the top is a failure, they can still be dissected out and there has been no damage done and nothing lost."—Geo. Still.

"Undoubtedly surgery must be resorted to in specific cases. Repeated infection serves to transform the lymphatic tissue to a mere fibrous shell eliminating those factors essential to active phagocytic and anti-toxic power. Gaping remnants of follicles welcome invading bacteria that must penetrate to the cervical nodes before meeting resistance. Surgery is our one remedy, tempered with conservatism and judgment."—F. C. Farmer.

"Irregularities in the position of the cervical and upper thoracic vertebrae, the mandible, the hyoid, or the upper ribs, are probably efficient factors in the disturbed circulation and thus the increased tendency to abnormal tonsillar conditions and the growth of adenoids.

"The correction of these structural abnormalities is a necessary part of the treatment of the conditions, whether surgical interference is indicated or not.

"Every effort should be made to save normal tonsillar tissue. There is no reason for saving masses of diseased tissue which may have replaced the tonsils.

"Adenoids large enough to compel mouth-breathing should be removed. The growths are not apt to recur if the spinal conditions and the hygienic conditions are corrected."—P. C. O. Clinic Report.

"Adenoids and other abnormal nasal conditions are important causes of mental deficiency. An important drainage-way for the lymph from the anterior fossa of the skull, and thus from the frontal lobes of the brain, is by the perivascular and perineural lymph spaces of the cribriform plate. Any disease which interferes with this drainage-way must exert a malevolent influence upon the development of the frontal lobes of the brain; in the case of adenoids, this evil influence is most effective at the time of life when the frontal lobes are beginning their most rapid development.

"Mouth-breathing is another factor in promoting inefficiency. Not only does mouth-breathing cause mal-nutrition of the brain, as of the rest of the body, but the lax state of the jaw muscles seems to be associated with faulty development of the corresponding nerve cells in the cortex. The entire cerebral and somatic mechanism concerned in what is usually called "strong-willed personality" is weakened by the open mouth and the drooping mandible of the mouth-breather. For this reason surgical interference ought not to be too long delayed."—L. Burns.

CHAPTER XX

DISEASES OF THE PHARYNX AND LARYNX

GENERAL DISCUSSION

The pharynx includes several varying structures, which are variously subject to disease, but which are anatomically and physiologically related. The tonsils lie between the pharyngeal pillars; the respiratory path as well as the digestive path traverses the cavity of the pharynx. The membrane lining the pharynx, larynx, and the lower digestive and respiratory tracts is continuous, through this common cavity, with the membrane of the buccal and the nasal passages. This membrane is well supplied with blood vessels, lymphatic paths, lymph nodes, mucous and serous glands, and the sensory nerves which are concerned in several varieties of sensations, as well as the efferent nerves which govern the secretion of the glands, the caliber of the blood vessels, and the tension of the muscle fibers which lie beneath the membrane through a varying extent of its area.

The vasomotor nerves are derived, for the most part, from the superior cervical ganglion, and also from others of the sympathetic ganglia of the cranial and cervical region. These, in turn, derive stimulation from the spinal segments of the upper thoracic cord, and from certain visceral centers of the medulla, pons and mid-brain. All of these centers are active according to the impulses reaching them, which are ultimately sensory in origin. Vertebrae of the upper thoracic and the cervical segments, upper ribs and clavicles, the hyoid and the mandible, are all included in the bones whose disturbed relationship may be responsible for disturbed circulation through this pharyngeal area, as well as for disturbed secretions.

Without discussing whether or not infection of the normal mucous membrane occurs, it may be granted that the danger of infection is increased by those agencies which interfere with the normal circulation of the blood, and the normal course of nerve impulses through the governing centers. To these factors must be added those which lower the systemic immunity, such as the rigid lower thoracic spinal column, various disturbances of nutrition, and the effects of autogenous or extraneous poisons.

The treatment of the diseases of the pharyngeal region consists chiefly in the removal of the factors which cause or perpetuate the diseased condition.

ACUTE PHARYNGITIS

(Angina catarrhalis; sore throat; angina simplex; hyperemia; edema of the uvula)

An acute inflammation of the pharynx is usually associated with varying degrees of laryngitis and tonsillitis. The trouble begins as an acute hyperemia, which may terminate in recovery, with no further symptoms, may go on to serious forms of pharyngitis, or may persist as a chronic hyperemia. This disturbance is an important cause of the more serious inflammations, and permits the infection of the throat by bacteria which might have been unable to attack a throat otherwise normal.

Hyperemia of the pharynx is due to irritation by tobacco smoke, constant use of the voice, is a part of naso-pharyngeal catarrh; may be due to lesions of the mandible, upper cervical or upper thoracic region, either alone or associated with any of the first-mentioned causes.

The mucosa is reddened, and the venules may show distension. Distended veins may be due to valvular heart lesions or to pressure upon the superior vena cava. Hemorrhage is due to local causes, usually traumatic.

Edema of the uvula is not uncommon in debilitated conditions; in milder degree it may be associated with lesions especially of the mandible, less frequently the upper cervical vertebræ. The enlarged uvula may irritate the throat to such an extent as to cause chronic hyperemia or even tend to a pharyngitis; the voice may become husky as the result of the laryngeal involvement. When the edema persists an overgrowth of tissue may occur; it may thus become necessary to remove the superfluous tissue surgically.

When acute hyperemia persists, or as a result of exposure to cold, digestive disturbances, rheumatism and gout, or other sources of disturbance of mucous secretion, a more **acute inflammation of the pharynx** occurs. Cervical and mandibular, upper rib and clavicular lesions predispose to the disease.

Diagnosis. The trouble begins as uneasiness and soreness on swallowing, a feeling of tickling and dryness in the throat, a desire to hawk and spit, and stiffness of the neck. The cervical lymph glands are enlarged and painful. The process may extend to the Eustachian tube, producing slight deafness, and to the larynx with hoarseness. The constitutional symptoms are chilliness, fever of moderate degree, increased pulse rate, cough, and more or less nasal voice.

Inspection shows a general dry, red, congested condition of the whole throat with edema of the uvula. The tonsils may or may not become involved. The cervical muscles are irregularly contracted and painful when touched. The skin over the neck is

often hypersensitive. The secretion is thick, tenacious and opaque. The voice is usually affected, as a result of the associated laryngitis.

Treatment. "In treating pharyngeal diseases, I first adjust the clavicles at both ends. I also adjust all of the ribs of each side from the first to the fifth. Adjust the atlas and axis. * * * Then I see that the lower ribs from the eighth to the twelfth are all left in a normal condition. I am very careful to have a normal adjustment of the whole lumbar vertebræ."—A. T. Still.

Muscular contraction anywhere in the neck or upper dorsal region needs relaxation to prevent lesions and blood stasis. Especially is it necessary to relax around the hyoid bone. Careful treatment of the upper cervical lymphatics is effective. The diet should be liquid if there is much fever, or if solid food causes much irritation. As a gargle or a pharyngeal douche, a normal saline is better than anything else. The main purpose of a gargle is cleansing of the membrane from the abnormal and irritating secretions, which often contain pathogenic organisms.

Prognosis. Recovery is the rule, in a few days to a week or more. Each attack predisposes to later attacks, and to chronic pharyngitis.

PHLEGMONOUS PHARYNGITIS

(Acute inflammatory phlegmon of the pharynx; retropharyngeal abscess)

These diseases are practically the same in etiology, diagnosis and treatment, whether the location is in the walls of the pharynx or in the posterior sub-mucous tissue.

Etiology. Primarily, the disease is due to pyogenic microorganisms. It may complicate scarlet fever, diphtheria, erysipelas, or syphilis.

Diagnosis. The disease begins with sore throat, dysphagia and hoarseness. Fever, dyspnea, and swelling of the cervical lymphatics are associated with considerable prostration. The pharyngeal mucosa is at first deep red, purple, swollen, tense, shiny and dry. Vesicles appear and the secretion becomes profuse; suppuration occurs speedily. The pus may be localized or may be diffusely scattered through the membrane.

The muscles of the neck, mid-thoracic region, and sometimes of the lumbar region are contracted and hypersensitive.

The blood shows leucocytosis in variable degree, according to the severity of the infection and the strength of the reaction to the invading organisms.

Treatment. An important factor in promoting the resistance to this, as to any infection, is to increase the mobility of the lower

thoracic region—from the sixth to the twelfth thoracic, with the corresponding ribs. Manipulation of the neck is difficult, yet, with care, muscles can be relaxed, bony and other lesions corrected, venous and lymph drainage facilitated. The ribs should be raised, the clavicles loosened, if they are found depressed or associated with tense muscles; the mandible and hyoid freed from tension. All treatment must be carefully based upon a recognition of the pathological changes occurring in each patient, as found on frequent examination.

When the pus accumulates it should be surgically evacuated at once. Incision must be made as indicated by the location of the pus, and by other local conditions. While there is little doubt that quite large collections of pus can be absorbed and carried away, sometimes without apparent injury, there is always the risk of rupture, with infection of the lungs or the digestive tract; septicemia may result from the invasion of the lymphatics or the veins by the infectious agent. Spontaneous evacuation during sleep may result in suffocation. The clean incision under ordinary surgical precautions with evacuation of the pus is much less dangerous.

Prognosis. With correct surgery and such other treatment as is indicated, practically all patients should recover. The prognosis of the underlying disease is to be considered; the outlook is always somewhat doubtful, in this as in all cases with pus formation, with the possibility of septicemia.

MEMBRANOUS PHARYNGITIS

(Croupous pharyngitis)

Membranous pharyngitis is due to infection by diphtheria (q. v.) or by any of the pyogenic organisms, rarely the pneumococcus or the bacillus coli communis; usually such invasions are upon pharyngeal membranes injured by direct trauma, or by the effects of circulatory disturbances. The condition may be associated with scarlatina, measles, typhoid, variola, etc. (q. v.). The treatment is that of the primary disease, plus the treatment of catarrhal or phlegmonous pharyngitis.

ANGINA LUDOVICI

(Ludwig's angina; cellulitis of the neck)

This disease is not very frequent in this country. It is caused by streptococcal infection, and is usually secondary to diphtheria or scarlet fever. The process is attended by swelling of the sub-maxillary glands of one side, spreads to the floor of the mouth, and to the front of the neck. The parts are dusky-red and present brawny induration.

Diagnosis. The symptoms are intense with much pain. Dysphagia, difficult mastication and articulation, and grave dyspnea may supervene from compression or edema of the glottis.

Treatment. When the pus does not accumulate, the treatment should be carefully devoted to securing better circulation through the infected area. So long as no necrosis occurs, there is little danger of septicemia from the circu-

lation of the blood through the infected area; when the pus accumulates and necrotic tissues are present, local manipulation should be limited to the surgical evacuation of the pus. Throughout the disease, the ribs should be freely raised, reflex muscular contractions corrected, and the mobility of the thoracic region secured by treatment as frequently given as may be necessary to secure these results.

VINCENT'S ANGINA

This form is due to the bacillus fusiformis and the spirocheta dentinum and is feebly contagious. There is superficial ulceration and the formation of a membrane, usually beginning on one or both tonsils and spreading to other parts of the pharynx.

Treatment. In addition to the corrective work advised for other forms of pharyngitis, the frequent use of a mild gargle is helpful and comfortable.

ULCERS OF THE PHARYNX

Follicular ulcers are usually small, superficial, and generally associated with chronic catarrh. **Syphilitic ulcers** are small, shallow, painless, rounded, yellow and sloughy, surrounded by a reddened zone, and appear upon the posterior wall. **Typhoid ulcers** are small, round or oval, and appear toward the close of an attack of typhoid fever. **Tuberculous ulcers** have irregular boundaries and a yellowish-gray floor, are intensely painful, and also appear upon the posterior wall. **Cancerous ulcers** have the usual characteristics of malignant disease.

The treatment of these is constitutional or surgical. Local application of 1 to 10% silver nitrate may clear up non-cancerous ulcers.

CHRONIC PHARYNGITIS

(Clergyman's sore throat; chronic follicular pharyngitis)

This is a disease characterized by a husky or muffled voice, and a tendency to clear the throat. Speaking becomes difficult, and the throat becomes tired when speech is necessary.

Etiology. The disease follows repeated acute attacks; improper or excessive use of the voice, especially with loud tones; excessive use of alcohol or tobacco or naso-pharyngeal catarrh. Perhaps the most important etiological factor is the presence of lesions of the third cervical or its neighbors, or of the occiput. The hyoid is frequently involved through muscular contractions. These lesions themselves tend to change the ease of vocalization; thus they act in at least two ways in the etiology of the disease.

Diagnosis. The symptoms and history are fairly pathognomonic. The examination of the throat shows the characteristic granular membrane.

The mucous membrane is more or less congested, numerous distended venules are seen, and the secretion is mucoid, mucopurulent, or purulent. Often dry scales of offensive odor are found. Hyperplasia of the lymph-follicles forms elongated rows in the lateral or posterior walls.

Treatment. The correction of faulty habits of speaking is important. Correction of the bony lesions found in each case is usually necessary to permanent recovery. A gargle of normal salt solution or of boracic acid or of hot water gives comfort and cleans the roughened membranes. Condiments, alcohol, tobacco, should be discontinued. Cauterization and astringents are dangerous and rarely give any relief. The scars left by these methods are often very annoying, and may lead to serious troubles later.

Prognosis. In early cases recovery may be expected within a few weeks. The time necessary for recovery depends upon the time during which the disease has been present, the obedience to the instructions concerning the use of the voice, to a correct dietetic and hygienic regime, and to the possibility of securing permanent correction of the lesions as found. There is a tendency to recurrence if the lesions recur, or if the voice is used improperly, or if the tobacco, alcohol, or other irritating factors are resumed.

ATROPHIC PHARYNGITIS

(Pharyngitis sicca)

In this type the secretion is scanty, the mucous membrane is reddish-brown in color, thin, smooth and shiny.

Diagnosis. There is a constant desire to hawk and spit, with a dropping of mucus from the upper pharynx, slight redness increased from various causes at times. On inspection, the mucous membrane of the posterior pharyngeal wall is seen a dusky-red and studded with the elongated lymph-follicles or is dry and glistening.

Treatment. The patient must be taught correct methods of phonation and articulation; the lesions as found must be corrected; the general health must be kept at high level. Complete rest of the voice may be found necessary in some cases.

Prognosis. Recovery is slow. It is not dangerous to life and may be greatly helped, if not entirely relieved, by long-continued, persistent treatment.

ACUTE CATARRHAL LARYNGITIS

(Acute laryngitis; sore throat; acute endolaryngitis)

Etiology. Acute laryngitis may be caused by the inhalation of irritating vapors or dust; by drinking irritating liquids; by overuse, or improper use of the voice; or by extension of inflammation from other areas. It is usually associated with pharyngitis, and often with tonsillitis and rhinitis. It often occurs during the course of the acute infectious fevers. Contraction of muscles and subluxations of bones in the cervical and upper thoracic areas are important causes; comparatively slight irritants cause severe inflammations when these structural perversions are already present. The hyoid and the axis are most often concerned in these cases. The

reflex muscular contractions caused by the irritant perpetuate the inflammation in many cases.

Diagnosis. The disease usually begins rather suddenly with sensations of dryness, pain and tickling in the laryngeal region, hoarseness increasing to aphonia, slight fever, painful deglutition, and a dry, noisy, hoarse cough. The laryngoscopic examinations reveal swelling of the mucosa, usually most marked in the ary-epiglottidean folds, with redness and swelling of the true vocal cords. The surface may be covered with a varying amount of mucus. Sometimes patches of erosion are found.

Treatment. Rest in bed, and absolute rest of the voice, is indicated. If it is necessary, the patient may whisper very faintly, but it is better for him to write his communications. Inhalations of steam, the ice bag to the neck, a cold pack, and a hot water bottle between the shoulders, are some of the things which give relief. Usually an accumulation of fecal material is found on palpating the colon; this should be removed by a moderately warm enema.

The important factors in treatment are the relaxation of the reflex muscular contractions, and the correction of whatever other lesions may be found. Carefully elevating the larynx and relaxing contiguous tissues are beneficial. Note the condition of the first ribs. It may not be advisable to do the corrective work until the local inflammation has begun to subside, but if further attacks are to be prevented, and if the patient is to recover and keep his voice, the corrections must be made. One or two treatments each day should be given, until the acute stage has passed; if one thorough treatment is given at the beginning of the attack it may be all that is needed. But the complete correction of structural perversions must not be neglected, even though the acute symptoms disappear completely, with or without palliative treatment.

Prognosis. Most cases recover in one or two days, if the treatment is given on the first appearance of the symptoms. Each day of delay in treatment means several days of delay in recovery. Recurrent attacks are to be expected, if the lesions remain or recur, or if the irritating agents persist or reappear. The repeated attacks lead to chronic laryngitis. (q. v.)

EDEMATOUS LARYNGITIS

(Edema of the glottis)

The infiltration of the tissues of the larynx and glottis may be a true inflammatory edema, or may be the result of diseases in other organs.

Etiology. It is rather more frequent in chronic laryngitis than in acute, and is especially frequent in acute exacerbations of the

chronic form. Subacute or chronic inflammations are often associated with edema—the husky voice in tubercular or syphilitic laryngitis is almost pathognomonic.

Noninflammatory edema occurs in angio-neurotic edema, which may affect the glottis; this may result in serious or even fatal asphyxia. Nephritis, and other diseases associated with edema, may affect the larynx; edema of the glottis thus produced may be serious.

Diagnosis. The onset varies according to the etiological factors. The dyspnea is urgent; dysphagia, aphonia, violent, ineffectual cough, stridulous breathing, and weakness are some of the more common symptoms. Death from asphyxia may occur at any time; sudden death without premonitory symptoms may occur.

The laryngoscopic examination shows very large, semitransparent, grayish yellow swellings, which involve the epiglottis and the true and false vocal cords.

Treatment. Vigorous treatment must be given to secure rapid drainage from the affected tissues. The cervical area and tissues around epiglottis must be relaxed and careful attention given to the upper dorsal vertebræ and ribs. An ice bag applied over the larynx and ice in the mouth are good. If relief is not speedily obtained, tracheotomy must be performed. Adrenalin spray may give temporary relief.

Prognosis. About half the cases terminate fatally. Patients are liable to die from exhaustion, sepsis, or pulmonary complications after the edema is removed. The duration is from a few hours to several days. Recovery depends upon early vigorous treatment.

CHRONIC LARYNGITIS

(Chronic catarrhal laryngitis; chronic endolaryngitis)

Chronic laryngitis may follow repeated attacks of the acute form, or it may begin insidiously, and be chronic from the first. It is often associated with granular pharyngitis.

Etiology. It is caused by the usual factors concerned in acute laryngitis; these may be mildly irritating through a long time, thus causing the chronic type; other causes include nasal obstruction and mouth-breathing; excessive and improper use of the voice (dysphonia clericorum), especially in the open air; excessive inhalation of tobacco smoke, and chronic alcoholism.

Diagnosis. The common symptoms are constant hawking and a desire to swallow; expectoration of a scanty mucoid or mucopurulent material or of small glairy balls or crusts; attacks of hoarseness or aphonia; and a husky, hoarse, rough voice. Very little pain is present. The general health is not affected. Laryn-

goscopic examination shows the mucous membrane slightly reddened, perhaps granular; the true cords grayish or slightly injected.

Treatment. Remove muscular contractures, and correct any bony lesions found, particularly those of the atlas, axis and third cervical vertebræ, the hyoid and the clavicle and the first rib. Removal of the cause is necessary. If the condition is due to overuse of the voice, rest absolutely; if to smoking or alcoholism, institute treatment to remove the habit; and if environmental or personal habits are faulty, secure their removal as far as possible. Plenty of fresh air, sponging the neck night and morning with cold water, avoidance of wrapping the neck too much, systematic throat exercises, and education in the use of the voice are some of the factors of general hygiene necessary in these cases.

Prognosis. Complete recovery is not common owing to the persistence of causes and the lack of coöperation on the part of the patient. If more favorable circumstances permit, the chances for recovery are good within a few weeks.

CROUPOUS LARYNGITIS

(Membranous croup; croup)

This disease is usually diphtheria. (q. v.) Occasionally other pathogenic organisms cause the formation of a false membrane, which usually peels off easily, without injury to the underlying mucous membrane. It may be due to any of the ordinary infections of childhood, and may accompany measles, scarlatina, or any of the exanthemata.

Diagnosis. Cultures should always be made; diphtheria is always to be suspected. The diphtheritic membrane is thick, yellow, tenacious, with necrotic areas; its removal leaves an injured, bleeding surface. The membrane due to other organisms is usually thin, bluish-white, semitransparent, and its removal leaves a hyperemic but intact mucous membrane. The membrane may be purulent and yellowish, tenacious and thick, when the infection is by the more virulent pyogenic organisms. The removal of such a membrane injures the underlying mucous membrane, as is the case in the true diphtheritic formation. The only distinction is found in the results of the culture taken from the throat, which is not absolutely reliable.

The symptoms are startling, and the disease is sufficiently serious. The onset is either sudden with an attack of spasmodic croup or gradual with acute catarrhal laryngitis. The voice becomes husky, smothered, whispering or suppressed; a prodromal "croupy" cough for a day or so becomes hissing, explosive and metallic during the attack; difficulty in breathing follows. The

child is unable to lie down. If quiet for a time, he starts up in fright, breathing heavily with a shrill inspiration. Expiration becomes difficult and noisy; suffocation seems imminent from spasm of the glottis. Cyanosis, profuse perspiration, and symptoms of asphyxia seem about to terminate in death, when the spasm ceases, and the child is fairly comfortable, though stupid for a time. Portions of the membrane may be expelled by coughing, during the intermissions. In cases tending toward recovery, the appearance of improvement is maintained between attacks, the paroxysms become less frequent and severe; expectoration of membrane is marked. The fever lessens and disappears.

In those cases tending toward fatal termination, the attacks become more frequent and severe; expectoration is absent; respiration is more frequent and shallow without whistling and stridor; stupor and insensibility deepen, and the child dies of asphyxia.

Treatment. The first thing is the relief of the dyspnea. Thorough relaxation of the tissues of the throat and neck usually give relief. The treatment for simple croup, especially the inhalation of steam from boiling water or slaking lime, are efficacious in promoting relaxation of the spasmodic muscles. Hot packs to the throat, if they can be used, are good. The room must be thoroughly well ventilated; the perspiring body of the child should be protected from drafts. A hot bath may be employed; this to be followed by vigorous rubbing of the skin.

During the intervals, if the child is not asleep, washes or gargles very soft and aseptic are good; care should be taken to avoid injury to the mucous membrane. No attempt at antisepsis is of any avail, but the washes should be aseptic—should carry no new germs into the injured throat. Restricted diet or none is permitted. Fruit juices, especially pineapple juice, are refreshing.

A child with any sickness should be kept from other children, especially is this true with fevers, and in cases which bear clinical resemblance to the acute infections, even though the actual infectiousness cannot be demonstrated, it is much better to secure as complete isolation as possible.

The prognosis is doubtful in all cases; most patients recover in six to ten days, but there is always the danger of asphyxia, and of more extended invasion of the tissues by the organism concerned.

SPASMODIC CROUP

(Including spasmodic laryngitis; simple croup; false or pseudo croup; catarrhal croup; laryngitis with spasm; spasm of the glottis; Miller's, or Kopp's, or thymic asthma; child-crowing; tetanic croup; laryngismus stridulus)

This is essentially a nervous disturbance with symptoms due to the spasmodic tension of the vocal muscles, with closure of the

larynx. The tension is often present in membranous laryngitis and in many forms of acute and chronic laryngitis, pharyngitis, and sometimes tonsillitis, rhinitis, bronchitis, and pneumonia.

Etiology. The patients are almost always children of neurotic make-up, not often more than seven or eight years old, rarely less than one year. Cases have been reported of very small infants, and of adults and senile patients. Reflex causes include worms, overeating, irritating and improper foods; chronic tonsillitis, and adenoids; bad teeth; rachitis, marasmus, or other malnutrition; exposure to sudden cold, or to dampness; emotional storms, frights, unwise attempts at discipline, and other shocks to the nervous centers.

Diagnosis. The symptoms vary according to the etiological factors. Usually it is of sudden nocturnal onset; the child is well or suffering from the causal condition, sleeps a few hours and wakes suddenly with a metallic, resonant respiration and great dyspnea, with stridulous inspirations from narrowing of the glottis by spasm, and wheezy stridulous expirations ending with a high-pitched, inspiratory crowing sound on relaxation of the spasm.

In severe cases all the accessory respiratory muscles are called into action during the attack. The lips and nails are blue, the surface cold, the countenance anxious, the inferior portion of the chest drawn in instead of expanded during inspiration, and there may be carpopedal spasms. General convulsions, strabismus, and involuntary discharge of feces and urine sometimes occur.

The attack lasts from a few minutes to an hour or more, and may return after a few hours' sleep or on the following night. During the day there may be a slight cough. There is little or no fever or hoarseness. It often recurs at the same hour on successive nights.

Treatment. To relieve the spasm, treat the upper part of the chest and diaphragm, especially through the phrenic nerve and its spinal relations, third to fifth cervical, and treat the eighth to tenth ribs anteriorly. Correct any sublaxations found.

A hot bath, with cold sponging to the chest and back, is a good emergency measure. This may be repeated if the spasms are persistent. The air of the room is best kept moist by steam from boiling water. Emesis may be produced by tickling the fauces with the finger. This often relieves the spasm very quickly. After an attack, the general health and diet must be regulated. Any irritating environmental condition, or personal habits, must be attended to promptly.

The **prognosis** is favorable for recovery. Death rarely occurs during the paroxysm in very young or debilitated children.

CHAPTER XXI

DISEASES OF THE BRONCHI

ACUTE BRONCHITIS

(Acute bronchial catarrh; tracheo-bronchitis)

Acute bronchitis is an acute catarrhal inflammation of the larger and middle-sized bronchi, occurring at all ages, but particularly at the extremes of life, characterized by slight febrile reaction, substernal pain, cough and expectoration.

Etiology. Among the **predisposing** causes are insufficient food and improper clothing; excessive confinement in warm rooms; subluxations of vertebræ from occiput to seventh dorsal, of the ribs from first to sixth, and the clavicle; and interscapular and anterior thoracic muscular contractions.

Among the **exciting** causes are exposure to cold or wet, recurring rhinitis, certain infectious diseases, inhalation of irritant vapors and dusts, and many micro-organisms among which are pyogenic cocci, pneumococcus, and micrococcus catarrhalis.

Diagnosis. The condition is usually ushered in with nasal or laryngeal catarrh or both, chilliness with aching pain in the limbs, joints, and trunk, a sense of constriction about the chest, pain of a raw, burning, tearing character behind the sternum aggravated by deep inspiration or coughing, a sense of languor and weariness out of proportion to the fever.

At first, the **cough** is hard and dry with little expectoration; in a day or so it becomes looser and the sputum more abundant. The breathing is embarrassed, noisy or whistling. The temperature is not high, 100° to 103° F., but the skin is moist; the pulse accelerated according to the fever. The more acute symptoms subside in a week or so according to severity and convalescence becomes slowly established.

Bronchial fremitus may be felt in thin chests. Percussion gives a clear resonance except when broncho-pneumonia and atelectasis complicate; hence the chest should be examined daily. During the first stage, there is harsh breathing with bilateral diffuse, piping, sibilant, or sonorous rales which are shifting and affected by coughing. After a few days, the breathing is puerile with prolonged expiration, profuse moist bubbling rales. Breath sounds are suppressed over collapsed areas if a portion of the tube becomes plugged with secretion.

Increased respiratory rate, cyanosis and dyspnea indicate involvement of small tubes, or **bronchiolitis**.

Urine is febrile, of the ordinary type.

The **sputum** during the first two days is almost pure mucin, is tenacious, viscid, frothy, and transparent. It contains a few leucocytes and red blood cells, few ciliated cells, a few mononuclear leucocytes, and a few myelin drops of the simpler types. After this, the cough loosens, the sputum is increased in amount, is less viscid and tenacious, frothy, with whitish and sometimes bloody streaks. This is followed by muco-purulent secretion of nearly uniform yellow color, containing many pus cells. Later, it becomes almost purely purulent, 100 to 200 cc. daily; contains much myelin; cells mainly polymorphonuclears and fat in large masses.

Treatment. Most cases yield without treatment if patient will take a hot foot or full tub bath and go to bed after freeing the bowels, though time can usually be saved the patient by following with a thorough general treatment with special attention to the upper respiratory areas until a definite reaction is secured. If the disease persists, relax the muscles of the spine and chest, raise the ribs, correct any subluxations found, secure free elimination by bowels and kidneys. The room-air is best kept moist, the patient in bed, plenty of water administered, acidulated with lemon juice if preferred, and a liquid diet prescribed for a few days. Treat once or twice each day until acute stage passes.

The **prognosis** is favorable for recovery within a few days or weeks. In young children and the aged, the course is more protracted, the symptoms more severe, and complications are more apt to occur, but recovery is the rule. The very aged and the feeble may rarely succumb, or chronic bronchitis supervene.

CHRONIC BRONCHITIS

(Chronic bronchial catarrh; secondary bronchitis; "winter cough")

Chronic bronchitis is an inflammation of long duration, affecting the larger and middle-sized bronchi, very common in the elderly and associated with chronic cardiac, pulmonary, and renal diseases, characterized by cough with no change in the general health.

Etiology. The chronic follows repeated attacks of acute bronchitis; occurs as an occupational disease among those working in much dust and smoke and in irritating vapors, in gout and rheumatism and in the chronic cardiac, pulmonary and renal cases.

Diagnosis. There is cough of a paroxysmal nature, often more troublesome at night and in the morning, with either scanty or copious expectoration depending upon the variety. Sometimes

shortness of breath is noticed upon exertion. The condition does not usually impair the general health except during acute exacerbations. There are usually some associated structural changes as emphysema, or bronchiectasis.

Many cases are associated with chronic catarrhal gastritis. The cough is often absent in the summer.

There are four general varieties.

Mucous Catarrh is the most common during the winter, and marked by more or less violent paroxysms of coughing and the expectoration of yellowish mucus.

Dry Catarrh has a harsh, distressing cough with a feeling of soreness or rawness under the sternum, and the expectoration of small globular masses. This occurs particularly when associated with emphysema, gout, rheumatism, or asthma.

Bronchorrhea is associated with bronchial dilatation, occurring most commonly in the elderly and marked by severe coughing, followed by copious expectoration of greenish-yellow, often fetid mucus (four to six pints in twenty-four hours).

Fetid Bronchitis is often associated with bronchiectasis and marked by excessively fetid odor of breath and sputum. The decomposition of the secretion within the bronchi may cause gangrene of the mucosa, or even of the lung itself.

Percussion is normal in simple, uncomplicated cases. If bronchiectasis is present, then there are diffused spots of amphoric or tympanitic sound. If emphysema is associated, there is hyper-resonance.

The respiratory murmur is roughened, harsh, less intense than normal, with expiration prolonged and forcible or wheezy. There are diffuse, bilateral, sonorous, sibilant or moist rales of all sizes, often crepitant at the bases, depending upon the amount of secretion. If dilatation is associated, there is broncho-cavernous breathing, with large and small gurgling rales. If emphysema is present, the sounds are modified according to the extent.

Subluxations are present from the occiput to the sacrum. Among the commoner ones found are atlas, axis, third cervical, second to fifth dorsal vertebræ, first rib and clavicular luxations, curves anterior or posterior of the upper dorsal area and contractions of the deep spinal muscles.

Urine may be highly acid and slightly albuminous in those cases with a decided acidemia. In chronic bronchitis always examine the urine on account of the liability of a primary kidney condition.

Sputum. In some cases is a very small amount of tenacious yellowish viscid mucus; in others a white sticky mucus. In the chronic cases, the amount is more abundant, yellowish, mucopurulent, separates into three layers, a mucous layer, brownish-gray serum, and a mucopurulent sediment.

In fetid bronchitis, the sputum is usually thin, grayish-white, separating into layers; the upper is covered by a frothy mucus, and the lower is a thick sediment where may be found pea-sized gray or yellow masses—Dittrich's plugs, bacteria, pus, leptothrix, and fatty acid crystals.

Treatment. A careful examination is necessary to determine whether there is an underlying organic disease. Relaxation of all contracted muscles and correction of the lesions found is of first importance; and the eliminative organs should be kept active. The general hygiene is important and must be carefully supervised. The clothing should be sufficient but not too warm. Room temperatures should be kept even.

The diet should be liberal, nutritious, and mixed, including plenty of water, fresh vegetables, and fruits.

Instruction in breathing and exercises to strengthen the chest muscles are important in the younger patients. A change to a warm climate for the winter is often beneficial.

The **prognosis** is never dangerous to life unless associated with other diseases.

FIBRINOUS BRONCHITIS

(Chronic idiopathic bronchitis; membranous, croupous, diphtheritic or plastic bronchitis)

Fibrinous bronchitis is an inflammation, usually chronic, marked by paroxysmal cough, difficult breathing, and the expectoration of fibrinous casts of the larger and middle-sized bronchi.

Etiology. The direct cause is unknown. It is associated with asthma, emphysema, typhoid fever and tuberculosis, and is usually a disease of adults.

Diagnosis. The symptomatology is not different from the catarrhal forms, until the expectoration of the false membrane. A violent paroxysm of coughing precedes or accompanies the expectoration which relieves the dyspnea. After more or less of the membrane has been raised, a muco-purulent, blood-stained sputum is present for several days. There may be a slight febrile reaction.

There are acute, subacute and chronic forms, the attacks recurring at intervals of days, weeks or years, the same bronchus being involved each time.

There is diminished fremitus and lessened respiratory murmur over the portions of lung supplied by the obstructed tube. When the casts are dislodged, the murmur becomes slightly roughened. In the unaffected portions of lung the sounds are normal. If collapse of the lung follows, there is dullness. The upper portions of the lungs are the oftener affected.

Spine. See chronic bronchitis.

The **sputum** is mucus, the casts being rolled up and mixed with it, but the true nature is shown when the sputum is shaken in water, appearing as little tubes, from the size of a bodkin to almost as large as the finger. The larger ones are hollow and the smaller, solid, with a tree-like appearance. They are nearly structureless, of fibrillated base with pus and mucous corpuscles, a few gland cells, occasionally a blood cell in the outer layers, many eosinophilic cells; Charcot-Leyden crystals and Curschmann's spirals are sometimes present. Instead of the definite casts, there may be shreds, lumps, or patches of membrane.

The **treatment** is that of chronic bronchitis. The vapor from alkaline solutions seems to help dislodge the casts.

The **prognosis** is favorable if not associated with tuberculosis, pneumonia, or emphysema. In young children it not infrequently proves fatal.

BRONCHIECTASIS

(Dilatation of the bronchi)

Bronchiectasis occurs primarily from traumatism or, secondarily, from chronic pulmonary conditions whereby the walls of the bronchi dilate so that sacs are produced, and clinically marked by cough and abundant expectoration.

Etiology and pathology. In the secondary form, contraction of the supporting lung tissue causes the walls to yield from lack of support. The cylindrical form is often produced by violent coughing. Until the cavity is infected, the membrane lining the cavity is smooth with very thin walls. It is much more frequent in the lower lobes than in the upper. The condition very frequently follows an attack of "grippe." It may be widespread or a single cavity.

Diagnosis. The cough is usually absent during the day, occurring mainly in the morning. The mode of expectoration is characteristic, the patient usually raising an enormous quantity of greenish-yellow sputum in the morning upon arising, or upon arising from the recumbent position. If a single large dilatation occurs, there are the physical signs of cavity.

When diffuse, the physical signs are those of the causative disease, usually tuberculosis. Fatal hemorrhage may occur from rupture of an aneurysm in the wall of the cavity.

The physical signs disappear as the cavity fills with secretion, to reappear upon coughing and expectoration. These are tympany, cracked-pot sound, bronchial breathing, with rales, bronchophony, and increased vocal fremitus. The **sputum** is a grayish-brown, or greenish-yellow color, separating into a brownish frothy top, a thin mucoid zone, and a sediment of almost pure pus, showing, microscopically, pus cells, epithelial debris, large fatty acid crystals;

sometimes cholesterin occurs; valerianic and butyric acids and H²S produce the horrible odor. Cerebral abscess is a very frequent complication.

Treatment. Is that of the primary condition, or if itself primary, that of chronic bronchitis.

Prognosis. It is incurable but has a protracted course. The acute form is unfavorable.

BRONCHIAL ASTHMA

(Spasmodic asthma)

Bronchial asthma is a neurosis marked by paroxysms of expiratory dyspnea during which all the accessory respiratory muscles are used; the diaphragm is fixed and there is a peculiar loud noisy wheezing.

Etiology. It often occurs in neurotic families; may be a result of bronchial irritation, direct or indirect, through the blood or nervous system; in children it occurs from imperfect recovery from naso-pharyngeal conditions, measles, whooping-cough, or capillary bronchitis.

There are three main theories of its formation: That it is a neurogenic spasm of the involuntary bronchial muscles; a hyperemia with swelling of the mucous membrane; an inflammation of the smaller bronchioles. Acidosis is also to be considered.

"The etiological factors found vary considerably, and include:

"Contraction of the cervical muscles, probably due to lesions of cervical vertebræ and exerting irritation to the trunk of the vagus;

"Pleuritic adhesions;

"Lesions of the first, second and third thoracic vertebræ, with slightly approximated ribs;

"Reflex effects from distant organs include: eye-strain; contracted sphincter ani, itself apparently due to anterior coccyx; scar tissue in cervix uteri; nasal polyps; cardiac disturbances, especially functional; gastrectasis and other conditions with accumulations of gas."—P. C. O. Clinic Reports.

Diagnosis. There may be premonitory symptoms as coryza, bronchial irritation, thoracic constriction, gastric disturbance, depressing emotions or worry, or the passage of a quantity of pale limpid urine.

The Attack. During the night, the patient awakens in great distress, feels as if there were no air in the room; assumes a characteristic attitude grasping some support; fixes the shoulder girdle and uses all the accessory respiratory muscles. Expiration is prolonged and accompanied by a peculiar loud noisy piping or wheezing. The face is flushed or cyanosed, covered with sweat, and the neck muscles are prominent; inspiration is short; respiration is not accelerated, and little air enters the lungs. A paroxysm of coughing

and expectoration gives relief, and may even terminate the dyspnea; sleep intervenes, or a slight lull occurs before another paroxysm. The dyspneic attack may last for an hour or be prolonged, with more or less severity, for several days. The patient is left more or less exhausted and with a cough for several days. During the attack the thorax is expanded and fixed; the diaphragm only slightly moves; the spinal muscles are rigid; inspiration is short and expiration is prolonged; the face pale, anxious in expression; speech is impossible, and later, the face is covered with perspiration. Dry, loud, wheezing, whistling, sibilant and sonorous rales are heard on expiration; later, bubbling rales and vesicular breathing, when the air enters more freely. During the height of the attack, vesicular breathing is hidden under the louder sounds.

Percussion shows a marked hyper-resonance over both lungs, due to an acute emphysema, or a vesiculo-tympanitic note (band-box tone of Bamberger). Cardiac and hepatic dullness are diminished but return to normal at end of attack. After many recurrences, the condition tends to merge into a permanent and chronic emphysema.

During the intervals there are the usual signs of bronchitis, or very little change from normal.

Subluxations are apt to be found from the occiput to the coccyx but those of the third to fifth cervical, second to fifth dorsal, and of ninth and tenth dorsal are particularly common. During the attack the whole spinal musculature is firmly contracted. There are changes in the natural curves of the spine, asthmatic hump-back, a posterior condition of the lower neck and the upper dorsal is frequent, or there are irregular short curves, the whole spine being stiff and the chest nearly immovable.

The blood shows a great increase in the eosinophilic leucocytes, often to 20% of the actual leucocyte count. Very high eosinophile counts are reported. The blood pressure is generally reduced. **The sputum** is expelled with difficulty and is distinctive, consisting of ball-like gelatinous masses (pearls of Lænnac), which can be unfolded and found to be casts of the small bronchioles; contains Curschmann's spirals of two sorts, one of spiral threads with eosinophilic leucocytes entangled in the meshes, and the second with a clear central filament surrounded by a spiral network of strands of mucus. Later in the condition, the filaments are replaced by octahedral phosphatic crystals (Charcot-Leyden crystals) in the now muco-purulent sputum.

Treatment. In a few cases, adjustment of the upper thoracic vertebræ and related ribs gives permanent relief, especially when this is done during the intervals of the attack. Occasionally the same work done during an attack gives immediate and permanent relief.

"During the attack, raising the first, second and third ribs may give relief."
—Meacham.

"Heavy movements, springing the spinal column generally, and raising the ribs, freeing the neck structures, with the patient first upon the side, then upon a stool, gives immediate relief."—S. C. Edmiston.

In the intervals, the general health must be built up by nutritious, easily digested foods, the personal habits regulated if necessary. It is often necessary to teach the patient a more rational view of life and its accidents so as to prevent emotional storms.

Prognosis. The disease may be intractable. Recovery is more frequent under osteopathic care; the paroxysms are relieved more quickly and the patient does not have to recover from the effect of drugs. Death seldom occurs from pure asthma.

Sequelæ. The condition results in emphysema of greater or less degree, dilatation of the right heart with subsequent dropsy, chronic bronchitis, or cerebral embolism. Sequelæ are best prevented by early attention to the asthma and, if possible, its permanent relief.

BRONCHO-PNEUMONIA

(Catarrhal pneumonia; lobular pneumonia; capillary bronchitis; suffocative catarrh)

Broncho-pneumonia is an acute catarrhal inflammation, affecting the extremes of life, limited to the mucosa of the smaller and terminal bronchial tubes or bronchioles, and the alveoli, caused by the pneumococcus, bacillus tuberculosis, or a mixed infection; characterized by fever, impeded and increased respiration, impeded circulation, short cough, scanty expectoration, symptoms of non-aeration of the blood, and great depression. Both lungs are affected.

Etiology. It often occurs as an extension of bronchitis and infection by a mixed bacterial flora; follows the infectious fevers, particularly measles, pertussis, and influenza; attacks those suffering from tuberculosis, rickets, and other debilitating diseases; and may be an infection by the bacillus of tuberculosis.

An acute primary form attacks children under two years in good health, and is probably a pneumococcus infection. There are aspiration and deglutition forms, and it also occurs after ether anesthesia.

Diagnosis. It is usually preceded by a mild bronchitis, the onset being gradual with chilliness or chills, rise of temperature 102° to 104° F. of a typical remittent character; the pulse rate increased, 100 to 120 per minute, somewhat compressible; the skin is hot, the face flushed, the head, neck, and upper part of the body may be covered with perspiration. The breathing becomes rapid, 40 to 80 per minute, shallow, and difficult with an expiratory moan,

dilating *alæ nasi*, and use of the accessory muscles. Inspiration may be easy or difficult but is always imperfect. There is a progressive dyspnea with orthopnea, followed by the onset of cyanosis, with inspiratory retraction of the base of the sternum and lower costal cartilages. The cough is dry, short, hacking, painful, and soon followed by more or less copious muco-purulent expectoration. Occasionally in children, the symptoms are predominantly gastro-intestinal or cerebral.

As the cyanosis develops, the pulse becomes feeble and flickering; the cough is slight and suppressed; general venous congestion is indicated by the livid countenance; lips and nails, blue; surface, cold and often covered with a clammy perspiration; the mind, dull. In children, stupor and convulsions rapidly supervene. The expectoration is scanty, viscid, and difficult to raise; the little patient usually swallowing what sputum it does raise; or it almost ceases. Death follows from apnea and depression.

The unfavorable symptoms are pale and livid countenance, bluish lips, dull eyes, restlessness giving place to apathy and a progressively increasing somnolence. Defervescence is by lysis and is rapid, although several weeks may elapse before complete recovery. The duration is from one to three weeks; rarely to three months.

Suppuration and gangrene often follow the aspiration and deglutition forms. A fibroid change is the common termination when the causal agent is the bacillus tuberculosis.

Increased vocal fremitus is present if large areas are involved. The intervening healthy lung gives a more or less hollow or tympanic note; there is increased resistance; when portions of lung are collapsed, there are circumscribed areas of dullness, these being sometimes shifting. The changes are most marked in the lower lobes posteriorly, and there may be compensatory emphysema in the upper lobes. During the first part of the disease, there is a feeble, high-pitched respiratory murmur which becomes distant and harsh as the disease progresses, or there may be a diffuse, or basic vesiculo-bronchial breathing. Expiration is lengthened, jerky, harsh and grunting. Persistent subcrepitant double rales are heard over limited areas, particularly on either side of the spine, followed in severe cases by large mucous rales. There may be undefined mucous clicks on forced inspiration. Sometimes there are patches of tubular breathing. Vocal resonance is increased. The urine is febrile.

The sputum is mucoïd or muco-purulent, glairy and viscid, and may be somewhat rusty or blood-streaked. It is difficult to raise and almost never typically rusty, ceasing with failing strength.

Subacute and chronic forms are known, presenting the same general and physical symptoms but marked by longer duration and greater exhaustion.

Treatment. The patient is confined to bed in a well-ventilated room of even temperature, 65° to 68° F., the air being moistened by steam. The position should be changed frequently in the aged and in the very weak.

“Feed milk, eggs, broths, ice cream and gruels freely; also give plenty of water to drink, and keep the organs of elimination wide open. Look carefully for upper dorsal lesions above the eighth, also the corresponding rib lesions, which are so often found in conjunction. Protect the chest by a cotton batting jacket, but I prefer to omit the antiphlogistine. Ice bags over the chest give comfort. In cases with high fever, sponge the patient or apply the wet pack. Keep close watch on the heart for signs of failure, and give general relaxation to assist the circulation and raise the left ribs to relieve the heart.”—W. H. Bedwell.

Reduction of the temperature is best secured by deep, steady pressure in the suboccipital fossa, or in the mid-thoracic region. During convalescence, the child must be carefully guarded to prevent relapse, and be built up by tonic treatment.

Prognosis. In the primary cases, it is good, recovery following prompt and thorough treatment.

In feeble and debilitated children and in the aged, it is unfavorable, although recovery may occur in apparently very serious cases. In weakly subjects, it may terminate fatally after a protracted course or develop into tuberculosis. The aspiration and deglutition forms are usually fatal.

CHAPTER XXII DISEASES OF THE LUNGS

CONGESTION OF THE LUNGS

Active congestion is an early stage in many pulmonary affections, although this may include some of the abortive forms seen during epidemics of the infective lung diseases. It is marked by initial chill, pain in the chest, dyspnea, moderate cough, temperature 101° to 103° F.; the physical signs being defective resonance, feeble sometimes bronchial breathing, and fine rales. Simple congestion clears while the more serious diseases increase in severity.

Passive congestion occurs from three classes of causes: Mechanical congestion is found whenever there is any obstacle to the return of the blood from the lungs to the heart or, more rarely, from the pressure of tumors; and is marked by dyspnea, cough, frothy, often blood-stained, sputum containing "heart disease cells." Passive congestion occasionally results from injury or organic brain disease. Hypostatic congestion is found in long-continued fevers and adynamic states, the bases of the lungs being deeply congested partly as a result of gravity, but chiefly by the weak heart action, the general symptoms being absent. The physical signs of passive congestion are slight bilateral dullness, feeble, sometimes blowing, breath sounds, the bases posteriorly being particularly affected, moist rales, and sometimes increased vocal fremitus.

Treatment. This is the same as the treatment of the first stage of pneumonia (q. v.).

PULMONARY HEMORRHAGE

(Hemoptysis; broncho-pulmonary hemorrhage; bronchorrhagia)

Hemoptysis is the expectoration of blood, pure or mixed with air, usually bright red in color, following the act of coughing.

Etiology. Pulmonary hemorrhage may be caused by tuberculosis and other pulmonary diseases; excessive cardiac action, particularly in the presence of mitral lesions, when it may be profuse and recur at intervals for years; aneurysm rupturing into the bronchial area; cancer or ulceration of the larynx, trachea, or bronchi; gangrene or infarction of the lungs; traumatism or excessive bodily exertion; in hemophilia, purpura, and scurvy; rarely as an attempt at vicarious menstruation; recurring hemoptysis in arthritis subjects; endemic hemoptysis (see under animal parasites).

Diagnosis. The hemorrhage occurs suddenly, is rarely preceded by epistaxis, cardiac palpitation, or some difficulty in breathing; begins with a warm sensation under the sternum, tickling in throat, sweetish taste in the mouth and coughing to remove these sensations. It is followed by a warm, saltish, bright red, frothy, alkaline liquid, gushing from the mouth and nose, composed of blood mixed with air and mucus.

The appearance of the blood depresses the patient; he becomes pale, and often faints. The attack may subside within a half hour or several hours, returning for several days, the sputum being either bloody or blood-streaked. There may be a slight febrile reaction and chest pains afterward as a result of inflammation at the site of bleeding.

Auscultation reveals coarse, bubbling rales in circumscribed areas. It is usually better not to examine the chest until the hemorrhage is stopped.

Diagnosis must be made from epistaxis by absence of air bubbles and by inspection of fauces and nasal cavities; from hematemesis, by the blood being vomited instead of expectorated, and being dark-colored, clotted, mixed with acid stomach contents, and followed by black tarry stools, with absence of rales in the chest. The exceptions are when the blood from the lung is swallowed and then vomited; and when a large gastric artery is eroded by ulcer, but the raising of such blood is preceded by epigastric pain and the blood is rarely frothy.

Treatment. The patient should be put to bed in the dorsal semi-recumbent position, or lying flat upon the affected side (denoted by the bubbling rales). The blood can be diverted from the lungs by giving steady pressure at the sides of the eighth to the twelfth thoracic spinous processes; by applying ice bags to the affected side; by applying heat to the extremities and the abdomen; or, less effectively, usually, by bandaging the arms and legs to delay venous return. Certain drugs, as morphine, may quiet the patient and diminish bleeding, but the danger of these is great; the throat reflexes are lost, the patient may drown in his own blood, or he may succumb to atelectasis or pneumonia. No food or liquid should be given for about six hours after the hemorrhage stops, and should then be only small amounts of very cold liquids, or ice cream. Prevention of later attacks depends upon finding and removing the cause of the hemorrhage.

PULMONARY APOPLEXY

(Hemorrhagic infarct; diffuse hemorrhagic infiltration)

This is an uncommon form where the blood is effused into the alveoli and interstitial tissues. It occurs in chronic heart disease, particularly mitral lesions,

in thrombus or embolus of the pulmonary artery in septicemia, pyemia, malignant fevers, and in certain brain diseases. The symptoms are indefinite, usually those of pulmonary embolism and thrombosis. If the injury is very large and in the lower lobe, there are signs of consolidation with blowing, breathing and pleuritic friction.

Treatment. Perfect rest in bed with the head and shoulders elevated, with absolute quiet insisted upon, the patient being turned upon the affected side, if it is known, is essential. The first thing to do is to reassure the patient. Then deep steady pressure from the second to the fifth dorsal vertebræ decreases the cardiac action. Pressure near the ninth and tenth lowers blood pressure, the blood is drawn into the abdominal veins. No corrective work should be attempted until the bleeding is controlled. As soon as possible after the hemorrhage, correction of the subluxations found, usually at the third dorsal, sometimes from second to the seventh dorsal vertebræ, clavicles, upper ribs, or in the cervical region, will assist in preventing a recurrence. The diet must be bland and non-irritating, with cool drinks, and ice to dissolve in the mouth. The success of treatment depends upon the primary disease, and measures must be used to combat it.

PULMONARY EDEMA

(Dropsy of the lungs)

Pulmonary edema is an accumulation of serous fluid in the air vesicles, bronchioles, and interstitial tissues of the lungs, associated with conditions favoring hypostatic congestion, and clinically marked by dyspnea, cough, and expectoration of frothy, blood-streaked sputum.

Etiology. It is associated with morbid blood states as Bright's disease, anemias, alcoholic excesses, and with conditions favoring hypostatic congestion, as cardiac valve lesions, malignant fevers, paralysis, and long-continued lying on the back. It may occur after the use of pilocarpin. The condition may also follow aspiration of the thorax. Upper thoracic and rib lesions predispose.

Diagnosis. The onset is usually sudden with dyspnea or orthopnea; the breathing is hurried, laboring and rattling; all the accessory muscles are used. Pain in the chest, sense of oppression and anxiety are extreme. The cough is short, constant, and harassing, followed by expectoration of copious, foamy, serous, blood-streaked sputum. The cardiac action is tremulous or feeble. The face is flushed at first, but as the left ventricle fails, or if the effusion into the alveoli prevents the entrance of sufficient air, symptoms of cyanosis rapidly follow, as shown by the feeble pulse, cold surface, shallow hurried breathing, suppressed cough, restlessness replaced by stupor, which soon deepens into coma.

Percussion is not resonant at first, soon becoming dull at the bases posteriorly. The breath sounds are deficient, weakened, with subcrepitant and bubbling rales of an unusually liquid character. The second pulmonic cardiac sound is accentuated. Hypertension usually precedes the edema.

The treatment is that of the cause, by removing the obstruction to the circulation and securing free elimination. Relaxation is indicated; raise the ribs and clavicles to relieve the dyspnea. Inhalations of oxygen may be necessary in severe cases.

Prognosis. Pulmonary edema may prove fatal within a short time, or be relieved to recur later. It is especially grave when complicating pneumonia, and in cardiac or renal diseases. In the majority of cases it is a terminal affection.

COLLAPSE OF THE LUNG

Collapse of the lung is a part of other diseases, but is associated with definite physical signs, and is of several types.

Congenital collapse, or atelectasis, occurs in weakly new-born in whom the inspiratory power is not sufficient to properly inflate the lungs.

Cases due to pressure from without, as in pleural or pericardial effusion or pneumothorax, may present collapse of the whole lung.

Cases are sometimes due to wounds of the chest-wall and perforation of the pleura.

Ordinary or lobular collapse often occurs in those cases of bronchopneumonia which complicate or follow measles, whooping cough, or other conditions.

Collapse may be due to paralysis of the respiratory muscles, the elastic recoil of the lung tissues being aided by absorption of air by the blood vessels.

Diagnosis. If an extensive area is involved, any existing dyspnea becomes increased, the pulse more rapid, and cyanosis may follow. In slight cases, the symptoms of the primary disease only are present—the “grippy chest” of milder cases of bronchopneumonia. If the area is extensive, dullness and possibly tubular breathing are present.

Auscultation discloses subcrepitant rales and weakened respiratory murmur.

Treatment. The primary disease must receive first attention. The patient must be taught full breathing, holding the lungs full of air for progressively lengthening periods. If the heart is good, cold shower baths, or having cold water poured upon the back of the neck, stimulates the respiratory organs. Care must be used, lest the shock to the heart be serious.

Prognosis. When the condition is due to pressure, as in emphysema, the outlook is very grave. When the area involved is not great, and no active infectious agent is present, symptomatic recovery may be expected.

EMPHYSEMA

(Alveolar ectasis)

This term is applied to several rather widely different conditions, all of which are characterized by the presence of abnormally large air spaces in the lungs. Two classes are recognized—interlobular and vesicular.

Interlobular or Interstitial Emphysema is the presence of air spaces outside the lung cavity, in the interstitial tissues, or rarely entirely outside the organ. It is due to rupture of the alveolar walls during violent expiratory effort. The causes include: violent coughing, as in whooping-cough or bronchitis; urgent straining, as in parturition, defecation, muscular effort, or hysterical fits; and injuries to the lung, as stab or gunshot wounds, etc. The air usually escapes upon the anterior aspect of an upper lobe; if it escapes from other areas, it is apt to work upward through the mediastinum, until it reaches the neck region, when its further progress is impeded. One of my cases (Burns) had a sac as large as a walnut, upon the upper aspect of the left superior lobe. Unless bacteria are carried in with the air, no harm results. No treatment is required.

Vesicular Emphysema is due to dilatation of the alveoli. Several types of this are recognized, each with certain peculiarities.

Compensatory or Inspiratory Emphysema is a condition in which a portion of the lung expands to take the place of a collapsed portion, as in bronchopneumonia, pleuritic adhesions, or in an area of old tubercular cicatrice.

Atrophic or small-lunged emphysema is due to primary senile atrophy of the lungs, the chest and lungs being small.

Hypertrophic, substantive, or expiratory emphysema, which is the usual form, is due to those causes which keep up a more or less persistent high intra-alveolar tension, such as playing on wind instruments and glass-blowing; occupations involving severe strain or heavy lifting; chronic bronchitis; heredity, probably depending upon congenital weakness of the elastic tissues of the lung. Any of these causes produces overdistension of the vesicles; atrophy of their walls; obliteration of the blood vessels and a consequent diminution of the oxygenating area; changes in the chest contour; changes in the right heart; general changes due to imperfect oxygenation; and often an associated bronchiectasis. The condition is clinically marked by the physical signs, dyspnea, and a chronic bronchitis.

Diagnosis. The general symptoms are not many until the condition is well advanced and consist of dyspnea and cyanosis from the deficient aeration. These are greatly increased on exertion, and

the patient is able to go about with cyanosis of an extreme grade; more or less cough from associated bronchitis; retention of waste products within the blood causing various disagreeable symptoms; the temperature is subnormal; the surface of the body, cool; and the pulse is weak. Hypertrophy and dilatation of the right heart with its symptoms of general venous stasis follow.

The chest is large, barrel-shaped, with round shoulders; the dorsal curve of the spine is increased and rounded; the scapulæ are almost horizontal, there are prominent sternum, clavicles, and sterno-mastoid muscles, a deep sternal fossa; the intercostal spaces are widened, the vertical diameter is elongated. The neck veins are distended. The auxiliary muscles are used. Prolonged expiration with a short inspiration is noted. A zone of dilated venules may be found along the line of attachment of the diaphragm.

Vocal fremitus is diminished, the cardiac impulse is depressed and nearer the sternum, the apex being only rarely palpable. Epigastric pulsation may be present.

There is a drum-like note to the hyper-resonance which extends to the seventh and eighth rib anteriorly and to the twelfth posteriorly, if the whole lung is involved. The areas of cardiac and hepatic fullness are encroached upon; the margins of the lung are fixed in the position of full inspiration from the disappearance of elastic tissue. The vesicular murmur is soft and weak, even absent, depending upon the amount of bronchitis present. The breath sounds are wheezy and harsh on expiration. The first cardiac sound is lessened in intensity and duration; the second sharply accentuated.

Treatment. The bronchitis often associated with emphysema must receive attention. Whatever other causative factors are found must be removed, if this is possible. During expiration, an attendant should exert pressure upon the thorax, relaxing as inspiration occurs. Inspiration against pressure upon the ribs gives exercise to the inspiratory muscles, though this is of less importance. A nurse can be taught to give this manipulation, and the exercises should be selected after due study of the patient's condition, and especially the positions of the ribs. It is best to see that rib lesions have been well corrected before any strenuous measures are advised. Cardiac lesions are to be suspected, and no violent exertion permitted until the suspicion has been allayed.

Breathing in compressed air, and breathing out into negative pressure, tends to remove the superfluous air, and to give exercise to the muscles of respiration. Raising the ribs and clavicles often gives relief.

The general health must be maintained in every way. The hygiene, exercise, diet, are those of the underlying cause, plus the measures indicated in chronic bronchitis. Sudden attacks of

dyspnea may occur, and these, though rarely fatal, are serious. In such cases oxygen may be required for relief.

The **prognosis** is clouded. Patients seldom die from the condition. When the emphysema is associated with asthmatic attacks, the prognosis is more serious. Cardiac changes are frequent, and death may be due to injury to the right heart. General edema may terminate the condition.

PULMONARY GANGRENE

Infection of the diseased tissue by any of the proteolytic organisms may result in gangrene of the lungs. It may follow abscess or pneumonia, especially in very old people, or those in whom the bodily resistance is greatly lowered for any reason. The most important distinctive diagnostic symptoms are the odor of the breath and the general symptoms of toxemia. Treatment of this disease is of very little use. Death usually supervenes within a very few days.

ABSCESS OF THE LUNGS

Pulmonary abscess results from the infection of the lungs by any of the pyogenic organisms. Staphylococcus or streptococcus are the most frequently found. These may infect tissue already diseased by pneumonia or tuberculosis.

“**Cold Abscess**” may be due to infection by the tubercle bacilli, or by actinomyces. Abscess of the liver may penetrate the diaphragm and drain through the lungs. In this case, the presence of bile in the sputum gives the diagnosis.

Treatment. Drainage through the bronchi may be sufficient, and recovery occur spontaneously. If drainage is not complete, the treatment is the surgical evacuation of the pus. Resection of one or more ribs may be necessary.

In any case the treatment should include a careful examination of the condition of the liver and the kidneys. The circulation through these organs and the spleen should be kept very free, in order that the normal bactericidal conditions of the body may not be interfered with.

The prognosis is grave in any case.

PNEUMOKONIOSIS

This term is applied to the condition of the lungs almost universally present in the cities, or even in country places, where soft coal is burned. The inhalation of particles of soot is inevitable. These are taken up by the white blood corpuscles, or are passed

through the alveolar epithelium into the lymph channels. The connective tissues are colored dark gray or black, and the bronchial lymph nodes are very deeply colored. The alveolar cells themselves may be permeated with the black particles.

When this discoloration is due to particles of coal, as in miners, the term "anthracosis" is used.

Those who work in stone and breathe the fine particles of this dust suffer from "chalicosis."

Those who work in iron and breathe the fine particles of this dust suffer from "siderosis."

In all of these cases, the resisting capacity of the lungs is diminished appreciably. The injury to the epithelium lowers the resistance to infections, and thus, pneumokoniosis must be considered one of the causes of pneumonia, tuberculosis and other less common disorders.

RARE PULMONARY CONDITIONS

Hydatid Cysts may be found in the lungs.

It is possible to diagnose this condition only when the hooklets are found in the sputum which, in such cases, is usually thin and watery. Lung stones are rarely found.

Bronchial Calculus. C. C. Wright reports a case of bronchial calculus with recovery. The calculus was "a hard, jagged stone of a dirty white color, nodular coral-like surface, and under strong glass looked like bone. Its dimensions were 12 by 9 by 6 m.m., and weight 10 grains. No blood followed it and no soreness preceded or followed its expulsion."

Primary Carcinoma is very rare in the lungs. It is usually found in the upper lobe of the right lung, and it may attain great size. Secondary carcinoma is usually from mammary carcinoma, though it may follow similar growths anywhere else in the body. These secondary tumors are usually small and very numerous.

Sarcoma is usually secondary, and its most frequent origin is in the pulmonary lymphatic glands.

Diagnosis. Pulmonary neoplasms are rarely suspected ante mortem. The X-ray may give the diagnosis. The only treatment is symptomatic, and the prognosis is extremely grave. Death usually occurs within a few months after the first symptoms are noticed.

PLEURISY

(Pleuritis)

Etiology. Inflammation of the pleura is usually the result of inflammation of the lungs. It is almost invariably present in pneumonia, tuberculosis, bronchitis, or in almost any other pulmonary

inflammation. The few primary cases are due either to trauma or to severe exposure to cold and wet. Repeated attacks indicate pulmonary tuberculosis.

Systemic diseases, such as rheumatism, nephritis, alcoholism, may cause pleurisy with little or no lung involvement. The right pleura may be inflamed in cases of hepatitis. Three forms of pleurisy are described: the acute, subacute, and chronic.

Acute fibrinous pleurisy, dry pleurisy, or acute plastic pleurisy is the most common condition. The disease begins with a sense of discomfort, followed by dyspnea and pain in one side of the trunk, "stitch in the side." There is a little cough, which is suppressed on account of the pain which it produces. A slight fever may be present. The symptoms may be very mild and the attack last only a few days. At other times, the symptoms are much more severe and acute, and may last for several weeks, or may terminate fatally.

Treatment. The most important part of the treatment is the relief of the pain. Painful areas may be strapped with bands of adhesive tape. Rib lesions should be corrected at the beginning of the disease, if this is possible. It is frequently impossible to correct the rib lesions after the inflammation has become pronounced. Hot and cold applications may relieve the pain. Counter-irritation may be indicated. Rest in bed is always necessary during the acute symptoms.

Prognosis. Most cases recover in a few days unless there is some marked pulmonary disease. Every attack predisposes to further attacks. When the inflammatory process does not disappear, the condition may pass into the subacute or the chronic form.

Subacute pleurisy, pleurisy with effusion, sero-fibrinous pleurisy, may follow the acute attack, but it usually begins with a much slower sequence of symptoms. After a day or two of pain, slight cough, dyspnea, the normal secretions begin to be considerably increased. The fluid may accumulate to such an extent as to exert compression upon the lungs or the heart. Dyspnea is progressively more marked. The cardiac disturbances may be very severe.

The diagnosis rests upon the area of dullness which may change with the changing position of the patient. The normal heart and breath sounds are muffled by the fluid over them.

Diaphragmatic pleurisy is associated with nausea, vomiting, pain in the pit of the stomach, and other symptoms of gastrointestinal disturbances. The X-ray may be helpful in diagnosis.

Encysted effusion is due to the adhesion of the inflamed pleural membranes around an accumulation of fluid which may increase in quantity through a considerable extent.

Interlobar pleurisy occupies the region between the lobes of the lungs and may drain into a bronchus. **Hemorrhagic pleurisy** is due to the extravasation of blood into the pleural exudate.

About three-fourths of the cases of subacute pleurisy are tubercular in origin, though the tubercle bacilli are rarely found in the fluid. The condition may be a part of the symptoms of acute articular rheumatism.

A fever of usually not more than 103° F. may be present. The whole course of the disease is slow and convalescence is usually greatly retarded. Tubercular cases often recover from the pleurisy, though the pulmonary disease may follow its usual course.

One of the most important factors in the cause of pleurisy is the existence of rib lesions. The inflamed area may be covered by the ribs or may be on a side of the thorax opposite the ribs, whose adjustment is imperfect. It must not be forgotten, however, that the reflex muscular contractions due to the inflamed pleura cause the approximation of the ribs and the disturbance of their structural relations.

Chronic adhesive pleurisy may follow any of the other types of pleurisy mentioned. It may or may not be associated with considerable effusion. Sometimes both forms are found present at the same time; that is, the two layers of the pleura may be adherent with connective tissue bands of varying strengths, while the areas not adherent are engaged in pouring out an abundant fluid. This form is especially frequent in chronic rheumatism and in nephritis. The pain is well localized and is increased by movements of the thorax, or the arms, by deep respiration, or by coughing. The effusion may embarrass the respiration and the heart's action to a considerable extent.

Paracentesis is necessary when the accumulation of fluid becomes great enough to interfere with the respiration and the circulation to any great extent. It may have to be repeated many times. Occasionally a single draining is followed by adhesion of the pleural membrane.

This form does not usually shorten life, but it predisposes to other diseases, and may make life a very uncomfortable matter.

EMPYEMA

(Purulent pleuritis or pleurisy; pleuritic abscess)

The infection of a pleuritic exudate may result in empyema. The infectious agent may gain entrance into the bronchial cavity by careless paracentesis, or it may be carried from an infectious area elsewhere in the body by means of the blood stream. Direct extension from pulmonary abscesses or from the liver or any other abdominal abscess through the diaphragm is rare. An examination

of the pus may show any of the pyogenic organisms singly or in combination.

Diagnosis. The dull area is usually rather less in extent than is the case in pleurisy with effusion. The pain may or may not be very severe. The constitutional symptoms are much more marked than in other forms of pleurisy. The fever may reach 107° F. The blood shows marked leucocytosis. Peptonuria and indicanuria are usually present. Gastro-intestinal symptoms are those ordinarily associated with the fever.

Pulsating empyema (pulsating pleurisy, empyema necessitas), is due to the presence of considerable amounts of pus, walled off and circumscribed by adhesions of the two pleural layers around it.

Treatment. The pus should be evacuated and the wall of the cavity thoroughly cleaned as soon as a diagnosis is made. Resection of one or more ribs is often necessary in order to provide sufficient drainage.

With early drainage, rest in bed and the treatment of such symptoms as may complicate the case, recovery should be expected. In old people, or in those in whom the vitality is greatly lowered for any reason, the prognosis is very serious.

Sequelæ. The danger of metastatic abscesses must be kept in mind. The pus or bacteria may be carried in the blood to the liver, the brain, kidneys, or any other organ in the body. With septicemia, the prognosis is most serious.

PNEUMOTHORAX

Puncture of the thoracic wall, or as the result of an injury to considerable of the alveoli, may permit air to enter the intrathoracic cavity after pulmonary abscess. This condition is called pneumothorax. Rarely, aerogenic organisms may infect the pleural cavity. The treatment is surgical.

HYDROTHORAX

(Dropsy of the pleura; thoracic dropsy)

The accumulation of non-inflammatory fluid in the pleural cavity is due to the same condition which causes dropsy elsewhere in the body; that is, nephritis, cirrhosis of the liver, valvular lesions of the heart, etc. The treatment is that of the underlying disease. Paracentesis may be necessary.

DISEASES OF THE MEDIASTINUM

The diseases of the mediastinum are not very frequently found. Lymphadenitis may be present. Abscess in the mediastinum is due

to about the same causes as before mentioned for empyema. Either abscess or tumors may extend into the mediastinum from the esophagus, bronchi or lungs. Hemorrhage of the mediastinum is due to rupture of a thoracic aneurysm.

The symptoms produced by these tumors are mostly due to pressure. In metastatic growths the diagnosis rests upon finding the original tumor. In certain lymphomatous tumors, excising a small gland from the neck for microscopical examination may give useful information.

Compression of the aorta may give murmurs like those of aortic stenosis. Unequal pulse in the two radials is apt to follow compression of the left subclavian or the innominate artery. When the esophagus is affected, dysphagia and pain result. The bougie or X-ray examination, especially with thick barium paste, should show the cause of the symptoms. Pressure upon the phrenic may give obstinate attacks of hiccough. Pressure upon other nerves gives varying pain, weakness, pupillary disturbances, gastric symptoms, hyperidrosis and other symptoms referable to the function of the affected nerves.

The position and shape of the mediastinum varies normally during respiration, and abnormally as the result of pathological changes in its neighboring organs. Pleural or pericardial effusions, pneumothorax, and other variations in the size or the shape of the lungs or the heart, may cause marked variations in the size and form of the mediastinum. Inflammatory changes may result in cicatricial thickening and this may lessen the normal elasticity of the mediastinal walls; the contraction of this new tissue may pull the mediastinum into a distinctly lateral position.

Neoplasms of the mediastinum include those from lymph nodes, as in Hodgkin's disease or lymphadenosis; sarcoma, which may be primary or secondary; carcinoma, which is probably always secondary, or the peculiar thymus-sarcoma or thymus-carcinoma. Dermoids may be found in the mediastinum. Supernumerary thyroid masses may be found; these cause no symptoms unless they undergo hypertrophy or hyperplasia, as in goiter. Echinococcus cysts, tubercles, gummy masses, are not often found.

In all these cases, diagnosis is difficult or impossible and treatment extremely doubtful. The X-ray may be of value in diagnosis. The prognosis is always very serious.

PART IV DISEASES OF THE BLOOD

GENERAL DISCUSSION

The blood is one of the most complicated of the tissues of the body. It differs from ordinary tissue in that its cells are not formed within it, unless we should include the red bone marrow and the lymphoid tissues of the body as part of the blood system. The intercellular substance of blood serum is not derived from the activity of the blood cells, but is composed of the material poured into the blood through the lymphatic duct, absorbed from the digestive tract, picked up all over the body with a load of the products of cellular metabolism, and it contains dissolved within it the internal secretions, waste products and many highly complex substances which are being carried for the use of other cells of the body, or which are on the way to elimination.

The red blood cells of adult life are formed within the red bone marrow, and this is found plentifully within the ribs. The granular white blood cells are formed within the red bone marrow also; the hyalin blood cells are formed chiefly in the lymph nodes of the body and partly within the red bone marrow.

When this complex nature of the blood and the many sources of its various constituents are recognized, it is easily seen that the nature of the blood diseases and the causes of primary and secondary anemias must be extremely variable.

From the standpoint of the physician, the chief interest in the blood diseases lies in the fact that all the erythrocytes and all the granular cells are formed in the red bone marrow. This is found in the flat bones of the body; the skull, scapulæ, innominates and ribs are the most important areas of blood formation. Of these areas, the largest amount is found in the ribs. It must be remembered that the ribs receive nutrient arteries, veins and nerves by way of the foramina upon their lower edges. Man stands upright, and the weight of the thorax exercises a constant, though slight, pressure upon these vessels and nerves. The nerves are both spinal and sympathetic, as are the nerves of other vessels and active tissues. The spinal segments are subject to the effects of bony lesions, and thus these, as well as the effects of direct pressure, may be involved in the control of the blood-forming cells and the vessels which supply them.

In order to make good blood cells, the marrow must receive the materials from the blood brought to it. The necessary food ele-

ments must be taken into the body, properly digested, and absorbed and carried by the blood to the marrow; it is evident that anything which prevents the normal eating and digestion of food, the normal circulation of the blood, and the normal nervous control of the vessels and the intrinsic cells of the marrow, must inevitably affect the quality or the quantity of the blood cells being manufactured.

Infectious agents may be carried by the blood from one part of the body to another, as in arthritis; parasites may have the blood as their habitat, as in malaria; tumor cells, fragments of vegetations, and other foreign bodies may be carried in the current of the blood stream to various parts of the circulatory system, with serious or trivial effects upon physiological integrity. Thus is the blood an important factor in pathogenesis.

As the blood circulates through the body, it takes up various substances, the products of normal or abnormal metabolism. These exert various influences upon the blood cells in circulation, and also upon the hematopoietic cells in the bone marrow. These changes can be recognized from the study of the blood, and thus the blood is an important factor in diagnosis.

The blood serum contains within it organic and inorganic compounds of great complexity, including ferments whose number and function have been little studied. Some of these appear to be bacteriolytic, either directly or indirectly, while others digest foreign substances which gain entrance into the blood, or which result from thrombosis or other pathological states of the blood itself. The body is thus protected against disease, though this protection is not always adequate. The blood itself is an important factor in preventing disease and in promoting recovery.

The treatment of the blood diseases must be based upon these facts; and the only thing that can be done is to provide the marrow with good blood making materials, carried freely to the marrow and to provide that the drainage of the wastes from the marrow and from the blood itself shall be normal, and to remove anything which interferes with the normal nervous control of the tissues concerned in the feeding, manufacture, or cleansing of the blood.

CHAPTER XXIII

THE ANEMIAS

SECONDARY ANEMIA

The term anemia, which literally means "without blood," is now applied to a condition of the body in which the blood is low in hemoglobin. The blood may be low in hemoglobin, either because it contains fewer than the required number of red blood cells, each of which is itself reasonably normal, or it may be due to the fact that the individual cells carry too small an amount of hemoglobin, though the number may be almost or quite normal.

As the name implies, secondary anemia is due to the effect produced upon the blood by some disease of other organs of the body. These diseases affect the blood in varying ways, so that in a large majority of cases it is possible for an examination of the blood to determine the condition of many of the organs of the body and the source of origin of the disease. It is usually easy after a blood examination has been made to say whether there is present some primary disease of the blood, or the blood forming organs, or whether the entire blood picture is simply the result of a disturbed metabolism, or the disturbed function of diseased organs elsewhere in the body.

Anemia which is the result of sudden hemorrhage or of certain forms of malnutrition, has its hemoglobin diminished as the result of the loss of the red blood corpuscles. Anemia which is the result of slower chronic diseases, usually associated with disturbed circulation through the red bone marrow of the body, has usually a slightly diminished red cell count, but a large majority of the red blood cells contain less than the normal amount of hemoglobin. The amount of hemoglobin in each cell may, in some cases, be as low as one-fourth that present in a normal adult blood cell.

In secondary anemias a study of the white blood cells is of considerable importance. Pernicious anemia, as well as secondary anemia due to the action of non-inflammatory etiological factors, is characterized by a white blood cell count almost or quite normal, and in which the varying classes of white blood cells are about those found in normal adult human blood. In tuberculosis the white blood count shows an increase in the lymphocytes and decrease in eosinophiles. In the ordinary neuroses and in hysteria, the eosinophiles are increased and the polymorphonuclear cells are usually diminished. In nearly all secondary anemias due to the presence of intestinal parasites from the hookworm to the tape-

worm, the number of eosinophiles is very conspicuously increased. In secondary anemia due to purulent inflammations anywhere in the body, the number of neutrophiles is greatly increased. In all of these conditions the changes in the blood are of the degenerative type.

There is another form of anemia usually classed as secondary, in which the blood deficiency is of congenital origin. This is called a developmental type. While the underlying blood defect is congenital, these defects are often increased as the result of pathological conditions occurring at any time during the life of the individual. Congenital blood defects are recognized by the presence in the blood stream of immature or atavistic cell types. These include nucleated red cells, oval red cells, and poikilocytes. The white cell count shows an increase in the relative number of lymphocytes, amphophiles, myelocytes and mononuclear neutrophiles. When these cells are found in blood which is being examined for diagnostic purposes, the prognosis for complete recovery is made somewhat more grave, and in mental defectives complete recovery is scarcely to be expected.

Secondary anemias due to the presence of poisons may be pathognomonic. The basophilic stippling of the red blood cells in lead poisoning is characteristic. Toxins due to proteid decomposition, to the presence of bile in the blood, and to disturbance of the metabolism in constitutional diseases, injure blood cells more or less seriously. Naked nuclei, fractured cells, bloated forms, shadows, and poikilocytes are indicative of the presence of some toxin in the blood serum.

COSTOGENIC ANEMIA

(Burns anemia)

Costogenic anemia is a disease of the blood due to imperfect blood formation, resulting from deficient circulation and innervation of the red bone marrow, especially of the ribs, and characterized clinically by marked weakness, pallor, hemic murmurs of the heart, and other symptoms of anemia; by the low color index and the presence of immature and atavistic cells in the blood stream.

Etiology. The disease is due to disturbed activity of the hematopoietic organs, resulting from disturbed circulation through the red bone marrow, or from disturbed innervation of the vessels or of the active blood-forming elements.

Lesions affecting the circulation through the scapulæ, innominates, and skull are less important than lesions affecting the circulation of the comparatively much greater area of the red marrow in the ribs. The mobility of the thorax may be lessened, and undue pressure thus be brought upon the nerve trunks, the veins and the

arteries which enter the nutrient foramina of the ribs, by several different and various conditions. Perhaps one of the most frequent is the drooping of the thorax, which occurs in people whose muscles are atonic—who are weak from any cause, or whose daily lives do not include a sufficient amount of exercise. Partly because of faulty education in the line of self-control—which is wrongly interpreted as self-repression—partly because of improper clothing, and partly because of the stress of modern living, the ribs are allowed to droop more and more. Thus the circulation through the rib marrow is impeded, and thus the nerve centers in the spinal cord fail to receive their due and proper amount of stimulation from the joint surfaces and muscles.

Diagnosis. The onset is gradual, unless it follows some other disease. Weakness, insomnia or drowsiness, gas accumulations in stomach and intestines; tense, anxious expression; pale sallow skin—sometimes vascular dilatation may give rosy cheeks—slow digestion; and usually constipation, are present. The symptoms are not pathognomonic. The thorax is found rather rigid, with extremely small chest expansion in quiet breathing; rarely forced breathing gives a fairly satisfactory expansion. The intercostal muscles are usually hard, and show the intercostal depressions plainly. The urine shows lack of elimination; the quantity may be normal or slightly increased in twenty-four hours, with low sp. gr., sometimes 1002; low urea, low phosphates, low sulphates, less frequently low chlorides; no albumin, casts, or indications of organic disease. Excess of indican may be present; calcium oxalate is frequent.

The blood itself is rather characteristic. Coagulation time is increased; specific gravity and viscosity diminished; red cell count normal or only slightly diminished; hemoglobin 6 to 10 grams per 100 c.c. of blood (Meischer); 40% to 80% (Dare). The red cells are small, pale, vacuolated, sometimes nucleated. The white cell count is normal, slightly increased or slightly diminished. The hyaline cells are normal, or slightly relatively increased. (These, being formed in lymph nodes, tonsils, etc., are not affected by rib changes.) The mononuclear neutrophiles are relatively increased. The nuclear average of the polymorphonuclear neutrophiles is low. Vacuolated and atypical neutrophiles are often found. Basophiles, myelocytes and amphophiles may be found in considerable numbers. Nuclei in all granular forms present evidences of immaturity or degeneration—they may be swollen, vacuolated, extruded, ragged, or with variable staining reactions.

Treatment. The treatment is indicated by the etiology and diagnosis. Most important is the raising of the ribs, and the teaching of proper respiratory activities. Whatever is wrong with the patient's habits of living must be corrected. A diet which includes an abundance of green vegetables, meat, and fruits, with only a

moderate amount of starch and sugar, is best adapted to blood making.

Prognosis. With efficient treatment and obedience, recovery should be thorough and permanent. If the case is neglected, or if the bad habits are too hard to be overcome, the patient is apt to live a subnormal individual, or a chronic invalid until some intercurrent affection terminates his days.

Prophylaxis. This is easy. It is only to use the ribs freely; to compel free breathing, especially under emotional tension of any kind, and to refrain from any habits of dress, breathing or living that lessen the respiratory excursions of the ribs.

CHLOROSIS

Chlorosis, "green sickness," is a disease of adolescent girls, characterized by anemia of an edematous type, circulatory disturbances of a nervous type, and a varying number of neurotic symptoms. The name "green sickness" refers to the peculiar yellow-green color of the skin.

The etiology is not known. Various theories refer to the presence of characteristics which may or may not be themselves due to some preëxisting etiological factor. The disease being found in its typical form only in young girls, especially those who suffer from menstrual difficulties, compels the view that disturbed secretion of the ovaries is an important etiological factor. A somewhat similar condition has been reported in adolescent boys.

That the disease is associated with the first wearing of corsets gives another theory of the cause of the disease. Constipation, often of a very severe type, is almost always present. For this reason copremia may be considered of etiological importance.

The heart is often of small size, and functional cardiac murmurs are often present. Aplasia of the blood vessels is frequent. This gives color to the view that a developmental defect, becoming evident only when the onset of the puberty changes necessitates considerable increased strain upon these organs, is the true cause of the disease. Gastric ulcer and exophthalmic goiter are frequent complications.

Tuberculosis and other diseases associated with poor nutrition either in the individual or in her ancestors increases the tendency to chlorosis. A direct inheritance of chlorosis is not rare—in the Pacific College Clinic a chlorotic woman was examined, whose mother, grandmother and great-grandmother had all suffered from chlorosis.

Chlorotic girls have always deficient mobility and usually localized lesions involving the mid-thoracic region. The most frequent

lesion is a slightly posterior and decidedly rigid condition affecting the third or fourth to the tenth or twelfth thoracic vertebræ, and the related ribs. The chest expansion in both quiet and forced respiration is diminished; rarely, after a girl has taken breathing exercises or calisthenics the forced expansion may be increased. But in all except rapidly improving patients the respiratory excursion is diminished habitually. The fact that diminished oxygenation is habitual is shown by certain symptoms of the disease, and also by the constant sighing usually noticed.

Diagnosis. The disease is of gradual onset. The girl becomes weaker and paler, and gives evidences of cardiac difficulty. Sighing, emotionalism, dyspnea, palpitation, headache, abnormal appetites—clay-eating, pencil and hair-chewing—a greenish tint around the eyes and mouth, lack of interest in work or play, usually without emaciation, sometimes with increase in weight, are characteristic. The diagnosis rests absolutely upon the blood examination. The typical "chlorotic cell" is a large erythrocyte, swollen, pale, and spherical. It is present in other diseases, but not so frequently nor so typically as in chlorosis. The total amount of blood is increased.

An average of eleven typical cases of chlorosis examined at the Pacific College of Osteopathy gives the following results:

Hemoglobin, 40% (Dare).

Erythrocytes, 3,780,000 per cubic millimeter; 84%.

Color index, .45.

Poikilocytes always present.

Chlorotic cells always present.

Microcytes usually present.

Normoblasts usually present.

Leucocytes, 8,500 per cubic millimeter, many atavistic forms present.

Lymphocytes, 37%, or 3,145 per cubic millimeter.

Neutrophiles, 58.8%, or 4,978 per cubic millimeter; many fractured.

Eosinophiles, 1.3%, or 110 per cubic millimeter.

Basophiles, .3%, or 26 per cubic millimeter.

Amphophiles, few.

Arneth's index was shifted slightly to the left: Neutrophile nuclear average, diminished.

Coagulation, time increased.

Viscosity, diminished.

Platelets usually diminished.

Treatment. The treatment rests upon the facts as already discussed. The correction of the rigidity of the thorax, the drooping ribs, the spinal lesions, is an essential factor in restoring health. The circulation through the abdomen must be kept competent.

The ribs over the liver and spleen must be raised, and deep breathing exercises compelled. The respiratory expansion in quiet and forced respiration must be measured with a tape, and the findings recorded. At intervals of a few days to several weeks, the measurements must be repeated, and progress noted. If no progress is found, the girl is failing in her obedience to the instructions given her.

The pelvic condition must receive whatever attention is indicated by the gynecological examination. In neurotic girls, especially, this must be postponed, unless immediately urgent, and must be made under all precautions to avoid nervous shock. Correction of innominate or sacral lesions may correct the pelvic disturbance with no further treatment of any kind. The love affairs must be investigated; pseudo-romantic imaginations, the reading of love stories and too great indulgence in moving pictures or theatrical performances, especially with strong love interest, are to be interdicted. Good, clean, wholesome discussion of the problems of life, duty, death, birth, marriage, religion, poetry and romance helps to overcome any effects of emotional repressions which may be active in perpetuating ovarian congestion and respiratory inefficiency.

The constipation is best met by enemas to secure immediate cleaning of the colon, followed by the correction of the thoracic, lumbar and costal lesions. The better diet, the breathing exercises, with the correction of the lesions as noted, should be sufficient. Enemas may be used, if anything further is necessary. Purgative drugs are urgently to be avoided. The abnormal appetites are best gratified in a modified way—lemons or grape fruit may be substituted for vinegar; a largely cellulose diet usually prevents an appetite for hair, while honey, candy, and other sweets with meals make it easier to stop the candy-munching habit between meals. The necessary iron is best given in the form of chlorophyll or hemoglobin. The juices of vegetables and meats may be given, if the foods themselves are not tolerated.

If the weakness is profound, the patient should lie quietly for half an hour after meals; if she is given to day-dreaming, her waking hours must be filled with useful employment, preferably something in which she can be interested, and which requires her entire attention. Change of scene may be wonderfully effective, especially if the usual love affair looms big in etiology.

Prognosis. Recovery is usually gradual and uneventful and complete. If the girl who has had chlorosis becomes subject to hemorrhages, accident, or other cause of secondary anemia later in life, her blood is apt to show some chlorotic characteristics. But, unless there is some very efficient cause of anemia, she is apt to live her life out without any ill effects from her chlorotic experience.

HEMOLYTIC ANEMIA

(Primary anemia; idiopathic anemia; pernicious anemia; Biermier's disease; Addison's anemia)

This is a disease of the blood characterized by rapid and progressive destruction of the blood cells, with rapid but insufficient regeneration, progressive weakness to death, and for which no cause has been determined.

Etiology. The cause of the disease in its typical form is unknown. The state of the blood cells ante-mortem, and the pathological findings at autopsy indicate the presence of some intense hemolytic poison, which acts not only upon the red blood cells, but also upon the nervous system, and to a less marked extent upon the other tissues of the body. Anemia, not to be distinguished from the idiopathic type, is sometimes due to the bothriocephalus latus, the ankylostome duodenalis, the necator americanus, and perhaps certain other intestinal parasites. The frequent presence of dry tongue, sore mouth, deficient hydrochloric acid in the gastric juice, and intermittent diarrhea and constipation, suggest a gastro-intestinal origin for the destructive toxins. Gastro-intestinal malignant neoplasms also may give symptoms and a blood picture greatly resembling that of idiopathic anemia; exhausting diseases, chlorosis, pregnancies, syphilis, malaria, in their more severe forms, may be followed by anemias of the pernicious type, though less certainly fatal. In some cases successive pregnancies may be associated with a milder anemia of this type; the intervals between pregnancies being characterized by almost or quite normal blood counts. Before the age thirty-five, more women have the disease; after thirty-five, more men.

Pathology. The autopsy findings are typical. The yellow or greenish skin is characteristic; the fat is of a brilliant orange color. The muscles have an unusually deep and brilliant scarlet; while the blood remains for days uncoagulated, and flows like pink-stained water. The red bone marrow fills the long bones, and penetrates them, as well as the flat bones, almost or quite to the periosteum. Irregular and variable areas of degeneration are found in the spinal cord and the brain. These correspond to the nervous symptoms present before death. Atrophy of the gastro-intestinal glands is almost constant.

Diagnosis. Only after exhausting every possible cause of secondary anemia is the diagnosis of pernicious anemia possible, since so many of the cases above mentioned present fairly typical blood pictures. The symptoms are fairly typical, but not absolutely so; the onset is very insidious; the disease is rarely suspected until the weakness and pallor have become profound. The deficient hydrochloric acid is sometimes recognized early, in the search for a cause for the gastro-intestinal symptoms. This deficiency persists through the course of the disease. At first there are dyspnea, weakness, palpitation of the heart, pallor, easy fatigue, and perhaps

some gastro-intestinal or nervous symptoms. This is followed by progressing weakness and cardiac symptoms, increasing diarrhea, nausea and vomiting, perhaps some submucous or subcutaneous hemorrhages. Pain is infrequent and never severe, unless there is some intercurrent affection. Paresthesias, ataxias, paralyses, amaurosis, may suggest some structural disease of the nervous system—the patient may first seek advice concerning the nervous system. The skin changes from waxy white or yellowish to a peculiar lemon yellow color, sometimes a greenish yellow is present; the conjunctivæ and mucous membranes are of the same tint. Emaciation is not marked; the apparent amount of fat may increase. Mental changes do not appear until the weakness is almost deadly, then there is somnolence.

Cardiac murmurs are often found; the pulse may be weak and rapid, or it may be full, "water hammer," like that of aortic regurgitation; though this lesion is rarely present. The urine shows the pigment in excess, excess of indican, sometimes excess of uric acid and urea. Albumin and blood are not usually present.

With progressive weakness and dyspnea, the patient finally becomes bedfast, and dies after more or less stupor and mild delirium. The termination may appear sudden; the patient may be walking, even upon the streets, until a very few days before dissolution.

Blood. The blood changes are remarkable. The hemoglobin is reduced to a very low figure (1.5 grams per 100 c.c. in one P. C. O. patient). Hemoglobin percentages of 20, (Dare) and even lower are frequently reported.

The red cell count is even lower than the hemoglobin percentage; the color index is thus above one, which is normal. A color index of 1.3 or 1.5 or even higher is not unusual. This factor is of value in diagnosis; while a high color index may be found in secondary anemia due to parasites, etc., yet in these the color index is almost never so high, so constantly, as in idiopathic anemia. The red cells include abundant poikilocytes, megalocytes, microcytes, normoblasts, and microblasts. Vacuoles, ring-like bodies, stippling, and other degenerated forms appear. The megalocytes are pathognomonic; the high color index is due to their abundance. Oval nucleated cells, like those of nonmammalia, are sometimes found. The finding of considerable numbers of megaloblasts shortly precedes death. Rarely these cells may be found in small numbers, and the patient live for some weeks or months; but if even a few are present the prognosis is very grave.

The white cells are not greatly changed, especially in the early stages. In most secondary anemias, the white cells share the disturbance; this is not so in idiopathic anemia; the number of the white cells, and their relations are not much different from the normal. Toward the close of life these assume many atavistic and

degenerated forms, but leucocytosis is not present, nor is there marked eosinophilia; this latter fact differentiates intestinal parasites fairly accurately. Myelocytes appear; these probably originate from the erythrocytic rather than the leukogenic areas. The platelets are reduced; viscosity, specific gravity, coagulability are all low.

Treatment. No adequate treatment of idiopathic anemia is known. The secondary forms require treatment indicated for the causative disease. In doubtful cases treatment for intestinal parasites may be given, and the feces closely watched. The anemia should promptly improve upon removal of the worms.

For the idiopathic cases, an urgent endeavor should be made to find out the source and nature of the hemolytic poison. Failing this, symptomatic treatment should be initiated; certainly this gives the patient his best chance of securing intermissions, and of living more comfortably; perhaps longer. The intestinal and renal and pulmonary activity should be maintained by the use of plenty of fresh air and fresh water. Free and plentiful water drinking should promote elimination to the greatest possible extent. The gastrointestinal symptoms are best met by free drinking of water and fruit juices, milk and broths, and, if necessary by nutrient enemata. Friction baths promote skin activity; hot and cold bathing is to be advised with care. The patient is to rest much, especially in the recumbent position, in the open air as much as can possibly be managed. A warm climate is best. Give plenty of nourishing food. The green vegetables are best; if they cannot be eaten raw, give the juice pressed from the raw, ground vegetables. It should be freshly made daily, should be greatly diluted in hot or cold water, but ought not to be cooked, or put into boiling water. Use this scantily for a few days; half a teaspoonful with each meal is enough, at first. Increase after three days, gradually. Too hasty feeding of this concentrated juice may cause a sore mouth. Broiled beefsteak, other appetizing foods, eggs, milk, anything that is pleasant, nutritious, easily digested, and especially that which the patient wishes, in reason, is to be given him.

Spinal and costal lesions vary; there is usually some rigidity of the thorax; this should be corrected. Such lesions as are present, on the examination of each patient, are to be corrected. Care must be employed to avoid fracture of the long bones, especially in the correction of innominate lesions; the thinning of the bones, by the red marrow, may leave them extremely fragile. At each treatment the ribs should be freely raised, and held in that position through one to three long breaths. The liver is to be treated directly, and the lower ribs raised from the liver and spleen. Manipulation of the abdomen is best avoided, unless there is some urgent indication therefor.

Prognosis. Remissions may be hoped for; these may last for a year or more. Unless there is some remission, death may be expected within a year from the time of the diagnosis. In many cases, the disease progresses more rapidly. If an underlying cause is found, and removed, recovery may be expected rather promptly. In such cases, the blood-forming organs appear to retain some effects of their experience; such a patient, having any cause of anemia later, is apt to show blood cells characteristic of idiopathic anemia.

Prophylaxis. Since the nature and cause of the disease are unknown, the prevention of idiopathic anemia is impossible. The severe secondary types are to be avoided by early and unremitting attention to the causes of secondary anemia, especially to intestinal parasites.

INFANTILE ANEMIA. (Anemia infantum pseudoleukemia; pseudo-leukemia of children; von Jaksch's anemia.) This is a rare disease of children under four years, characterized by greatly enlarged spleen, evidences of erythrocyte destruction, and increase in the white cells.

The **etiology** is unknown; it is usually associated with rickets or with some wasting disease, gastro-intestinal disorders, syphilis, or tuberculosis. The increasing wasting and pallor, with the enlarged spleen, suggest the diagnosis, which is proved by the blood examination. The red cells diminish to 3,000,000 or less, while the white cells may rise to 100,000 or more. Poikilocytes, stippled red cells, vacuolated and nucleated erythrocytes are found. The white cells retain their normal proportions for a child of that age.

The **treatment** is that of the causative disease, plus that for other secondary anemias. The **prognosis** is as good as that of the primary disease, whose course it seldom modifies.

SPLENIC ANEMIA. (Banti's Disease.) This is an infectious disease of the spleen and the blood-forming organs, characterized by extremely rapid increase in the size of the spleen, rapidly developing anemia, and death.

The anemia due to long-continued malarial invasion, associated with large spleen, is sometimes called splenic anemia—it is not properly so called, though malaria may predispose to the true form of Banti's disease. The same is true of rachitis and syphilis, which are often given as causes of the disease.

Diagnosis. The spleen is very much enlarged and is painful. The red bone marrow shows inflammatory changes. The lymph nodes may or may not be enlarged. Weakness and emaciation are the first symptoms, then splenic and hepatic enlargement, then hemorrhages, jaundice, ascites, and death. The blood shows the chlorotic picture—red cells, 3,000,000 or less, hemoglobin reduced much more greatly, with a color index of one half or even lower. Leucopenia is usual.

Treatment. The usual treatment for anemia should be given, plus raising the ribs, and the correction of anything found in the structure or the occupation of the patient that might interfere with the circulation of the spleen or the red bone marrow. Recurring hematemesis should suggest the propriety of removal of the spleen.

GAUCHER'S DISEASE. (Large-celled splenomegaly.) This is a rare hereditary disease, affecting females mostly. It is characterized by enormous splenic enlargement; a brownish discoloration of the skin; tendency to hemorrhages in mucous membranes and skin; thickening of skin and conjunctivæ;

and fairly good blood and health. The blood examination distinguishes it from other diseases with which it might be confused. The spleen contains a remarkable number of very large endothelial cells, whose origin and function are unknown. The treatment is that of splenic anemia. The prognosis is good for life and comfort, but recovery from the chronic state is not to be expected. Improvement may occur. It may develop into Banti's disease later, with death.

POLYCYTHEMIA. This is a rare blood disease, most often found in middle aged Jews, either men or women. It is clinically characterized by vertigo, headache, gastro-intestinal symptoms, cyanosis, and splenic enlargement. The blood count gives the diagnosis—red cells may reach 10,000,000, but may not be so high; hemoglobin may reach 20 g. per 100 c.c. of blood—about 150% of the normal. The color index is usually about .75, the white cell count is about normal, though the mononuclears may be slightly increased. The total amount of blood is increased. Several slight variations in type have been reported. No satisfactory treatment has been found; venesection gives temporary relief; splenectomy is advised. The prognosis is bad, and death occurs with toxic symptoms, or from hemorrhage.

CHLOROMA. (Green tumor.) This is a rare disease, characterized by a sarcomatous growth in the orbital bones and tissues. It contains a greenish pigment, whence the name. The spleen and lymphatic nodes are often enlarged; there is a gangrenous stomatitis; pain in and around the eye and mouth, deafness, and a very severe anemia. The blood picture may be that either of pernicious anemia, or of acute lymphatic or myelogenous leukemia. X-rays have delayed the growth of some of the tumors, and are without benefit to others. No other treatment has been found of any use. The disease terminates in death in a few months, with symptoms of malignant cachexia.

BLASTOMYCOTIC ANEMIA. Infection of the blood by certain of the smaller yeasts has been studied in the laboratories and clinics of the Pacific College and of the A. T. Still Research Institute. The infectious agent gains entrance through abrasions in the skin; other modes of entrance may be found on further study. Predisposing causes include malnutrition and excessive carbohydrate diet. Diminished alkalinity of the blood has been present in the cases studied.

The symptoms vary according to the organs most seriously involved. Pulmonary invasion suggests tuberculosis; the recognition of the yeast in the blood and sputum, with the absence of tubercle bacilli and the more indolent progress of the disease give the correct diagnosis of blastomycosis. The presence of yeast in the sputum alone is not significant. The skin is often the seat of peculiar dry scabby sores. Invasion of the joints causes vague pains suggestive of rheumatism, but not associated with as marked inflammatory changes. The systemic symptoms include sighing, malaise, weakness, evanescent slight chills and feverishness, insomnia and drowsiness and other symptoms suggestive of auto-intoxication, but without furred tongue, foul breath or evidence of gastro-intestinal disturbance.

Treatment consists in promoting nutrition and elimination and blood formation, as in secondary anemia. The organism disappears from the peripheral blood under treatment and good hygienic conditions, but tends to reappear under adverse nutritional states.

CHAPTER XXIV THE LEUKEMIAS

ACUTE LYMPHATIC LEUKEMIA

Acute lymphatic leukemia is a rare disease, characterized by sudden onset with high fever, rapid and pronounced increase in the lymphocytes, the rapid development of emaciation, dyspnea and early death. Etiology is unknown.

Diagnosis. The early symptoms are atypical. They are weakness, emaciation, insomnia, sometimes edema, and other symptoms characteristic of cancerous cachexia. The lymphatic glands all over the body and the spleen undergo marked and rapid increase in size.

The diagnosis rests upon the onset with high fever, the enlarged lymph nodes, and the result of the blood examination. The red cells are not materially changed early in the disease; later they undergo the changes characteristic of secondary anemia of the toxic type. The most remarkable finding is the great number of lymphocytes. At first these are all small, but later the large lymphocytes are greatly increased and considerable numbers of basophilic hyalin myelocytes are present. The total white cell count rarely exceeds 100,000 perhaps with 99.5% of lymphocytes. The blood picture in the very last stages of acute lymphatic leukemia is not to be distinguished from that in acute spleno-medullary leukemia.

The most marked change in the urine is the presence of considerably increased amounts of uric acid and other purin bodies.

The course of the disease is rapid and death is to be expected within a few months to two years after the first symptoms are noted. It is improbable that any treatment can interfere with the course of this disease.

The symptoms may be relieved by treatment adapted to the condition of the patient upon examination. The most important factor in the care of these patients is to make the diagnosis accurately and give whatever directions are necessary as to the general care.

CHRONIC LYMPHATIC LEUKEMIA

(Chronic lymphadenoid leukemia; chronic lymphadenosis)

Chronic lymphatic leukemia is now known to be somewhat less rare than was earlier supposed. It is a disease of the lymph nodes of the body, characterized by a slow development of cachexia. The symptoms of chronic rheumatism—weakness, dyspnea, and

pain—develop slowly, and the condition is likely to be mistaken for rheumatism. The excessive uric acid in the urine is characteristic, both of chronic lymphatic leukemia and of gout or rheumatism. Rather early in the disease the lymph nodes of the body are slightly enlarged; the spleen is usually slightly enlarged.

Only the blood examination can give the **diagnosis**. The red cell count and the hemoglobin are usually about normal; the actual number of the neutrophils is about normal; the small lymphocytes are increased, reaching about 10,000 per cu. mm.; the large lymphocytes are increased proportionately with the small. The disease may at any time show an acute exacerbation, when the symptoms characteristic of acute lymphatic leukemia occur, and this may result in the death of the patient. The total white cell count may run up to 500,000, with 60% or more small lymphocytes.

The relation between chronic lymphatic leukemia and acute lymphatic leukemia appears to be somewhat as that between the benign neoplasms and the malignant neoplasms. In chronic lymphatic leukemia, as in the presence of any of the benign tumors, the life of the patient is not markedly shortened; death is usually due to some intercurrent disease.

Treatment. No satisfactory treatment has yet been outlined. In any case, the diagnosis should be made carefully from the study of several blood counts. Whatever improvements can be made in the diet and general hygiene should be made and the symptoms relieved according to the condition of the patient as found upon examination.

ACUTE SPLENOMYELOGENOUS LEUKEMIA

Acute spleno-médullary leukemia is a disease of the spleen and red bone marrow, characterized, clinically, by the rapid development of high fever, cachexia, pallor, edema and very rapid enlargement of the spleen and sometimes of the lymph nodes.

The **etiology** of the condition is unknown. It usually appears in young people. The increase in the white blood corpuscles may be remarkable. Remissions are rare, during which the white cell count may drop almost to normal and the symptoms may be relieved to a certain extent. Usually, however, the condition of the patient grows steadily worse and death is likely to occur in a few months from the onset of the first symptoms.

The red cells vary from 3,000,000 to 5,500,000, with hemoglobin about 4.5 gr. per 100 c.c. or about 34% of the normal. The total leucocyte count may run very low, 1,500 per cu. mm, but is usually high, to 500,000 per cu. mm. Of these, myelocytes are most abundant, reaching 99% of the total white count, in some cases.

CHRONIC SPLENOMYELOGENOUS LEUKEMIA

(Lienteric leukemia; spleno-medullary, or myeloid leukemia)

This is a disease of the blood and bone marrow, characterized clinically by insidious onset, vague symptoms leading progressively to death; and by the occurrence of large numbers of granular leucocytes, especially mononuclear forms, in the blood.

Etiology. The cause of the disease is unknown; it may follow malaria, syphilis; wasting infectious disease, as typhoid; pregnancy in women or the climacteric in either sex. A blow over the spleen has been reported in some instances; gastric or intestinal ulcers, and stomatitis may precede the diagnosis; but not necessarily the beginning of the disease.

Lesions affecting the ninth and tenth thoracic vertebræ are constant.

Diagnosis. The symptoms are vague; the onset is insidious and slow. Weakness and dyspnea, irregular fevers, speedy fatigue, occasional diarrhea, pallor, nervous irritability, priapism, insomnia with tendency to drowsiness, all without wasting, perhaps with increase of body weight, an especially large abdomen, are the usual symptoms. The diagnosis must be made upon the blood examination.

Blood. In the early stages the red cells and hemoglobin remain almost or quite normal. Later, both are reduced; the hemoglobin first and most rapidly; the color index is usually less than 1, and is sometimes very low (.5 or even less). With diminution of the hemoglobin, poikilocytes appear. Later microcytes, normoblasts, vacuolated, spherical and granular red cells appear; toward the end, megalocytes and megaloblasts appear; the latter presenting immature and atavistic characteristics. The most important changes are in the white cells. The total count is from 15,000, in the early stages, to 500,000 or more in the later stages (more than 800,000, in one P.C.O. clinic case). The increase is in the granular cells, especially the neutrophils. The eosinophiles are absolutely increased, sometimes relatively; the basophiles are increased both relatively and absolutely; amphophiles are usually fairly abundant. The pathognomonic finding is the presence of considerable numbers of myelocytes. These are usually of the neutrophilic variety, and may make up 25% of the total white count.

Basophilic, eosinophilic and amphophilic granular myelocytes are found; near the termination of the disease, basophilic myelocytes of great size, resembling those of the acute leukemias, may be found.

During the progress of the disease, periods occur when the actual count is almost or quite normal; occasionally leucopenia occurs. The myelocytes and atavistic forms rarely disappear, how-

ever, and in doubtful cases the blood count should be repeated at intervals of a week or a few weeks until the diagnosis is clear.

The **spleen** is enlarged in every case, though its size is subject to considerable variation. It may extend into the pelvis and to the right iliac crest; the abdomen is the size of that of full term pregnancy. The liver is also larger than normal. Lymph nodes are sometimes enlarged. Hemic murmurs may be found; the pulse is full and compressible.

The **urine** shows excess of uric acid and other nuclear derivatives.

Hemorrhages may appear upon the mucous membranes or subcutaneously. Death may be due to internal hemorrhage.

Treatment. The correction of the lesions of the ninth and tenth thoracic, raising the ribs, and the study and correction of other causes of poor circulation through the abdominal viscera is of most importance, and has seemed to be effective in the early cases reported; it is important that complete histories with blood reports should be kept of such cases. In the late cases, symptoms are relieved and life apparently prolonged and made more comfortable, as the result of corrective measures. The patient must be warned against overexertion. An abundance of fresh air, a plentiful mixed diet, and quiet living are essential to the greatest improvement. Extirpation of the spleen has been followed by relief in some cases, by immediate symptoms of acute leukemia and speedy death in others, and by a period of relief, followed by later acute leukemia and speedy death in still other cases. Death from shock may occur as the immediate result of the operation.

Prognosis. In early cases, with comparatively low counts, recovery may be hoped for; in later cases, recovery is doubtful but improvement is to be expected; after the white cell count exceeds 200,000 and myelocytes are abundant, especially if hyaline forms appear, death is probably inevitable in a few months. Even in these cases, however, remissions with months of fairly good health may be hoped for. Death is preceded by some days of great weakness, dyspnea, often orthopnea. The mind remains unclouded until increasing weakness leads to unconsciousness.

HODGKIN'S DISEASE

(General lymphadenoma; pseudo-leukemia)

Hodgkin's disease is sometimes called pseudo-leukemia. It is characterized by very rapid enlargement of the lymph nodes of the body and of the spleen, usually without leukemia.

The *cornyobacterium granulomatis maligni* is supposed to be the specific infectious agent.

The diagnosis rests upon the generalized enlargement of the lymphatic glands and the blood examination. An increased amount of uric acid is present in the urine. The symptoms are vague and not usually severe. A slight weakness, occasionally dyspnea, together with some rheumatoid symptoms, are all that are usually present. Fever may be present, irregularly, rarely above 100.

The blood shows no constant changes. Excess in the large mononuclear cells and the myelocytes are frequent. Platelets are increased. Masses detached from the pseudopodia of the megalo-caryocytes have been described. (Bunting.) Increase in the white cell count usually appears after the disease is well advanced. Rarely marked leucocytosis appears early.

The progress of the disease is slow and death is usually from some intercurrent affection. In some cases a rapidly developing anemia and cachexia, increasing fever, and hemorrhages cause hasty death. Rarely lymphatic leukemia develops from Hodgkins disease; in some such cases it is probable that the first diagnosis was faulty.

Treatment is commonly unsatisfactory. The symptoms may be met as they arise, with a fair degree of success.

LEUKANEMIA. Leukanemia is a disease of the blood, characterized by an increase in the white blood cells in toto, associated with rapid deterioration of the red cells, similar to that observed in pernicious anemia.

The disease is rapidly fatal, and no satisfactory treatment has yet been found for it.

APLASTIC ANEMIA. This is a disease of youth or young adult life, more frequent in women than men, in which the anemia seems to be due to defective blood formation. Autopsy shows the red bone marrow shrunken and atrophied. It begins insidiously but rapidly, with increasing weakness and dyspnea. Hemorrhages upon the mucous membranes and skin, and into internal organs may suggest scurvy.

The red cells and hemoglobin are about equally reduced; no normoblasts, megaloblasts, or poikilocytes, or other indication of hurried blood formation are present, nor do the red cells show stippling, unequal staining or other indications of toxin presence. The granular leucocytes are diminished greatly, while the total lymphocyte counts remains practically normal.

The course rapidly goes on to death, under the treatment medically indicated. No reports have been made by osteopaths.

PART V DISEASES OF THE URINARY SYSTEM

GENERAL DISCUSSION

The kidneys occupy rather a peculiar position among the organs of the body. Since it is their duty to secrete from the blood these substances which are the more or less harmful products of katabolism, they are primarily somewhat more resistant to the action of these toxins than are other cellular elements, and they are at the same time subject to injury when the blood contains foreign elements or varies to any great extent from that of the normal body.

The kidneys secrete according to the varying qualities of the blood and the varying speed of flow through the renal capillaries. Generally speaking, the higher the pulse pressure, the greater the urinary flow.

No secretory nerves have yet been demonstrated for the kidneys. The vasomotor nerves for the kidneys and the suprarenals are derived from the eleventh and the twelfth thoracic segments of the spinal cord. Vertebral or costal lesions affecting these segments are very important factors in modifying the circulation through the kidneys, and thus their secretion and nutrition.

The normal constituents of the urine vary widely, under normal as well as under abnormal conditions. The following abnormal findings are not rare.

Hematuria. Blood may be found in the urine in small quantities, as the result of most forms of nephritis. The passage of a calculus is usually associated with more marked hemorrhage. Blood from the bladder is fresh in appearance. The red blood cells are less disintegrated and fragments of the bladder epithelium are often recognizable. Fractional catheterization shows blood increased in quantity in the last part if the hemorrhage is in the bladder, in the first part if the hemorrhage is found in the urethra, and about equally through all parts if the hemorrhage is from the ureter or the kidney.

Hemoglobinuria. When the hemoglobin is dissolved out of the red blood cells, it is speedily eliminated by the kidneys. This is the case after the use of certain drugs, in malaria, and in some other blood diseases.

Albuminuria. Albumin is eliminated by the kidneys chiefly as the result of disease of the kidney epithelium. This may vary from slight hyperemia to very severe kidney lesions. As a tem-

porary occurrence and in small quantities the presence of albumin in the urine must not be considered a very serious matter. It may be the result merely of overtire, or possibly from an orthostatic spinal condition (orthostatic albuminuria). It should always arouse the suspicion of a kidney disease when it is found, and the patient's condition be the subject of more careful investigation.

Indicanuria. This occurs most commonly as the result of intestinal putrefaction. It is present also in cancerous cachexia, in pus accumulation anywhere in the body, in high fevers, and, generally speaking, wherever the blood is absorbing the products of proteid decomposition.

Pyuria. Pus is present in the urine as the result of infection of the bladder or of the kidneys. It is very necessary to determine as speedily as possible the source of the pus. In women the possibility of contamination of the urine from a vaginal discharge must not be forgotten. In men, abscesses which drain into the urethra are to be considered. Catheterization should eliminate these factors. Catheterization of the ureters shows which kidney, if either, is affected. Injection of the bladder and sometimes of the ureter may precede the X-ray examination. Without this injection the X-ray may show the abscess in the kidney in some cases.

Chyluria is a rare condition in this country, and is usually due to infection by the *filaria sanguinus hominis*. (q. v.)

Glycosuria. Sugar is eliminated in the urine in diabetes mellitis (q. v.) and also as the result of the overeating of sugar. There seems to be considerable difference in the sugar toleration of different individuals. In some people the most unbridled eating of candy or honey does not seem to be followed by glycosuria; in others comparatively small amounts of carbohydrate excess give rise to glycosuria. In diabetes mellitis, certain poisons, long fevers, and other conditions, acetonuria, diaceturia, and oxybutyria are frequently present. These are of more or less serious import, according to the other conditions with which they may be associated. The occurrence of diacetic acid and oxybutyric acid in the urine in diabetic patients usually precedes the onset of coma and death.

Other Urinary Constituents. Calcium oxalate occurs in the urine as the result of deficient oxidization processes. Leucin, tyrosin, and cystin are usually associated with diseases of the liver. *Echinococcus hooklets* may be found in the urine when a hydatid cyst is present in the kidneys, or breaks into any part of the urinary tract. The urine may contain various infectious agents, as the gonococcus and the ordinary pyogenic bacteria, molds and yeasts, and certain protozoa. Such findings are only of value when perfectly fresh urine taken under aseptic conditions is examined.

CHAPTER XXV

DISEASES OF THE KIDNEYS

ACUTE HYPEREMIA

(Active hyperemia; active congestion)

This condition may be the first stage of acute nephritis or it may be present for a few days and terminate apparently with recovery. The most common cause of the condition is the presence of irritating substances in the blood.

Experiments upon animals and upon healthy individuals show that the salts of all the common metals, including sodium chloride, the immune serums, or any foreign proteids injected into the circulation, or any of the active medicines in common use, produce the symptoms of active hyperemia of the kidneys, increase the multiplication and loss of the renal epithelium and thus are largely responsible for the prevalence of renal diseases occurring in middle life. The gargling of potassium chlorate permits small quantities of this drug to be swallowed; the application of turpentine stupes and the giving of alcohol rubs permit certain amounts of these drugs to be breathed into the lungs or absorbed into the blood; and it has been shown conclusively that even these small quantities of irritating drugs act upon the kidney epithelium to a certain slight, but irreparable extent. Most of the acute infectious diseases are associated with kidney symptoms. Prolonged exposures to cold and focal infections are factors.

Lesions of the tenth to the twelfth thoracic vertebræ and the corresponding ribs are etiologic factors.

Nephrectomy of the opposite kidney, blocking of the opposite ureter, or Dietl's crisis on the opposite side, produce active hyperemia, probably of reflex origin and similar to that produced by a blow upon the back, or by suddenly produced bony lesions of the dorso-lumbar area.

Diagnosis. The symptoms are not pronounced. There may be a dull pain in the loin, a slight feverishness and a slightly increased pulse rate. The urine is scanty with no marked variation in the total elimination of the ordinary solids. A few blood cells, a few hyalin casts, a trace of albumin and some cells from the kidney tubules are present.

Treatment. First, all irritating drugs must be stopped; bony lesions as found must be corrected; the lower ribs should be raised; and whatever contracted muscles are found should receive atten-

tion. Free drinking of water is to be encouraged. This may have lemon juice, or any other fruit juice, added to it, and may be either hot or cold. A free milk diet is good. Tea, coffee, alcohol, spices, meats are to be omitted from the diet until recovery.

Most cases recover in a few days under this treatment.

PASSIVE HYPEREMIA

(Chronic or passive congestion)

Most commonly passive congestion of the kidney is due to the ordinary causes of venous interference, such as mitral lesion or cirrhosis of the liver. The kidney is large and purple presenting the appearance called cyanotic induration. Direct pressure upon the renal veins may be caused by abdominal tumors, pregnancy, ascites, visceroptosis, and other somewhat less frequent conditions. Rarely thrombosis or embolism of the renal vein may be responsible for passive hyperemia. Nephroptosis may occur as part of Glenard's disease or it may exist independently and be a cause of passive congestion.

The symptoms of passive congestion include a rather constant dull aching in the loins; scanty, highly colored urine, which may contain small quantities of blood, albumin, casts, renal epithelium, and an excess of uric acid; to these symptoms must be added all those due to the cause of the hyperemia.

Treatment. The removal of the cause of the congestion, if this is possible, is the first need. Palliative treatment is of value in all cases. This includes the treatment already advised for active hyperemia, together with such measures for the relief of the circulatory embarrassment as may be indicated. It may be necessary, in passive congestion, to reduce the amount of water taken into the body to a certain extent.

ACUTE NEPHRITIS

(Acute Bright's disease; acute diffuse nephritis; catarrhal nephritis; acute parenchymatous nephritis; including glomerular and tubal acute nephritis; and acute productive and desquamative nephritis)

Acute nephritis is inflammation of the kidneys, usually of sudden onset, and characterized by some pain and gastro-intestinal symptoms, diminished urine with varying amounts of albumin and casts.

Etiology. Acute nephritis may appear at almost any time of life. It is due to changes in the circulation of the blood or to toxic or infectious elements in the blood.

The bony lesions are factors in producing acute nephritis. Blows or strains affecting the eleventh and twelfth thoracic ver-

tebræ and the corresponding ribs are important. Lordosis is generally recognized as a cause of albuminuria and is a predisposing cause of acute nephritis. Irritants in the blood include alcohol, which is very efficient in producing nephritis; certain drugs, especially turpentine, the coal tar derivatives, cantharides, ether and others. The bacterial diseases, especially the exanthemata, are usually associated with acute nephritis, but the protozoan diseases, such as malaria and syphilis, rarely cause the acute form. Injury to the skin, such as result from severe burns, poison oak, trauma, may cause nephritis. Exposure to cold may be responsible.

Pathology. The kidney shows more or less localized areas of inflammation; the affected cells are undergoing granular degeneration; the capsule is somewhat adherent; and the entire kidney slightly increased in size. Other organs of the body show the effects of the edema. Special varieties are described according to the locality affected.

Glomerular Nephritis is found most frequently in scarlet fever and diseases of somewhat similar character. The inflammation may be rather strictly localized in the glomeruli in this form. Edema is practically invariable in the glomerular form.

Tubular Nephritis is especially due to alcohol or other forms of poison. The inflammation of the tubules is somewhat less strictly localized than is the case in the glomerular form. Edema is sometimes slight or absent.

Diffuse Nephritis involves not only glomeruli and tubules, but also the interstitial tissues.

Hemorrhagic Nephritis is especially characterized by the presence of blood in the urine and the occurrence of numerous small hemorrhagic foci in the kidneys.

Acute Productive Nephritis is characterized by rapid multiplication of the connective tissues in localized areas of the kidney which results in the formation of wedge-like areas of fibrous tissue. It is somewhat more speedily fatal than are other acute forms.

Lymphomatus Nephritis is an acute form which is characterized by marked lymphocytic and leucocytic infiltration of the intermediate zone of the kidney.

Diagnosis. The symptoms of acute nephritis are sometimes typical and sometimes easily confused with gastro-intestinal attacks. Chilliness followed by a slight fever with nausea, sometimes vomiting and pain in the loins or sometimes between the shoulders, is characteristic; a puffiness under the eyes, sometimes in the lids, and a generalized swelling of the face, usually occurs rather early; the skin becomes pale and waxy-looking; later the ankles, and following this the legs and other parts of the body are affected; ascites may be marked and the external genital organs are frequently enormously distended; the highly concentrated urine may irritate the bladder and urethra to such an extent as to initiate cystitis.

The occurrence of any of these symptoms, even if edema is absent, should cause an examination of the urine to be made. The total quantity is diminished in acute nephritis, sometimes even

complete suppression may occur; the color is dark, the specific gravity high; there may be marked cloudiness from the presence of the anatomical elements; albumin may reach 1% or 1.5%, or may be absent; renal epithelium, red and white blood corpuscles, and cells from the bladder may be present; casts may be hyalin, blood, epithelial, or granular, all forms may be present in a single specimen; the urea and the normal inorganic constituents are diminished.

The onset of uremia is marked by visual disturbances, headache, backache, vomiting and convulsions.

Treatment. The consideration of the causes of nephritis in any given case should determine to a certain extent the methods of treatment employed. All irritants must be omitted from food and drink; alcohol, tea, coffee, tobacco, meats, spices, are to be forbidden; a strict milk diet is by far the best thing. During the acute attack rest in bed is necessary; very free drinking of hot water is to be encouraged.

Treatment should be given twice each day during the presence of the acute symptoms, later, less frequently. The mobility of the lower thoracic and upper lumbar spinal column should be increased; reflex muscular contractions of the dorso-lumbar region should be corrected; the ribs raised; and whatever lesions may be found are best corrected as speedily as possible.

Prolonged sweating is useful so long as this does not weaken the patient. Colonic irrigation may be useful; it may be continued for hours, in severe cases. The urine should be examined carefully and frequently.

After recovery from the acute attack, the patient should return for examination and for urinalysis at intervals of a few weeks, in order that the occurrence of the chronic form may be avoided.

Prophylaxis. Acute nephritis may be avoided by using a good wholesome diet; by the correction of lesions of the eleventh and twelfth thoracic vertebræ, especially by the avoidance of alcohol and of exposure to cold. During the acute infectious diseases the treatment of the dorso-lumbar areas goes far toward preventing the occurrence of nephritis. The urine should be watched and the first appearance of albuminuria, casts, or renal epithelium should be followed by vigorous treatment.

Prognosis. Recovery usually occurs within one to three weeks. If the cause of nephritis persists, the condition may pass into the chronic form.

KIDNEY OF PREGNANCY

The typical kidney of pregnancy precedes eclampsia, as a general thing, and is a toxic tubular nephropathy. The toxins produced by the fetal metabolism are, for some unknown reason, retained within the body in an apparently

virulent form; the kidney tubules suffer markedly, while the glomeruli are little affected. With the emptying of the uterus, the kidney condition is immediately relieved.

Women who have had acute glomerular nephritis, or in whom the causes of glomerular nephritis exist, are apt to suffer exacerbations of this disease during pregnancy. Emptying the uterus may give relief, but the kidney disease may go on to death days or months after child birth.

The treatment is that of acute nephritis (q. v.) with the modifications indicated by the state of pregnancy. The urine should be analyzed at intervals through pregnancy, whether symptoms of renal disturbance appear or not.

CHRONIC PARENCHYMATOUS NEPHRITIS

(Chronic Bright's disease; chronic exudative nephritis; including chronic tubal, chronic glomerular, and chronic diffuse nephritis; large white kidney; small white, or contracted kidney)

This is an inflammatory process, involving chiefly the glomeruli and the tubules of the kidney, and only secondarily the interstitial connective tissue.

Pathology. The large white kidney is present in the earlier stages of the disease. It is paler than normal; the capsule is not usually adherent; on section, the kidney presents a yellowish color, with areas of congestion or hemorrhage. There is some overgrowth of the connective tissue, especially in Bowman's capsule.

The small white kidney may follow that just mentioned, as the result of the contraction of the newly formed connective tissue. The capsule is adherent over considerable areas; there are fatty degeneration and atrophy of the glomeruli and tubules and the interstitial connective tissue is increased. Occasionally, waxy degeneration may be present.

Another form of kidney is that called the large red kidney, which is present in chronic hemorrhagic nephritis. In this type the hemorrhagic foci are followed by cicatrices; the contraction of these leads to a pitting of the surface of the kidney, which thus presents a distinctly bumpy appearance. On section, the kidney is seen to be mottled with brown areas resulting from the earlier hemorrhages.

Etiology. This form of nephritis may follow repeated attacks of the acute disease, or it may begin slowly. It is usually the result of irritations, of a mild degree, more or less constantly present. It is certainly due in a considerable number of cases to the habitual use of drugs.

The kidney recovers from injury by the multiplication of the cells left intact. Any of the salts of the common metals, any drug which affects any of the secretions of the body, the poisons associated with any of the bacterial infections, and the serums used in the treatment of some of these, have all been shown to cause loss of kidney epithelium, and this loss is repaired by the multiplication of the cells already present in every case. The kidney epithelium has only a limited power of reproduction and while it is true that slight injuries, such as may be due to the factors just mentioned, are followed by apparently complete repair, it is also true that such demands for multiplication cannot be indefinitely

met. When repeated irritation has exhausted the power of a considerable portion of the renal epithelium to repair itself through the multiplication of its parenchymatous cells, the phenomena of acute parenchymatous nephritis become marked and usually serious,

The place of **bony lesions** in the etiology of this form of nephritis is probably twofold. In the first place, lesions affecting the eleventh and twelfth thoracic segments of the cord interfere with the normal vasomotor control of the kidneys and thus render them more easily injured and less well nourished; bony lesions affecting the centers controlling the action of the liver, spleen and intestines, may result in the accumulation of the toxic products of katabolism within the body, and these toxins are important sources of irritation to the kidney glomeruli and tubules.

Diagnosis. The symptoms of acute nephritis may be continued in a somewhat less pronounced form into the general symptoms of chronic nephritis. In other cases the disease begins with subacute symptoms from which recovery does not occur. Usually the earlier symptoms in this disease do not suggest a kidney complication—a progressive loss of appetite, with increasing weakness, some nausea, attacks of acute gastritis, and varying headache which rarely completely disappears. Examination of the urine during this time should lead to the diagnosis; too frequently, however, urinalysis is postponed until the appearance of edema; this frequently affects only the eyes and the ankles at night for some time; later the area extends over more or less of the entire body, and it may be so pronounced that the patient is almost unrecognizable; the complexion assumes a pallid, pasty appearance, and appears translucent. Death may result from edema of the larynx or the lungs, by the embarrassment of the heart directly, or as the result of hydropericardium; or the disease may terminate by the appearance of uremic symptoms—these include headache, nausea, vomiting, diarrhea, dizziness, and insomnia, which go on to delirium, coma and death.

The analysis of the **urine** should be repeated at intervals of a few days, in order that the actual condition of the metabolism of the body, as well as of the kidneys may be determined. The total quantity is diminished at first; in later stages it may be nearly or quite normal in quantity; and during the time when the exudates are being absorbed, the total quantity may be considerably increased. The albumin is very high, sometimes reaching 3% by Esbach's test; the total daily quantity of normal constituents is diminished; the urine is turbid and dark in color; blood cells, all forms of casts and granular debris are present.

Treatment. The treatment consists first in removing the causes of toxemia. Constant attention to diet and hygienic living is necessary. Whatever treatment is indicated by an examination

of the spinal column especially in the region of the eleventh and twelfth thoracic vertebræ should be given and this should be repeated at rather frequent intervals for several weeks. The treatment for acute nephritis may be employed.

Probably in no other disease than nephritis is definite adjustment of the vertebræ corresponding to the renal segments more urgent. Frequently specific adjustment of this region is almost immediately followed by definite improvement in renal functioning. Owing to marked ligamentous changes it is oftentimes difficult to secure thorough release of the parts. Then again lesions lower down in the spine or innominate, and even ones higher up, may play a primary role in so far as the maladjustments are concerned. The corresponding ribs should also be released. All of this should be considered in conjunction with syphilitic, streptococcus and other infections, metabolic toxins, alcoholism, and the general hygiene that makes up the daily habits of the patient.

Prognosis. Complete recovery from chronic parenchymatous nephritis is rare, though many of the subacute cases recover provided thorough attention to spinal lesions, intestinal hygiene and elimination of all infective processes is instituted. The best that can be hoped from treatment in serious cases is to delay the inflammatory process and to give what parts of the kidney may be left the best opportunity for doing good work. It seems that the nephritis associated with scarlet fever is of special virulence.

The results of osteopathic treatment during the time when the kidney is large or normal in size are very good. In many cases a symptomatic cure has been reported; this means, no doubt, that with a good circulation and nervous control, the parts of the kidney which remain intact are perfectly able to meet all of the ordinary requirements of the body. Such patients should be warned, however, that a certain amount of their kidney tissue has been injured as the result of the disease and that they should pay special attention to their habits of living if they wish to live the long and happy and useful lives to which they are entitled.

CHRONIC INTERSTITIAL NEPHRITIS

(Chronic non-exudative nephritis; chronic Bright's disease; cirrhotic kidney; primary, genuine, contracted, red, glomerular, or gouty kidney)

Chronic interstitial nephritis is an inflammation chiefly affecting the connective tissue of the kidney and associated with degeneration and atrophy of the parenchymatous cells. Cardio-vascular changes are always marked in this disease.

Pathology. Several varieties of pathological change are described in connection with chronic interstitial nephritis.

In the primary form of the disease, the kidneys are red in color and very small, both kidneys together may weigh less than three ounces; the capsule is

much thickened and very adherent; the kidney itself is brown in color, finely granular, containing many cysts; the connective tissues are greatly increased in quantity, and are hardened and shrunken; the parenchymatous cells show granular, fatty, or waxy degeneration, as well as atrophy. In gouty patients, deposits of sodium urate and other uric acid compounds may be present. When the condition is secondary to arteriosclerosis, the vessels of the kidney show more marked changes, while the capsule is less adherent and less thickened. While the surface of the kidney is smoother in the typically senile form, the entire kidney takes part in the atrophy, the capsule is very thick and adherent, and both the cortex and pyramids are rather uniformly atrophied. There is, in the senile form, a marked increase in the pelvic fat.

Etiology. The causes of chronic interstitial nephritis are many; yet the real nature of the underlying etiology is vague. Parenchymatous nephritis is always associated with more or less marked interstitial inflammation and this may go on to so great an extent that the interstitial changes ultimately mask the primary parenchymatous affection.

With the onset of old age there is a tendency to overgrowth and contraction and toughening of all connective tissues in the body. These changes are, in the case of the kidney, merely a part of the general onset of senility. Heredity is certainly a cause of interstitial nephritis, as it is of interstitial inflammations and premature senility of the entire body.

A part of the phenomena associated with senility is found in the progressive rigidity of the articular tissues. This is associated with a posterior curve in the upper thoracic region, and a bending forward of the head and neck. The lower limit of this posterior upper thoracic curve usually comes at about the ninth thoracic segment. A somewhat increased mobility in this region is followed by rigidity of the tenth thoracic and throughout the remainder of the spinal column. In some cases the whole spinal column is uniformly rigid.

The effects produced by this rigidity are several—the activities of the liver, perhaps the spleen, certainly the intestinal tract, are somewhat diminished; the power of these organs to neutralize poisons is correspondingly lessened; this results in more or less toxemia. The nervous control of the vessels of the kidneys is also impeded. In other ways the accumulation of the more or less toxic products of katabolism is rendered inevitable. The rigid thorax is not associated with proper habits of breathing. Cardiac difficulties complicate the picture. All of these things are more or less directly due to the rigid spinal condition.

The protozoan infections, such as syphilis and malaria; habitual alcoholism, especially what is ordinarily called "moderate" drinking; the overuse of proteid foods, and overeating of too great a variety of complicated foods; are certainly causes of this condition. Too little exercise and excessive exposure to cold, damp climates; gout, and rheumatism are also important factors. Like senility,

gout, and several of the causes already mentioned, interstitial nephritis seems to be favored by the general conditions of modern civilized life, with all that is associated with that term. Streptococcus infection (e. g., tonsillitis) by way of the blood stream probably plays an important role in certain cases.

Diagnosis. The symptoms may be latent for many years, during which the kidney changes are being gradually produced. Not rarely the kidney disease remains unsuspected until some pulmonary or cardiac or hepatic disease is forced to a fatal termination by the sudden exacerbation of the kidney difficulty. Post-mortem examination of such kidneys shows that disease has been slowly progressing, though unrecognized, for many years.

Occasionally the first symptoms are those of uremia—headache, nausea, vomiting, dyspnea, visual disturbances, convulsions or stupor, ending in coma and death, or slow recovery. Sometimes the symptoms are more gradual, and include failing vision, sleep disturbances, disordered digestion, sometimes frequent micturition. This state may go on slowly for some years, and it may be interrupted by uremic attacks. The urine is usually considerably increased; the hyperacidity of the urine leads to bladder disturbances, which may cause considerable annoyance; the daily quantity may reach a gallon or more; the specific gravity may be as low as 1002; albumin may be absent or present in mere traces; the total elimination of solids and urea is considerably diminished. The low urea is an important factor in diagnosis and prognosis. Red and white blood cells, hyalin and granular casts are found with difficulty. The indistinct urinary findings may cause the diagnosis to be considerably delayed.

The circulatory disturbances include a high blood pressure, sometimes exceeding 200 mm. of Hg. The arteries are hard, thickened, and sometimes tortuous. Not all of the arteries are equally affected, and in examining the condition of the vascular system the radial, temporal, carotid, and other accessible arteries should be palpated. The heart is hypertrophied; the aortic sound accentuated. Cardiac asthma may be present.

The respiratory disturbances include dyspnea, sometimes with signs of hydrothorax. Epistaxis may be the first symptom. Orthopnea and Cheyne-Stokes breathing are present in the later stages.

The nervous symptoms include drowsiness, which may be associated with marked insomnia. Apoplexy may be the first sign of the condition. Various sensory disturbances may be present. Retinitis, partial or complete blindness, tinnitus aurium, and fatigue may be early symptoms. The retina shows characteristic changes. Vomiting, nausea, diarrhea are the most prominent digestive disturbances.

In addition to the edema, which is not usually pronounced in interstitial nephritis, the skin may show marked dryness, and

occasionally crystals of urea are found. Cyanosis and pallor are usually present. Pruritis and a very obstinate eczema are very annoying symptoms. Uremic attacks may appear suddenly, or uremia may come on gradually, and terminate in death.

Treatment. The prophylaxis of interstitial nephritis must be begun some forty years before the onset of the disease. A good wholesome way of living and eating should prevent the disease altogether. Very likely syphilitic (predisposing) and streptococcus infections are important considerations.

When the symptoms appear, the patient must be put upon a very rigid diet and daily regime. Exclusive milk diet is frequently of value for a short time, though it should not be attempted to put the patient upon a milk diet for the rest of his life. After a preliminary week or two weeks of milk and fruit juices alone, he may begin to take fruit, vegetables and some cereals. He should be instructed to make his entire diet upon vegetables, fruits, milk, with only very small amounts of sugar, salt, starch or meat. Indeed, in many cases these four articles are best omitted altogether.

The warm dry climates are best and it is frequently of value to change from a low to a high altitude or vice versa.

The correction of the spinal rigidity, which is universally present, is of great value. Treatment should be given very gently, with movements which exert no recognizable stimulation upon the nerve centers. It is best in the beginning to give treatments every day, or every other day until the spinal column and the ribs show some increased mobility. Still do not neglect definite corrective work. After this, treatment should be given three times each week, then twice, then once, until a very flexible spinal column is secured. After this the patient needs to return for examination and perhaps a few treatments two or three times each year.

"Venesection is of marked benefit in uremia. About a pint of blood should be taken, under aseptic conditions, from a large superficial vein. The sudden lowering of venous pressure produced in this way often causes immediate kidney activity and relieves the toxemia very speedily, far better than the usual sweating and other methods."—McConnell.

"In addition to the specific osteopathic treatment, we must pay close attention to diet, and I prefer ordinarily to fast the patient twelve to twenty-four hours, following it with as nearly a milk diet as the patient will stand for, and later add some vegetables, spinach and lettuce—some cereals, eggs and fish as the case progresses. In addition to this, if the blood pressure be not too high, showing the absence of arteriosclerosis, I believe in the Turkish baths, because the skin is one of the chief aids in elimination, and will take much work off of the kidneys. I prefer to have the patient sleeping in the open air as in tuberculosis, because you have a constitutional disturbance, and you increase the oxidation of the waste materials by means of the open air sleeping and relieve the kidneys of that much work. We have to protect these cases; ordinarily I advise the woolen underwear and give them plenty of rest. I do not believe in rest in the recumbent position too much, for then we have too much passive hyperemia. I advise alternating the upright position and the recumbent

position. The use of salt water enemas in these cases is helpful, using the normal salt solution and having the patient take from one to two quarts of water at night before retiring and retaining as much as possible over night."—F. H. Smith.

Prognosis. The diseased kidney tissue cannot be restored. On the other hand, it is very remarkable how great efficiency is possible to badly diseased kidneys. The treatment as outlined gives the best possible circulation through the kidneys and relieves them to as great a degree as is possible of the burdens that they have been unfairly compelled to bear throughout life. If the patient is obedient and cheerful, he should be able to live his life out in a fairly comfortable manner. If he fails to obey instruction or if the kidney lesions are too pronounced, he may die either as the result of the associated cardio-vascular disease or from uremia; or some intercurrent disease, such as pneumonia or gastritis, may be fatal on account of the kidney lesion rather than on account of its own severity.

PYELITIS

(Pyelo-nephritis; pyonephritis)

This term is applied to inflammation of the pelvis of the kidney and the pyramids. Also, the term pyelo-nephritis is applied to those conditions in which the mass of the kidney is recognizably involved.

Pathology. The catarrhal form is the most common. A pseudo-diphtheritic inflammation is occasionally present. Tubercular pyelitis is occasionally found. Suppurative pyelitis is usually due to metastasis.

Etiology. Pyelitis rarely occurs as a primary disease. The most frequent cause is a renal calculus. Gonorrheal inflammation lower in the urinary tract may extend upward through the ureter to the pelvis of the kidney, especially when the renal circulation has been impaired. The colon bacillus may be responsible for pyelitis under similar circumstances. Infections, such as are associated with acute nephritis, or renal carcinoma or tuberculosis may cause pyelitis. Occasionally drugs in the urine may inflame the membranes of the renal pelvis.

Diagnosis. It is usually difficult to make a diagnosis of pyelitis except as the causative factors are recognized. Sometimes it is possible to find the epithelium from the pelvis of the kidney in the urine. It is usually difficult to distinguish these from the cells of the inflamed bladder.

Pain is often acute, extending down the ureters. This is especially severe when the condition is associated with passage of a renal calculus. The fever may be very irregular, hectic or typhoid.

Symptoms resembling those of uremia rarely occur. Reflex muscular contractions of the lumbar region are extremely marked, and hypersensitive areas are usually found.

Treatment. The treatment varies according to the cause of the disease. If the X-ray examination shows a stone, surgery may be indicated. Free drinking of water, application of heat and cold, relaxation of the lumbar muscles, adjustment of the lower dorsal and lumbar vertebræ and innominata, are all important factors in relieving the pain and promoting recovery.

Prognosis. The prognosis depends upon the associated conditions. Purulent cases are liable to infect the peritoneal cavity and cause death.

RENAL NEUROSES

All attempts toward demonstrating the existence of nerves directly governing the secretion of urine have failed. On the other hand, the secretion of urine is known to depend upon the rate of the blood flow through the kidney; this in turn depends upon the difference between the arterial pressure and the venous pressure, and also upon the caliber of the renal arterioles. Vasomotor nerves to the kidney have been demonstrated by different observers. These are derived from the eleventh and twelfth thoracic segments of the spinal cord. The renal splanchnic nerves from these segments pass by way of the hypogastric plexus. Gray fibers from these ganglia and from the aortic plexus pass to the blood vessels of the kidney.

The fact that the kidneys are profoundly affected by nervous conditions is shown by the urinary variations associated with certain nervous diseases. For example, in hysteria, especially after a crisis, great quantities of extremely pale urine of low specific gravity are voided. After an epileptic attack, on the other hand, very little urine is secreted for some hours. Individuals who undergo any nervous shock, excitement, passion of any kind, suffer from changes in the urinary secretion and these are most commonly like those found in hysteria.

Local influences which act upon the eleventh and twelfth thoracic segments, including both acute and chronic conditions of trauma, such as a blow across the back, may shock these nerve centers, so that urine is not secreted for some time after, and when the flow again begins, it may be scanty, dark, of high specific gravity, and may sometimes contain blood, casts or albumin. A wrench or sudden jar may have the same effect.

Bony lesion of the tenth thoracic to the first lumbar vertebræ may be responsible for disturbed kidney secretion. It seems to be a cause of chronic parenchymatous nephritis, and also it increases the danger of renal involvement during the presence of the acute infectious diseases.

In every case of renal disturbance it is very important that the nervous relationships should be investigated. Not only the disturbed structural conditions, but also those factors associated with emotional disturbance must be corrected, if the patient is to make the most speedy and complete recovery.

RENAL CALCULUS

(Nephrolithiasis; gravel, renal colic; pyelitis calculus)

Renal calculi are concretions in the kidney substance or in the pelvis of the kidney. They are of various sizes and are called renal sand, renal gravel, renal stone, or calculus, according to the

size of concretions. When the stone makes a mold of the pelvis, it is called a coral or dendritic calculus. The most frequent of these stones are precipitates of uric acid and the urates. Others are composed of calcium oxalate, the phosphates, or, rarely, calcium carbonate or fatty deposits. Calcium oxalate calculi are dark and very irregular in size; they are called mulberry calculi. The presence of renal calculi is usually associated with varying degrees of pyelitis. The blocking of the ureter may lead to hydro-nephrosis.

Etiology. The cause of renal calculus is not very well known. It is most frequent in children and in old people. Men suffer more than women. Gout and the hygienic conditions associated with gout seem to be important factors. Those conditions which lead to the elimination of an excess of the nitrogenous wastes in the urine seem to be important in the etiology of renal calculus. Injuries to the kidney region may be a factor.

Diagnosis. The symptoms may be atypical. The passage of a stone through the ureter may cause most agonizing pain, extending downward to labia or penis, which begins suddenly, terminates suddenly, and is followed by the passage of the stone through the urethra, or by its retention within the bladder.

A stone which is too large to enter the ureter, and which fits snugly in the pelvis of the kidney, may attain tremendous size with no symptoms whatever. The most important diagnostic point is found in the X-ray plate.

Treatment. Hot baths and hot applications to the loins and over the abdomen, the free drinking of hot drinks, and very strong pressure over the tissues near the lumbar vertebræ, may be sufficient to relieve the pain, so that the stone may be finally passed into the bladder. Its passage through the urethra is usually less painful. During the spasms of pain of renal colic, it may be necessary to use chloroform or morphine.

The further formation of gravel or stones may be prevented by a nonpurin diet, and by free water drinking.

When an incarcerated pelvic stone is recognized, its surgical removal should be considered.

Prognosis. This depends upon the structural conditions associated with the presence of the stone and upon the obedience of the patient to instructions given him concerning diet and habits of living.

AMYLOID KIDNEY

Amyloid, waxy, or lardaceous degeneration of the kidney is associated with a similar condition existing in other viscera.

Pathology. The kidney is large, pale, usually smooth, and sometimes marked by prominent veins. On section, the kidney presents a somewhat

"bacon-like" appearance. The usual tests for amyloid substance give positive results. The amyloid change usually begins in the walls of the capillaries of the tufts. The disease is nearly always associated with a diffuse nephritis. Amyloid disease is due to wasting diseases—the cachexias, tuberculosis, prolonged suppuration, especially of the bones, intestinal ulcers, and many other purulent diseases. It is frequently present in tertiary syphilis. Less frequently it is associated with uncompensated heart lesions, leukemia, gout, or malaria.

Diagnosis. The symptoms are those of nephritis and are frequently masked by the symptoms of the associated disease. The urine presents few diagnostic changes. When amyloid casts are found the diagnosis is sure. Edema is occasionally, but not always, present.

Treatment. This depends upon the nature of the causative condition, and is rarely of much value, so far as the kidney condition is concerned. As a rule, the condition of the patient is hopeless by the time the amyloid disease of the kidney is recognizable.

PERINEPHRIC ABSCESS

Suppuration around the kidney is a rather rare condition. It is usually secondary to purulent nephritis, purulent appendicitis, or abscess of the liver. Occasionally the infectious agent is carried by the blood from distant parts of the body.

Diagnosis. The pain characteristic of abscess formation is located in the loin on the affected side, and may extend down into the thigh, or up into the thorax. The thigh on the affected side is usually flexed. The general symptoms are severe, including rigor, fever, heavy sweating, and prostration. When the kidney is involved, pus may drain into the urine. Otherwise, no recognizable changes may be present. As the pus accumulates the tumor becomes palpable.

The treatment is surgical. The prognosis must always be grave and the kidney is usually permanently damaged.

HYDRONEPHROSIS

This is an accumulation of urine in the pelvis of the kidney. It is usually unilateral.

Pathology. The pelvis of the kidney is dilated and the pressure thus exerted upon the kidney parenchyma produces variable degrees of atrophy. The pressure upon the mucous membrane by the pelvis and calyces, first thins the membrane and then leads to a marked overgrowth of the connective tissue, which supports it. The fluid which is retained is very much like diluted urine. When infection occurs, blood and pus are found abundantly in the retained liquid.

Etiology. The condition is due to an occlusion of the ureter. It may be congenital or it may be due to impacted calculus; to cicatricial stenosis of the ureter; to pressure by tumors, pregnancy, or adhesive bands; to torsion of the ureter, as in floating kidney; or to other more rare causes of ureteral occlusion.

Diagnosis. The symptoms are not distinctive. There may be pain in the loins and running down the thigh. Digestive disturbances, often with diarrhea, may be present, or obstinate constipation may result from pressure.

Physical examination shows the presence of a tumor, which may be elastic or fluctuating. An intermittent form, usually due to movable kidney, presents many difficulties in diagnosis. The X-ray should show the location of the impediment.

Treatment. Surgery of the urinary tract is always difficult, but this represents about the only possibility of relief in hydronephrosis. An exception to this statement is found in the case of floating kidney. (q. v.)

Prognosis. Occasionally the pressure of the urine forces a way through the ureters. Rarely there may be a rupture of the sac. In those conditions in which the obstruction can be removed, the prognosis depends upon the severity of the causative factors.

FLOATING KIDNEY

(Ren mobilis; nephroptosis; movable, palpable, dislocated, or wandering kidney)

The kidney is held in place rather insecurely, chiefly by means of the fat in which it is imbedded. When for any cause, it is allowed to move slightly from its normal position, so that it may be palpated, the term "palpable kidney" is applied to it. When its change of position is sufficient to allow its upper edge to be palpated, but it does not fall below the level of the umbilicus, the term "movable kidney" is used. The position of the palpable kidney and the movable kidney changes with deep respiration.

The "floating," "wandering" or "dislocated" kidney can be pushed around rather freely and it does not change its position with deep respiration.

Etiology. Lesions of the dorso-lumbar region and the lower ribs are important in etiology. By far the most common cause of floating kidney is rapid emaciation, especially following a period of plumpness or obesity. Increased weight of the kidney due to congestion or to tumor, such as hypernephroma, are rare causes. Pregnancy, tumors, ascites, tight lacing, are all somewhat important factors in etiology. Floating kidney may be a part of the general visceroptosis of Glenard's disease.

Diagnosis. The condition is recognized by palpation. The patient should be examined in various positions; as, standing with body somewhat bent forward; lying upon the table, upon his back, side and face; and in Sim's position. Other changes of position may permit the kidney to be palpated more readily.

The X-ray gives valuable information, especially after the ureters have been injected. The urine rarely shows any particular modification, except those due to slight hyperemia after Dietl's crisis.

The symptoms may be either local or general. Vague nervous states are usually present. These are very much the same as those found in other constant nervous irritations. Dietl's crises or "incarceration symptoms" are attacks of severe pain, sometimes with symptoms of collapse, which occur in floating kidney and were at first supposed to be due to the incarceration of the organ. It now seems certain, however, that the symptoms are due to the torsion of the ureter or of the renal vessels.

Treatment. The general treatment for visceroptosis should be instituted. Tight lacing and other faulty habits of dress must be corrected. The kidney should be pushed back into its normal position and held there by properly fitted bandages or corsets. The correction of lesions affecting the lower thoracic spinal column and the lower ribs is an important factor in securing better tone of the abdominal muscles and of the supporting tissues of the abdominal organs. The patient must be guarded against heavy lifting, running upstairs, straining at stool, or any violent muscular effort. A full diet in order that the patient may gain in weight is frequently beneficial.

Attempted surgical relief of the condition is much less common now than it was a few years ago. In some cases the kidney may be attached to the abdominal wall with benefit, but this should not be advised until milder measures have failed.

NEOPLASMS OF THE KIDNEY

The kidney is subject to both benign and malignant tumor growths. The adenoma may be single or multiple and usually undergoes cystic degeneration. Lymphadenoma, angioma, fibroma and lipoma may occur and may produce little or no symptoms until the tumor has reached considerable size.

Sarcoma is sometimes found in children. It may be associated with rhabdomyoma. Carcinoma is somewhat less rare as a primary condition. Renal carcinoma is somewhat common as metastasis. The hypernephroma is a tumor of the kidney, due to the presence of an overgrowth within the kidney of masses of tissue, resembling aberrant suprarenal masses. These are frequently capsulated and resemble benign growths, but their rapidity, metastases, and peculiar secretory activity causes them to be somewhat more properly included among the malignant neoplasms of the body.

Diagnosis. Dull pain in the loins is usually present. The tumor cannot be recognized by palpation until it reaches considerable size. The X-ray is often helpful in diagnosis. Hematuria, casts, cells from the tumor, may be present in the urine. The occur-

rence of cancerous cachexia with the symptoms above mentioned may make the diagnosis fairly certain.

Treatment. The surgical removal of the entire kidney while the growth is very small, should leave the patient in good condition. Unfortunately the diagnosis is not usually made until the tumor has reached so great a size and has given rise to such wide metastases that there is no possibility of relief. Children die somewhat more speedily than adults. Death usually occurs in a few weeks to a year after the appearance of the first symptoms.

CYSTIC KIDNEY

(Renal cyst)

Renal cysts are congenital and multiple. Rarely cysts may appear in the kidneys during later life, as the result of degeneration processes occurring in the kidney parenchyma. Renal adenoma may become cystic.

Diagnosis. The symptoms are somewhat like those of chronic interstitial nephritis. The diagnosis is extremely difficult and is frequently made only post-mortem.

When there is reason to suppose that only one kidney is involved, or the cyst is solitary, surgical treatment may give a reasonably favorable outlook. If both kidneys are involved, the condition is invariably rapidly fatal, after the appearance of the first symptoms.

EMBOLISM OF THE KIDNEY

After leaving the renal arcades the renal arteries are terminal. Emboli reaching these produce small connected infarction areas. These are rarely diagnosed ante-mortem, but may be suspected when patients with endocarditis, or any other recognizable source of emboli, suffer from a sudden pain over the kidney with tenderness in that region and the sudden appearance of blood in the urine.

Rest and palliative measures are the only treatment required. The infarct area usually becomes filled with connective tissue and if this accident occurs several times the kidney is irregularly shrunken and presents a mottled appearance on section.

CHAPTER XXVI

DISEASES OF THE BLADDER

THE NEUROSES OF THE BLADDER

The nervous control of the bladder is partly reflex and is somewhat directly voluntary. The lumbar segments of the spinal cord receive sensory impulses from the bladder and the urethra as well as from the skin, muscles, articular surfaces, and other pelvic viscera. Descending impulses from the cerebral cortex and the lower brain centers act upon the micturition center in the lumbar cord, and thus the voluntary control of the bladder is secured.

Conditions which interfere with the normal activity of any of these nerve centers are included in the term neuroses of the bladder. It is a very common occurrence for involuntary micturition to occur under the influence of intense emotional excitement. In neurasthenic individuals and in some functional insanities the muscular tone of the bladder is deficient, probably as the result of the asthenic state of the nerve centers in the lumbar cord, and the bladder is permitted to remain unemptied for considerable time—in some cases as much as a gallon of urine has been thus retained. In this atonic form the bladder does not become ruptured unless there is associated with the neurosis some local disease.

More commonly the inhibitors of the micturition center are asthenic and the bladder becomes unduly irritable. This is almost invariably the case in hysteria, and is present in most individuals to a slight extent when they are affected by fatigue or long-continued emotional strain. Under such circumstances micturition occurs at short intervals, with the voiding of very small quantities of urine. The treatment of this condition is that of the underlying neurosis.

Local sensory disturbances act upon the micturition center also. Disturbed bladder control is usually present in women who suffer from disease of the vagina, uterus, and more rarely of the ovaries or tubes. Sometimes this lack of control may be due to mechanical pressure, as by tumors or malpositions, rather than as the result of a lack of nervous control. In men the irritation arising from disease of the prostate, urethra, and more rarely the scrotum affect the nervous control of the bladder. This is more apt to occur in men who are of neurotic temperament.

Bony lesions include most commonly lumbo-sacral and sacroiliac subluxations. Less frequently lesions of the coccyx and of the upper lumbar vertebræ are concerned in disturbed control of

the bladder. The bladder disturbances which result from organic nervous diseases are considered with these diseases.

ENURESIS

(Bed wetting)

The reflex nerve control of the bladder is completed at birth. In a baby the filling of the bladder initiates the nervous mechanism which empties it. The process is entirely involuntary, and so far as can be determined, unconscious. During the second year of life the spinal nerve tracts to and from the brain become developed and functional. At this time, it is best for a child to be taught to exercise voluntary control over the act of micturition. It is not necessary that he should be taught to exercise this control, since he will grow naturally into the habit of consulting his comfort and convenience, but a certain amount of education leads to somewhat earlier and certainly more efficient bladder control. Efforts toward establishing the volitional control before the necessary nerve connections are made, are useless. The whole process may be greatly delayed by ill-judged attempts at education, especially when this takes the form of whipping, or of punishment which unduly excites the whole nervous system, especially in neurotic children.

A child which is only a few months old has regular habits, if it has been well cared for, and with a little attention on the part of the nurse, the bladder may be emptied without soiling the clothing, but a child under one year is rarely able to delay micturition voluntarily.

When bed wetting or involuntary micturition during the daytime persists beyond the second year of life, the condition of the child's health must be investigated. Any of the functional nervous diseases may be responsible for this condition. Nocturnal epilepsy and petit mal must not be forgotten in the search for causes. Local conditions sometimes require careful study. Innominate and lumbo-sacral lesions are much more common among children than is generally recognized. The correction of these lesions may be all that is necessary for immediate recovery. The possibility of anemia and malnutrition should be investigated. In either sex uncleanliness, rectal irritation, vesical calculi, highly acid and concentrated urine, worms, tight clothing, masturbation and bad training are etiological factors which have only to be recognized in order to receive suitable curative measures.

The child who suffers from bed wetting should not be permitted to drink much water during the evening hours, nor to eat his heartiest meal at night. After he has been in bed an hour or two, he should be awakened and induced to empty the bladder. The habit will soon become fixed. Care should be taken that the night

clothing fits properly. A firm and plain talk with the child old enough to understand conditions, is much better than scolding or punishments.

The prognosis is good in all cases, except those due to epilepsy.

ACUTE CYSTITIS

Inflammation of the urinary bladder occurs at almost any time of life, but its etiology varies at different periods of life. A predisposing cause of cystitis is found in lesions of the lumbar vertebræ, the sacrum, innominates and coccyx. These act by disturbing the nervous control of the blood vessels of the bladder, and also by interfering with the reflex mechanism which controls its emptying.

The milder forms of **catarrhal** cystitis are associated with redness, swelling and epithelial exfoliations of the mucous membrane lining the bladder. In children the condition is most frequently due to chilling, caused by sitting in cold, wet places. It may result from injury, as by falls or by the improper use of a catheter, or by the pressure of fetus in parturition. More commonly catarrhal cystitis is due to the influence of irritating substances in the urine, or the retention of the urine until irritating substances have been produced by fermentation. Gouty urine is usually irritating. Alcohol and drugs frequently cause cystitis.

Several infectious agents may set up a cystitis, which varies in severity. During the progress of any of the infectious diseases, the bladder may become infected. Gonorrhœa usually reaches the bladder by extension from the urethra. Various forms of yeast and mold infection of the bladder have been described. Infection by means of the pyogenic organisms may result in the formation of small abscesses or ulcers in the wall of the bladder. Diseases of the pelvic organs may affect the bladder by extension.

In all cases of cystitis the symptoms include pain, which is usually just above the symphysis pubis and which often extends around to the back over the lumbo-sacral articulation, down into the external genitals and into the thighs. Reflex muscular contractions across the lumbar and sacral regions and involving the abductors of the thighs are commonly present. Micturition usually occurs at very short intervals, though occasionally the bladder may become enormously distended. The urinary findings include bladder cells, pus, sometimes blood, sometimes mucus, and sometimes the infectious agent; this should give the diagnosis.

Treatment. The treatment should include the relaxation of the reflex muscular contractions, correction of lesions as found, and such movements as increase the mobility of the lumbar and pelvic bones. The leg movements are very efficient in relieving tension.

The local treatment depends upon the underlying cause of the cystitis. Rest and warm applications are beneficial. In all cases a constant and thorough washing of the bladder with a warm, non-irritating, sterile fluid is indicated. This is best secured by having the fluid flow from above downward. In order to secure this constant irrigation with no danger of sepsis, it is best to use the urine itself, by having the patient eat little or no food and drink very freely of hot and cold water. In order to make the water more palatable, fruit juices may be added, but no alcohol or any substance which could possibly irritate the kidneys should be permitted. A rigid milk diet for a few days is very good, if it is possible for the patient to take the milk as directed. The only essential feature is providing a great quantity of bland urine.

The gonococcus and probably the yeast and mold infections first invade the superficial epithelium. As this is constantly being pushed off by the growth of the cells from the deeper layers, it is evident that to a certain extent these infections are self-limited, providing the bladder epithelium reproduces itself with sufficient rapidity and the exfoliated cells are carried away as rapidly as possible by nonirritating irrigation.

"The prognosis in acute cystitis is good, but when the condition is chronic, it is less favorable; it is not unfavorable, however, under proper treatment. When it is due to tuberculosis, enlargement of the prostate, or is associated with disease of the kidney, its recurrence is almost certain.

"Where there is profuse suppuration with rapid decomposition, the bladder should be washed out at least twice daily. Where the cystitis is slight in grade, and the urine is not decomposed, irrigations may be used every two or three days. A negative microscopic examination is the only proof that a cure has been effected, when after frequent examinations and over a long period of time it remains so."—P. F. Kani.

CHRONIC CYSTITIS

The mucous membrane in chronic cystitis is less swollen and is usually of a peculiar bluish color. Erosions, polypoid growths and thickenings of the connective tissue of the bladder wall are characteristic. Occasionally these pathological changes may partially or completely obstruct the ureteral passage, and the urine thus dammed back into the ureters and the pelvis of the kidney on the affected side. The pain is less severe in chronic cystitis than in acute, and occasionally is referred to other parts of the body. Backache, which may suggest lumbago, is usually associated with contractions of certain muscle groups of the lumbosacral neighborhood and with a loss of tone of other muscle groups. Examination of the urine shows varying amounts of pus, mucin, blood, bacteria, and albumin. The kidney may be affected, also, in which case renal epithelium and true casts are present. Also, the examination of the catheterized specimen should show the nature of the infectious agent.

The etiology and treatment of chronic cystitis are the same as that of acute cystitis. The prognosis is somewhat less favorable but if uncomplicated, recovery should occur, provided the patient is reasonably obedient to instructions given him.

Neoplasms of the Bladder. Primary tumors of the bladder or rarely tumors of other pelvic viscera may extend to and invade the bladder. These cause varying degrees of cystitis and other symptoms, according to whether the wall of the bladder is, or is not, penetrated.

The diagnosis, treatment, and prognosis of vesical neoplasms is that of the origin of the tumor.

Vesical Hemorrhages. Hemorrhage of the bladder occurs as the result of a number of very different conditions. Late in pregnancy, it may be due to hemorrhage per diapedesin or hemorrhage per rhexin. Dilatation of the veins may result in the formation of vesical hemorrhoids, and these are very liable to rupture. Vesical calculi may so injure the wall of the bladder as to produce severe hemorrhages. Any of the causes of cystitis may be so serious as to cause rupture of the blood vessel or capillary hemorrhages.

The diagnosis rests upon finding the blood in the urine, the recognition of the underlying causes and upon the cystoscopic examination. The X-ray should show the presence of calculi. After filling the bladder with a collargol solution, any marked irregularities of the bladder wall become evident.

DISEASES OF THE URETHRA

Diseases of the urethra are usually surgical and are discussed in text-books of genito-urinary diseases. Specific infections and the adhesions of connective tissues, and overgrowths which result from earlier inflammation are the most important causes of urethral diseases. Direct injury is not rare. Disease of the urethra is usually associated with severe local pain and reflex muscular contractions over the sacrum. Recovery from these conditions, either without surgery, or after the necessary surgical operations have been performed, is made more speedy and complete if these reflex muscular contractions and any bony lesions that may be found upon examination receive suitable attention.

DISEASES OF THE PROSTATE

Acute prostatitis is usually due to infection by the gonococcus, tubercle bacillus, staphylococcus, bacillus coli, or other bacteria. Lesions of the sacrum, innominates or coccyx, or of the lumbar vertebræ are predisposing factors. The symptoms include pain on sitting, defecation or urination, vesical and rectal tenesmus and hematuria. Abscess may result, which may drain without much evil after-effects, or may break into the rectum, bladder, or neighboring tissues.

Chronic prostatitis may result from repeated attacks of the acute form, or from the constant action of the etiological factors. The symptoms include referred pains in rectum, perineum, back, legs, and upward toward the kidneys, melancholy and neurasthenic states, circulatory disturbances, and various disturbances of sexual functions. Chronic rheumatism and endocarditis are probably often due to chronic prostatitis.

Hypertrophy of the prostate is common in elderly men. Infections, constipation, bony lesions of the pelvic girdle, and circulatory disturbances are

etiological factors. The symptoms include those of chronic prostatitis, and careful examination gives evidence of the enlarged prostate. Care must be taken to avoid confusing chronic prostatitis, hypertrophy and prostatic neoplasms.

Neoplasms of the prostate. Carcinoma may be primary. It occurs in men over fifty years old, most often after the age of sixty years. Pain is more common in carcinoma than in hypertrophy, and blood is more often found in the urine. The mass is found to be larger upon one side than the other; is distinctly lobulated, and of stony hardness, all of which help to distinguish it from hypertrophy. Sarcoma is softer than carcinoma, and is less distinctly lobulated. Obstinate sciatica in men past the half-century age should suggest the disease. Metastatic growths may be found in the bones, by the X-ray, sometimes very early in the disease.

Treatment. In all these cases the treatment must be decided after examination of each patient. Surgical interference is often of doubtful value, yet is necessary at times. Catheterization, dilatation, and irrigation must be performed, when necessary, under the most aseptic precautions possible.

Correction of the bony lesions is an important factor in the treatment of all cases; in certain cases this is all that is necessary to secure recovery. In nearly all cases careful but thorough massage every week or ten days per rectum of the contiguous tissues and to a certain extent of the gland itself is beneficial.

Examination of the prostate should be a routine procedure in the examination of men whenever the diagnosis is uncertain, especially when chronic rheumatism, nervous or toxic states of unknown cause, or pain in the region supplied by the lumbar and sacral nerves are included in the symptoms.

PART VI

THE TOXIC AND CONSTITUTIONAL DISEASES

CHAPTER XXVII

GOUT AND RHEUMATISM

GENERAL DISCUSSION

Recent studies have thrown the old names, always unsatisfactory, into still greater confusion. The muscles and joints are subject to the adverse influence of several different factors, which may act singly or in various combinations in any given case.

The terms "gout" and "gouty" should be limited to those states in which the presence of excessive amounts of uric acid (monosodium urate) is an important factor in pathogenesis.

The term "rheumatism" or "rheumatic" should be limited to those states in which the streptococcus rheumaticus, or other infectious agents, or bacterial or other toxins, are responsible for the symptoms. Septic foci, tonsillitis, pyorrhea alveolaris, with their secondary infections, gonorrhoea, latent infections anywhere in the body, are to be considered in these diseases.

There are other muscular and arthritic states in which the senile connective tissue hardening seems to be the only causative agent; others in which nervous disturbances alone appear responsible; while in another large group of cases the cause seems to be the bony lesion, affecting the joint either directly, or indirectly through its nerve or blood supply. This appears to be the case in lumbago, pleurodynia and cephalodynia, especially. (q. v.)

GOUT

(Podagra, gout of the foot; chiragra, gout of the hand; gonagra, gout of the knee)

Gout is a nutritional disorder of unknown pathogenesis, associated with an excess of uric acid (monosodium urate) in the blood and tissues, and manifested clinically by periodic attacks of acute arthritis, usually of the metatarso-phalangeal joint of the right great toe, certain visceral disturbances, and deformity of the joints attacked.

Etiology. Heredity is a considerable factor. It develops in the grandchildren, usually the males, and occurs chiefly in middle or

later life. Habitual indulgence in heavy or sweet wines and heavy malt liquors, excessive eating, particularly of nitrogenous food, with sedentary habits, are the common causes; defective hygiene, and sometimes deficient food, may cause "poor man's gout."

Chronic lead poisoning is often accompanied by gouty symptoms. In the predisposed, worry, emotion, or a trivial injury may determine an attack. Disturbances of protein metabolism, not yet understood, interfere with the purin balance, cause increased uric acid in the blood and other factors which produce the symptoms. Subluxation of the bones of the foot, notably the astragalus, or of the bones of any other part affected, together with subluxations in the spinal area from which the nerve supply comes, are factors in etiology.

The pathogenesis is uncertain. Uric acid is found in excess in the blood, in the gouty joint, and in the exuded serum of gouty arthritis.

The morbid changes are outlined as follows (taking the great toe as a type): Fine crystalline needles are deposited in the interstitial parts of the cartilage and in the synovial fluid. The synovial membrane, cartilages, and ligaments become covered with a chalk-like deposit of urates. The tissues underneath are more or less necrosed.

The cartilages may be eroded and the synovial membranes thickened, ends of the bones are enlarged and the joints deformed. Nodular masses appear around the joints consisting of urates plus calcium phosphate—the chalk-stones or tophi of gout. These may ulcerate through the skin. They appear in other structures than joints, as the lobes of the ears, tendinous aponeurosis of muscles, and in many other places.

Several types of gout are recognized, according to the effects produced by what seems to be a common metabolic disturbance.

Acute gout may occur as a single attack, or may recur at intervals, varying with the habits of the individual, precipitated by overindulgence in any of the dietetic errors mentioned in etiology, by emotional storms or trauma. Acute attacks occur during the course of chronic gout.

There are usually premonitory symptoms consisting of dizziness, mental depression, flatulence, irritability of temper, and scanty, high-colored urine. The attack most commonly commences after midnight with severe pain in the big toe, usually the right, the pain increasing to acute agony. The patient may or may not become feverish, to 102° F. The joint is first a bright red and exquisitely painful; later is swollen, of a dusky red color, and with distended venules. The swelling extends for some distance from the joint. Sudden spasmodic muscular contractions increase the agony. Toward morning the symptoms subside. This may be repeated several times. During the attack, the patient is usually most irritable; the tongue is furred, the breath offensive, and the bowels constipated. An attack lasts from five to eight days, the severity of the symptoms gradually abating.

The skin of the joint desquamates in thick flakes after the attack. Subsequent attacks may affect the joint first implicated, or a number of joints may become involved. If the attacks are fairly frequent, they cause the so-called chronic gout.

Chronic Gout (gouty arthritis). The small joints of the toes and fingers are affected. The fingers are stiff, swollen, flexed, or extended, sometimes deflected toward the ulnar side. Tophi may form in the joints, the bursæ or in the cartilages of the ears. Constitutional symptoms are present but milder than in the acute form. The kidneys are affected.

Suppressed or Retrocedent Gout is a condition in which the development of internal symptoms coincides with rapid disappearance of the joint signs.

The symptoms may be either gastro-intestinal, with nausea and vomiting, much severe pain, usually diarrhea and great, even fatal, prostration; pulmonary, as asthma, dyspnea; cardiac, with dyspnea, pain, arrhythmia, pericarditis, syncope; or cerebral, as headache and delirium which are probably uremic. Any of the smaller joints may become affected. Later, renal complications include deposits of urates, and interstitial nephritis. Arteriosclerosis is a common accompaniment. Uremia, pleurisy, pericarditis, peritonitis, and meningitis are common terminal affections.

Irregular Gout. (Lithiasis; uric acid diathesis; lithemia; lithemic state; uricemia; American gout.) Lithemia is a condition in which the fluids of the body contain an excess of nitrogenized wastes in the form of uric acid or related compounds, occurring in persons not suffering from articular gout and manifested by various digestive, nervous, and circulatory phenomena, muscular and articular pains, and scanty, high-colored urine.

The symptoms referred to the digestive system include esophageal spasm, gastralgia or gastritis; colic or enteritis; hepatic diseases or "bilious" attacks with furred tongue, foul breath, constipated bowels, and torpid liver. Circulatory phenomena are palpitation, arrhythmia, cardialgia or angina pectoris, dyspnea, syncope. The blood pressure is high, the vessel walls are stiff, and renal changes are found. Respiratory symptoms resemble bronchitis or asthma. Nervous phenomena are varied and include headache, neuritis, neuralgia, meningitis, and symptoms of cerebral congestion. Skin affections as eczema, urticaria, erythema multiforme, etc., may occur. Iritis, glaucoma, retinitis, and suppurative panophthalmitis have occurred. Urinary disturbances include gouty glycosuria, oxaluria, calculi and urethritis.

The complications are chronic interstitial nephritis, chronic bronchitis, hepatic enlargement, arteriosclerosis, leading to apoplexy, cardiac hypertrophy leading to dilatation.

All forms of gout are characterized by certain common factors. The **blood pressure** is always increased. The **blood** shows no common factors, but there is usually slight leucocytosis. The granular leucocytes show the effects of some destructive influence, in fragmented nuclei, vacuolated protoplasm, atypical staining reactions, and ragged cellular outlines.

The **urine** is characteristic. Before and during an acute attack the quantity is diminished; color high; acid reaction; specific gravity above normal; urea is not much altered; uric acid is diminished during the paroxysm; phosphates are nearly always diminished; albumin is present in a very small amount. The sediment contains hyaline and granular casts, renal cells and altered blood cells free or adherent to the casts.

Before and after recovery from the attack the quantity is normal or increased; the normal solids are usually increased; uric acid and urates are greatly increased, while evidence of more or less renal irritation persists.

Treatment. During the intervals the treatment should be devoted to securing better circulation through the liver especially; to the removal of lesions wherever found; to securing increased mobility of the spinal column; and to the correction of hip, innominate and lumbar lesions particularly. Bony lesions of the foot are frequent, and predispose to the usual location in the toe.

During the acute stage the intense pain can be relieved by careful manipulation of the joint itself, freeing the circulation around it. It is better to begin at the hip, working down to the affected joint. The joint is carefully stretched by tension and a careful side to side motion if in the great toe. Hot fomentations may be used. The limb should be at rest and elevated.

Restrict diet to milk and barley water during the attack and make the patient use plenty of water. The mineral waters are of no special use except for the water content. Lemon juice is a very good addition to increase the quantity of water taken.

As soon as the patient is over the attack, write out a regulated diet list consisting of a moderate amount of nitrogenous food without excess of carbohydrates, using plenty of dairy products, eggs, fats, green vegetables, fresh fruits except strawberries and bananas, and avoiding foods rich in nucleins, tea, coffee, and alcohol. Restrict the use of common salt. All rich foods of any kind are to be avoided. Meals must be regular. Water must be freely used, preferably between meals. Exercise should be regular and in the open air, walking and golf are advisable. Rides are good if walking is painful. In the robust, cold baths may be taken each morning; the warm evening bath is more beneficial for weaker patients. Friction should follow the bath. The clothing must be warm. Residence in a warm climate is often advisable.

After the acute attack subsides, gentle friction and passive movements for the affected joint promote recovery.

Prognosis. Acute gout is rarely fatal but is prone to recur. Chronic gout has a less favorable outlook, as the renal, arterial, and cardiac complications shorten life. Acute diseases and injuries arising during its course are more serious than under other circumstances. Suppressed gout may be fatal at any time.

MUSCULAR RHEUMATISM

(Myalgia, myositis, fibrositis)

Muscular rheumatism is an inflammatory affection of the voluntary muscles and their fibrous attachments, marked by pain, tenderness, and stiffness of the affected muscle.

Etiology. Muscular overstrain and exposure to cold and damp, bony lesions affecting the vaso-motor or sensory nerve centers of the muscles affected, gout, septic foci anywhere in the body, and rarely extension from a chronic infection of neighboring joints, are the usual cases found.

Diagnosis. The general symptoms are: a rather sudden onset with pain, slight tenderness, and stiffness of the affected muscles, increased on any attempt at movement. Spasmodic contraction and rigidity of the muscles may be present. Fever and constitutional symptoms are absent. The variety depends upon the location.

Lumbago. (Lumbodynia.) The aponeurosis of the erector spinæ and the latissimus dorsi is most frequently affected. Lumbar subluxations are usually present. It is often attributed to some physical exertion such as heavy lifting. The pain usually affects both sides, is often severe and may affect locomotion. When complicated with sciatica, the suffering is intense.

"Lumbago is usually classed among the myalgias, but, as a rule, it is rather a distortion of one of the lateral joints of the spine, due to sudden movement when the joint has not been prepared for it by preliminary fixation."—L. F. Barker, Johns Hopkins.

Cephalodynia is situated in the occipito-frontal muscles. It is distinguished from facial or occipital neuralgia by pain on both sides of the head aggravated by movement. It may affect the eye muscles when movement of the eye-ball excites the pain; or the temporal muscle, rarely. The masseter muscles are involved when pain is induced by mastication. The trouble can be often traced to the upper five cervical vertebræ.

Muscular Torticollis. (Wry or stiff neck.) The sterno-mastoid muscle of one side only is the usual one affected so the head is twisted and great pain is excited on attempting to turn it. This

form must not be confused with spasmodic torticollis nor with congenital deformity. Subluxations of the third, fourth, and fifth cervical vertebræ are usually found. If the muscles of the back of the neck are involved, it is known as cervicodinia.

Pleurodynia. The sheaths of the pectoral muscles, the intercostals, or the serratus magnus are most commonly affected. Respiratory movement of the affected side is embarrassed; the patient often leaning toward that side, and pain is excited by forced respiration, coughing or sneezing. It may be mistaken for pleurisy but the concomitant signs are absent except for a distinct fremitus. The subluxations found are those of the ribs and their corresponding vertebræ.

Treatment. In any form of muscular rheumatism search must be made for some source of poison or infection. The teeth, tonsils, nose, middle ear, gall-bladder, intestines, genito-urinary tract, may be associated with septic foci which constantly give either bacteria or toxins to the blood. These must be properly treated if recovery is to be permanent.

Fomentations applied to the affected area for twenty minutes prior to treatment is of considerable assistance. Careful, forced flexion of the thighs on abdomen for three or four minutes is frequently effective in lumbago. Springing the spine from the tenth dorsal to the fourth lumbar, gently, may permit corrections to be made with greater ease. Applications of heat may be needed to prevent muscular tension from reproducing the lesion after correction has been made. Adhesive straps may be useful in maintaining the normal relations. Thorough careful relaxation of the muscles affected, then correction of the specific lesions found will often relieve the patient immediately in acute cases. Stimulation in the splanchnic area is helpful in promoting elimination. In chronic cases more time is required as the subluxations are harder to reduce.

"In torticollis, lesions may be found from the first to the seventh cervical vertebræ, and first and second dorsal. A lesion of the first and second ribs may interfere by misplacement or pressure with the blood or nerve supply to the neck. The affected muscles undergo fibrous degeneration, becoming hard and unyielding. The sternal head of the sterno-mastoid muscle is more frequently affected symptomatically. There is pain on motion of the affected muscle and it becomes tense and stands out prominently from beneath the skin. The tenderness is marked. The head is drawn to one side and the face rotated upward.

"In severe cases the face may look directly toward the shoulder of the unaffected side. The sterno-mastoid muscle originates on the manubrium and clavicle and is directed upward and backward to the mastoid process and adjacent portion of the occipital bone. It flexes laterally the head and neck and rotates the face to the opposite side and when acting conjointly with its fellow, raises the manubrium and clavicle or flexes the head or neck. The constant pulling of the muscle would cause lesions of the axis.

"Cases have been cured osteopathically after section of the muscle and resection of the nerve have failed. The treatment consists in correcting

the lesions and improving the general health. Where the lesion is the primary cause, correction of the same will accomplish a cure."—G. W. Goode.

"Take a case of torticollis where the patient's neck is too stiff and sore to manipulate, and, as often in such cases, manipulation aggravates rather than helps: I give the patient just enough ether or chloroform to relax, then, with great care to avoid any additional irritation to the joint, gently adjust the third and fourth cervical. I have never failed to find a lesion there and I have never failed to produce a cure in one treatment, that is in acute cases."—C. G. Hewes.

The prognosis is favorable for recovery. The chronic form frequently recurs, especially with changes in the weather, hence the patient must increase his resistance by continued treatment for some time, by correct habits of living, and by avoiding things which tend to produce his particular subluxation.

THE CHRONIC ARTHRITIDES

(Including chronic articular rheumatism; rheumatoid arthritis; rheumatic gout; hypertrophic arthritis or osteo-arthritis; chronic infectious arthropathy; chronic progressive polyarthritis)

These diseases are thus grouped because the essential nature of all is now more or less uncertain, and because they have so many factors in common, with our present ignorance of their pathogenesis.

Etiology. The bacterial origin of all forms of rheumatism must be suspected. Septic foci in tonsils, intestinal tract, generative organs, middle ear, around the teeth, and other locations may be responsible for either chronic infection or chronic poisoning. Poverty, exposure, especially to cold and wet; trauma; worry; grief; fear; uterine and ovarian disease, heredity of tuberculosis, gout or rheumatism, or anything which lowers the general vitality, predisposes to the disease. Subluxations of vertebræ increase predisposition. An acute form appears to be infectious. Lesions affecting the innervation of the involved joints are constant—usually this includes structural impediments affecting the nerve trunks, as well as vertebral subluxations. Lesions of the first rib and clavicle, with contractions of the scaleni, may exert direct pressure upon the brachial plexus; these lesions are also effective as reflex disturbances affecting the trophic centers of the cervical enlargement. Lesions of the lumbo-sacral region are associated with tension of the psoas magnus; this causes slight direct pressure upon the lumbar plexus; this also exerts a reflex effect upon the trophic centers in the lumbar enlargement. These lesions are constant, in trophic affections of the articulations of hands and feet.

Pathology. In *arthritis deformans* the disease begins in the cartilages and synovial membranes. The cartilages become soft and vascular and are gradually absorbed; the result is the approximation of the two articular surfaces which become very dense, hard, and highly polished—eburnation. Rarefaction and atrophy may occur, leading to shortening and deformity. The

synovial membranes are inflamed and thickened; often portions become detached and form loose bodies in the joint.

Ligaments are thickened, contracted, sometimes calcified. Ankylosis is rarely complete. At the margin of the joint where pressure is less, ossification goes on, resulting in the formation of irregular bony outgrowths, called osteophytes. There is not tendency to suppuration; muscular atrophy is a common accompaniment.

In **chronic rheumatism** the shoulder and the knee are most frequently affected. The fibrous tissues are chiefly involved; the synovial membranes may be reddened but effusion is very slight. The capsules and ligaments of the joints, sheaths of adjacent tendons, and aponeurotic sheaths of muscles may be implicated. These become thickened and inflamed, thus limiting joint movement. There is little deformity and no bony ankylosis.

Pain and stiffness of the parts involved are the main features. This state is aggravated by damp or stormy weather. The joints may be a little swollen and tenderness present during the acute exacerbations. Many joints may be involved. The pain is usually worse at night, and in the morning it may be very severe, but after exercise it mitigates until it is tolerable but does not disappear. The joints may be felt and heard to creak. In very chronic cases, some atrophy of the muscles occurs; permanent stiffness or even fibrous ankylosis may follow.

Spondylitis Deformans is the name given when the disease attacks the vertebræ. It is more common in men. The spinal column becomes completely rigid and strongly kyphotic.

Mono-articular form attacks spine, shoulder or hip, in elderly men.

General Progressive Form. The process affects the smaller joints symmetrically, especially the metacarpo-phalangeal and inter-phalangeal joints of the hands. At first, the joints may be red, swollen, and tender, but this stage may not appear. Later, or from the beginning in other cases, stiffness and gradual deformity without signs of inflammation are present. The joint changes and the accompanying muscular atrophy cause the deformities to assume a very characteristic appearance. The lower ends of the ulna and radius project at the wrist, the metacarpo-phalangeal joints are flexed, the first phalangeal joints are overextended, the second are flexed, and the fingers deviate to the ulnar side. The joints give forth a creaking sound when moved. The attached muscles are subject to cramps. The temporo-mandibular articulation is apt to be affected.

The pulse is rapid, 100 to 120, or even higher, soft and compressible in the presence of a normal temperature. A return to a normal pulse-frequency is a sign that the process of the disease is arrested.

The skin is soft, subject to local sweats, often moist and clammy; diffuse melasmic discolorations, or level dark-brown patches with numbness and tingling, are often present. The blood, blood pressure and urine show no characteristic changes. The majority of patients reach a quiescent stage, suffer no pain and enjoy excellent health except for the inconvenience due to deformity.

The osteophytes upon the hands receive the name of **Heberden's** or **Haygarth's Nodosities**. They occur most commonly in middle-aged women, especially those who have long suffered digestive troubles. Little transparent cysts, possibly pouches of synovial membranes, may be associated with the nodes. After the hands and wrists, the knees and ankles may become involved. The thumb and the large joints usually escape. The muscular atrophy is largely contributed to by nonuse.

The acute form is much less common than the chronic. After a febrile onset, the joints become distended with fluid and are speedily disorganized. Erosion of the cartilages with a grating sound on motion follows but there are no osteophytes. It may subside in about a month or become chronic.

In children, it follows a somewhat different course. The onset is always before the second dentition with an attack which may be febrile, slight stiffness of one or two joints, gradually extending to others. There is no bony grating. The enlargement is due to general thickening and not to bony overgrowth. Limitation of movement may be extreme and there may be muscular wasting. There is enlargement of the spleen and lymph glands, which may be general, the lymph glands being quite large. Sweating is profuse. There is anemia although the heart complications are rare. The children look puny and generally show arrest of development.

Treatment. Correction of any lesions, especially those mentioned in etiology, is absolutely necessary. Local treatment to the joint involved must be careful, and is occasionally best omitted. All corrective work must be done without causing nerve shock. Attention to the general health by a liberal diet, fresh air, moderate exercise, and residence in a dry, warm climate are indicated.

Prognosis. Pronounced structural changes are incurable. In favorable cases the process can be checked, the function of the joint be partly restored, and the enlargement reduced.

CHAPTER XXVIII
DISTURBANCES OF METABOLISM

DIABETES MELLITUS

(Glycosuria; melituria)

Diabetes mellitus is a nutritional disorder characterized by excess of grape-sugar in the blood and its excretion in the urine and attended by polyuria and progressive emaciation.

Etiology. A posterior middle and lower thoracic curvature, especially containing "rotary" lesions, is a common predisposing factor. Lesions involving the tenth thoracic are also reported. Septic foci with systemic poisoning may be a factor. Other predisposing factors are Hebrew race, male sex, between 40 and 60 years, worry, nervous shock, gout, sexual excesses, syphilis, and excessive use of farinaceous foods and malt liquors.

Injuries or diseases of the brain or cord, especially to the floor of the fourth ventricle, and diseases of the pancreas, have borne a causal relation to this affection. Disease of the liver and of the kidneys may produce glycosuria.

Childhood is not exempt from this disease; it is speedily fatal in the young.

"The pathogenesis is not known. Disease of the pancreas, especially of the Islands of Langerhans, may be responsible for a lack of the glycolytic ferment normally formed in these bodies. Disturbance in the internal secretion of the posterior lobe of the pituitary body is associated with glycosuria. The secretion of the suprarenal glands seems to be necessary to normal action of the pancreatic islands, and disease of the adrenals is one factor in diabetes. The glycogenic activity of the liver may be disturbed by disease of that organ or of its nerve and glycosuria result. This type is less serious and fatal than is that due to the disease of the ductless glands. Injury to the nervous system, especially to the floor of the fourth ventricle, causes diabetes. Brain tumors, etc., may have glycosuria as an early symptom. Nervous shock, emotional storms, etc., produce glycosuria in certain individuals; rarely, such a shock may induce a very rapidly fatal diabetes.

"The pancreas and liver receive their secretory nerves from the eighth to the tenth thoracic segments. Bony lesions which disturb the normal balance of these centers are important in perpetuating glycosuria, and in predisposing to diabetes. In a number of cases reported by osteopathic physicians, the sugar appeared in the urine whenever such lesions were permitted to recur.

"The lesions I have found may be summarized: (1) In the lower dorsal and lumbar, marked posterior curvatures; (2) pressure lesions at the atlas, axis, clavicle, first two ribs, fourth and fifth dorsal, in relation to the heads of the ribs (sympathetic); (3) in acute cases there is intense muscular contraction in the lower dorsal and lumbar regions."—J. M. Littlejohn.

Diagnosis. Diabetes is to be suspected when a patient complains of thirst, hunger, polyuria, boils and carbuncles, pruritus,

debility, impotence, or loss of weight. Constant elimination of sugar, increased urea, constant marked polyuria, and loss of weight establish the diagnosis. The history varies according to several factors. The disease has the more rapidly fatal course in the young; in old people it may persist for years without causing any serious symptoms.

Acute Diabetes is usually found in the comparatively young, even in children; the symptoms very rapidly assume a grave type and post-mortem the pancreas is found extensively diseased. It may terminate in four or five weeks.

Chronic Diabetes. The symptoms are often obscure. Except for the peculiar urine, and attacks of dyspepsia, the patients may obtain a fair degree of health for a long time. A typical case has characteristic symptoms; polyuria, hyperorexia, and polydipsia with progressive muscular weakness and emaciation, and loss of sexual power. The tongue is irritable, beefy-red, often cracked, and glazed; the mouth is dry and the gums swollen and spongy with marginal gingivitis; the skin is harsh, dry, scaly, and often intensely itchy; the countenance assumes a distressed and worn expression; the bowels are constipated with pale, dry stools. The irritating urine causes constant itching, burning, and uneasy sensations along the urethra and at the meatus. Lumbar pain is common. There may be severe attacks of diabetic dyspnea or air-hunger. The breath has a peculiar sweetish, apple-like odor due to acetone. The onset of coma is often sudden but patients frequently die of intercurrent disease as pneumonia, critical diarrhea, and other infections.

Diabetic coma occurs in one of three ways: Suddenly, after exertion; gradually, with headache, delirium, dyspnea, very heavy sweetish odor to the breath and sometimes cyanosis; abruptly, with headache, feeling of intoxication and rapidly fatal coma. The coma is thought to be due to B-oxybutyric acid in the blood.

Complications. Peripheral neuritis is manifested by leg-cramps, knee-jerk often absent, numbness, tingling, neuralgias and paralyses. Herpes zoster and perforating ulcer of the foot sometimes occur. Diabetic tabes is a peripheral neuritis characterized by lightning pains in the legs, loss of the patellar reflex, and peculiar high steppage gait. Melancholia is frequent. Cutaneous effects include boils, carbuncles, eczema, pruritis of the vulva and pudendi, painful onychia and gangrene of the extremities. Acute pneumonia, gangrene of the lung, and tubercular lung conditions are common. Cataract is liable to occur and progress with great rapidity in young persons. Retinitis, hemorrhages, sudden amaurosis, optic atrophy, and paralysis of the muscles of accommodation occur.

Otitis media and mastoiditis are infrequent. Impotence is nearly always present; this may be the first recognizable symptom. Conception is rare and if it occurs, abortion is likely.

Blood. Polycythemia is not uncommon with marked polyuria due to the concentration of the blood. Hyperglycemia is present

in the plasma, often as high as 0.57% instead of the normal 0.15%. Lipemia is present. The fat may form a creamy layer on the top of clotted blood. Leucocytosis and anemia may supervene in diabetic coma. Blood pressure is usually subnormal in uncomplicated cases.

Urine. The quantity is large, 3,000 to 20,000 cc. (6 to 40 pts.) per diem, and generally in direct ratio to the amount of sugar present. The color is clear, very pale, greenish-yellow, and watery, becoming opalescent upon standing. Reaction is generally acid. The specific gravity is usually 1025 to 1050.

The urea is increased. The normal solids are relatively diminished. Preceding and during diabetic coma, they are relatively and absolutely diminished. The phosphates and calcium salts are markedly increased. Uric acid is not increased. The daily quantity of sugar varies from 0.5 to 12% or 20 gms. to 500 gms. in 24 hours. Glycogen may be present. Albumin is present in very small amounts in the early stages.

In the late stages, acetone, diacetic acid and B-oxybutyric acid are present. Occasional hyaline and finely granular casts, moderate excess of squamous epithelium and sometimes leucocytes are found.

Albuminuria with later cirrhosis of the kidneys and the symptoms arising therefrom occur. Edema of the feet and ankles is due to the renal disturbance.

Diabetic Diarrhea is very easily provoked and this should be remembered in treatment.

Treatment. The treatment of diabetes must rest upon a recognition of the especial factors producing the condition in each case. In the typical case, with the thoracic lesions mentioned, the corrective work is certainly indicated.

"The corrective work should be not only applied to the dorso-lumbar curve, but to relieving the approximation between the occiput and atlas. * * * Corrective work should at first be given three times weekly; later, twice weekly, and still later, once weekly. Follow up your case with occasional treatment and urinalysis to be sure you have a permanent result.

"In addition to the corrective work, by which I mean the replacement to normal position and securing of normal motion of the spine throughout the region of the curve, we must treat the liver direct.

"Next in importance to treatment is the limitation of the quantity and quality of the food. And I am inclined to believe that the limitation of the quantity, so as not to overwork the already crowded organs of assimilation, is of more importance than the limitation of the quality of food."—F. H. Smith.

Diet. In determining a diet for a diabetic patient, the output of urea is of more value than the output of sugar, so far as his maintenance of strength is concerned. If the urea can be kept within fairly normal limits, the prognosis is fairly good. The best way to decide an efficient diet is as follows: Give the patient a few

charcoal tablets; put him upon a strictly carbohydrate free diet. When the feces become black, make an analysis of the 24 hour urine each day for three days; if the findings are fairly constant, the test may be terminated; if the findings vary, the analyses and the carbohydrate free diet must be kept up for two days longer. The amount of sugar eliminated upon a sugar-free diet indicates the amount of sugar that his perverted metabolism demands; and will secure, if necessary, from proteids; even from his own body tissues. Carbohydrates to the equivalent of this elimination should then be added to the diet, and more charcoal tablets given. When the feces are again black, the 24 hour analyses are to be repeated; if the sugar is being eliminated in excess of that given, more must be added to the diet; and these tests are to be repeated until the sugar intake equals the sugar output. The urea, on this diet, should be about normal; the weight of the patient constant, and while the elimination of sugar is, no doubt, greater than would be the case with strictly carbohydrate free diet, yet the condition of the patient is much better. The better nutrition and strength give a better prognosis for recovery than the lessened sugar output with increased body loss. Some patients have idiosyncrasies for certain forms of carbohydrate—one can handle potato but not bread, another can take honey but not potato, another can handle oatmeal with ease, and so on. These conditions must be tested by urinalysis, since patients often have most unbased ideas of these things.

In more severe cases the full Allen diet should be given. In lighter cases a careful study should be made of the sugar tolerance, and different carbohydrates should be tested in order that as varied and satisfactory a diet as possible may be determined, which shall yet be free from danger of increasing the progress of the disease.

"The excretion of quantities of sugar overworks the kidneys, making them liable to specific kidney ailments. There is a very considerable variety of foods that a diabetic can take with impunity, and the diet should be as well balanced as may be considering the fact that so much of the carbohydrate food must be forbidden. * * *

A careful distinction that must be made between the foods which really contain little or no sugar, and those which seem to have none but in reality contain it; for example, sour milk and buttermilk—they are often given to a diabetic where sweet milk is forbidden. In the sour milk the sugar is still present and the taste merely concealed by the lactic acid. And again "tart" apples are prescribed and sweet ones barred. The sugar again is present, but simply disguised by the acid taste."—H. M. Conklin.

"An absolute withdrawal of carbohydrates from the food of patients having true diabetes mellitus will always increase the acetone and diacetic acid and often the ammonia and B-oxybutyric acid, and toxic acidemia and coma become imminent. Hence, it is unjustifiable, sugar having been discovered in the urine, to withdraw the starches absolutely or too rapidly from the diet."—O. T. Osborne.

"There is danger, then, in diabetes, of giving too much meat and too little carbohydrate, for meat, aside from being a prolific source of sugar, leads to the formation of acid products in the process of metabolism that may become

dangerous; meat moreover, in diabetes reduces the boundary of tolerance."—A. C. Croftan.

The patient must make up his mind to lead a quiet life, avoid worry, to take daily systematic exercise, bathe daily, and to behave, in short, as sensible, well people do in every way, except that he must avoid overtire.

The great thirst may be relieved by lemon juice, ice, or small amounts of water sipped slowly.

The pruritis is relieved by cooling lotions of boric acid or hyposulphate of soda (1 oz. to 1 qt. of water). In coma, inhalations of oxygen may be necessary.

Prognosis. In these days true diabetes is regarded as curable. The younger the patient, the more likely and more rapid the fatal issue. In advanced cases, the outlook is grave. Patients past middle life may not suffer any serious inconveniences from the condition, provided they have proper care.

DIABETES INSIPIDUS

(Polyuria)

Diabetes insipidus is a rare condition characterized by the passage of an excessive quantity of pale limpid urine, free from sugar or albumin and accompanied by insatiable thirst.

Etiology. It is probably due to the presence of an excessive amount of internal secretion of pars media of the hypophysis in some cases. It has been experimentally produced by implantation of this tissue, and persons suffering from other pituitary diseases often have also diabetes insipidus. The essential feature is the inability of the kidneys to secrete urine of high osmotic tension. Severe nervous shock, diseases of the brain, or suddenly produced bony lesions affecting the eleventh and twelfth thoracic segments, may cause marked polyuria.

No constant structural changes are noted. The most common are the result of the polyuria—hypertrophy of the bladder and dilatation of the ureter and renal pelvis.

Diagnosis. The main symptoms are the polyuria and great thirst. The appetite is sometimes voracious; there are headache, dyspepsia, constipation, mental irritability, muscular weakness, severe lumbar pain. The mouth is dry, and thirst severe. The health may be undermined by the persistent thirst and the frequent micturition. The ability of the kidneys to secrete urine of high specific gravity should be tested. Give the patient very little water, with a salty diet. If urine of high specific gravity be voided, the condition is one of symptomatic polyuria, and should yield readily to correction of the vertebral lesions mentioned, with good hygiene.

If the urine is still of low specific gravity, the true diabetes insipidus is probably present. The X-ray should be used to determine the size and shape of the sella turcica.

The spinal examination often shows lesions of the ninth to twelfth dorsal vertebræ and the corresponding ribs.

Urine. The quantity is increased to 6,000 to 30,000 cc. per day. The color is very pale; the reaction is faintly acid or neutral. Upon standing it becomes ammoniacal and turbid, and often has an offensive, fish-like odor; the specific gravity is low, 1001 to 1005; the normal solids are absolutely much increased but relatively much diminished. The total urica is greatly increased; the chlorides, phosphates, and sulphates are high. Sugar and albumin are usually absent. Sediment is very slight, of cellular elements, squamous epithelium and small round cells.

Treatment. In true diabetes insipidus, when the pituitary is involved, treatment must be devoted to that gland. Usually other symptoms appear early, and the urinary condition evades notice. The urinalyses should be made, carefully grading the water intake, until just enough water is given to dissolve and carry away the total body wastes. The food should also be restricted to the actual body requirements, in order that the urinary solids may be kept low. In nervous polyuria, and in that due to bony lesions the prognosis is much better. The lesions of the lower thoracic region are to be corrected. Springing the spinal column gently gives immediate relief in many cases. The diet should be almost or quite free from sodium chloride; fruits and raw vegetables should be freely used as foods. Meat should be reduced in most cases; many patients do better upon a rather low proteid intake. Regular and systematic exercise in the open air is very beneficial. If the patient is of neurotic temperament, the educational measures indicated for hysteria may be needed; recurrences may follow emotional storms in neurotic patients.

ACIDOSIS

Acidosis is a condition of metabolism characterized by an excess of acid radicles in the blood and probably in the tissues. In diabetes mellitus, starvation, high fevers, certain wasting diseases, diet lacking in carbohydrates, and in other conditions, there is an accumulation of certain acid products of fat, or proteid, decomposition. These include acetone, beta-oxybutyric and aceto-acetic acids, and other acids of the volatile series. Diabetic acidosis is associated with weakness, stupor or somnolence, and later coma and death.

In other conditions, not well understood, there is faulty neutralization of the mineral acids. This may be due to lack of alkaline

salts in the foods; to imperfect oxidation; to defective metabolism, or it may be due to defective elimination of the urinary acids. There is lowered carbon-dioxide tension in the alveoli, air-hunger and hyperpnea, and varying nervous and digestive symptoms. Various writers attribute a great number of ills to acidosis, some of which may perhaps be due to the condition. When these acid wastes (the poorly oxidized katabolites) accumulate in the blood, they are usually neutralized by the use of a moiety of the proteid molecule, broken up into ammonia and other radicals. The amount of urinary ammonia thus gives a fairly accurate indication as to the amount of acidosis present. Another indication is found in the increase in the respiratory rate—this is due to the stimulation of the respiratory center by the increased acidity of the blood.

Acidosis should not be confused with diseases due to food deficiencies. For example, beri-beri is due to a loss of certain elements, probably those called "vitamins." If these are replaced, even without any alkaline substances being added, the patient recovers. In scurvy, other substances seem to be lacking, though so far the nature of these substances is not known. The addition of lime juice to the diet gives immediate relief, though this contains too small an amount of alkaline salts to neutralize any great amount of acids. Neither beri-beri nor scurvy are relieved by the use of alkaline substances, unless these contain the valuable vitamins or other "vital" substances. Acidosis, on the other hand, yields quickly to the administration of alkaline foods or soda, though these may be cooked or may be inorganic. The confusion resulting from an attempt to include all diseases due to food deficiencies under acidosis is regrettable.

Treatment. Acidosis characterized by acetone in the breath, and acetone, beta-oxybutyric and aceto-acetic acids in the urine, must be met by the administration of carbohydrates; oatmeal is perhaps the most useful of these, though other forms of starch or sugar may be better adapted to special conditions. (See diabetes mellitus.)

Acidosis characterized by excess of urinary ammonia must receive different treatment. Carnivorous animals or human subjects suffer less from this form of acidosis than do vegetarians; this is because they have a larger available supply of ammonia with which to neutralize the acids. This form of acidosis must be met by the administration of alkaline salts, preferably in the form of the vegetable compounds. Raw vegetables, such as lettuce, celery, carrots, onions, cabbage, and others are useful.

Every effort must be made to increase the oxygen supply and its use by the tissues. Respiration, circulation, the blood itself and the internal secretions should all be investigated, and whatever abnormal conditions are found should receive suitable treatment.

Acidosis is a symptom of many varying states, and it must everywhere be treated according to its underlying causes. Much more study is needed before we are ready to consider these questions answered.

RACHITIS

(Rickets)

Rickets is a chronic nutritional disorder occurring in infants and very young children, attended by changes in the development of the bones and clinically characterized by wasting, stunted growth, characteristic physiognomy and deformity.

Etiology. The real cause is unknown. It usually develops between the sixth and fifteenth months of age; from improper feeding, especially that poor in animal fat and protein; bad hygiene, including lack of sunlight; lack of exercise; overcrowding, and other conditions associated with extreme poverty or lack of sanitation. "Good" babies, left too long lying quietly, are apt to suffer from rachitis. Milk which has been cooked, or any of the prepared foods, used to the exclusion of fresh milk, or foods too largely carbohydrate, all are deficient in certain compounds required for the development of the skeleton. It is not merely a lack of lime that is responsible for the disease, since this is sufficiently supplied by those diets which appear most harmful. Breast milk, when this is deficient in quality, may cause rickets, as do the artificial foods. The disease is found in the new born; and some infants are born with evidences of having suffered before birth. It is supposed that maternal mal-nutrition is the cause of this condition. Family history of rachitis, syphilis, tuberculosis, and certain other wasting diseases also predispose to the disease.

Diagnosis. There are three early pathognomonic symptoms: (1) profuse sweating of the head and neck, especially during sleep; (2) restlessness at night, as if the weight of the clothing is uncomfortable—as it probably is—this occurs even if the room is cold; (3) the child lies unduly quiet when left alone, and cries as if with pain when handled. These symptoms, especially the last, should arouse a suspicion of rickets, even when no digestive disturbances have manifested themselves. A slight fever, some diarrhea and constipation, increasing weakness and fretfulness, and usually emaciation, may precede the bone changes for weeks, sometimes for months. An abnormal fat may be present, instead of emaciation. The changes in the ribs, later of other bones, and the bending of the long bones, with or without recognizable fracture, may be noticed early, or may not attract attention until the deformity becomes very serious. When the disease is well developed, the appearance of the child is characteristic. The long bones, ribs, and skull are chiefly affected. The lime salts are much

diminished in amount; the cartilaginous epiphyses are thickened; ossification and dentition are delayed and when taking place are imperfect. Periosteal proliferation causes thickening of the flat bones of the skull but ossification is slow so that the fontanelles remain open an abnormally long time. The occipital bone is apt to be thinned so that it may crackle under the fingers (parchment crackling or craniotabes).

The head is elongated from back to front, flat on top, the forehead square and overhanging, the fontanelles slow in closing, the skull sutures prominent if ossification is complete, the maxilla flattened, and the skin veins distended. Raised areas, "bosses," may be felt on the skull. The face appears small in proportion to the rest of the head but may be plump. The ribs show a characteristic "beading" at the junction of the costal cartilages (rickety rosary), this being usually the first change noted. Pressure of the external air on the softened anterior ends of the ribs produces the "rickety chest" marked by a shallow vertical depression on each side of the sternum. "Pigeon breast" and "Harrison's grooves"—a transverse depression running from the xiphoid cartilage toward the axilla—are due to impeded inspiration.

The legs are bowed or sickle-shaped, showing well-marked epiphyseal enlargements, especially at the lower ends of the tibia. The pelvis is often much deformed, being of later significance in the female in regard to parturition. The arms show the most marked changes at the lower ends of the ulna and radius. The humerus and clavicle may be affected.

The spine may be kyphotic. Scoliosis is not so common. The deformities of the limbs are largely due to yielding of the softened bone to mechanical pressure hence rickety subjects must avoid any undue strain such as walking or using the arms. The mind may be deficient; the body stunted and emaciated; the abdomen is prominent from flatulent distention and from enlargement of the liver and spleen; muscular weakness is marked and digestive disturbances are common. Mental development is usually retarded, though with better nutrition these children may attain normal minds later.

The blood presents the picture of secondary anemia, sometimes of the chlorotic type; sometimes developmental. A slight lymphotosis may be present; it must not be forgotten that lymphocytes are high in normal children's blood.

Among the complications are: Pulmonary diseases; tetany; laryngismus stridulus; convulsions; adenoids and hypertrophied tonsils; green-stick fractures are frequent. The disease predisposes to the various affections of childhood. These must be kept in mind during the treatment.

Treatment. The main treatment is to correct the causes, dietetic and hygienic. If the mother is unhealthy, she must stop nursing the child, placing it with a healthy wet-nurse if possible, or upon artificial feeding, cow's milk suitably modified to the age of the baby being the essential element during the first year of life. Goat's milk is better than cow's milk. Barley water or oatmeal gruel properly made and strained are excellent additions to the milk and aid in keeping the bowels in a normal condition. Plenty of good water should be given. Orange juice an hour before feeding; olive oil at night, according to the age of the child, may be added to the diet.

The older child can have beef juice, light meats, eggs, green vegetables and fruits according to his age. A large proportion of fat is a good addition.

A daily warm bath is necessary. An olive oil rub aids in nutrition; no oil is absorbed, but its use keeps the skin soft, and gives comfort.

The clothing should be light, yet warm. The child should be well wrapped up and kept in the open air and sunshine, shading the eyes, as much as possible. No attempt to persuade the child to use his arms or legs is permissible, until the general nutrition is recognizably bettered; walking must be prevented until the child is thoroughly strong. Gentle massage of the arms and legs, with very gentle pulling and attempts to straighten them out, may help in correcting deformities already present, and prevent further distortions.

The spinal curve usually yields readily to manipulative treatment, supplemented by posture. The child should not be permitted to lie upon one side, or to maintain any position too long.

The limb deformities may be outgrown if mild and the proper manipulation is employed, or may require braces or orthopedic surgery.

The active symptoms cease when the child reaches the age of eighteen to twenty-four months. The earliest signs of recovery are a diminution of the nervousness, increased muscular strength, diminution of the head sweats, and disappearance of craniotabes. Improvement is slow but progressive as there are seldom relapses.

Prognosis. The disease is not fatal in itself but renders the child very susceptible to intercurrent affections, especially those of the respiratory tract.

A condition called **Late Rickets** or delayed rickets, may appear at any time from four to twelve years, and is usually due to some severe infectious disease. The symptoms and bony disturbances are atypical. Fractures at the epiphyses are frequent. During puberty, a form of malnutrition with some rachitic symptoms may appear; this is often present in overfat boys, and the fracture of the femur may simulate hip joint disease. It seems to be due to

some disturbance of the pituitary secretion, and is associated with delayed puberty.

SCORBUTUS

(Scurvy; scorbutic purpura)

Scorbutus is a nutritional disorder characterized by great debility, a spongy condition of the gums, a tendency to hemorrhage, and anemia.

Etiology. It is due to improper and insufficient food, especially lack of fresh vegetables, and insanitary surroundings. It is rare except in Russia. A very mild form appears among people living upon a diet chiefly of canned or dried foods, especially with salt meats in too great proportion.

Diagnosis. The onset is gradual. The patient becomes weak and thin, drowsy or languid, with more or less general aching of the bones. The gums are soft and swollen, bleeding easily on the slightest pressure; the tongue is coated and red, the skin is dry, rough and sallow; diarrhea alternates with constipation.

As the disease progresses, the teeth may fall, the mouth ulcerate and emit an intensely fetid odor. Petechiæ around the hair follicles or large subcutaneous extravasations appear on the extensor aspects of the limbs. Epistaxis or subconjunctival hemorrhages may be annoying. Death may occur from hemorrhages into the body cavities. Hard, brawny, tender swellings of the calves are due to subcutaneous and intramuscular hemorrhages.

The patients present a cachectic appearance. Sometimes a peculiar night blindness develops which is dependent upon the exhaustion of the retina.

Infantile Scurvy or Barlow's Disease is sometimes present in children fed constantly with proprietary foods; occurs most frequently between the ages of six and twenty months, and is marked by tenderness of the limbs, and weakness. Exclusive diet of malted milk, condensed milk, various baby foods, and sterilized milk are the causative factors.

Diagnosis. The legs are kept drawn up and still. When these are moved there is continuous crying. The child grows cachectic. Some obscure swellings may be found, ill-defined, but resembling thickenings, around the shafts of the bones. Crepitus may be found in epiphyseal regions, due to separation of shaft and epiphysis. Proptosis of one or both eyes with puffiness and very slight staining of the upper lid appears. A profound anemia develops. The complexion becomes sallow or earthy-colored and small ecchymotic petechiæ appear upon various parts of the body. Asthenia is well marked but emaciation is not so apparent. The

temperature is erratic. If teeth have appeared, the gums may become spongy and bleed.

The heart may show a hemic murmur, the impulse is feeble and irregular.

Subluxations are apt to be found in the splanchnic area. The urine is high-colored, of high specific gravity, the phosphates are increased, there is often blood and albumin. The blood is that of severe secondary anemia.

Treatment. The most important factor is the diet. Give first a little lime juice or lemon juice in water. Good soup with raw vegetable juices, in very small quantities at first, may be added. As soon as the digestion will permit a mixed diet—with amounts of fresh fruit and vegetables—leads to rapid recovery. In the infantile form, breast-feeding should be employed if possible. Properly modified cow's or goat's milk may be used. Orange juice should be given, one tablespoonful four times a day, one hour before feeding. Normal saline or other bland solutions should be used as a mouth wash, several times a day. Other treatment depends upon conditions as found on examination.

Prognosis. Recovery is the rule if appropriate treatment is instituted early.

Prophylaxis consists in good feeding and good hygiene. Too great a proportion of canned and salt meats are to be avoided.

OBESITY

(Including corpulence; lipomatosis universalis; polysarcia adiposa; Dercum's disease; adiposa dolorosa)

Obesity is a nutritional disorder characterized by an abnormally increased deposit of fat in the body. It begins insidiously, and by its presence weakens the muscular and glandular tissues of the body.

Etiology. Several classes are recognized. The plethoric type is the result of habitual overnutrition. Persons who constantly assimilate even a very little more food than they utilize each day, must inevitably put on weight; this process continued for years, results first in uncomfortable weight, then in the embarrassment of the active organs, and pathological states affecting almost or quite the entire body. The anemic type is due to deficient oxidation processes, and usually follows some wasting or exhausting disease, or is associated with chlorosis or cardiac weakness. Lack of certain internal secretions may be responsible; it appears in men after the climacteric, in women after the menopause, or during prolonged lactation, or after exhausting child birth, or who suffer from ovarian disease. Typhoid, syphilis, and other wasting dis-

cases may be followed by this type. The hydremic type may follow either of the two just given, or may be directly due to cardiac weakness, arteriosclerosis or nephritis. In this form the connective tissues are fatty, but are also slightly edemic.

Hypophysial obesity is due to disease of the pituitary body; it is associated with delayed development of the genital organs, in the young, or with their atrophy, in older patients. The relation of disturbances of the reproductive organs with ordinary types of obesity suggests the possibility that these also may be due to deficient activity of the hypophysis. In this form the use of pituitary extract is to be commended, after the failure of ordinary methods of treatment.

Adiposa Tuberosa is characterized by the deposit of lumps or tumors of fat. When this is associated with general lipomatosis, the prognosis is fairly good for improvement; when not associated with the generalized condition, it may be intractable. The tumors are often painful. The term **Adiposa Dolorosa** (Dercum's disease) is usually applied only to those cases in which the fatty deposit is localized and very great, as in the abdomen, the neck, or the mammae. It may be exquisitely painful.

Bony Lesions in obesity vary greatly. In the form due primarily to overnutrition or to under exercise, the spinal condition is good in the beginning. Later, the weight of the abdominal organs compels overextension of the spinal column, rigidity of the lower thoracic region, and variations in the normal spinal contour. In the anemic type, the spinal variations are those associated with the primary disease. In many cases in which the fatty deposit appears to be due to lack of oxydizing ferments, lesions of the eleventh thoracic are present and seem to be active etiological factors. Correction of this lesion, in these cases, results in gradual return to the normal, even with no change in exercise or food intake, when these are already not unhygienic.

Heredity is a strong factor, though many cases supposed to be hereditary are due to family habits of eating and exercise.

Diagnosis. The recognition of the condition presents no difficulty. In order to determine what causes are active in perpetuating the disease much study of the case may be necessary. The history should indicate whether the disease is hereditary or is the result of over-nutrition. Examination of the heart with a history of rheumatism or other etiological factor in cardiac disease; of some wasting disease just previous to the beginning of obesity, may lead to useful information concerning the further treatment of the case. Gouty forms can usually be recognized by a study of the urea-uric acid relationship. An examination of the blood may explain some cases. When the hypophysis is at fault there are changes in the genitals and in adults disturbances of the sex feelings. Symptoms of increased intracranial pressure are present. (See brain tumor.)

Treatment. Almost as many methods of treatment have been advised as there are patients. When it is remembered that obesity

is not a disease but is a result of some departure from the normal structure of the body or from the normal care of the body it is evident that every patient requires some special care. A large proportion of cases are primarily of a plethoric type. In these cases it is necessary first to plan a diet and daily regime which shall put the patient into nitrogen and carbon equilibrium. This done the amount of carbon must be reduced until the loss of weight becomes established. No rule can govern the diet list but each patient is a law to himself. The fact that the reduction in carbohydrates is necessary in most cases is due to the fact that an excessive intake of carbohydrates is habitual with many people. Each patient must be given exercises which also are adapted to his individual case.

Great care must be taken to avoid heart injury in advising both diet and exercise for obese patients. Excessively nitrogenous diets may seriously embarrass the action of the kidneys. Too great limitation of a watery intake and too sudden reduction in the food as well as too violent exercise may produce serious injury to the heart.

In young, vigorous, plethoric subjects the most rapid loss of weight is secured by the following regime: Two days' fasting with plenty of hot water to be taken as often as possible. Third day, a plentiful amount of a single nitrogenous food, such as milk, cheese, meat, eggs, etc. Fourth day, fast with hot water. Fifth day, raw, green vegetables, celery, lettuce, etc., as freely as may be desired. Sixth day, fast and hot water. Seventh day, nitrogenous food, and so on. Fast may be for two days if this is desired. In outlining such a regime as this it is necessary to examine the heart and to analyze the urine at least twice each week. This plan may be modified by omitting the day of fast in patients who must keep on working.

When obesity is complicated with anemia or endocrinic, circulatory or other organic disturbances great care must be exercised in treatment. A high cellulose diet especially of raw, green vegetables is usually safe and often efficient. Ordinary massage is useful in the hyperemic or anemic form. Violent rubbing may reduce the weight temporarily. The same is true of baths, sweats and other methods especially in vogue at various sanatoriums. Such courses of treatment reduce the weight speedily in many cases, but unless the life habits of the individual are modified a return of the disease is to be expected. When there is reason to suspect that obesity is due to lack of the secretions of the ductless glands the attempt should be made first to secure increased activity of these glands through controlling their circulation. When this is found impossible and when the condition of the patient does not yield to ordinary methods of treatment the use of the animal extracts of the gland may be cautiously begun.

From what has been said it is evident that the treatment of obesity is really best secured by the treatment in each case of the factors which cause or which perpetuate the abnormal fat deposit.

"The cardinal points of treatment are: first, removal of osteopathic lesions; second, diet; third, baths; fourth, exercise and regulation of clothing. The greatest problem in treatment is the dietary. The diet may be reduced as much as two-fifths without danger, but it must contain normal proportions of the proteins, carbohydrates and fats. In other words, the diet should be a mixed one."—Earl Scammon.

Prognosis. The outlook depends upon the nature of the case. In plethoric subjects in whom no ordinary disease has manifested itself the outlook is measured absolutely by the self-control of the individual. Upon a wholesome diet with normal habits of life his weight can be kept within a normal limit and his strength and comfort be assured. If he is unwilling to control himself the condition becomes fixed and organic disease is inevitable. Older patients and those in whom organic disease has become fixed should be permitted to lose weight only gradually and should be watched carefully to prevent complications. Such patients do very much better with a reduction of fatty deposit and life is prolonged as well as made more comfortable by the reduction which need not be very great in amount. The most efficient prophylaxis is based upon the recognition of the fact that when the carbon intake exceeds the carbon outgo an accumulation of fat in the body is inevitable.

Whether there is an abnormal state of the body, so that less than the usual amount of carbon can be utilized, or whether there is simply the habitual ingestion of too great an amount of carbon in food, the principle still remains, that one who assimilates more carbon than he eliminates must inevitably store fat; while one who habitually assimilates less carbon than he eliminates must as inevitably lose fat.

goiter. The upper thoracic, first rib, clavicle, hyoid, atlas, axis and other cervical vertebræ are reported by other writers as being etiologial in simple goiter.

Diagnosis. The enlargement of the gland is easily recognizable. When the tumor is small, or when its growth invades the cervical tissues causing pressure upon the vagus and sympathetic nerves, or upon the jugular vein and carotid artery, or upon the trachea, the symptoms may be very much confused. Irregular heart beat, sometimes rapid; dilation of the pupils with mild exophthalmos; giddiness, vertigo, nausea and more or less marked mental symptoms due to abnormal pressure conditions may suggest exophthalmic goiter. The fact that simple goiter may occasionally take on the exophthalmic type adds difficulty to the diagnosis. More frequently degeneration occurs in the simple goiter, leading to symptoms of myxedema; usually the simple goiter remains unchanged in character throughout life.

As the simple goiter increases in size its weight may cause considerable discomfort. The pressure exerted upon the trachea may lead to asphyxia. Small goiters are not incompatible with long and comfortable living.

Treatment. The correction of the bony lesions already mentioned is sometimes the only treatment that is necessary. Usually several weeks or months of attention is necessary in order to prevent recurrence. The upper ribs should be raised and the clavicles lifted; the cervical tissues well relaxed; the hyoid moved from side to side and attention paid to all tissues which might possibly interfere with the normal drainage of the gland. Undue pressure or manipulation of the gland may cause symptoms of hyperthyroidism. This was often noted in the old-time treatment by bandaging the neck. Tissues around the gland may be lifted and pushed toward the gland in order to permit free exit of blood and lymph from that neighborhood. (R. D. Emery.) The patient should not overuse the voice and should be warned against sexual indulgence. (E. Sisson.)

Prognosis. Circulatory goiters may diminish with remarkable speed. Cystic goiters become smaller but rarely regain normal size unless the condition is of very recent development. Fibroid goiters (and those which have existed for several years usually are more or less fibroid) rarely regain normal size, if indeed they ever do. They may be diminished and may cause no further symptoms.

EXOPHTHALMIC GOITER

(Basedow's disease; Graves' disease; hyperthyroidism; hyperplastic goiter)

Enlargement of the thyroid gland, with protruding eye-balls, muscular tremor, and rapid heart make up a syndrome called

exophthalmic goiter. The thyroid enlargement is never very great; the exophthalmos may be delayed until after the other symptoms have been some time present.

Pathology. The structural changes are not well understood. A true hypertrophy of the gland has been described; increased vascularization is constant. The superior and middle cervical sympathetic ganglia have been found more or less degenerated. The pathogenesis of the disease has been much discussed; the relationship between this disease and myxedema and cretinism is of interest.

Other tissues and organs of the body are abnormal in this disease; the adrenals, pituitary body, pancreas, thymus and para-thyroids are variously atrophied or inflamed when the thyroids are hypertrophied. Sugar-metabolism is often perverted, though rarely to the point of typical diabetes mellitus; polyuria without glycosuria occurs. The pigmentation of the skin, with or without scleroderma or leucoderma, is of interest in this connection; the bronzing of Addison's is not often present. A fatty cushion behind the eyeball is the result, rather than the cause, of the exophthalmos. F. J. Feidler and others view exophthalmic goiter as a systemic disease, in which hyperthyroidism is a symptom rather than a cause. Most of the evidence is in favor of hyperthyroidism as a cause of the other symptoms as observed, though the ultimate cause of the increased thyroid activity is yet to be found.

Etiology. Occasionally a simple goiter assumes the characteristic features of the exophthalmic type. Emotional storms have often been mentioned, by the patient or his family, as the cause of the disease; it is difficult to determine whether the emotionalism was a cause, or was simply one of the earlier symptoms of the disease; the causes of the emotionalism are usually found to be comparatively mild, such as are "the common fate of all" and which are not associated with any permanent after-effects in most individuals. Pregnancy and lactation, exhausting diseases, and other factors which certainly lower the general bodily resistance to disease are considered causative factors in many cases. Foci of infection of the upper respiratory tract and mouth, and intestinal stasis are possible factors.

Lesions of the first to sixth thoracic are most important; lesions of the cervical vertebræ, the first, second and third ribs, of the occiput, hyoid, mandible, and clavicle, are reported.

Diagnosis. In well-developed cases, the protruding eye-balls, nervous instability, rapid pulse, muscular tremor, and slightly enlarged thyroid, make the diagnosis easy. In the early stages, diagnosis may be somewhat difficult. Wasting may be a very early symptom; when this is associated with muscular tremor hyperthyroidism should be suspected. When to these symptoms the rapid heart is added, with nervous instability, the diagnosis is fairly certain; exophthalmos removes doubt, even if the enlargement of the gland is not yet perceptible.

The onset is usually insidious, though occasionally the disease may develop rapidly, even to death within a few days or weeks. In these acute cases diarrhea and vomiting are associated with

extremely rapid pulse, dyspnea, and speedy emaciation. In chronic cases the heart may beat at 100 or more, rarely to 200. The thyroid pulsation is constant; a peculiar rushing sound is frequently heard over the gland. The heart may be enlarged; hemic murmurs may be present.

Diarrhea and vomiting may or may not be present. The appetite is whimsical. The secretion of sweat is usually increased; sometimes this affects the hands or feet especially; rarely one side of the body is most affected by the hyperidrosis. Night sweats are common. Flushings and pallor may occur without recognizable cause; these often resemble the "hot flashes" of the menopause. Discolorations and thickenings of the skin may suggest Addison's disease, pregnancy, scleroderma, and other trophic disturbances of the skin.

The eye symptoms are marked; the protrusion of the eye-balls may become so pronounced that closure is impossible. The upper lid does not follow the eye-ball when the gaze is directed downward—von Graefe's sign. Retraction of the upper lid causes widening of the palpebral fissure—Stellwag's sign. Imperfect convergence for very close vision—Moebius' sign—may be present also in myopia, hysteria and neurasthenic states. Rarely paralysis of the external eye muscles is observed. Tremor of the muscles of the eye-ball and of the lids is frequent. The exophthalmos appears to be due to the contraction of the nonstriated muscle fibers of the capsule of Tenon; the symptoms referable to the upper lid are probably due to action of the non-striated fibers of the levator palpebræ; both these muscles are controlled by the sympathetic nerves.

The nervous symptoms are conspicuous. The muscular tremor is fine—about 8 per second. Muscular tone is increased. Psychic changes are marked. The mental instability rarely reaches the point of actual insanity, but may resemble mania or delirium temporarily. Most often irritability with rapid and exaggerated tendency to be affected by trifles is the most conspicuous factor in the mentality. This is responsible for the erratic way in which such patients change physicians and methods of treatment—they are often very unsatisfactory patients, disobedient and refractory.

The urine may show increased nitrogen elimination; it is difficult to keep these patients in N-equilibrium. Increased excretion of phosphorus is present in some cases. The blood is normal in hemoglobin and erythrocyte count; the lymphocytes are often greatly increased while the neutrophils are diminished. The viscosity is increased; the coagulation time is usually increased.

Treatment. The treatment of exophthalmic goiter includes those measures already advised for simple goiter, and attention to the factors in etiology, plus an increased amount of rest, the

avoidance of all excitement, worry, or overstrain of any kind and a largely vegetable diet. These patients seem to have a peculiar inability to dispose of the waste products formed by a meat diet. Correction of the bony lesions as found has resulted in apparently permanent recovery in many cases. Rest in bed for a few days, at intervals of a few weeks, is useful in cases with marked heart-hurry. The ice bag over the heart gives relief in exacerbations of tachycardia. Change of climate is useful in some cases, especially from a goitrous region to higher altitude—not best above 4,000 feet. Sea level relieves the dyspnea and heart-hurry in certain cases—individuals vary in susceptibility to climatic conditions.

The preferred operative treatment consists of consecutive ligations of the thyroid arteries—one is tied, and the effects noted, then another, until normal activity of the gland is secured. Partial thyroidectomy sometimes gives good results. Injection of boiling water into the gland destroys a part of the glandular tissue, and this may result in toxic symptoms, not usually very serious. It is employed only in mild or early cases. In a few cases operation on the thymus seems necessary.

In acute forms, and during exacerbations of the chronic forms, operations are apt to be fatal. In any case, injury or destruction of a part of the gland may result in atrophy of the rest of the gland; the symptoms of myxedema may appear, or death may occur too rapidly for these symptoms to become noticeably developed.

It is necessary to recall that secretory, trophic and vasomotor nerves arise from the upper dorsal, and, though cervical lesions are important, the effect is probably due to the contiguous structural relationship of the sympathetics. Then, there is a distinct relationship between the adrenal secretion and thyroid activities.

D. L. Tasker reports a case with third cervical and seventh to tenth thoracic lesions, in which treatment for correction was not successful so far as the bones were concerned, but was followed by relief of symptoms, with increased mobility and lessened tension of the tissues.

Prognosis. This is always grave. Death may occur in a few weeks, in the acute cases—rarely in a few days. In the more frequent chronic cases, death may be postponed for months, rarely years, unless a remission occurs—as is not infrequent. With treatment of the structural conditions, recovery may be apparently complete; some cases have been watched for several years with no recurrence of the disease.

MYXEDEMA AND CRETINISM

Myxedema is a condition of perverted body metabolism associated with disturbances in the secretion of the thyroid gland and probably due to the lack of this secretion.

Three forms are recognized. In the **congenital** form the thyroid gland is absent or is functionally inefficient from birth. Children so affected are called cretins. **Operative** myxedema or cachexia strumipriva is due to the surgical or accidental destruction of the thyroid gland. **Atrophic** myxedema is due to the degeneration or atrophy of the thyroid and it may follow goiter.

Cretinism. Cretins are usually idiots; they appear fairly normal at birth, but they fail to develop as normal children should. They are often unable to support the head until long past the time when they should be sitting alone. Sometimes the condition does not become manifest until the child is able to walk. The position of the body is characteristic—the child stands with the feet apart, often with the knees bent together; the abdomen is very protuberant; there is marked lumbar kyphosis, which adds to the apparent size of the pendulous abdomen; the mouth usually hangs open. The muscles of the body are deficient in tone. The child appears fat, but this appearance is due to a hardened and slightly edematous condition of the skin; pitting does not occur on pressure. The growth of the skeleton is greatly delayed—at the age of twenty the cretin may not be more than forty inches tall. The face, arms and legs are abnormally broad. Mental development ceases at an early stage; the child may never learn to talk. The blood pressure is low, the heart's action slow, but not correspondingly strong. The fact that the condition is, in part, due to the lack of the thyroid secretion is indicated by the improvement which occurs upon the administration of thyroid extract.

Etiology. Cretinism appears to be hereditary. In some cases there are families in whom cretins occur in every generation. No direct inheritance is possible. Parents who have goiter often have children who are cretins. The disease may appear, very rarely, sporadically. Malaria and syphilis in the parents is supposed to be responsible for some cases. In one Pacific College Clinic case, it was not possible to find anything in either parent, or anywhere in the family, which could have been responsible for the condition of the child. In other cases, paternal syphilis, maternal goiter, or family inheritance were found present.

Treatment. The symptoms of cretinism do not occur in a typical manner when any part of the functional thyroid gland remains. Definite permanent improvement has been noted following adjustment of upper dorsal and cervical lesions, even when the use of extract has failed. Any method of treatment may include the administration of the thyroid gland of animals, or the use of extracts from these. The commercial extracts should be administered first, and it is necessary to give very small doses in the beginning, increasing these until the physiological effects are

observed. Different preparations of thyroid contain varying amounts of different products of thyroid metabolism. If one preparation causes unpleasant symptoms, or if it seems to be inefficient in modifying the symptoms of cretinism, another should be tried. If none of the ordinary preparations on the market modify the course of the disease, the thyroid itself may be fed. In order to receive the best results, the fresh thyroid should be ordered. It may be sliced and slightly cooked upon its outer surface. The equivalent of one thyroid should be eaten once to three times each week. This method is not very accurate, but it sometimes brings about improvement in the condition when the more convenient methods of administration have failed. Overfeeding of thyroid extract may cause rapid heart beat, dyspnea, nervous instability, diarrhea, nausea, headache, and sometimes other symptoms. The amount of thyroid should be cut down in such cases. It must be remembered also that whatever conditions have been responsible for the lack of the thyroid may have affected, also, other organs.

Prognosis. It is not to be expected that the cretin will ever occupy the place in life to which he might, otherwise, be entitled. By the artificial administration of the thyroid extract, which the body needs, life may be made much more comfortable and efficient. In those cases in which the thyroid of the patient becomes active, the prognosis is brighter for fairly normal mental development.

Operative Myxedema is now of infrequent occurrence. It follows total extirpation of the thyroid, or the degeneration of parts of the gland that might be left after operation for goiter. It is characterized by low blood pressure, increased breadth of the face, hands and feet, with marked thickening and hardening of the skin. The edematous areas do not pit on pressure, nor do they contain fluid. The mental processes become steadily deficient, resulting in dementia if death does not occur at an early time. The progress of the disease may be delayed by the use of animal extracts, as in cretinism. The cause of the original disease for which the operation was necessary should be studied, and that condition also should receive attention. Structural perversions should be corrected and symptomatic treatment instituted when necessary; the use of the animal extracts alone may not meet all the individual requirements of the case.

Atrophic Myxedema. This may appear as a primary disease, or may result from degenerative processes following goiter. The symptoms are those of the operative type, except that the onset is more gradual, and is often confused by some of the symptoms of hyperthyroidism. The mental state is frequently confused; the patient is at times erratic and penetrating, at others stupid and indolent; confusional symptoms are usually present in either case,

and dementia finally results. The treatment consists in first, an attempt to restore normal function to the gland by correcting the conditions which interfere with its circulation, drainage, innervation, and after this has failed, the administration of the animal extracts, or of the fresh gland. If one extract does not meet the requirements, other preparations should be tried; the use of the fresh gland is inconvenient and often of no value but is sometimes more efficient than the prepared extracts. Hypodermic preparations may be more useful than those given by mouth, or vice versa.

DISEASES OF THE PARATHYROIDS

These small ductless glands lie in the neck and their position is decidedly variable. One disease, tetany, is supposed to be due to lesion of the parathyroids. It seems probable that certain convulsive disturbances, sometimes mistaken for hysteria, are really due to the lack of secretion or to the abnormal secretion of these small glands.

Etiology. Perhaps the most common cause of parathyroid injury is that due to the injury or removal of these in thyroid operations. Other causes are the infectious diseases, extension of inflammation from neighboring tissues, and rarely a primary interstitial inflammation without recognizable cause.

Tetany is a disease of the body which is characterized clinically by variations in the muscular tone, and disturbances of motor control. During the intervals between the attacks, the patient appears to be fairly well, except for the existence of areas of extreme hypersensitiveness in various parts of the body. The hands, feet, and face appear to be swollen or edematous, but do not pit on pressure. There is a tendency for the skin to be somewhat purplish. Pressure over the nerve trunks, or over large vessels which lie near nerve trunks, may produce an attack at almost any time. The attacks may vary from a few minutes to several hours, or sometimes several days. At first there appears a peculiar sensory disturbance, as numbness, tingling, or other parasthesias. The muscles, usually first of the fingers, seem to stiffen and this condition gradually extends to the arms, trunk and finally to the entire body. The spasmodic cramps are not especially painful when the muscular contraction is feeble; the greater the amount of contraction, the greater the pain in the affected muscles. Attacks may be nocturnal only, or may occur at varying intervals. An attack may be precipitated at any time by violent emotional storms, or by any strenuous effort (Trousseau's sign).

Slight fever may occur during the attack. The urine is especially rich in the phosphates and the calcium salts.

The prognosis for recovery is gloomy. There may be an interim in the progress of the disease. Death may occur at any time within a very few days from the development of the disease from cachexia, respiratory failure, or the effect produced in the central nervous system by the poisons in the circulating blood.

Treatment. The treatment must be symptomatic. It may be necessary to use chloroform for the relief of the spasms. The general health of the patient should be improved. Occasionally the administration of thyroid extract, either with or without parathyroid extract, results in recovery.

DISEASES OF THE PITUITARY BODY

Diseases of the pituitary body may affect either its anterior or its posterior lobe or both. The symptoms produced vary accordingly and may be confused by the effects of pressure upon the optic nerves and neighboring tissues and in the case of tumor of the pituitary by the effects of increased intracranial pressure.

Overfunction of the anterior lobe (hyperhypophysism, hyperpituitarism), gives rise to acromegaly or gigantism, with various modifications of these. Overfunction of the posterior lobe or the pars intermedia causes symptoms of diabetes insipidus. Underfunction of the anterior lobe (hypohypophysism, hypopituitarism), gives rise to the symptom complex included under "Frohlich's type," (hypophyseal dystrophia adiposogenitalis), characterized by rapid obesity, infantilism of the genitals, myxedema-like skin. This state is sometimes associated with dwarfism, pseudohermaphroditism, asthenic states, tachycardia, bronzing, and other symptoms referable to various endocrine disturbances.

In all diseases of the pituitary body X-ray plates may show peculiarities of the sella turcica.

Acromegaly. This is a rare disease most often associated with tumor of the pituitary body, characterized by gradual deformity of the face, hands, feet and to a less marked extent other bones of the body. The face shows broadening and prognathism; the malar bones increase in size until they may resemble horns. The bones of the fingers, hands and feet broaden very conspicuously. The skin becomes hard and thick. The hair thins and falls. The nails become very broad, thick and heavy. Mentality slowly diminishes in vigor to complete dementia. Blindness, either partial or complete, is usually due to pressure upon the optic nerves or the optic tracts.

Gigantism. Disease of the pituitary body occurring before or shortly after birth may result in symmetrical enlargement of the bones so that the child becomes abnormally large without being

especially deformed. These giants may attain a height of seven or eight feet. They are weak in body and mind.

Dwarfism. Deficient development of the long bones or of all of the bones of the body may be due to pituitary disease. In both giantism and dwarfism, hereditary syphilis may be a factor.

Osteitis Deformans. This disease may not be due to pituitary involvement, but the symptoms suggest very strongly such a relationship.

The name is also applied to a very different condition—in which single bones are affected through repeated irritation, as in men who are much on horseback, and may suffer from deforming osteitis of the femur. In such cases disease of the pituitary body is not probable.

In its systemic form osteitis deformans affects nearly all of the bones of the body. It appears in middle life, chiefly among males, and is not due to any recognizable antecedent disease. The skull thickens and increases in size so that the circumference of the head may be two inches or more above normal. The bones of the arms and legs are greatly thickened and softened. They are bowed anteriorly and laterally producing a characteristic waddling gait and position of the arms. The subcutaneous knife edge of the shin may become broadened to two inches or more. The X-ray of the bones shows them much broader and much less dense than normal. During the stage of active inflammation circular areas of diminished density cause the X-ray plate to display a peculiar "bubbly" appearance.

The stage of active inflammation is associated with dull, aching pain of a peculiarly unbearable type. The muscles attached to the affected bones and the skin over them are hypersensitive and the seat of considerable pain. The mental attitude of the patient is characterized by profound gloom, not like melancholia nor with any evidences of true insanity, but simply a distressing depression of spirits, which is most unendurable to the patient himself and to his friends.

In one P. C. O. clinic case, palliative treatment, devoted to securing relief from reflex muscular contractions, was moderately successful in relieving pain during exacerbations.

Hypophysis Adiposity. Disease of the pituitary body sometimes manifests itself as a loss of control of fatty growth. These cases occur in childhood or puberty and are characterized by a remarkable and uncontrollable obesity. Such children retain health and strength for months or even a few years after the obesity becomes pronounced. With the development of the sexual organs and other ductless glands at puberty the adiposity may slowly disappear and the patient retain good health for the rest of his

life. In other cases, probably those in which there is a structural disorganization of the pituitary body, the symptoms of brain tumor appear, usually followed by death. In all these cases of adiposity the bones seem rather more easily broken than is normal. The fatty overgrowth interferes with the recognition of the fracture so that permanent deformity, especially of the hip joint, may be produced by neglect due to imperfect diagnosis. In one patient examined in the P. C. O. clinic fracture of the surgical neck of the femur was found which had been overlooked for some months.

Treatment and Prognosis. Disease of the pituitary body, like that of other ductless glands, is not apt to manifest itself until the internal secretion is almost or quite totally absent. For this reason there is very little that can be done in the way of treatment. Compensatory activity on the part of other glands appears to occur when the pituitary body is involved to a greater extent than is the case with other ductless glands. The use of the animal extracts in the diseases characterized by bone changes has not been successful. In adiposity the use of pituitrin has been followed by good results.

The possibility of surgery should be considered. Since the prognosis is hopeless when the pituitary fossa is invaded by malignant tumor, surgical interference even with its very doubtful prognosis may be justified. Recovery is never to be expected in pituitary disease of the common sarcomatous type.

DISEASES OF THE ADRENALS

Over-function of the adrenals, or hypertrophy of adrenal tissue, as in hypernephroma, is called hyperchromaffinopathy, or hyperpinephrinemia. The condition is supposed to be responsible for arteriosclerosis, and to be associated with Graves' disease, diabetes mellitus, and other disturbances of internal secretions. Certain peculiar types of pseudohermaphroditism are referred to this disturbance, as are also cases of premature puberty, and other disturbances in the development of the sexual characteristics.

Diminished function leads to the symptoms of Addison's disease.

Addison's disease is the term applied to the symptoms produced by disease of the suprarenals. It is characterized by slowly developing weakness of the skeletal, visceral and vascular muscles, emaciation, and a peculiar bronze-like pigmentation of the skin.

Etiology. Men are more affected than women. The third and fourth decades include the time of onset in most cases. Tubercular infection is responsible for the disease in about nine tenths of the cases. Other causes include sarcoma and other tumors, and the involvement of the adrenals in disease of other abdominal organs.

Simple atrophy or atrophy depending upon a chronic interstitial inflammation may be present, for which sometimes no adequate cause is to be found.

The pathogenesis of the condition is not well understood. Several theories have been offered in explanation of the manner in which the symptoms of Addison's can be referred to disease of the suprarenal capsules, but the physiological relationships of these organs are, as yet, too little known to warrant any adequate statement concerning their relationships in disease.

In the few cases reported, lesions of the eleventh and twelfth thoracic vertebræ, with marked muscular tension and hypersensitiveness in the immediate neighborhood, have been constant. These lesions may be either produced by the reflexes (which can be produced experimentally in animals) or they may be causative factors.

Diagnosis. The symptoms are, in the beginning, atypical. A noticeable weakness usually appears first; this is associated with extremely weak heart beat and low blood pressure. The symptoms of tuberculosis are usually associated with these. Gastro-intestinal symptoms include nausea, vomiting and diarrhea. The appearance of the peculiar discoloration is usually necessary to a diagnosis. This is a characteristic bronze color and it may be at first diffusely spread over the body, or it may appear in rather well marked patches. It is worse in those parts of the body which are normally darker, as around the nipples, and in those parts subject to irritation of clothing, as around the waist. It is distinguished from other conditions associated with pigmentation by its metallic hue and by the presence of weakness, low blood pressure, and weak heart.

Since the symptoms do not usually appear until the suprarenals have been almost completely destroyed, it is evident that the outcome is necessarily fatal. Attempts to treat the condition by the use of adrenalin, or varying combinations of extracts of the suprarenal capsules, with the extracts from other ductless glands, have not met with marked success. The symptoms must be met with suitable palliative treatment, but in typical cases with no hope of avoiding the ultimate fatal outcome.

Death usually occurs from exhaustion. Sometimes syncope, sometimes delirium precedes death.

Treatment. The treatment is largely symptomatic and palliative. The muscular contractions should be kept relieved; such other lesions as may be found should be corrected, if this can be done without too great discomfort. The diet should be largely but not exclusively cellulose—especially the raw green vegetables and raw fruits, except such as increase the diarrhea. The anemia associated with the disease is met by the treatment for secondary

anemia. (q v.) The low blood pressure and muscular weakness cause less discomfort, and the progress of the disease is delayed, by limiting the amount of muscular and cardiac exertion. The patient must spend much time resting in the fresh air, mostly in the recumbent position. He may take walks, slowly, may ride, but never hurry, or engage in any exercise which requires strenuous effort.

THE PINEAL BODY

This body has only recently been studied as an endocrine gland. Cysts or tumor of the pineal body may compress the aqueduct and thus cause internal hydrocephalus, or may exert pressure upon the hypophysis or upon the cranial nerves or their nuclei. These facts render exact diagnosis of pineal disease very difficult.

Premature puberty and disturbances of carbohydrate metabolism occur in pineal disease. Girls may menstruate in infancy. In either sex the genital organs may reach adult size very early in childhood. Obesity, cachexia and emaciation may be associated with the disturbed carbohydrate balance.

THE GONADS

The interstitial cells of Leydig appear to be responsible for the internal secretion of the testicle, while in the ovary the interstitial cells produce an internal secretion. The place of the corpus luteum has not yet been determined. The corpus luteum of pregnancy gives evidence of endocrine function, while the corpus of menstruation yet remains almost unstudied.

Over-function of the glands is associated with premature sexual development. Children of one or two years of life begin to show abnormally rapid skeletal growth, and may become sexually mature within a few months. Under-function of the gonads is associated with deficient development of the body. Menstruation is lacking or scanty; the primary and secondary sexual organs remain infantile, the voice of the boy remains high. Obesity is common in both boys and girls.

Tuberculosis or pneumonia terminate the life in most cases, usually in the early twenties.

MULTIGLANDULAR DISEASES

Several glands may be diseased in one individual, or the disease of one gland may affect others, thus producing complex symptoms. Sometimes sclerosis of several glands is found at autopsy. The effects thus produced include variations in the functions of many organs.

The bones, skin and hair may undergo marked changes. Pigmentation is frequently noted. Sexual functions are modified. Mentality may or may not be affected, but emotionalism is often marked. Blood pressure varies, and is more often lowered. Heart action is variously disturbed. Alternate constipation and diarrhea may occur. Polydipsia and polyphagia are variably present.

CHAPTER XXX
UNCLASSIFIED DISEASES

PURPURA
(The purples)

This is a general term applied to subcutaneous, submucous or subserous extravasations of blood. In its most easily recognized form spots resembling bruises appear upon the skin, usually the limbs, without being caused by trauma. Petechial hemorrhages, resembling flea bites, also occur, and may be overlooked in making the diagnosis.

Etiology. Purpura may be due to many causes, as a complication or symptom, or may appear without recognizable cause (idiopathic purpura). It is often present in severe cases of the infectious diseases such as "black" measles, small-pox, or malaria, and in scurvy, the anemias and leukemias. Certain poisons, as ergot, the iodids, quinine, antipyrin, turpentine, snake venom, and many others may cause purpura; it appears in some nervous diseases, hysteria, myelitis, and others; and is present as the result of mechanical forces, severe coughing and vomiting, arteriosclerosis, heart lesions; in senility several agents may be responsible for the condition.

Idiopathic Purpura includes several types, which have received different names.

Purpura Simplex usually occurs in children before puberty. Petechiæ, vibices or ecchymoses appear, usually upon the legs, especially after standing or running more than usual. The spots are slightly sore, and present the changes in color characteristic of ordinary bruises. When they are conspicuously due to standing, and are severe, the condition is **orthostatic purpura**. Rarely the extravasation of blood may lead to the blebs; joint pains, probably hemorrhagic, are not uncommon. Diarrhea is frequent, and blood may appear in the stools; these symptoms may be present without apparently causing any particular ill-health. A similar condition occasionally appears at about the climacteric, in either sex.

Chronic Purpura is probably due to weakness of the vessel walls, and may be present for years, or throughout life, without causing any serious symptoms; the ecchymoses rarely appear upon parts of the body exposed to the light, and evidences of internal hemorrhage are rare.

Factitious Purpura is probably associated with hysteria; it is characterized by irritability of the vasomotor centers, plus vascular weakness. Any sharp irritation of the skin, as by a pencil mark, is followed by purpuric reaction; it is possible to write upon the skin, and leave the letters written in ecchymotic colors. It is probably related to dermatographia. (q. v.)

Henoch's Purpura occurs in children. Swollen joints, extravasations of blood over the joints, and also as a generalized eruption; vomiting and diarrhea; epistaxis; and the presence of blood in diarrhetic and vomited discharges, and in the urine, are the usual symptoms. Fever is slight, nephritis is often a sequela. The joints are painful, and abdominal pain is often very severe.

Peliosis Rheumatica (Schonlein's Disease) begins with sore throat and fever, resembling acute rheumatism. The joints are very sore and are swollen, subcutaneous edema and an eruption which may be urticarial, petechial or ecchymotic appears; bullæ may be filled with blood (pemphigoid purpura). Bleeding from the mucous surfaces—epistaxis, hematemesis, hematuria, metrorrhagia—may occur. There may be extravasations of blood into the joint cavities.

Purpura Hemorrhagica (Werlhoff's disease) is the most severe form of the primary purpuras. It is probably due to some intense toxin which injures the endothelial cells of the blood vessels. It is rather more frequently found among young women than elsewhere. After a day or a few days of malaise, the disease appears rather abruptly, with fever, headache, and slight bleeding from some mucous membrane. The temperature may rise to 105° F. or more; the bleedings increase in amount and frequency; death occurs either from acute anemia, from hemorrhage, or from apoplexy. In **Purpura Hemorrhagica Fulminans** death results within a day or two—sometimes before the bleeding has been noticed upon the surface of the body at all; death is due to apoplexy or to hemorrhage in some other vital organ. The diagnosis must be made upon the symptoms, in those cases not rapidly fatal, and is possible only post-mortem in the fulminating form of the disease.

Diagnosis. The diagnosis of purpura is usually difficult—the recognition of the submucous, subcutaneous, and internal hemorrhages is not often difficult, but the distinction between the primary and secondary forms, and the finding of the causative factors is frequently almost impossible. The blood examination is necessary in all cases; urine analysis is indicated; while the history of the case may include many variable factors of value.

Treatment. The treatment of the underlying nutritional disease is of first importance. Feeding of gelatine is often advised; in

some cases its use is associated with good results. An abundance of fresh air is always indicated.

Raising the ribs, and the correction especially of lesions of the thoracic spine are always indicated; care must be taken to avoid strenuous movements; the slightest pressure is sometimes followed by the appearance of large ecchymoses which may be very painful. The diet should be mixed, including considerable proteid and green vegetables. In cases associated with symptoms of toxemia, the diet should not include the purin bases very abundantly. Foods rich in calcium are indicated, if delayed coagulation is a factor in the hemorrhagic tendency; usually, however, it is the weakness of the vascular walls that permits the hemorrhagic tendency.

Prognosis. In purpura simplex the prognosis is good for speedy and complete recovery, especially in children. In the rheumatic type, the outlook for recovery is good, but may be slow. In hemorrhagica fulminans, death is probably inevitable when the diagnosis is made; in the ordinary hemorrhagic type death may occur at any time, from cerebral or other hemorrhage, but recovery may be complete.

HEMOPHILIA

(Bleeder's disease)

Hemophilia is a disease, usually hereditary, in which hemorrhages occur profusely upon slight provocation. Nasse's law, that the disease exists only in males, but is transmitted only by females, has many exceptions. Females do sometimes have the disease, and it is sometimes transmitted by males without the intervention of female blood—directly from father to son, for example. The law holds for most cases, however, and females in the families of bleeders, and bleeders themselves, should avoid marriage. Men in bleeder families are able to marry safely, however. Strangely enough, while women may be bleeders, they rarely die in the menstrual period or in childbirth, though they may die of hemorrhage from a scratch or the pulling of a tooth. The most important factor seems to be a weakness of the walls of the capillaries and other blood vessels, though a deficient coagulability of the blood is present in some cases. Spontaneous hemorrhages upon the mucous membranes, or into the joint cavities may occur.

Diagnosis. The patient is usually aware of his peculiarity early in life, from his bloody experiences with slight wounds of boyhood. Rarely, the first hemorrhage is fatal.

Treatment is mostly prophylactic. No surgical operations should be performed upon a "bleeder" except as a very last resort in a case otherwise hopeless. Circumcision, tonsillectomies, are best omitted. Teeth should not be lanced, nor pulled if this can be

avoided. Strong massage around a wound may increase the formation of thrombin by the tissue cells.

Feeding of gelatine has been employed; it seems to increase the viscosity of the blood, and apparently its coagulability. Increased amount of the calcium-containing foods is advised.

Prognosis. These men usually die of hemorrhage, sooner or later. The disease itself does not interfere with life or health.

DISEASES OF THE SPLEEN .

The function of the spleen is as yet unknown. It is composed chiefly of tissue which greatly resembles ordinary lymphoid tissue and it is certainly associated in some way with the development of the white blood cells and with the disintegration of those red blood cells whose term of usefulness is past. The spleen is enclosed in a muscular capsule and this is innervated from the eighth, ninth and tenth thoracic spinal segments. The spleen undergoes marked variations in its size, which appear to be due to the nervous control of the muscular fibers of its capsule and to the variations in the circulation of the abdominal viscera. It seems to act as a reservoir for the blood content of the abdomen.

Lesions of the seventh to the tenth vertebræ and the corresponding ribs cause a relaxation of the muscular capsule and predispose to splenitis. The relationship of these lesions to splenomedullary leukemia is discussed in connection with that disease.

Splenic hyperemia passes by degrees into **acute splenitis**. The bony lesions above mentioned predispose to splenitis. During any of the infectious fevers, or any acute inflammatory process of the abdominal viscera, the spleen is likely to become involved.

Diagnosis is rarely possible, the treatment is that of the primary disease and the prognosis for recovery, so far as the spleen is concerned, is usually good. The consideration of the various forms of splenitis are chiefly pathological in interest.

Embolism is not infrequent. The infarcts are small and usually terminate as small white fibrous masses. After infection occurs, localized abscesses are produced. Because of the peculiar structure of the spleen, hemorrhages of small degree are not recognizable. Profound hemorrhages may rupture the wall of the spleen and the blood thus escape into the peritoneal cavity.

Interstitial Splenitis leads to an overgrowth of the connective tissue of the trabeculæ which is constant and does not terminate by any apparent shrinkage. The cirrhotic spleen is larger than the normal spleen, and has a tendency to constantly increase in size.

Proliferative splenitis follows typhoid and other acute fevers, and reaches its most pronounced extent after malaria. The "ague cake" characteristic of chronic malaria is of this type. The tremendously large spleen of leukemia is associated with a chronic proliferative process of the spleen pulp.

Splenitis causes a heavy, aching pain over the left ribs and is associated with reflex muscular contractions, involving the lower intercostals and interthoracic region, and sometimes the small of the back. Pain over the tip of the left shoulder is frequently found and the tissues over the top of the shoulder and around the lower part of the neck are usually hypersensitive. The ribs on the left side may be raised and separated as the result of the splenic enlargement, or they may be drooping and approximated as the result of the reflex muscular contractions.

Amyloid degeneration of the spleen (sago spleen) occurs in connection with amyloid diseases affecting the other viscera. The malphigian bodies possibly are chiefly and sometimes solely affected. It is to this fact that the name sago spleen is due. The disease may extend to the splenic pulp and trabeculæ, until practically the whole organ may become involved in the degenerative process. No treatment is possible and death cannot be very long delayed after the recognition of this splenic disease.

Primary Splenic Tumors are rare, except for the peculiar overgrowth which occurs in leukemia. This is probably to be considered an adeno-lymphoma and it may reach tremendous size. Leukemia, on the other hand, is sometimes considered a form of sarcomatous growth.

Secondary Neoplasms are rather common. Carcinoma of the spleen usually originates in the stomach or duodenum. By far the most common cause of splenic tumors is found in tubercular or syphilitic infection. Splenic tubercles may reach considerable size and they may abound throughout the splenic pulp. Syphilitic gummata may be very large and often associated with amyloid degeneration.

STATUS LYMPHATICUS

This is a peculiar disease of childhood characterized by a persistent thymus and marked enlargement of the thymus, spleen and all other lymphoid tissues of the body, which often manifests itself first by the sudden death of the patient.

The etiology of the disease is completely unknown. Its existence is rarely recognized ante-mortem. Children so affected die suddenly upon very slight provocation. Anesthesia itself or a very slight surgical operation such as circumcision or the removal of adenoids may result in sudden death. More rarely a child may die as the result of a fall, or of fright. At a post-mortem it is

found that the thymus extends well down into the thorax and around the heart. In a few cases, careful physical examination ante-mortem shows the increased thymic dullness, enlarged spleen and enlarged superficial lymphatic nodes. Children in whom these conditions are found must be carefully guarded against shocks or fright until atrophy of the thymus occurs.

Though the condition is rare, the seriousness of its occurrence should lead to the careful examination of children before surgery or anesthesia is advised.

MOUNTAIN SICKNESS

Mountain sickness is a condition due to rarefied air, and which develops in high altitudes. It is characterized by severe headache, gasping for breath, parched tongue, intense thirst, loss of appetite, and an intense malaise. There may be a slight fever. It may be a transient condition or may last for several days.

In a less degree, it occurs in moderate altitudes in susceptible individuals. Tubercular individuals who go to high altitudes often suffer very severely from mountain sickness. In some cases this clouds the diagnosis of tubercular systemic infection. The involvement of the meninges, especially, gives symptoms not easily distinguishable from mountain sickness, and this may lead to serious error in prognosis.

The treatment must be based upon the patient's general condition. He should be put to bed at first, and kept on either a very dry diet, with water given only between meals, in small quantities sipped slowly, or on a completely liquid diet, taken in small quantities, sipped slowly. As the symptoms diminish he may take more food. The iron-containing foods are needed.

A patient whose physique is poor, especially those who are tubercular, should be sent to lower altitudes if the symptoms do not clear up within a few days—or even earlier, if the symptoms are severe.

Susceptibility to mountain sickness may be based upon low hemoglobin, weak heart, valvular lesions, "nervous" heart; bony lesions affecting the cardiac, gastric, or vasomotor centers; chronic inflammations affecting the middle or inner ear. Suitable treatment for these conditions may enable the individual previously susceptible to mountain sickness to live comfortably in high places.

SEASICKNESS

This is a disease due to irregular motion of the body, characterized by nausea and usually vomiting, sometimes intense headache, and always very severe sensations of extreme illness, which are indescribable.

Etiology. Primarily, the illness is due to the motion of the boat. Predisposing causes include disturbances of the digestive tract and the nerve centers. Bony lesions of the upper cervical region are important factors. Seasickness is "no respecter of persons," and people in excellent health may succumb while those of deficient vitality remain comfortable; the opposite relation is also true. The same person may be free for many voyages, only to succumb at some more or less unpleasant time. Usually one becomes exempt after a few hours or days, but some people never become adapted to the motion of a boat. No doubt the odors and sights are also factors, though these are popularly exaggerated.

Carsickness is the same disease, appearing among those riding upon swaying railroad coaches.

Pathogenesis. The disorder is probably due to the effects of the motion upon the vestibular nerves, and the effects of this irritation upon the visceromotor centers in the basal centers and the medulla.

Treatment. Rest in bed with plenty of fresh air is the best thing. Plentiful liquid intake is good in some cases, very dry diet, eaten slowly, gives good results. "General treatment" often terminates an attack.

Prophylaxis. Before voyage, the digestive tract should be known to be clean. The cervical region should be examined and lesions corrected; also the thoracic.

Prognosis. The disease terminates with the voyage. Elderly or weakly persons may die, though rarely.

RAYNAUD'S DISEASE

(Symmetric gangrene)

This is a disease apparently affecting the vasomotor nerves, and characterized by circulatory disturbances and later gangrene of the peripheral parts of the body, especially the fingers and toes.

Several grades of the affection have been described. In none of these is a satisfactory **etiology** known. Exposure to cold is the most common. The condition resembles "frost-bite" slightly.

Diagnosis. Very early in the course of the disease, variations in the size of the pupils and especially dilatation affecting both pupils is noticed. **Local syncope** is characterized by pallor and numbness of the fingers of both hands. There may be neuralgic pains and peculiar sensory disturbances in the arms. These attacks may be precipitated by cold and occur more frequently during the autumn and spring seasons. Such attacks may be caused by emotional disturbances. **Pseudo-Raynaud's** is hysterical local syncope. It is not followed by gangrene.

Raynaud's disease is certainly due in some cases to lesions of the third and fourth thoracic vertebræ and the corresponding ribs. Several very typical cases have been reported in which recovery has followed correction of such lesion. In one case at least, no recurrence has appeared for ten years after such correction. (P. C. O.)

Local asphyxia is a more severe grade of the vasomotor disturbance. The fingers or toes are blue and edematous; there is much aching, especially after the attack passes away. This condition may affect the tips of the ears and the nose, as well as some other parts of the body more rarely. Hemoglobin may be found in the urine. Trophic changes characterized by ridges upon the finger nails and by skin lesions of the affected part may be noted. Following this, **gangrene** may appear. The fingers soften, blebs appear under the skin and unless recovery occurs speedily, the fingers fall off. Autolytic enzymes digest the dead tissue which may dry away, leaving the fingers mummified (dry gangrene).

The injured part may drop off, leaving a stump. This may heal over and the progress of the disease be stopped.

The **treatment** consists in thorough corrective work applied to the upper thoracic and cervical spine. General measures for increased nutrition are helpful. In the first and second stages, the prognosis is very good; and even after considerable destruction of tissue, the progress of the disease may be stopped and the patient make remarkably good recovery.

ANGIONEUROTIC EDEMA

This is a disease of unknown cause, characterized by the sudden appearance of localized swellings of the skin or mucous membrane.

Aside from a slightly neurotic tendency on the part of these individuals, nothing of etiological importance can be found. The disease rarely affects females and is most likely to appear during early adult life.

The edema usually appears suddenly and disappears with equal rapidity. Any part of the body may be affected. In a few instances, edema of the glottis has caused death. Aside from the annoyance due to the presence of the swellings upon the face, hands, or other parts of the body, no evil results are usually present.

The treatment should be directed to the underlying neurotic condition. The prognosis is uniformly good.

SUNSTROKE

(Insolation; thermic fever; heat-stroke; *coup de soleil*; *siriasis*)

Sunstroke is an attack due to excessive heat, and characterized by marked increase in the body temperature, rapid heart, **syncope**,

coma, delirium, or other nervous symptoms, and sometimes by symptoms referable to hemorrhages in various parts of the body.

Etiology. Among the contributing causes may be mentioned excessive bodily fatigue, depression due to long exposure to the heat; insufficient food and the overuse of alcoholic drinks. In true sunstroke the brain shows parenchymatous degeneration. After death, the whole body is found in a state of venous congestion, the left ventricle firmly contracted and the right heart and vessels engorged with dark fluid blood. Rigor mortis is early and marked.

Sunstroke is properly applied to those working under the direct rays of the sun; the violet rays, as well as the red rays, are active. Men who work hard, and are heavily clothed, are especially liable to sunstroke. Farmers and soldiers on the march suffer in this way.

Heat Stroke or Thermic Fever occurs in men who work hard in intense heat, but in dim light. Bakers, engineers, firemen, are very liable to heat stroke. In all these cases the temperature of the body is high.

Heat Apoplexy may occur under any of the preceding conditions. There are some prodromal symptoms referable to the heat, dizziness, visual disturbances, and dyspnea. Sweating may cease; the patient may fall in coma or convulsions, and die immediately; or he may remain convulsive or delirious and recover in a few days, or finally die as the result of the injury. The temperature rises very high, reaching 115°, or more, in fatal cases. Such temperature, maintained for more than a very few minutes, must coagulate the globulins of the entire body and render death inevitable.

Heat Prostration has milder symptoms, unconsciousness does not occur, and recovery is to be expected.

Heat Cramps, myospasm, due to direct injury to the muscle cells, occur in men whose work is hot and exhausting—stokers on steam ships, for example. The calves are most affected; they contract rigidly with much pain. The paroxysms last less than a minute, and recur almost at once; the attacks may last a day or longer; recovery is attended with soreness and exhaustion.

In any form of heat injury, the blood is dark, thin, either feebly alkaline or slightly acid and the coagulation time is exceedingly slow or absent. The blood pressure is low.

It is important to distinguish between sunstroke and heat exhaustion, and also between these and alcoholic coma, apoplexy and epilepsy.

The *sequelæ* include headache, vertigo, insomnia, inability to bear high temperature, loss of power of concentration, failure of

memory, peripheral neuritis, epilepsy, mental enfeeblement, monoplegia, paraplegia, or hemiplegia.

Treatment. Remove the patient to a cool place, place in the recumbent posture with the head low, loosen clothing, stimulate the respiratory and cardiac spinal areas from second to fifth dorsal and directly over the heart. In hyperpyrexia cold douching to the head is the first indication, with strong relaxation of the cervical muscles. Remove to a hospital as soon as possible where cold baths, cold pack, or rubbing with ice can be used until the temperature is reduced. Cold enteroclysis or hypodermoclysis may be used. Keep the whole spinal musculature relaxed as the muscles are usually very contracted, paying particular attention to the cervical region. Tonic treatment is necessary during the stage of depression and during convalescence.

Prognosis. Hyperpyrexia has unfavorable outlook, death resulting in one half to several hours in many cases. Permanent injury results if death is avoided.

The unfavorable indications are: increased temperature, cardiac failure, convulsions, absent reflexes, followed by complete muscular relaxation.

The favorable indications are: decline in surface heat and in axillary and rectal temperature, stronger pulse, increased depth of respiration, restored reflexes, and return of consciousness.

HEAT EXHAUSTION

This is a state of asthenia or collapse due to overwork in hot, usually dark and unaired places, such as furnace rooms, foundries, etc. It may also occur in weak children or older persons, in hot, unaired rooms, especially in tenement districts. The exhaustion of the vasomotor, heart and other nerve centers is due to the increased viscosity and toxicity of the blood, resulting from increased perspiration and diminished urine and other secretions. Fatigue, any form of toxemia, alcoholism or other drug-taking, weakening diseases, mal-nutrition, all predispose.

Diagnosis. The most important symptom is the hypothermia, sometimes to 95° F. or even lower. Marked pallor, weakness, vertigo, syncope or delirium, weak pulse and low blood pressure are characteristic. The skin is clammy; symptoms of apoplexy may occur. Death may be sudden or delayed for hours, or recovery may occur.

Treatment should be stimulating. The patient should be placed in bed, if possible; plenty of fresh air is essential. Warmth is necessary; heat may be applied to feet and body. Liquids must be speedily added; hot drinks, tea, coffee, hot lemonade, warm

enemas, sometimes hypodermoclysis or enteroclysis are to be employed for this purpose. Friction of the limbs should be vigorous.

The heart centers are stimulated by work in the upper thoracic and cervical region, and over the apex region; the ribs are to be raised and the flexibility of the thorax increased; pressure over the liver, suddenly released, is useful.

A warm bath and warm enema may be given, if convenient. The patient should be put to bed, if possible, or placed in a reclining position, with fresh air, warm covering, and heat at feet and perhaps near the body. Friction over the limbs is useful. In applying friction and heat, the danger of injuring the skin of an unconscious person must not be forgotten. Drugs and alcohol are dangerous. Hot drinks, such as broth, tea, or coffee may be freely given; it is necessary to add liquids to body rapidly.

With returning consciousness and increasing heat, chilling and overwarmth must be equally avoided.

Sequelæ. The symptoms of the attack persist for some time, in severe cases. The patient must avoid overwork and overheat for some months, and may be unable to endure extremes of heat for several years. Frequent bathing, wholesome food, the avoidance of alcoholic drinks and of excessive heat, should diminish the tendency to recurrence.

SNOW BLINDNESS AND DELIRIUM

People who are exposed to the glare of snow and ice, especially in great cold, suffer from a peculiar ocular disturbance, due to the effects of the constant strain upon the eye muscles which are often totally unable to protect the retina from the evil effects of excessive light. The ultra-violet rays are especially disastrous in the glare from the snow. The glare from the desert and the glare from the electric lights give similar but usually less disastrous reactions. Blindness may occasionally persist, but it usually disappears with rest from the intense light. It may be necessary to wear dark bandages for days, and to remain in a dark room, and then to wear dark glasses for weeks or months, after a severe exposure.

The effects produced upon the entire system, and upon the mind, by the glare and the snow, may be serious. The isolation of individuals in the extremes of Arctic and Antarctic latitudes, the difficulty of securing proper foods, the desolation of the surroundings, all tend to develop a mental and physical depression. The mental effects include increasing irritability, and a sense of the unreal; hallucinations are frequent, and quarrels among friends are not rare. Gastro-intestinal disturbances are sometimes due

to poor food, but appear to be inevitable even with good food. Constant nausea, vomiting and diarrhea are usually associated with scurvy; attacks of these symptoms occur without recognizable causes. The cold air leads to various pulmonary diseases, especially tuberculosis and pneumonia.

All symptoms disappear rapidly with return to the latitudes to which the patients have been accustomed. Colored glasses prevent the trouble to some extent.

DESERT SICKNESS

The intensely dry air of the desert, plus the desolation and isolation, the glare of the sunshine, and the intense heat, often affect those who first visit the desert. The effects are more pronounced in the higher altitudes.

Nausea, vomiting and other symptoms of mountain sickness are frequent. The dryness causes roaring of the ears, which may be severe. Increased thirst leads to the drinking of too much ice water, if it is available, and gastritis may result; the condition is more severe if alcoholic drinks are used.

The quivering light rays lead to hallucinations; this is magnified by the occurrence of the mirage, with its strange and varying pictures.

If water is lacking, the symptoms are serious. In the dry air, the mucous membranes dry out rapidly, and the effects are apparent in every organ of the body. Delirium results rapidly. The mirage is not recognized, and a wild dash for the water and greenery thus seen often leads to hasty death. A peculiar effect is the tendency to remove the clothing; shoes are thrown away, the hat, and ultimately every thread of clothing is removed. Death occurs from exhaustion.

SIMPLE CONTINUED FEVER

(Febricula; irritation fever; ephemeral fever)

Simple continued fever is an acute, noncontagious disease of short duration and of mild type unattended by characteristic lesions, occurring most commonly in childhood and arising from gastro-intestinal disturbances, mental or physical fatigue, excitement, emotion, or exposure to high degrees of heat or cold.

Diagnosis. The onset is sudden, may be ushered in with nausea and vomiting, convulsions or chill. There is great lassitude, temperature rises suddenly to 102° to 103° F., accompanied by headache, increased respiration, quick, tense pulse, dryness of the skin, thirst, coated tongue, constipation and febrile urine. Delirium may be present. There is no characteristic eruption; herpes is common on the lips.

The duration is short, if lasting for a day and completely disappearing is called ephemeral fever; if persisting for three or more days without any local affection, it is then called febricula, or continued fever. The affection terminates by lysis or crisis, and convalescence is rapid.

Treatment. Rest in bed is the first consideration. Then a gentle, thorough spinal treatment from occiput to coccyx, paying particular attention to the thoracic area and adjusting every deviation found, and lastly giving direct manipulation to the abdomen to secure free elimination. An enema may be given at first. The diet should be liquid, preferably fruit juices and plenty of water.

Prognosis. Recovery occurs without after-effects. Future attacks are prevented by the correction of hygiene, diet, and regulation of hours of play.

ANAPHYLAXIS

This condition has not been sufficiently studied to warrant its classification. It appears to be a factor in the pathogenesis and symptomatology of certain infections, certain cases of hay fever and asthma, proteid poisonings, autointoxication, urticaria, and in some cases of personal idiosyncrasy. Its importance increases with the tendency to employ serums in the treatment of disease.

Foreign proteids in the blood stream produce sensitization within a few days to a few weeks. The amount injected is not important; either extremely minute or very large doses appear to produce equal effects. After this sensitization, further injections of this proteid may produce immediate and very serious symptoms, including respiratory and circulatory disturbances, urticaria, syncope, paralysis, and other nervous symptoms, diarrhea and vomiting, and often death within a few minutes or several hours.

Sensitization persists throughout life, and may be transmitted from mother to offspring. Both the sensitizing and the activating doses may gain entrance into the body in one or more of several different ways. Recently the use of serums in diagnosis, prophylaxis, and therapeutics is responsible for injection of foreign serums, usually horse serum, directly into the circulation. Inhalation may be efficient as in cases of asthma from association with horses. Absorption may occur through abrasions but not, apparently, through healthy skin. Absorption may occur through the walls of the alimentary tract, as in urticaria from eating strawberries, shell-fish, or other articles of food by persons sensitive to them. In this case it may be that the products of imperfect digestion of the foods are the efficient agents, rather than the proteids of the foods themselves.

CHAPTER XXXI CHRONIC DRUG POISONING

GENERAL DISCUSSION

For the recognition and treatment of accidental and suicidal poisoning, books on toxicology must be consulted. But chronic poisoning often confuses the diagnosis of organic disease, and is so often associated with organic disease, that a short description of the more common of these is included in this volume.

Generally speaking, the treatment of the chronic poisonings depends upon stopping the intake and hastening the elimination of the drugs. It is rarely harmful to stop the drug suddenly; in a very few cases its gradual diminution may be necessary on account of the weakness of the patient. Elimination may be hastened only by the use of the milder measures—the use of emetics and purgatives is limited to the acute poisonings. Antidotes are rarely of value in the chronic cases, since in these the drug is within the fluids of the body, and probably in some cases within the cells themselves. The treatment finally narrows down to the efforts made to keep the eliminating organs in the best possible condition, and to keep the blood flowing as rapidly, with normal pressure, as possible. It is necessary in some cases to provide new blood cells as rapidly as possible. This is secured by good food, good circulation through the red bone marrow, and the usual treatment for secondary anemia.

It is suggested that the organs of elimination might be induced to work beyond their normal capacity. This is possible, for a short time, but a reaction is bound to occur, so that the ultimate efficiency of any organ is lessened. In acute poisoning, the rapidity of elimination may be so necessary that the later inactivity of the eliminating organs becomes a negligible matter; in chronic poisoning, the need for good elimination persists for days, sometimes for weeks, and any attempts to stimulate liver, kidneys or bowels to greater activity, by adding yet other poisonous substances to the blood circulating through them, must ultimately interfere with the elimination of the poison for which the treatment is being planned.

Just normal structure, just normal blood, flowing freely under normal pressure, just normal innervation, are necessary to enable the organs of elimination to throw out from the system those substances which they are capable of handling.

So the treatment for chronic poisoning includes the correction of structural perversions which prevent normal activity of the

eliminating organs; such washings of the colon as may be necessary to remove the accumulating feces; such increased drinking of water, and of fruit and vegetable juices, and such eating of good food, as may be necessary in order to provide fluids and foods for the body. Fresh air, in abundance, exercise in the open air, and all hygienic conditions, enable the elimination processes to go on more rapidly than could be the case under unhygienic conditions.

ALCOHOLISM

Alcoholism is the term used to designate the physical and mental phenomena induced by the use of alcoholic liquors, and occurring in several distinct forms.

Etiology. Heredity, local and family custom, the use of alcoholic and other drugs in infancy; occupation, those handling liquors; social association; and the physical depletion due to improper food, the use of other drugs, worry and overwork, all tend to establish the habit.

Morbid changes are numerous and affect nearly every portion of the body; including chronic nasal, oral, esophageal, gastric or gastro-intestinal catarrh; fatty and cirrhotic liver; arteriosclerosis, dilatation of the heart; and interstitial nephritis. The nervous system is especially liable to suffer. Peripheral and multiple neuritis, pachymeningitis, myelitis, apoplexy, and degenerative brain lesions occur. The germ cells in both sexes are affected.

Certain peculiar forms of alcoholism may be mentioned. The use of the cheaper grades of whisky leads to poisoning with wood alcohol, in which blindness and visual disturbances are common. Cheap drinks are sometimes mixed with other poisons, each of which may modify the picture presented by uncomplicated alcoholic poisoning.

Women sometimes use Cologne water, or other alcoholic extracts, for stimulation. A warm bath, perfumed by any of these, may give enough inhaled alcohol to produce recognizable effects. Alcohol used in the arts and the trades may give off fumes enough to result in poisoning. Jamaica ginger is taken as a drug, but really for its alcohol; the use of patent medicines containing alcohol is, fortunately, diminishing.

Absinthe is a peculiarly deadly liquor, made from wormwood and alcohol. It gives greater exhilaration than alcohol alone, with more profound depression and more violent delirium. Its effects upon the nervous system are more profound than are those of alcohol in other forms.

Acute Alcoholism (*Temulentia*; drunkenness or alcoholic intoxication). The ordinary forms do not often come under treatment unless at a receiving hospital. Alcoholic coma (dead drunk)

is important as it may be confused with more serious conditions. The breathing is stertorous, the face bloated and congested, the lips swollen and purplish, the pulse feeble and slow, the temples depressed, the skin cold and clammy, the pupils dilated; frequently control of the sphincters is lost. It is too often confused with cerebral hemorrhage, uremia, brain injury and coma from other causes.

Von Wedekind's test is: "By simple pressure on the supra-orbital notches with a steadily increasing force one may, with certainty of success, bring an unconscious alcoholic to his senses, and thus differentiate between alcoholic and other comas."

Treatment. Emergency treatment is given, according to circumstances. Wash out the stomach. Hot coffee may be given by the stomach tube. Alternate hot and cold applications should be made to the skin. Vigorous stimulation of the upper thoracic area is necessary if the heart and respiration are failing. If the diagnosis is at all doubtful, physical diagnosis, urinalysis, and blood, retinal and other examinations should be made to reveal the true condition.

The odor of alcohol upon the breath is of no value in diagnosis; abstemious men may drink when symptoms of coma appear. Coma cases should be considered serious until a diagnosis of alcoholism is demonstrated. The common view that a drunk man is immune to abuse is responsible for much injury. More humane care of the drunk, followed by further measures for cure of the habit would work almost as much of a revolution as did the establishment of similar measures in the care of the insane.

Mania a Potu (Crazy drunk) is a state of transitory, acute, often homicidal mania which occasionally replaces ordinary intoxication in those of neurotic temperament. It must be distinguished from acute mania. Wash stomach and colon, unless vomiting has been free and has ceased. Give much hot water, weak tea, lemonade, and diluted fruit juices. Restraint may be necessary, but must be made as nonirritating as possible. Chloroform may be required in violent cases, when restraint is difficult. The paroxysm is short, and terminates in stupor, from which the patient awakens with no memory of his storm.

Heavy extension of the neck, with the sudden correction of whatever lesions may be found, employing strong movements, has been known to terminate suddenly the paroxysm, and produce sleep. After an attack, the knowledge of things done and the dangers incurred during the paroxysm may serve good educational purpose.

Dipsomania (Oinomania) is a true mental disease manifested by periodic attacks of excessive alcoholic indulgence or this may be replaced by other irresistible desires such as lead to the com-

mission of crimes and the gratification of depraved appetites. During the intervals the patient may neither wish nor crave alcohol. Imbecility and dementia frequently follow.

Chronic Alcoholism. After months or years of alcohol using with no serious effects, the symptoms begin with nausea or a feeling of sinking in the morning, soon followed by morning vomiting. The tongue is furred and tremulous, the appetite fails, and the bowels are first constipated, then loose. Later, the hands become tremulous, muscular power is diminished and the gait may become ataxic. The patellar reflex is lost. Insomnia or disturbed sleep is common. Sensory disturbances of nearly every kind are found in different individuals. The mental state is expressed by Korsakoff's syndrome—weak memory, weak morals, weak will. Hallucinations of sight and hearing may arise. Some cases end in dementia, others in cirrhosis of the liver or kidneys, cardiac failure or meningitis.

Delirium Tremens occurs in habitual drinkers and may be excited by injury, shock, exposure, prolonged debauch, abstinence, from proper food, or in the course of acute diseases. The onset is accompanied by irritability, restlessness and disturbed sleep. Tremor is marked especially of the small muscles of the hands, face, and tongue. The patient talks to himself or answers imaginary voices. In a day or so, visual hallucinations of moving animals appear from which he tries to escape. Illusions of smell and hearing may also appear. Paresthesias of various sorts may be present. Noisy delirium may appear. Perspiration is abundant; the temperature is somewhat elevated, rarely above 103° F.; the pulse is rapid and soft and easily compressible. There is complete insomnia. Sleep usually returns about the third to the fifth day, from which the patient awakens sane and hungry and convalescence begins.

Should the delirium subside into a low muttering type, with subsultus tendinum, dry cracked tongue, regurgitation of a dark brownish and bilious matter, an early death is to be expected, in coma, convulsions or from exhaustion.

The urine is often albuminous and contains casts, kidney cells, blood. The blood may show leucocytosis at the height of delirium tremens.

The four diagnostic points of chronic alcoholism are: insomnia, morning vomiting, muscular tremor, causeless mental restlessness. It is to be distinguished from general paralysis, disseminated sclerosis, paralysis agitans, locomotor ataxia, cerebral and spinal softening, epilepsy, dementia chronica, and nervous dyspepsia.

All forms of chronic alcoholism require scientific institutional care to build up the patient physically and morally.

Prognosis. Acute alcoholism has good outlook if the patient is manageable. Chronic alcoholism tends to shorten life by producing morbid changes in the vital organs. Delirium tremens produces liability to heart failure or death through a gradually deepening coma. Acute lobar pneumonia is a very fatal complication in any form of alcoholism.

MORPHINISM

(Morphine habit; morphinomania)

Morphinism is a term used to designate the phenomena following the habitual use of opium, especially of its derivative, morphia.

The habit usually originates in use for the relief of pain. The ordinary narcotic effect is succeeded by euphoria and exaltation, with quickening of the mental processes; this lasts for a limited time and is in turn followed by profound depression. Brain workers are especially liable to fall victims of the habit which has been greatly on the increase in this country. Doctors of medicine and nurses are frequent victims.

Diagnosis. The victim usually presents a characteristic appearance; has a sallow, hard, wrinkled skin, is prematurely aged, emaciated and of cachectic appearance. Variable, occasional colic, alternating constipation and diarrhea, chills followed by profuse sweating, variable fever, itching of the skin, restlessness, exaggerated sensibilities, disturbed sleep or insomnia, are the usual symptoms. The reflexes are at first increased; later abolished. The pupils are contracted just after a dose and dilated, sometimes unequally, in the intervals. Patients are remarkably untruthful and ingenious in concealing the habit.

If a patient shows evidences of malnutrition without cause, has some fever, pruritis, and the appearance above indicated, it is well to examine the urine or washings from the stomach for morphia. Death may be due to progressive asthenia, intercurrent disease, or to accidental or intentional overdose.

Acute Opium Poisoning (Opium narcosis) is due to an overdose and may occur in habitues as well as with nonusers. The first symptoms appear within five to forty minutes. In subjects of alcoholic mania, it may be followed by sudden and complete coma. The onset is usually abrupt; the patient may be talking one moment, the next be profoundly unconscious; the jaws, at first fixed, are, later, relaxed. The pin-point pupils do not react to light, and sensation is lost in the cornea.

The respiration drops to 10, perhaps 4, per minute; the heart action is weak, the pulse feeble and well nigh imperceptible, the face is pale, sometimes cyanotic, the skin is dry or bathed in perspiration. The coma is profound. When partially aroused, speech

is incoherent and the patient relapses quickly. There is retention of urine and later vesical tenesmus. The tongue may drop back into the pharynx. Respiration is stertorous and the cheeks flap. Under successful treatment, the coma lessens, the color and pulse improve. Relapses are frequent and days may elapse before the patient is out of danger. Diagnosis must be made from coma of uremia, alcohol, sunstroke, and cerebral hemorrhage.

Morphia may be isolated from the urine and from the stomach contents.

Treatment. In opium narcosis, the main thing is to prevent coma, hence walking the patient, and elimination by all possible avenues, hot and cold sprays, sharp blows upon the skin, anything to keep him awake, are indicated. Give strong, stimulating movements to the cardiac areas; raise the ribs and give shaking movements to the lower part of the thorax; extend the cervical spine. If convenient, electric stimulation of the skin may help. As much strong hot coffee as the patient can swallow helps to overcome the narcosis. When the breathing becomes regular and the heart strong, he may rest, but not sleep for several hours. For two days he must be watched. Toxic symptoms may appear at any time for several days.

Chronic morphinism must receive institutional care, as a rule. The habit depends partly upon the existence of an antibody which results from the use of the drug, for which the morphine itself is an antidote. In order to rid the system of this poisonous antibody, it is necessary to promote elimination in every possible manner. This, with the fact that absolute control of the patient is necessary to keep the drug away from him, at first, renders the home care of such patients most difficult.

It is best to take the drug away at once, in all but a very few badly depleted persons, and from them within a few days. There is not apt to be any appetite, and food is denied, anyway. Free drinking of water or diluted fruit juice is necessary, the colon washed, sometimes the stomach, if nausea and vomiting are bad; very heavy treatment for the rigidity of the thorax and the lower thoracic spine are helpful. Baths, hot and cold sprays, massage, should keep the patient occupied with something practically all the time during his wakefulness. It may be necessary to use some purgative drug at first, this is to be avoided if possible. The patient must not be permitted access to the drug until his entire body is clean and strong, and he has shown evidences of recuperated will power as well as body strength.

Prognosis. Few habituated morphinists recover, alone. Those who receive proper care may overcome the habit permanently.

COCAINISM

The cocaine habit is frequent, especially in the southern states. It is used by morphinists, after the morphine has become too expensive or hard to procure. Its use is indicated by emaciation and mental disturbances. Moral perversion develops rapidly. There is frequently a sensation of sand under the skin. If unchecked it leads to melancholia or mania.

Its treatment is even more difficult than the morphine habit, with which it is frequently associated. Its use by boys who show other signs of degeneracy makes the prognosis still more serious. It is rather widely used among artistic and literary people of neurotic type, and in these it terminates suddenly with marked mental and nervous disturbances, total inefficiency, and death after a variable period of invalidism.

LEAD POISONING

(Plumbism; saturnism)

Lead poisoning is a common occupational disease, the lead entering the system by deglutition, inhalation, and absorption through the skin. It is eliminated principally by the bowels and kidneys.

The morbid changes affect the whole body especially the nervous and the circulatory systems, and the blood.

Acute Lead Poisoning usually results from lead acetate or subacetate being swallowed by mistake. The chief symptoms are sense of constriction in the throat and at pit of stomach, crampy pains around the umbilicus, and stiffness of the abdominal muscles.

Treatment is sodium sulphate, magnesium sulphate or alum dissolved in water to form the insoluble lead sulphate. Emetics is indicated.

Chronic Lead Poisoning. Among the first symptoms are anorexia, constipation, a metallic taste in the mouth mornings, tendency to headache, fetid breath and coated tongue. The patient becomes morose, apathetic, and irritable. Saturnine cachexia appears, the face becoming progressively pale and sallow. The blue-black line, the specific symptom, is seen at the margins of the gums; if no teeth, no blue line.

Lead Colic (Painter's colic; Devonshire colic; colica pictonum). This is of sudden onset and is briefly outlined as follows: There may be acute or superficial, paroxysmal pain centered about the umbilicus accompanied by tenderness and more severe on one side; or, constant deep-seated pain with retracted abdomen and constipation. The pulse is slow, of high tension, and sometimes unequal in the two wrists. Vomiting is frequent. The attack

usually passes off in about three days but may be frequently repeated.

Lead Paralysis (Paralysis saturnina; lead palsy). This frequently appears as a bilateral **wrist-drop** in which the extensor muscles supplied by the musculo-spiral nerve to the fingers and wrists are affected, the hands hanging flabbily at the sides. The supinator longus and extensor metacarpi pollicis also supplied from the musculo-spiral usually escape.

Ankle-drop (Peroneal paralysis) may be present instead of the brachial variety. Occasionally both are seen in the same patient. Paralysis of the upper arm muscles and Aran-Duchenne type of paralysis are less frequent. In all forms, muscular atrophy is rapid and the reaction of degeneration present. Pain is slight or absent.

Cerebral symptoms may appear, as optic neuritis, delirium with hallucinations, tremor, and headache.

Encephalopathy Saturnina is less common. It is most frequent in women. It is marked by severe headache followed by either delirious, convulsive, or comatose symptoms.

The delirium is at first tranquil, becoming later furious and paroxysmal, with intervals of quiet. Later, true sleep follows with complete restoration, or coma, ending in death. Rarely, insanity and amaurosis may be permanent.

Arthralgia (Arthralgia saturnina) is not uncommon. There are often severe, tearing, burning, paroxysmal pains with exacerbations and remissions, present in the joints and contiguous muscles. The knee is most commonly affected. Gout is frequent among lead workers.

Pregnant women abort or have still-births. If children are born alive, they usually succumb in infancy.

Lead poisoning may result in contracted kidney, hypertrophy of the heart, and arteriosclerosis.

Lead may be isolated from the urine in minute quantities. Hematoporphyrin has also been found.

The **blood** shows a moderate grade of anemia. The red cells do not usually fall below 50% but show basophilic granular degeneration of large numbers of cells and nucleated reds are constantly present. There may be a slight increase in the diameter of the reds; megaloblasts are sometimes seen and their rigidity is increased. The white cells are practically normal.

Treatment. Lead colic requires rest in bed, hot applications, enemata and the usual treatment for colic. Change of occupation is very desirable in chronic lead poisoning preferably to some active outdoor pursuit. Paralyzed limbs require treatment at the spinal source of nerve supply and local treatment to keep the

circulation active. Saturnine encephalopathy is best treated by securing free elimination as rapidly as possible. In rare and exceptionally severe cases, lumbar puncture may be necessary.

Prophylaxis. All lead works should teach their employees the dangers of uncleanness, should provide means of thorough cleanliness and should use every precaution possible to keep the amount of lead dust at a minimum. The employees should keep their hands and finger nails clean, bathe frequently, and use respirators when it is necessary. Painters must be very careful about eating with unwashed or poorly washed hands.

MERCURIALISM

(Chronic mercurial poisoning)

This is chronic poisoning, by mercury, of persons who may be susceptible to its effects. Its presence from the use of mercury as a drug is diminishing rapidly, on account of the less frequent use of calomel in medicine. Those who work in smelters, or mines of quicksilver, or who make thermometers, mirrors, certain pigments, etc., breathe in the vapor, even should their hands be kept scrupulously clean. Mercury is still used in drugs, and thus a few cases are yet found, of poisoning therefrom.

Diagnosis. It may be difficult to distinguish between this poisoning and late syphilis, especially since the drug is used in treating the infection. The symptoms of mercurialism include salivation and stomatitis, loosening of the teeth, softening of gums, with ulceration and necrosis of the jaw, brittle nails, brittle and falling hair, anemia, gastrointestinal disturbances, tremor, aphasia, paralysis, confusional insanity, various sensory disturbances, including severe pains in the legs and in other parts of the body.

The **treatment** is chiefly the removal of the possibility of further poisoning. The drug is eliminated slowly from the body, and structural lesions never are repaired. The usual treatment for chronic poisoning is to be adapted to the condition of the patient on examination.

Prognosis depends upon the amount of structural injury. Recovery is slow, at the best.

ARSENICISM

(Chronic arsenic poisoning)

This is a slow poisoning by arsenic. It is taken into the body as a drug, especially for its effect upon the complexion, and in the medical treatment of anemia; it may be an occupational disease, as in those who work in smelters, dyers, makers of wall

paper, rugs; or who embalm animals or prepare hides and furs, or who use arsenic in their work in any way. Those who live in poorly ventilated rooms whose walls, rugs, and ornaments contain arsenic may suffer arsenic poisoning—this form is less commonly found than before. Children who drink the milk from cows that feed upon the grass wet by the rain, in air polluted by smelters, may suffer from arsenic poisoning.

Diagnosis. Arsenic poisoning should be suspected when the following symptoms appear: a gradually increasing neuritis, affecting the legs first; mild and constant catarrhal gastritis; headache and vertigo; mild nephritis. A slow anemia, with waxy skin, bright eyes, with little or no loss of weight are usually present in varying degrees, and should lead to a urinary test for arsenic; this may have to be several times repeated before the positive reaction is secured.

Treatment. The immediate removal of the arsenic is indicated, though this may be followed by symptoms of increased intoxication. Later treatment to provide for increased nutrition may be necessary.

HEADACHE MEDICINES

Many very different medicines for the relief of headache and other pain are in constant use. Their effects are variable, but mostly include low blood pressure, erratic and fleeting pains in the nerves and muscles, hypersensitiveness of the skin and deeper tissues, and diminished powers of resistance to the ordinary emergencies of life. Mental effects are mostly included in an increasing loss of attentiveness and memory, and progressive inability to endure any pain or discomfort.

The habit is extremely obstinate. The effects upon the heart, the nervous system or the stomach, according to the particular nostrum affected, may cause influenza, pneumonia, or other disease to be speedily fatal. Comfort and efficiency are lowered throughout life, and much suffering ultimately results from this pernicious habit.

It is sometimes possible to recognize these drugs by urinalysis. A deep purple, blue or red color appears upon the addition of a few drops of a saturated ferric chloride solution to the urine. A negative reaction has no significance; and there are many drugs which may give a positive reaction.

CHAPTER XXXII

FOOD POISONING

GENERAL DISCUSSION

Poisons which enter the body with foods, or foods which as the result of bacterial or other changes become transformed into poisons, are receiving more than usual attention just now, since the comparative prevalence of pellagra is recognized.

The chemical differences between foods and poisons are often very slight. The bacteria which invade food may change its molecules from food to poison, rarely without changing recognizably the taste or the appearance. Bacteria may be taken into the body with the food, and acting upon them in the intestinal tract, may form poisonous compounds slowly, which are thus enabled to be absorbed into the blood stream without arousing inflammatory reaction, and cause death. Other materials are acted upon, either by autolytic enzymes, or by perverted digestive juices, in such a way as to become poisonous. It is not possible to deny absolutely that these cases are not really due to bacterial action, but there are several reasons for supposing that the reaction is sometimes due to an enzyme rather than to cellular activity.

Other substances which are foods for one person may be poison for another. Personal idiosyncrasies cover many puzzles. There are yet other instances in which the too constant use of some single class of food, itself desirable, perhaps necessary, results in disturbed metabolism and finally symptoms of intense poisoning. In many diseases, especially of the digestive tract, it is probable that the place in the symptom complex due to the absorption of perverted food molecules is a very large one; the diseases and deaths due to the absorption of poisonous compounds from foods at all times are probably more than we now realize.

Diagnosis. The recognition of acute poisoning by food must be based upon the symptoms, plus the history. Speedy evacuation of the entire digestive tract is urgent, and this must be secured in any way that does not injure the membranes. It must not be forgotten that an inflamed membrane may take up more poison than a normal membrane. There is a protective action of normal intestinal membrane, for certain poisons, which may be destroyed by too urgent purgation. If the material is still in the stomach, the stomach tube may remove it completely; later, purgative medicines that are least irritating should be used. The constant and free use of the enema is indicated in all cases; prac-

tically no absorption takes place in the lower bowel, and the constant removal of this material promotes peristalsis of the upper part of the digestive tract.

After the poison has been absorbed, it must be removed by liver, kidneys, lungs and skin. Circulation must be kept active by stimulating manipulations, hot and cold spray, friction of the skin, etc. Body heat must be artificially maintained in some cases—friction, hot coverings, packs must be freely employed. These also promote oxidation and elimination. The patient should drink very freely of hot or cold water; if he is unable to do this, sterile normal salt injected into the subcutaneous tissues is absorbed into the blood stream, eliminated by the kidneys, and thus much poison is carried away.

When the intestinal tract is cleaned, the systemic symptoms may be severe. Fever is combatted with the ordinary methods—suboccipital and mid-dorsal inhibition; baths; collapse requires stimulating manipulations affecting the heart centers, raising the ribs, stimulating the liver and spleen, and plenty of hot drinks and warm clothing, with hot water bottles. Convulsions may need the neutral bath, friction, rarely chloroform inhalations; parasthesias and paralyzes do not require immediate attention.

After the acute attack is over, there probably remains some poisonous material in the system, and the cells of the body have been injured by the poisoning. In order to promote the most complete and rapid recovery, whatever structural changes may have been produced from the illness, or which may have been present before, should be corrected. Free drinking of water promotes the elimination of the remaining poison. The intestinal tract may have suffered from the violent purgation and emesis; rest and bland foods are best for a few days. As soon as conditions permit, the patient should go upon a very largely cellulose diet; this fills and stimulates the intestines; carries no putrefiable material, and little that is fermentable. The digestive secretions receive normal stimulation, the intestines are cleaned, and conditions permit rapid recovery. A certain amount of nutrition, and especially the inorganic salts in organic compounds, is given by this class of foods, and they are excellent to use under all toxic conditions.

PELLAGRA

(Alpine scurvy; Italian leprosy; maidismus)

Pellagra is a disease due to some unknown cause. Several bacteria and protozoa have been described. Lack of vitamins seems important, as is also intoxication from an unbalanced diet, chiefly carbohydrate, and often more or less injured by fermentation. It appeared first in those who eat too much stale and sour polenta in Italy; later it appeared in this country, among those with

various unbalanced diets—excess of cotton seed oil; excess of sugar cane; generally a lack of fresh nitrogenous foods is characteristic. Cases appear in asylums, orphanages, prisons, when the diet is too greatly restricted and too greatly carbohydrate. Insanitary conditions are fairly constant, though a few cases have been reported among people of fairly good homes.

Diagnosis. This rests almost exclusively upon the symptoms. The pathognomonic triad includes obstinate diarrhea with marked cachexia; eruption recurring each spring, mostly on exposed areas, exacerbated in sunshine; and melancholia often of the excitable type, with tendency to suicide by drowning.

The blood is of chlorotic type, with leucopenia and a relative excess of large mononuclears. No characteristic symptoms are found in the urine, nor upon physical examination.

"The prodromal stage varies in length, and is marked by clinical symptoms that appear in any disease of microbic origin—general malaise, headache, languor, and mild digestive disturbances. One of the earliest symptoms is an erythema that usually first appears on the hands and feet and that is particularly severe on exposed parts of the body. The eruption comes on suddenly, and manifests itself as a dark, or bright red, diffuse erythema. This may be a simple hyperemia that will disappear on pressure, or a livid congestion that may become hemorrhagic. The skin swells, burns, and itches severely. The rash lasts about two weeks and is followed by desquamation of the epidermis, first in large flakes and then in branny scales. The skin is left pigmented and somewhat thickened, conditions that with repeated annual attacks of the disease are increased. Following four or five such recurrences, the skin atrophies and becomes thin, loose, dry, wrinkled, and pigmented. The area affected by these changes also increases as years go on, until finally the entire body may become involved. The peculiar distribution of the lesion is very characteristic, and seems to point to the sun as an exciting cause, in that the exposed parts of the body—backs of hands, forearms, face, neck, and dorsum of the feet are particularly affected. Sensation is disturbed. Patients describe their feelings as that of flames surrounding them, of hot or cold water being poured over their heads or backs; others, of prickly sensations, formication, etc. In passing, it may be of interest to note that on account of this burning sensation, water has a peculiar fascination for the pellagrins. They like its feeling on their skin; they gaze at it; yet they are lured on by the spell in which it holds them until overcome by nausea and vertigo they become the victims of its charm. With others the sight of water seems to cause a vertigo that temporarily overwhelms them. So strong is this influence on pellagrins that statistics from pellagrinous districts show a striking percentage of deaths by drowning. The extreme sensitiveness of the skin may induce a spasm from so slight an exciting cause as a breath of air or a ray of light. Most victims suffer pain of varying intensity in some parts of the body.

LATER SYMPTOMS—The disease appears in the spring, lasts until midsummer, disappears—perhaps completely—during the winter, only to reappear the next spring with increased severity. After two or three years all of the constitutional symptoms become exaggerated. The tongue becomes red and dry, there is a burning sensation in the mouth, swallowing is painful, diarrhea increases, and the patient emaciates rapidly. There are severe headache and backache, tenderness over the dorsal vertebrae, and insomnia. Paralysis of the third nerve is common. The reflexes are at first increased and later diminished or disappear. Perverted appetite is frequently observed, and may lead the patient to gluttony or to abhorrence of food. In the late stages of the disease all of the cerebro-spinal symp-

toms are increased. Mild cases may run ten or fifteen years, but the average duration is about five years. In the most advanced cases mental disturbance, in the form of depression, acute melancholy or insanity, adds a stroke that makes the picture more gruesome."—L. M. Beeman.

"The spine was found quite rigid, however, especially in the splanchnic area. The whole of the spine was abnormally rigid, but this I am led to believe is reflex, rather than primary.

"The osteopathic treatment was given every day and often twice per day to overcome this rigid condition and to keep the spinal muscles relaxed. There certainly is no specific osteopathic lesion accounting for pellagra, hence there can be no specific treatment given; but on the same principle that we treat pneumonia, measles, scarlet fever, etc., successfully without recognizing or removing a specific lesion, so we can deal with pellagra. That character of treatment which removes the cause of nerve impingement, or circulatory disturbance, and promotes elimination of disease toxins, is the treatment indicated.

"To that end the diet should be regulated and adapted to each individual case. Corn products were eliminated from the food of my patients, otherwise a light, well-balanced diet was given."—E. W. Patterson.

"The diet I am using on all cases now under treatment, is ten ounces of fresh beef per day and plenty of fresh vegetables, except cabbage, collards, etc., two ounces of sugar in egg custard, absolutely no corn bread, rice, hominy, or grits. It will be apparent to the reader that the purpose of this diet is to eliminate as much as possible the articles of food the patient eats or has eaten as a sole diet; for investigation proves beyond doubt that all pellagrins eat practically the same thing 365 days in the year and that is largely composed of starchy food. I allow them to cook their vegetables with salt pork, but do not allow them to eat the pork.

"In addition to the dietetic treatment, of course, the osteopathic lesions are given proper attention and the symptoms are cared for as they arise, but the distressing symptoms almost always rapidly subside under this radical change of diet."—E. C. Armstrong, D.O.

GRAIN AND VEGETABLE POISONING

(Sitotoxismus)

Ergotism. The prolonged use of bread made from rye contaminated with *claviceps purpurea* (ergot fungus) causes digestive disturbances and later one of two forms, gangrenous or convulsive symptoms.

The gangrenous form begins in spasmodic muscular contractions, pain, paresthesias, anesthetics, and finally blood stasis, gangrene resulting usually in the fingers and toes although sometimes in the nose and ears.

The convulsive form is accompanied by a prodromal period of one to two weeks of headache, slight fever, occasional tingling or pain. This is succeeded by muscular cramps and spasm during which there is painful spasmodic clenching of the hands and hyperextension of the feet. In very severe cases, there is early delirium or epilepsy but dementia or melancholia are more frequent. Ataxia may be present. The degeneration of the posterior spinal columns resembles that of *tabes dorsalis*.

Lathyrism (Lupinosis) is due to eating food made from the seeds of the vetches, *Lathyrus sativa* or *L. cicera*, and produces symptoms of spastic paraplegia, most frequently affecting the legs only.

Potato Poisoning is due to the solanin, the amount of which may be increased over the normal under certain circumstances by the action of the bacillus *solaniferum noncolorabile* and the bacillus *solaniferum colorabile*, occurring in those potatoes which are partially exposed above the ground or in those sprouted during storage.

The symptoms are chills, fever, headache, vomiting, diarrhea, colic, and great prostration. Jaundice may occur and collapse is not infrequent. The patients recover.

Mushroom Poisoning is less common now than formerly, yet incidents occasionally occur. Fresh morels are dangerous; the poison disappears on drying. Nausea, diarrhea, vomiting, hemoglobinemia and jaundice may precede death; if the poison taken was small, or if the stomach is quickly emptied, recovery may occur. Red agaric (*amanita muscari*) is very dangerous; convulsions, gastro-intestinal symptoms, slow pulse, dilated pupils, salivation, coma and death follow when this is eaten, unless speedy removal of the poison is secured.

POISONING FROM NITROGENOUS FOODS

Milk Poisoning (Galactotoxismus) is marked by gastro-intestinal and choleraic symptoms and high fever.

In **Cheese Poisoning** (Tyrotoxismus) the fever is not continuous and collapse occurs early.

Mussels (*Mytilis Edulis*) produce mytilotoxin if they have been placed in filthy water. The symptoms are of an acute poison without fever, profound nervous symptoms with collapse appearing rapidly. There are no gastro-intestinal symptoms.

Fish Poisoning (Ichthyotoxismus) is unattended by fever, the symptoms are referable to the nervous system and collapse occurs early.

Meat Poisoning (Kreotoxismus) is due either to the alkaloidal products of decomposition (true ptomaine); or to organisms, usually bacillus botulinus, bacillus enteritidis, or proteus vulgaris and allied organisms. These gain access to meat after slaughter and produce a chemical poison, without evidences of decomposition, or they may be swallowed with food and produce their poison within the body. Sausage poison (botulinus; allantiasis) is destroyed by boiling.

Diagnosis. One form (true ptomaine) resembles atropin poisoning, appears within a very short time, with dryness of throat, hoarseness, dysphagia, rapid pulse, dilatation of the pupils (which do not respond to light), nausea, vomiting, abdominal pain, diarrhea, and prostration. Death is not infrequent and recovery is slow.

The more common form may appear at once or after an incubation of 12 to 48 hours during which there may or may not be prodromal symptoms of malaise, anorexia, nausea, and colicky pains.

Chilliness or rigor is followed by fever, 101° to 104°, prostration, giddiness, faintness, cold perspiration, great thirst, headache and backache, diarrhea, crampy tearing and burning pain in the chest or between the shoulders, and increasing abdominal pain. The clammy perspiration becomes more pronounced; the pulse is rapid, 100 to 128, and later may become thready; there is extreme muscular weakness; cramps in the legs and arms are followed by convulsive movements; there are paresthesias of various forms. Choleraic symptoms are present in some cases. In mild cases, the symptoms of acute gastro-intestinal irritation and muscular weakness with fever are the main manifestations. In more severe cases, the fever is replaced by collapse.

Treatment. In all these forms of acute poisoning, the offending material must be eliminated speedily, without causing inflammation of the gastro-intestinal membranes. The stomach tube and the enema may be used freely. Strenuous purgation may so inflame the membranes as to facilitate absorption of the poison. After the alimentary canal seems fairly clean a diet chiefly cellulose should be given for several days. The further treatment is that of acute gastritis and acute enteritis. (q. v.)

PART VII

DISEASES OF THE NERVOUS SYSTEM

CHAPTER XXXIII

DISEASES OF THE MENINGES

GENERAL DISCUSSION

Both spinal and cerebral meninges are subject to infection. Tumors are rare and are usually of a benign nature. The bacterial invasion may be through direct extension around the roots of the cerebro-spinal nerves or the infectious agent may be carried by the blood; occasionally there may be direct invasion of the meninges from the rupture of an abscess or from injuries. Mastoid abscesses may rupture into the meninges. The direct extension from the nasal membrane upward around the roots of the olfactory nerves is certainly responsible for some meningeal infections. Meningeal tuberculosis is probably the result of blood-born infection as is the case with syphilis.

The blood vessels of the meninges are controlled by the vaso-motor nerves from sympathetic ganglia; these, in turn, are controlled from the lateral horn cells of the spinal cord, and homologous centers in the medulla and the midbrain. The spinal meninges thus may have their circulation disturbed by bony lesions of the first thoracic to the third lumbar vertebræ, and the cerebral meninges may be affected by lesions of the upper thoracic vertebræ or by axis, atlas, or occiput lesions.

Gravity is a factor in causing meningeal congestion when the blood vessels have deficient tone, as may be the case in the presence of bony lesions, such as have been mentioned, or in the presence of exhausting illness, as typhoid, or when toxins affect the vascular walls, as in scurvy, influenza, and certain other acute or cachectic diseases. For this reason the supine position is to be avoided, during any serious or long-continued illness.

The pia and arachnoid are to be considered as one membrane, in disease; inflammation of these usually attacks the dura to some extent, and vice versa. Disease of the dura is associated with nerve-root symptoms more often and more intimately than is disease of the pia-arachnoid.

Meningeal diseases have usually a grave prognosis, and satisfactory treatment is difficult. Surgical interference is usually dubious, though it may give good results in selected cases. By

far the most important thing is the prophylaxis of meningeal invasion; this must be based upon the consideration of the etiological factors.

Epidemic cerebro-spinal meningitis is discussed with other acute infectious diseases.

PACHYMENINGITIS

Inflammation of the dura mater may affect chiefly either the extradural space (external pachymeningitis), or the subdural space (internal pachymeningitis). Either the cerebral or the spinal dura may be involved.

Cerebral External Pachymeningitis is due to trauma, middle ear disease, syphilis, or disease of the skull. The symptoms are often indefinite, but include constant, dull headache in nearly all cases. Chills and fever, drowsiness and stupor, rarely convulsions and paralysis, may suggest the diagnosis. Choked disk is present, and is due to the increased intracranial pressure. Symptoms of pyemia, with leucocytosis, may appear. The history of injury, previous middle ear disease, etc., may help in the diagnosis.

Cerebral Internal Pachymeningitis may follow the external form, or may not be associated with it. It is found in alcoholics, epileptics, the insane, and paralytic demented. Rarely it may appear in childhood, after acute infections. The condition is hemorrhagic; successive subdural hemorrhages occur, and these become organized, so that at autopsy a laminated false membrane may be found; this may or may not be stained with hemoglobin and its derivatives. Headache, convulsions, paralysis are the most common symptoms. Each hemorrhage may be associated with a fairly typical epileptic attack; the progress of events may be much slower than ordinary epileptic fits in some cases. Cortical epilepsy is frequent; this may lead to localizing symptoms, and to surgical relief. The paralysis may be upon the same side as the hemorrhage; this may be due to the pressure of the opposite side against the skull; or to flexion of the brain stem, thus causing pressure upon the pyramidal tracts of the opposite side. After organization of the clot, the paralysis is upon the opposite side of the body, as is to be expected from the anatomical relations.

Spinal External Pachymeningitis results from trauma; vertebral disease, either syphilitic, tubercular, or other; from the pressure of tumors, etc.; it is always secondary. The symptoms are mostly referable to involvement of the nerve roots.

Spinal Internal Pachymeningitis is due to alcoholism, syphilis, trauma, or extensions from vertebral disease. It is usually hemorrhagic, and is most frequent in the cervical enlargement (pachy-

meningitis cervicalis hypertrophica). First, involvement of the sensory nerves causes neuralgic and neuritic symptoms of the arms and shoulder girdle; paresthesias, pains, formication, and various reflex muscular symptoms appear. Later, paralysis of the hands, arms and shoulders appears; this is of the lower neuron type, and atrophy may be speedy. Third, the legs show spastic or upper neuron paralysis, due to the pressure upon the descending tracts. Death is from exhaustion, after months of illness, or earlier, from involvement of the phrenic centers.

Diagnosis. The symptoms may make the diagnosis evident. Spinal puncture and the examination of the cerebro-spinal fluid may show the etiological agent. Traumatic cases, some tumors, especially osteoma, and cases with increased intracranial pressure, may be recognized by the X-ray, especially in stereoscopic views. Blood examination shows leucocytosis in pyogenic cases; diminished eosinophiles in tubercular, and sometimes eosinophilia plus lymphocytosis in syphilitic cases. Wasserman's, Noguchi's and other biological tests for syphilis should be made.

Treatment. In traumatic cases, the removal of bits of bone or of thickened dural areas may give relief. Drainage of the cerebro-spinal fluid, several times repeated, is of value under certain conditions. Tumors may sometimes be removed.

Palliative measures may give much relief. Very gentle general spinal treatment gives relief which may last for a week or more. Counter-irritation, ice bags, mustard plasters, heat, may give temporary relief.

Hygienic conditions must be corrected. Alcohol, sexual indulgence, excessive meat diet, stimulating foods and drinks of all kinds, must be forbidden for a long time, even though symptoms abate markedly.

Prognosis. Complete recovery is not to be expected, except in early trauma, where the pressure can be removed before tissue degeneration has begun. Partial recovery is to be expected when the causative factor is amenable to treatment. Improvement may be hoped for with palliative measures. Death may occur at almost any time, but may be postponed for months or even years.

LEPTOMENINGITIS

Inflammation of the pia-arachnoid occurs as the result of an infection; rarely trauma gives entrance; usually the infectious agent is borne by the blood. The meningococci, the pneumococci, typhoid bacilli, tubercle bacilli, and the streptococci and staphylococci of various types are the most frequent. The disease may follow any of the acute infectious diseases, measles, mumps, diphtheria, influenza, or any others. Tubercular meningitis is

more common in children. The inflammation may involve the spinal membranes alone, the cerebral alone, or both. Of the cerebral, the basal area is more frequently involved, probably partly on account of gravity, and partly on account of the many nerve roots and blood vessels, which present so great areas of folding membranes to the action of the invading agents.

Cerebral Leptomeningitis of the convexity is characterized by headache, fever, stupor and delirium. Constipation, coated tongue, nausea, projectile vomiting, convulsions, are common symptoms. Photophobia is constant; hypersensitiveness to all sensory impressions amounts to severe pain upon any stimulation whatever.

Basilar Cerebral Leptomeningitis is characterized by the symptoms associated with inflammation of the convexity, and also by ptosis, pupillary changes, strabismus, facial spasm or paralysis, athetoid movements of the hands, especially, and the delirium is sometimes characterized by weeping, laughter, and apparent expressions of rage or other passion.

Spinal Leptomeningitis is characterized by marked pain in the back, with rigidity, opisthotonos and retraction of the head. Reflexes are first marked, then diminished or absent. Varying sensory disturbances are present, according to the early irritating, later paralyzing effects upon the sensory nerve trunks, roots, and ganglia. The spinal cord may be involved, with paralysis, bed sores, incontinence of urine and feces, and other symptoms of meningo-myelitis.

Serous Meningitis (wet brain; meningitis serosa) may be either acute or chronic. It involves the cerebral membrane almost exclusively. In its chronic form it gives symptoms of brain tumor. In this type there is excessive formation of cerebrospinal fluid. The condition is due to chronic alcoholism. The basilar membrane is usually involved, as well as the convexity, and the symptoms referable to the involvement of the cranial nerves are often severe.

Diagnosis. The history of an acute infectious disease, of chronic alcoholism, or the presence of the signs of tuberculosis or syphilis elsewhere in the body, with the symptoms as given, should suggest the diagnosis. The examination of the cerebrospinal fluid, obtained by means of lumbar puncture, should establish the nature of the disease. In serous meningitis this fluid is great in amount, escapes under pressure, and is clear. In infectious cases there is usually a rather small amount of a cloudy or flocculent fluid, which usually contains the infectious agent. Sometimes this is not to be found either on slides or in culture; injection into animals may give the diagnosis when other methods fail.

The blood examination shows marked leucocytosis in purulent cases; diminished eosinophiles in tubercular cases, and sometimes indications of other less common etiological factors.

Treatment. The treatment of all types of leptomeningitis follows closely after that given for acute infectious cerebrospinal meningitis. (q. v.) The prognosis is always grave. Recovery may occur, but usually with more or less permanent injury.

CHRONIC LEPTOMENINGITIS

This may follow the acute form, or may occur as a slow and chronic form from the beginning, as the result of alcoholism, syphilis, and possibly as the result of intense overstrain of the muscles of the back with exposure to extremes of heat and cold.

The symptoms are referable to involvement of the nerve roots, and include hyperesthesias, paresthesias, and anesthasias, affecting the sensations of heat, cold and pain, or of touch and muscle sense, variably and at different times. Motor symptoms include spasms and weakness, rarely paralysis. Herpes, slight and varying disturbances of bladder, rectum, and genital functions, and progressive loss of all powers until death from exhaustion or intercurrent disease are included in the ordinary history of the disease.

Treatment is limited to the correction of the causative factors, and such general spinal treatment as may be indicated on examination.

CHAPTER XXXIV

DISEASES AFFECTING BOTH BRAIN AND CORD

MULTIPLE SCLEROSIS

(Insular sclerosis; lacunar sclerosis; disseminated sclerosis)

Multiple sclerosis is one of the most common of organic nervous diseases. It is characterized by the formation of plaques of neuroglial overgrowth in many widely distant areas of the nervous system, and clinically by tremors, weakness, speech disturbances, emotional instability and visual disturbances, which appear and disappear suddenly or slowly, and which constantly progress to more serious symptoms, to helplessness and death.

Pathology. The plaques are usually slightly denser than the normal nerve tissue, and are of a pearly luster. They are composed of neuroglia cells, and usually surround a small blood vessel. Through them the naked axons pass, often fairly normal except for the loss of the fatty sheaths, and which seem to carry nerve impulses in a fairly normal manner. The nerve cells often retain their normal appearance, in the midst of the plaques. The pathogenesis is not known. It has been supposed that the degenerated fatty sheaths give the stimulus to the neuroglia which causes the overgrowth; the proximity of the vessels leads to the view that the disease is altogether circulatory in origin; it is supposed that congenital peculiarities of the neuroglia predispose to overgrowth, and that this is excited by toxic substances in the circulating blood.

Etiology. The sexes are probably about equally affected, though statistics disagree considerably. Rarely cases are reported before puberty; after that age they are frequent until after thirty years; after that age they are again very rarely found. The exanthemata, malaria, sunstroke, typhoid are all mentioned as causes; this incidence is little if any greater than might be expected from the laws of coincidence. Strains of various kinds are rather more frequent as possible etiological factors. A neuropathic ancestry is probably one factor. Metallic poisons, lead, mercury, and probably arsenic, are considered as causes. A history of fright, or some other profound emotional storm, is sometimes given as the cause of the disease; in such cases further investigation usually elucidates earlier symptoms; the emotional storm is usually one of the first recognizable symptoms, rather than a real cause of the disease.

Pseudosclerosis. Certain cases diagnosed as multiple sclerosis have come to autopsy, and no signs of sclerosis have been found; doubtless in some of these cases the patches were so small as to be overlooked. On the other hand, the possibility of functional imitation of the disease must not be forgotten.

Familial Sclerosis (*aplasia axialis extra-corticocollis*) is a very rare form of multiple sclerosis which appears rather constantly in certain families. It is sometimes directly hereditary.

Diagnosis. This rests chiefly upon the symptoms and history. The onset, in early adult life, is insidious. Usually the first symptom is a weakness in one leg; soon the other is affected, then the arms, and other muscles. Complete paralysis is rare, in the early stages, and the weakness may pass away for days or weeks at a time. Nystagmus appears early; it may not be noticeable except upon voluntary movements of the eye-balls. Retrobulbar optic nerve atrophy may be the first symptom. The retina often shows marginal pallor before the symptoms of the disease appear elsewhere. After a few weeks the intention tremor becomes marked; the speech becomes slow and drawling, and later scanning. Writing becomes difficult, on account of the tremor. Vertigo is common, rarely projectile or ordinary vomiting. Paresthesias are rather rare. Bladder symptoms are frequent and variable. Rectal and sexual functions are usually normal until late in the disease.

Mentality usually suffers. Emotional instability is constant; forced laughing and weeping are frequent. Less commonly dementia or mania is present.

The location and nature of the symptoms depend upon the location of the plaques. Sometimes involvement of the lateral funiculi gives an imitation of lateral sclerosis; in other cases implication of the posterior funiculi causes symptoms of *tubes dorsalis*. Occasionally the diagnosis is impossible. (*Formes frustes*.)

The disease resembles hysteria in many ways, and certain other organic nervous diseases may give difficulty in diagnosis.

Treatment. This can be only palliative. Rest, good hygiene, and such corrective work as may be indicated upon examination are helpful.

It must be remembered that these patients have prospect of remissions, followed by exacerbations, and that they are apt to live many years, unless some accident or intercurrent disease interferes. Hysteria certainly is often associated with sclerosis, and functional disorders are also frequent; treatment for the relief of symptoms may give gratifying, though probably temporary, results. Patients must be taught to make the best of their lives, and to understand that while serious symptoms may occur at any time, yet that these are not to be thought of as permanent; it is much better that they understand these things, rather than that they are taught not to expect further accidents. They should engage in such pursuits as are possible, and should live as happily and usefully as possible. Interest and good cheer go far toward pro-

moting general health, and toward preventing the functional disorders so often associated with the organic disease.

Especially when the prognosis is not frankly given, these patients go from one doctor to another, and from one patent medicine to another. Being erratic, in the very nature of things, they try everything that promises relief, without much judgment. "Nerve tonics" and purgatives seem especially attractive to them, and are, of course, either inert or harmful.

Prognosis. Recovery is not to be expected. Improvement is probable, and may last for months. Later symptoms may appear at any time. Life is probably not shortened by the disease; rarely it may involve cardiac or respiratory centers. Death usually occurs from some intercurrent affection, or some accident.

TABES DORSALIS

(Locomotor ataxia; posterior leucomyelitis)

This is a parasymphilitic disease, characterized by symptoms indicative of the degenerations of sensory neuron systems. These include lancinating pains in the legs, loss of the knee-jerk, Argyll-Robertson pupil, analgesia of the lateral surfaces of the legs with tactile hyperesthesia of the trunk, and other variable symptoms. The girdle sensation, visceral crises and ataxia due to the sensory disturbances are usually present. Lymphocytosis of the cerebrospinal fluid and increase of its globulins are significant; Wasserman and Noguchi are usually positive. The disease is characterized anatomically by degeneration of the fasciculus gracilis (the tract of Goll) and sometimes of the fasciculus cuneatus (tract of Burdach).

Etiology. Syphilis is the most important cause of the disease. Exposure to violent climatic changes, especially standing in cold water, heavy lifting, or violent exertion, and injury to the lumbar spinal column are sometimes concerned in the etiology. Atypical cases in which the eye symptoms are always absent and the gastrointestinal symptoms are usually wanting sometimes occur as the result of the factors just mentioned in the absence of syphilitic history.

Pathology. The constant pathological findings include the atrophy of the long sensory nerve fibers in the posterior funiculi of the cord. The posterior nerve roots and the cells of the sensory ganglia become atrophied later in the course of the disease. A diffuse pachymeningitis of the cerebral concavity is usually present and this may be responsible for the ocular symptoms. Other syphilitic evidences are usually present in typical cases of locomotor ataxia. The brain and the cardio-vascular system are usually affected.

Diagnosis. The symptoms are very typical, though there is much variation in the time of their onset. Sometimes the digestive, sometimes the ocular, sometimes the sensory, and sometimes

the motor symptoms may first appear. In the typical case the gait is first affected. The patient finds himself stumbling more frequently than usual, especially in the dark. He is unable to walk as well as usual, and it is noticed that the toes turn outward and that the foot drops when the forward step is taken; the legs are swung out in a semicircle in order to prevent the toes from scraping the ground. The ataxia becomes gradually more marked until the patient is unable to walk at all. The arms are rarely affected. The typical gait is almost pathognomonic. The lightning pains usually appear about the time of the ataxia. These are excruciatingly severe and come and go with lightning rapidity. It is very difficult to relieve this suffering; even moderate doses of morphine are often ineffective. The girdle sensation is a sense of constriction which may appear first around the legs, but which usually is noted first around the abdomen. The sensation follows the disturbance of the spinal nerves and in typical cases the girdle rises with the progressive degeneration of the sensory neurons. The gastric crises usually resemble severe attacks of acute gastritis. They may not be associated with any dietetic indiscretion, but sometimes appear to be precipitated by irregular meals, by alcohol or by emotional storms. Diarrhea with intestinal colic is sometimes present. More rarely the place of the gastric crisis is taken by crises involving the larynx, heart, vessels, or other viscera. The **Argyll-Robertson pupil** is present. This means that the pupils react normally to distance, but do not change in size with changes in the light. Pupils constantly dilated, constantly contracted, or of an oval or comma shaped outline are sometimes found. Vision is not disturbed, except as the result of retinal hemorrhages or optic nerve atrophy, or some other ocular lesion; these usually occur. Diplopia may be an early symptom.

Impotence and incontinence may occur early or late.

The tendon reflexes are first exaggerated, usually for only a very short time, then diminish and finally disappear. The loss of the sensations of heat, cold and pain during the later stages is associated with diminished nutrition of tissues affected. **Charcot's joint** usually affects the knee. This is a rarefying osteitis and arthritis. The knee may reach a size almost or quite equal to the waist of the patient. It is not usually painful but adds greatly to the difficulty of walking. A lax condition of the joints of the legs, especially of the hips, is present. It is not rare for a patient to be able to wrap his legs around his neck in much the same way that a normal individual could twist his arms around his neck. Injury to the feet is unnoticed, and burrowing abscesses may result from infections. The bones of the foot may be destroyed in this way with no pain to the patient. **Romberg's sign** consists in the patient's inability to stand alone with the eyes closed. It is present in other ataxias as well as in this. No characteristic blood or

urinary changes have been reported. The examination of the cerebrospinal fluid shows lymphocytosis. A positive reaction is given to the Wasserman test or any of the later modifications of this.

H. F. Goetz shows by spinograms a posterior lumbar spine in typical locomotor ataxia. Spinograms of syphilitics without locomotor ataxia do not show this spinal conformation. Hence, if all cases of locomotor ataxia have this posterior displacement of the lumbar vertebræ, then all cases of syphilis must be examined with the object in view of discovering whether they have posterior displacement of the lumbar vertebræ, and if so, this lumbar displacement must be corrected with the second object in view of preventing locomotor ataxia.

"The importance of this point is also apparent if the diagnosis of locomotor ataxia is made early, for then by correcting this displacement or disalignment of the lumbar vertebræ, we may not only prevent further advancement of the condition but also by reëstablishing the normal blood supply and nutrition, cure those cases in which no great havoc has been wrought. In other words:

"Removing this posterior disalignment of the lumbar vertebræ should act as a preventive or prophylaxis in locomotor ataxia."—H. F. Goetz.

Treatment. In very early cases, increased mobility of the dorso-lumbar spinal column, rest of the affected part and a hygienic manner of living usually result in stopping the course of the disease, and frequently in partial restoration of the loss of function. The bones are fragile; careless treating may result in fracture of the ribs or the bones of the legs or arms.

The older medical treatment with mercury and the iodides has been largely superseded by the present methods which are based upon the use of certain delicate arsenic compounds. If these are to be employed in any case they should be given by doctors who have made a special study of their administration.

The educational treatment is extremely important. The patient should be taught to perform first very simple movements and then gradually more complex movements until in many cases walking again becomes possible. This fact seems to be produced through the education of nerve centers or nerve paths not ordinarily functional under normal conditions and not injured by the syphilitic poison.

The prognosis for complete recovery is very serious. The prognosis for considerable improvement under the osteopathic treatment without drugs is very good. In untreated cases the disease may stop at any time and the condition of the patient remain stationary for many years. When no intermissions in the progress of the disease occur, death is to be expected within five to ten years after the occurrence of the first symptoms.

GENERAL PARALYTIC DEMENTIA

(General paresis; general paralysis of the insane)

This is a parasymphilitic disorder occurring in late middle life and characterized by successive attacks of paralysis associated with progressive dementia.

Etiology. It is probably always due to syphilis plus alcohol. Sexual excesses are also accessory etiological factors. The disease usually begins in the second or third decade after the occurrence of the primary lesion. Overwork, overworry, nervous strain and other mental injuries are frequently considered by the patient and his friends to be responsible for the disease. Investigation shows, however, that the actual importance of these factors is considerably overestimated.

Pathology. The pathological changes in the brain are very conspicuous. Thickenings, hemorrhages, and adhesions are found in the meninges and the cranium. In the brain itself are the evidences of syphilitic vascular disease associated with small foci of softening and neuroglial proliferation. Microscopic examination shows the cerebellar neurons undergoing various forms of degeneration and atrophy. Old and fresh hemorrhagic areas are scattered through the brain substance. Yellow pigment is abundant in the large nerve cells.

Diagnosis. The symptoms are very characteristic. At first the patient shows signs of what is ordinarily called a nervous breakdown. A superficial examination at this time gives a diagnosis of neurasthenia. Sometimes this period of nervous depression is preceded and sometimes it is followed by a period of marked exaltation. During the time of exaltation the patient is full of big plans for the future; he borrows money to extend his business; he buys many things on the installment plan; he begins work whose completion might require several lifetimes; he invents impossible machines; he sleeps little and considers himself fortunate in being able to devote more than the ordinary time to the pursuance of his new-found ambitions. He may suffer from exaltation in the sexual sphere; if he is a widower or bachelor, he is likely to marry a young girl, or he may cause grief to his family by his infatuations for young women. It is unfortunate that during this stage of exaltation the true nature of the condition is so rarely recognized, for it often happens that men introduce such absurd business enterprises that they jeopardize the futures of children and wife.

During the stage of nervous depression, melancholia may be marked. The character becomes suspicious, irritable and careless; the patient may show apparently more than normal ingenuity in devising methods of circumventing the members of his family; emotional irritability becomes more and more marked; he laughs and cries easily upon slight or no provocation; convulsive attacks resembling epilepsy are likely to occur; slight cerebral hemorrhages precipitate paralysis, which is more likely to affect the right side of the body, and which usually involves the speech centers; one attack of paralysis follows another until finally the whole body is involved. The dementia is progressive; the patient gradually losing interest in himself, or his surroundings, and finally becoming mindless and completely paralyzed. He may live in this pitiable condition for a number of months until paralysis involving the cardiac or respiratory centers brings a welcome death.

In the early stages, that is, during the period of exaltation or the period of nervous depression, diagnosis may be doubtful. It should be a matter of ordinary routine to make a Wassermann or other biological test for syphilis in every case in which apparently causeless neurasthenia occurs in men in middle life. Pupillary changes are usually present. The Argyll-Robertson pupil, the oval pupil, or inequality in the two pupils, are all important factors in an early diagnosis. The absence of these findings has no significance, but when they are present syphilitic history should be strongly suspected.

Treatment. Since the symptoms of the disease are due to actual nervous degeneration and since serious structural perversions precede any symptoms, it is evident that treatment is commonly of very little value after the diagnosis is possible.

Prophylaxis is important. The prevention of syphilis is the prevention of parietic dementia. Men who have had syphilis may avoid this form of insanity by living continent and temperate lives.

The **prognosis** is hopeless unless an early diagnosis is made. The course of the disease is sometimes halted for some months or years, but its further progress to death is inevitable.

TABO-PARALYSIS

There are certain cases of parasymphilitic disease in which the spinal degeneration resembles that of locomotor ataxia, and the cerebral degeneration resembles that of parietic dementia. To these cases the term "tabo-paralysis" has been applied. The mental derangement is less pronounced than in the ordinary case of paralytic dementia; the pupillary changes are early and marked; the ataxia is variably marked but never absent; the occurrence of epileptoid attacks is rather rare. Speech is less frequently an early symptom, and the paralysis is oftener a weakness with incoördination than a true paralysis. The disease is probably to be considered an intermediate type between locomotor ataxia and parietic dementia, rather than a combination of the two diseases. The treatment and pathology are practically the same as in parietic dementia. The prognosis is somewhat different; the progress of tabo-paralysis is more constant, and less subject to remissions, than is either parietic dementia or locomotor ataxia.

DISSEMINATED MYELITIS

In this form there are many patchy areas of inflammation in the cord, medulla, and brain. The disease is due to almost any of the ordinary infectious agents, and may follow any fever. The symptoms are those of acute myelitis, plus the symptoms of bulbar and brain involvement. The ocular disturbances include variations in the size of the pupils, various incoördinations of the extrinsic eye muscles, and visual disturbances. Mentality may be variously affected according to the area involved. Coma and delirium may

precede death. The bulbar symptoms may be immediately followed by death, or may be limited to the centers of the cranial nerves; twitchings and paralysis of the face, paresthesias of sight, taste, smell and hearing may occur.

Treatment is almost useless, and death is apt to occur at any time within a week or so after diagnosis becomes possible.

BONY LESIONS AS LOCALIZING FACTORS

In diseases affecting both brain and cord, it is very evident that some localizing factors are present. Different patients present different symptoms, according to the location of the lesions in each case, but what factors determine the location of the lesions in any case is not yet to be determined exactly.

Vasomotor nerves have been demonstrated for the brain and for the meninges of both brain and cord. Vasomotor nerves for the cord itself have not yet been certainly demonstrated but their existence seems fairly certain. Bony lesions are certainly not less efficient in modifying spinal and cerebral circulation than in modifying renal and pulmonary circulation. Thus, lesions affecting any segment of the spinal cord must be considered efficient in localizing general disease in that, and neighboring, segments. Lesions of the occiput and the cervical vertebræ are efficient in modifying the cerebral circulation, and thus in localizing the effects of disease in the brain. The localization of vasomotor control within the brain has not yet been completed.

The functional activities of nerve centers depend chiefly upon the nerve impulses reaching them. Bony lesions which limit the mobility of any joint lessen the normal stimulation to the related centers. Bony lesions which are irritating send abnormal impulses into the related centers, and thus these have undue stimulation. When a lesion associated with limited mobility is associated with increased mobility above and below the affected joint, or when it is associated with marked hypersensitiveness, the disturbance of the function of the related nerve centers may be profound.

All these factors, disturbed circulation through the nerve centers, lessened stimulation, and irritation, are concerned in lessening the resistance of the nerve centers to infection and to the influence of poisons, and thus are localizing factors in diseases affecting the central nervous system in a somewhat general manner.

CHAPTER XXXV

DISEASES OF THE SPINAL CORD

GENERAL DISCUSSION

The diseases which affect the spinal cord itself are characterized by various motor, sensory and trophic disturbances varying as the injury destroys the anterior or posterior gray matter, the white matter or the nerve roots or the spinal ganglia.

Pathology. Spinal cord diseases are characterized by pathological findings which vary from those practically negligible in the functional disease to absolute destruction of the cord or of some area in it as in syringo-myelia or myelomalacia.

In the gray matter the nerve cells may show merely a slow progressive diminution in size which goes on to complete destruction as in chronic anterior poliomyelitis or they may show various degenerated types with chromatolysis, extrusion of nuclei, vacuolization and swelling of nucleus and protoplasm, fatty degeneration, pigmentation and other less easily recognized changes. The neuroglia may be unaffected; may increase in amount either by multiplication of the nuclei with cellular division or without (this leading to a syncytium-like appearance), or the fibers may increase, forming a dense felt-like tissue in the injured spinal matter. The blood vessels may be uninjured or they may show the effects of ischemia, hyperemia, congestion, or inflammation in varying degrees. In the spinal diseases due to syphilis changes in the walls of the blood vessels are usually to be found. In myelitis vascular changes are probably an important factor in the determination of the characteristics of the disease. The walls of the blood vessels may show arterio-sclerotic changes; the intima may show thickening which may go on to the point of total occlusion. When this process occurs inside the spinal cord itself the death and degeneration of the infarct area are inevitable since there are no anastomoses within the cord. In the meninges similar conditions are usually associated with chronic pachymeningitis of varying degrees. The wealth of anastomotic relations in the meninges maintains a fairly good arterial supply even when rather large vessels are occluded.

Etiology. The causes of disease of the spinal cord are extremely varied and numerous. Of all these, however, the infections hold first place and of all the infections syphilis either directly or indirectly is a factor of paramount importance. Acute anterior poliomyelitis or infantile paralysis is the next most important of the spinal diseases due to specific infection. The organisms responsible for many of the ordinary infectious diseases, such as typhoid fever, pneumonia, scarlet fever, measles, as well as those found in pyemia may gain entrance into the spinal cord itself and there set up extremely rapid and usually fatal spinal inflammations. Inflammatory processes in the meninges may extend into the spinal cord and this condition also is usually very rapid and fatal.

Toxic influences of all kinds may be considered in connection with diseases of the spinal cord. Alcoholism goes with syphilis

as an etiological factor in spinal diseases; as indeed these belong together in most discussions of personal and social pathology. Lead, mercury, and other inorganic salts sometimes exert serious influence upon the spinal cord. The diminished use of calomel as a drug is removing one cause of spinal disease. The poisons, whatever they may be, that are responsible for pernicious anemia, insular sclerosis and a few other diseases of doubtful etiology bring about the disease of islands of the nerve tissue with symptoms localized according to the area affected. Spinal diseases due to this factor are usually easily recognized by the history. Whether concussions, jars or blows can be considered important in the cause of the spinal disease in any given case is not always easily determined. Certainly the occurrence of injuries to the spinal column does seem to localize and often to predispose to spinal disease when other conditions are favorable to the development of a pathological condition.

The place of the bony lesion as an etiological factor in spinal cord disease has not yet been positively determined. There is very good reason for believing that bony lesions exert a detrimental influence upon the circulation in the meninges and at least indirectly upon the circulation in the segments of the cord. Though the presence of vasomotor nerves within the spinal cord itself has not been demonstrated, the fact remains that spinal diseases appear to affect first those areas of the spinal cord which send sensory nerve fibers to subluxated vertebræ and ribs. It must not be forgotten in this connection that resistance to infection generally, elimination of poisons, and the nutrition of the body are all subject to profound variations as the result of slight malpositions of the bones and ligaments and the abnormal muscular tension so often associated with these.

Perhaps there is no one factor much more responsible for spinal diseases than inheritance. Except for infantile paralysis, most of the spinal diseases in children are due to inheritance. This inheritance follows Mendel's law so that such diseases are more frequently referred to as familial than hereditary. Many of the diseases whose chief cause is infectious or toxic have bad inheritance as a predisposing factor. In many of the diseases associated with syphilis, alcoholism, sexual excesses and so on, it is difficult to determine the relative proportion of blame due to these things in themselves, to the inheritance of nervous weakness or to the fact that the different members of the same family are usually educated to the same habits and the same use of life.

Diagnosis. Some general factors in diagnosis may be given here. Lesions of the anterior gray matter alone bring atrophy and paralysis of the skeletal muscles innervated from the area affected. In such a case there are no sensory disturbances except that the

weakened muscles may sometimes ache or feel sore. Such muscles undergo atrophy with varying degrees of rapidity. There is present a reaction of degeneration and loss of reflexes; there is loss of muscular tone so that in early stages the muscle is very flaccid and soft. Later the overgrowth of connective tissue usually associated with the atrophy of the muscles, makes them hard and dense and the contraction of these connective tissues together with the unbalanced action of antagonists leads to various deformities.

Disease of the posterior gray matter is usually associated with more or less destruction of the anterior gray matter. In such diseases sensory disturbances are likely to be very profound. Paresthesias include the sense of formication, tinglings, pain, sensations of heat and cold and the girdle or stocking or glove sensations. Total loss of sensation in some area is usually present. Anesthesias, analgesias, lack of temperature sense or of the sense of muscular effort may appear in varying degrees according as the injury is or is not strictly localized in the gray matter. It must be remembered that the sensations of heat, cold and pain are carried chiefly by way of the nerve cells in the posterior gray matter, while the sensations of muscular effort and touch are carried chiefly by the long white tracts in the posterior funiculi. To a certain extent, however, it is probable that each of these pathways includes at least some of all the sensations named so that any destruction of the gray matter of the cord is associated with diminution of all somatic and visceral sensations.

Diseases of the white matter of the cord are mostly limited to those of the long tracts so far as our present methods of diagnosis are concerned. The most important of these on the sensory side is locomotor ataxia in which the long fibers of the fasciculus gracilis and to a less extent those of the fasciculus cuneatus are involved. On the motor side destruction of the lateral and the anterior descending cerebrospinal or pyramidal tracts leads to the symptoms of lateral sclerosis.

In those diseases in which heredity or a congenital condition is responsible for the disease the blood cells usually show the presence of many immature and atavistic types. In the infectious diseases the blood shows the same characteristics that are present in the same or similar infections occurring in other parts of the body. In many cases of spinal disease of doubtful diagnosis the blood examination will make this real condition clear.

It often happens that cases of pernicious anemia show their first symptoms as paralysis or atrophy referable to the spinal cord lesion. Under such conditions the blood examination may throw much light upon the condition and it should be made in every case in which there is the least doubt of the diagnosis. The blood pressure is usually very high in senile and syphilitic diseases.

The urine often shows no changes whatever. When there is any marked destruction of nerve matter phosphorus may be increased beyond the amount expected from the patient's diet. In making this test it is best to put the patient upon an almost phosphorus-free diet, for a few days before the 24-hour sample of urine is collected. A good test for this is to have the patient begin his phosphorus-free diet with a few charcoal tablets. Then when the black color due to the charcoal has ceased to appear in the feces, collection of the urine may be begun. In diseases with marked degeneration of the nerve tissue or with abscess formation an excess of indican is present. In diseases associated with trophic symptoms the kidneys may be seriously involved either directly or as the result of the harm due to the elimination of the products of the abnormal metabolism elsewhere in the body. When the bladder is involved the urine may show the effects of this condition. When catheterization is necessary, the bladder is very likely to become infected and the urine then shows the results of the cystitis so produced.

At present the X-ray is limited to the recognition of the diseases of the vertebræ as these may affect the spinal cord. Tumors and bone diseases may be recognized by the X-ray and since such conditions cause symptoms which are atypical, the X-ray should be used in all cases of doubtful diagnosis.

Treatment. In many cases of disease of the spinal cord there is very little efficient treatment. Nearly everything in the way of drugs has received at least one voice of commendation as to its use in spinal cord diseases and several times as many voices of condemnation for its use in these same diseases. The diagnosis usually gives the indications for treatment. During the acute stage of any of the infections the treatment must include suitable measures for reducing the fever, such as are used in fevers in general. The patient should not be permitted to lie upon his back but must be kept upon the side or in the left lateral or the right lateral position. The prone position is good, except for the difficulty of getting the head in a comfortable place. In most cases an extremely gentle relaxation of the spinal muscles is usually very grateful to the patient and should be repeated from one to several times each day. Ice packs are sometimes of value. Massage of the arms and legs is sometimes good. Usually no foods except fruit juices are given during the acute stage. In the chronic diseases the treatment varies according to the condition. Contractures of the limbs and deformities of various kinds are best treated by suitable orthopedic surgery. Massage of the affected muscles and very mild faradization are sometimes helpful in the treatment of the muscles paralyzed. In diseases associated with incoördination of the muscles but no true paralysis or where the

paralysis is of the upper neuron type exercises looking toward re-education are of considerable value. This is especially true of the diseases of the long sensory tracts such as locomotor ataxia.

In both acute and chronic conditions the osteopathic measures to be employed depends entirely upon the indications as these are interpreted by the experience and good judgment of the practitioner.

The sensory disturbances are very hard to deal with. Generally ice packs give more relief than do applications of heat. Alternations of heat and cold may give relief when neither alone is efficient. Usually in the girdle sensation massage is grateful. Sometimes a rather tight bandage placed over the girdle relieves the discomfort. The same thing is true of painting the skin with celloidin. Great care must be employed to prevent the skin from being injured in any of these measures. The danger of bed sores and of serious infection from slight abrasions of the skin must be kept in mind. Careful nursing is the best thing in these conditions. An important factor in dealing with the disturbed sensations is the education of the patient. He must find interest in life and must thus be made to forget as far as possible the things that are so annoying and uncomfortable. The occurrence of these diseases which are so often hopeless so far as recovery is concerned is in itself a dreadful thing and the patient must be encouraged to find such occupations and interests as to get the most good out of such a life as will be possible to him.

The **prognosis** varies according to the area and amount of the spinal tissue destroyed and to a less extent upon the possibility of securing compensatory development of other nerve centers and tracts. The amount of coöperation which the patient is willing to give is sometimes very important. Under suitable cases nerve surgery gives a good prognosis. The prevention of the spinal cord diseases lies in the prevention of the causes. Stringent isolation of infantile paralysis and other contagious diseases is important. Perhaps the greatest thing of all is the prevention of alcoholism and syphilis. Those diseases of the spinal cord which come on during middle age or later should be lessened with the diminished use of alcohol and drugs. A large preventive field lies in keeping the structure thoroughly adjusted.

HEMORRHAGE OF THE SPINAL CORD

(Meningeal apoplexy; hematorrachis; hematomyelia; spinal apoplexy)

Hemorrhage into the spinal membranes occurs from rupture of an aneurysm into the extrameningeal space, or from erosion of an artery by malignant neoplasms, caries of vertebræ, or as the result of hemorrhagic diseases, hemophilia, scurvy, and others.

Hemorrhage into the cord itself is usually due to trauma, or to rupture of small vessels which have become atheromatous or otherwise diseased; it may occur in the hemorrhagic diseases.

In either case, the symptoms depend upon the extent and the area of the hemorrhage. The onset may be extremely sudden (apoplectic), with paralysis and various sensory disturbances; or the injury may be so slight as to make diagnosis impossible. The extradural and the subdural spaces may contain a large amount of blood without any particular difficulty or pressure. The symptoms, if any, are due to pressure upon the nerve roots. Hemorrhage into the subpial space or the substance of the cord produce serious symptoms, usually immediate and serious, unless the amount of hemorrhage is extremely minute.

Death usually results within a few hours; if this does not occur, the later symptoms, the treatment and the prognosis are those of myelitis.

MYELITIS

This term is applied to any inflammatory disease of the spinal cord. Several types of the disease are recognized.

Meningomyelitis is an inflammation involving both meninges and spinal nervous matter; it is generally considered syphilitic.

Poliomyelitis is an inflammation of the gray matter, and may be either anterior, as in infantile paralysis, or posterior, as in certain forms of acute myelitis.

Leucomyelitis affects the white matter; it may be posterior, as in *tabes dorsalis*, lateral, as in amyotrophic muscular atrophy, or may affect any area, as in pernicious anemia.

Transverse Myelitis involves almost or quite the entire cord, for one or several segments.

Disseminated Myelitis is characterized by its widespread patches of inflammatory foci.

Myelomalacia is probably due to occlusion of an end artery; the area affected undergoes softening, resolution, and, later, absorption. Neuroglial growth fills the area with scar-like tissue, if life persists after the acute process is complete.

Pathology. The nerve cells of the affected area show chromatolysis, vacuolization, swelling of the protoplasm; the nuclei are eccentric or extruded, vacuolated, and present variations in staining. The neuroglia cells may be degenerated, or may show signs of rapid multiplication; the walls of the blood vessels may be almost or quite normal, or they may show inflammatory changes—a proliferative endarteritis is especially frequent, and this is an important cause of the softening found in myelomalacia.

The axons are swollen and bubble-like; granular degeneration is everywhere found.

Etiology. The causes of the different forms are slightly variable; the treatment and prognosis must also be considered for each form.

ACUTE INFECTIOUS MYELITIS

This is an acute infectious disease of the spinal cord, characterized by symptoms referable to the nature of the infectious agent and to the area of the nerve tissue destroyed.

Etiology. Any of the ordinary infectious diseases may affect the cord, though rarely does this occur. It may be difficult to isolate the infectious agent from the lesions, though injection into animals usually gives positive results. The infection may be carried by the blood or the lymph vessels, or may affect the cord through extension, especially in Pott's disease. Whitlow, carbuncle, parturition, may initiate the disease.

Diagnosis. This rests partly upon the symptoms; partly upon the history of the presence of some infectious disease. In tubercular cases the onset may be somewhat gradual, with progressive sensory and motor symptoms, leading, usually, to death within a week or two. In cases due to the ordinary acute infections, the onset is rather sudden, with increased pyrexia, vomiting and nausea—rarely projectile vomiting—and very severe burning pain in the back. Within a few hours flaccid paralysis in the muscles innervated from the segments of the cord affected, with variable sensory symptoms, makes its appearance. Usually the legs and lumbar centers are first affected; bladder and rectal symptoms are serious from the beginning, and the disease progresses rapidly upward until involvement of the respiratory muscles terminates life. When the disease affects other segments of the cord, the location of the symptoms vary; the visceromotor involvement is almost constant. When the upper thoracic cord is affected, flaccid paralysis of both arms with spastic paralysis of both legs may occur. Paralysis of the intercostal muscles compels diaphragmatic breathing; when the cardiac centers, or the phrenic center is involved, death is immediate.

Treatment. This is commonly of little value, after the diagnosis becomes possible. The patient should be given no food, but plenty of water. The position should be left lateral or prone, so that the influence of gravity may lessen the spinal congestion; also, less heat is permitted in the spinal region, and the back is accessible to treatment. The spinal muscles may be very gently examined, and any deep contractions relieved. Unless the correction of vertebral lesions is very easily secured, it is better not to attempt this until after the acute symptoms have subsided. Ice bags may be placed over the spinal column; gentle sponging with moderately cool water is better in most cases. The position of the patient must be changed, after the first few hours, rather frequently, as bed sores are almost inevitable. A water-bed or air-bed should be secured if possible.

Prophylaxis. During the progress of the disease, bladder infection should be carefully avoided; catheterization is often necessary, and the greatest of care is necessary to avoid infection; the resistance of the tissues is greatly lowered, and infection is much more dangerous and less easily avoided than under ordinary conditions.

The disease itself is avoided by care during the progress of the acute infectious diseases, tuberculosis, and other rarer infections—as actinomycosis—and by maintaining at all times as good a circulation of as good blood as is possible. Sick persons ought never be left to lie upon the back, but should be turned from time to time; blood vessels, weakened from fever, may yield to effects of gravity, when the relief given by the change of position may prevent injury.

CHRONIC MYELITIS

True chronic myelitis is probably rather rare. Erb's syphilitic paraplegia is probably the same disease. According to Erb's account the disease is characterized by five qualities. First, it is of syphilitic origin. Second, the reflexes are greatly exaggerated without being associated with any marked muscular rigidity. Third, bladder trouble of insidious onset and with symptoms of varying intensity usually antedate the paralysis. Fourth, paresthesias are present and usually associated with the paralyzed areas. Fifth, the disease has always very gradual development and it may improve under the antisyphilitic remedies. The diagnosis and pathology are such as would be indicated by the above definition of the disease.

Cases of chronic myelitis are reported as following the acute form; probably these are either cases of mistaken diagnosis, or are complicated with other spinal cord lesions.

COMPRESSION OF THE SPINAL CORD

(Compression myelitis)

Etiology. This condition is due to trauma; to neoplasms; or to inflammatory disease of vertebræ, as tuberculosis or syphilis. It is almost always associated with meningeal inflammations and with myelitis.

Diagnosis. This depends upon recognition of the causative factors, plus the symptoms observed. These are due to the area affected.

The first injury is usually to the nerve roots. Pressure upon the posterior roots gives pain, neuralgic in character, and radiating along the various nerves of that area. Paresthesias, formication, pains, are followed by anesthesia. Dissociation of sensations may be noted. Pressure upon the anterior roots causes spasmodic mus-

cular movements, followed by paralysis of the lower neuron type. Pressure upon the white substance produces variable effects; and this is closely followed, or sometimes preceded, by pressure symptoms referable to the gray matter of the cord.

The X-ray is of value; tumors of several kinds, caries, and traumatic causes of the compression are thus quickly and certainly recognized. Stereoscopic views give most accurate information in all but the simplest cases.

Treatment. This is mostly surgical or orthopedic. If the pressure cannot be removed, or after the removal of the pressure, the treatment is that of acute myelitis.

The **prognosis** depends upon the possibility of removing the cause of pressure before degeneration of the nervous tissue has proceeded to any great extent, and the power of recovery left in the injured tissues.

MENINGOMYELITIS

This is a parasymphilitic disease, and is probably never found in its typical form except as the result of gummy inflammation of the meninges, with simultaneous or immediate involvement of the nerve roots and the cord substance.

Pathology. The spinal membranes are thickened, and the subdural and subarachnoid spaces are more or less completely filled with gummy deposit. The meninges around the nerve roots are involved in the process, and present a swollen and "stubby" appearance. From the pia, wedge-like projections of the gummy and proliferative process enter and penetrate the white, then the gray matter, destroying the tissues in turn.

Etiology. In addition to the syphilitic infection, overstrain of the spinal muscles, sexual excesses, and exposure to extremes of heat and cold are given as causes.

Diagnosis. The onset is gradual, with pains resembling neuritis. Backache is usually severe, especially in the lumbar region. Motor symptoms of a neurotic nature follow; then disturbance of reflexes, incoördination, and the disturbances in the bladder, rectum and sexual organs. Impotence and priapism are not unusual. Weakness of the muscles is followed by paralysis, of the lower neuron type in the area of the affected segments, and of the upper neuron type in the muscles innervated from segments below the affected area. When the disease is limited to one side of the cord, as it may be for a short time, a Brown-Sequard paralysis may be present.

When symptoms, first of nerve trunk involvement, then of white and gray spinal involvement appear, with history or evidences of syphilis, the diagnosis is evident.

Treatment. The treatment for syphilis must be given. (q. v.) The patient must avoid overexertion, alcohol, sex indulgence, and

normal pressure. Half an hour to an hour should be spent in decompression, according to pressure.

Neuralgic pains in the muscles and joints, with giddiness, are the mild symptoms. Headache and tinnitus, with cramping pains in the muscles; then anesthesia, and weakness of the legs, then of the entire body, are noticed. After being a few hours or a day under ordinary pressure, paralysis develops; this is usually paraplegia, and the sphincters may be also involved. Monoplegia and hemiplegia are sometimes found; total motor and sensory paralysis for four limbs and the trunk may be produced.

Treatment. The prophylaxis consists in short hours of work; the forbidding of alcohol for workers; and slow decompression. When the disease appears, the patient may be gradually subjected to a pressure greater than that to which he has previously been submitted for a short time, then be decompressed with extreme slowness—a day or more may be devoted to this process, if the disease resulted from very high pressure. Under the high pressure, the blood again takes up the air bubbles, and under the extremely gradual decompression, this is all breathed out through the lungs, as is to be desired. If this decompression is done immediately, recovery may be absolute; the longer the delay in initiating the treatment, the greater is the tissue destruction.

LANDRY'S PARALYSIS

This is a disease of adults characterized by a very sudden and acute onset, ascending flaccid paralysis of the leg, thigh, abdomen, thorax and arms and neck. It is probably due to some infectious agent.

Etiology. The disease is somewhat more frequent during an epidemic of infantile paralysis, and this together with simultaneous incidence of the two diseases in the same household has led to the inference that it may be due to the same organism. On the other hand no relationship can be established in most cases. The disease appears between the twentieth and fortieth year for the most part. Men are more often affected than women. There is no reason for supposing that the disease is due to any previous infection, though it has been reported in adults who had had infantile paralysis in childhood. In a few cases the symptoms of Landry's paralysis may appear in the terminal stage of typhoid, pneumonia, or other infectious diseases.

Pathology. The spinal cord shows all the usual symptoms of an acute inflammatory process involving particularly the anterior horn cells; this is practically identical with the change in the anterior gray matter in infantile paralysis.

Diagnosis. The disease begins very suddenly. Fever, nausea, sense of weakness, and malaise appear first. Weakness of the legs is speedily followed by paralysis and this weakness and paralysis involve successively muscles of the thigh, the abdomen, the arms and the neck. The foot is rarely affected. The muscles are atonic and the reflexes are lost. No sensory disturbances are present in typical cases. There is no loss of control of the sphincters. The mind remains clear until death. When the paralysis involves the thoracic muscles, respiration is managed through the action of the diaphragm alone; then, when the cervical segments are affected, the paralysis of the diaphragm causes death. The heart's action is not affected and life may be maintained even for hours by the use of artificial respiration. Death usually results in a few days. Rarely the patient may live and the later symptoms produced resemble acute ascending myelitis. Rarely sensory symptoms are present, such as numbness, tingling and cramps in the affected muscles. These are no doubt partly due to the effects produced in the muscles and their action upon the sensory nerve endings in the muscles themselves or it may be that the sensory disturbances are due to the involvement of the posterior gray matter of the spinal cord.

Treatment. Whatever manipulative work is indicated during the acute attack should be carried out with special care. Patients suffering from this disease should be isolated. Since the infectious agent is not known the sick room should be carefully screened from flies and the patient protected from insects. All excretions including those from the nose and throat as well as urine and feces should be thoroughly destroyed. The room should be disinfected after the death or recovery of the patient, just as if he had suffered from any of the ordinary infectious diseases. The fever should be controlled by the ordinary treatment and by gentle baths of tepid water. Great care must be used to prevent having the water cold enough to produce any shock to the sensory nerves. Sponging with water of the temperature of the body reduces the fever and frequent repetitions of this are much better than the use of water which is too cool. Patients should be induced to lie either upon the face or in the right or left lateral position in order that the force of gravity may help to prevent congestion of the spinal cord. The dorsal decubitus should be avoided if possible in this as in all spinal cord disease. Solid food should not be given. Water and fruit juices should make the most of the diet permitted. If the patient recovers from the acute disease the methods of treatment advised for infantile paralysis and for myelitis may be adapted to his particular paralytic symptoms.

Prognosis. This is always grave. Death may be expected within a week or in two weeks at most. Complete recovery is never to be expected and the remaining paralysis is always serious.

SPINAL PROGRESSIVE MUSCULAR ATROPHY

The various diseases which are chiefly characterized by slowly progressing atrophy of skeletal muscles present so many similar features that they may be discussed together, with only various factors of differentiation mentioned in detail. Atrophy of muscles may be due either to disease or degeneration of the muscle itself, as in the muscular dystrophies; or to diseases of the nerve trunk, as in multiple neuritis; or to diseases of the cells in the anterior horns of the spinal cord, as in infantile paralysis or the ordinary form of progressive muscular atrophy; or to diseases of the descending cerebrospinal tracts which in turn produce atrophy of the anterior horn cells, as in amyotrophic lateral sclerosis.

Spinal progressive muscular atrophy includes a class of diseases in which the atrophy of the anterior horn cells of the spinal cord is responsible for atrophy of the nerve fibers and of the muscles supplied by them. The features which distinguish the various diseases included under this generic term depend upon the area of spinal cord first affected and the manner in which the disease extends to other nerve centers.

The most common is the **Duchenne-Aran type**. In this disease the atrophy begins in the anterior horns of the cervical thoracic cord which gives origin to the seventh and eighth cervical and the first thoracic nerves; weakness of the hands is thus one of the first symptoms. The thenar and hypothenar eminences diminish in size. The interossei and lumbricales slowly weaken and disappear. The shoulder muscles are next atrophied and the disease extends very slowly to the upper arm and to the trunk muscles. Death usually occurs from some intercurrent disease but after years of slow progression the atrophy may involve the respiratory muscles thus leading to death.

Duchenne's Subacute Ascending Paralysis. This form begins in the lumbosacral region of the cord and thus the muscles of the feet are first affected. The disease involves next the muscles of the thigh, then of the leg. It ascends to the trunk muscles as the disease ascends through the nerve centers in the cord. Ultimately death results from paralysis of the respiratory muscles, unless some intercurrent disease, usually pulmonary, interferes with the paralytic course of events. The progress of this disease is more rapid than in the case of the Duchenne-Aran type as is indicated by the term "subacute."

A **third type** (Erb), which is more rare in this country, begins also in the lumbosacral region and affects the peroneal muscles and the anterior tibial, but does not extend to the arms, though it may involve most of the leg and thigh muscles. This disease is extremely slow and may remain stationary for several years. It practically never causes death except indirectly, from accidents due to paralysis.

Progressive Bulbar Palsy may be included in this group also. In this disease the atrophy begins in the motor nuclei of the medulla. There are difficult speech, drooling, dysphagia, which may go on to complete inability to speak, swallow or close the lips. The mentality is not affected. The heart is very weak and rapid and death is due to complete failure of the heart or starvation or suffocation, or all three combined.

A number of other variations in type have been described, with slightly different symptoms. These are all very rare.

Pathology. The pathology of all these diseases is practically identical, a chronic anterior poliomyelitis. The nerve cells in the anterior horns of the spinal cord undergo a very slow atrophy. There is no chromatolysis, no extrusion of the nuclei, no swelling, no pigmentation, and no degeneration in the ordinary sense of the word. The cell-body shows first merely an increased pericellular lymph space. Later the body of the cell diminishes. The nucleus diminishes in size and takes the stain more lightly than under normal conditions. This process goes on until nothing is left of the nerve cell or of the axon which arises from it. The neuroglia proliferates, filling up the space left by the disappearing nerve cell. The spinal cord in an old case may show almost no trace of the nerve tissue in the anterior horns. The columns of Clarke and the posterior horns remain unaffected. The nerve trunks share in the atrophy; there is no recognizable proliferation of the connective tissue cells of the nerve trunk.

Sections of the muscles during the process of atrophy show a granular muscle protoplasm followed by a deposit of fine fatty granules. Occasionally a single hypertrophic muscle fiber may appear. The atrophy of the muscle is very complete and ultimately only a shred of connective tissue may mark its original site. Usually bony lesions are found in close central connection with the spinal area involved, but it is not possible to say whether these are primary or secondary.

Etiology. Practically nothing is known of the real cause of this disease. It begins in middle life, rarely appearing before the age of thirty. It is found in adults who have suffered from infantile paralysis in childhood, but perhaps not more frequently than the law of averages would explain. Occasionally it seems to date from some infectious disease, and sometimes from pregnancy, especially from very frequent pregnancies. Alcoholism and syphilis are not probable factors.

The place of the bony lesion has already been mentioned. The presence of bony and muscular lesions associated with the spinal centers first involved is probably invariable but whether these are localizing factors in the disease or whether they are really important in etiology or whether they are merely some of the effects

of the disease acting through the spinal muscles cannot yet be determined.

The **diagnosis** depends upon the history of a slow and gradually increasing muscular atrophy with no sensory, bladder or erectile symptoms. It is distinguished from progressive muscular dystrophy in the fact that this disease appears in childhood, and is associated with hereditary or family history; has no fibrillary tremors and has usually an individual history and an early hyperrophy.

Laboratory tests and X-radiance throw some light upon the diagnosis. Fibrillary tremors are present during the early stages. There may be pains in the muscles themselves which are apparently due to the fatigue of the weakened muscles being used as if they were normal.

No **treatment** seems to affect the course of the disease in any really efficient way. In correcting the bony lesions great care must be exercised to prevent irritation of the sensory nerves distributed to the skin, muscles and articular surfaces which are in close sensory connection with the trophic area. This work very slowly and gently accomplished seems to delay the progress of the disease in most cases. In a few cases such treatments given once each week or once in two weeks through several years have been associated with relief of the symptoms while the disease seems to progress less rapidly. Perhaps in cases seen very early through treatment will be successful.

Rest should be given the affected muscle groups and ordinary good hygienic conditions should be maintained. Some authors advise hot applications to the muscles involved. Mild stimulation by static electricity and frequent gentle massage of the affected muscles are useful in some cases, though these agents appear in other cases to increase the rapidity of the atrophy.

Prognosis. Recovery is probably impossible since the atrophy of the muscles and of the nerve cells innervating them is complete. The disease may remain stationary for some years at almost any time. It is not likely to cause death unless the atrophy involves the trunk muscles or the bulbar centers. When the paralysis involves the legs it may lead to accidents. Pulmonary affections usually give the terminal chapter in the story of this disease.

AMYOTROPHIC LATERAL SCLEROSIS

Amyotrophic lateral sclerosis is a disease of the spinal cord characterized by atrophy of the descending pyramidal tracts, secondary atrophy of the anterior horns of the cord and a slowly progressive muscular paralysis and atrophy.

Pathology. The fact that the disease begins in the lateral tracts in most cases is demonstrated by numerous autopsies, though for a long time it

was supposed that the anterior horn cells were primarily degenerated and that the atrophy of the lateral tracts appeared as a secondary phenomenon. Examination of the spinal cord of the patient who has suffered from this disease shows that the atrophy of the lateral tracts begins at the end of each individual axon, extending upward. The atrophy does not usually pass the medulla, though in a few instances it has been traced to, and involving, the larger pyramidal cells in the precentral convolution.

Etiology. The cause of the disease is not known. It is probably to be included among the abiotrophic diseases. The nerve cells are not reproduced during life so far as our present knowledge goes, and when any given cell is subjected to a greater amount of use or to less than the conditions required for its proper nutrition then progressively increasing inefficiency must result. Such a cell shows senile changes. These may become evident either in the cell body or, as in the case of amyotrophic lateral sclerosis, by a diminution of function followed by an atrophy which most commonly shows disease first in those parts of the protoplasm most distant from the nucleus of the neuron. Atrophy of the lateral tracts may follow anything which separates these fibers from their cell body. Direct injury to the spinal cord such as may be produced by wounds or other trauma, or by tumors, which may exert pressure upon the spinal cord, tumors or abscesses, tubercles or gumma, hemorrhages or any other pathological changes in the brain itself or in any part of the pathway traversed by the pyramidal axon may result in the atrophy of the crossed, or more rarely, the direct pyramidal tracts and thus to the development of the disease referred to. In pernicious anemia and in multiple sclerosis paralysis of this type may be one of the earliest and most conspicuous symptoms.

There is no reason to suppose that syphilis is an important factor. Probably anything which lowers the nutrition of the body as a whole or which interferes especially with the nutrition of the spinal cord may act as an exciting or predisposing factor in the development of this as in any other nervous disease.

The place of heredity in this disease has been very much discussed. There seems no doubt that there is a tendency for the disease to appear among members of the same family and also to be interchangeable in inheritance with several other diseases of the central nervous system.

Diagnosis. The disease usually appears first in the lower part of the body, perhaps because the crossed pyramidal tracts are made up of the longest fibers. There is at first a stiffness in the muscles involved which is associated with an increase in the muscular tone. Reflexes are increased. Paralysis may involve the hands first of all in which case the small muscles are first paralyzed and the disease follows the path of the Duchenne-Aran type. Fibrillary contractions are present. Reflexes are increased; ankle

clonus and Babinski are present. There is a spastic gait. The legs may cross in walking, giving rise to a "scissor's gait," which is rarely very pronounced. The disease is usually bilateral, but one leg may be first involved. There are no bladder or rectal symptoms. As the process of atrophy extends the muscles are progressively involved. When the disease affects the bulbar centers the muscles of the lips, tongue, palate and throat are paralyzed and later atrophied. Fibrillary twitchings are prominent symptoms of the beginning of this atrophy. The patient's speech, deglutition, and mastication become increasingly difficult. The face becomes flat and expressionless after the completion of the paralysis. Rarely the eye muscles are involved. Intelligence is not affected. When the atrophy extends above the medulla there is, as in bulbar palsy, a tendency to excessive emotional expression, so that the patient laughs and cries more extravagantly than is usual among normal individuals. The cause of this excessive emotionalism is not known. It is a source of considerable annoyance to those patients whose knowledge of their own condition is decidedly acute. There is very good reason to believe that the integrity and development of the motor system as a whole is directly associated with those psychological qualities commonly included in the expression "self-control."

Tachycardia is a fairly constant symptom. Death may occur from some intercurrent infection usually of the lungs, or starvation may result from the bulbar effects.

Treatment. The osteopathic treatment must be planned to secure the best circulation through the spinal cord and the muscles as well as to keeping up the general circulation and nutrition of the entire body. Since nervous diseases of this type seem to follow Mendel's law persons from neurotic families should be strongly advised against intermarriage. When one parent comes of a family in which this or other nervous diseases of an abiotrophic type have been present every care should be exercised to guard the children from causes of malnutrition. Their life should be more than usually hygienic. No strain, overwork or excitement should be permitted. Not only while they are children but also when they have reached adult life they must live normally hygienic lives if they are to avoid falling a victim to this or some other serious nervous disease.

After the onset of the symptoms the general health is to be kept up in every way. Stimulation of the muscles by mild massage or by electrical and thermal stimulation seem sometimes to be of some use. When there is difficulty in swallowing it is better to give all food and drink through the stomach tube in order to avoid the danger of aspiration pneumonia.

Prognosis. Probably no recovery is possible. The best that can be hoped for is to somewhat delay the progress of the disease and possibly to cause it to become stationary.

HEREDITARY SPINAL ATAXIA

There is a group of abiotrophic diseases which are variously described by different authors and which present symptoms which vary to a certain extent and have resemblances which are sometimes quite marked. By some authors the term Friedreich's ataxia is applied to the entire group of hereditary ataxias, which are characterized by symptoms referable to degeneration of the posterior funiculi of the cord. The description given, however, seems to apply especially to the spinal cord type of diseases, while the cerebellar form has been best studied by Marie.

The disease is invariably hereditary or familial. The ataxia appears from the third to the ninth year. It involves the legs and the arms about equally. At first, the children appear merely to be awkward; they walk with straddling gait, and the feet are turned in somewhat the position of varo-equines; the child drops things, spills fluids he is trying to carry, knocks things from the table, falls, and appears generally to be awkward and careless; as the condition grows worse, it becomes evident that it is a disease rather than a bad habit from which he suffers; the facial muscles and the respiratory muscles may be involved in the later stages; with constant effort some of these children learn to walk and to handle themselves fairly well. A kyphosis or kypho-scoliosis is almost always present. Nystagmus is bilateral. Stuttering speech is followed by an unintelligible jargon. Intelligence may not be affected.

The pathological changes include degeneration of the posterior funiculi, atrophy of the cells in the dorsal nucleus (Clarke's column), and of some of the cells in the posterior root of the ganglia, and some of the fibers in the peripheral nerves.

Recovery is impossible. The disease does not shorten life, unless some accident should occur as the result of the incoördination. One family was kept under observation for several years in the Pacific College Clinic. Attempts were made to correct the kyphosis but without success. No good results from the treatment were perceptible.

CHAPTER XXXVI

DISEASES OF THE BRAIN

GENERAL DISCUSSION

The diseases to which the brain is subject appear to be due for the most part to variations in its circulation and to the effects of bacteria and of various poisons. There is no reason whatever for supposing that any brain disease is due to overwork except as too long continued devotion to work may lessen the hours of sleep and exercise, or the food necessary to the maintenance of a good circulation of good blood; in other words, in all cases in which overwork is considered a cause of brain disease it is far more probable that it is the poor nutrition, the lack of oxygen or the presence of toxic materials in the blood that is responsible for the brain disease rather than any overactivity of the brain tissue.

The brain is supplied by terminal arteries; vasomotor nerves are known to be supplied to these and to originate for the most part in the superior cervical sympathetic ganglia which in turn receives its control from the first to the fifth thoracic segments of the cord. Bony lesions in this area may thus modify the circulation through the brain to a certain extent. By far the most important factors in controlling the arterial supply to the brain, however, are the conditions which modify the general blood pressure.

Infection of the brain itself extends from meninges in most cases. As in the case of the spinal neurons the extreme irritability which gives the brain its value in function renders it also extremely subject to the effects of poisons in the circulating blood. Poisons as well as bacteria seem to have a selective action upon certain parts of the central nervous system. This is especially noticeable in the effects produced by the syphilitic toxins, lead, mercury, the bacteria responsible for anterior poliomyelitis and the protozoa responsible for rabies.

Circulatory disturbances may be due to poisons, in which case they most frequently occur during middle life; or to birth injuries, in which case the symptoms occur during the first year or the first decade of life; or to senile diseases of the blood vessels, in which case the disease occurs after the sixtieth year. Functional nervous diseases are associated with the time of life during which the nervous relationships and neuronic development are undergoing most pronounced changes and are thus especially frequent during the period of adolescence or during the climacteric period.

CEREBRAL ANEMIA

This condition occurs secondarily in a number of other disorders. It is characterized by nausea, sometimes vomiting, and dizziness, vertigo, or syncope. Mania or delirium may occur. A mild degree of anemia is present during normal sleep.

General anemia, such as occurs after large hemorrhage anywhere in the body, is associated with cerebral anemia also.

In cachectic diseases, with primary or secondary anemia, the brain shares in the bloodlessness. Varying mental disturbances may result; drowsiness and stupor, even to coma; mania and delirium, or only a diminished interest and ambition, are the results of the starvation and poisoning that are caused by a deficient circulation of poor blood through the brain.

Ordinary fainting, or syncope, is due to overfilling of the splanchnic vessels with blood; under certain emotional disturbances, fright, horror, disgust, rarely anger or delight, the vasomotor centers controlling the liver, intestines, and spleen appear to be paralyzed, and these organs are filled with blood; the muscular wall of the spleen and the muscles of the intestines are also relaxed. The first condition adds to the cerebral ischemia; the second adds to the ischemia and also permits carbondioxid gas to be set free in the intestines in considerable amounts.

Treatment is usually devoted to the underlying cause of the bloodlessness. Anemias must be treated according to the causes of this condition. In ordinary syncope, the head must be lower than the reclining body, and sensory stimulation, sprinkling of cold water, rubbing the hands, smelling salts, etc., are all useful. If the heart is weak, stimulating manipulations around the fourth thoracic spine, and in the left fifth interspace anteriorly, hasten its return to normal.

Another form of cerebral anemia is produced by pressure; overfilling of the meningeal vessels or the venous sinuses, or tumor, or serous meningitis, or cerebral edema, all cause an ischemia of all or part of the brain substance. In these cases, the symptoms produced vary greatly.

CEREBRAL HYPEREMIA

Active hyperemia, aside from the primary stage of inflammatory process, is not certainly known to exist in the brain. The fact that the vasomotor nerves of the brain are comparatively inefficient, and that the circulation is chiefly dependent upon variations in the general blood pressure, seems demonstrated by clinical and by experimental evidence. The rigidity of the skull also prevents the facile variations in circulation, in functional activity, that is found in glands and other active tissues of the body. Transient apoplectiform attacks may be due to the sudden local hyperemia of the brain, and these are best treated by elevating the head, inhib-

iting the splanchnics, and the application of ice bags to the head. The old tendency to consider hyperemia of the brain present when the face is red and congested, is now known to be fallacious.

Passive congestion of the brain may be caused by pressure upon the jugular, the innominate, or the vena cava, or by tricuspid lesion. It is characterized by constant, dull headache, somnolence and sometimes mental torpor. The **treatment** includes removing the pressure upon the veins, in the one case, and inhibition of the splanchnics, correction of muscular and bony lesions which may interfere with the circulation in any way, and, in general, relieving the burden upon the heart, in the other.

CEREBRAL EDEMA

Passive congestion of the brain may cause edema. Nephritis, blood diseases, heart diseases, cause edema of the brain, as of other organs. Angio-neurotic edema may affect the brain, either locally or generally; death may result from this disease. Alcoholism, especially, may cause a form of "wet brain" probably an over-secretion of the cerebrospinal fluid as the result of an inflammatory process (see serous meningitis). Certain other forms of meningitis may be associated with an increase in the cerebrospinal fluid, but these, as hydrocephalus, may not be associated with any increased amount of water either between or within the brain cells.

Edema of the brain cannot be certainly diagnosed ante-mortem, but may be suspected when the symptoms of increased intracranial pressure appear together with any of the etiological factors just mentioned.

The **treatment** is that of the causative factors, plus measures toward equalizing the circulation of the blood, and especially facilitating the drainage from the cranial cavity. Correction of all abnormal structural relations in the cervical region, anteriorly and posteriorly, and such manipulations as may be required to give plenty of room in the thoracic inlet, are the most important factors. The treatment must include good hygiene and frequently some special diet, adapted to the patient's general condition.

APOPLEXY

The term is limited by some authors to cerebral hemorrhage; the impossibility of making ante-mortem diagnosis between hemorrhage, thrombosis, and embolism, and the close relation between these accidents in their pathological, etiological, and clinical significance has led to the broader definition of the word. Apoplexy is a circulatory accident occurring in the brain, and characterized by sudden onset of paralysis, with varying degrees of unconsciousness.

Cerebral hemorrhage includes also meningeal hemorrhage, insofar as this produces cerebral insult and symptoms of apoplexy. At the time of birth, and for a few months after, cerebral hemorrhage is rather frequent; after this period it is rare until the time of arterial degeneration. Hemorrhagic diseases, as scurvy, "black" infectious diseases, etc., may be associated with cerebral hemorrhage; such cases are rare, and may occur at any time of life. After the age of fifty, arteriosclerosis is by far the most common cause of apoplexy. Syphilitic endarteritis is a frequent cause.

By far the greater number of cases are due to rupture of small aneurysms; and this most frequently occurs in the left lenticulostriate artery. This fact is due to the anatomical relations of the branches of the aorta; the most direct path of the cardiac force leads from the left ventricle to this artery. For the same reason, the middle cerebral artery, in some of its branches, is most often the seat of embolism.

Injury to the head, as a blow, may cause rupture of the vessels; this may occur upon the surface of the brain, or within its substance, according to the location and force, and the manner in which the blow falls upon the skull. It must be remembered that the brain, during life, is almost fluid in consistency, and that, like other fluids, it transmits force, undiminished, in every direction. The structural injury produced by a blow with a soft or elastic object is the resultant of many varying lines of force. The destroyed area may be upon the opposite side of the brain, or upon some area in the basal ganglia, where the lines of force meet or cross. Such distant injuries are said to be produced from "contre coup." Disintegration of the brain substance may follow such a shock, and this may result in weakening a blood vessel, which ultimately yields to some slight variation in the blood pressure; this is called "delayed apoplexy."

The term "apoplectic habit" is applied to stout, heavy-set people, usually with thick necks and red faces. When such persons are overfed, alcoholic, and deficient in self-control, they are decidedly prone to apoplexy.

Capillary hemorrhages may result from cerebral congestion, or from any of the infectious diseases; they usually produce no recognizable symptoms, and are merely found after death. Venous hemorrhages may result from injury, from the rupture of varicose veins, or from passive congestion and emotional or muscular stress.

In all cases, some pathological condition of the cerebral vessels must be supposed to be present if any ordinary change in blood pressure initiates hemorrhage. This weakness being present, the rupture may be finally caused by anything which raises the general blood pressure; emotional stress, coition, straining at stool, coughing, muscular effort, as running or lifting, are all causes;

but many cases occur during sleep, and at times of absolute quiet of body and mind.

Diagnosis is directed chiefly to the localization of the injury. Prodromal symptoms are not frequent; there may be headache, increased blood pressure, paresthesias, weakness, vertigo; a vague discomfort, and a tendency toward awkward speech for a few hours or days before the attack. The speech difficulty attracts most attention, and is rather diagnostic of an impending attack, in persons whose vessels are diseased. The voice becomes slightly husky, the words enunciated more slowly but less plainly than usual, and there may be tendency to "forgetfulness" of familiar words—which is really a form of aphasia—in such cases. The symptoms are usually referred by the patient and his family to slight indigestion. The attack begins with unconsciousness of sudden onset. The patient falls; breathes with stertor; the cheeks are relaxed and flap; the pulse is first feeble, then becomes full and strong; the blood pressure is high; the face is flushed, often purple; there may be relaxation of the sphincters. The pupils may be contracted or dilated or normal; the eyes and head may or may not be deviated; the limbs fall flabbily when raised. If the hemorrhage is in the medulla or the fourth ventricle death usually occurs during this time. If the temperature is very high— 106° or so—death is usually inevitable within a few hours. If death does not occur this period passes away in a few hours to a day or two. Consciousness returns, more or less completely, and the extent of the paralysis is manifested. Fever, delirium, coma, with spasmodic movements of the muscles of the affected and the sound side, may persist for several days. The temperature on the paralyzed side is higher, perhaps $.5^{\circ}$ to 2° , than on the normal side of the body. Reflexes are lost, at first, then are exaggerated. Speech is usually impossible for some days, even when the speech center is not directly affected; mentality seems dulled for some days after the other symptoms have largely disappeared. Within a few days to a few weeks, the effects may have altogether disappeared; or, when the hemorrhage has been great, or the locality affected of considerable importance, there may be permanent paralysis of the side of the body opposite to the injury. The exact extent and locality of the paralysis depends upon the location and the extent of the cerebral injury.

In most cases, the hemorrhage is from the lenticulo-striate artery, and affects the internal capsule, thus, the fibers descending from the motor cortex of the left side. Injury to the deeper cerebral tracts involves the speech mechanism. Lesion of the posterior limb of the capsule causes sensory disturbances; bilateral homonymous hemianopsia, somatic anesthetics, and partial deafness in

both ears may thus be produced. Sometimes muscle and thermal sensations are lost, but touch, vision, and audition are preserved.

When the hemorrhage involves the pons, the pupils are contracted, the temperature is high, the face is paralyzed upon the side of the lesion, and the arms and legs upon the opposite side. When the injury is in the lower part of the pons, the oculomotor nerves may be paralyzed upon the side of the lesion, and the rest of the face and the limbs upon the opposite side.

Cerebellar hemorrhage is rare, and is hard to recognize. If one lobe is involved, no effects may be produced, beyond the initial insult. Hemorrhage into any of the ventricles is usually quickly fatal. Ingravescient apoplexy is characterized by the slow onset of the coma; it is usually fatal. A second attack, occurring before recovery from the first, is usually fatal. If partial or complete recovery occurs between attacks, a large number of successive attacks may occur, without fatality; that the hemorrhage will ultimately be fatal may be granted in every case; unless death from some other cause occurs speedily.

The paralysis produced is of the upper neuron type; except as hemorrhage into the pons might produce lower neuron paralysis of the facial nerve. Reflexes are exaggerated, but may seem to disappear as the result of the contractions. No reaction of degeneration, or true muscular atrophy occurs, though as the result of disuse, and the steady pull of opposing muscle groups, deformity and atrophy of the muscles may ultimately be noted.

Occasionally, hemorrhages in other parts of the brain, and the effects of the hemorrhage upon the basal centers themselves, cause various choreic and athetoid movements; instability of the emotional states; easy laughter and weeping; stammering and stuttering speech. The mental processes may remain fairly normal, even with these effects, but more frequently mentality deteriorates steadily. Epileptiform attacks are even less frequent, especially in nonsyphilitic cases.

Embolism. The obstruction of an artery by materials carried in the blood stream is called embolism; the matter which is carried is an "embolus," or plug.

Pathology. In the brain, since the arteries are terminal, embolism produces a cone-shaped infarct, whose apex is the point of obstruction and whose area is that of the distribution of the artery interrupted. If there is overlapping of other arteries, or anastomosis in any degree, the after-changes are slower, and recovery may occur. The loss of the circulation may cause recognizable changes in the nerve cells and fibers within a day; the starvation and degeneration of the nerve tissue is very rapid. When there is any hemorrhage into the infarct—and there usually is, especially in gray matter—the process is called "red softening." With progressive digestion of the hemoglobin, and with the occurrence of fatty degeneration, especially in areas which have been hemorrhagic, the "yellow softening" takes place. Infarcts in the scantily-blooded white matter are often colorless—"white softening" then occurs. Softening is the same process, however, in all colors. The nerve cells

and fibers undergo first granular, then fatty metamorphosis, then are digested, and, in time, absorbed. A clear liquid is left, if the softened area is of some size, which may be slightly tinged with red or brownish color. The degenerating material gives stimulus to the connective tissues around the blood vessels, and to the neuroglia of the injured region, so that either or both of these tissues multiply, forming a wall, which surrounds the larger infarcts and contains the liquid remnants (hemorrhagic cyst), or fills the cavities left by the small ones with a scar-like tissue.

Etiology. The emboli are most frequently fragments of clots or vegetations from the aortic valves. Less frequently bacteria or fragments from an atheroma may become emboli. Materials from the lungs sometimes pass through the heart and become emboli, these are often infected, and thus the infarct is also infected by the same disease as that of the lungs.

Thrombosis. Clotting of the blood in a vessel may result in complete obstruction; this process is called "thrombosis"; the clot is called a "thrombus." The same process of infarction follows as in embolism. (q. v.)

Etiology. The coagulability of the blood is increased in pregnancy, in most fevers, after hemorrhage, and in certain of the blood diseases and in cachexia. In the arteries, where the current is usually comparatively rapid, thrombosis usually occurs as the result of atheroma, aneurysm or traumatism. All of these factors are exaggerated by the presence of increased coagulability of the blood. Thrombosis of veins may be due to varicosities, diseased vessel walls, trauma, but is more frequently due to those diseases which increase the coagulability of the blood. Marantic thrombosis, in children with marasmus; cachectic thrombosis, in patients with tuberculosis, carcinoma or chlorosis; and anemic thrombosis, after hemorrhages, or in blood diseases, are not very uncommon causes of apoplectic attacks. The venous sinuses in the brain are so broad, and so irregular in shape, the blood flows more slowly through them and thus coagulation occurs more frequently in them than in other veins. The most common seat is the superior longitudinal sinus. When the coagulation is due to trauma, the location of the injury is that of the thrombus.

Diagnosis. The onset is usually less sudden in thrombosis than in embolism or hemorrhage. In either the motor cortex may be irritated and convulsions occur; this is rare in cerebral hemorrhage in adults; otherwise the symptoms are very much like those of hemorrhage.

Prognosis. Death is less probable in thrombosis and embolism than in hemorrhage. Absorption of the clot; digestion of the embolus, within a few days, may permit almost or quite complete recovery. Softening of the brain may extend beyond the original infarct, however, involving small vessels; this is especially true

in infected emboli; these effects, however, are generally less serious than are the results of the organization of the clot, or the dangers of later attacks, in hemorrhagic apoplexy.

Treatment. When any person is unconscious, or presents evidence of clouded consciousness, if the limbs fall flappily when raised, especially if the head and eye-balls are drawn to one side, it is wisest to treat the case as one of apoplexy. A smell of liquor, or signs of chronic alcoholism, are perfectly in harmony with this diagnosis, and too many unfortunate men have been allowed to die from apoplexy and other diseases with coma, because they were treated as common drunkards. It is a disgraceful fact that it is often considered a joke to give a drunk man care, under a mistaken diagnosis of apoplexy, while death from the lack of care, in apoplexy is merely concealed by those responsible for the death.

The patient should be kept recumbent and quiet; preferably on the side, so that the paralyzed tongue may not interfere with respiration. The clothing must be loosened, if there is any constriction, especially at the neck or the waist. Ice bags to the head and hot applications to the feet facilitate cerebral drainage. Steady, deep pressure in the region of the sixth to the tenth thoracic spines, dilates the splanchnic vessels, and withdraws the blood from the brain; this should lower the blood pressure and cause diminished redness in the face. The patient should not be moved until the breathing and the pulse become fairly regular, if this is possible.

After the coma has passed, general treatment, such as maintains a good circulation of the blood, should be given, at first daily, later at longer intervals, to once each week, until no further improvement is to be found. The food must be mild, preferably liquid, and mostly of fruit and vegetables for some weeks. Stimulating foods and drinks are forbidden. Rest in bed is necessary for several days, in the light cases, and several weeks, in more serious forms.

When the extent of the paralysis is manifest, and no further feverishness or indications of impending hemorrhage are found, reëducation of the patient must be begun. This reëducation is important. The opposite side of the brain seems to have a certain amount of power to control the paralyzed side, especially in the more complicated movements, such as speech or writing. Exercises should be carefully worked out for each individual, beginning with movements which he is barely able to begin even in an incoördinated way, and going on through increasing degrees to the attainment of the greatest possible skill. Dr. Evelyn Bush and Dr. A. A. Gour have published articles giving such exercises in greater detail than is possible here; the underlying principles are included in what has been said—the adaptation of the exercises to

each individual, and a constant working up to the more difficult exercises; the first must be very easy and simple.

DELIRIUM ACUTUM

This is an acute, probably infectious, disease of the brain, occurring in persons previously normal and not necessarily either neurotic or subject to any hereditary taint. The disease comes on suddenly, with a high fever, delirium is very severe and violent. Lucid intervals of a few seconds to half an hour in duration may occur at almost any time. The delirium recurs suddenly after these intervals and often the fever is considerably higher. After death the brain is found full of blood and showing the evidences of very acute inflammatory changes. The infectious agent has not been isolated. No evidence of its being contagious has been reported. The only treatment is symptomatic. Ice bags to the head and cool sponges sometimes seem to give some relief.

Death usually occurs within one or two weeks. The few patients who recover have very slow convalescence, but usually no serious mental after effects.

SENILE DEMENTIA

Just how long people ought to live and how long they should be expected to retain full possession of the mental faculties, is a question which cannot be answered. There is very good authority for supposing that "the years of a man's life shall be 120," but this is not at present the case. The senile changes in the tissues of the body are inevitable. Premature senility is due to overwork, especially to severe muscular exertion associated with exposure to climatic changes; to the vascular diseases associated with alcohol, syphilis, sexual excesses, and overeating; and to inheritance.

The brain, as a whole, undergoes a slight atrophy. The sulci appear broader, the convolutions somewhat smaller; increase in the dural fluid occasionally is found. Upon microscopic examination, the nerve cells are found atrophied; the nuclei may be eccentric, and very large masses of yellow pigment granules occur within the nerve cells. The large multipolar cells of the cerebral cortex and Purkinje cells of the cerebellum show atrophy.

Senility may be considered premature in all cases when it occurs before the age of sixty. In families in whom senility is usually delayed until eighty or ninety, this process should be considered premature in any one person at the age of seventy. In other words, the hereditary character of any individual must be taken into consideration in making a diagnosis of premature senility.

The body may not show senile changes even when the mind is seriously affected; on the other hand, the body may show all of the symptoms of old age to a marked extent and yet the mentality be apparently uninjured.

Treatment. The prophylaxis of senile dementia depends upon the maintenance of a normal blood pressure and the rapid elimina-

tion of the toxins of the body throughout life. The mental aspect is usually important. The man or woman who maintains an interest in the world's progress, who takes up new lines of thought occasionally, who is associated on terms of friendliness with young people, and who lives a wholesome, sane life, is less likely to suffer from premature senility.

After the symptoms are observed, a great deal of help can be given by properly planned treatment and attention to hygiene. People with senile dementia almost invariably have very rigid spinal columns and ribs; they breathe inefficiently and they have either a very high blood pressure or other evidences of arteriosclerosis with cardiac lesions. The treatment must be based upon as much of a relief from these conditions as is possible. Treatments which very gently increase the mobility of the vertebræ and which raise the ribs, increasing the flexibility of the thorax, often cause very satisfactory improvement in the symptoms. If possible, the patient should be taught better habits of breathing and should be made to take an interest in something outside of his recent experiences. If he has been taking alcohol and tobacco, it is probably unwise to deprive him of these things altogether, though in most cases a reduction is advisable. The diet should be light and easily digested. Milk and buttermilk, fresh green vegetables and fruits should make up by far the larger proportion of his food. He needs little or no meat and only a very small amount of starchy food. An increased amount of water should be taken. If he can be induced to drink as much as his heart and kidneys will permit, the increased elimination of toxins will be promoted most satisfactorily.

Prognosis. Naturally, no hope of recovery is possible, but considerable relief from the symptoms in early senile dementia may be expected. Attacks of paralysis and occasionally epileptiform attacks may occur and either of these or some intercurrent malady, especially pneumonia, provide the last injury necessary to death.

HYDROCEPHALUS

This term is applied to any condition in which the amount of cerebrospinal fluid within the skull is greatly increased. It may be either congenital or acquired, or may be either internal or external.

Congenital Hydrocephalus may occur without recognizable cause. Its more frequent occurrence in the children of alcoholic parents suggests the "wet brain" of alcoholism (see serous meningitis). Prenatal infection of the meninges and chronic ependymitis, due to any one of several infectious and toxic agencies, is to be recognized. Congenital hydrocephalus is more frequently

internal. The head may be tremendously enlarged; the fontanels remain open, or are closed by Wormian bones; the sutures spread widely apart, and Wormian bones may be interposed. The cerebral cortex is thinned, sometimes until it contains little or no recognizable gray matter; the white matter may be scarcely perceptible. The basal ganglia are flattened; the lateral and third ventricles, and the cerebral aqueduct (of Sylvius) are greatly dilated; the fourth and fifth ventricles are rarely dilated. The cerebellum may or may not be flattened greatly. Children in whom very slight hydrocephalus is present may attain normal or remarkable mentality; those in whom the hydrocephalus is sufficient to cause noticeable deformity of the skull, with injury to the brain, are mentally defective, and suffer from spastic paralysis, epileptic attacks, and malnutrition. The skull is rounded, rather than square, as in rickets, and the malnutrition of the body is not associated with bony fragility. Congenital hydrocephalus is frequently associated with spina bifida and with club foot, various slight bodily deformities, and stigmata of degeneracy of varying types.

Congenital external hydrocephalus is usually due to deformity of the brain, with normal skull size, or to abnormally large skull with normal brain. In the latter case previously existing internal hydrocephalus is suspected.

Acquired external hydrocephalus may appear at any time of life, but is most frequent during the first few months, or in senility. Wasting of the brain may leave a space, which is filled with liquid (vacuum dropsy), or there may be an increased secretion, probably inflammatory, of the endothelial cells.

Acquired internal hydrocephalus is due to meningitis or to brain tumor. Closure of the veins of Galen or of the foramina of Monro or of Majendie result in an accumulation of fluid within the ventricles. Softening of the brain, epileptic attacks, various paralyses, and coma lead to death.

Diagnosis. The disease is suspected when enlargement of the head in children, or symptoms of increased intracranial pressure in adults, are associated with any of the etiological factors. Examination of the cerebrospinal fluid, and the use of the X-ray, particularly of the stereoscopic views of the skull, should make the diagnosis clear in most cases.

Treatment. Drainage of the fluid from lumbar puncture gives relief and may lead to recovery; pressure upon the skull, by straps and bandages, may lead to absorption of the fluid, and prevent its greater formation. Drainage of the cisterna, directly, is of doubtful value and of certain danger. Palliative measures include correction of cervical and upper thoracic lesions, and attention to the nutrition of the entire body. Children with heavy heads

should not be encouraged to try to hold the head up, but some support should always be given; the heavy head swinging around on the weak neck leads to various cervical and upper thoracic lesions, which still further embarrass the circulation and drainage of the cranial cavity.

AMAUROTIC FAMILY IDIOCY

Amaurotic family idiocy is a hereditary degenerative disease of the brain, characterized by progressive blindness and loss of mentality. Direct inheritance is, of course, impossible, but the disease attacks several members of the family in each generation. Normal children may be found in the same family, but all the children in one family who suffer from this disease show the first symptoms at about the same time.

Two types of this disease are recognized. One attacks infants and results in complete idiocy and death before the age of three years; in the other the onset is somewhat later, perhaps at about the fifth year, and death may be postponed until the tenth year, or rarely later.

The brain shows no changes on macroscopic examination as a rule, though sometimes irregularities in the convolutions occur. On microscopic examination degenerative processes in the cerebral neurons are observed. Swellings of the cell bodies are especially conspicuous. The granular layer of the retina shows the same changes; atrophy is usually present in retina and optic nerves.

The disease is limited almost exclusively to children of Jewish descent. One very typical case in the P. C. O. clinic had no history of Jewish ancestry.

No treatment is of real value. The case is hopeless from the beginning and the most that can be done is to keep the child comfortable for the remaining months of his life.

CEREBRAL PARALYSES OF CHILDREN

The paralyzes which appear first in childhood are characterized by a number of factors which are not present, or are present in different degree, in the paralyzes which first appear during adult life, or in old age. The etiology of children's paralyzes is greatly different from that of adult paralysis, though both are based upon destruction of nerve cells.

Etiology. Paralysis in children may be due to any one of a large number of factors. Specific infection, as in anterior poliomyelitis, or the infectious agents present in most of the acute infectious diseases of childhood, may destroy the nerve centers in the cord or the brain. Trauma, after birth, at birth, or before birth, may injure the peripheral nerves, as in paralysis of the brachial plexus produced by pressure upon the shoulder in delivery. Long labor or awkwardly used forceps may injure the brain directly; long labor or asphyxia may lead to cerebral or meningeal hemorrhage. Jaundice may poison the nerve cells; marasmus may prevent brain development; the acute fevers may injure by overheating or by bacterial poisons. Premature birth may be associated with malnutrition, or the causes of the prematurity may affect the brain development. Before birth, the

nutrition may be below normal; maternal toxins may injure; direct trauma to the fetus through the mother's abdomen, is not rare; attempts at abortion may injure the fetal head and brain. (See Hemorrhage into Fetal Cord, C. A. Whiting.) Deformities of the nervous system cannot always be explained; these result in variable disturbances of function, often including more or less paralysis. Heredity is important. Syphilis in the parents stands first; next alcoholism is to be considered; neurotic inheritance, especially familial defects of body or mind, is frequently found; these hereditary qualities follow the laws of Mendel. Children of very old parents, and those born last in very large families, are more liable to nerve instability and paralysis. Children of the cachectic, those born during serious ill-health of the parents, are rather often paralytic.

Yet, after all, in very many cases, no efficient cause for the paralysis can be found, even upon the most thorough and careful investigation.

Pathology. Examination of the brains of such children shows various defects. Usually the cerebral and spinal injury is much more serious than would be expected from the symptoms observed. This is, no doubt, due to the fact that in childhood a great deal of compensatory action on the part of other developing nerve centers is possible.

Meningeal hemorrhage at birth is frequent; this may cause no recognizable symptoms in a large majority of cases. Large hemorrhages clot, are digested and ultimately are absorbed; or they become organized with scar-like formation of connective tissue and neuroglia; or these form a wall, within which the digested blood and nerve matter undergo further softening until a cyst filled with a clear and colorless liquid remains. These "hemorrhagic cysts" are often found in the brains of defective children. Thrombosis is not rare at about the time of birth; this causes infarction, perhaps softening, perhaps cyst formation.

Mal-development is indicated by variations in the size and form of the convolutions, by imperfect myelinization of tracts, especially the pyramidal tracts, and by the presence of atypical patches of gray matter scattered through the white matter, especially in the subcortical region. Various atypical relations and defects of the circulation are found.

The effects of hydrocephalus may also be found, in many cases (q. v.). Hereditary syphilis is indicated more vividly in the viscera and skin than in the brain itself; syphilitic lesions of the brain resemble the circulatory defects already mentioned.

Defects in the brain substance are frequent; these may be due to pressure of cysts, hemorrhages, etc., which may have been absorbed before death; or to hydrocephalus; or to abiotrophic changes; or to deformities of unknown cause.

Sclerosis due to neuroglial overgrowth is not uncommon. This may be diffuse or patchy, or may occur in hard, raised, knob-like elevations.

CEREBRAL HEMIPLEGIA OF CHILDREN

This disease is due to destruction of the nerve cells and fibers of the cerebrum, appears early in life, and causes paralysis of arm and leg, rarely face, upon the opposite side.

Etiology. The disease usually has its onset in the first three years of life; occasionally appears to be due to birth injury; and often follows an acute infectious disease, or a series of children's acute infections. Occasionally it seems to be primary. The onset and later history suggest infection, as in infantile paralysis, but no infectious agent has yet been isolated.

Diagnosis. The child shows no prodromal symptoms, save those of the contagious disease, when this is present; has high fever, vomiting, convulsions, and some torpor. As this passes away, one side of the body and face are found to be paralyzed first with relaxed muscles, which soon become spastic. Aphasia is usually present, no matter which side of the body is paralyzed, if the child has begun to talk. Within a few days, the aphasia passes, and the paralysis lessens. Recovery is not complete, and the arm is most seriously affected. Within a few weeks the extent of paralysis is fixed. The muscles which recover motor power show athetoid movements and spasmodic twitchings. Within a year or two, attacks of epilepsy occur; these are mild at first but increase in severity. With these, mental deterioration becomes evident, and this may go on to amentia. In some cases the epilepsy and mental deterioration do not occur, and the after life of the child is affected only very slightly by the paralysis. The growth of the paralyzed limbs is deficient, as in infantile paralysis. In some cases the extent of the paralysis is slight, but the mental effects are profound—paralysis of the intellect.

Treatment. After the paralysis is evident, the treatment should be directed first to securing the best possible circulation of the best possible blood through the brain, cord and muscles; next to the orthopedic correction of the deformities resulting from the paralysis. Special training is necessary for those children in whom epilepsy and mental deterioration are beginning; such children should be taught cleanly habits, and as much of good humor as is possible; but education, in the sense of "book learning," is mostly thrown away. Too urgent efforts toward teaching hasten the ultimate amentia. Sane, wholesome living, with such work as they can do cheerfully and easily, provide the education that is best for them.

Prognosis. The outlook is bad. For two or three years after the paralysis, the imminence of epilepsy must be recognized. The greater the athetoid movements the greater the danger of mental defect. Early cessation of athetoid or choreic movements is a good sign. When the epileptic attacks are frequent the prognosis is worse than when they occur at longer intervals, even though the less frequent attacks may be more severe. Mental deterioration is practically certain when epilepsy follows hemiplegia in children.

Life is rarely interrupted or shortened. After the climacteric the epileptic attacks may disappear; mentality is not usually modified by this.

DOUBLE HEMIPLEGIA

Occasionally this disease affects both sides of the body, and a condition resembling cerebral diplegia results. In double hemiplegia the onset is like that of cerebral hemiplegia, athetoid movements, epileptic attacks, etc., all resemble those of the unilateral type, and the mental deterioration is marked. In some cases, however, it may be quite impossible to distinguish between the paralysis due to disease (hemiplegia) and the paralysis due to defective development (Little's disease).

CHOREIC HEMI-PARESIS

This disease is probably related to cerebral hemiplegia. The paralytic stage is omitted, and choreic and athetoid movements of one half the body occur, as in the post-hemiplegic stage of the disease mentioned. The onset is more insidious, and it usually follows either severe acute infectious disease, or a very severe fright or nervous shock.

CEREBRAL DIPLEGIA

(Little's disease)

Cerebral diplegia is a paralysis due to defective development of the pyramidal tracts; it affects the legs more seriously than the arms, as a rule; and is especially characterized by rigidity of the skeletal muscles. Sometimes paraplegia alone is present, with characteristics of Little's disease.

Etiology. The disease is due to defective development; this, in turn, to asphyxia at birth, difficult labor, or to deficient nutrition before birth. Premature birth is mentioned; this may be the cause of the disease, or both disease and premature birth may be due to some earlier defect in development. Upper cervical lesions seem to be constant findings. These may often be secondary, and often appear to have been caused at birth. In any case, they usually seem to be important in the later history of the patient.

The pyramidal tracts, and sometimes the motor cortex, are found undeveloped; the tracts are nonmedullated or may be absent. This defect leaves the reflex arcs of the spinal cord uncontrolled; whence the rigidity.

Diagnosis. The entire motor system in its lower mechanism seems to be irritable; these children are thrown into spasms by sudden noises or lights. The mothers notice these spasmodic movements, and think the child is "trying so hard to understand, and to learn to control himself." Reflexes are increased; in some cases it is difficult to recognize the reflex response on account of the rigidity. It may be noticed that the child is too stiff, even when it is very small; when it should be holding up the head, this is not done; when it is time for it to sit alone, it is noticed that the

legs do not bend properly, and that the child stiffens itself out, instead of making the usual movements of the legs and arms. Sometimes the condition is not noticed until the child should begin to learn to walk. The rigidity of the legs causes them to be drawn together, so that they may cross; if the child is helped and the legs moved as in walking, or, in lighter cases, if he learns to walk, the legs cross, "scissors gait," and the walking movements are extremely stiff and slow. The muscles may be smaller than normal, or may hypertrophy; there is never any true atrophy, as in other types of children's paralysis.

The development of the tracts may simply be delayed, in which case the symptoms gradually disappear, and the child appears fairly normal at ten or twelve years of age. In most cases, however, the development never reaches the normal, and he is more or less crippled during life.

Mental development is defective, if the paralysis is marked; in this disease the defect in mentality seems to run a fairly parallel course with the paralysis. The vocal muscles are often affected, and this mutism increases the tendency to mental defect. When the face is not involved, the children are often quite intelligent in appearance, with friendly smiles and expressions of joy or grief.

Treatment. In order that every possible opportunity may be given the developmental powers of the nervous system, the constant care of the nurse and the physician is necessary. Treatment must be adapted to conditions as they arise; very important is the repeated correction of the bony lesions which are caused by the muscular tension. Once or twice each week the body must be examined, and very gentle manipulations given, which increase the mobility of the spinal column and the ribs. If these increase the rigidity, there is some error in technique; the result of each treatment should be to slightly diminish the muscular tension. Daily massage of the affected muscles, if gently done, is good; this gives the exercise in as nearly normal a way as is possible. Prolonged warm baths often relieve the rigidity; massage during the bath is especially useful.

Education should be wisely attempted. The child should be taught to rest, first; later very simple and easy movements should be given. At first only those movements which he can make easily should be given; later, these may be increased. It must be remembered that the brain centers are undeveloped, and that very little overuse may result in harmful tiring; constant watchfulness is necessary. The results which have been secured in a few cases as the result of this persistent treatment by osteopathic physicians, with the assistance of good nursing, is most encouraging.

Prognosis. The outlook is always grave, but in all cases of typical Little's disease there is a chance for the later development of the defective tracts.

LENTICULAR DISEASE

Disease of the corpora striata, and especially of the lenticular nucleus, has been described by several authors. The progressive softening associated with cirrhosis of the liver is of interest. The symptoms of lenticular disease include tremor, often intentional; spasticity of the skeletal muscles, usually bilateral and universal; excessive emotionalism; dysphagia; dysarthria but no true aphasia; difficulty in maintaining equilibrium but no true ataxia; and usually no reflex disturbances or sensory peculiarities. Athetoid movements and spasmodic actions may occur.

When associated with cirrhosis of the liver, recovery is not to be expected. Similar cases due to the presence of some peculiar toxin, which can be eliminated from the blood, may disappear with treatment.

Rarely, Babinski's sign, increased reflexes, and mental deterioration are present; these cases are not expected to recover.

BRAIN TUMOR

The term "brain tumor" is applied to any neoplasm or deposit of any kind which affects the brain in any way, either directly or by causing increased intracranial pressure. It is not usually possible to diagnose the variety of tumor until after death or operation.

Varieties. Tumors may originate from the membranes, the blood vessels, the neuroglia, or the connective tissues. They may originate in place, or as metastases.

Membranous tumors include enchondroma or osteoma, from the dura or the skull; psammona, usually from the neighborhood of the pineal body; lipoma, cholesteatoma, fibroma, myxoma, sarcoma, endothelioma, angioma, from the dura and the pia-arachnoid; carcinoma, practically always metastatic; tubercle and gumma, resulting from infections.

From the blood vessels arise aneurysms, tubercles, gummata, and angiomas, perhaps also endotheliomas. From the neuroglia arise gliomas. From the connective tissue grow fibroids and sarcomatous growths.

Tumors of extraneous origin include hydatids, rare in this country; cysterci; and many even more rare varieties. Brain cysts are usually caused by destruction and digestion of brain tissue or of extravasated blood. Hematoma is due to hemorrhage (See apoplexy).

Etiology. Tubercle is more common in children; glioma and sarcoma in youths; gumma in adults; carcinoma in late middle life; and others according to the nature of the infectious cause, or the nature of the neoplasm, or the opportunity for traumatic causes. Men are more frequently affected than women, probably on account of the incidence of gumma and the risk of trauma.

Diagnosis. The diagnosis of brain tumor is usually difficult, especially in the early stages, and when it does not affect the membranes. Symptoms are due partly to the increased intracranial pressure, and partly to the local irritation and destruction of brain tissue.

Headache is present only when the meninges are involved; since the brain substance is devoid of sensory nerves. Uncomfortable sensations may result from local irritation, however. Rarely, pain may be elicited on percussion, near the tumor, but this is subject to so many modifying influences that it is not satisfactory as a means of diagnosis. **Vertigo** is common; it is most marked in cerebellar disease. **Vomiting** is also most frequent and annoying in cerebellar tumor. It may be of the projectile type, or may be of the commoner variety; it bears no relation to the quality or the time of meals. **Choked disk** is almost invariable; interlacing of the limits of the color fields is a frequent ocular finding, considered of great value in more recent writings. **Mental** disturbances usually include dullness and apathy; rarely mania. **Emotional** or hysteroid attacks are frequent in some cases; increased emotional instability is usually present, especially when the frontal lobe or the basal ganglia are affected. **Constitutional** symptoms include emaciation, adiposity, peculiarities of the pulse and respiration, varying temperatures, most marked in basal ganglia disturbances, and pupillary changes.

The focal symptoms vary chiefly according to the fossa involved. Tumors of the anterior frontal region give only vague or elusive symptoms, chiefly mental disturbances of orientation and behavior. Tumors affecting the speech and writing centers, in the second and third frontal convolutions, destroy these powers. Tumors of the precentral area cause first, convulsive movements and epileptoid attacks, or Jacksonian epilepsy, later, paralysis; in the post-central convolution, paresthesias are followed by anesthetics, and these may be associated with convulsive or epileptoid attacks. Tumors of the right anterior frontal and a large part of the parietal and temporal lobes may cause no localizing symptoms. Lesions of the posterior area of the parietal lobe, especially on the left side, cause astereognosis; of the occipital lobes, especially the angular gyrus and cuneus, give varying light flashes during the irritative stage, if present, followed by homonymous bilateral hemianopsia. Lesions of the occipito-temporal region cause auditory and visual aphasia.

When the base of the brain is affected, ocular symptoms are marked; this is due to the effects upon the optic and the oculomotor nerves. The region of the sella turcica is most often affected of all tumors in the supratentorial region, and this leads to blindness, through pressure upon the optic chiasm. The pituitary gland is often concerned, with the symptoms of disease of that ductless gland. (q. v.)

Tumors affecting the basal ganglia are often associated with emotional instability, involuntary laughing or crying attacks, athetoid movements of the limbs, especially the fingers and arms, and peculiar hesitating speech. Lesions of any kind in the basal ganglia are apt to involve the internal capsule, with resulting widespread paralysis and usually more or less motor aphasia.

The cerebellum and cerebello-pontine angle are often the seat of tumors. Subtentorial tumors do not cause symptoms of increased intracranial pressure unless the tumor is of considerable size, or involves the aqueduct, thus leading to internal hydrocephalus. The localizing symptoms depend chiefly upon the effects upon the cranial nerves, unless the middle lobe of the cerebellum is affected. When this occurs, the symptoms progress rapidly. Cerebellar ataxia is marked; the Romberg sign is present; the skeletal muscles, especially those of the legs and back, are weakened and may either be atonic or hypertonic, sometimes variably on the two sides; nystagmus; various symptoms of cranial nerve involvement; strabismus; intense headache; severe vertigo, and often vomiting without digestive disturbance, are present.

Some part of the auditory tract is usually affected in cerebellar or cerebello-pontine tumor; tinnitus and deafness, and the symptoms of Meniere's disease are thus produced.

Tumors of the pons, if small, produce varying motor and sensory symptoms, according to the location and the function of the areas affected. Tumors of the peduncles cause cerebellar symptoms. Tumors invading the fourth ventricle, of slow growth, cause diabetes insipidus or mellitus, and sensory and motor, cardiac, respiratory and vasomotor symptoms, according to the areas affected. Death is not long delayed when the visceral symptoms appear.

Treatment. The most satisfactory treatment in most cases is surgical. Inoperable cases are more or less slow in development, according to the nature of the case. Tubercle and gumma are to be treated constitutionally. Decompression operations may prolong comfortable existence for weeks or months; occasionally decompression permits later reparative surgery. In any case of increased intracranial pressure, measures which lower the systemic blood pressure may give temporary relief.

SUPPURATIVE ENCEPHALITIS

(Abscess of the brain)

Etiology. Direct injury is the most frequent cause; pyemia causes multiple small foci; extension of infection from the mastoid cells, the nasal, and other neighboring areas is sometimes causative; rarely circulatory disturbances, due to any of the usual causes, is followed by infection and abscess. More often such conditions are followed by softening by autolytic enzymes than by infection.

Diagnosis. The symptoms are those of tumor, plus those of suppuration—these include chills and fever, leucocytosis, indicanuria, and often the symptoms of the primary infection, as typhoid, pneumonia, or endocarditis. Retinal congestion is usually marked, but choked disk is rare. The symptoms progress by extension along the line of least resistance, rather than by increasing intensity in one place, as in tumor. Multiple abscesses often follow, as in one P. C. O. specimen, in which an unsuspected temporal abscess underlay an old bullet cyst, with multiple abscesses of microscopic size over the cerebral and cerebellar cortices; the apparent cause of death was the rupture of the abscess into the ventricle.

Treatment. When the abscess can be localized, the pus may be evacuated, and recovery follow. When diagnosis is doubtful, and the pus cannot be localized, systemic treatment is to be employed; this includes correction of the cervical and occipital lesions, promotion of nutrition and elimination, liquid diet, with free drinking of water; palliative treatment for the symptoms as they appear, and constant watchfulness in order that surgical interference may be based upon as exact knowledge as possible.

Prognosis. When evacuation of the pus is not surgically secured, the abscess may break into the nasal passage, with immediate relief and recovery; into a venous sinus, with septicemia and ultimately death, or into a cerebral ventricle, with sudden death. In all cases the prognosis for life is serious, and recovery is apt to be slow and incomplete, in the most favorable circumstances.

CHAPTER XXXVII

FUNCTIONAL NEUROSES

HYSTERIA

Hysteria is a functional disease of the nervous system, characterized chiefly by various constant disturbances of sensation and motion and by occasional exacerbations of these disturbances or by convulsive attacks.

Pathogenesis. No morbid anatomy has been described for hysteria, though several investigators have reported finding aberrant masses of gray matter and various slight irregularities in the form of the cerebral convolutions. It is difficult to understand how any single disease-producing factor can possibly be responsible for phenomena so varied and apparently so antagonistic as are the symptoms of hysteria. The most satisfactory theory depends upon a recognition of the nature of the inhibitions under normal conditions. Minimal stimuli repeated at intervals too great to produce summation may so affect the nerve centers as to prolong the refractory periods into a constant inhibitory effect. In hysteria the liminal value of the nerve centers is so greatly increased that stimuli which ordinarily are inhibitory are now of no effect whatever, while stimuli which should ordinarily produce marked effects in consciousness or in bodily activity are now reduced to a level of inhibitory reactions. The specific symptoms in each case depend upon the location of the nerve centers affected; this, in turn, depends upon the etiological factors present in each case, and upon the physiological condition of the different centers at the time of irritation.

Etiology. By far the most important cause of hysteria lies in heredity. Hysteria is one of a group of neuroses which are interchangeable in inheritance; that is, if one parent has migraine and another is addicted to the use of drugs or alcohol, the children may be hysteric or neurasthenic or epileptic or subject to any one of several forms of insanity. These interchangeable neuroses follow Mendel's law quite closely.

The next most important factor in causing hysteria is a bad education. The only child is especially liable to hysteria, as is the child with brothers and sisters much older or, indeed, any child unduly pampered by the other members of the family. As a result, consideration for others has no place, or only a very small place, in their ideas. Physiologically, it may be said that the neuronics relations of the left frontal lobes are excessively developed at the expense of general cerebral balance. As the result of this inflated egocentric psychology, there is a tendency for every sensory impulse to be immediately transferred into a personal and emotional expression, either word or deed. Given the unbalanced nervous control, exciting causes which would not interfere to any great extent with the health of a normal individual may

have very profound and serious effects. The repressed emotions and wishes so often exaggerated by the followers of Freud occur before puberty, as a general thing.

The stress of modern education is an important factor especially in girls. High school buildings are often badly arranged. Class rooms scattered from the basement to the fourth story and connected by steep and winding stairs, crowded and unpleasant toilet and dressing rooms, together with the need for too much home work, are certainly enough to interfere with the normal development of adolescent nerve centers, but when these are further complicated by the emotional storms incident to fraternity and sorority associations, social affairs, music, art, and dancing, the problem becomes too complex for any ordinary brain to meet in an efficient manner. Girls have the worst of all this; boys usually have outdoor sports, girls may have these but household cares, needle work, and devotion to personal appearance add further complications.

During adolescence, the first love affairs, religious experiences, and more or less freakish ambitions may initiate hysteria. The exciting cause of any attack is usually absurdly trivial. It is indeed "the last straw that breaks the camel's back" in these cases. Recovery from any given attack may also be secured by apparently trivial causes.

Spinal Conditions. The hysterical spine is usually very irregular. No two are alike. Lesions of the occiput, atlas and axis are almost universal. Lesions of the mandible are frequent. Rib lesions are often associated with improper habits of breathing. It is very rare to find a hysterical patient whose respiratory muscles are free and whose respiratory excursion exceeds one-half inch in quiet breathing. Lesions of the coccyx are usually present. Many cases called hysterical coccygodinia are really due to misplaced coccyx and not to the hysteria. Given the hysterical temperament, the symptoms which cause greatest distress are frequently localized through the influence of bony lesions which may be the result either of accident or of reflex muscular contractions.

Diagnosis. True hysteria is rather rare. Hysterical symptoms associated with organic diseases almost anywhere in the body are so common that it is rather rare to find a patient who has been sick for months or years whose symptoms are not somewhat modified by unbalanced neuronc activity. A diagnosis of hysteria alone can only be made when every organic disease has been found to be absent. The symptoms of hysteria are so varied that this fact itself is of a certain value in diagnosis, though it must constantly be remembered that many organic diseases of the nervous system as well as of many visceral organs are associated with hysterical symptoms.

Hysterical phenomena are classified according to the structures chiefly affected.

The **memory** of the hysterical patient shows many lacunæ; doubtless this accounts for the many variations in behavior. Multiple personality depends largely upon this state, as does the existence of split personalities, buried complexes, and the various peculiar antipathies of these patients.

Variations in **consciousness** include trances, twilight states, somnambulism and sleep-like states which may continue for months at a time. Remarkable visions are often associated with these lapses of consciousness.

Hysterical **paralysis** may have a sudden onset following some emotional shock or strain, or it may begin insidiously with gradually increasing weakness of certain muscle groups. The paralysis may be either flaccid or spastic. It may continue for many years until the limbs involved become fixed by contractures and by changes in the articular tissues. The muscles involved do not show atrophy or any marked electrical variations, and reflex action may be increased, diminished or lost. Paralytic muscular contractions disappear under anesthesia and during sleep. It is rare for the contractions to persist through accident, especially if this persistence should be about to result in fracture or other serious injury to the body.

Hysterical paralysis often disappears under the influence of shock. Attempts have been made to cure the condition by providing apparently accidental catastrophes; as, for example, leaving a patient in the house alone and then providing a strong smell of smoke. It is needless to say that attempts of this sort usually result disastrously.

Disturbed **cutaneous sensations** are almost invariably present and are usually rather strictly localized. Modified sensations are more common than total anesthesia. This accounts for the peculiar response which such patients make to tests of sensation; for example, if a patient is blind-folded and is told to tell when she feels a touch upon any part of the body, as the arms, she may respond "Yes" to a touch upon the right arm and "No" to a touch upon the left arm. The fact that the answer "No" is made to a touch upon the left arm proves, of course, that it was perceived in some way. The disturbed cutaneous sensations do not follow the distribution of the nerve trunks, nor of the spinal segments. They do correspond rather closely to the cerebral localization of the sensations affected. Disturbances of touch and pain sensations are the most frequent and most marked. Disturbances of muscle sense, temperature sense and of the peculiar sensations produced by the electrical current are less frequent and the tests for these sensations are decidedly unsatisfactory.

Disturbances of **smell and taste** are usually present. Odors which have been previously considered pleasant are likely to become obnoxious. Hyperosmia is not rare. One patient in the P. C. O. clinic was able to tell whether any one of her acquaintances had been in a room within the last hour or more, by the personal odor. She was not able to follow odors in the open air. Anosmia occasionally occurs. Perverted sense of taste is less frequently found and it is usually a disturbance of the olfactory sense, rather than of taste, that is present. When a persistent sweet taste or bitter taste is complained of some visceral disease should be suspected. Occasionally, however, these taste-perversions are present as hysterical phenomena.

Deafness and tinnitus are not frequent. Occasionally hallucinations of hearing occur. **Visual** disturbances are usually present. Quivering lights, flashing alternations of light and darkness, diplopia and other transient phenomena are very frequent. Unilateral blindness and amblyopia occur at intervals. Total blindness of sudden onset may last for minutes or for years, and may disappear suddenly. Contraction of the visual fields and especially of the color fields is so constant a finding that it is of diagnostic value. The retraction of the color fields is usually concentric, though often the blue-yellow field retracts within the red-green field. The visual field may be so retracted that the patients seem to be looking through a tube—"tubular vision." This condition is rarely suspected until the examination is made.

Disturbances of **visceral** sensations are variable. Lack of appetite, voracity, lack of thirst, polydipsia, very severe causeless visceral pain, anesthesia in severe visceral diseases ordinarily painful, sexual frigidity, nymphomania or satyriasis, may be found in different individuals or in the same individual at different times.

The **blood** in hysterical patients is usually good. The hemoglobin, erythrocyte count, and leucocyte count are usually practically normal. The individual cells, however, frequently show the characteristics of immature blood. A few nucleated red cells and immature forms of the white cells are found in those cases in which the hereditary or congenital factor is pronounced.

The examination of the **urine** shows usually a diminished excretion of solids. Phosphates are frequently increased and calcium oxalate crystals are often present. After a hysterical crisis large amounts of urine of low specific gravity are usually voided. This serves to distinguish certain doubtful cases of hysteria from epilepsy.

Crises. The fits or convulsive attacks, called crises, described with so great detail by Charcot and other of the Salpêtrière school, are rarely found in this country. These are usually precipitated by some emotion or fatigue but may be self-originating. They

rarely resemble epileptic fits quite closely. They usually last longer than epileptic attacks; the movements have a purposive appearance and usually imitate the expression of some profound emotion or passion. The hysterical patient rarely bites the tongue, injures the body in any way, froths at the mouth or passes urine and feces involuntarily. The hysterical patient is usually bright and appears to feel very well after the attack. Very different conditions are associated with the epileptic fit. (q. v.)

Pseudohydrophobia (Lyssophobia) occurs in neurotic persons after having been bitten by a dog, or even after having been frightened by a dog or any other animal. The use of the term "mad-dog" has caused virulence to be imputed to the saliva of any infuriated animal even though perfectly healthy. The symptoms of hydrophobia are greatly exaggerated in imagination. Some weeks, months, or years after the fright, usually upon some unpleasant occurrence, the patient begins to complain of feeling ill. The site of the wound may become painful, occasionally even reddened slightly. The patient often bites at the old wound, or at the site of an imagined wound, until it becomes decidedly sore, perhaps infected. A horror of water is urgent, and the patient struggles, bites and snaps like a dog, and imitates whatever symptoms of hydrophobia he may have heard of, or imagined. Only under unusual conditions is there difficulty in making a differential diagnosis between this form of hysteria and true hydrophobia.

Pseudomeningitis. Spinal meningitis lends itself readily to imitation by patients with the hysterical love of the spectacular. It is found most often in girls and young women; especially if they consider themselves hopelessly in love. A death from "brain fever" sounds delightfully tragic; and their neurotic symptoms lead them really to believe themselves seriously ill. The hysterical muscular contractions lead easily to opisthotonos; nausea and vomiting are easily encouraged; the fanciful or sportive or maudlin delirium of true meningitis is not unlike the natural expression of the hysterical love-lorn maiden. The hysteria is easily recognized unless the diagnosis of meningitis is accepted by an unsuspecting physician.

Treatment. The essential thing, in treatment, is to provide, first a normal circulation of normal blood through the brain, second, a normal stream of nerve impulses leading to a reëducation of the brain centers. The exact methods to be employed vary for each individual, and must be based upon a physical and mental examination.

The spinal and costal lesions should be corrected by means of movements which do not add to the irritation of the conditions already present. Care must be taken in giving the osteopathic

treatment to avoid securing too great relaxation of the spinal ligaments. It is necessary also to avoid the "treatment habit." Hysterical patients too often find themselves impressed with the need for corrective treatment and go from one doctor to another, constantly seeking heavier or more gentle or more efficient treatments.

Patients who are emaciated, weak or anemic may have the rest cure such as is found beneficial in neurasthenia. (q. v.) Those whose bodies show good nutrition and in whom the blood pressure is low, are best benefited by being sent out doors and by being given exercises which lead to the development of the muscles.

The next most important factor in the treatment of hysterical patients is found in reëducation. It is necessary that the whole trend of thought should be changed from the egocentric to the altruistic. This is not best done by attempting to appeal to the generous emotions, since this leads rather to further self-pity, or to the development of the "martyr" idea. Any sort of fad which leads to out-of-door work may be encouraged. Change of scene is frequently recommended; to be efficient it should be complete. The one who seeks a change of scene, carrying with her her maid, her pet dog and everything which has kept her mind wrapped in cotton wool through all her life long is not likely to find a change of scene in any proper sense, whether she goes to Greenland or to India.

In those cases in whom some emotional shock has been the original cause of the disease, some methods of psychoanalysis may be employed. There is no question that some hysterias do rest upon a basis of repressed feelings, either sexual, religious, or other. In such cases the complete exposure and discussion of the varied complexes frequently results in recovery which appears almost unbelievable. On the other hand patients whose condition rests upon some other etiological factor are too often put through a series of unpleasant discussions, whose only effect is to transfer the symptoms into the psycho-sexual sphere. For this and other reasons it is best that these methods should first be employed by the physician in charge of the patient, and without explaining the reason for the various discussions. Much more frankness is secured, from most patients, by asking questions, either directly or indirectly, after the treatment has been given, while the patient still lies upon the table. The variations in pulse rate and in blood pressure are valuable in recognizing significant statements or evasions. Psychoanalytic methods require much time and a certain amount of skill and sympathy. When any physician finds himself unable to give these, or when his best efforts fail, it is much better to send the patient to a professional psychoanalyst for that special line of educational work. The correction of the structural perversions can be done, either before, during, or after the analysis of the mental content. In any case, the structural perversions must

be corrected, else later attacks, though of different symptoms, may be expected.

During a *crisis*, the patient should usually be left alone. When the symptoms are very severe, some treatment may be required; this is palliative and symptomatic. Very slow and strong spinal extension is often useful. A neutral bath, continued for one or several hours, may relieve convulsions. Rest in a dark room is generally the very best thing. No atmosphere of excitement is permissible; nor is any sense of punishment to be manifested. Scoldings may avert an attack, in the very beginning, in mild cases, but these usually exacerbate the fit and intensify the neurosis. Commonly following an emotional storm the patient feels decidedly refreshed.

It is rarely useful to treat symptoms directly, unless there is some organic disease present. Bony lesions may be responsible for various functional diseases of the various organs; correction of the lesions, with or without an explanation of the desired effects, is all that is needed for these conditions. Functional diseases of certain organs, especially gastro-intestinal or genito-urinary, may be due to the hysteria alone; in such cases, the less said about the disease, after one discussion and explanation, the better. Especially in neurotic girls and unhappily married women should the discussion and treatment of the pelvic organs be evaded. When serious organic disease is present the condition should be properly treated; when the pelvic conditions are secondary to the neurosis, local treatment should be postponed until better nervous control is reestablished.

Sensory disturbances usually need no treatment; when they are severe, massage, counter-irritation, electricity, or sun-baths, may be recommended. Motor disturbances also may be disregarded, unless pain or great inconvenience is caused. Bandages, adhesive straps, electricity, warm baths, may give temporary relief. Orthopedic measures usually do more harm than good; after the neurotic condition has been completely overcome, if structural deformities persist, orthopedic surgery may be necessary.

It is too frequently the case that doctors and nurses, as well as the members of the family, consider hysteria merely another form of malingering. They think that the hysteric patient could be all right if she would, which may be true, but it is also true that she "can't would." No doctor should assume charge of a case of hysteria unless he can deal with the condition in just the same impersonal and scientific and kindly way that he would use in dealing with a patient who suffers from any other disease. The pain in hysteria is as severe and distressing as is the pain in any other disease; the paralysis is as inevitable as it is in poliomyelitis. Unless one is willing to give attention and thought to the disease in a professional and scientific manner he should not attempt to

care for these cases, but should refer them to some other physician who is willing to treat the case properly.

Prognosis. With proper care, the prognosis for recovery is good so far as the symptoms are concerned. Inasmuch as the condition rests upon a constitutional foundation, it is evident that this must persist throughout life, but with ordinary care and good hygienic living these patients should complete long, happy, useful lives.

THE NEURASTHENIC STATES

The term neurasthenia is somewhat vaguely applied to a functional nervous disease which is characterized by symptoms of fatigue of the certain groups of nerve centers.

Pathology. The structural changes are at present extremely doubtful. Chromatolysis of the motor neurons has been described. Functionally there is an increased irritability and increased fatigability of the nerve centers. The muscles are not fatigued as is indicated from the manner in which they react to direct electrical stimulation. The reflexes are first increased but speedily diminished.

Etiology. Both predisposing and exciting causes must be recognized. Of the first by far the most important is **heredity**; it is very rare to find a typical neurasthenic in a family whose ancestors are all nervously sound. Alcoholism, syphilis, tuberculosis, extreme youth, old age, drug addictions, migraine, hysteria often occur in the parents or are characteristic of the ancestry of the neurasthenic patient. When these conditions are variously combined in both parents or grandparents only a normal life can prevent the occurrence of the neurasthenia or other neurosis in the children. Other **predisposing** causes are the use of stimulants, and unhygienic living; overwork has been greatly exaggerated as the cause of neurasthenia. It seems certain that no amount of mental overwork or responsibility causes neurasthenic states in an individual who has proper hours of sleep and of outdoor exercise and whose food is that best adapted to his manner of living; in other words work which does not interfere with hygiene probably is never excessive. The overwork which is associated with an undue sense of responsibility, which causes unrest and worry often leads to the use of stimulants. Work which is never satisfactorily completed causes a troublesome sense of inefficiency, and this in turn often leads to the use of sedatives and stimulating drugs.

"It must not be forgotten that it is not the work which injures; probably persons injured by overwork are rarely found; but it is the lack of sleep, out-of-door exercise, the overeating, either of overly rich food or the food of some faddist, it is the lack of proper hygienic habits which bring the trouble. The person who has good food, good air, good exercise and a body whose parts are properly related, who eats, sleeps, laughs, and plays enough, has no time for overwork and is not apt to overworry."—L. Burns.

"Different cases present different lesions, and no typical lesion may be described for all cases, but certain lesions are common, in the various types; as cervical and upper dorsal in the cerebral; mid-dorsal and ribs, in the gastric; lower dorsal, ribs, and upper lumbar, in the intestinal. Upper cervical and upper dorsal lesions seem to be most constant in the spinal and sympathetic variety. The lesion of third and fourth cervical to the right (reported by Hazzard and also by McConnell and Teall) seems responsible in many of my own cases for the cerebral symptoms, except, possibly, the vertigo which may, and generally does, result from atlas displacement."—C. A. Champlin.

"The neurasthenic complexes are formed by education, and like useful or normal complexes, such as those of motion in piano playing, require time and repetition in formation. The basis of these complexes may be formed without intention, by accident, or by environment. The conditions favoring its formation are repeated frequently and enlarged upon until it is often very hard to recognize the basic causative factor. If this was brought about by education, it requires reëducation to show the patient wherein the misconception of his condition started. If we can trace for a patient from the beginning the successive steps that have led to his present condition, we have gained in the understanding of his case and in starting him on the road to recovery. But we must regard such a case as disease and treat it as such, and see that the family looks upon the patient as sick, not, as is frequently said, suffering from lack of self-control."—C. E. Farnum.

"In run-down neurasthenic patients, anemic or not, the blood pressure is apt to be too high or low. Its level will determine absolutely the dietetic and hygienic treatment; its reaction will determine the osteopathic treatment, frequency, and severity."—L. G. Robb.

Bony Lesions. The characteristic neurasthenic spine is rigid and flat through its entire extent. The various lateral subluxations of individual vertebræ and long slight curves and rotations may be present, but the flatness is characteristic. The irregular cervical spinal column is frequently important in the cerebral or mental types. Coccygeal lesions and innominate lesions are most common in the sexual neurasthenics; depressed lower ribs are practically constant, the eleventh rib stands out and the twelfth rib usually lies within the iliac crest.

Areas of hypersensitiveness are variable in location and in degree. Often the tissues along the spinal column and the angles of the ribs are practically anesthetic at the first examination, becoming increasingly hyperesthetic as the increased mobility, resulting from the treatment, permits the more normal activity of the spinal centers concerned in carrying sensations of heat, cold and pain upward to the brain. There is no question that the spinal condition is an important etiological factor in the neurasthenic states.

Diagnosis. The onset of the disease is usually gradual; it begins with a tendency to fatigue more easily; there is some insomnia and irritability of temper. Very frequently these conditions follow a prodromal period of unusually strenuous living, during which time the patient sleeps less and indulges himself more than is proper in pursuing ambition or pleasure. The fatigability, insomnia and irritability grow worse, a sense of pressure in various

parts of the body is frequent, this gives rise to the sensation called "stocking sensation," "glove sensation," rarely "girdle sensation" and the "lead-cap headache." Sensations geometrically outlined are very apt to be neurasthenic. The sense of fatigue is worse in the morning. During the day, meeting other people and amid the emergencies of work and play, the patient feels more and more able to meet the demands of living. By night he is often very much alive and ready for anything except sleep.

The insomnia is characteristic. The depth of normal sleep is very profound for the first two hours or so of the night, the level then returns almost to the waking line and remains fairly constant until early morning, the depth of sleep increases at this time usually to a point about one half that of the earlier depth and this terminates by awaking. The neurasthenic has only the two "drops" for his sleep period; those hours which a normal person passes in shallow sleep the neurasthenic passes in wakefulness. This daily history is in itself almost pathognomonic. Besides the general symptoms just given neurasthenic patients are subject to various other symptoms, referable to different organs.

In the **gastric type** the patient complains profoundly of digestive disturbances. It is extremely difficult to make a certain diagnosis of this form of neurasthenia because of the difficulty of eliminating organic stomach disease. Gastrectasis is eliminated with difficulty because the neurasthenic has usually relaxed and atonic abdominal and gastric muscular walls. Accumulations of gas within the stomach are quite constant. X-ray pictures taken during the digestion of a contrast meal give the most satisfactory diagnostic information. Reflex muscular contraction, bony lesions and hyperesthetic areas are to be found from the fifth to the tenth thoracic vertebræ and the corresponding costal areas.

Cardiac Type: Vasomotor Type. Neurasthenic disturbances of the circulation are characterized by a weakness in the heart's beat, low blood pressure, slow circulation, cold hands and feet and pallor of the conjunctivæ and mucous membranes. This pallor may be so marked as to suggest profound anemia; the examination of the blood, however, easily eliminates any form of anemia. It is less easy to make a satisfactory diagnosis of the cardiac condition. The weakened muscle walls and the diminished force of systole are probably responsible for the hemic murmurs so frequently found in neurasthenics. The hypersensitiveness and bony lesions are found in the second to the fourth thoracic region and in the upper cervical vertebræ.

Sexual Type. This is one of the most common types of neurasthenia among men. Sexual overactivity and sexual perversions are certainly factors in this form of neurasthenia but their place in etiology has been very greatly overestimated. It is far more

frequently the case that the lack of self-control associated with the neurasthenic state is responsible for the sexual wrongdoing than that these initiate the neurasthenic state. There is no question, however, that sexual perversions and excesses do increase the neurasthenic symptoms most profoundly, especially in men. In women the injury seems to be more often due to unrecognized desire rather than as the result of overindulgence. The evil effects of day-dreaming, romantic literature, and all of the emotionally morbid surroundings to which women of idle lives are often addicted, are extremely injurious to the nerve centers of the lumbo-sacral enlargement. Lesions of the lumbar vertebræ, the innominates and coccyx are almost universal in these cases. The neurasthenic state as well as the bony lesions mentioned exert a harmful effect upon the pelvic organs. Lax muscles and ligaments, congested ovaries, heavy, soft uterus, are usually present in neurasthenic women. When the infantile uterus and poorly developed sexual organs are found in women hysteria is rather more apt to occur than neurasthenia. In men sexual desire is sometimes increased, premature erections and emissions are frequent, satisfactory intercourse is often impossible, and in both sexes intercourse is frequently followed by profound exhaustion and distaste. Marital unhappiness produced by this condition frequently adds to the general nervous malfunction.

Cerebral Type: Psychasthenia. This type sometimes exists with very little sign of neurasthenia as affecting the rest of the body. It is characterized by a mental exhaustion, if the expression may be permitted. The patient realizes his condition but finds himself unable to maintain the interest and the effort necessary to enable him to do the work to which he is accustomed or which he desires to do. The mental state is frequently suggestive of atavistic phenomena. **Kleptomania**, or the passion for annexing and secreting objects for which the patient cannot possibly have any legitimate use is one of these. **Mysophobia** or the horror of contamination is probably not to be included as an atavistic phenomenon. **Agoraphobia**, the fear of open spaces; **claustrophobia**, the fear of closed in places; **zoophilia** or the inordinate love of animals, are among the most common phenomena whose nature suggests more or less vividly the past experience of the race.

Laboratory Findings. These are more helpful in showing the condition of the individual patient than in naming the disease. The amount of **urine** varies; the total excretion of solids is usually low, a retention of uric acid and other purins is very common. Calcium oxalate is present in a great many cases and it indicates the deficient oxidation present occurring in the body. **Phosphaturia** is frequently present; the examination of urine is of value in

the differential diagnosis between the nervous symptoms due to early diabetes or nephritis and those of neurasthenia.

The blood is characteristic. The color index is low; this is due either to an increase in the number of red cells or to a decrease in the hemoglobin percentage. The red cells usually show irregularities in size, shape and staining reactions. Among the white cells the most conspicuous change is the relative increase in the eosinophiles, this is constant and is of value in diagnosis. The blood changes appear to be due to the lack of circulation through the red bone marrow, especially of the ribs. Neurasthenics rarely breathe properly, the respiratory excursion is invariably diminished. Blood examination is useful in making the differential diagnosis between the nervous states of secondary anemia, pernicious anemia, chlorosis, the leukemias, all of which have more or less profound nervous disturbances, and true neurasthenia.

Treatment. The correction of bony lesions as found is important in this disease but this is rarely sufficient to provide all conditions necessary for recovery. Improved nutrition, improved circulation through the spinal cord, improved functional activity of the nerve cells, all of which result from the increased mobility of the spinal column and the raising of the ribs give the best possible conditions for recovery on the part of the inefficient spinal neurons. On the other hand if the etiological factors are constantly throwing greater burdens upon these centers, if the circulating blood is constantly filled with the toxins resulting from bad diet, poor breathing, and insufficient water intake, it is evident that the manipulation alone is not the whole of osteopathic treatment in such cases.

In suitable cases a modified form of the Weir-Mitchell rest cure with a full milk diet works wonders. Rest and increased nutrition of the nerve centers is the whole matter of treatment. Increased proteids, increased fats and increased water intake are extremely important matters. Starches and sugars need not be increased. The raw vegetables in the form of salads should be added freely to the diet.

In many cases it is better to lessen the amount of work but not to take it away altogether. Very frequently the relief from responsibility is all that is necessary. If the work performed is kept within the limit of that which can be satisfactorily completed day by day, leaving time for a few hours of outdoor exercise, most patients do better than when they suffer the humiliation and discomfort of being removed completely from work which has heretofore occupied a very great part of the waking hours.

In other cases a complete change of scene is necessary; this is especially true when the patient has no great amount of interest

in the work which he has been doing. The change of scene must be truly a change. The patient who goes to another climate carrying with him his family or servants, who eats the same food, affects the same dissipation, drinks the same drinks and stays up to the same unholy hours at night, finds no change of scene even though he should travel from the equator to the pole. The great value of a visit to the various hot springs and health resorts comes as much from the fact that change in occupation and thought and a physiological division of the day are insisted upon as from any other factors. The patient must be taught that his mental attitude is an important factor in the insomnia, and, to a certain extent, in the other symptoms.

Prognosis. Neurasthenia rarely terminates life either directly or indirectly; indeed, the disease itself lessens the exposure to the ordinary dangers of living. A recovery from any given attack is certain if the patient will willingly obey directions and receive the proper treatment for his condition. Future attacks are to be avoided only by avoiding the causes as mentioned above. Neurasthenics and those who have suffered from neurasthenic attacks should not marry other neurasthenics. The mildly neurasthenic may safely marry persons with sound and wholesome nervous systems. The children of such marriages are often all that is to be desired in the way of health and usefulness.

TRAUMATIC NEUROSES

The term "traumatic neuroses" is applied to those disturbances of the nervous system following shocks or accidents, but not associated with gross lesions of the nerves, the brain or the spinal cord. The shock is usually associated with some concussion and with very profound fright or excitement. Frequently the symptoms do not appear for some hours or even days after the accident. The symptoms are sometimes very vague and may present an extremely complicated diagnostic picture. Disturbed personality such as characterizes neurasthenic and hysterical states, together with various sensory and motor disturbances, contractures and paralyzes may be present. The complicated nature of the effects produced by accidents often leads to a suspicion of bad faith and malingering. There is no question that people who have been in railroad or other accidents often deliberately magnify the results of the injuries in the hope of securing larger amounts of money in payment for the damage they have sustained. Such attempts rarely deceive any earnest investigator. It is necessary that the investigation of these cases shall be pursued in such a way as to protect both the victim and also the company or individual who has the duty of paying for the damages inflicted; in other words, it is the duty of

the physician, in such cases, to seek for the actual truth of the condition. If he makes the examination in a frank and kindly manner, it is usually not difficult to draw the line between even vague and complicated nervous results of accident and the awkward attempts at deceit which are usually made by dishonest persons.

The very fact of litigation causes pronounced nervous disturbances of a functional nature. Railroads and other companies responsible for accidents frequently have the date of trial postponed in the hope that the recovery of the injured persons may lessen the sense of injury. It is true also that with the lapse of time the force of public opinion is considerably diminished. All of this works for harm to the patient. In order that the most speedy recovery may be made from such shocks, the financial aspect of the case should be settled as speedily as possible. The fact that recovery occurs very quickly after the compromise has been effected, or the court procedures have been fully completed, is often held as evidence that the patient was merely a pretender. This is a serious injustice, since it is often the relief from worry that removes the last obstacle to recovery. .

Pathology. In many cases in which death has followed some inter-current disease after such shocks, the examination of the brain and cord shows slight capillary hemorrhages. Concussion certainly causes a tremendous shock to sensory neurons. The effects of these may be very serious but are usually transient. The wrenches of the bony tissues of the body produced by accidents are certainly responsible for a large proportion of the symptoms found in the traumatic neuroses. Lesions thus produced are overlooked by the ordinary doctor of medicine, but are none the less important in etiology. Lesions of the occiput and upper cervical region cause various disturbances in mentality. These may vary from a slight loss of self-control to severe acute confusional insanity. Lesions of the upper thoracic region cause disturbances of the heart action and various vascular disturbances. Lesions of the lower thoracic region affect the abdominal viscera, while lesions of the lower cervical or of the lumbar spine may be responsible for paralysis and for sensory disturbances. Lesions affecting the dorso-lumbar area cause disturbances of the circulation and secretion of the kidneys and suprarenals. Cervical or upper dorsal lesions may cause various disturbances of the eyes and of the ears. The recognition of these lesions as etiological features in functional diseases of the organs named above and their correction should go far toward promoting recovery more speedily in these traumatic neuroses.

Treatment. Bony lesions as found are to be corrected as speedily as is possible under the varying circumstances. After this, the most important factor is termination of litigation. The treatment for neurasthenia is indicated. (q. v.)

MIGRAINE

(Hemicrania; periodic sick headache)

Migraine is a functional disease of the nervous system, characterized by periodical attacks of intense unilateral headache, visual

disturbances, and usually nausea and vomiting. No pathological findings have ever been reported for this disease.

Etiology. Migraine is one of the neuroses which are interchangeable in inheritance. The inheritance of migraine usually follows the female line. The attack may begin as early as the first or second year of life, though the most frequent age of onset is ten to fifteen years. The attacks appear at intervals of a few days to a few months until the climacteric has been passed, when they usually disappear.

Bony lesions, chiefly of the upper cervical region, are important, even in hereditary cases. Lesions involving the splanchnic area are often present. In women in whom the attack occurs at the menstrual period, lesions of the lumbar spine, the innominate or coccyx are frequently found. Often the attacks cease during pregnancy and lactation.

Eye strain, hardened ear wax, adenoids, and other causes of peripheral nerve irritation probably help in promoting the nervous instability. Patients themselves usually consider overwork and the use of improper foods an important factor in precipitating an attack. The relation of migraine to epilepsy has been variously discussed. Since absolutely nothing is known as to the real nature of either migraine or epilepsy, such discussions do not lead to any very useful results.

Diagnosis. Migraine is usually recognized upon the symptoms and history. The attacks begin most frequently with visual disturbances—flickering lights or flashes, floating spots, dim vision, and diplopia. This is followed (sometimes preceded) by various sensations of vertigo, dizziness, nausea, and dull headache. Very sharp pain, usually frontal, practically always unilateral, gives the name "hemicrania" to the disease. This may be so severe as to cause unconsciousness; it is very obstinate to the usual analgesic drugs, and attempts to relieve the paroxysms by these are important causes of drug addictions. The pain is of a neuralgic type; sometimes hot, sometimes cold, applications give relief. After a variable time, usually a few hours, vomiting becomes free; the stomach contents are first vomited, then bile; and usually when much bile has been vomited the pain is relieved, and the patient is left comfortable but very weak and listless. A long sleep, sometimes twenty hours or more, usually terminates the attack and gives the necessary rest. In the intervals the patient is in good health, so far as the migraine is concerned.

Treatment. During an attack it is rarely possible to do more than secure relief. Occasionally extension and careful correction of muscular or bony lesions is possible, and this may give marked relief. This is especially true at the onset of the attack. When manipulations are painful, it is best to postpone corrective work

until the acute attack has passed. The patient may drink freely of hot water, have an enema of rather warm water, and go to bed with a hot water bottle at the feet or over the abdomen, and an ice bag or a hot water bottle at the base of the occiput; this may avert the attack. In patients of sedentary habits, the hot water and the enema may be followed by a walk or some game in the fresh air; by a hot or Turkish bath; or by massage of the entire body. In either case, at least a day of rest is necessary, even if the pain and nausea are averted altogether; otherwise the next attack will occur more quickly. It must be remembered that the usual exciting cause of an attack is fatigue of some of the nerve centers.

During the intervals, treatment must be initiated for the prevention of the attacks.

In any case of migraine a thorough blood examination should be made for the sake of determining the true physiological condition of the patient. The urine analysis serves the same purpose.

Any effective treatment must be persisted in for months. Structural perversions must be corrected and the corrections must be repeated as frequently as may be necessary. The diet must be wholesome, easily digested and planned according to the results of the blood and urine examinations. Once carefully decided upon the diet must be rigidly followed. A study of the habits of the patient is necessary. A careful regime must be worked out and this must be followed religiously. If these directions are persistently followed even the most evident of hereditary cases usually recover completely within a year or two. Recovery is not sudden. In the beginning the condition may seem to be exaggerated, the attacks more severe and the intervals shorter. After one or two apparent exacerbations, the attacks become modified and the intervals longer, until they should finally disappear. The person who suffers from migraine should never marry another who suffers from migraine, nor from any other neurosis.

OCCUPATIONAL NEUROSES

Persons of neurotic temperament whose occupations require the repeated performance of complex movements frequently suffer from a cramp of the muscles concerned which is sometimes associated with considerable pain when their use is attempted. In typical cases pain is not present and the use of the muscles in other movements is perfectly normal. The only etiological factor is the occurrence of fatigue of the nerve groups which control the more complicated movements, especially of the hands. In a number of cases reported, bony lesions of the lower cervical and the first and second thoracic vertebræ have been reported. The condition of the shoulder and clavicular joints should be investigated.

Writers' cramp or scrivener's palsy is the most common of these neuroses. Pianists, violinists, telegraphers, seamstresses, barbers, tailors, shoemakers, and cigar wrappers are all subject to these muscular cramps. Dancers, men who walk upon snow shoes, and skaters are sometimes affected by similar cramp, affecting the muscles of the legs.

The diagnosis of writer's cramp is not often difficult. In some cases agraphia, ataxia beginning in the arms, and early paralysis agitans may be confused with this, or some other occupational disease.

The cramp which results from the habitual and improper use of skeletal muscles in maintaining equilibrium probably belongs in this group. Lesions affecting the pelvic girdle cause cramp of the muscles of leg; lesions affecting the shoulder girdle cause cramp of the muscles of the forearm; lesions of the occiput cause cramp of the muscles of the neck; lesions of the mandible cause cramp of the muscles of mastication, and lesions of the thoracic vertebræ may cause cramp of the intercostal muscles and the diaphragm. These, and other muscular cramps, are sometimes confused with neuritis, as in cases of sciatica and lumbago, now generally recognized by orthopedic surgeons and other physicians as being due to lumbo-sacral strains, or to subluxations of lumbar vertebræ.

Treatment. Rest is essential. The correction of the bony lesions as found facilitates recovery. The left hand may be used instead of the right, but the cramp soon affects this hand also. For writers' cramp the typewriter may be advised. A bracelet which holds the pen and is moved by the forearm muscles can be used. Cramp is, however, apt to attack these muscles in the course of time. In general, a change of occupation ultimately becomes necessary.

CHAPTER XXXVIII NEUROSES WITH MOTOR SYMPTOMS

EPILEPSY

(Falling disease; seizure; morbus sacer)

A satisfactory definition of epilepsy is very difficult. Certainly it is a disease of the brain, of unknown cause, and characterized by attacks associated with loss of consciousness and with more or less pronounced motor phenomena. There is a tendency on the part of some authors to limit the term epilepsy to the idiopathic form, others apply the term to all typical seizures in which the epileptic sequence of events is present.

Grand Mal is the term applied to the ordinary epileptic fit which shall be described hereafter.

Petit Mal has little or no muscular action and is characterized only by a loss of consciousness, usually very short.

Jacksonian Epilepsy is due to a localized cortical lesion. The attacks always begin in a certain limited area of the body and spread to neighboring muscle groups until the whole body is concerned in the convulsion.

Epileptic Equivalent or psychic epilepsy is rather rare. In this form the place of the fit is taken by what may be called a mental convulsion. It is really an attack of more or less violent insanity.

"Running Epilepsy," *epilepsia cursoria*, or *procursva epilepsia*, are terms applied to a condition in which the place of the ordinary convulsion is taken by a sudden attack of violent running until the patient is exhausted. All epileptic equivalents are dementing.

Myoclonic Epilepsy is a form in which the muscles are in a state of increased tone during the intervals of the attacks.

Status Epilepticus is a state in which the fits follow one another rapidly; consciousness may not be regained in the intervals, and it may be impossible to count the fits. Occasionally death occurs speedily from exhaustion; occasionally the patient lives longer than seems in any way possible in this state, and may even recover his usual health after days of apparently constant subjection to the epileptic attacks.

Nocturnal epilepsy occurs during the night only. **Diurnal epilepsy** occurs only during the day time.

Symptomatic epilepsy is a symptom of recognizable disease anywhere in the body, but usually involving the brain.

It is very evident that all epilepsies are truly symptomatic. Only because we do not know the true cause of what is ordinarily called idiopathic epilepsy, do we apply that term to it.

Pathology. Epilepsy is preëminently a degenerative disease of the cerebral cortex, though the true nature of this disease is as yet unknown. Gliosis of the horn of Ammon has been described. Various degenerations and atrophies especially affecting the external layer of the cortex have been described. Small hemorrhagic areas have frequently been found in the basal ganglia.

Abnormally small aorta, deficient cerebral blood vessels and the congenital absence of certain branches of the circle of Willis have been considered responsible for the condition through the defective circulation through the brain thus produced.

Most epileptics suffer from gastro-intestinal disorders. In most cases the time required for the passage of food through the alimentary tube is considerably increased. The colon is frequently dilated. It is supposed that the toxic materials absorbed as the result of this slow peristalsis may be in part responsible for the attacks. The gastro-intestinal disorder is probably due to the underlying neurosis which manifests itself also in the epileptic attacks.

Etiology. Heredity is a very important factor. While epilepsy itself is not often found in the parents, it is very rare to find a case of epilepsy occurring in a family in which no other neurosis appears. Hysteria, migraine, drug addiction, the alcoholic habit and other neuroses in the parents are very frequently associated with epilepsy in the children. As had been stated elsewhere, the inheritance of neuroses in general follows Mendel's law.

Alcohol is certainly one of the important factors. The old idea that the child resulting from conception occurring during an alcoholic spree and especially during the drunkenness of the father is predisposed to epilepsy is certainly based upon truth. This is supported by a study of the children born at a time corresponding to various feast-days in certain localities in which drunkenness is usually limited to such holiday periods, and by the finding of a number of individuals in whom a single drunken intercourse resulted in conception. Alcohol given children is one cause of epilepsy. Fortunately the indiscriminate use of medicines containing alcohol or the opium derivatives is not at present permissible.

Epilepsies occurring during early life may be due to injury at birth or to the acute diseases. The cerebral hemorrhage produced at birth has long been recognized as a cause of epilepsy occurring sometimes rather late in childhood. The fact that injury to the cervical spinal column may be produced by abnormal birth processes, or by improper obstetric procedures, is recognized by osteopaths as being an important factor in birth palsies as well as in epilepsy.

Falls and various mental and physical shocks occurring during the first few years of life are probably responsible in some cases. Here again the presence of the spinal injuries must not be forgotten.

Bony Lesions. It is very rare to find a case of idiopathic epilepsy in which there is not a lesion of the occiput or the atlas. Lesions of the other cervical vertebræ, the second to the fourth thoracic, and of the ribs are also described in this connection.

Diagnosis. It is usually not difficult to make a diagnosis of grand mal. The typical grand mal presents the following history:

The patient may have prodromal symptoms for a few hours to a few days before the attack. These usually include vague uncomfortable sensations, some indigestion, sometimes headache and very often a marked irritability of temper; rarely a tendency to somnolence is observed. The **aura** precedes the attack but a few seconds or a few minutes. This may be either sensory or motor. The sensory auræ include olfactory sensations, e. g., a smell of burnt feathers or of violets; gustatory, e. g., a sweetish taste; auditory, e. g., ringing or crackling noises; visual, e. g., a brilliant red light, a sensation as of flames or floating bright specks; visceral, e. g., nausea or hunger. More commonly the aura consists of a vague, indescribable sensation of impending catastrophe. The aura may be sufficiently prolonged to permit the epileptic to lie down and thus lessen the danger of injury.

The **convulsion** begins with a tonic phase, during which all the muscles of the body are contracted and tense; the face is at first pale, later red and then purplish. The sudden contraction of the respiratory muscles produces the typical "epileptic cry." The tonic phase is followed by the clonic, in which the muscles alternately contract and relax in a violent and often disastrous manner. The movements grow progressively less marked and finally cease. The patient regains consciousness within a few minutes or passes into a deep sleep, which may be from a few minutes to several hours in duration.

During the fit the tongue is often bitten so that the blood mixes with the saliva. The forced respirations churn the saliva into a froth which is, of course, sometimes bloody. Urine and feces may be voided, less commonly semen is expelled. When these attacks occur at night the patient may not be aware of his condition. The soiled or wet bed clothing may be the only indication of an attack. In children in whom persistent bed-wetting occurs the possibility of nocturnal epilepsy should be borne in mind.

In grand mal the attacks may come at intervals of six months or even a year, or they may recur so often that there is no interval of consciousness between them. In this condition the term "**status epilepticus**" is used.

The blood of epileptic patients is characterized by high viscosity, diminished coagulation time, and usually an increase in the eosinophile percentage. The hemoglobin and the red and white cell counts are usually normal or slightly above. The water in the blood always seems deficient.

In the intervals between the attacks the urine may be normal. Just before the attack the solids may be considerably diminished. After the attack a small amount of urine, highly colored, usually offensive in odor, with high specific gravity and heavily charged with urates is voided. Blood and albumin are often present, and the

phosphates may be increased at this time. Occasionally there is no change from the normal in the urine.

The blood pressure is usually above normal at all times and increases 10 to 30 millimeters before an attack.

Petit Mal. The occurrence of short attacks of unconsciousness is not infrequently associated with grand mal, though petit mal may exist alone. The attacks may occur at rather long intervals as several days apart, or they may come rather frequently. In one patient in the P. C. O. clinic the attacks came every two minutes for some days. The length of the attacks varies from a second or even less to several minutes. The patient is usually unaware that anything has happened. He may stop in the middle of a word and at the termination of the attack complete the word with no idea that his speech has been at all interrupted. Occasionally a slight sense of dizziness tells him that he has "been away" or "had a spell." The relation between petit mal and the epileptic equivalent must not be forgotten.

Psychic Epilepsy. The cases of psychic epilepsy include some of the most peculiar, and some of the most horrible of all of the crimes in history. From those cases in which the patient, after a slight period of unconsciousness, such as that of petit mal, performs some clownish or illogical act, such as partially undressing himself, or whirling in a circle while he spits very rapidly in every direction, to terrible murders of the Jack the Ripper type, these patients display many absurd and freakish phenomena. One P. C. O. patient had visions in which she visited the home of the Katzenjammer Kids. Occasionally the patient who has seemed to be perfectly harmless during the attacks may suddenly develop a destructive mania. These patients are very dangerous if they become angered or frightened.

Jacksonian Epilepsy. This form is invariably symptomatic. The area of the brain affected can be rather strictly localized by noticing the character of the movements which begin the attack. In this form one certain muscle group, as, for example, the flexor of the index finger, first undergoes tonic contraction, this is followed by flexion of the other fingers and the forearm, etc., until the whole body is in tonic convulsions. This is followed by the clonic convulsions as in the case of the grand mal attack. Sometimes these attacks are abortive, and consciousness may not be lost at any time.

Treatment. The treatment of epilepsy must vary according to the conditions as found upon examination. In idiopathic epilepsy the upper cervical and occiput lesions must be corrected. The diet should be almost exclusively vegetarian, with the addition of milk and the milk products and eggs. Meat, alcohol, tobacco, tea,

coffee, rich pastry, are to be refused absolutely. Excess of starch and of sugar should be avoided. Some epileptics are unable to manage more than a very small amount of fats. Fresh fruits and vegetables, especially raw vegetables, are to be eaten very freely. An increase in the amount of water intake is almost always necessary. A few weeks upon the exclusive milk diet is sometimes advantageous in patients in whom there is pronounced weakness and emaciation.

The condition of the gastrointestinal tract, especially the colon, is important. Dilatation of the stomach, constipation, viscerop-tosis must be treated vigorously. (q. v.) H. W. Conklin considers the ascending colon and the sigmoid especially important. X-ray examination should be used for determining the true condition of the intestinal tract; this gives foundation for rational treatment. Enemas and manipulations directed to restoring the correct structural relations are indicated in most epileptics.

Every effort should be made to remove possible sources of nervous irritation. The presence of eye strain has been discussed pro and con. There is no doubt that epileptic as well as all other persons should be fitted with glasses when the condition of the eyes renders such a course advisable. Adenoids, hardened ear wax, scar tissue in any part of the body, intestinal parasites, anal abnormalities, adherent prepuce or clitoris, and any other sources of peripheral nerve irritation should be completely corrected. Children should be especially guarded from excitement. They should not be sent to the ordinary schools, but should receive teaching under circumstances that preclude the possibility of their being associated with other children at the time of an attack. Drugs are to be avoided. It is true that certain drugs (bromides) commonly used diminish the force and the frequency of the fits, but these invariably increase the mental deterioration and they usually cause more or less of gastro-intestinal and other disturbances.

The patient who suffers from petit mal should be carefully guarded lest some of the psychic phenomena appear suddenly. The patient with psychic epilepsy should usually be placed in some institution where he can be guarded from injury to himself or to others. In Jacksonian epilepsy and also in certain other types of epilepsy in which a history of injury to the skull is secured, surgical procedures are often most helpful. It is necessary to make a careful study of each case in order to decide upon the location and the nature of the operation to be performed. The help to be secured from surgical interference depends greatly upon this procedure being initiated at an early stage. It seems that the recurrence of these attacks for a considerable period of time brings about a degeneration which is more or less widely spread throughout the brain centers.

In symptomatic epilepsy, the treatment depends upon the true cause of the condition. Brain tumors are sometimes operable. The prognosis and treatment in these cases is always that of the underlying cause.

The epileptic character. When epilepsy begins early in childhood, especially after the attacks are frequently repeated, the mental deterioration is speedy and marked. This is probably due to the fact that injury to the cerebral nerve cells is more profound when it acts upon them during the stage of their most rapid development than it is if it acts upon them after the development has reached a fairly stable degree.

When the first attacks begin during late childhood or during puberty, the effect upon mentality is somewhat less marked. In these cases and also in milder cases of very early onset, we have developed a peculiar personality which may be due to the effects produced upon the brain or may be due, at least in part, to the effects of the treatment which epileptics receive from other children and from the grown people with whom they are associated.

The epileptic is almost universally gloomy, pessimistic, egotistical and suspicious. He may love intensely and even with great self-sacrifice. With this he rarely trusts even those whom he loves and is almost invariably subject to furious jealousy. Not rarely the ingenuity and the powers ordinarily called purely mental are excellently developed in epileptics. This is evident in the fact that so great a number of epileptic men and women have been powerful in modifying the course of a history of the world.

"Epilepsy, affecting centuries ago the greatest of the Cæsars, has been present as a human affliction during all the span of human existence. It is recognized as a condition resulting from effects upon the central nervous system, due to abnormally constructed brain elements, the sequence of alcoholic or syphilitic parentage, to fright, injury to the head or a sunstroke, to peripheral nervous irritants such as adenoids, enlarged tonsils, adherent prepuce or lumbricoids or to auto-intoxication of a severe type.

"In this case I have assigned its causes under two heads, accidental and predisposing, and I have chosen to call the accidental as follows:

"1. Forceps delivery, in which no deformity was produced at the time, but which was undoubtedly the cause of a severe lesion, occipito-atloid.

"2. Fright early in her sixth year, due to a narrow escape, while with parents, from being crushed by a train.

"3. A fall from a small cart drawn by a boy, striking violently on her head on a cement walk, no appreciable damage to skull, this occurring two or three months before the appearance of any trouble.

"The predisposing causes were an oversensitive nervous system, reacting to all environal changes, even the most minor and a tendency to gastro-enteritis, with its concomitant nervous influences.

"The lesions presented are an occipito-atloid, previously referred to, in which the occiput on the left is tightly jammed down upon the lateral mass of the atlas and a compensating lateral axis. With these as primary lesions the secondary lesions are alternating lateral conditions at the cervico-dorsal junction and lesions in the lower thoracic and sacro-iliac regions."—C. H. Phinney.

Prognosis. When epilepsy begins early in life, it is usually incurable and dementing. When it begins late in childhood, it may be outgrown by about the age of twenty. When its onset shortly precedes the puberty changes, it may disappear within a few years after the puberty changes are completed. Grand mal has the better outlook; petit mal is more frequently dementing, while the psychic type is almost always dementing. Combinations of types have the more gloomy prognosis; occasionally, however, a petit mal will be followed by grand mal for a few attacks, and this be followed by cessation of the attacks. The sequence is sometimes reversed.

Life is not shortened by epilepsy, until status epilepticus leads to death from exhaustion. The fits prevent patients from engaging in much hard work; rarely they may cause death by accident. Epileptics are usually so egotistical and so selfish that they care for themselves better than normal persons usually do; they may outlive their generation.

Recovery may be expected when some removable cause can be found for the condition, provided suitable treatment is begun at an early date, before brain injury has supervened.

ACUTE CHOREA

(Infectious chorea; Sydenham's chorea; St. Vitus dance; St. Anthony's dance)

Acute chorea is an infectious disease of the nervous system, characterized by the occurrence of awkward, spasmodic movements, especially of the face and hands, and occurring chiefly in children from 5 to 15 years of age.

Pathology. Very little is known of the brain changes in chorea. Degenerations in the lenticular nucleus have been reported. The heart is almost invariably affected. Vegetations are found mostly upon the mitral valve. Cerebral embolism affecting the smaller arteries may occur.

Etiology. The disease occurs most frequently in children after they begin to go to school and before puberty. It is rather rare before the age of 7 or after 20, though cases do occur in very young children and among old people. Although it is probably an infectious disease, hereditary neurotic taint is very common. It would seem that children who descend from neurotic parents have nerve cells less resistant to the action of infectious or toxic agents than those of normal ancestry.

The ordinary infectious diseases of childhood appear to be responsible for a few cases. It is more frequently associated with rheumatism or with tonsillitis than with any other disease. Heart lesions are very common. The diagnosis of chorea is denied by some authors in the absence of evidence of cardiac injury. The place of reflex nerve irritations as a causative factor has probably been overestimated. The infectious agent has not been isolated.

There is some reason to believe that it may be identical with that which produces acute articular rheumatism.

Diagnosis. The disease may follow any other contagious disease, rheumatism or tonsillitis. There is a prodromal period during which the child is extremely irritable and hard to manage, sleep is disturbed, bad dreams are frequent, and night terrors may occur. After a few days, it is noticed that he is very awkward in his movements; he drops things which he has in his hands, may knock the dishes off the table while he is eating and behaves generally in an unusually awkward manner. If he is punished, as is too often the case, the condition grows more rapidly worse, the involuntary and spasmodic character of the movements then becomes evident. Silly grimaces, twitchings of the facial muscles and of the muscles around the eyes and eyelids are usually associated with more or less of a shrug of the shoulders. The hands and feet and sometimes the whole body take part in these spasms. The child may be so seriously affected as to die from exhaustion. He may be unable to swallow and respiratory movements may be irregular. The movements cease during sleep, but they may prevent his being able to go to sleep. In most cases the symptoms are less severe and recovery occurs in one or two months. Those cases in which the fever is high, perhaps 104°, have a worse prognosis. The diagnosis is made upon the symptoms as observed.

Treatment. The treatment of chorea depends upon securing and maintaining the best possible circulation of the best possible blood through the central nervous system. It is equally advisable to pay no attention to the spasmodic movements during the acute stage of the disease. The child should be treated as gently and kindly as possible during the period of his greatest irritability. After the disease has terminated, the movements may persist as habit spasms. In this case the condition should be treated as are other habit spasms or tics.

"The prognosis of simple chorea is good, nearly all cases get well under osteopathic treatment. Some few cannot be cured but can be materially benefited. In those cases where grave nervous diseases are traceable in the ancestry, the prognosis is never so good for an absolute cure."—A. H. Zealy.

CHRONIC PROGRESSIVE CHOREA

(Hereditary chorea; degenerative chorea; Huntington's chorea)

As the name indicates, this is a degenerative disease of the brain, characterized by gradually progressive choreiform movements of the voluntary muscles, by a progressive dementia and by its hereditary nature. It is rare in the United States.

Etiology. Heredity seems to be by far the most important cause of the disease. In "choreic families" normal individuals may occur. The children of these are usually free from the disease, but children who are free from the chorea and the descendants of these are very apt to suffer from epilepsy, hys-

teria, idiocy, the adolescent insanities, or paranoia. Its onset in middle life (rarely before thirty or after forty-five years of age) permits the transmission of the disease in direct heredity, though not usually to many children in one family.

Pathology. A diffuse meningitis which involves both the dura and the pia-arachnoid is usually present. Capillary hemorrhages, which seem to be most marked in the corpora striata, are usually found. Associated with these are various degenerations and atrophies of the cerebral neurones.

Diagnosis. The symptoms and history give the diagnosis. The disease begins in middle life with a change of character, the patient becoming irritable and unstable. Peculiar movements, jerky respirations, changes in speech, appear at first to be the expression of whimsy or eccentricity. The involuntary nature of these movements soon becomes evident. The movements do not often become so severe as to cause injury, as is the case in infectious chorea, but they may interfere with the patient's ability to earn a living. He walks with his legs wide apart, the arms hanging dangling in a jerky way, and the whole gait and habit are often clownish. Indeed it is not improbable that clownishness originated with such patients. The movements disappear in sleep and can be voluntarily inhibited for a short time. Usually after voluntary inhibition, they recur with increased violence. After a few months or a few years, the mentality becomes recognizably diminished and finally complete dementia supervenes. Life does not seem to be shortened by the disease and the patient may remain helpless and demented for twenty years or more, unless some intercurrent malady terminates his pitiable existence.

Treatment. The treatment must be symptomatic. A child born into a family in which this disease has occurred should be kept in as nearly as possible a normal environment, with wholesome surroundings, good food and preferably outdoor life. After the onset of the disease, it is doubtful if anything can be done to prevent the ultimate degeneration. Intercurrent maladies should receive appropriate attention. As soon as the dementia reaches a noticeable degree, the patient should be sent to some institution where he can be made comfortable and kept harmless. Marriage should be prevented, or if members of these families are married, they should remain childless.

The prognosis is hopeless after the disease has become evident.

INFANTILE CONVULSIONS

(Eclampsia infantilis)

The occurrence of convulsions resembling those of eclampsia and sometimes those of epilepsy in children during the first or second year of life is not at all unusual, especially in children of neurotic inheritance.

Etiology. Convulsions occurring in children may be due to a great many different factors. These are always either of nervous or toxic origin, or both. Perhaps the most common causes are intestinal disturbances occurring during the eruption of the first teeth. Convulsions due to this condition usually leave no serious after-effects. The presence of worms in the intestinal tract is also a frequent source of infantile eclampsia. No doubt both the nervous irritation due to the presence of the worms and the absorption of the toxic substances produced by their metabolism are concerned in producing the convulsions.

Acute nephritis in children may produce uremic convulsions. Rachitis is frequently associated with convulsions, which in this case are probably toxic in origin.

Not rarely the meninges become inflamed in the course of the acute infectious diseases of childhood, in which convulsions resembling those of ordinary meningitis are likely to occur. High fever associated with the acute infectious diseases, or with gastrointestinal diseases, may produce convulsions.

Emotional storms in neurotic children frequently cause extremely severe convulsions, and these may be associated with slight capillary hemorrhages into the brain substance. Children who suffer from convulsions upon apparently trivial excitement or emotional shocks are very likely to grow up into hysterical or neurasthenic adults.

Sometimes the fits which appear to be infantile convulsions recur through childhood as true epilepsy. In such cases it is probable that what appeared to be infantile convulsions due to gastrointestinal disorders, was merely epilepsy occurring at that time.

Convulsive attacks in children may be due to organic brain lesion, brain tumors, rarely hydrocephalus, brain tuberculosis, inherited syphilis; or the postponed effects of cerebral hemorrhages caused at birth may be responsible for one or several convulsions occurring during the first few years of life. All of these extremely varied etiological factors indicate that infantile convulsions, as well as epilepsy, must be considered a symptom of some underlying disease.

Pathology. The pathology differs according to the various causative factors. Various degenerations of the motor cortex and the basal ganglia have been reported. Capillary hemorrhages in the meninges and in the brain are sometimes present. The lesions of rickets may be found. The convulsions themselves are probably responsible for minute hemorrhages in the brain and meninges and for the chromatolysis and vacuolization of the motor neurons of the brain and cord.

Diagnosis. The diagnosis of infantile convulsions is easy, for the very fact of the convulsive spasm is rather typical. A child which has been more or less ailing for a few days becomes pale, seems to lose consciousness, the muscles undergo sudden stiffness, and the legs, arms and back become straight; the respiratory muscles are contracted, the breath is held; lips are blue, face is very pale, and this terrifying appearance remains for a few seconds or a few minutes, the breath is caught, face flushes, the child screams, the muscles relax, and the attack is over, or it may be immediately succeeded by another similar attack. Occasionally the muscles remain contracted, respiration is difficult, and pallor is marked for some hours.

The diagnosis of the underlying cause of the convulsion is sometimes very difficult. When the spasm is due to gastro-intes-

tinal symptoms, the history of previous gastro-intestinal disease or of the eating of improper foods may help in the diagnosis. The stomach tube or enema may bring absolute proof of the cause of the disturbance. The recognition of worms (q. v.) in the intestine is sometimes difficult. Kidney disease should be suspected when there has been edema, or when there is a urinary odor about the child. Urinalysis is always indicated. Diagnosis of the acute infectious diseases, rickets or meningitis can be made by applying the tests usual in these conditions. Usually there is something in the symptoms which suggests these diseases. The organic brain lesion may present considerable difficulty in diagnosis. Examination of the fundus of the eye should never be neglected in children who are subject to convulsions without recognizable cause. Blood examination may indicate the correct diagnosis.

Treatment. The treatment of the convulsion itself is rarely difficult. The old-fashioned process of putting the child into warm mustard water is probably the best thing the mother can do. Gentle and prolonged extension of the spine is good. Raising the ribs in the movements of artificial respiration frequently brings the convulsion to a sudden termination. If gastric disturbances are present, it may be necessary to use the stomach tube as soon as the relaxation of the muscles permits. Dilatation of the anal sphincter may terminate the attack, and is indicated when there is reason to believe that worms or other anal irritations are present. When the convulsion is caused by adherent prepuce or clitoris, the relief of this tension may relieve the spasm. In uremic convulsions the treatment as outlined for uremia in general should be employed.

The convulsions due to brain lesion usually do not yield to any ordinary therapeutic methods. In these cases or in severe convulsions due to any other cause, the inhalation of chloroform may be necessary. A very few drops sprinkled upon a handkerchief and held in front of the child's nose is usually sufficient. It is not advisable to permit chloroform to be given by any member of the family as a general thing. Not only is there danger of sudden disastrous results from overuse or improper use of the chloroform, but this poison itself sometimes has a very serious effect upon the liver.

For the treatment of the cause of the convulsion it is necessary to consider the etiology. The underlying neurosis is usually best met by securing increased nutrition and better hygiene and education for the child. Emotional disturbances and especially ill-judged attempts at discipline by nervous and erratic parents must be carefully avoided. Education must be secured by the use of firm and yet gentle measures, always avoiding emotional storms. Organic brain lesions and certain bodily conditions may

best be removed by suitable surgical measures. Proper diet, proper habits of living, the correction of bony lesions as found upon examination, together with the treatment adapted to such other abnormalities as may be found on examination should result in recovery in by far the greater number of these cases.

Prognosis. In any case of infantile convulsions, a somewhat guarded prognosis should be given. While it is true that by far the larger number of these cases recover completely with no ill after-effects, yet it is impossible in any given child to say definitely whether this will be true in his case. The possibility that the convulsion may be the first of a series of epileptic attacks, or that it may be the symptom of some unrecognized nervous disease, must never be forgotten.

TICS

(Habit chorea; habit spasm; motor tic; palmus)

A tic is an involuntary movement occurring in neurotic individuals as the result of some voluntary movement first performed under the influence of a morbid physical or mental condition.

Etiology. Probably a neurotic constitution is necessary to the formation of any tic. Morbid physical conditions affecting the activity of the nervous system in pain certainly act as predisposing factors. Tics may originate from habit as in the case of a limp which persists after a painful injury to the foot or it may originate from some violent emotional state, as the blinking of the eyes after the sight of some terrifying object, or it may represent some of the repressed emotions, such as have been so strongly emphasized by the Freudian school, as in certain forms of tremor of the right hand.

Children are especially apt to have tics develop as the result of imitation of other children, a child with chorea, for example, may set the example of choreiform movements to his playmates.

Diagnosis. It is sometimes rather difficult to decide whether any given movement is a tic or spasm. The tic can usually be imitated exactly, the spasm cannot. The tic disappears with education, either with or without some psychoanalysis. The origin of the tic is in some volitional movement, spasm makes its own appearance. The tic may involve almost any of the voluntary muscles. Functional wry-neck, blepharospasm, grimaces, peculiar movements of the tongue and the mouth, shrugging of the shoulders and many awkward movements of the hands and fingers are forms of tic. Certain types of stuttering and stammering speech are tics.

Treatment. Reëducation is by far the most important factor in treatment. In order to secure cure, the patient must imitate

his involuntary movement until he can perform it voluntarily. If the tic includes speech disturbance, he must imitate his stuttering performance, or imitate very carefully whatever sounds he may have been making. One can refrain from doing only those acts which he is capable of performing. As soon as he has learned to perform the action represented by his tic exactly, he is able to refrain from performing that action. Usually the very learning to do the act results in its inhibition. When there is reason to suppose that an emotional shock or some repressed complexes are concerned in the etiology of any particular tic, some modification of the methods of psychoanalysis may be employed.

GENERAL TIC

General tic is a disease which is characterized by the occurrence of extremely complicated movements, with or without speech disturbances. The mentality is not affected, though imperative ideas and obsessions are not rare.

Etiology. No cause is known for the occurrence of the disease, other than that it is most apt to occur in neurotic individuals or in those of neurotic heredity. It occurs in late childhood, frequently just before the onset of adolescence, and both sexes are about equally affected. The disease generally begins in some of the eye muscles, especially orbicularis palpebræ. Uncontrollable winking is the most frequent first symptom. Various facial spasms follow and then other muscles take part in the convulsive reaction. Various cries, sometimes imitating the crow of the cock, or the bark of a dog, or the sudden and explosive speaking of certain words (coprolalia, echolalia, etc.) may occur. Echokinesis or the tendency to imitate any movement which he sees others perform may result in considerable mental disturbance. The mentality is not affected and the patient usually feels his lack of self-control most keenly.

Diagnosis. The diagnosis rests upon the symptoms as enumerated and is usually not difficult.

Treatment. The treatment is based upon securing the best possible circulation of the best possible blood through the brain and cord. Rest and ordinary good hygiene are important.

Prognosis. The prognosis is very bad for recovery. The most that can be hoped for is to delay the further progress of the disease to some extent. Life is not shortened by the disease. Indeed such patients are apt to live longer than normal people, because they are, by their infirmity, protected from the ordinary infections and accidents of normal life.

PARAMYOCLONUS MULTIPLEX

(Myoclonus multiplex; including also myokymia fibrillary; chorea of Mouvine; myoclonus fibrillaris; multiplex of Kny; electric chorea of Dubini; Bergeron, and Henoch)

This is a disease of unknown etiology and pathology, characterized by sudden spasmodic contractions of muscles which are rapid and do not produce movements of the limbs or body.

Etiology. The disease occurs in families in which the hereditary neuroses occasionally appear. Emotional disturbances, especially fright, are frequently given as the cause by the patient or his family. Similar spasmodic contractions are sometimes associated with idiocy.

Diagnosis. This rests upon the lightning-like character of the contractions, which greatly resemble the effects produced upon a muscle by stimulation with the electric current. The movements may be very frequently up to 100 each minute. There are no symptoms of organic nervous disease and no changes in mentality, the tendon reflexes are increased but slightly and no changes in the electrical reactions have been reported. The disease may be confused with hysteria or with infectious chorea.

Electric Chorea of Dubini is endemic in Northern Italy, and is found in this country only among immigrants. This form begins with pain in the neck. The muscular contractions are marked and may be painful. In a few days to a few months coma appears and death results. It is almost invariably fatal within a few months. In this form meningeal congestion is found, and it is often associated with inflammatory diseases in the lungs or sometimes in other viscera.

Henoch's Chorea may be merely a subtype of infectious chorea. It appears in infants or children and becomes chronic rather than self-limited, as is usual in the infectious type. It may disappear at puberty.

Bergeron's Chorea appears in poorly nourished and anemic children. The progress is about that of Henoch's Chorea.

Tetanic Chorea is a peculiar form of chorea in which the movements are made slowly and somewhat strenuously, as is evidenced by the expression tetanic. This disease is rather rare and is associated with cirrhosis of the liver in every case so far reported.

Nodding Spasms of Infants. This is rarely found in this country. A few hours or a few days after birth nodding movements occur. These disappear during sleep and do not seem to cause the infant any particular discomfort. They may persist for a few months or they may last until the child begins to walk when they gradually disappear.

Treatment. In all of these cases the treatment must be planned towards securing the best possible circulation of the best possible blood through the entire central nervous system. The prognosis is implied in the description of the disease already given.

PARALYSIS AGITANS

(Parkinson's disease; jerking palsy)

Paralysis agitans is a disease of late middle life which is characterized by a trembling of the muscles, increase in muscular tone and progressive weakness.

Etiology. Almost nothing is known of the cause of the disease. There is no reason to suspect any hereditary taint. The disease is likely to occur after a fall, hard work, fright or excitement, or after the occurrence of some infectious disease. Since all of these factors are very common, while the disease itself is rather rare, it is evident that these factors alone are not sufficient to account for its etiology. Bony lesions of the cervical and upper thoracic region are almost universally present.

Pathology. Almost nothing is known of the pathology of paralysis agitans. Atrophy of the cells in the motor cortex, gliosis in the spinal centers, and overgrowth of neuroglia around the spinal arteries have been described. All these changes are found in senility, whether paralysis agitans had been present or not. Similar conditions have been induced in animals by the removal of the parathyroid glands, and there is a certain amount of evidence looking to the thyroids and the parathyroids as being concerned in this disease.

Diagnosis. The diagnosis is made upon the symptoms. The disease begins in the fingers, then extends to the muscles of the arms, the neck and other groups. The increased tone of the muscles gives a certain stiffness to all voluntary movements. This increase in tone is not limited to the trembling muscles, but usually involves practically the entire body. The face assumes a set mask-like expression; all ordinary movements are performed in a stiff and awkward manner; the gait is characteristic—the patient finds difficulty in getting started to walking and his shoulders bend forward, his arms hang stiffly and he walks as if he were being pushed from behind. This effect is emphasized by the fact that the change in the center of gravity of the body makes it necessary for him to walk more briskly. The gait resembles a sort of slow trot.

The mental processes usually are delayed, increased reaction time sometimes is evident even without the use of any particular tests. The simplest question may have its answer delayed for some seconds or minutes. The mentality is usually unaffected, although a recognition of his condition usually causes him to be more or less depressed. One patient in the P. C. O. clinic was so affected in this way that he committed suicide. Usually, however, the depression is much less marked.

Treatment. The correction of the bony lesions as found or the use of movements which increase the mobility of the spinal column in a general way usually lessen the tremor or cause it to disappear altogether for some hours. The progress of the disease is somewhat diminished, apparently, by such treatment. A few cases in the incipient stage have been reported cured.

The affected muscles should be kept at rest. Passive movements and massage are somewhat beneficial. Cold usually increases the stiffness and the tremor. Therefore, patients should

be sent to a warm climate if possible. A long continued warm or neutral bath frequently relieves the trembling for some hours. Rest of body and mind are very important. Members of the family must be warned against any display of impatience when the patient is slow in answering questions, or when he fails to understand as readily as had been his custom.

The neck must receive careful attention. Contracted muscles may interfere with cerebral drainage, or with the circulation or innervation of the thyroid or parathyroid glands. This treatment relieves the melancholy tendencies in many cases. The lower thoracic region, especially the eleventh and twelfth thoracic vertebræ and ribs usually require correction. Normal condition of the liver and kidneys may prevent adverse toxic influences upon the muscles.

Prognosis. The disease does not apparently interfere with the general health, except as the stiffness may be responsible for some accident. Recovery is not to be expected in typical, well-developed cases.

CHAPTER XXXIX

DISEASES OF THE PERIPHERAL NERVES

GENERAL DISCUSSION

The symptoms produced by abnormal states affecting the peripheral nerves depends upon the structure of the nerve trunks and their central and sympathetic relations. The nerve fibers which make up a nerve trunk are three in origin and function. The motor nerve fibers arise from the nerve cells in the anterior horns of the spinal cord; the sensory fibers arise from the cells in the sensory ganglia in the intervertebral foramina, and related cerebral ganglia; the vasomotor and secretory and visceromotor fibers arise in sympathetic ganglia, situated in various parts of the body. The motor and sensory nerve fibers (except the olfactory) are enclosed in a fatty sheath, called the medullary sheath, or white substance of Schwann; this is structureless and its existence depends in some way upon the functioning of the nerve fiber. Around the medullary sheath is a very delicate membrane of connective tissue, the neurilemma. The sympathetic fibers, which lack the medullary sheath, are surrounded by the neurilemma, as are the cerebrospinal fibers. These various fibers are bound into bundles, which are loosely supported and permeated by connective tissues. Blood and lymph vessels for the nutrition of the nerve trunks are carried in the connective tissues; these receive nerves for their control. Sensory nerves also are distributed to the nerve trunks.

Abnormal conditions which affect the vasomotor and sensory nerves of the nerve trunks, *nervi nervorum*—may cause severe pain in the nerves themselves, without causing any interference with the structures innervated by the nerves affected (neuralgia); irritating substances in the circulating blood may affect either the nerve fibers within the nerve trunks (toxic neuritis); or may affect more seriously the *nervi nervorum* (toxic neuralgia); pathogenic bacteria affecting the nerve trunk usually affect all its structure (neuritis due to the infectious diseases); abnormal structural relations, tumors, fragments of bone, callus, gummata, etc., affect first the *nervi nervorum*, causing what is usually called neuralgia, later, affect the ultimate fibers, and pressure neuritis results.

It seems fairly evident that the vasomotor control of the nerve trunks is a function of the spinal vasomotor centers in the lateral horns of the cord, and thus is subject to reflex disturbances, as are other tissues of the body. The neuralgia which results from cold, or from visceral disease, is thus explained. Bony lesions

may cause disturbed vasomotor control of the nerve trunk in this way; the slight congestion may persist and ultimately a true neuritis result.

It is probable that much of the pain caused by visceral disease is due to neuralgia of the somatic nerves, most closely related to the affected viscera in the spinal or lower cerebral centers. Abnormal irritability in any sensory center is apt to be referred in consciousness to those peripheral areas most frequently the origin of stimulation; for this reason sensations arising from visceral disease are often referred to the skin, joints and muscles, innervated from the same segments (referred or reflex neuralgia). Here again the effect of bony lesions may be found; the disturbed sensory impulses due to the tension on the articular nerve endings may be referred to the peripheral areas. The hypersensitiveness associated with bony lesions is often of this type.

The peripheral effects produced by neuritis and neuralgia, such as paresthesias, anesthetics, lesions of the skin, disturbances of secretion and of the growth of hair, paralysis, muscular hypertension and muscular atony, are undoubtedly due, in some cases to the structural injury to the nerve trunk itself, and in some cases to the disturbed action of the spinal or lower cerebral nerve centers; this may in turn be due directly to the neuralgia itself, or, more frequently, due to the same underlying conditions which cause the neuralgia.

From what has been said it is evident that a diseased condition which is, at first a neuralgia, may so affect the circulation through the nerve trunk and perhaps the trophic relations of the fibers, that a true neuritis is produced.

NEURALGIA

Neuralgia is a painful disease of the nerve trunks or their distribution, characterized by varying intensity and location, and by the absence of any constant recognizable anatomic changes.

Etiology. It is due to variations in the circulation through the nerve trunk, or to the presence of irritant toxins in the circulating blood, acting upon the sensory nerve endings. The first factor may be reflex, as in the facial neuralgia due to decayed teeth, eye strain, etc., the sciatica due to rectal or other pelvic disease, and to those neuralgias due to bony lesions anywhere. The second factor may be due to autointoxication of any kind, including copremia; to inorganic poisons, as lead, arsenic, or mercury, or to organic poisons taken as drugs or with foods, as alcohol, tobacco, tea, coffee, or meat used excessively. Generally, poor nutrition causes neuralgia, both from the lack of efficient circulation, and from the products of metabolism, which are usually retained more or less extensively in starvation. Early stages of pressure neuritis

are often wrongly diagnosed as neuralgia. Any cause of neuralgia, persisting, may ultimately cause a structural change in the nerve trunk, often inflammatory, and thus terminate in a true neuritis.

Diagnosis. The symptoms are fairly pathognomonic. The attacks begin as paresthesias which become sharply painful; sensations of heat, cold, boring, cutting, grinding, pricking, stabbing, are variously described. Twitchings, like those produced by electricity, are frequent. Muscular contractions, most pronounced in the deep spinal layers of the segment of origin of the affected nerve, are constant. Vasomotor changes—pallor or flushing—of the area of distribution of the affected nerve may occur. Trophic disorders may include dermatitis and eczematous eruption, urticaria, and others less frequently.

Neuralgia may be confused with neuritis; diseases of the spinal cord, especially myelitis and tabes; meningitis, rheumatism; and disease of the brain.

Treatment. The treatment includes the recognition and removal of the cause in each individual. In any case the pain itself initiates reflex contraction of the muscles innervated by the same spinal segment or medullary center. These muscular contractions tend to cause slight congestion of the nerve trunk and to increase the neuralgic pain; the relief of these muscular contractions, and of whatever structural perversions these may have caused, is an important factor in the treatment of any case of neuralgia however produced. Neuralgia is almost always associated with poor nutrition; though the patient may be obese.

Prognosis. With such modifications in the diet and hygiene as may be indicated in each case and the relief of structural perversions nearly any case of neuralgia will disappear. Those cases due to pressure, by tumors, broken bones, scar tissue, usually require surgical relief; in the case of the callus around a broken bone, it may be necessary to use merely palliative measures until the bone is healed, when the pain disappears; or persists until surgical relief is compelled. In such cases, massage, hot and cold applications may give relief.

Facial Neuralgia. (Tic doloureux, frontal neuralgia.) Neuralgia often affects some of the branches of the fifth cranial nerve, with perhaps greater suffering than in any other location. The pain is often of a twitching nature, superimposed upon a dull, unendurable aching.

Lesions of the upper cervical and upper thoracic vertebræ, and of the mandible, are important factors in etiology and in treatment. Diseases of the teeth, especially at the roots, antrum disease; nasal polyps; middle ear disease; and probably eye-strain, are the most frequent causes of the milder forms; these usually

yield to the treatment already mentioned. Occasionally the neuralgia is due to a degenerative process occurring in the Gasserian ganglion, which in turn may be the result of a syphilitic pachymeningitis, or of arteriosclerosis, and relief is secured with great difficulty. A lowering of the blood pressure (see arteriosclerosis) may afford relief in some cases. Surgical extirpation of the ganglion is a serious operation, but may be inevitable. Destruction of the affected nerve trunk—except the ophthalmic—may be secured by injections of alcohol into the nerve itself. Surgery is only to be recommended after other means fail, and the pain remains unendurably severe. Sometimes it recurs after surgery. Not rarely nothing gives relief until the death of the patient.

Occipital Neuralgia is usually due to carrying heavy loads upon the head or shoulders, or to falls; it is practically always associated with lesions of the occiput, atlas or axis. Rarely spondylitis is found as high as this area. In most cases, correction of the lesions as found gives speedy relief; the pain may recur when the lesions recur, but persistent treatment should result in permanent relief. If the conditions persist, the hair may fall or turn gray upon the affected side.

Intercostal Neuralgia may affect one or more of the intercostal nerves. It may be difficult to distinguish between this disease and pleurisy, especially when the pleuritic adhesions follow the nerve distribution. The lesions of the ribs and the related vertebræ are usually easily found, easily corrected, and the relief of the pain is usually immediate.

Mastodynia is neuralgia of the breast; it is often associated with slight edema, often localized. This arouses fear of malignancy; which increases the pain and tenderness. Vomiting may be associated with the paroxysms. The scar left from an old mastitis may add to the difficulty in diagnosis. The condition is usually associated with rib or clavicular lesions; the correction of these relieves the pain; this and the explanation, relieve the fears of the patient.

Cervico-brachial Neuralgia may affect any of the branches of the cervical or the brachial plexuses. When the pain is bilateral, the trouble may be due to spinal cord disease, or disease of the vertebræ. Neuralgia due to bony lesions of the vertebræ usually affects one arm more than the other; rarely, these may also be bilateral. Lesions of the lower cervical or upper thoracic vertebræ may be responsible; usually rib and clavicle lesions are associated with these. Contraction of the scaleni may raise the ribs, so that direct pressure is exerted upon the brachial plexus. The clavicles may be too low; anterior curve of the neck—"ewe-neck," "bicycle neck"—with tensions upon the anterior cervical muscle group,

may also exert direct pressure upon nerve plexuses. Surgical cases include tumors, scars, and calluses. The treatment is indicated in the etiology.

Sciatica (Neuralgia of the sciatic nerve) is a very severe form, and may be confused with spinal cord disease, tumors of the cauda equina, the pain of tabes and neuritis. It may be due to pressure, as in childbirth, or long sitting in an awkward position; or to severe constipation; or to trauma, in addition to the usual causes of neuralgia. Lesions of the innomines or of the fourth and fifth lumbar vertebræ, or the coccyx are constantly present. Ovarian disease, hip disease, pelvic diseases of various kinds, may cause a reflex pain, with muscular contractions. The treatment is that of the causative factors; rest, with the leg wrapped in cotton, gives relief; the leg should be very gently stretched and rotated, avoiding undue pain in the manipulation. The manipulation of the tissues around Poupart's ligament, as well as those around the sciatic notch and along the course of the nerve, facilitate better circulation and promote recovery. The relief will not be apt to be permanent until the bony lesions mentioned have been corrected.

Coccygodynia, neuralgia of the coccygeal nerves, is most frequently found in women. It may occur in either sex as the result of trauma or of anal diseases. In men it is caused by stone, or by prostatic disease; in women, by ovarian or uterine disease. The coccyx is often dislocated; in recent injuries it may be easily replaced, working with a finger in the rectum and a thumb on the outside, over the coccyx; sometimes old cases are easily corrected; more often the treatment must be repeated for some weeks, until the tissues either become sufficiently relaxed to adapt themselves to the abnormal state, or better, until the bone remains fixed in its normal position. If the joint is flexible, with normal tone of the surrounding tissues, the fact of its malposition is of comparatively small importance. The pelvic lesions should receive proper treatment, and the usual ordinary systemic treatment for neuralgia is indicated in most cases.

Visceral Neuralgia, lumbo-abdominal neuralgia, femoral, obturator and genito-crural neuralgias, affect the nerves mentioned; the examination of each patient reveals the specific causes in each case, and indicates the treatment. These neuralgias are rare, and are often associated with other diseases.

NEURITIS

Inflammation of a nerve trunk, however produced, is called neuritis. When the inflammation is limited to a single nerve trunk it is called "local"; when many nerves, or all the nerves, are

involved the condition is called "polyneuritis" or "multiple neuritis."

Pathology. The inflammatory process may chiefly involve the connective tissue coverings of the nerve trunks; "interstitial neuritis," or it may affect chiefly the axis cylinders, "parenchymatous neuritis." The changes in the nerve fiber, in either case, may resemble those of Wallerian degeneration, or of simple atrophy, or of fatty degeneration.

Etiology. Local neuritis is usually due to local causes—chilling or trauma; lesions associated with arteriosclerosis; extension of inflammation from neighboring diseased tissues; septic foci, bony lesions, and any disturbances of the circulation of the nerve trunks. Multiple neuritis has usually some poison as its cause; alcohol, lead, arsenic or mercury, extrinsic poisons, or the toxic effects of other diseases, as typhoid, syphilis, malaria, influenza, beri-beri—and many others, or the poisons arising from disturbances of metabolism, as in diabetes, gout, pregnancy, arteriosclerosis, pernicious and severe secondary anemias, and the cachexias generally. "Idiopathic neuritis" is that in which no cause of the trouble can be found; such cases are not rare.

Alcoholic Neuritis is usually multiple, and is associated with more or less profound mental disturbances. Other symptoms of chronic alcoholism are usually present. (q. v.) When the mental deterioration includes delirium or hallucinations, with progressive dementia, the condition is called "Korsakow's psychosis" or "syndrome."

Arsenic neuritis is not usually associated with mental changes.

Workers in rubber and silk manufacturers may suffer from neuritis due to carbon disulphide. Frontal headache and giddiness, with the symptoms of a multiple neuritis, should lead to change of occupation.

Saturnine, or lead, neuritis, affects chiefly the muscles, and has little or no pain. "Wrist drop" and "foot drop" are almost pathognomonic; the "blue line" upon the gums, "lead colic," sometimes delirium, "lead encephalopathy," and rarely optic neuritis, may be associated with the neuritis.

Beri-beri is a specific neuritis (see acute infectious diseases).

Senile neuritis occurs in old age, and is probably due to arteriosclerosis.

Diagnosis. The symptoms of neuritis include motor, sensory and trophic phenomena. Pain varies; it may be very severe, especially is this true in local neuritis. The nerve is sensitive to pressure, usually along its entire course. Its area of distribution is hypersensitive, and the tissues around the vertebræ of the segment of origin of the nerve trunk are hypersensitive; this is true whether any bony lesion is present or not. Tactile sensation may be lowered, while the hypersensitiveness to pain and to temperature

changes becomes extremely exaggerated. Anesthesia and analgesia may follow, or may be present from the beginning of the disorder. Motor disturbances include convulsive movements and twitching, which may or may not occasion pain; paralysis may follow the convulsions, or may be present from the beginning of the disorder. Trophic changes include a peculiar shining appearance of the skin, which is usually reddened; thickening of the nails, and dropping or whitening of the hair, or rarely an overgrowth of coarse hair may be found in the area of distribution of the affected nerves. Vasomotor changes include variable pallor and reddenings, and sometimes edema.

Treatment. The treatment depends absolutely upon the etiological factors present in each case, plus such palliative measures as may give relief. In painful cases, the affected area should be well protected from temperature changes, usually by wrapping in warm cotton wool, and by complete rest. Local neuritis must always be treated with complete rest of the affected part, if possible. Very gentle manipulations or none are to be given; massage is to be omitted during the painful stages of any neuritis. It is best to postpone correction of lesions closely related to the affected areas until after the acute pain has disappeared. Just absolute rest and protection is the best thing during the acute stage of neuritis.

After the acute stage has subsided, and in those cases in which the pain is not severe, the course of the nerve trunk from the periphery to the spinal origin should be investigated, and all structural perversions corrected as gently as possible. Corrections of bony lesions must be made in such a manner as to avoid irritation to the sensory nerves, rarely it may be necessary to postpone corrective work until the pain has disappeared completely. The corrections should then be made, in order to prevent later attacks. Complete rest of the affected limbs is important during the entire course of the disease.

The motor changes require especial care. During the convulsive stages the affected parts are to be kept quiet, and every sensory irritation of the entire body avoided. The affected muscles should be well protected from chill, usually by wrappings and cotton wool; these should extend well beyond the affected areas. When paralysis is present, during the acute stage there must be absolute rest. With the subsidence of the symptoms of acute inflammation, passive movements, then active movements and massage should be begun. The muscles are weakened, and overwork is to be avoided. The patient may be able to perform movements while he is in a warm or neutral bath, which would be impossible out of the water; this is an excellent exercise.

Trophic disorders may lead to bed sores; these are avoided by the usual good nursing and baths. A water or air bed is useful in severe cases.

Neuritis which is due to arteriosclerosis should receive treatment for that condition (see arteriosclerosis). Special attention should be given to any possible septic focus. Whatever poison is active should be removed as speedily as possible; alcoholics may have to be brought rather gradually to abstinence; other poisons are to be removed at once, and even alcohol can sometimes be suddenly stopped. Occupational causes must be met by change of occupation. Elimination of poisons is facilitated by thorough correction of the lesions and the reflex rigidities usually present; especially in the lower thoracic and dorso-lumbar region. Baths, enemas, special exercises, are sometimes indicated, according to individual needs.

The following treatment is illustrative:

"As the general system was much run down I advised the use of a nutritious diet, including raw eggs and milk and a liberal allowance of open air. The specific treatment consisted in, first relaxing the contracted cervical muscles followed by gently stretching the shoulder muscles and those of arm and forearm and the ligaments of the shoulder and elbow joints. This was preceded by deep inhibition all along the roots and trunks of the affected nerves, thus permitting deeper adjustive work. The nerves were gently stretched wherever possible. The subluxated cervical vertebræ were adjusted during the second month of treatment. The upper ribs were adjusted."—W. B. Keene.

Prognosis. In favorable cases, the recovery may be complete. When the nerves have been seriously damaged, some anesthetics or paralyzes may remain permanently. The death of the axis cylinders may lead to atrophy or degeneration of the nerve cells of the anterior horn of the cord and the sensory ganglia; later ill effects may follow from these changes. When the inflammatory changes affect the muscles of respiration, death may occur from asphyxia. In the infectious cases, death may occur from heart failure, thrombosis, or exhaustion.

Prophylaxis. The use of arsenic and mercury in the treatment of diseases is much less frequent than formerly; alcoholism is decreasing; modern knowledge of nerve surgery prevents many traumatic cases; the use of poisonous substances in the trades is being constantly more closely supervised and controlled by law; all of these factors should lead to great diminution of the number of cases of neuritis.

NEUROMATA

Nerve tumors are rare; they cause varying degrees of pain and inconvenience.

Amputation Neuromata (stump neuromata) follow amputation of a limb, or section of a nerve. The nerve fibers grow out into the tissues, and often

form bulbous masses, or coiled fibers. They are usually avoided by modern methods of amputation; the treatment consists of surgical excision.

Nerve-Trunk Neuromata are tumors upon the nerves; they may be true or false, and may be extremely numerous. They may occasion no symptoms, or may be painful. The only treatment is surgical; and that is not often satisfactory, on account of the number of the tumors.

True Neuromata include nerve fibers, rarely nerve cells, with connective tissues for support, as in normal nervous tissues.

False Neuromata are connective tissue tumors growing upon nerve trunks.

REGENERATION OF NERVE FIBERS

When a nerve trunk has been cut, or its continuity severed in any way, the fibers degenerate peripherally to their endings, and centrally for one or several nodes. The fibers and the nerve cells of origin undergo certain changes, but do not necessarily die. If the cut ends are brought together, or if the pressure be removed, or other causes of injury be removed, regeneration may occur. This means that the ends of the nerve fibers above the degenerative processes begin to send out fibrils, which ultimately grow into the peripheral remnant of the nerve trunk, and reach the original field of distribution. Function is thus restored with varying degrees of completeness.

In surgical cases, the nerve ends should be sutured. Regeneration begins within a few days, and the fibers grow at an average rate of about one millimeter each day—this is subject to great variation. In cases in which the nerve is injured by pressure, as by tumors, exostoses, and other structural factors, the removal of the pressure may be followed by regeneration only slowly, if at all, and regeneration is less complete than in surgical cases.

Regeneration may be facilitated by correct treatment. The field of distribution of the injured nerve trunk must be kept in normal condition by bathing, massage, and sometimes by electrical stimulation of the muscles left without the normal nerve stimulation. Volitional attempts to move the paralyzed muscles seems to exert a helpful influence upon the motor nerve cells.

CHAPTER XL

DISEASES OF THE CRANIAL NERVES

The **Olfactory Nerves** are peculiar in having no medullary sheaths. They are not often diseased. Inflammations of the nasal membranes may destroy the olfactory nerve endings, in which case olfactory anesthesia or anosmia results—loss of the sense of smell. Injury to the nerve trunks or the olfactory bulbs or tracts may be due to fractures of the skull, brain tumors, or meningitis. Anosmia results from abnormal dryness of the nasal membranes, as in early acute rhinitis, or in disease of the nasal branches of the fifth cranial nerve.

Hyperosmia, olfactory hyperesthesia, may be present in hysteria or insanity, or as a congenital peculiarity. Delicacy of smell comparable to that of wild animals or dogs may be present occasionally in such individuals. Parosmia is often due to partial loss of smell; occasionally as a hysterical symptom it may be pronounced. Olfactory hallucinations are often present as epileptic auræ; they may be present in insanity and in hysteria.

In testing for olfactory variations, it is necessary to employ odorless substances which do not affect the common sensations; ammonia, smelling salts, pepper, act upon the fifth nerve and are useless. Aromatic oils are most useful for such tests. It is necessary to avoid too great stimulation with these, and very small quantities give most accurate results.

Treatment of the olfactory nerve disturbances is usually very unsatisfactory. Hysteria which shows olfactory symptoms is usually obstinate. (q. v). Nasal diseases may be treated; this may relieve the olfactory disturbance to a certain extent. The temporary loss of smell due to acute rhinitis disappears completely, in most cases. In all other olfactory disturbances the prognosis is bad for recovery. Fortunately, olfactory sensations are not essential to life or to comfortable living.

The **Optic Nerves**. Normal vision depends upon the activity of many nerves—the retina and the optic nerves; the sympathetic nerves which control the circulation, nutrition, and the action of the intrinsic eye muscles; and the motor nerves which control the extrinsic muscles. The activities of several brain centers are also essential to normal vision.

The **Retina** is subject to disturbances of several types.

Toxic Amblyopia is most often due to tobacco or alcohol; less often to lead or other poisoning. Central scotoma, especially

affecting the red-green fibers, is usually the first symptom; this is followed by progressive loss of vision. The disturbance may be a retro-bulbar neuritis.

Hemeralopia (day blindness) is characterized by inability to see clearly in a bright light, but vision is very clear in dim light. It may be due to abnormal dilation of the pupil; to albinism, cataract or it may not be possible to find the cause after careful examination.

Nyctalopia (night blindness) is most often due to syphilitic retinitis; less often to abnormal constriction of the pupils, and to retinal fatigue. In this disturbance vision is practically normal in a bright light, but fails completely in dim light.

Retinitis is characterized by progressive failure in vision, and its diagnosis is based upon the retinal examination; this shows the disease before the vision is affected, and should be made as a routine procedure in cases in which the condition is suspected. Albuminuric retinitis may be the first symptom of chronic interstitial nephritis; it may occur in any nephritis. The retina shares and sometimes precedes edema of other parts of the body. Retinal hemorrhages are frequent and may be serious.

Syphilitic Retinitis is usually associated with choroiditis; it occurs late in the disease. There are whitish or opalescent patches upon the retina.

Detachment of the Retina is present in wasting diseases; it is due to diminished intra-ocular pressure or to exudates back of the retina. Heavy falls, blows upon the head, and suddenly produced cervical lesions are causative.

Pigmentary Retinitis is chronic, usually attacks young adults with hereditary syphilis or some wasting disease; it is associated with progressively increasing pigmentary deposits upon the retina, with gradual loss of vision to blindness.

Retinal Hemorrhages occur in many systemic diseases; nephritis, leukemia, purpura; scurvy; pernicious anemia; arteriosclerosis; under conditions associated with high blood pressure, during parturition or muscular strain; it is recognized by the retinal examination. The blood may be absorbed and vision restored, or the injury may be permanent.

Choked Disk (papilledema) is a condition in which swelling or edema of the portion of the retina occupied by the optic nerve in transit causes it to project forward. It is recognized by the retinal examination, and is present in nephritis and in all conditions associated with increased intracranial pressure. It is an important factor in the diagnosis of brain tumor and certain other diseases.

Optic Neuritis is due to the causes of neuritis elsewhere (q. v.) especially to syphilis, alcoholism, and nephritis; mild cases may be due to refractive errors. If the process continues, optic nerve atrophy results. The treatment is indicated by the etiology. Vision may not be changed at first; the diagnosis can usually be made by the retinal examination. Pain is not present.

Optic Nerve Atrophy occurs in multiple sclerosis, and in the parasyphilitic diseases, tabes dorsalis, parietic dementia and tabo-paralysis; it may be the first symptom observed in these diseases. It may result from optic neuritis, may be hereditary, and is present in amaurotic family idiocy. It is characterized by variations in the color sense, followed by gradual loss of vision to blindness.

Destructive Lesion of either optic nerve causes blindness in the corresponding eye, with almost total loss of light-reflex in that eye. Inflammatory conditions of either eye may affect the other eye; for this reason surgical removal of an injured eye is often required in order to preserve the normal eye from injury.

The **Optic Chiasm** is injured by tumors of the pituitary body or by basal meningitis. The decussating fibers are chiefly affected, in most cases, and the result is blindness of the nasal halves of both retinae; so that the patient seems to be looking forward into a tunnel. The macula retains its vision, and its field occupies part of the outermost limit of vision, in both eyes.

The **Optic Tracts** are also affected by tumors and basal meningitis; lesions anterior to the quadrigemina usually affect the motor nerves of the eyeball and sometimes other cranial nerves; a ray of light thrown upon the blind half of the retina in such cases may initiate pupillary contraction. This reaction is not always present. Lesion of either optic tract causes blindness upon the same side in both retinae—bilateral homonymous hemianopsia.

The **Visual Cortex**—i. e., the region of the cuneus and the calcarine fissure—may be injured by blows, fragments of skull or osteomata; thickenings of the dura, however produced; tumors of various kinds, hemorrhage, or softening. When one side is destroyed, bilateral homonymous hemianopsia is produced; when both sides are destroyed, blindness may result, or the macula may escape, leaving fairly good vision for direct fixation. When the neighboring cortical tissue is destroyed, memory for the significance of things seen may be lost; such a patient sees fairly clearly, but without understanding; he cannot read, nor recognize persons; the condition is called "mind blindness." When an irritative lesion, as a throbbing aneurysm, affects the cuneus or calcarine fissure, flickering lights, vague visual sensations of several kinds, are present; when the neighboring or overflow areas are so affected, memories appear as visions, and various visions of angels, dead friends,

etc., may be described very clearly and in great detail. Such occurrences are not rare in old persons, and in early cerebral degenerations.

The motor nerves of the eyeball include both somatic and visceromotor fibers. The visceromotor fibers include those which govern the blood vessels, the pupils, the lens, and the nonstriated fibers of the levator palpebræ and the capsule of Tenon. The centers of the third nerve send fibers which terminate in the ciliary ganglion (sympathetic), and these innervate the circular fibers of the iris and the ciliary muscle. From this and related centers, fibers pass to the region of the upper thoracic spinal segments; fibers from the gray matter of that area pass to the superior cervical sympathetic ganglion, whence the gray fibers pass to the radiating muscle fibers of the iris, to the capsule of Tenon, the nonstriated fibers of the levator palpebræ, and the blood vessels of the orbit. The fibers which reach the eye by way of the upper thoracic spinal segments may be affected by lesions of the upper thoracic vertebræ, and indirectly by lesions of the cervical vertebræ. Thus, functional disorders of circulation of the conjunctivæ and the eyeball; ptosis, unequal and irregular pupils, may be caused; these may lead to later and more serious disturbances of the orbital tissues. Correction of the lesions as found is the only treatment required at an early time, but if the disturbance has been active for months or years, the tissue changes may be so marked that considerable time, and perhaps other treatment, are necessary.

Disease of the nerve centers or of the meninges along which the nerves pass may cause disturbed function of the nerves, either irritative or destructive, as the case may be.

Iridoplegia is paralysis of the muscles of the iris; several forms are described.

Myosis, or contraction of the pupil, may be produced by an irritative lesion affecting the third nerve fibers, or by paralysis of the sympathetic fibers from the upper thoracic segments. It is present in locomotor ataxia; sometimes in tabo-paralysis and parietic dementia. In these cases it may affect the pupils unequally. Tumors, etc., pressing upon the cervical sympathetic ganglion or the cervical sympathetic cord may produce unequal pupils. In any case, the fibers in either pupil may be unequally contracted, so that a "comma pupil" or "feline pupil" is produced.

Mydriasis, or dilatation of the pupil, may arise from irritative lesion of the sympathetics or from paralysis of the third nerve fibers or visceromotor center of the third nerve. Lesions of the upper thoracic vertebræ are most often followed by slight mydriasis; this may be unequal.

Cycloplegia is paralysis of the ciliary muscle; vision is unchanged for distant, but accommodation for near objects is lost.

Accommodation Iridoplegia is characterized by absence of the contraction of the pupils on near vision. The pupils may contract when the lids are closed, or such motion is attempted. It is most often found in paretic dementia.

Ophthalmoplegia Interna is characterized by loss of the pupillary reflexes, both for light and for distance.

Argyll-Robertson Pupil is one in which the pupils change normally to distance variations, but not to light, "light reflex iridoplegia."

The somatic motor nerves are distributed to the extrinsic eye muscles. These may be irritated and thus spasm is produced; or destroyed, when paralysis follows. Functional variations may occur also; usually either twitchings of the muscles or weakness of one or more of the eye muscles is produced.

Lesions of the extrinsic motor nerves occur as the result of syphilitic or alcoholic meningitis, brain tumors, fracture of the base of the skull, and in other less well recognized conditions. The sixth nerve has the longer course upon the meninges, and is most often affected.

These nerves innervate special muscles—the sixth, the abducens; the fourth, the superior oblique; the third, all the others—but the nuclei of these are so intimately related, especially in the control of antagonistic muscles, and in so many cases fibers arising in one nucleus are distributed with the fibers of another nerve, of the same or of opposite sides, that the special symptoms observed do not always indicate the exact anatomical lesions.

Nystagmus is a rapid motion of the eyeballs, due to alternating contractions of muscle opponents. It is rarely a congenital neurosis; and is a symptom in Friedrich's ataxia, insular sclerosis, Meniere's disease, meningitis, and other diseases of incoördination. It may appear temporarily on voluntary movement in eyes with a weakened or partially paralyzed muscle. It is usually present in albinism.

Strabismus occurs when the weakness of any muscle prevents correspondence of the axes. The deviation of the paralyzed eye is called the "primary deviation"; when this eye is fixed, the normal eye suffers from overaction of the corresponding muscle; this is termed "secondary deviation." It does not occur in strabismus due to spasm, and its presence indicates paralysis.

Ocular Vertigo is due to the effect produced in consciousness by imperfect vision, whereby the objects appear farther away than normal, on account of the increased effort required for fixation in partially paralyzed eyes; the incongruousness between the eye

efforts and the information of other senses gives a peculiar and distressing sense of dizziness.

Diplopia, or double vision, may result from strabismus. It occurs also as a neurosis, and in wasting diseases.

The **Fifth, Trigeminal, or Trifacial**, nerve has such a wide area of nuclei of origin and insertion, and its fibers so intricately interlace with the fibers of other nerves, that it is difficult to decide, in any given patient, whether the fifth nerve alone is involved or whether other nerves also are involved. Its broad and long nuclear relations render it very improbable that a nuclear disease affecting the fifth nerve does not also affect other nerves. The nerve trunk may be variously diseased, rarely as a whole, but frequently as one of its branches. (See neuralgia.)

Sensory disturbances of the fifth nerve are varied. Irritative lesions cause various neuralgic pains and paresthesias in the area of distribution. Abnormalities of taste vary in individuals, apparently. Parageusias are recorded in irritative fifth nerve lesions; in other cases with apparently identical pathology, the sense of taste remains unaffected.

Destructive lesions cause anesthesia in the area of distribution of the nerve, or of its injured branches. Variations in the sense of taste are sometimes reported. Injury of the sensory portion of the nerve causes various trophic changes also. Dryness of the olfactory membrane may cause anosmia; dryness of the conjunctivæ may result in injury to the orbital tissues. Corneal ulcers are frequent. Herpes and increased liability to infection result from the loss of sensory impulses, or of trophic control of the tissues.

Irritative motor lesions cause either tonic or clonic spasm of the muscles of mastication. Tonic spasm is most common in tetanus, tetany, and hysteria. The clonic spasms most often occur with other muscular disturbances, as in paralysis agitans, chorea, and general convulsions.

Destructive lesions cause paralysis of the muscles of mastication. The fibers of the fifth which supply the mylohyoid, digastric, and tensor tympani, do not show symptoms when the nerve is paralyzed. It must be remembered that the area supplied by the fifth nerve is overlapped greatly by other nerves, and that there is also much overlapping of the right and left areas of innervation.

The **Seventh, or facial** nerve is the nerve which controls the muscles of expression. It is frequently subject to functional and structural diseases; and the diagnosis of its various affections is usually rather easy.

Sensory disturbances are not marked. Common sensation in the skin and mucous membranes of the lower part of the face

and the mouth is sometimes slightly changed, in lesions of the nerve trunk. Loss of taste is variable, and occurs when the nerve lesion lies between the geniculate ganglion and the beginning of the chorda tympani nerve. Disturbance in the buccal secretion occurs when the lesion lies centrally to the beginning of the chorda tympani; this is usually a diminution of the salivary flow.

Motor disturbances may be irritative or paralytic; paralysis may be of the upper or the lower neuron type.

Spasms of the facial muscles may be either functional or associated with gross lesions. Functional disturbances include the various tics, choreic movements, and hysterical neuroses. (q. v.) Athetoid movements may appear in lesions of the basal ganglia, especially the striata, whether congenital or due to tumors, etc., and are often associated with other localizing symptoms. Variable spasms may be due to injury to the facial nerve as the result of middle ear disease.

The bony partition between the middle ear and the facial nerve is thin, often defective, and is easily penetrated in diseased conditions. The nerve is thus left with only membranes; these may even be destroyed; and only the nerve sheaths are left for protection. Anything which causes variation in the circulation through the ear membranes, such as cold, nervous disturbances, bony lesions of the cervical and upper thoracic vertebræ, extension of infection from the throat or other tissues may thus bring pressure upon the nerve trunk, or permit the infection of the surrounding tissues.

When the pressure thus produced is variable, the spasms vary in intensity and in location. Increasing pressure causes first spasm, then paralysis of muscle fibers or muscle groups, in turn; sensory disturbances and secretory disturbances may also vary, according as the pressure irritates, inhibits, or destroys the nerve. In many cases supposed to be due directly to cold, the middle ear disease is the intermediate factor in the etiological series of events.

Paralysis of any branch of the facial nerve is usually due to injury of that trunk alone; a comparison of the symptoms with the anatomical distribution of the nerve branches will usually give the location of the injury within narrow limits.

Bell's Palsy is lower neuron paralysis of the seventh nerve. It is characterized by flaccidity of muscles, which do not react to reflex stimulation nor to emotional states; and which give the reaction of degeneration to the electric tests. The lips and eyelids drop, and the saliva and tears flow freely, as a rule. After some weeks or months, the paralyzed muscles shrink, causing various deformities of the face. Many of these cases can be completely relieved by early attention to the upper cervical region.

The muscles of expression have little or no bony attachments; and antagonistic muscles are lacking or are not exactly antagonistic; thus the effects of this later shrinking of the muscles is not like that produced in paralyzes of the other parts of the body, where the contractions resulting from paralysis are associated with hypertension of the muscle antagonists. The shrinking of the facial muscles produces a mask-like drawing of the face, so that at first the normal side appears to be the paralyzed one. Attempts at whistling or blowing show the true condition.

Hyperacusia is said to be due to paralysis of the stapedius, in facial nerve paralysis. Probably the effects produced upon hearing in Bell's palsy are more often due to the fact that disease of the middle ear is a common cause of the paralysis rather than that the paralysis itself exerts any marked effect on the intrinsic muscles of the ear; occasionally, no doubt, the latter factor is of some importance.

Upper neuron paralysis of the facial nerve is characterized by increased tension of the affected muscles; the mouth is drawn upwards, the wrinkles are deepened; saliva and tears are normal; reflexes are exaggerated or normal; taste is normal or very slightly affected; emotional states may cause movements of the affected muscles in variable degree or the paralysis may involve the emotional reactions also. Rarely the face alone is involved in upper neuron paralysis; usually the limbs are also included.

Lesion of the pons, taking in the decussation of the nerves, may cause bilateral facial paralysis. Two lesions, affecting the facial centers, may cause bilateral paralysis; occasionally an upper neuron paralysis on one side may be associated with a lower neuron paralysis of the opposite side. Various complicating factors may occur under such conditions.

Treatment. In addition to the usual features of treatment of cranial nerve diseases, the facial nerve should receive attention from the standpoint of the ear affection. Relief of the diseased condition of the middle ear may prevent further development of the paralysis of the seventh nerve, and may permit a return to normal function on the part of fibers which have been affected by the pressure but have not been destroyed.

In cases which do not yield to conservative measures, the surgery of the nerve trunks may be useful. The hypoglossal may be sectioned, and its central end sutured to the peripheral end of the facial; paralysis of the hypoglossal is less serious and annoying; much reëducation is necessary before restoration of normal condition of the facial muscles.

The **Eighth** cranial nerve is composed of two physiologically distinct parts. The **Auditory** portion is stimulated by sound

waves, and is important in conveying these impulses to the brain. Higher cerebral activities depend in great measure upon the sounds received by the auditory apparatus and the nervous effects of these in the central nervous system.

The **Vestibular** portion is stimulated by varying pressure conditions within the semicircular canals, and is important in the effects produced upon the coördinating apparatus. Little information is conveyed by this apparatus, but equilibrium is maintained and the efficiency of certain body movements is secured through the vestibular apparatus.

Deafness may be due to any one or more of a great number of causes. The membrane of the middle ear is continuous with that of the Eustachian canal and the pharynx; infections of this region are readily carried to the ear, with varying subsequent effects upon the otoliths, tympanum, and lining membranes. Injury to the internal ear, affecting the cochlea with the membrane, organ of Corti, and nerve endings may follow middle ear disease, or may arise independently, from hemorrhage, infections, the effects of alcoholism or syphilis. Deafness may be due to involvement of the auditory nerve itself, either within the canal in the petrous portion of the temporal bone, or within the skull. Cerebellopontine tumors often cause deafness; this may be a very early symptom.

Atrophy of the auditory nerve may occur in tabes. Injury to the auditory cortex may interfere with hearing, but rarely causes deafness.

Mind or word deafness is due to injury of the cerebral cortex in the auditory overflow areas—the psychic auditory areas. In this condition hearing is reasonably acute, but the significance of things heard is lost—words are heard, as if they were in a foreign language. A certain degree of aphasia is usually associated with this condition.

Hyperacusis is a condition in which all sounds are intensified. Paralysis of the stapedius muscle allows low tones to be heard with especial distinctness. Neurasthenic individuals are affected uncomfortably by sounds, and complain of their loudness; rarely is audition more efficient in neurasthenia. In hysteria, there is often increased hearing; sounds may be heard and interpreted with greater facility than in normal individuals.

Dysacusis is difficult hearing. It is sometimes applied to partial deafness. It may be due either to middle ear or to labyrinthine disease. When due to middle ear disease, bone conduction is better than air conduction; the tuning fork placed upon the skull can be heard longer than when held near the ear, in the air. When

the labyrinth or the nerve itself is at fault, bone conduction and air conduction are about equally diminished.

Tinnitus Aurium, or ringing in the ears, may be due to a number of very different causes. In anemic or neurotic individuals they appear to be due to an abnormal appreciation of the sounds produced by the circulation of the blood—these are synchronous with the pulse. Noises which are unnoticed by normal individuals may arouse unpleasant sensations; this can be determined by closing the ears, and noticing the cessation of the sounds supposed to be tinnitus.

Hardened ear wax causes varying crackling, ringing, buzzing noises. Other causes of tinnitus, which affect the middle ear or the labyrinth include the effects of poisons, as quinine, alcohol, or certain diseases, otitis media, arteriosclerosis, brain tumor, or aneurysm. Irritation of the cervical sympathetic chain, and bony lesions affecting the cervical and upper thoracic spinal centers, may cause tinnitus, through varying the circulation through the ears or the general blood pressure. Attacks of migraine and epilepsy may be preceded by tinnitus.

Noises due to involvement of the nerve trunk are less common. Irritative injuries to the auditory cortex cause sounds which are usually complex; words, and even long speeches, often associated with visual hallucinations, may be reported by the patient with great detail; he is usually very certain that these have an extrasomatic origin.

Meniere's Disease. Disease of the labyrinth, associated with vertigo and disturbances in equilibrium, usually with tinnitus and partial deafness, sometimes with vomiting, is called Meniere's Disease. It is most common in men past thirty, and is due chiefly to syphilis, alcoholism, gout, senility, or hemorrhage into the vestibule or the semicircular canals. It may be precipitated by gastric disturbance, emotional shock, or blows or falls. A single attack may persist, or a series of attacks may occur; unless the cause is removed, the vertigo, nausea, and other vestibular symptoms persist until the destruction of the affected nervous elements; then the centers for equilibrium and coordination become adapted to the conditions, and no further symptoms are noticed. The deafness becomes permanent.

Similar symptoms may be produced by tumor in the cerebello-pontal region, or by basal meningitis. Other symptoms of meningitis or of tumor should make the diagnosis fairly easy.

Treatment must be based upon the cause of the attack, and upon its severity. The recumbent position may give relief. Thorough treatment to the cervical spinal column, with correction of whatever lesions may be found, may relieve, probably through relieving the congestion in the vestibule. Counterirritants to the mas-

toid may be helpful. If the patient can be kept fairly comfortable until the death of the neurons concerned, his later life is not affected.

The **Glosso-pharyngeal** nerves are so closely related to the other basal nerves, and their areas of distribution are so thoroughly overlapped by the distribution of neighboring nerves, that almost nothing is known of their diseases. Disturbances in taste are due to involvement of these nerves, but individual variations are common, and the fact of disturbed gustatory sense is not conclusive. Its disease is probably always associated with disease of the vagus.

The **Tenth, Vagus, or Pneumogastric** nerve has such intimate relationships with the ninth, eleventh and twelfth cranial nerves that it is practically impossible to make exact ante-mortem diagnosis in cases in which many branches of the vagus, or any complicating factor whatever, are present.

The vagus is subject to the usual causes of basal meningitis and increased intracranial pressure, such as syphilis, chronic meningitis, toxic influences, and tumors. During its course through the neck its proximity to the pulsating carotid modifies the symptoms produced by direct pressure upon the common sheath. In passing through the superior thoracic inlet the nerve trunk may be subjected to pressure by goiter, tumors, aneurysm, anterior curve of the cervical spinal column, and other less frequent factors. Hypertension of the scapular and other muscles of the anterior cervical group may raise ribs and clavicles and may also, by their swellings, diminish the size of the thoracic inlet and exert more or less serious pressure upon the vagus-carotid-jugular sheath. Wounds and surgical operations in the neck may injure or sever the vagus. Neuritis, especially diphtheritic and toxic, may affect it also.

The vagus is peculiar in being only very indirectly and feebly subject to volitional control, yet it is, in all its branches, very urgently affected in emotional, and still more, hysterical, control. It may almost be called the "hysterical nerve."

The **Pharyngeal** branches are intimately associated with the branches of the glossopharyngeal nerves, in the pharyngeal plexus. Spasm of the pharyngeal muscles is usually hysterical, "globus hystericus." Paralysis of these muscles causes various disturbances in deglutition; when the soft palate is paralyzed also, the food passes into the nose. This disease is usually part of a glosso-labio-pharyngeal paralysis, and is usually nuclear. (See bulbar paralysis.)

The **Laryngeal** branches are both sensory and motor. The winding of the left recurrent laryngeal around the arch of the aorta and of the right around the subclavian artery, subjects these nerves to the effects of aneurysm of these vessels; the left nerve

is also affected by pressure from the dilated auricle in mitral stenosis.

Laryngeal spasm is most frequent in children (see laryngismus stridulus). It may occur in adults as part of a general neurosis of various types; in hysteria; as an equivalent for migraine; as a crisis in locomotor ataxia, and under other even more rare conditions. It causes dyspnea, which reaches apparently a severe stage; the accumulation of carbon dioxide finally so affects the respiratory center as to produce relaxation. Death never occurs from asphyxia due to this alone, though in organic diseases of the nervous system or the heart, death may be precipitated by such an attack.

Laryngeal paralysis is usually bulbar and is generally bilateral. Rarely cerebral lesion may occasion upper neuron type of laryngeal paralysis; this is practically never limited to the area of the laryngeal muscles. The weakness of the laryngeal muscles that comes from overuse, as in "clergyman's sore throat" or as part of general weakness, must not be confused with true paralysis of the muscles. In complete bilateral paralysis phonation and coughing are impossible; respiration is unimpeded, though there may be some harshness of the respiratory sounds, due to the relaxation of the cords, perhaps also to some swelling of the mucous membranes. In unilateral complete paralysis the symptoms are variously modified.

Paralysis of the abductors permits the approximation of the cords by the unopposed adductors. Various whistling and stridulous sounds are caused by the long, sometimes difficult respiratory movements. Bilateral paralysis of the abductors may at any time become very serious from swelling of the membranes; asphyxia may be fatal. In unilateral paralysis the voice is hoarse and low; ultimately contractures result in about the same condition as in bilateral paralysis.

Paralysis of the adductors leads to loss of phonation; coughing is normal; there is no strident tone, and no dyspnea. This is usually hysterical; overuse of the voice may result in fatigue that may be practically identical with paralysis. Usually recovery is to be expected upon relief of the etiological factors.

Sensory paralysis of the laryngeal nerves may allow the food to enter the larynx and trachea; aspiration pneumonia or immediate suffocation may result.

The **Cardiac** branches. Irritation of the vagus produces slower heart beat. When the irritation is long continued, the action of the heart reflexes, with the variations in blood pressure thus produced, result very often in an irregular beat. The proximity of the pulsating carotid prevents pressure inhibition of the

vagus, such as may occur in most nerve trunks of the body. Cervical lesions affect the vagus both through muscular contraction and through the reflex action of the centers in the upper cervical cord and the medulla. When both right and left nerves are destroyed the outlook is grave; the condition is rarely recognized ante-mortem, on account of the speediness of death. Most affections of the cardiac branches are functional. (See cardiac neuroses.)

The **Pulmonary** branches are related with sympathetic branches and are distributed to the blood vessels and to the nonstriated muscle fibers of the bronchioles; trophic fibers are not certainly proved. Sensory fibers controlling the action of the respiratory centers are present. Irritation of these nerves causes attacks of asthma. Respiratory movements are influenced by many factors, and are thus of variable value in diagnosis.

The **Gastric, Intestinal, and Esophageal** branches of the vagus have such intimate relations with the sympathetic and the splanchnic nerves, and the symptoms referable to these various nerve trunks and their related centers are so complex, that it is difficult to distinguish between organic and functional disturbances of the different groups. Nausea is caused by irritation of the vagus or its center; vomiting may occur. Bilateral lesion of the vagus causes persistent disturbance of digestion, usually with vomiting of bile, sometimes of feces, with other symptoms of acute intestinal obstruction.

Vagotony is the term applied to a symptom complex supposed to be due to increased action of the vagus. It includes constipation of the spastic type, with attacks of diarrhea and mucous colitis, which are precipitated by slight nervous disturbances, or by drinking hot or cold water. Pain in the colon, very severe just after defecation, is often a prominent symptom. The heart is slow, asthma is often present; variations in perspiration and in vasomotor control are frequent. The treatment is chiefly symptomatic. Reflex causes of disturbed function must be sought and relieved.

The **Spinal Accessory, or eleventh** nerve is composed of two distinct parts; one joins the vagus, and is probably properly considered as a part of that nerve, since it is derived from the vagal nucleus. The other part represents a spinal nerve trunk, and is derived from the upper cervical spinal segments. It is distributed efficiently only to the trapezius and the cleido-mastoid muscles.

Spasm of the second of these, with or without associated spasm of the first, causes wry neck. This is often a temporary condition, as in the wry neck caused by rheumatism or cold. It is then either due to disturbed nerve action, or, more frequently, to a

muscular rheumatism affecting the cleido-mastoid, with other neighboring muscles. Spasms may be present in chorea or in tics. Congenital wry neck is properly a deformity, a shortening of the muscle of the affected side. It may begin primarily as a muscle spasm, with ultimate shortening of the contracted muscle. (See Torticollis.)

Paralysis of these muscles causes the shoulder to droop, and those arm movements which depend upon shoulder-girdle fixation become impossible or difficult. This type of paralysis is always of the lower neuron type; upper neuron lesions affecting these muscles include other muscles also.

The most common causes of organic disease of the eleventh nerve are caries of the upper cervical spinal column, meningitis, or the usual causes of neuritis. The most common causes of functional disturbance are rheumatic, toxic, or the result of emotional disturbances.

The *Hypoglossus*, or twelfth cranial nerve, is rarely affected alone. Irritating lesions cause spasm of the tongue; this is most commonly caused by hysteria, and not by organic lesion.

Destructive lesions result in paralysis; the tongue is drawn to the affected side, by unopposed action of the normal muscles. Nuclear and infra-nuclear lesions cause paralysis with loss of reflexes and muscular atrophy; supra-nuclear lesions cause loss of voluntary movement, but not of reflexes, and without atrophy. Little evil effect follows this paralysis.

PART VIII

THE DISEASES OF THE SKELETAL MUSCLES

GENERAL DISCUSSION

The skeletal muscles are protected by their anatomical relationships from many of the diseases affecting the visceral muscles. Very few of the primary muscular diseases are found in ordinary practice, especially in this country. Anything which interferes markedly with the innervation or the circulation of striated muscles may produce atrophy or weakness.

Toxins or infections of the muscles cause the muscle fibers to lose their striæ; the muscular nuclei may increase in number; and there is usually a multiplication of the interstitial connective tissues. Fat is frequently deposited between the muscle fibers under such conditions. The abiotrophic muscular diseases, like similar diseases in the nervous system, appear to be due to a congenital or hereditary defect of the germ plasm.

Muscles kept contracted by a constantly acting stimulus acquire a peculiar state which seems intermediate between normal muscular contraction and contracture. Doubtless the condition finally terminates in fibrosis. This constant contraction is noticed most frequently in the muscles of the deeper layers of the back, when these are stimulated by nerve impulses reflexly produced by bony lesions or by visceral disease. The muscle becomes stiff on palpation, often with harder knots or cords which are usually very hypersensitive; sometimes the entire muscle becomes hypæsthetic or anæsthetic after long contraction. Rigidity of the spinal areas affected is promoted by these contractions, especially when several spinal segments are involved.

The affected muscles are weaker than normal; they tend to recur to their contracted state after relaxation, and it appears very probable that they are responsible for the perpetuation of bony lesions, and for their recurrence after correction. It is evident that normal sensory stimulation does not arise from muscles kept unduly tense; thus, they are at least partly responsible for the diminished activity of the nerve centers of the corresponding spinal segments. Such muscular tension is properly called a "muscular lesion."

Bony lesions are frequently found responsible for weakness of individual muscles or for muscle groups, but not, so far as our present knowledge goes, for true muscular disease.

CHAPTER XLI DISEASES OF MUSCLES

ACUTE POLYMYOSITIS

(Infectious myositis)

This is a rare disease, probably due to the presence of some unknown infectious organism. It is a true inflammatory process, characterized by hyperemia, swelling, pain, and edema of the muscles. Leucocytic infiltration is present in the muscle.

The muscles of the arms and legs first become hard, swollen, painful and stiff; later, the muscles of the face and trunk become involved; swallowing and respiration become difficult; and death usually occurs in a few weeks in the acute form. Rarely the acute form of the disease may become chronic and death be delayed for two or three years. A low fever is usually present during the earlier stages.

The treatment is unsatisfactory, on account of our ignorance concerning the true cause of the condition. Such treatment as seems to be indicated by the condition of the patient at the time of the examination may be given as a palliative measure. The treatment which generally increases the resistance of the body to infection is indicated on general principles. Rest in bed, a non-purin diet, with very free water drinking, are perhaps the most useful factors in the treatment.

MYOSITIS OSSIFICANS

Two forms of this disease are known. The local form is due to irritation of single muscles, or muscle groups. It is present in horse-men as the result of the pressure of the saddle upon the legs; it occasionally affects the muscles of the shoulders in men who carry heavy burdens upon the shoulders. In this form the muscles affected undergo first the changes characteristic of acute myositis, with marked overgrowth of the interstitial connective tissue. The scarlike tissue thus formed undergoes slowly progressive calcification.

General, or systemic, myositis ossificans is a rare disease, characterized by the spontaneous occurrence of bonelike growths, involving mostly the musculo-tendinous areas. The cause is unknown. No history of heredity or syphilis is present. It appears usually before the tenth year of life.

The muscles affected, usually first of the shoulder or pelvic girdle, become slightly swollen, stiff and painful; a small hard lump appears, which may reach the size of an orange; the calcification extends along the tendon and the muscle, following the connective tissue trabeculæ. The muscle does not become paralyzed, but movement of the neighboring joint becomes impossible on account of the ossification of the tendons. In this type the tumors resemble newly formed bone.

It is rare for life to be prolonged beyond the twentieth year. Death occurs either from some intercurrent disease, or as the result of suffocation due to the involvement of the respiratory muscles.

SECONDARY MUSCULAR DISEASES

Rheumatic Myositis. Rheumatic myositis is an inflammation of the muscles due to the bacteria which cause other rheumatic diseases. (q. v.)

Suppurative Myositis. Suppurative myositis, or muscular abscess, may be due either to the infection of a wound or to septicemia. The diagnosis of this condition rests upon the pain, leucocytosis, and other symptoms of pus formation. The treatment is surgical.

Gouty myositis is a painful chronic inflammation of the muscles associated with systemic gout. (q. v.)

Trichiniasis. Trichiniasis (q. v.) often involves the muscles. The diagnosis rests upon the history of pork eating, the character of the pain, marked eosinophilia, and sometimes a microscopical examination of an excised bit of muscle. The treatment is symptomatic, and the prognosis may be very serious.

Paralysis of the Striated Muscles without Atrophy is due to some lesion of the upper neuron system.

Paralysis, or Weakness, of the Striated Muscles with Atrophy may be due to injury to the muscle itself as in the primary muscular diseases, to diseases affecting the motor end-plates, to disease of the nerve trunk, or to disease of the anterior horns of the spinal cord. These conditions are discussed in connection with the diseases of the nervous system.

Arthritic Muscular Atrophy. After the occurrence of arthritis anywhere in the body, the muscles which move the affected joints undergo a variable amount of atrophy. This type of atrophy is not associated with the presence of any hypertrophic fibers and with only slight increase in the interstitial tissue.

It seems to be due to some reflex trophic effect, resulting from the irritation of the sensory nerves distributed to the articular

surfaces, with the subsidence of the inflammation in the joint. The muscles may regain their normal size and strength. Occasionally the atrophy persists and secondary contractions occur which may resemble those found in anterior poliomyelitis.

THE MUSCULAR DYSTROPHIES

This group of diseases affecting the skeletal muscles includes several subdivisions, all of which are characterized by the importance of heredity in their etiology; by the appearance of the disease before puberty; as a rule, by the fact that a certain amount of hypertrophy is associated with the atrophy; and by the lack of recognizable nerve lesions.

No treatment appears to be of any value in preventing the ultimate fatal outcome, though in some very mild cases the after-history of the patient may not be seriously modified by the occurrence of this disease in early life.

Myotonia Congenita (Thomsen's disease). This is a familial disease of the muscles, characterized by the following symptoms: When the patient attempts any movement, after a period of rest, the muscles affected contract strongly and do not relax for a considerable interval; the next contraction is followed by a somewhat diminished contracture period; the third, by a still less prolonged tonic contraction; until finally the patient becomes able to perform the motion which he had first decided upon. This series of events is repeated whenever the patient endeavors to begin any complex action, as in walking. Sometimes the attack is so severe as to throw him to the ground, more frequently there is merely difficulty in getting started.

The visceral muscles are never involved. Mental disturbances may be present. Reflexes are slightly modified or unchanged. Muscular weakness is noticeable, though the muscles may be normal or considerably increased in size. Electrical reactions are changed (myotonic reaction).

A similar atypical disease may occur without hereditary basis; its cause is unknown.

The attacks are made worse by exposure to cold and by emotional excitement. Treatment is practically useless. It does not greatly shorten life, but recovery is not to be expected.

Pseudohypertrophic Muscular Atrophy, or pseudomuscular hypertrophy (Duchenne) is a form of the disease which is characterized by its first affecting the muscles of the calves of the legs. This comes on rather slowly as a hypertrophy and may at first be considered evidence of the child's excellent health. There is usually a lordosis, which exaggerates the deformity. The muscles are very weak, even when the size is much greater than nor-

mal. Other muscles of the body, including the trunk and respiratory muscles, become affected and death occurs from cachexia.

Occasionally this form of muscular atrophy is associated with epileptic attacks and with mental defect.

Leyden-Moebius type. In this form of muscular atrophy the hypertrophy is not apparent, and the hereditary influence is even more marked. Otherwise, the disease is like that just described.

The Scapulohumeral type has been described by Erb. It comes on later in life, even up to the age of twenty, and affects first the muscles of the shoulder girdle.

A peculiar wing-like position of the scapulæ results from the atrophy of these muscles. The disease extends to the leg and trunk muscles, and death occurs as already mentioned.

Facioscapulohumeral type (Dejerine-Landouzy). This disease is especially characterized by its onset in about the third or fourth year, affecting first the muscles of the face. The disease affects then the shoulder, leg and trunk muscles. This form of the disease is very slow in its progress and patients may live to be thirty or forty years old.

Atrophic Myotonia. This is a rare disease characterized by abnormally slow relaxation of certain muscle groups after contraction, and by the occurrence of atrophy in the muscles affected.

Oppenheim's Myotonia. In this disease the muscles undergo flaccid paralysis with loss of the reflexes. It does not shorten life and is incurable. The muscles atrophy and the patient becomes helpless. Massage of the affected muscles and electrical stimulation seem to delay somewhat the course of the disease. Some relation between the thymus gland and this disease has been suggested.

Myasthenia Gravis. This is a rare disease of unknown etiology. The muscles of mastication, speech and deglutition are involved, and also the extrinsic eye muscles. The disease is characterized by very rapid fatigue, which is inherent in the muscle itself, rather than in the nervous control. Dyspnea, dysphagia, and ptosis of the eyelid are noticeable symptoms. Death occurs from exhaustion, or the patient may be strangled while trying to swallow.

Dysbasia Lordoca Progressiva (Tortipelvis). This is a disease peculiar to Jews, which appears in children and young adults. Muscular spasms of the lumbar and pelvic region cause a deformity of this part of the body. There is marked lordosis of the dorso-lumbar spinal column. There are no signs of organic disease of the nervous or osseous systems. The terms "monkey gait" or "dromedary gait" have been applied to this condition.

FUNCTIONAL MOTOR DISTURBANCES

The different varieties of chorea, spasm, tic and tremor are generally considered functional or idiopathic. It is needless to say that the use of these terms is merely a confession of our ignorance of the structural or biochemical changes which must necessarily be present in every disease. The term spasm is applied to those muscular contractions which result from some irritation in the lower reflex arc. True spasm is involuntary and is not to be controlled by any process of education. The choreiform movements resemble, to so great an extent, the movements resulting from pathological changes in the basal ganglia, especially in the lenticular nucleus, that it may be granted that these movements are due to the irritation somewhere in the higher reflex arc, including perhaps the pontine centers as well as the basal ganglia. Tic, or, as it is sometimes called, habit spasm, results from the repetition of complicated movements. These are involuntary in the beginning and are often initiated under some emotional strain. Reeducation is often efficient in dealing with these cases. The seat of the disturbed function in the tic is probably in the deeper layers of the cerebral cortex where other habitual unconscious actions are controlled.

All of the functional motor neuroses having a certain degree of hereditary taint rest upon the presence of a neuropathic constitution. In all of them, the treatment must include the measures necessary to secure good nutrition, good elimination, rest and wholesome, sane, hygienic life for the patient.

Primary Athetosis. This is a rare functional disease, characterized by the occurrence of slow athetoid movements of the hands. It occurs in late middle life or old age and is not associated with mental deterioration. Only after organic lesions of the brain and especially of the corpora striata and optic thalamus have been eliminated can a diagnosis of primary athetosis be made. No treatment affects the course of the disease. It persists throughout life, which it does not seem to shorten.

Senile Tremor. This occurs in old people frequently at the age of 70 or thereabouts. The fingers and thumb are usually held straight, at right angles to the hands, and the tremor involves both fingers and hand and occasionally the neck muscles are affected, so that the patient constantly nods his head. The condition is not associated with any mental peculiarity and the only pathological conditions are those characteristic of old age. No harm results from the condition and no treatment is of the least avail in controlling it.

Toxic Tremor. Alcohol or tobacco, lead, mercury and certain other metallic poisons or the organic poisons or auto-intoxication may all act upon the nerve centers as to produce a rather irregular

tremor. The condition disappears with the elimination of the poison.

PERIODIC PARALYSIS

(Family periodic paralysis)

This is a family disease of rare occurrence in this country, characterized by the occurrence of almost or quite total paralysis, from which the patient rather speedily apparently recovers.

Etiology. The disease is always hereditary. It appears to follow Mendel's law, though the number of cases on record is not sufficient to prove the law by exact numbers.

The individual attacks may occur without recognizable cause, but they are frequently precipitated by muscular exertion or by overeating.

Pathology. Almost no structural changes are constantly present. An examination of the muscles sometimes shows slight vacuolization with occasionally a hypertrophied cell. In some cases no changes in either the muscles or the central nervous system are to be found upon the most careful examination.

The diminished excretion of the calcium and magnesium salts in the urine seems to be fairly constant. It has been suggested that the paralysis is due to the excess of these salts thus retained within the blood which inhibits the action of the nerve and muscle cells.

Diagnosis. The symptoms and history are fairly typical. The family history shows the hereditary taint, while the history of previous attacks with recovery should make the diagnosis certain. There are prodromes usually of a vague discomfort. The patient goes to sleep and awakens completely paralyzed. Occasionally the paralysis is not quite complete, but it usually involves all four limbs. Speech, the sphincters, the respiratory muscles and deglutition are not affected. The reflexes are clearly diminished or may be absent. The muscles do not usually contract in answer to the electric current. The heart is frequently found dilated on examination during an attack. This disappears with recovery. Examination of the urine shows some albumin, some blood and occasionally some hemoglobin.

The attack lasts a few hours to a few days. Then a very profound perspiration occurs, followed by weakness, sometimes sleep and a gradual recovery. During convalescence the muscles are very weak and strength is regained only after some days or weeks of gradual improvement.

Treatment. The treatment is devoted to preventing attacks. Overeating, constipation, undue muscular exertion, are to be avoided. The correction of such bony lesions as may be found on examination should be of value in securing good nutrition and good elimination.

Prognosis. The prognosis is bad for complete recovery; is very good for recovery from any attack, and is bad for the descendants of the individual. Marriage should be prohibited.

PART IX THE INFECTIOUS DISEASES

GENERAL DISCUSSION

This group includes a number of diseases which have many factors of etiology and treatment in common. All of them are infectious and most of them are due to bacteria. It is quite possible that protozoan agents may be present in some cases. All owe their presence to some form of uncleanness. They are a disgrace to modern civilization. Children, with their gregarious habits in regard to the use of pencils and chewing gum, transmit disease germs from one to another with truly remarkable celerity. Even with such facilities for the transmission of infectious agents comparatively few children contract these diseases, even in an epidemic. This fact is due to the immunity of the resistant children.

Immunity depends upon many factors. Certain diseases confer immunity to succeeding attacks—this is the basis for certain types of so-called preventive medicine. The blood serum and the white blood cells appear to be actively bactericidal. The skin and the membranes lining the body cavities are normally impermeable to bacterial invasion. (A very few pathogenic bacteria are persistent and able to live upon normal body tissues and fluids.)

The skin and mucous membranes resist bacteria only so long as they are intact. Diseased tonsils, decayed teeth and abrasions are important gateways for the entrance of pathogenic bacteria into the body. The value of the blood as a factor in immunity is diminished when it does not circulate freely or when it contains certain toxic elements.

The lymphoid tissues are important agents in immunity. Normal tonsils are included with the spleen and lymph nodes.

The place of bony lesions in lowering immunity depends upon the relationships already stated. Lesions of the upper thoracic and cervical regions predispose to infection of the mouth and the upper respiratory tract. By lowering the resistance of this area of the body infectious agents may gain entrance into the body and produce systemic disease. This is especially the case in scarlet fever, measles, diphtheria, and a number of other acute infections. The fifth thoracic to the first lumbar spinal segments control the action of the liver, spleen, pancreas and the gastrointestinal tract. "A rigid lower thoracic spine is an important factor in lowering immunity and vigorous treatment to this spinal

area to the liver and spleen raises the body resistance."—C. A. Whiting.

General immunity is lowered through poor nutrition, the retention of bodily waste, reduced alkalinity of the blood, fatigue and overwork, lack of sleep, lack of exercise and of fresh air, disturbed digestion, harmful emotions, especially fear, and the after-effects of many drugs, including serums used in therapy. Almost any one of the acute infections lessens resistance to other acute infections and to tuberculosis.

Treatment. Any child who is sick should be separated from other children until the noninfectious nature of his malady is evident. Especially during an epidemic no sick child should be allowed to be with other children. The stringency and length of the time of quarantine depends on the nature of the disease after diagnosis becomes possible. The prodromal symptoms are very much alike for all the exanthematous diseases; therefore it is not possible to make a certain diagnosis until after the disease is easily transmissible. During this stage the treatment should be thorough. The entire spinal column and the ribs should be examined, and all lesions, bony, muscular, or other, corrected. Solid food should be stopped immediately. Fruit juices and plenty of water should be freely given. If the child is very hungry he may be allowed to eat raw apples, lettuce or other cellulose foods. Berries with seeds, starch, sugar, meat, eggs are to be denied. If either diarrhea or constipation is present an enema is to be given. Many doctors advise the enema of normal salt solution as a part of the routine procedure in all cases. The child should be kept in a warm, well-ventilated room and be dressed very lightly. He should be put to bed as soon as the temperature goes above 100°. He may play quietly, playthings must be burned upon his recovery. All rugs, hangings, etc., should either be removed or should be such as can be thoroughly boiled after the child has recovered. Pictures should be removed from the room or should be burned later. During convalescence books, pictures and inexpensive toys should be provided which can keep him busy and happy and can be burned at the termination of quarantine.

The fever can usually be lowered by a few minutes' steady pressure between the transverse processes of the eighth to the eleventh thoracic vertebræ or over the suboccipital triangles. This pressure should be given after the ordinary treatment. In the intervals of treatment, cool baths lower the temperature. The patient may be placed in the tub of water at about the body temperature and cold water added to about 80°. The patient may lie in this bath from two minutes to thirty minutes, according to his comfort and the effect produced upon the body temperature. A sponge bath is better under many circumstances. This should

be slowly given with water at or slightly below the temperature of the body. Only a small area of the body should be exposed unless the temperature of the room is high.

The odor associated with exanthematous diseases can be somewhat relieved by adding a few drops of carbolic acid, creolin, soda or borax to the bath water. Plentiful ventilation is important. An open ammonia bottle or smelling salts may give relief.

The itching and burning of the skin can be relieved by the addition of the substances already mentioned to the bath water, and by ointments of cold cream, white vaseline, etc., to which may be added talcum powder, starch, small amounts of soda or boric acid, zinc oxide. Powders should be used over moist or weeping surfaces. These may be of browned flour, corn starch, talcum, or any other smooth powder. To any of these may be added small amounts of boracic acid or soda. Lotions may be applied with a soft cloth. Strips of gauze may be soaked in these and laid over the areas of greatest painfulness. Lotions are made of water with a little alcohol or glycerine to which is added a small amount of carbolic acid, creolin, zinc oxide, powdered calamine or any other slightly antiseptic or bland soothing constituent. Any lotion which does not injure the skin and which feels good may be used for this purpose.

Most of the exanthematous diseases have a tendency to infect the conjunctivæ and thus lead to serious eye troubles. It is difficult to avoid light and also to have suitable ventilation in the room. Ventilation is of urgent importance. It is better to shade the eyes with dark glasses or in some other way and to have good ventilation than to darken the room at the expense of fresh air.

The patient should receive thorough osteopathic treatment twice each day in the beginning of the disease, then once each day until convalescence is established. He should receive careful examination after recovery is complete in order that any sequel may be speedily recognized and treated.

After the fever goes down the patient is usually very hungry. His diet should be largely of fruit and vegetables with milk, eggs, broths, according to his age and general habits. Too speedy a return to the mixed diet may result in digestive disturbances. Too much meat or other concentrated food may add to the danger of kidney disturbances. Too speedy a return to ordinary activity may throw too great a burden upon the heart and permanent valvular injury may result. Deficient ventilation during course of the disease and carelessness in clothing or any exposure to the weather during convalescence increases the danger of pulmonary complications. It is much better that convalescence be prolonged a few days than that permanent heart, kidney or pulmonary diseases should be allowed to occur.

"To correct bony lesions in acute diseases, the physician must take time and care, as the patient is suffering and not in a mood to be handled quickly or roughly. The correction of the bony lesions is not so difficult when the condition and position of the abnormal structure are clear in the physician's mind. When the lesion is corrected with the proper ease, the physician will feel the movements of the abnormal structure slide or slip into place so easily that it is oftentimes surprising.

"The question might arise: 'Is it safe to correct a bony lesion in a severe acute disease when the patient is suffering, temperature high, and all things point to a severe toxic condition, as the system is under a severe strain due to accumulation of the toxic poisons?' One thing we need in a case like this would be harmony, not only of structure, but normal physiological functioning as well. Therefore, let us correct the lesion. We may have to relax the unequal muscular contraction which not only tends to maintain the lesion, but also produces a tension which interferes with the normal nerve forces as well as the blood and lymphatic system. The object is to procure normal action and function of structure as well as to assist nature in producing a normal physiological action. The amount, length, and technique of your treatment must be determined by the condition of the patient."—E. R. Proctor.

Prophylaxis. If every child who is sick could be immediately isolated from other children until the diagnosis is made it would go a long way to stop the spread of contagious diseases. Children at school must be taught to keep things out of their mouths and to wash their hands before eating. This is a hard task. The old idea that children must at some time have the diseases called "children's" is a dangerous fallacy and one which is responsible for many deaths and a very great number of chronic invalids. Children should be protected from even the mildest of these diseases very carefully. Every one leaves a gate open for its successor and tuberculosis is usually ready to enter at any gate. The typical course of the disease as generally described is greatly modified by early, frequent and vigorous treatment which always should include the increased mobility of the lower thoracic spine and raising of the lower ribs. Other treatment depends upon the conditions as found at examination, and should include correction of vertebral and costal subluxations, as well as of other structural perversions wherever possible. In every case the urine should be tested for albumin, sugar and the microscopical findings every few days. The heart should be watched during every acute disease. With the first appearance of albumin or casts or kidney epithelium in the urine the treatment for acute nephritis should be begun. With the first sign of cardiac complications treatment for pericardial and endocardial diseases should be added to that already described for exanthematous. In this way the usual sequelæ may be avoided.

The most common diseases due to bacilli are tuberculosis and leprosy, due to acid-fast bacilli; typhoid and typhus, affecting chiefly the intestinal tract; influenza, pertussis and diphtheria, affecting chiefly the respiratory and pharyngeal areas. The diseases due to cocci include pneumonia, meningitis, infantile paral-

ysis, erysipelas and rheumatism. Spirochætes are responsible for relapsing fever and syphilis.

Diseases which are usually contracted from animal associates include plague, hydrophobia, tetanus, and others less frequently. Many of the most serious of the infectious diseases are due to agents not yet recognized. Mallory's studies of scarlet fever should be mentioned. Recent development of routes of travel, which no doubt will become freely accessible at the close of the war, render the tropical diseases of greater interest than heretofore. The protozoan diseases are of especial interest because of their frequency and malignancy in tropical countries and the possibility of their becoming acclimated among us.

CHAPTER XLII

TUBERCULOSIS

Tuberculosis is an acute and chronic infectious and contagious disease caused by the bacillus of tuberculosis, characterized anatomically by the formation of nodular bodies or diffuse infiltrations, and clinically by symptomatology varying with the tissues or organs involved.

Etiology. The essential immediate cause of the disease is the tubercle bacillus. This organism, almost omnipresent, is rather more plentiful in the northern latitudes.

The most important predisposing factor is the bony, muscular, or ligamentous lesion. Practically every person who suffers from any tubercular infection has diminished flexibility of the lower thoracic spinal column. The nature of the lesion varies as does the tubercular process, but the most frequent condition is the characteristic straight spine, infantile chest and flat interscapular region with drooping and immobile ribs.

"The spinal outline characteristic of tuberculosis and of the pretubercular stages presents the following peculiarities: The cervical spine presents various abnormalities, usually lesions involving single vertebræ and associated with irregular muscular tensions. The upper thoracic spine is anterior, the ribs drooping and rather more freely movable than normal; the vertebral articulations are less movable than normal; the tissues in the neighborhood of the upper two or three dorsal spines are abnormally sensitive and the muscles innervated from these segments are contracted irregularly when the disease involves the apices. The lower interscapular region is found sensitive and these muscles are contracted when the lower lobes of the lung are involved, and the location of these sensitive areas may be employed in the localization of the lung area infected.

"In every case recorded in this clinic, lesions involving the area of the origin of the upper and middle splanchnic nerves have been found. The typical tuberculosis spine must include lesions of the lower dorsal area. Probably these lesions are predisposing factors in tuberculosis, partly because of the effects produced upon nutrition thereby, but doubtless the lack of the normal mobility of this part of the spine prevents the normal stimulation of the liver, the spleen, perhaps the pancreas, thus the normal opsonic index is lost, and immunity broken. The treatment of tubercular cases should include careful attention to the splanchnic area, the maintenance of the normal mobility and structural relationship of the entire spinal column, and such stimulating movements to the ninth and tenth thoracic neighborhood as is indicated in each individual case."—C. A. Whiting.

The immunity lowered and the bacilli within the body, the area ultimately affected depends at least to some extent upon the existence of the bony lesions and their effect upon the circulation of the blood and the nutritive condition of the different parts of the body.

Lesions responsible for the hospitality of certain tissues to tubercular invasion vary according to the locality affected. Lesions of the upper thoracic spine and upper ribs are present when the first injury is to the upper lobes of the lungs, as is so often the case. Lesions of the midthoracic region are associated with injury to the middle and lower lobes of the lungs. Laryngeal tuberculosis is more frequent in those who have also lesions of the cervical vertebræ, and contractions of the cervical muscles, as well as lesions of the upper thoracic vertebræ.

Intestinal tuberculosis is associated with lesions of the lower thoracic spine, as is tuberculosis in almost any part of the body; in this case the general lowering of the bodily resistance is associated with the specific area involved. Why it is that the intestinal tract so often escapes is not easy to determine.

Kidney lesions are associated with disturbances in the vertebræ and neighboring tissues of the eleventh and twelfth thoracic segments, from which arise the vasomotor nerves to the kidneys, and the secretory nerves to the suprarenals. So it is everywhere—in almost every case efficient factors are usually found which are more or less responsible for the presence of the disease in the organs affected. Naturally, the correction of these lesions as found is important; naturally, also, this correction must be made in such a manner as to prevent injury to the tissues already so seriously diseased.

Bad air, poor nutrition, lack of sunshine and exercise are also most important predisposing causes.

"It is a well-known fact if there were no tubercle bacilli there would be no tuberculosis; also if there be no suitable soil there would be no tuberculosis.

"The fact still remains that humanity has not yet become civilized to the point of cleanliness, and so long as part of the human race persists in living in filth and spreading it broadcast human beings will pay the penalty with a wrecked body and too often death from tuberculosis."—W. J. Hayden.

No age is free from the disease, though it attacks the young rather more frequently than the old. In young subjects the bones and bronchial lymphatics are most liable to be invaded. From puberty to middle age the disease attacks the lungs most frequently, while in old age the intestines are rather more frequently attacked.

The sexes are about equally affected throughout life. Pregnancy is a cause of acute exacerbation of the disease, but probably not of its first appearance. No races seem to be exempt. Negroes are very susceptible. Its ravages are especially severe among savages who have become sufficiently civilized to dwell in houses. Jews are frequently supposed to be almost exempt, but in large cities where Jews of the poorer class are herded together in tenements, tuberculosis is very prevalent. Generally speaking the poor

are more subject to the disease than the rich on account of the poor nutrition and imperfect sanitation of the former.

Occupations which compel inactive, indoor living, especially in bad air, are those in which tuberculosis occurs most frequently. Tailors, for example, sitting in cramped positions, in badly ventilated, overheated rooms, with the lint from cloth flying in the air, are especially subject to the disease.

Pathology. The characteristic pathology of tuberculosis is that of the tubercle, a semitransparent gray gelatinous body, just visible to the naked eye, which later becomes opaque, and softens in the center. They are produced by the local specific irritant action of the bacilli and may be few or numerous in the affected organs.

The growth of the bacilli in the tissues excites a proliferation of the neighboring cells. Certain of these cells which are situated in the center, as a result of an increase in their size and repeated division of their nucleus, or by fusion of contiguous cells, become giant cells. Bacilli are found in these endothelial and giant cells. Around this cell mass is a zone composed of small round cells surrounded by a network of fibrous tissue. This tubercle being nonvascular is open to degenerative changes as caseation and coagulation, encapsulation, or calcification.

The bacteria themselves being walled in by the connective tissues of increasing density ultimately die. The dead bacteria, the plasma cells, the old blood corpuscles which are entangled with them all become degenerated into a cheesy mass. If no secondary infection occurs the complete death of the bacilli and the increasing thickness of the connective tissue wall around the tubercle terminates the process. If, however, the ordinary pyogenic bacteria gain entrance into the injured tissues or into the tubercle itself pus is formed. If the staphylococcus is the invading agent the abscess formation is rather slow and chronic, and the health of the patient is not materially affected thereby. If the streptococcus of any of the ordinary varieties should be the more important invader the abscess formation is rapid, the amount of pus plentiful, and the patient's health suffers very severely. In either case the tubercle becomes broken down into soft pus and the condition which is called tubercular abscess is present. Tubercles may grow together and become confluent, thus causing a consolidation of very large areas of the lung tissue. These being broken down result in the formation of abscesses and cavities of great size. The description of the tubercle as given for the lung applies with almost equal verity to tubercle in almost any part of the body, except the brain. In the brain the tubercle bacilli multiply upon the pia mater or upon any surface of the brain itself. The giant cells do not appear to any great extent in this locality and the connective tissue does not limit the growth of the bacteria to any one region. For this reason tuberculosis affecting the brain has a very rapid course, very severe symptoms, and usually speedy death.

In favorable cases, and in some tubercles even in fatal cases, the wall of the tubercle thickens, the pus and caseous material become inspissated, and the bacteria die; the whole or any part of the mass may become calcified. Recovery is practically complete when this condition is universal. Even quite large pus cavities may become healed, and filled with scar tissue, as is found after death from later tuberculosis or from other diseases. A partial immunity is established by recovery from tuberculosis; this is easily broken, and patients who are convalescent are very susceptible to reinfection, either from themselves or from other persons.

Diagnosis. Tuberculosis should be suspected when any patient loses weight gradually with no recognizable cause. An early finding is mild secondary anemia, with relative lymphocytosis and

diminished eosinophiles. This blood picture is almost pathognomonic. The X-ray shows very early changes in lungs or bones, and is helpful in any case.

Varying rales and other pulmonary sounds depend upon the size and location of the pulmonary lesions. The subnormal morning temperature with afternoon fever, not usually above 101° in the early stages, is usually associated with pyogenic infection. Night sweats are also indicative of pyogenic infection. (These may sometimes be referred to a habit of being too warmly clothed at night, however.)

The sputum varies with the progress and the type of the disease. Bacilli of tuberculosis may be abundant, or may be found with great difficulty. Inoculation of the sputum into laboratory animals may give the diagnosis in doubtful cases. Small white cheesy masses are characteristic; these may contain the bacilli in large numbers. The sputum may be very tenacious and heavy, or may be thin and frothy. It may contain alveolar cells, blood, ciliated cells, and various micro-organisms which include harmless as well as virulent forms.

Other diagnostic points are mentioned in connection with the various forms of the disease.

The **treatment** of tuberculosis should be based upon a recognition of the conditions as found upon the examination of each individual patient, together with the results of the investigations made into the pathology and the progress of the disease by various investigators.

The correction of whatever factors are found which have been instrumental in causing the disease, in each individual, and which are efficient in perpetuating the disease, must be removed as speedily as possible under the circumstances in each case. It must be urgently insisted upon that each patient is to some extent a law for himself, and the most speedy and complete recovery is secured only when the entire individuality of each patient, his history and his environment, his tastes and his mental habits, are taken into consideration.

The corrective work includes usually two factors: first, the lesions which lower the body resistance to tubercular invasion, and second, the lesions which permit the invasion of the particular tissues affected.

The correction of these lesions is easy in the earlier stages of the disease, but after the formation of cavities and abscesses is suspected, considerable care is necessary, in order to prevent the danger of injuring the walls of these formations, as well as of precipitating hemorrhages.

"What I would emphasize above all else is the necessity of administering corrective treatment with a full understanding of the pathological condition present, and the fact that the strictly osteopathic lesion present—and to be cor-

rected above all else—is a *posterior* upper lumbar and an *anterior* lower dorsal. With care and certainty in the correction of this lesion, with palliative treatment as indicated, and with attention to any other osseous lesion that may be present, the correction of which is not contra-indicated by the pathological lesion in the lung, you may be assured of an ultimate result not surpassed or even approached by any other system of therapeutics devised by the brain of man.”—W. B. Meacham.

“In the main I believe it is better for the natural desires of the patient to determine the kind and quantity of food taken. I do not believe in the forced feeding of these patients. In many cases where the stomach is not disturbed at all the ordinary diet can be maintained. I believe one great essential in the treatment of tuberculosis is rest of the patient, both body and mind. * * * As said at the beginning, the real cause of the lowered resistance is the structural derangement of the spine and chest, and observation and many observers maintain that these lesions are located usually at the second, third, and fourth ribs, over the diseased lung. Lesions of the second and third dorsal should also be corrected. Treatment should be directed to the cervical region, which involves the lymphatics to the lung and to the vaso-motor area which supplies the lungs with blood and in turn increases the phagocytic activity of the leucocytes, which are the chief warriors against the invading germ. The clavicles should be raised, as also any ribs that are drawn down.”—C. A. Williams.

Open air living is urgently desirable. In mild climates, day and night should be spent out of doors. In inclement weather, protection is necessary; there are many appliances which permit out-door air to reach the nose and mouth, while the rest of the body is kept in the warm room. It is most important that the patient be kept warm, dry and comfortable. Hot water bags and warm coverings are essential. Too great warmth upon retiring leads to more severe night sweats; these can often be avoided by having the bed warm upon retiring, but with rather less than the usual coverings. Indeed, many night sweats are due to nothing more than an excess of bed coverings.

The change of climate so often recommended is of chief value in the early stages of the disease, and must be advised only after a consideration of all factors concerned. A sudden change to a warm climate may be enervating; homesickness may be a serious matter; comforts of home may be lacking; the money spent in the change may necessitate lack of proper food; and in the last stages of the disease it is rare that leaving home at all is permissible. On the other hand, when the home conditions are not good; when nervous depression is a factor; when the patient lives where the climatic and sanitary conditions are bad; when he is sensible and willing to make an endeavor to recover his health; when he has money enough to live on without worry, a change of climate is stimulating and refreshing, and if this is associated with out-door life, complete change of scene, good food and proper structural corrections, recovery may occur in cases which appear almost hopeless at first. A sanitarium should be investigated before a patient is sent; there are many such places where every condition makes for the most speedy recovery; there are others where the sanitary conditions, crowding, and diet are absolutely

destructive. Happiness is important in these cases; fortunately tubercular patients are usually hopeful. **Altitude** is less important than other factors; the high altitude is usually advised; 3,000 to 6,000 feet is a very good height in good climates. Dryness is more constant at the high altitudes; cough is often relieved more by a lower altitude. If a patient does not get along well in the mountains, a lower place, usually not very near the sea, should be tried.

Diet is of importance, though perhaps of less moment than has been supposed. "Stuffing" is obsolete; increased swallowing does not necessarily mean increased nutrition. Tubercular patients need greater amounts of proteids, fats, and the vegetable salts than do normal people; this is because poor nutrition is an important factor in causing the disease, "a functional lesion," if the term be permissible. "Calory feeding" is a method used in some sanitariums; the patient is given a menu at each meal, in which the calory value of each article of diet is given. He must choose from this menu whatever kind of food he likes, but the sum of calories must equal the amount prescribed for him on examination each week. Intelligent patients may be taught to estimate calory values, and to diet themselves at home.

Many patients have ideas of what they can and cannot eat; these ideas may have been a cause of the original malnutrition, and they must be taught to overcome foolish prejudices. It is rarely advisable to force food down a rebellious gullet. Either the patient must be talked into a more rational viewpoint concerning food values, or the essential elements must be given him in some other way—possibly in unrecognized combinations. Foods which have been refused may contain elements necessary to nutrition; in such cases every effort must be made to replace these, or similar substances, in the diet list.

The diet must include fats, such as cream, butter, olive oil, bacon, especially. These are interchangeable; if any one is taken plentifully, others, which may not be appetizing, may be omitted.

Proteids are essential; eggs, milk and milk products; meat, especially beefsteak, chicken, and others; wild meats are appetizing, but probably not more nutritious; leguminous foods are nutritious, but cannot substitute for other proteids. The hemoglobin and myohematin of meat are important in building red blood cells, thus providing the necessary oxygen supply to the tissues.

Chlorophyll and the organic compounds of inorganic salts, found in vegetables, are valuable aids in tissue building. Some of these are broken down by cooking; so that some raw green vegetables should be eaten; if this is not possible, the juices pressed from the raw green vegetables may be added to broths until the digestion improves. Cooked vegetables may be eaten, but the

raw salads must not be omitted. Raw fruits, especially apples, are to be freely given.

The carbohydrates are usually eaten in sufficient quantities without special encouragement. White bread may be eaten if it is preferred and if it agrees with the patient's digestion. The dark breads are better. Too great a proportion of starches and sugars are to be avoided, but as long as the fats, proteids and vegetables are eaten in sufficient quantity, the carbohydrate question may usually be left to the appetite of the patient.

It is often useful to add to the number of meals eaten; a lunch of milk, fruit, broth, or some one such thing may be given at two or three hour intervals. A cup of hot milk or broth before arising and before retiring are good; each patient is a law to himself in regard to details; the important thing is to promote nutrition. During the feverish periods solid foods are best omitted; fruits or fruit juices or buttermilk may be taken, preferably cold. Pure, fresh ice cream may be eaten.

Symptoms must be treated as they occur. One rule is absolute: the patient must rest during the feverish periods. A temperature above 100° F. should send the patient to bed; he cannot be on his feet until the temperature goes down to 99° F. Exercise in the mornings, or in the absence of fever, may depend upon his inclination, usually.

Hemorrhages vary greatly; they give little information as to the prognosis in any case. Very severe hemorrhages may be fatal, of course. Rest is important; the patient should remain in bed after recognizable loss of blood; merely stained sputum is of no importance. Strong inhibition around the tenth thoracic spine lowers blood pressure, and lessens hemorrhage. Gelatine feeding seems to increase the coagulability of the blood, thus diminishing the danger of hemorrhage.

Cough may be distressing, and may prevent sleep. Thorough relaxation of the cervical and interscapular tissues helps in relieving cough; inhibition of the tenth thoracic region is useful here also. Sometimes the patient can stop cough by bending forward, with the muscles relaxed and the head falling forward; this is usually followed by easy expectoration of increased amounts of sputum.

Emaciation may cause pain upon the bones subjected to pressure in sitting or lying; water cushions or air cushions are good in such cases.

The **swelling** of the legs may usually be greatly relieved by the leg movements, relaxing the tissues around Poupart's ligament and around the groin. The tissues around the sciatic nerve should be examined, and any tension relieved. The rotation and elevation of the legs, with every possible easy bending and stretching, give relief which persists for days, sometimes.

The **mental depressions** sometimes present when the lower lobes of the lungs are involved, or when cardiac or gastric complications exist, are hard to handle. More frequent feeding helps; an explanation of the source of the gloom—gastric, especially—helps the patient to exercise self-control. Surroundings are rarely able to give cheer; but every effort should be made to keep him happy as is possible. Forebodings may be hailed as evidence of the nonexistence of tuberculosis in some cases in which the diagnosis is doubtful.

Prognosis. In the early stages the prognosis for complete symptomatic recovery is good. Destroyed tissue is replaced by scar tissue, and since lungs contain several times as much area as is really needful, the patient's life need not be shortened nor made less happy and efficient by his experience. After recovery, the weight should be watched for about five years; if no loss of weight nor other symptoms appear, recovery may be considered complete. He is not immune to later attacks, and should remain in the region of his improved health, and should keep up his rational habits of living.

In the later forms of chronic tuberculosis; in the miliary types, and in cases complicated by other diseases, the prognosis is bad for recovery, but good for relief of symptoms and improved comfort.

Acute Pulmonary Tuberculosis (Acute phthisis; florid phthisis; catarrhal phthisis; caseous pneumonia; galloping consumption). This is an acute type of pulmonary tuberculosis characterized anatomically by inflammation, caseation, and liquefaction of lung substance, and clinically by hectic fever, coughs, night sweats, prostration, dyspnea, and the expectoration of large quantities of sputum which usually contain tubercle bacilli and pyogenic organisms. Two types are recognized; pneumonic and broncho-pneumonic. A subacute form of either type is recognized, which may become chronic.

The **pneumonic type** simulates croupous pneumonia, but usually affects the upper lobes. The onset is sudden, following a chill with pain in the side, remittent fever, cough with a profuse expectoration, which is soon rusty and purulent, dyspnea, night sweats and rapid emaciation. After a few days the tubercle bacilli and elastic fibers are found in the sputum. There is rapid loss of flesh and strength and the patient succumbs in a few weeks. It may become prolonged and last for months.

Tubercular bronchopneumonia is more frequent than the preceding condition and usually occurs in children following measles and whooping cough. The onset is gradual with hectic fever, rapid

pulse and respiration, severe cough, dyspnea, night sweats with rapid emaciation and prostration.

Both lungs are attacked, especially the upper lobes, and present branching areas of caseation with small ragged cavities. The thorax shows signs of a diffuse bronchitis with increased vocal fremitus and apical dullness upon percussion, with mucous and subcrepitant rales.

Chronic Pulmonary Tuberculosis (Tubercular phthisis; consumption; incipient phthisis; chronic phthisis and chronic ulcerative phthisis). A chronic pulmonary disease characterized anatomically by the ulceration and softening of tubercles situated in the lung tissue inducing a septic infection and clinically by fever, cough, dyspnea, emaciation and exhaustion.

Symptoms. The onset is insidious—is usually attended with gastrointestinal disturbances as anorexia, dyspepsia, epigastric distress after meals, malaise, pallor and secondary anemia and cough. Soon an afternoon temperature is noticeable and a little later night sweats appear; face is flushed, eyes glassy, pupils dilated, cough becomes more severe with free expectoration, progressive emaciation with marked loss of weight and impaired strength, pains in the chest, dyspnea, irritable heart, and diarrhea which may alternate with constipation. Although the emaciation and weakness become profound the patient is hopeful until the end (*spes phthisica*). The cough, which is one of the first and distressing symptoms, is at first dry and hacking with little expectoration, but later with consolidation is aggravated; the expectoration is mucopurulent and contains the bacilli and elastic fibers. With cavity formation the cough becomes very severe and profuse; the expectoration is purulent, greenish in color and made up of heavy coin-shaped plugs which sink when placed in water (nummular plugs).

Pain when present is due to an associated inflammation of the pleura. Often respiration is increased to thirty or more per minute. Dyspnea is not marked except in the later stages or upon exertion. Hemorrhages may be early or late. The blood may be bright red and frothy or dark and heavy from stagnation. Hemorrhages are caused either by a hyperemia, or more frequently, from an erosion of the blood vessels or rupture of an aneurysm.

The fever is quite characteristic. At first there is only a slight elevation in the afternoon, but later with beginning degeneration of the tubercular areas the fever presents a remittent type. With cavity formation it is always intermittent, the highest temperature occurring in the afternoon about four o'clock, with the lowest in the correspondingly early morning hours.

Associated with a decrease in temperature is the sweating which is often excessive, saturating the bed clothes and producing

great exhaustion. Emaciation always occurs in the later stages of the disease and is due to the fever and impaired digestive and assimilative powers. The thorax and extremities are more commonly affected. With cavity formation and hectic fever there occurs a marked leucocytosis which is probably caused by a secondary infection by one of the pyogenic organisms. The gastrointestinal symptoms are anorexiá, constipation, alternating with diarrhea and gastric catarrh. The genito-urinary symptoms are due to a fever and toxemia characterized by decreased elimination and dropsy. Albumin and casts are found in the urine.

Inspection usually shows a long and narrow emaciated chest, ribs depressed and oblique, costal arch very acute; cartilages prominent, sternum depressed, scapulæ winged, clavicles prominent with supra and infra claviclar areas depressed. The interscapular region is immobile and flat. The X-ray gives much more accurate information than ordinary methods of diagnosis. The first areas involved are usually under the sternum.

In the early stages a slight dullness is found over the apices, more commonly on the right. Later with marked consolidation and expansion of the parts the area of dullness is increased and may be elicited above or below the clavicles or between the scapulæ. With cavity formation a tympanitic or cracked-pot note is detected. In the early stages respiration may be inaudible over the affected area. Later the breathing is harsh and expiration is prolonged. Crackling rales are usually detectable and if not present coughing will develop them. The vocal resonance is increased.

Auscultation over cavities may detect cavernous or amorphic breathing with large bubbling and gurgling rales. Bronchophony and pectoriloquy may be present. The irregular fever, cough, pallor, emaciation, hemoptysis, night sweats, signs of consolidation and cavity formation; the presence of bacilli and elastic fibers in the sputum are all characteristic, and these confirm the diagnosis.

Prognosis. This varies with the stage of the disease, but generally it is very unfavorable as the individual dies of exhaustion in about two years. Many cases under the influence of dry, rarified atmosphere, rest, sunshine, good food with fresh green vegetables and light spinal treatment are prolonged indefinitely and often the process is rendered latent. Unfavorable signs are high temperature and rapid pulse, continued gastric and intestinal disturbances and the development of secondary tubercular processes.

Acute Miliary Tuberculosis (Acute phthisis; galloping consumption). This is an acute infectious febrile disease characterized anatomically by the general or local development of miliary tuberculosis, and clinically by the symptoms of an acute infection; this may be generalized (typhoid), pulmonary, or cerebral, according to the locality chiefly infected.

This acute form of tuberculosis occurs more frequently in infants and children than adults and with few exceptions is secondary to an active or latent tubercular process in the lymphatic nodes, bones or lungs. It may follow other infectious diseases as measles, whooping cough, variola or influenza. The bacilli are probably disseminated by the blood.

General or Typhoid Tuberculosis. The onset is gradual with headache, anorexia, malaise, progressive weakness and moderately high, irregular temperature (102° or 104° F.), hurried respiration, rapid and feeble pulse. Cough and sweating may or may not be present. As the disease advances typhoid symptoms develop as brown fissured tongue, muttering delirium, subsultus tendinum, carphologia, but soon the prostration becomes more profound, and cyanosis develops with stupor and coma. Death supervenes within six to eight weeks.

Acute Pulmonary Miliary Tuberculosis. In this form the tubercles are chiefly located within the lung tissue. The onset is usually sudden with a chill and a previous history of cough or chronic phthisis and in children of measles or whooping cough. Respiration is rapid. Dyspnea and cyanosis are marked. Fever is high, 102° to 104° , with pain in the chest and prostration. Sputum is abundant and may be rusty in color. Elastic fibers and tubercle bacilli may be found. Leucocytosis may be marked.

Progressive emaciation and anemia are accompanied by vertigo, headache, sleeplessness, coma and death, which occurs in from four to twelve weeks.

Tubercular Meningitis (Basilar meningitis; acute hydrocephalus) is an acute tubercular inflammation of the pia mater characterized by cerebral irritation and compression, emaciation and death.

This usually occurs in scrofulous children, between two and seven years of age and is almost always secondary to some other tubercular process in the body. The tubercles are found along the blood vessels in the pia mater, usually at the base of the brain as grayish-white, translucent gelatinous granules causing a productive inflammation with consequent thickening and opacity of the membranes. The resulting inflammatory exudate confined to the cranial cavity and the accompanying toxemia produces the symptoms.

The onset is insidious with irritability, anorexia, headache, sleeplessness, constipation, loss of flesh and irregular periods of fever. This lasts from a week to a month and gradually passes into the stage of excitation.

This is characterized by projectile vomiting, severe headaches, convulsions and fever ranging from 98° in the morning to 103° or 104° in the evening with an irregular compressible pulse, retrac-

tion of the head, photophobia, tinnitus aurium, vertigo, contracted pupils, muscular twitching, intolerance to sound with the hydrocephalic cry and cutaneous hyperesthesia. This stage lasts from two weeks to a month and passes into the **stage of depression**.

In this stage all the symptoms of cerebral irritation abate. The vomiting and headache gradually subside. Temperature is less, pupils dilated, pulse slow, irregular and compressible. Respiration irregular and sighing, periodic convulsions, strabismus, carphologia, mental stupor and paralysis are frequent. Collapse finally occurs with Cheyne-Stokes breathing and coma which terminates in death in a day to a week.

Fibroid Phthisis (Chronic interstitial pneumonia; cirrhosis of the lungs; Corrigan's disease). This is a chronic inflammatory condition of the lung, characterized anatomically by an increase in the connective tissue, decrease of the parenchymatous structures and clinically by emaciation, cough and mucopurulent expectoration containing the tubercle bacilli.

Pathology. The disease is caused by the bacilli of tuberculosis, but predisposing is a low-grade inflammatory condition of the supporting structure of the lung causing a fibrosis of the interstitial tissue with pressure atrophy of the alveoli. The common irritants are those which occur in the pursuit of occupation, such as chemistry, stone cutting, grinding, mining. The straining respiratory excursion causes a dilation of the bronchi and bronchiectasis results. The process usually begins in one apex and gradually extends over the whole lung, seldom affecting both sides. The lung is hard and fibrous; the alveoli obliterated. It resists cutting and upon section presents a dry gray, marble appearance and areas of caseation. The unaffected areas are emphysematous and the right ventricle of the heart is always hypertrophied. From the long-continued toxemia amyloid degeneration is found in the abdominal organs.

Diagnosis. The onset is very gradual, characterized by a persistent cough occurring in paroxysms in the morning with a profuse mucopurulent expectoration containing the bacilli. If bronchiectasis is present it may be fetid. This condition may last for years with only slight loss of weight but later irregular fever with night sweats and dyspnea develop. Edema due to failure of the circulation is accompanied by rapid emaciation and eventually death. The course of the disease is from five to twenty years.

X-ray plates indicate the location and extent of the lesions.

Inspection shows a retraction over the affected area due to contraction of the mature connective tissue. Palpation shows lessened respiratory excursion with increased vocal fremitus. Percussion shows a dullness and impaired resonance over the affected region with temporary or impaired resonance of the adjoining emphysematous areas. Auscultation in the early stages shows vesicular breathing with large and small moist rales, but later the breathing is bronchial, broncho cavernous or cavernous with localized gurgling rales.

Scrofula is a mild tubercular inflammation of the lymphatic nodes. It occurs in children and young adults with a weakened constitution which is probably hereditary. Cervical and upper dorsal lesions so alter the circulation to the head and neck structures that the resistance of the lymphatic nodes is lowered and when the tubercle bacilli enter the lymph stream through diseased tonsils or nasopharyngeal membranes they are able to proliferate and produce their characteristic reaction. It occurs more often in the colored than the white race and usually affects the cervical region, but is occasionally found in the bronchial and mesenteric nodes. Rarely it affects all the nodes of the body.

It is first noticed as slight kernels under the angle of the jaw which slowly enlarge until the whole chain causes a marked swelling in the anterior cervical triangle.

The nodes are tender upon manipulation, are solid and move under the skin. Accompanying symptoms are moderate fever, headache, restlessness, anorexia and constipation. Later as supuration occurs the nodes soften and become adherent to the overlying tissue; these are perforated, allowing a dark colored discharge to escape. The symptoms are always exaggerated during suppuration, but abate as the toxemia is relieved and the process tends to take a chronic course which may last for months or years.

The bronchial lymphatics are often affected; they become hardened and calcified, and are easily recognized by the X-ray during life. These may cause later irritative symptoms, and may lead to an unbased diagnosis of fibroid phthisis.

M. L. Burns reports calcified tubercular bronchial lymphatic nodes found by X-ray examination in patients with local pain and persistent cough, but no other tubercular symptoms.

In such cases correcting the cervical lesions and raising the ribs and sternum, with the establishment of better habits of breathing is usually followed by relief of the symptoms.

Tuberculous laryngitis (Laryngeal phthisis; throat consumption) is an infection of the larynx with the bacillus tuberculosis. It is characterized by ulceration, dysphagia, cough, weakness of voice, hectic fever, and progressive emaciation. It is nearly always secondary to pulmonary tuberculosis.

Huskiess proceeds to a painful whisper. General ill-health; irritable, short, frequent, husky, ineffectual cough; frequently severe pain, increased by swallowing; local dryness and rarely paresthesias are noted. Dyspnea is marked and edema is present. There is sometimes suffocation on swallowing. Irregular fever, night sweats, and other symptoms of pulmonary tuberculosis are usually present.

Examination of the larynx very early shows local anemia. A little later, there are numerous bilateral, pale, round, or pointed

eminences. These become broad, shallow, irregular, ill-defined, slow, painful ulcers with gray bases and raised edges. The vocal cords and epiglottis are infiltrated, thickened, and paralytic, often being destroyed late in the course of the disease. There is local soreness on pressure and often enlarged cervical lymphatic glands.

The sputum is moderately gray, thick, ropy, and mucoid containing the bacillus of tuberculosis.

Treatment includes that of tuberculosis in general, with local treatment to render the patient comfortable. The larynx should not be manipulated either internally or externally. Relaxation of the cervical and upper thoracic tissues is usually required. The use of the voice is forbidden, the patient may whisper a few words at a time.

Tuberculous Peritonitis is usually secondary to infection of the intestine, whether intact or ulcerated. In women, it may originate in the Fallopian tubes. In males it may follow testicular disease.

It may complicate phthisis. It is most common in children, again between the ages of 20 and 40, and may occur at any age.

The symptoms may set in acutely with considerable fever, meteorism, and abdominal pain, or the onset may resemble typhoid fever.

In children, it is most commonly chronic from the start, with fever, gradual enlargement of the abdomen, areas of dullness and resistance, and others of resonant percussion. Sometimes distinctly palpable nodules due to enlarged glands may be palpated; at other times, the sausage-shaped omental tumor is found.

The general symptoms include irregular fever; wasted limbs and thorax; persistent diarrhea which often alternates with constipation; the stools are thin and offensive, and if the large intestine is involved, streaked with mucus and blood. There are moderate colicky pains and tenderness; profuse sweating; and the pleura is sometimes involved.

The local symptoms may be any of the following: Abdominal enlargement with effusion; enlargement with tumor; a combination of both of the above, or enlargement without evidence of fluid or tumor.

There is a moderate reduction of the red cells in some cases; leucocytosis is not constant. The eosinophiles are low in uncomplicated cases.

The diagnosis is difficult in adults but is assisted by evidence of tuberculosis elsewhere in the body. If it is localized in the cecum or appendix, a tumorous mass may develop. The tuberculin tests may be of use in the diagnosis. Most of these have an element of danger.

Treatment. Special attention should be given the lumbar and dorsal spinal regions, that there is no undue muscular contraction, and that there are no spinal or rib mal-adjustments.

Rest in bed is advised, with plenty of fresh air, and an appropriate diet of a highly nutritious nature and rich in fats. If there is much diarrhea, milk alone is indicated. The abdomen must be kept warm by a flannel binder. If the case is obstinate, laparotomy with evacuation of the fluid is sometimes followed by a cure. Exposure of the peritoneum to air and light even for a short time seems beneficial.

Prognosis. This is usually unfavorable. Long and tedious convalescence, with recurrences of the symptoms are usual in cases which recover.

Tuberculous Joints. The joints are affected by blood-borne bacteria. Probably there is usually some traumatic localizing factor. The tubercles set up a chronic inflammation in the synovial membrane, or they may affect the bones themselves, and thence invade the joints.

Pott's disease is tuberculosis of the spinal column. The disease affects the bodies of the vertebræ, thus removing the spinal support. The transverse and laminar parts of the vertebræ are thus allowed to fall together, whence the deformity.

Hip disease is tuberculosis of the hip joint.

"A tuberculous joint should be given absolute rest. That does not mean that you must not treat the patient osteopathically. The patient wants osteopathic treatment all the time, and it does not mean that you must not treat the joint osteopathically, but it does mean that you must not manipulate the joint. I do not mean that the tissues about the joint cannot be very carefully manipulated, if the joint is not disturbed; but I do mean that it is oftentimes injurious and mischievous to manipulate any articulation of the body where there is chronic inflammation due to any infectious agent, tuberculous or otherwise. There is the dividing line between where we should manipulate an inflamed joint and where we should not. Inflamed joints not due to infection in the joint may be manipulated locally and much benefit result. Where we have an inflamed joint, an acute inflammation due to an infectious process (as in a post infectious arthritis following pneumonia), or, in a chronic inflammatory process as in tuberculosis of the joint, and that is nearly always chronic, leave that joint alone; give it rest. Improve the nutrition to the joint and the general nutrition of the patient all you can by giving him fresh air, sunshine, pleasant surroundings, good food and plenty of it, and manipulation of the spine and abdomen. That is the kind of treatment indicated, but have the joint itself absolutely quiet. Fix the limb in such position that the patient will rest and by so doing you will prevent deformity and get quiescence in most cases after several months. When the symptoms of inflammation in the joint subside, gentle manipulation should be instituted to prevent ankylosis."—Geo. M. Laughlin.

"We do not attempt to prevent ankylosis in cases of tuberculosis of the hip. Where the case is taken early we can often restore the joint to good function, but in well-developed cases ankylosis in good position is desirable. Practically in Pott's disease ankylosis in good position gives good results."—Geo. M. Laughlin.

"In all tubercular troubles you have a lowered vitality. If you confine your treatment to the local conditions and neglect the general conditions, and the matter of nutrition, I believe you will make a failure.

"I would give them as nutritious diet as possible, and besides that I would feed them liberally with eggs, milk and cream, provided the digestive organs will stand it, or some form of assimilable fats.

"Then you have the condition of the emunctories to look after. You have the condition of the liver and the spleen, owing to the mal-assimilation which is present in this case. You will have to look to the splanchnics, and so even in the absence of the lesions in that part of the spine throughout the splanchnics, I would thoroughly relax, and I would thoroughly spring that spine, giving as nearly free play of nerve force to the affected part as I could possibly do. That is about all the corrective work that is necessary. In different cases you must use your own judgment."—P. H. Woodall.

Tuberculosis of the pericardium is rarely recognized ante-mortem. It is practically always with effusion, and the aspirated liquid is blood stained. It is difficult to find the bacilli in the liquid, but inoculation of animals gives, usually, positive results. When the condition is recognizable, death is probably imminent. This is sometimes the cause of death, when patients apparently in an early stage of pulmonary tuberculosis die suddenly.

Tuberculosis of the kidneys is not a very common condition. The diagnosis is suspected when hematuria appears in a tubercular individual. Symptoms of nephritis may appear, and urinalysis show pus, renal epithelium, and bacilli. It is necessary to take great care to avoid confusing smegma bacilli with tubercular bacilli. Accidental contamination of the urine with hay bacilli is also to be avoided.

Since the kidney is only rarely affected primarily, if ever, the lungs should be examined (best by the X-ray) for tubercular foci. X-ray of the kidneys, with or without injection of contrast solutions, may give the diagnosis.

For milder grades and with marked infection of other organs, the systemic treatment of tuberculosis is all that should be done. When one kidney is seriously involved, while the other kidney and the rest of the body are reasonably free from the disease, surgical treatment may be considered.

Tuberculosis of the genital organs and the bladder sometimes occurs. Primary disease of the genitals has been reported but is rare. The treatment is systemic as well as local. Surgery may be indicated.

CHAPTER XLIII

LEPROSY

Leprosy is a chronic specific disease caused by the bacillus lepræ, and characterized by the development of cutaneous tubercles, anesthetic patches or neuritis, and followed by ulceration and destruction of tissue. These forms may coexist in the same person.

Etiology. The exciting cause is the bacillus lepræ. The predisposing causes are use of common drinking vessels, and intimate contact. The modes of infection are probably through inoculation, minute lacerations as scratch marks, use of a common pipe or drinking vessels. The contagion is from open sores, saliva and nasal secretions, and through infected clothing. Several types are recognized.

Tubercular or nodular form. With or without prodromata, reddish or bronzed, erythematous, slightly elevated patches at first hyperesthetic, later anesthetic, appear upon the face, arms, and knees. They fade with the fever, and leave brownish stains or slight hardening. After weeks or months, the attack is repeated, perhaps affecting other areas. These "leprous storms" keep recurring and ultimately raised, somewhat tender, nodules appear on the site of the former eruption. These are pink at first, later becoming a dirty brown tint. These may fade, or may persist until a fresh febrile attack adds to their number. The skin of the face is thickened, the folds deepened, the whole face is broadened, and assumes a "leonine" aspect. Nodules appear upon the limbs, the cornea is attacked, nasal cavities suffer early and severely, fauces, vocal cords, and larynx may be involved. Blindness from the keratitis, ozena, aphonia, cough, hoarseness, and dyspnea occur. The nodules ultimately ulcerate, open sores and cicatrices being seen upon the skin. The constitution suffers from the febrile attacks, weakness first and then prostration; the disease frequently ending in phthisis. The duration is from two to eight years.

Anesthetic leprosy. Prodromata of neuralgic pains, sometimes weakness, and wasting of the fore arm muscles may last for many months. Then pale or light yellowish, itchy, level spots, often symmetrical, appear upon the back and extensor aspects of the limbs, sometimes upon the face, while the corresponding nerve trunks are thickened, nodular, and tender. This stage lasts from two to three years. The patches become anesthetic, cease to

secrete sweat, their surface is white and their edges are serpiginous. Bullæ appear on the limbs and trunk; the fingers are contracted; the phalanges may be amputated by necrosis; perforating ulcers attack the feet with spontaneous amputation of the toes; the ears may also be mutilated. The temperature is sub-normal except during the eruption of bullæ. This stage lasts from six to ten years. The third stage is marked by muscular paralysis, the third and seventh nerve being often affected, and by dry or moist gangrene of the extremities. The course is very slow, the patient surviving for twenty or thirty years.

"Locally (in Hawaii) leprosy is not considered a fatal disease, for most of the patients die of something else. * * * Just how the disease is transmitted is not known, but it is assumed to be by contact.

"*Symptoms*—Usually the first symptoms to appear are anesthetic nodules in the skin of the face, arms, or legs. The smaller ones give the sensation of imbedded shot on passing the finger over the skin. They attain also a pea-size. These nodules are filled with bacilli lepræ, and their presence, when anesthetic, is almost diagnostic. This is confirmed by incising them, making a scraping for a slide, staining, and finding bacilli lepræ under the microscope. The bacillus of leprosy is rod or club shaped, similar to, but thicker than, that of tuberculosis; it occurs often in chains, but more often sparsely; yet it has no absolutely regular shape, no constant quality except sluggishness, no constant characteristic except that of being 'acid fast,' and it cannot be cultivated in artificial media nor in animals. In these facts lies the chief difficulty of the leper situation.

"The bacillus has a penchant for soft pendulous areas, the lobes of the ears and the alæ nasi of lepers being usually thickened with them and they are always present in the nasal discharges. A common symptom is leucodermic areas, whitish patches of skin anywhere on the body which become anesthetic; loss of sensation occurs in any region invaded by the bacilli.

"Fingers and toes become enlarged, and distorted by flexion; extremities ulcerate and slough away by erosion. Of all the strange symptoms of this sluggish disease, perhaps the ulcer is the most curious. It presents a clean, raw surface of flesh, yet steadily erodes the tissues until amputated. A foot may become hollowed out by this process from below while from above it looks normal with the exception of being swollen and slightly flexed.

"Constitutional symptoms are, as a rule, not marked, though some cases show a 'leprous fever' early in the disease. Otherwise the cases run along uneventfully for many years, especially if they will take treatment, until, as remarked before, they die of some other disease."—S. D. Barnes.

The bacilli may be found in the blood. The special points are the dusky-red hyperesthetic macules of the early stage and the subsequent development of anesthetic areas.

Treatment. The treatment is eminently unsatisfactory. A few cases of apparently spontaneous recovery are recorded. For single nodules, extirpation is advised. Cleanliness and good hygiene are helpful. Lepers have a contentment which makes it difficult to secure active coöperation in hygiene or therapy. This peculiarity suggests the tubercular hopefulness; in leprosy it is less hope than contented resignation. In either case, lack of interest in therapeutic measures lessens the prospect of efficient or satisfactory treatment.

Prognosis. The prognosis is hopeless as to recovery, but the disease is extraordinarily chronic, lasting for four to thirty years.

Prophylaxis. Segregation should be compulsory in all cases unless the relatives can show that they can make provision for complete isolation and take the proper care of the patient.

A very common and irrational fear of leprosy is responsible for occasional injustice in the treatment of lepers. No doubt this terror is in part due to the religious history of leprosy, and in part due to its rarity in this country. Diseases far more terrible and far more contagious arouse little or no fear, partly because they are common, and partly because there is a tendency to conceal the ravages due to those most to be feared.

Leprosy is feebly contagious, especially in skin lesions. Patients with nasal secretions are most dangerous. In countries where leprosy abounds, leprous men and women have healthy wives and husbands and children, often without transmitting the disease in any form.

Recently successful attempts have been made to inoculate rabbits with leprosy (Stanziale). This may enable such study of the disease as is necessary to better methods of treatment of prophylaxis.

CHAPTER XLIV

TYPHOID AND TYPHUS

TYPHOID FEVER

(Enteric fever; gastric fever; nervous fever; autumnal fever; enteromesenteric fever; typhus abdominalis or abdominal typhus)

Typhoid fever is an acute, specific, infectious, mildly contagious, febrile affection due to the bacillus typhosus and characterized anatomically by hyperplasia and ulceration of Peyer's patches and other lymphoid tissues; and clinically by insidious prodromes, epistaxis, headache, stupor and delirium; diarrhea and tympany; a peculiar rose-colored eruption upon the abdomen appearing in successive crops, rapid prostration, and a prolonged course ending by lysis and a slow convalescence.

Etiology. The exciting cause is the bacillus typhosus of Eberth, found in the lesions, the blood, stools, urine, and sputum of patients. The disease occurs epidemically and sporadically. It is transmitted by the excretions and soiled linen of the patient or of "typhoid carriers," and gains entrance through the alimentary tract by contaminated water, ice, milk, shell-fish, and oysters grown on beds polluted by sewage, uncooked vegetables grown on infected soils and foods contaminated by flies. It is most frequent during late summer and early autumn.

The predisposing causes include lesions of the ninth thoracic to the second or third lumbar vertebræ. Lesions of the cervical region, either vertebral or muscular, and lower rib lesions are to be considered. Lessened mobility of the dorso-lumbar region is constant.

Pathology. Typical typhoid ulcers have the following characteristics: They lie in the longitudinal axis; the edges are thin and undermined; are located in the last three feet of the ileum, and are most numerous near the ileo-colic valve; show a tendency to perforate but do not cause constriction after they have healed. In recovery the ulceration is replaced by granulation tissue, the mucous membrane extends inward over it and the ulcer is healed, leaving a smooth, diffusely pigmented, brownish or slate-colored scar. The gland structure is not regenerated. This stage is usually associated with the fourth week of the fever. The mesenteric glands undergo similar infiltration, enlargement, and softening but seldom rupture or ulcerate. The mucous membranes of the entire body, as well as intestinal tract, undergo catarrhal changes.

Abortive. Convalescence is established within ten days or two weeks after an abrupt onset with marked symptoms. Under proper conditions, this type or the next should be the only form with which we are acquainted. When called after the disease has become well fixed, the more serious cases may be met.

Mild typhoid (*typhus levis*) is marked by moderate fever, slight diarrhea, and few or no nervous symptoms.

Ambulatory (walking typhoid fever) is a mild type with symptoms so slight as often to be disregarded by the patient. He may come to the physician complaining of dull persistent headache and increasing weakness. This type sometimes terminates fatally by sudden perforation or hemorrhage.

Grave forms include those in which there is sudden onset with pronounced pulmonary, toxic, gastro-intestinal, renal or cerebro-spinal symptoms.

Diagnosis. In the typical case the following symptoms occur:

During an incubation period of a few days to two or three weeks, there is an insidious onset with general malaise, vertigo, chilliness, disordered digestion, epistaxis, disturbed sleep, dull occipital headache, depression, and increasing weakness which compel the patient to take to his bed toward the end of the period. The patients are unable to say when the symptoms began. During the first week of the illness the temperature rises to about 103° F. in the evening. The tongue is sticky and moist. Each day the temperature rises slightly above any previous point. The pulse increases daily, and may be dicrotic; the malaise becomes more marked, the patient is listless and has thirst, nausea, and headache. Pressure in the right fossa elicits tenderness and gurgling, and the tongue becomes heavily coated with a white fur. There may be a diarrhea of brownish stools or constipation.

At the end of the first week the temperature in morning is about 103° and evening 104.5° F. Tympanites is marked. The eruption appears upon the upper part of the abdomen, chest and back as five to twenty small, rose-colored spots, raised slightly convex, disappearing upon pressure and at death. These last from three to five days and are succeeded by another crop. They may not appear until the twelfth day and are sometimes absent. During the second week the temperature may rise to 105° F. in evenings with the usual morning remission. All symptoms are exaggerated; there is low delirium. The tongue coating disappears and the tongue resembles raw meat, is fissured, and covered here and there with dry, bloody mucus. Sordes cover the teeth and lips. The spleen reaches its maximum enlargement. The "pea-soup" stools are fluid, offensive, yellow, may be streaked with blood and are from three to fifteen during twenty-four hours. From this time hemorrhage or perforation may be looked for. Stupor and carphologia are grave symptoms. Abortion is liable to occur in pregnant women. During the third week the fever becomes remittent; prostration is extreme; the respirations are shallow and quickened; loss of flesh is noticeable; the diarrhea lessens. All other symptoms begin to show amelioration and convalescence

begins, or the typhoid stage becomes more marked, there is hypostatic congestion of the lungs and death.

During the fourth week the temperature is daily decreasing to normal or subnormal in the morning. The appetite is voracious. The apathy disappears, sleep is more refreshing, delirium is slight or none, the pulse is more full and strong, and the spleen is much smaller.

Convalescence is marked by great debility, emaciation, extreme anemia, severe nervousness, irritability of the heart, profuse night sweats and loss of the hair in women. Bradycardia is frequent. Relapse may occur about the tenth day of convalescence with nearly all the symptoms repeated but less intense than the original. Recrudescences due to excitement or gastrointestinal disturbances are common.

Intestinal hemorrhage is the most frequent and critical of any complication. It is indicated by a sudden decline in temperature to the normal or below, frequently followed by the passage of blood by stool. It is usually due to the erosion of a blood vessel during ulceration, and death may occur.

Perforation may occur in third or fourth weeks. It is indicated by sudden, severe, and localized pain in abdomen, abrupt fall of temperature, tympanites, absence of abdominal respiration, increased hepatic and splenic dullness, hiccough, and signs of peritonitis. Death is probably imminent.

Peritonitis without perforation is not necessarily fatal. Lobar pneumonia, hypostatic congestion of the lungs, and bronchitis are frequent. Nervous symptoms include headache, drowsiness and stupor with great prostration, deafness, impaired or double vision. In the coma vigil, the patient lies perfectly quiet and inattentive with eyes open. He can be aroused but speedily relapses into semi-consciousness.

Phlegmasia alba dolens; acute nephritis; neuritis; jaundice; ulcerations of the larynx, tongue and buccal mucosa; and mixed infection causing anything from boils to meningitis may complicate typhoid fever.

The sequelæ are not frequent. They include the "typhoid spine"; constipation, cholelithiasis, neurasthenia, and general ill-health. Occasionally, paralysis, neuritis, chorea, hyperesthesia, epilepsy, orchitis, edema and gangrene of the uvula, metrorrhagia and well-marked marasmus follow typhoid. Alopecia and transverse markings of the nails are due to the malnutrition. Acute confusional insanity is more frequent after typhoid fever than after any other febrile condition except influenza.

The urine has the usual febrile characteristics. Albumin is variable. Acetone and diacetic acid may be present. Typhoid

bacilli are often demonstrable, Ehrlich's diazo-reaction is present by the third to the tenth day. It may never appear.

If uncomplicated by preëxisting cardiovascular or renal conditions, the blood pressure falls below normal after the patient takes to bed. From the end of the first week a gradual fall in the blood and pulse pressure continues until convalescence is established.

The blood is characteristic. A fresh smear may show the large phagocytic cell of Mallory. During the first week there is a slight rise in the number of red cells which slowly falls until a marked anemia is present by the time convalescence is established. Regeneration begins with defervescence. The fall may be accentuated during the fourth week. After hemorrhage, nucleated reds may be found. The hemoglobin runs parallel with the number of red cells but returns to normal more slowly. Blood-platelets and fibrin are reduced. For this reason peritonitic adhesions are not usually serious in typhoid. The white cells are slightly increased at first, the count gradually diminishing to about 5,000 per cmm. A decided rise after a cold bath is not unusual. There is no true leucocytosis in uncomplicated typhoid. Differential count shows polymorphonuclears and eosinophiles diminished, mononuclears and lymphocytes increased. During convalescence there is mild eosinophilia, and degenerated leucocytes, leucocytic shadows and leucocytes with granules of glycogen are to be found. Return to normal blood picture is slow and the blood retains its characteristic features for about three weeks after the temperature is normal.

The Widal reaction is usually positive during the second week. Occasionally it is positive in non-typhoid patients, and occasionally it remains negative during the course of disease presenting typical typhoid course. Repeated tests should be made in doubtful cases.

Hemorrhage causes an acute posthemorrhagic anemia with leucocytosis. Perforation or pyogenic infection is accompanied by a rising leucocyte count.

The stool is copious, watery, fetid, like "pea-soup," in appearance, containing, besides the fecal matters, bacilli of typhoid, blood, shreds of mucous membrane, sloughs, and many triple phosphate crystals. It has an alkaline reaction. A stool frequently tinged with blood is sometimes a warning of coming hemorrhage. When hemorrhage occurs the stool is black, tarry and sticky, and the usual chemical tests for blood are positive.

The data for diagnosis are (1) general from the clinical symptoms, the temperature curve, eruption, peculiar diarrhea, and enlarged spleen, (2) specific by isolation of the typhoid bacillus from the blood, stools, urine and rose-spots, and by the Gruber-Widal reaction.

The disease must be diagnosed from enteritis with an irregular fever, peritonitis, acute miliary tuberculosis, meningitis, appendi-

citis, peritoneal tuberculosis, rightsided salpingitis, simple continued fever, typhus fever, relapsing fever, trichiniasis, and cryptogenic septicopyemia.

Treatment. When typhoid fever is present in a community, its presence should be suspected in any individual showing the characteristic prodromal symptoms. Treatment inaugurated at this time should consist of thorough correction of any lesions found in the lower thoracic spine and the ribs. The ribs should be raised freely and the usual spinal rigidity be completely removed. Bony lesions anywhere in the body should be corrected. The thorough examination of heart, lungs, liver, spleen, bowels, urine and blood at this time may be very important in governing the later care of the patient and in preventing complications. The Widal test is usually negative until the second week, but the test should be made as soon as possible and should be repeated if negative each week through the course of the disease. It is not possible to make a certain diagnosis of typhoid during the prodromal stage, but many cases presenting the prodromal symptoms and receiving correct treatment never show characteristic symptoms of well-developed typhoid. Whether true typhoid can be aborted or not is a question which cannot possibly be answered by the very circumstances of the case. It is true that patients presenting prodromal symptoms and receiving early and correct treatment rarely, if ever, succumb to the disease.

The long days of serious illness of the ordinary type of typhoid too often cause an unwise demonstration of vigorous therapeutic measures of various kinds. The use of whisky and other alcoholic stimulants or any other drugs is urgently contraindicated. Almost infinitesimal amounts of alcohol may exert serious influences upon a body already weakened by the disease. Even the alcohol inhaled as the result of an alcohol rub is too much for the ordinary patient. The alcohol rub should be superseded by a dry rub with a moderately rough towel and by mild massage. If skin stimulation is urgently desired a pepper solution or mustard water may be used instead of alcohol for rubbing. The collapse that sometimes follows a cooling bath can be avoided by exposing only a small area of the body to the sponge and making the process a very slow one. A sponge bath of water of a body temperature or slightly above reduces the fever through evaporation, but gives little or no shock.

During convalescence treatments for the correction of the "typhoid spine" should be given once to thrice each week. The various accidents of convalescence can be met as they occur.

Diet. Liquids are usually given. Milk, diluted with water or lime water, is an old stand-by. About three pints every day should be given; if curds appear in the feces the milk may be peptonized. Whey, sour milk, buttermilk, broths, albumin water, all are sub-

stitutes, and are given when the patient cannot take sweet milk. Recently a number of new diets have received commendation. These include the "high calory" diet, which includes three pints of milk with one of cream, two to eight ounces of milk-sugar, eggs, butter; sometimes cereals, toast, potato, and other soft foods are given. A full sugar diet, as of candy alone, is based upon the immediate absorption of sugar, its value as a source of energy, and the fact that a plentiful carbohydrate supply lessens the danger of acidosis.

Rectal feeding may be necessary. Three or four times each day the rectum should be gently washed with warm salt solution, or with a weak molasses or sugar enema. After this has been voided the nutrient enema, of 3 or 4 ounces peptonized milk, one-half ounce meat juice, and either the yolks of two eggs or an equivalent amount of other proteid, should be slowly injected. The molasses enema has received much praise; it gives some nutrition, relieves meteorism, and appears to be pleasant in after effects.

The plentiful giving of cool, fresh water in abundance is most helpful. At intervals of twenty minutes a few drops may be allowed to fall upon the tongue, and this will be swallowed without the patient's being disturbed.

"If your judgment will permit you to do so, correct the predisposing spinal lesions at once; thus restoring normal circulation and nutrition to the bowel. Treat other spinal conditions as you find them, giving slow deep treatment, relaxing all contractions full length of the spine, occiput to coccyx. * * * Give gentle stimulative treatment to the spleen, for upon the early activity of this organ in the production of both red and white blood cells depends the speedy restoration of the body tissue. The neck treatment must be soothing, gentle, relaxing, deep, and not of long duration."—Julia E. Foster.

"Gentle treatment twice or three times a day at first usually keeps the fever down and patients always give evidence of its grateful effects. * * * The relaxing of the spinal musculature which always becomes tensed as the fever increases, tends to avoid the congestions of spinal areas and thereby prevents complications and keeps the bodily functions active. The treatment also greatly relaxes the high tension of the patient due to fever and intoxication. It precludes the call for a nerve sedative and frequently induces sleep immediately following. Typhoid makes such pronounced ravages upon the nervous system and osteopathic treatment so essentially combats this effect, that the rapid convalescence of a case brought through under that treatment is in striking contrast to the slow recovery where other means are employed."—P. M. Peck.

"The patient should be seen at least three times a day; in administering treatment he should be rolled over on his side, the attention first being directed to the contracted muscles of the back, the relaxation of which is best accomplished by firm inhibition along the spinal column on each side, and then by gently springing it, which if continued for a little while invariably brings relief.

"In the first stage of the disease or during the first week, severe headache is nearly always present. This can generally be relieved by thorough relaxation of the muscles and ligaments of the neck especially the ligamentum nuchæ. * * * Tympanites is almost always present especially after the second week, and sometimes in such an aggravated form as to render the condition most serious. A good deal of the gas is usually gotten rid of by stimulation over the splanchnics; *very* gentle abdominal manipulation can also be given, but this should be

done very carefully. If those means should fail, a small rectal tube should be used; it should be inserted very carefully and not too high."—T. D. Lockwood.

"Mechanical stimulation of the liver and kidneys is called for, with special attention to treating the ninth to twelfth dorsal vertebrae, which are considered to be the area of the spine most closely connected by nerves with the portion of the small intestine, in which the typhoid germs are most active, and quieting pressure treatment along the spine to relieve the tired restless feeling.

"I have said nothing relating to correcting vertebral lesions in typhoid. Excepting such corrections as will take place when we have relieved the pull of unequally contracted muscles, I believe it best to defer the adjustment of spinal lesions until convalescence. If we attempt such corrections during the febrile stage we will violate our principle of avoiding all strains and the added irritation would be more likely to raise the fever than to lower it. Our treatment of typhoid would be far from complete if we confined our activities to the proceedings already mentioned. Our duty to the public can only be fulfilled by enforcement on our part of all hygienic principles which are of service in preventing the spread of the disease."—R. F. Weeks.

"The first step in the treatment is to confine the patient to bed, regardless of how mild the symptoms seem to be. Correct all lesions affecting both nerve and blood supply to the infected region when it is possible. * * * A severe or rough treatment is contraindicated. If the patient has a high temperature and is excitable the best thing is to get the muscles thoroughly relaxed from the occiput down, giving especial attention to the splanchnic region. By gently stretching the spine and securing motion between each vertebra you will get satisfactory results. * * * The liver and spleen should be given careful attention, see that the gall bladder is thoroughly emptied, as the bile has a beneficial effect on the intestinal tract. The kidneys are to be kept active. It is best to use a saline enema at the first visit to be sure the bowels are thoroughly emptied. Constipation during the course of the disease, that cannot be controlled by the treatment, should be relieved with the saline enemas, it will not be necessary to use them oftener than every second day. If, as is usually the case, a diarrhea is present, the treatment should be inhibitory. The manipulation used requires a great deal of judgment, be careful not to overtreat and at the same time try to get results with each treatment. Unless the patient is critically ill or is having hemorrhages, two treatments a day will be all that is necessary, a few cases will require more than this."—M. J. Carson.

A positive **prognosis** cannot be made. Favorable signs are constipation or slight diarrhea, low temperature and moderate or no delirium. Unfavorable symptoms are: obstinate and severe diarrhea, high temperature appearing early, cardiac exhaustion, marked nervous symptoms with coma vigil or stupor, nephritis, repeated intestinal hemorrhages, and a great reduction in the blood platelets. A steadily falling blood pressure is a sign of great danger. The prognosis is more favorable in the winter than in the summer and in children than in adults. Pregnancy and obesity give a bad prognosis. Complications such as pneumonia, pleurisy, meningitis, otitis, or erysipelas may occur.

Recovery may begin at almost any time. Convalescence is longer the greater the weakness and higher the fever. Under osteopathic care convalescence is less tedious.

Death results from exhaustion, cardiac failure, or some complication, and usually during or about the third week of disease.

Prophylaxis. Public prophylaxis is partially secured by maintaining good drainage, a pure and uncontaminated water supply, and control of flies.

The patient must not be allowed to infect others. Isolation is best. Disinfection of urine, stools, sputum and of all articles which may be accidentally contaminated by these excretions is necessary. For the urine use equal amounts of a 1:20 solution of carbolic acid and urine and let stand for two hours. For the stools, mix with at least twice the amount of carbolic solution and let stand for several hours. Disinfect bath water after using with chloride of lime, one-half pound to a bath of 200 quarts, and let stand for one-half hour before allowing to run into sewer. Sputum should be collected in tuberculosis cups or upon small cloths and burned. Bed and personal linens should be soaked for two hours in the carbolic solution before leaving the room, then sent to the laundry to be boiled. Dishes should be boiled before sending from the room.

The nurse should wear a rubber apron and rubber gloves when convenient, and these sterilized as occasion demands. The room should be thoroughly disinfected after the patient has recovered.

There seems to be no doubt of the existence of "**typhoid carriers**," whose alimentary or urinary tracts carry the bacilli, but who, for some reason, are not greatly affected thereby. In such carriers, any unclean habit, which results in the presence of even microscopical amounts of their fecal material upon their fingers, renders them a source of considerable danger. The remedy is easy—for each person to be so clean in habit that absolutely no fecal material reaches the fingers; and also that the hands be thoroughly scrubbed with soap and water after every defecation. Surely these are nothing more than reasonably cleanly precautions, yet they are enough to protect against the danger of typhoid carrier—if he only would become educated into the habits. When a typhoid carrier is a cook, and has unclean habits about toilet and hands and food stuff, then the danger is considerable. Only the forces which lie within the normal cells of the normal body are able to combat infections so constantly and so insidiously introduced into the body.

Typhoid, like typhus, should be considered a disgrace to modern civilization. It is a filth disease, absolutely. Its existence would be limited to those now suffering from it, if there were no avenues by means of which the excreta could reach food and drink.

PARATYPHOID FEVER

Paratyphoid fever is an acute infectious disease similar to typhoid fever but of a milder type. It is caused by the paratyphoid bacillus, a form or forms intermediate between the bacillus typho-

sus and the bacillus coli communis. It agglutinates with cultures of its own kind but not with those of the typhoid bacillus.

Pathology. There are no special intestinal lesions as in typhoid. There may be irregular and atypical ulcers in the lower eight or ten centimeters of the ileum but these are not confined to the lymphoid tissue and are not accompanied by enlargement of Peyer's patches or swelling of the mesenteric glands.

Diagnosis. The symptoms in most cases resemble typhoid fever closely but it is of shorter duration, the premonitory symptoms are absent, prostration is early, myalgia is more marked, and the temperature rises more rapidly. In the gastro-intestinal form, the temperature rises rapidly after a chill, and diarrhea supervenes at once. The fever usually terminates by crisis.

Complications are mainly purulent arthritis and myositis.

Diagnosis is by the serum reaction only. Both species of bacteria must be employed in the test. The clinical symptoms of vomiting, epigastric pain, and marked prostration are dominant features. Cultures may be obtained from the blood, urine and feces.

The treatment is the same as for typhoid fever. No doubt many of the "aborted" cases of typhoid, in which the diagnosis rests upon symptoms alone, are really of this fever.

TYPHUS FEVER

(Contagious fever; ship fever; jail fever; camp fever; exanthematous typhus; Brill's disease; petechial typhus; spotted or putrid fever)

Typhus fever is a comparatively rare, acute, specific, epidemic, very highly contagious, febrile disease characterized by sudden invasion, rapid rise in temperature, pains in the head, back, and limbs, the appearance on the fifth day of a macular and petechial eruption, low muttering delirium, a heavy, drunken expression, a musty odor, and a crisis about the fourteenth day.

Etiology. The specific organism is the bacillus typhi-exanthematici (Plotz). The predisposing causes are filth and overcrowding. It is rare in the United States except in seaports. It has appeared in Europe during this war. It is transmitted by contact, fomites, and human body-lice, probably the respiratory secretions, and it is infectious throughout the disease and convalescence. The incubation period is from a few hours to two weeks, usually twelve days, with malaise a day or so before invasion.

Diagnosis. The onset is sudden with chill and pains in back, limbs and head; temperature reaching 104° F. within a few days; pulse frequent, 100 to 140, bounding, often dicrotic; the usual fever symptoms; tongue with a thick white fur later becoming brown; bowels constipated; conjunctivæ injected; pupils contracted, "ferret eye"; face with a uniform deep, dusky flush and glazed skin,

expression dull, heavy, and apathetic; early prostration; and noisy delirium.

As the disease progresses, the temperature continues to rise; the pulse becomes small and weak; a pungent musty or mousy odor appears; the teeth become covered with sordes, and the prostration is extreme.

Eruption. On the fifth to the seventh day there appears a "mulberry rash" over the whole body except the face. Distinct papular rose-spots which do not disappear on pressure nor after death, appear first upon the abdomen, and constantly increase over the body for forty-eight hours. Some of these may become hemorrhagic. During the second week the typhoid state comes on rapidly with low muttering delirium, ataxic symptoms, subsultus, tremors, carphologia, dilated pupils, and perhaps bronchial symptoms. Coma vigil, retention of urine, paralysis of the sphincters, and death may occur.

About the fourteenth day the patient sinks into a sound sleep, the temperature falls rapidly, there is profuse sweating, a critical diarrhea, and an abundance of urates in the urine, after which the patient gains strength rapidly. The spots pass through gradations in color to branny desquamation.

The duration of the disease is from six to fifteen days. Extremely mild cases may have slight fever, no delirium and convalescence established by the tenth day. **Malignant** or typhus siderans is very severe from the onset and death occurs in two or three days.

The complications may include retention of urine, gangrene of extremities or bed-sores; hypostatic congestion of the lungs, bronchitis and broncho-pneumonia. Parotid bubo and pyemic abscesses, thrombosis of the femoral vein, meningitis and nephritis are rare.

The heart shows the effects of the poison early. An abnormally slow pulse (50 to 30) is a bad sign. The spleen is enlarged but not tender. The urine has the usual febrile characteristics. The blood changes are not characteristic.

Treatment. Isolation and disinfection of clothing and excreta are imperative. Put the patient to bed, in the open air if possible. An experienced nurse should be constantly present.

The position of the patient should be changed from time to time to prevent hypostatic congestion. Adjustment of the entire spine from occiput to coccyx is necessary, paying particular attention to the relationships between head and atlas and neck and inferior maxillary. Stimulating treatment along the spine and to the heart may be indicated.

No solid food is permitted. Liquids should be used as plentifully as the assimilative powers will admit. Milk, milk and soda water, broths, and albumin water may be used.

The **Prognosis** depends upon age, temperature, frequency of pulse, early stupor and severity of symptoms. Mortality of the young is slight, in those past middle life it is high. Death occurs during the second week from toxemia; during the third mainly from pneumonia. Second attacks are very rare.

Prophylaxis. Keep the community in a hygienic condition, prevent overcrowding, and look to the condition of immigrants. The existence of typhus fever in any city, or camp, or in any other place, as an epidemic, is a disgrace. Only a most inexcusable lack of attention to the simplest laws of hygiene permits the continued existence of this disease. Sporadic cases may, and no doubt do, occur, in the absence of serious neglect of sanitary precautions; this is especially true of seaport towns, and of places where the populations are frequently changing. But the typhus epidemic has no place in a civilized community.

CHAPTER XLV

INFLUENZA, PERTUSSIS AND DIPHTHERIA

INFLUENZA

(La grippe; grip; contagious catarrh; epidemic or catarrhal fever)

An acute, specific, infectious, highly contagious disease, occurring sporadically, epidemically, and pandemically, characterized by fever, by protean symptoms affecting mainly the respiratory, digestive and nervous systems, by muscular pains, and by a prolonged prostration out of all proportion to the intensity of the fever.

Etiology. It is caused by the bacillus influenza of Pfeiffer, present in the nasal and bronchial secretions. The bacilli persist after the severe symptoms have subsided. It attacks oftenest adults between the ages of twenty and forty. One attack seems to predispose to subsequent attacks. Lowered vitality from poor food, fatigue, exposure, old age, bad sanitation, or bony or muscular lesions anywhere in the body are predisposing factors. Lesions involving the midthoracic region are almost invariable. The incubation period is from one to six days, oftener three to four.

Diagnosis. The onset is sudden, marked by chill, temperature which rises abruptly to 102° to 104° F.; quick compressible pulse; sneezing; injected, watery eyes; severe frontal headache and backache; coryza and catarrh of the upper air passages; and marked weakness. In mild cases, defervescence occurs by lysis or crisis; sometimes a secondary rise occurs from the third to seventh day; the depression and debility following is out of all proportion to the fever and persists for a considerable time.

In the severer cases, after the first few days the symptoms may group themselves so that an attack may be said to be of a respiratory, gastro-intestinal, nervous or febrile type according to the predominating organs attacked; or one group of symptoms may quickly merge into another.

The **respiratory type** is marked by paroxysmal, violent cough, after which bronchitis or broncho or croupous pneumonia may develop. The pneumonias are especially apt to develop in the elderly or in infants and are often fatal.

The **gastro-intestinal type** is ushered in by nausea and vomiting, anorexia, epigastric pain, profuse diarrhea, prostration amounting to collapse, and sometimes jaundice and enlargement of the spleen.

In the **nervous type** the initial pains are more severe, there may be delirium, and after defervescence the heart becomes slow

or irregular, with sometimes anginoid pain. Great depression and insomnia follow. Meningitis or encephalitis may be found post-mortem.

In the **febrile type** there is continued fever with delirium, dry, brown tongue and other symptoms of the typhoid state.

The **complications** form a long list: any form of nervous disorder as epilepsy, myelitis or degeneration of the cord, neuritis, neuralgia, insanity; acute otitis media; conjunctivitis; functional or organic cardiac disorders; pneumonias of various types and pleurisy; nephritis; arthritic pains; and cutaneous rashes.

The **sequelæ** are also numerous, the most common being phthisis, chronic gastro-intestinal catarrh, lymphatic enlargement, persistent headache, neuralgia, insomnia, neuritis, neurasthenia, melancholia, mania, and confusional insanity.

The history of a previous attack or the presence of an epidemic are leading factors in diagnosis.

The **spinal examination** shows an extremely contracted musculature with bony or other lesions anywhere from occiput to coccyx. The region in the neighborhood of the fourth thoracic spines, following around to the third, fourth and fifth ribs, is practically always subject to hypersensitiveness and pronounced muscular tension, both of the spinal and the intercostal muscles.

The **sputum** is greenish yellow with coin-like lumps, scanty at first, profuse and purulent later.

The bacillus influenza, a slender rod staining readily with ordinary aniline dyes and growing only on blood streaked serum, is found in the moist respiratory secretions, less commonly in the lung, heart, or central nervous system but rarely in blood. The contagion is carried by the moist nasal and bronchial secretions. The blood and urine show few changes.

Treatment. Rest in bed is imperative even in mild cases and should be continued for a day or two after the temperature is normal to avoid any risk of relapse or complications. The sputum and nasal secretions must be disinfected. The manipulative treatment varies with the symptom-group predominating. Careful relaxation of the tense muscles along the entire spine, very careful correction of any bony lesions, inhibition of the posterior cervical areas to control the fever are some necessary factors. Stretching with internal and external rotation of the legs gives relief.

At the inception a thorough sweat and enema are beneficial. For the rhinitis, the treatment given under this subject should be employed. Gastro-intestinal symptoms may be met with the treatment given under acute gastritis; cardiac symptoms should receive the treatment given under acute endocarditis.

The **diet** should be liquid during the height of the fever, then semisolid with plenty of water. Cooling drinks are good during

the attack. During convalescence, the food should be plenty and nutritious. If the temperature is high, tepid sponging and the ice-cap to the head are indicated. If constipated at the onset, give enema. Frequent inhalations of steam may relieve the nasopharyngeal and bronchial symptoms. Hot fomentations to the back aid in relieving the distress. If diarrhea is present use the hot fomentations to the abdomen also. The patient must be protected from changes of the weather, especially those at either extremes of life or those having chronic disease. During convalescence, great care must be given to avoid relapse or sequelæ. Rest, nutritive diet, and change of air is advisable.

Prognosis. In uncomplicated cases the prognosis is good for recovery except in the elderly and in infants. Relapses are common.

Prophylaxis. This is best secured by isolation of the patient and disinfection of the bodily discharges. It is not quarantined.

Persons suffering from influenza should avoid crowds, and they should not come into close contact with other persons. Certainly kissing should be tabooed at this time. It is particularly desirable that children should be protected from infection. The person who suffers from influenza is also particularly liable to contract certain other diseases, notably tuberculosis and pneumonia; so, for his own sake as well as for the sake of those who might suffer through him, he should very carefully avoid mixing with his fellows during the attack.

WHOOPING COUGH

(*Pertussis*; *tussis convulsiva*)

Whooping cough is a specific, epidemic, infectious, contagious disease affecting the respiratory organs and attended by a peculiar paroxysmal cough known as the whoop.

Pertussis is highly contagious, being carried by direct contact and by fomites, attacking principally children between the first and second dentitions. The Bordet and Gengou bacillus is the specific cause. This is found in the sputum most abundantly during the first week, the most infectious period, and becomes gradually less. One attack usually confers immunity. The incubation period is from seven to ten days. The patient may be considered noninfectious five weeks after the first whoop.

Lesions of the cervical and upper dorsal vertebræ and of the first, second and third ribs, affecting the vagi, the phrenic, the sympathetic, the recurrent laryngeal or the vasomotor nerves predispose to the disease.

Diagnosis. Three stages of the disease are usually recognized.

Catarrhal. The invasion is either insidious or well-marked with an initial temperature of 100° to 102° F., attended by symptoms of ordinary naso-laryngo-bronchial catarrh and a loose cough of an incessant character. After one or two weeks, instead of improving, the cough becomes worse and the second stage appears.

Spasmodic. The cough becomes paroxysmal, consisting of a succession of fifteen or more short, rapid, expiratory puffs with no intervening inspiration, immediately followed by a deep, loud inspiration. This is the characteristic whoop and is due to the partial closure of the glottis. Each paroxysm is composed of three or more such spells, the last one followed by the expectoration of a small plug of mucus or by vomiting. During the paroxysm the facies presents a swollen, dusky appearance, eyeballs protruding, reddened eyes, and puffy pinkish lids. The body is bent forward, and the patient is perfectly helpless. Urine and feces may be passed involuntarily. Cyanosis may occur from the strain. The child knows the attack is coming by a sensation of tickling in the larynx, tries in every way to stop it, and runs frightened to its nurse or some object for support.

Emotion, irritation of the throat by dust or a tongue depressor, even swallowing, and especially accumulations of mucus in the larynx provoke an attack. Between paroxysms the child is apparently well. If vomiting frequently occurs he becomes anemic and wasted.

During the severe cough petechiæ of the forehead, ecchymosis of the conjunctivæ, epistaxis, bleeding from the external auditory meatus or from the frenum of the tongue and occasionally hemoptysis may occur. Ulcer of the frenum of the tongue is common. The number of paroxysms varies from four to eighty or more in twenty-four hours. This stage lasts three to six weeks, usually about four weeks.

Terminal. The paroxysms occur at longer intervals, are of shorter duration and of less intensity, the catarrhal symptoms are more marked, the expectoration becomes thinner, fluid, mucopurulent, and looser. This state lasts from a week to several months. "Habit cough" may follow.

Convalescence varies greatly, is generally slow and the patients are particularly liable to tuberculosis at this time.

The most common complications are: convulsions in infants, cerebral hemorrhage, broncho-pneumonia, acute dilatation of the right ventricle, tuberculosis and emphysema. The disease may result in cardiac valvular lesions, hernia, or pigeon-shaped chest from the strain. Chronic bronchitis and asthma may follow.

The blood shows an early leucocytosis ranging from 20,000 to 40,000 cells per cubic millimeter, lymphocytes being 35 to 55%; polynuclear cells relatively decreased; eosinophiles, normal or

diminished. The hemoglobin and red cells bear no direct relation to the leucocytosis.

The urine has a high specific gravity, 1022 to 1023; is light yellow; contains much uric acid; and may contain albumin and sugar as a result of the physical strain.

The diagnosis is made by the characteristic whoop in the second stage. If no real whoop is present, the swollen face and eyes, the ulcer of the frenum of the tongue and the vomiting after the severe cough leave no doubt.

Treatment. Isolation of the patient in a well-ventilated, sunny room where he can secure fresh air day and night is essential. Children exposed to infection should be disinfected and isolated for at least three weeks as the disease cannot be diagnosed in the catarrhal stage. If at all severe, rest in bed is advised.

If the physician sees the patient early he may abort the disease. Treatment of the whole respiratory tract with correction of vertebral and rib lesions and relaxation of any contracted muscles should be given. A subluxated atlas and axis are especially harmful. Dr. Still considers the diaphragm a factor in the spasm and treats it as well as the phrenic nerve to give relief. Subluxations of the first and second ribs produce irritation of the recurrent laryngeal nerve and hence of the whole larynx.

"Children who play and sleep out of doors get along better. For the paroxysms I use an elastic belt, with a pad over the stomach. Sometimes the children realize its comfort and refuse to have it taken off. Steam inhalations may give relief; sprays I find useless. A spoonful of syrup made of sugar with lemon or pineapple may be given at the first tickling sensation."
—Asa Willard.

The diet must be nutritious and easily digested. The child should be warmly clad and protected from drafts of air. The excretory systems are kept in active condition by plenty of water and diet. Treat the various symptoms as they occur. Relieve the respiration by raising the upper ribs especially those over the heart. Treatment throughout the vasomotor area is indicated.

Inhalations of steam may be beneficial. During convalescence, the child must be carefully watched and fed as broncho-pneumonia or tuberculosis is apt to develop. Change of air is often of benefit. Tonic treatment to assist in restoring the respiratory equilibrium and to increase the nutrition of the child is urgently demanded.

Prognosis. With the complications, this is the most fatal of the acute infections under five years of age. Infants and young children should receive especial care.

Ordinary uncomplicated cases are favorable for recovery. The prognosis depends upon the age and strength of the patient, the severity and number of paroxysms, and the presence or absence of complications. No recurrence is to be expected.

Death is due to spasm of the glottis or to extensive subdural hemorrhage, occurring chiefly in the children of the poor and in delicate infants.

Sequelæ are rather frequent especially in the poorly nourished. Careful watchfulness on the part of the physician and the nurse will do much to prevent these results if treated when the slightest symptoms of overstrain are first noticed.

Prophylaxis. This consists in isolation, disinfection of sputum and final fumigation of the premises. It is not quarantined. Children should be protected from danger of infection, by keeping them away from cases of whooping cough, and also by having their general health kept up by sane and wholesome living throughout childhood.

DIPHTHERIA

(Putrid sore throat; malignant ulcerous sore throat; malignant quinsy; membranous angina)

Diphtheria is an acute, specific, infectious, epidemic and sporadic, contagious constitutional disease occurring chiefly among children, and associated with grave throat symptoms, general symptoms of fever, glandular enlargement, and great prostration, and the formation of a false membrane or fibrinous exudation on mucous and abraded surfaces and often followed by paralyses in various situations.

Etiology. The exciting cause is the bacillus diphtheriæ of Klebs and Loeffler which produces a toxalbumin the absorption of which produces the symptoms of the disease. It is associated with other organisms the most important of which is the streptococcus pyogenes.

The predisposing factors are childhood, ages from two to ten years; naso-pharyngeal catarrh; individual susceptibility; and structural perversions of the neck, clavicle, upper ribs and vertebræ. Muscular contractions of the scapuli and the large neck muscles disturb the relations of the first rib with the clavicle and the vertebræ, thus interfering with the size of the thoracic inlet and the relations of the contained important structures. First rib subluxations are nearly always found. The bacteria are found in the exudation and secretion of the fauces and the saliva.

The usual modes of infection are from one person to another by contact or by infected articles. (The bacillus may retain vitality for months.) Diphtheria carriers are persons who present no recognizable signs of the disease yet carry the bacillus in their throats. They may spread the disease widely. Milk, and rarely other foods, may carry the bacilli. Accidental infection from culture or through animals is rare. The incubation period is from one to five days.

Diagnosis. The bacilli are cultured from the throat, and these, with the characteristic symptoms, are necessary to diagnosis. The **pharyngeal** is the most common type. The invasion may be mild with general malaise and rigors succeeded by a moderate fever, 100° to 103° F., usually falling on the second to third day; pulse full and strong, 100 to 120; anorexia; stiffness of neck, tenderness and swelling of the deep faucial glands at the angles of the jaw; a slight soreness of the throat, and a complaint of a frequent desire to hawk in order to clear the throat. On inspection, the fauces and the pharyngeal mucous membranes are found red, swollen, and with a characteristic glazed appearance. This is soon followed by whitish patches which rapidly coalesce into a dirty white membrane upon the fauces or tonsil, the removal of which exposes a raw bleeding surface. Both tonsils and the uvula may be greatly swollen and spotted with exudate.

By the third day, the false membrane covers the tonsil, pillars of the fauces, and perhaps the uvula which is thick and edematous. The growth ceases after this or the fourth day. The tongue is slightly coated, sometimes with more or less exudate upon it. The bowels are regular or diarrhetic. Prostration is marked. After the seventh day, the throat clears, and convalescence begins unless complications intervene.

Atypical forms are many. They are a grave danger to the community by remaining undetected and thus spreading the malady. The Klebs-Loeffler bacillus may be cultivated from the throat. No local membrane may appear, a simple catarrhal angina with a croupy cough being the only symptoms. In other cases the tonsils are covered with a pultaceous exudate but not a consistent membrane. Some cases present only symptoms of a typical lacunar tonsillitis.

"Latent diphtheria" occurs chiefly in hospital practice in young persons subject to wasting diseases. It is manifested by fever, naso-pharyngeal catarrh and gastro-intestinal disturbances.

Nasal diphtheria is usually secondary to the pharyngeal. The main symptoms are bloody, offensive discharge from the nose, attacks of epistaxis, a nasal twang to the voice, and regurgitation of food and drink through the nose. The constitutional reaction is marked. The membrane may or may not be visible.

Laryngeal diphtheria (membranous croup). Extension to the larynx is indicated by hoarseness or loss of voice, a brassy, croupy cough, noisy and stridulous breathing, obstructive dyspnea, and cyanosis. The membrane may appear first in the larynx.

The **bronchial** form has all the symptoms of a severe capillary bronchitis. The membranes after reaching the bifurcation speedily become purulent.

Malignant form. The symptoms are all severe from the start. There is marked prostration, a marked tendency to hemorrhages, and the typhoid state develops early with death in a few days.

Complications are many. Nephritis is the most common. Albuminuria is nearly always present and when associated with blood and epithelial casts and scanty urine indicates parenchymatous changes of the kidney. Uremia may develop without the presence of severe throat symptoms.

Diffuse erythema is common. Occasionally urticaria and purpura are seen. Membrane formation upon external wounds sometimes occurs. Severe ulceration of the throat may follow careless treatment.

Cardiac disturbances are constant. A murmur is heard in 94% of cases. Rapid action with gallop rhythm and epigastric pain and tenderness are serious symptoms. Fatal dilatation may occur as late as the sixth or seventh week. Cardiac diseases, especially myocarditis, are most common during the second and third week.

Capillary bronchitis and broncho-pneumonia are frequently found in fatal cases. Otitis media occurs by extension through the Eustachian tube. Conjunctival diphtheria is rare. It may occur in the physician or nurse from receiving expectorations in the eye while examining the throat of the patient. Meningitis, thrombosis, and septicemia are rare.

The sequelæ may be serious. Post-diphtheritic paralysis is due to a toxic neuritis and is the most common sequela, being present in 10% to 30% of cases. It may appear at the end of the first week but usually within three weeks of apparent recovery. It seems to be more frequent when antitoxin is used, and may appear without diphtheritic symptoms, from preventive doses.

Anesthesia of the pharyngeal mucosa with paralysis of the pharyngeal muscles and soft palate may seriously interfere with deglutition and impair the voice.

Loss of accommodation of the eye causes squint or diplopia. Anemia and chronic naso-pharyngeal catarrh may follow even mild attacks.

The blood pressure is subnormal during invasion, bearing a direct relation to the severity of the faucial attack. Albuminuria does not cause a rise in pressure. Steady progressive fall in pressure is often present in fatal cases.

The urine is febrile. Albumin is present early. Often tube casts and renal epithelium can be found. Bacilli are present only when the diphtheritic lesions are so situated as to communicate with the urinary tract.

Blood. Hypercythemia is frequent. It may reach 7,500,000 cells. With the drop in count, nucleated reds and polychromat-

ophilic cells are seen. During convalescence there is a more or less severe anemia depending upon the severity of the toxemia. Specific gravity is increased. Hemoglobin is slightly reduced. Leucocytosis is proportionate to the severity of the disease, usually between 15,000 and 30,000 cells.

The polymorphonuclear cells are increased, there may be a relative or actual lymphocytosis, and the eosinophiles are normal or decreased. Myelocytes are present, 3% to 16%, over 3% being of grave prognostic omen. There may be an acidophilic tendency. Leucocytic shadows are common.

Treatment. The present antitoxin method of treatment is much less dangerous than the older medical methods. It may even be advantageous in malignant cases. Its value diminishes steadily with the course of the disease. In order to prevent disaster due to the use of horse serum and to anaphylaxis, if antitoxin is to be given, an extremely small dose should be given, and the patient watched for two hours or more; if serious effects are produced, no further attempt should be made to use the serum. If no ill effects are noted, a large dose should be given, and this should be sufficient. At any time greater than ten days after antitoxin or any other preparation of horse serum has been injected, there is a probability of sensitization, and no more serum should be injected, except with very careful precaution.

"The treatment of diphtheria by osteopathic methods is often a pleasure rather than a trial because of the success which rewards us for our efforts.

"There has been considerable discussion by the members of our profession regarding the methods to be employed in successfully overcoming this disease, and many have expressed the view that since antitoxic serum is a physiological remedy, which naturally belongs to all schools of healing, it should be employed by the osteopathic physician in cases of diphtheria. I have no objection to the use of serum therapy by those members of the profession who conscientiously feel that they need it in their practice to secure the highest measure of success. However, I feel, on the other hand, that, if they were well acquainted with the technic of the methods which will be given below, they would not feel it to their advantage, from the standpoint of success, to use serum injections in a single case.

"The important measures illustrating this technic, from the writer's standpoint in a case of diphtheria are: First, remove any influences which are interfering with good circulation and nerve control in the region of the throat, and throughout the neck generally, by properly directed adjustive manipulation. Furthermore, promote the best possible circulation in the gastro-intestinal tract, in the liver, in the kidneys, and to the whole vascular system. Second, cleanse the large intestines with enemata, and if there is material in the stomach at the beginning of the illness, wash out the stomach with the stomach tube. Each day thereafter use an enema as a routine procedure. Third, stop all food and give **nothing but water**. Let the patient have all the water desired, either hot or cool. The food is not to be resumed until the disease is fully under control, indicated by the return of the temperature to the normal and the disappearance of all active symptoms of the disease. Fourth, the temperature is controlled by the manipulation and by hydrotherapy, using the full tub bath if necessary. At all times the feet should be kept warm and artificial heat should be supplied to the feet and legs when necessary, even if

the temperature, by the mouth, is somewhat above normal. Ice may be used over the throat while the temperature is high, and may be replaced by hot applications when the temperature has fallen below 103 degrees Fahrenheit. Sixth, the osteopathic physician should resort to intubation in those cases which come under his care after the case is quite advanced and the membranes cause an extreme interference with respiration. The introduction of an O'Dwyer tube into the larynx is not a difficult procedure, and used in those severe cases which, on account of the unfavorable constitutional condition of the patient and the rapidity with which the disease may progress under such circumstances, may develop distressing obstruction to the breathing before the remedial agents which have been mentioned above could control the situation, the results would be highly gratifying. I feel that, if we fully understood and practiced the treatment of diphtheria on the basis outlined above, our results would be exceedingly satisfactory, and we would never feel it necessary to resort to anti-toxin at any stage of the disease. In fact, I am convinced that any case which can be cured by antitoxic serum can be cured—and that more quickly and satisfactorily—by the above technic.”—R. D. Emery.

The heart action must be carefully watched. Each day pay particular attention to the upper dorsal vertebrae and ribs. Clavicles, ribs, and sternum must be in proper relationship. The occipito-atlantoid articulation, the hyoid, and the inferior maxillary must be watched daily.

“Search out the contracted muscles and the cause of their contraction. Examine and know the condition of the kidneys and bladder. Know that the ureters are freed from all obstructions by pressure or otherwise and are carrying out their normal functions.”—A. T. Still.

For the pain around the throat, careful treatment of the cervical muscles and the glands, and hot applications to the angle of the jaw are a comfort. In the laryngeal form, inhalations of hot water vapor with ice pellets to suck afford relief. If suffocation is threatening, intubation or tracheotomy may be necessary.

The mouth must be washed with Dobell's solution or normal salt solution every hour to keep the mouth and pharynx as clean as possible.

Nasal cleansing is especially necessary in the nasal form. Normal salt solution (1 teaspoonful to the pint of water), saturated boric acid solution, or Dobell's are used.

Convalescence requires nourishing foods, fresh air and stimulating treatment.

Prognosis. The prognosis is always guarded, more so in children than in adults. It is usually proportionate to the severity of the symptoms. Favorable indications are moderate fever, only slightly impaired strength, good constitution, and moderate exudate, plus early and vigorous treatment.

Unfavorable signs are high fever, great depression, spreading exudate, great swelling of the cervical glands, large amounts of albumin in the urine, extension to the larynx or nasal mucous membranes, hemorrhages from the fauces and nose, and the general epidemic character.

Death results from involvement of the larynx, sudden heart failure, diphtheritic paralysis, septic infection, occasionally from uremia, or broncho-pneumonia during convalescence.

Prophylaxis. Isolation of the patient should be absolute. All bed and personal linen should be sterilized by boiling. Instruments, tongue depressors, spoons, etc., should be boiled immediately after use or kept immersed in carbolic acid solution. The room after the patient leaves is disinfected.

Careful scrutiny of milder cases of sore throat during epidemics will assist in controlling its spread. Strict surveillance during convalescence is also necessary for the same purpose. After convalescence is established, the patient should be washed with soap and water, then with 50% alcohol (carbolic acid solution 2%, or bichloride of mercury 1:10,000) for three successive days. The hair should be similarly treated or cut off. After death from diphtheria, the body should be wrapped in a sheet which has been soaked in 1:3,000 solution of bichloride of mercury and placed in a closely sealed coffin. The funeral should be private.

Quarantine. The period of quarantine is continued until two cultures taken on different days are negative.

CHAPTER XLVI

DISEASES DUE TO COCCUS INFECTION

LOBAR PNEUMONIA

(Lung fever; croupous pneumonia or pneumonitis; fibrinous pneumonia; specific pneumonitis)

This is an acute infectious disease, variably contagious, due to infection by the micrococcus lanceolatus, and characterized chiefly by pulmonary symptoms of great severity.

Etiology. The specific organism is almost omnipresent in the mouth and in dust. It grows actively only when the tissue-resistance is lowered. The etiology of the disease is practically the etiology of lowered immunity in general, plus some factors due to the peculiarity of the organism. While atypical pneumonias may be due to other infectious agents, such as the typhoid bacillus, or pyogenic organisms, these usually present varying symptoms referable to the nature of the invading agent. These organisms gain entrance into the lung tissue through respiration. Since they are so widely distributed in persons who do not succumb to the infection, it is evident that the disease cannot be considered very contagious, though epidemics sometimes appear to be due to organisms of unusual virulence, and in these an increased contagiousness often appears.

The disease is most frequent in the late winter and early spring; it may or may not appear to be the result of an ordinary "cold" or influenza; these diseases doubtless lower the immunity both in general and in specific relation to pulmonary infections. It very often gives death to the senile and the physically defective; mental defectives frequently die from pneumonia in youth. Heart lesions, diabetes, carcinoma, nephritis, anemia, tuberculosis, all predispose to pneumonia, and long suffering is often mercifully prevented by the disease, truly named "friend" of those who are unfit or unable to maintain comfortable existence in the world.

Bony lesions are widespread, as is to be expected from what has been said of other etiological factors. Rigidity of the mid-thoracic region is the most frequent finding in uncomplicated cases. Other lesions include those of the cervical region, and of the ribs and clavicles. Innominate lesions are also reported as causative; this is probably due to the effects produced upon upper spinal relations through the imbalance caused by the innominate lesions; or to the lowering of resistance through the directly irritating nervous effects of the lesion.

Pathology. The structural changes follow well-marked stages, and these are of vital importance in diagnosis, treatment, and prognosis. The first stage is that of hyperemia, followed by engorgement. The second stage is that of red hepatization, in which the alveoli are filled with red blood cells. The third stage of gray hepatization is due to the partial digestion of the red blood cells, and infiltration of the mass with white cells. The fourth stage is that of resolution, in which the blood is being digested and absorbed, and recovery occurs. The treatment and symptoms vary during these stages, and each must be considered independently.

First stage: Hyperemia and engorgement. The onset may be very acute; in elderly or poorly nourished persons the reaction may be less pronounced. The changes in the lung begin with acute hyperemia, due to the presence of the infectious agent, with the other etiological factors already mentioned. The fever rises, and there is some dyspnea. The hyperemia increases; the lungs become very seriously congested and a few white cells, followed by many red cells, begin the engorgement, the filling of the alveoli with blood occurs by diapedesis; few or no rhexin hemorrhages occur in typical cases. The filling of the alveoli is associated with great dyspnea and coughing. During the first few hours the cough is hard and dry, perhaps absent; as the engorgement and the inflammation progress the cough becomes looser, often with streaks of blood. Intense pain is associated with the coughing, especially if the pleura is involved.

During hyperemia and early engorgement, the lung sounds are not materially changed. Rales may be heard, variously, according to the area involved. Percussion notes are normal or slightly tympanic. Dullness may begin, and progress slightly during the later stage of engorgement. The urine is of the ordinary febrile type, varying according to height of the fever. The blood shows marked and early leucocytosis; slight leucocytosis, leucopenia, or normal counts indicate either a very mildly virulent infection, or very diminished resistance on the part of the patient. The polymorphonuclear neutrophiles are unusually high, in typical cases. During this stage, the increase is in the younger forms—the finely granular and mononuclear forms. When the infection is severe and the resistance low, the few polymorphonuclears show ragged outlines, very irregular and sometimes extruded nuclei, atypical forms and granules, and many masses of naked nuclear matter are found, all indicating the effects of virulent toxin upon blood of poor resisting qualities. The systemic blood pressure is low, in early hyperemia, increasing during the increase in the fever, in typical cases. Suddenly dropping arterial pressure indicates failing heart, and is a sign of great danger in early cases.

The treatment during this time must include thorough and frequent relaxation of the interscapular region and the lower thoracic region; increased mobility of the entire cervical and thoracic region; if possible, correction of the bony lesions as found on

examination. The colon usually contains an increased amount of fecal matter—this must be removed, preferably by enema of warm water, carefully given. Any of the usual solutions may be employed, provided that no irritation results. The patient must be placed in a pleasant, well-ventilated room—the ventilation is the most important thing. The windows must be opened widely, day and night, unless the weather is unusually inclement. Fresh air is absolutely the most important thing, after the structural corrections, in the treatment of pneumonia. Warmth may be provided by blankets, not too heavy, hot water bottles, irons, or salt bags. The thorax may be wrapped in cotton during the stage of engorgement, and until recovery; this is not advised in all cases. Usually no food is asked; none but liquids should be given in typical cases. These may include hot milk, vegetable broths, fruit juices, ice cream, according to the season and the patient's desires. Plenty of cool fresh water should be freely given during all stages. Steady pressure in the suboccipital triangles, or at the sides of the ninth to the eleventh thoracic spines, lowers the blood pressure, diminishes the cough, and lowers the temperature. Sponge baths of water at body temperature lower the temperature and give much relief. Some cases can be aborted during this stage, and recovery be speedy.

"In all pneumonia cases I make use of a hygroscopic clay poultice (such as antiphlogistine) from the very start. This assists greatly in relieving congestion in the lungs by withdrawing serum through the skin and is so specific in its action that the area of inflammation may be *outlined quite precisely* by noting the semi-liquified area of the poultice. These poultices should be changed at least every twelve hours. Every eight hours is better if the physical condition of the patient permits."—F. A. Cave.

Stage of Hepatization. This includes the second and third stages, of red and of gray hepatization, of the older authors. The blood which fills the alveoli, during the stage of engorgement, coagulates. If the lung is cut, the section resembles liver, whence the name. A piece of such a lung sinks readily in water. Percussion elicits a dull note over the affected area. The lung sounds are absent over this lobe, and the rest of the lung gives rales and sometimes tympanic notes. The fever is very high, sometimes to 106° F., delirium may be present; the cough is looser, very painful, and productive of sputum, usually profuse, and of a rusty appearance. The color is due to the partly digested blood, with its hemoglobin transformed partly into methemoglobin.

Engorgement, red and gray hepatization may be present in different parts of the lung at the same time. The course of events is not materially modified by this fact. When the lungs are partly filled with coagulated blood, the clinical picture is characteristic. The blood undergoes autolysis, becomes partly digested, and the white cells emigrate into the affected areas in

large numbers. These changes cause the hemoglobin to become somewhat transformed into methemoglobin, and this to become further broken down into simpler compounds. These changes, with the added leucocytes, give the grayish appearance referred to as gray hepatization.

The urine shows the febrile changes in increased degree; the pulse is usually quick and somewhat irregular. The respiratory rate is very high, especially in relation to the pulse—a 1:2, or 1:1.5 ratio is sometimes seen in patients who recover. The blood in strong individuals shows marked leucocytosis, sometimes to 25,000, with a high neutrophile percentage. The neutrophiles present a less immature appearance.

During this stage the treatment should follow the outline previously given for the first stage, plus efforts to maintain the oxygen intake. When the condition of the lung is recognized, it is evident that the supply of fresh air must be kept very plentiful. If the respiratory deficiency is considerable, oxygen may be given. It may be necessary to use an inhalation tube at first, but as soon as can be the oxygen should be allowed to escape slowly from a pipe near the patient's nostrils. The oxygen supply should be maintained until the lungs are well cleared out. During the hepatization the heart's action is labored, and the heart must be kept in as good a condition as possible by attention to the condition of the first to the fourth thoracic segments. The ribs, vertebræ, and muscles of these segments must be watched, and all lesions removed speedily. The colon must be kept clean by enemas given once or even twice a day, if necessary. The ordinary nursing, with reference to the teeth, etc., must not be neglected. The danger of hypostatic congestion must be remembered; the patient who is weak must not be allowed to lie too long a time in any one position, but must be moved to new positions, so that the blood may not gravitate constantly into the same areas. During this stage treatments should be given once to three or four times each day. It is often necessary to remain almost constantly within call, for hours, if the patient is to have his best chance of recovery.

Stage of Resolution. The termination of hepatization should be resolution. The coagulated blood undergoes digestion, partly as the result of autolysis, partly as the result of the activity of the leucocytes, partly as the result of fatty changes going on in the blood, thus freed from its vessel walls. The liquid thus produced varies in color, from variously digested pigments, and is thin. Much of it is coughed up, by the loose and efficient cough, and some of it is absorbed into the general circulation and thus carried away. The treatment should be devoted to facilitating resolution; this is best done by maintaining a constant temperature within the thorax—this is the place for the cotton wrappings and the

antiphlogistin and the various wrappings that are employed for the purpose of maintaining a constant temperature of any part of the body. The patient's respirations become more easy, the loose cough diminishes, and he seems on the road to recovery. The fever drops by crisis, often below normal, sometimes with fatal collapse. The patient is left very weak, but the delirium and pain disappear with almost magical celerity. This is the time during which cardiac failure is a serious danger. The absorption of the resolved liquid may allow infection of distant parts of the body; the meninges, intestinal tract, and any of the mucous or serous membranes may become the seat of pneumococcus infections.

The elimination of this material is a serious matter. The kidneys often show the effects in a nephritis of varying severity. The kidneys, heart, skeletal muscles, and brain, examined during death in resolution, show fatty metamorphosis and other symptoms of intense toxemia. All these organs must be guarded from strain during the resolution, absorption and elimination of the lung detritus. The patient must remain in bed until every sign of danger has passed, and he must not try to engage in any strenuous labor, nor any intense mental effort, for several weeks after the temperature falls to normal.

The blood shows secondary anemia, and there are many ragged and degenerated and senile leucocytic forms. The urine is that found during recovery from almost any fever. The pulse increases in strength and regularity, and the appetite increases. It is often difficult to keep a patient in bed, or to hold him to a rigorous diet, as long as is safe, for he rebels against confinement when he feels so well. The weakness is often profound, and while the sense of weakness is unpleasant, it yet may prevent too strenuous exertion during this critical period.

Stage of Organization. In some cases the resolution does not completely occur. The coagulated blood undergoes organization, the migrating cells and the leucocytes, with perhaps other cellular elements, form masses of rather dense connective tissue, which fill the alveoli. This condition is not usually immediately fatal but it lessens the usable lung space, and is apt to become the seat of later infectious processes.

Complications. Headache is present with the fever. Alcoholic patients are prone to delirium, at the onset of pneumonia. The pneumococcus may invade the meninges, whereupon the symptoms of cerebrospinal meningitis are produced. When the infection is limited to the cerebral meninges, the diagnosis may be very difficult. The toxins of the disease may cause somnolence, delirium, and other nervous symptoms, without meningeal infection.

Especially in the weak, very young or senile, the disease is apt to be associated with low delirium—with no meningeal involvement.

Cerebral symptoms are avoided by preventing undue excitement, and by keeping the cervical muscles and other tissues in normal condition.

Pleurisy is to be expected. When the pleuritic involvement is marked the respiratory pain is more severe; coughing also is very painful. When the pleuritic symptoms are conspicuous, the disease is called pleuro-pneumonia. Effusion often occurs, and may be overlooked in the severity of the lung symptoms. The fluid is richer in fibrin than is the more frequent pleurisy with effusion. Invasion by the pyogenic bacteria may result in empyema. These conditions are avoided, in most cases, by the treatment outlined for the pneumonia.

Pericarditis and **endocarditis** are frequent complications and sequelæ. These are avoided by keeping the patient very quiet from the beginning of the disease, and by preventing too hasty return to the upright position and to the ordinary duties of life. Lesions of the upper thoracic region should be prevented or corrected. Thrombosis may occur, and lead to sudden death, or to cerebral involvement. It is not possible to guard against this complication, except as the maintenance of good circulation may prevent abnormal blood states, and the usual treatment for the disease may facilitate recovery.

Rarely, nephritis, neuritis, parotitis, arthritis, gastritis, colitis or hepatitis may result from the invasion of the organs mentioned by the pneumococcus. The treatment as above outlined provides the necessary protection; plus the usual hygienic care of the body as a whole.

"A specific treatment, directed toward the relaxation of the tightened muscles about the chest and the dorsal spine and toward the raising of the ribs, can be given with profit every four hours during the first twenty-four or possibly forty-eight hours, according to the conditions, and as frequently thereafter as conditions demand."—C. A. Williams.

"The important symptoms to be controlled are the dyspnea, cough, pain, tympanites, fever, toxemia, and weakened heart action.

"The dyspnea may be controlled by elevation of the ribs and by draining the congested lung to some other part. This may be accompanied by pressure in the lower dorsal, dilating the abdominal vessels, or by hot abdominal packs, or hot leg packs to dilate the surface blood vessels of lower extremity. The cough may be controlled by the above measures, and in addition work on clavicles and first and second ribs and at the fourth dorsal. The pain is controlled by separation of the ribs, relieving the pleura of pressure and securing efficient lymphatic drainage of the affected area by separation of the ribs and relaxation of the axillary structures. . . .

"Treatment should be given frequently, once in six or eight hours at least. . . . Manipulations should be given by slow movements across the muscles, using strong pressure throughout the dorsal region and cervical area to thoroughly relax the musculature and interosseous structures. . . . Dr.

Whiting showed us that treatment in the lower dorsal and to the liver and spleen will increase the opsonic index for a period of from six to eight hours."—G. V. Webster.

"In case of extreme delayed resolution, particular attention should be given the region of the fourth dorsal vertebra, as treatment at this point will assist in strengthening the heart, which has to work against heavy pressure in these cases. All cervical lesions should be carefully searched out and corrected, and the neck muscles kept in a state of relaxation throughout the course of the disease."—J. A. Overton.

The labored breathing in pneumonia can be relieved to some extent by careful and gentle dilatation of the nostrils. For this purpose an ordinary wire dilator may be used.

Prognosis. Recovery is to be expected in adults, who receive proper attention early. Cases aborted during the first stage are hardly to be diagnosed; thus it is not possible to know how many such cases are to be found. If treatment is delayed until after the symptoms of hepatization, recovery can only be expected after resolution—the coagulated blood cannot be absorbed until after it has been digested and made fluid. The prognosis is much more serious in elderly patients, in the very young, and in persons who are weakened from other diseases. Pneumonia is a good friend of the aged, the defective, and the insane—many deaths occur in these unfortunates, no matter how well cared for. It terminates, not too painfully, many unhappy and useless lives.

EPIDEMIC CEREBROSPINAL MENINGITIS

(Brain fever; cerebrospinal fever; spotted fever; epidemic spinal fever; malignant purpuric fever)

This is an acute infectious disease, characterized by irregular course, moderate fever, and profound nervous symptoms; it is due to the diplococcus intracellularis meningitidis. It may be sporadic, epidemic, or pandemic.

Pathology. The disease is essentially an acute inflammation of the pia-arachnoid; the dura is involved later. Almost every organ in the body shows the effect of the invading bacteria—pericarditis, sometimes endocarditis and myocarditis show the cardiac effects; kidneys and liver show granular and sometimes fatty degeneration; spleen and liver are enlarged and full of blood; lungs show bronchitis and pneumonitis; skeletal muscles show granular degeneration; nerve trunks show neuritic changes; the brain and the cord are variously injured. Meningeal spaces and ventricles are filled with a fluid, first only increased in quantity, later containing white, then red blood cells, and bacteria; still later the fluid is purulent and of greenish yellow color.

After recovery, adhesions between the thickened pia-arachnoid and the dura, or the cord and the brain, are frequently found; these adhesions may be responsible for many symptoms occurring for months, sometimes for years, after recovery from the acute disease.

Etiology. The diplococcus meningitidis is the infectious agent. It resembles the pneumococcus in many respects, and the gonococcus in other qualities. It is biscuit shaped, and is found within

the leucocyte protoplasm, but not within the nucleus. It is recovered from the cerebrospinal fluid, the nasal secretions especially, the pus, the urine, and probably other secretions. With this organism other bacteria are usually associated—the pneumococcus, bacillus coli communis, and various pyogenic organisms.

Bony lesions of the cervical and upper thoracic region appear to predispose to the disease. Lesions of the upper ribs are reported. Occiput, atlas and axis lesions are present in some cases; these lesions have been found in a few patients who afterward became infected. Various bony lesions result from the inflammatory process, and these may perpetuate certain symptoms for months after the acute attack has passed.

Children and young adults are most frequently affected. The disease is almost unknown in warm climates; it is most prevalent in the Northern areas of the temperate zone. Unhygienic surroundings predispose; crowding, as in the slums and in barracks, prisons, and orphan asylums encourages the spread of the disease.

The infectious bacteria may be carried from one person to another by means of the nasal or other secretions; these may retain their virulence for some hours; possibly for some days or weeks. Fomites may be responsible for the spread; older adults are often "carriers" and may spread the disease through uncleanness in regard especially to nasal secretions.

The mode of entrance into the body is not known. Breathing infected dust may permit the infection of the nasal passages, whence the blood and lymph carry the bacteria over the body. Direct extension by way of the nasal lymphatics and the olfactory nerves is not improbable.

Diagnosis. This is based upon the symptoms, especially in an epidemic, and upon the recognition of the specific bacteria in the nasal secretions and the cerebrospinal fluid.

The **incubation period** is unknown, though brief; probably three to ten days. Prodromal symptoms vary; the onset may be frightfully sudden, or there may be a few days of lassitude, backache, headache, and slight feverishness. Nausea and vomiting may occur as prodromal symptoms. Most cases have rather sudden onset in the afternoon or early night. Fever is moderate; headache and backache are extreme; children may have convulsions; retraction of the head, opisthotonos and spinal rigidity are marked. Vomiting may be serious; sometimes projectile. During the first few days the fever varies, rarely going above 103° after the first day. In rapidly fatal cases, the temperature may reach remarkable heights—110° or more, at death. The pulse is accelerated practically with the fever. Hyperpnea and Cheyne-Stokes breathing may occur; respirations may be slowed by pressure upon the bulbar center; death may occur from this.

Hyperesthesia is marked; the slightest sensory stimulation of any kind is intensely painful, and increases the muscular rigidity. Coma and delirium may appear early; they are rarely absent in mild cases. Especially toward night there is a tendency for the delirium to become hysterical in females, and maudlin or sentimental in males; eroticism may be noticed; priapism and emissions are not rare in males. Muscular twitchings, spasms, and choreic movements may occur; paralysis is rare. Herpes is common. A petechial, purpuric, or urticarial eruption is frequent; whence the name "spotted fever." In severe cases the skin eruptions, bedsores, and ecchymoses may terminate in gangrene.

The blood shows moderate leucocytosis; water is usually deficient. The urine shows ordinary changes of acute fevers; occasionally the nephritis may be serious. Reflexes are increased; Kernig's sign is usually present but is not in itself pathognomonic.

Rudimentary types are very mild; the diagnosis would probably not be made except during an epidemic.

Abortive forms begin with marked symptoms, which speedily disappear; recovery is rapid, and the entire disease persists only for a week or so.

Intermittent forms are characterized by remarkably rapid improvement at intervals for two or three days; these are followed by equally rapid exacerbations within a few hours or a day.

Typhoid forms are characterized by a steady, slow course, with stupor and coma, and extremely slow recovery or delayed death.

Fulminant type; apoplectic type, begins very suddenly, runs a rapid course with death, sometimes within a few hours. When death is delayed for a few days, the eruption is purpuric and involves the mucous membranes and the meninges. All symptoms are extremely intense; the pulse is usually slow and feeble.

Complications. The eyes are often inflamed. Conjunctivitis, iritis, retinitis, panophthalmitis, optic neuritis, may result in blindness after recovery from the acute disease. Inflammation of the internal and middle ear is not infrequent, and partial or complete deafness may result. Involvement of the nerves at the base of the brain may cause permanent facial paralysis, usually with hemiatrophy. Infection of the lungs with the ever-present pneumococcus or tubercle bacillus may hasten death. Pneumonia is usually speedily fatal. Infection of the pericardium, myocardium, and endocardium are frequent; sudden death may be due to these inflammations, or the heart may be left injured after recovery from the acute disease. The liver and spleen are always involved, but these usually recover with the disappearance of the acute symptoms. The kidneys are seriously infected, and may be left with

varying degrees of parenchymatous nephritis; death may occur from this, months after the symptoms of meningitis have disappeared.

The brain and cord are often associated in the inflammatory process. Permanent paralysis of certain muscle groups is not infrequent. Cerebral injury may leave the patient with mental defect; in a child, this may cause idiocy, imbecility, or feeble-mindedness, or may merely diminish slightly his capabilities in mental development; in adults dementia, chronic confusional insanity, or merely an emotional instability may persist. Confusional states and memory defects may persist for a time, and then pass away.

Treatment. The sick room must be clean, well aired, quiet and dimly lighted. Only the nurse should be permitted within the room, and all noise and confusion carefully avoided. The pain that is caused by the least noise, or by being compelled to move or to talk, or by moving objects or lights, is beyond imagination. During the high fever, fruit juices alone are permitted; much water is given; the patient is not to be disturbed except at long intervals for water. The lips may be kept moist by a cotton pad in ice water, a small amount of this water may be swallowed, when the patient is too sick to drink. This constant washing of the lips is pleasant and grateful; it may prevent labial herpes. With subsidence of the fever, liquid foods, milk, vegetable juices and broths may be given in greatly diluted form and at diminishing intervals. Convalescence may be shortened by providing nutritive food as soon as it can be digested and absorbed. A bent glass tube should be used; the patient should not be compelled to make any exertion. It is essential that a good nurse be provided; proper feeding, changing, bathing, and attention to the bedding, and to the bowels and bladder of the patient can only be secured through the care of a well-trained nurse. This skillful care may mean life instead of death; certainly it means a more speedy recovery, with less of suffering during the attack.

The patient should not be permitted to remain upon his back; the lateral or the prone position is much better. The weight of the body upon the back increases opisthotonos; the influence of gravity increases the meningeal congestion, when the patient lies supine; and this position encourages heat retention in the spinal tissues. The lateral positions are far better in every respect; though the patient has a strong tendency at all times to assume the supine position.

From the beginning of the disease until convalescence is well established, a very gentle general spinal treatment should be given once or twice each day. If the symptoms recur, this treatment may be repeated at intervals of a few hours; otherwise, the visits may be postponed for a day; later, the intervals are increased;

but it is much better to risk an extra visit than to allow too long an interval to elapse.

Ice bags are of great value. An ice cap to the head gives great relief; ice bags to the neck often reduce the retraction of the head and give sleep; long, slender bags to the spinal region relax muscles and lessen hyperesthesia. A hot water bottle may be placed at the feet or, rarely, over the abdomen, if there is a tendency toward too great chilling.

Prognosis. The prognosis must be guarded in all cases, especially with reference to sequelæ. Not for weeks after apparent recovery may one be sure ill effects are not left by the inflammation. Recovery is usually to be expected, except in the apoplectic or fulminant types; there is much variation in the virulence in different epidemics, therefore in certain types everything depends upon early, vigorous and constant attention. It would seem that Flexner serum is of value in the severe types, in comparison with previous medical methods. The sequelæ have already been mentioned under the head of "complications."

INFANTILE PARALYSIS

(Acute anterior poliomyelitis)

This is an acute infectious disease of the spinal cord, characterized by sudden onset with high fever, and complete paralysis of one or more limbs or muscle groups, followed by rapid atrophy of the paralyzed limbs. Pain may be present at the onset of the disease, but there are no permanent sensory disturbances.

Etiology. The disease is due to a streptococcus (Rosenow) or micrococcus (Nuzum) of peculiar variability. Grown without oxygen it is filterable; grown aerobically, it attains greater size and wider virulence. It can be cultured from tonsils and nasal and other secretions, and the culture produces the disease in several lower mammals, from whom identical or variable cultures can again be secured. The manner of transmission has not yet been determined. Flexner's experiments show that it is quickly destroyed by the blood, though it lives for some time in the lymph or mucous secretions. The point of entry is probably by the nasal passage and upward through the cribriform plate by way of the lymph spaces surrounding the nerves and blood vessels passing into the nasal cavity. Most animals are subject to this infection though they do not all show typical paralytic symptoms and in them it frequently runs a much more chronic course. It is probable that pet dogs or cats who carry this disease in its chronic form may be responsible for the appearance of sporadic cases in children or may even initiate serious epidemics. One attack gives immunity. There are few exceptions to this statement.

Other infectious agents such as those of diphtheria, measles, pneumonia, scarlet fever, malaria and furunculosis may gain entrance to the anterior gray matter of the spinal cord and give rise to symptoms not to be distinguished from those due to the epidemic form of infantile paralysis.

Exposure to cold and sudden check of perspiration, wading in cold water, or some trauma, such as a blow or fall or jar are often given as causes of the disease by parents. These factors may easily be contributing causes by lowering the resistance of the body to infection. Experimental work done upon animals by C. P. McConnell and others shows that such factors as those already mentioned may interfere with the circulation through localized areas of the spinal cord. Thus it is very probable that trauma, temperature variations, etc., may act as predisposing factors not only in a general but also in a rather strictly localized way.

The disease is very much more frequent during the summer months and especially in dry weather when the germ-laden dust is more plentifully inhaled and flies are plentiful. Both sexes are afflicted in about the same way.

The favorite age is from one to four years. Children are said to have been born with the paralysis though it is not certainly known that intra-uterine infection really exists. The difficulty in making the differential diagnosis between this and other causes of congenital paralysis is easily seen. The earliest typical case on record is that of an infant four days old. It rarely occurs above ten years of age though it has been known to affect men and women up to thirty or more years. (See Landry's paralysis.)

Pathology. The effects of the disease are marked in the anterior gray matter of the spinal cord. During the acute stage profound inflammatory changes are found in the gray matter. These are followed by degeneration and atrophy of a large number of nerve cells including all of the large multipolar cells in the affected areas. The nerve fibers degenerate and disappear and the muscles undergo very rapid atrophy. The bones and the joints normally moved by these muscles also cease growing to a very marked extent. Contraction of the tendons of the paralyzed muscles together with the wasting of the joint tissues brings about various deformities.

Symptoms. Like other acute infections this disease begins with fever, which goes up to about 103° , rarely 105° . This may begin with a chill and may be associated with profound perspiration. The temperature usually returns to 101° or 102° within a few hours or a day and remains at that point for several days. Vomiting, rigidity of the neck muscles, and pain on movement are characteristic symptoms. There is not usually more than a week after the onset until the fever has completely disappeared. Death may occur during the first and marked hyperpyrexia. Opisthotonos may suggest meningitis. Delirium and convulsions may occur. In about 90% of the cases digestive disturbances, nausea, vomiting, and diarrhea are present. Sometimes the fever is not

marked, digestive symptoms are absent and there is only a few hours or perhaps a few days of slight malaise. The thermometer would probably always show some rise of temperature in such cases but this apparently mild attack very frequently evades notice.

The paralysis is first noticed on the first to fifth days. At first it includes a very widespread area. There may be great pain in the joints and muscles when motion is contemplated. The skin, muscles and bones are frequently hypersensitive to pressure. With the passing of the fever the sensory symptoms abate. The extent of the paralysis diminishes rapidly for a few weeks; more slowly for a few months. At about three or four months after the acute attack the true extent of the paralysis is usually evident. At first the paralyzed limbs are cold, mottled and edematous. In the cases in which the fever is not noticeable the paralysis seems to occur very suddenly with no prodromal symptoms whatever.

The right leg is somewhat more often affected than the left. Both legs are affected rather less frequently than either alone. If both an arm and leg are affected they are usually upon the same side of the body. Rarely the muscles of the back are involved; this may produce a lordosis or scoliosis. Sometimes the disease affects the medullary motor centers. The third, fourth, sixth, seventh, and twelfth nerves may be paralyzed. Torticollis may result when the eleventh nerve is involved. When the visceral centers in the medulla are affected death results at once.

Hypertrophy of the opposing muscles or of the nonparalyzed limbs may be very marked. The arms may become so strong and large as to suggest partly replacing in function the paralyzed legs. Remarkable accounts of hypertrophy of the tongue and its assumption of very complex functions are recorded in cases in which the paralysis involves both legs and both arms.

Diagnosis during the acute stage may be difficult. The sudden onset, with gastro-intestinal symptoms for which none of the usual causes can be found, rigidity of the posterior neck muscles, sometimes of other spinal muscles, and evidences of pain upon movement, should indicate the diagnosis, which is only to be considered definitely established with the onset of paralysis. After the acute stage has subsided, the history of sudden onset with no anesthesia and no bladder symptoms, the atrophy of muscles and bones, the lack of reflexes and the reaction of degeneration in the affected muscles should make the diagnosis easily evident. Every case of sickness in children should be viewed with suspicion during an epidemic, but it is not possible to make the diagnosis until the occurrence of localized hyperesthesia or paralysis.

Acute transverse myelitis rarely affects children and in this disease the bladder and rectum are involved and bedsores appear very speedily.

Multiple peripheral neuritis is rare in children. There are gradual onset, and more severe pain; the muscles and nerve trunks are very sensitive to pressure, and there is a history of alcoholism or some other cause of the neuritis.

Spinal hemorrhage has more marked sensory symptoms. Pain and temperature-sense are lost speedily. The bladder and rectum are usually paralyzed and some muscle groups are not affected. Progressive muscular atrophy has a gradual onset and the paralyzed area increases constantly in extent.

Spastic hemiplegia due to cerebral lesions is characterized by rigidity of the limbs; increased reflexes, no reaction of degeneration and atrophy is either not present or else is very diffuse. Erb's paralysis involves the deltoid, biceps, brachialis anticus and supinator longus, rarely other muscles, and is due to birth injury; diminished cutaneous sensation is usually present over area supplied by the fifth and sixth cervical nerves. This location and the history of birth trauma should make diagnosis easy.

Treatment. During an epidemic, all children of susceptible age should be examined, and all bony and other lesions corrected. Food and other conditions of hygiene should be investigated. These factors are important in preventing the disease, and in increasing the resistance of the body to the disease.

Every sick child should be isolated; every child with fever should be put to bed in a quiet room, protected from insects. During the fever, plenty of cool water should be given, and perhaps some of the fruit juices; nothing more of food. Usually an enema is needed the first day; sometimes for several days. The fever can be controlled by sponging with water at the skin temperature. These things must be done with great care, to avoid painful movement.

It is most important that the child should not be allowed to lie upon the back. The left or right lateral position is usually comfortable and is very good. No weight of bed clothes should be permitted upon the body; a frame is easily arranged for their support. Movements are painful, and rest is greatly to be desired.

The osteopathic treatment includes also the relief of the muscular rigidity. Extension of the neck and the spinal column generally and very gentle movements for the relief of the spinal rigidity are usually attended with relief of the pain and this should be given two or three times each day during the acute stage of the disease. As the fever subsides, the extent of the paralysis becomes evident. As soon as manipulations are not painful, massage of the affected limbs, following the course of the nerve trunks to and including the muscles, is helpful. This is not to be done when any pain is produced. The diet should return to the normal gradually, after the fever disappears.

Even after the paralysis is complete, much help can be given by osteopathic treatment. There is good reason to believe that a better circulation through the spinal cord promotes the recovery of cells which have been injured but not destroyed by the infection and also promotes the assumption of increased duties by nerve cells of an immature type. The massage and stretching of the injured muscles gives some good results in the earlier weeks. It is of less value after the third or fourth month.

Violent stretching of the muscles and tendons under anesthesia is sometimes followed by the correction of deformities of the limbs, though a dangerous operation unless skillfully done. Tenotomy and myotomy are performed for the sake of lengthening the contracted tendons and muscles. Arthrodesis is sometimes performed for the sake of giving fixation in those joints left abnormally flexible.

Tendon transplantation is the shifting of the tendon of one of the normal muscles on to the paralyzed side of the bone. In this way a fairly good amount of control is frequently secured. Neuroplasty is performed in two ways. Sometimes a healthy nerve is split and one end is sewed into the paralyzed muscle. Or, the paralyzed nerve trunk, when it can be found, is sometimes set into a healthy nerve. In either case nerve filaments grow into the paralyzed muscle by the slow process of regeneration and ultimately the muscle returns to something of its normal tone. The nerve centers in the central nervous system must be reeducated in such a case in order that volitional control may be secured. The osteopathic treatment of patients for whom any of these orthopedic measures are being employed should never be forgotten. No matter what mechanical and surgical methods were helpful in these cases, still, the maintenance of the best possible circulation of good blood through the affected area and through the spinal centers in close connection with the injured areas must be an extremely important factor in promoting an efficient recovery. Treatment should be kept up periodically for years if necessary.

"Lesions requiring osteopathic skill are so obvious that the slowest may read as they run. . . . The three-minute, specific-lesions osteopath should let these cases alone; they take exquisite care and patience and an almost painful regard for details. The words "paralysis," "crippled," "afflicted," are positively and entirely eliminated from the family vocabulary. . . . During the acute stage, rest in bed is essential. As soon as condition permits, begin giving gentle massage every three hours during the waking time. As strength returns, the patient is given joint movements with the massage, then resistive movements, first passively, then actively. Go slowly rather than over-tire. Devise plays to bring the muscles into use . . . A "walker" is of great value. . . . A six-strand wire stretched across room with pulley running along it offers a splendid opportunity for leg and arm work. . . . We do not lessen his difficulties because of his condition, but rather increase them. . . . "He loves best who does least." . . . There is never a time to be discouraged. Persistent and conscientious treatment is the essential."—Evelyn R. Bush.

"Paralyses of central origin can be but little benefited by osteopathic gymnastics, while those of superficial or spinal origin may be greatly aided. If there is any voluntary motion possible in the fingers or toes, the nerve cells controlling the musculature to these parts are not entirely destroyed and new nerve paths may be developed or old ones restored. To accomplish either, however, it requires time and perseverance.

"Briefly, the line of procedure is thorough osteopathic manipulation followed by assistive and, later, resistive movements. Last of all, single movements are prescribed. Assistive movements mean movements willed by the patient, but executed by the operator. Resistive movements are performed by the patient and resisted, according to the patient's needs, by the operator. Single movements are exercises performed by the patient without outside assistance or resistance."—A. A. Gour.

ERYSIPELAS

(Erysipelatous dermatitis; the rose; St. Anthony's fire; cryptogenetic erysipelas; ignis sacer; wildfire)

Erysipelas is an acute, specific, infectious disease, characterized by more or less severe febrile reaction and a peculiar inflammation of the skin, generally of the neck or face. This inflammation exhibits a marked tendency to spread, to induce serous infiltration and suppuration of the areolar tissue, and to affect the lymphatic vessels and glands.

Etiology. The exciting cause is the streptococcus erysipelatis of Feheisen. The predisposing causes are lowered vitality, existence of abrasions and wounds, the puerpural state, and chronic alcoholism. Lesions of the upper dorsal, second to fifth, of the middle and lower cervical vertebræ, affect the vasomotor nerves either directly or through the fifth cranial nerve and also the lymphatic circulation.

"When the case is one of facial type, which is the most common, then I generally find trouble with the articulations of the inferior maxilla, the cervical vertebræ, the clavicles or the upper ribs."—Dr. A. T. Still.

The virus clings to rooms and furniture and can be conveyed by a third person. The incubation period is from two to seven days.

Diagnosis. The onset is usually sudden with chill, nausea, vomiting, malaise, headache, and pains in the limbs. The temperature rises to 104° to 105° F. with very slight remissions during the course of the disease. The pulse is correspondingly increased. The tongue is coated, diarrhea or constipation is present and delirium is frequent. The cervical lymph glands are swollen. The eruption soon follows the initial chill appearing as bright red spots upon the bridge of the nose, cheeks, or at the junction of mucous membrane and skin. These spots rapidly coalesce, so that the external symptoms are well marked within twenty-four hours. This area is swollen, firm, hot and tender to the touch, pain-

ful, and pitting on pressure which also increases the pain. The edges are raised, hard, and more elevated, thus forming a sharp line of demarcation from the surrounding healthy tissue.

The patient complains of heat, tingling, itching, and burning of the infected area. Vesicles and blebs are frequent upon the surface of the inflamed area. The edema of the surrounding parts is marked so that when the face is involved the features are distorted out of all recognition. The eruption begins to subside after five or six days, followed by moderate desquamation of large or small flakes. The fever declines by crisis. The mucous membranes of the mouth and pharynx may become involved. In the puerperal form the genitals may be involved.

Phlegmonous erysipelas is attended by marked infiltration and suppuration of the areolar tissues. Erysipelas ambulans or migrans is shown by the eruption being migratory in character, disappearing in one place to appear in another location. The duration is from ten to twelve days.

The complications include local suppuration especially small skin abscesses; septicemia; ulcerative endocarditis; edema of the larynx from extension of the eruption; thrombosis of the cerebral vessels; rheumatism; and nephritis. Elephantiasis may follow frequent relapses. The irregular fever, the early spreading eruption with burning, swelling, tension, and sharply defined border, and the albuminous urine, will distinguish it from the eruptive fevers, eczema, and erythema.

The urine is scanty, highly colored, albuminous, and may contain the specific bacteria.

The specific bacteria may be found in the bone marrow during the acute stage. Polymorphonuclear leucocytosis is almost constant, and is proportionate to the temperature and the extension of the infection. The eosinophiles are diminished or absent, as the leucocyte count falls the eosinophiles may rise considerably.

Treatment. The patient should be isolated from surgical and puerperal cases. The physician attending a case should not attend confinements or surgical operations.

The correction of the bony and muscular lesions wherever found is important. Increased flexibility of the lower thoracic spinal column, and of the entire thorax, is usually indicated.

For the restlessness and insomnia, treatment of the upper cervical region, especially the deep, steady pressure to the posterior muscles, gives relief.

Diet should be liquid and nutritious.

For the local treatment, no manipulation can be used. Hippocrates used cold water as an application; it gives much relief. Clay poultices are recommended. Local application of vaselin will assist in relieving the tension. In migrating erysipelas ad-

hesive strips along the border of the lesion will compress lymphatics and interfere with spreading.

Prognosis. The outlook is favorable except in alcoholics and the aged. In the new-born, erysipelas of the navel is usually fatal. In the ambulatory form, death may occur from exhaustion.

ACUTE ARTICULAR RHEUMATISM

(Inflammatory rheumatism; acute rheumatic polyarthritis; rheumatic fever)

Acute articular rheumatism is an acute, noncontagious febrile disease characterized by a polyarthritis, a tendency to hyperpyrexia, a special tendency to involve the pericardium and endocardium, and in children often associated with chorea.

Etiology. The infectious agent is the streptococcus rheumaticus (Rosenow). This is one of the bacteria subject to marked mutations through environmental changes. It gains entrance into the body through some previous infection, and in about 90% of cases is preceded by symptoms of acute angina. The virus may gain entrance into the blood from some nidus, as tonsillar pockets, abscesses around the roots of the teeth, or elsewhere.

In addition to the presence of pus in the body, the usual causes of lowered immunity are of etiological importance. Bony lesions, especially of the lower thoracic region, as well as lesions which interfere with nutrition or excretion are important. Young adults are most often affected. Overfatigue, exposure to sudden change in temperature, especially cold and dampness, and other factors of diminished resistance, are predisposing factors.

Pathology. The synovial membrane is hyperemic, there is swelling, effusion, usually turbid, containing albumin but seldom purulent, and the ligamentous structures are swollen and the cartilages are slightly eroded. The complicating pericarditis, endocarditis, pleurisy, and myocarditis show the changes of an inflammatory process.

Diagnosis. In some cases there may be prodromal symptoms of a feeling of malaise, more or less soreness, these beginning very often after an attack of tonsillitis, and rheumatic pains begin in one of the large joints, usually the knee, wrist, or ankle. The usual order of attack is knee, ankle, shoulder, wrist, elbow, hips, hand and foot. In other cases the onset may be abrupt with chilliness, loss of appetite, and the arthritic pain.

The temperature may not be very high, usually between 100° and 103° F. but hyperpyrexia is not uncommon, reaching 107° to 110° F. The fever usually reaches its height in twenty-four hours and is very irregular. The defervescence is gradual.

The pulse is rapid, full and soft. The tongue is usually very large, covered with a thick white fur—"blanket" tongue, there is great thirst, the bowels are constipated, the mind is clear except

during hyperpyrexia, and the weakness depends upon the amount of sweating.

Arthritis. The joint is at first red, hot, swollen, and intensely painful; later the joint may assume a dead-white appearance. Frequently the inflammation rapidly subsides in one joint to appear in another. The appearance is governed by the law of parallelism, affected joints either are on one side of the body or are symmetrical. Pain is increased by motion and pressure.

Sweating. Marked sweating is constant. The excretion has a peculiar sourish smell, and is acid at first, but neutral or alkaline later. Various hair follicles and cutaneous glands become inflamed and painful.

Subcutaneous nodules fibrous in character may develop over bony ridges.

The severe symptoms usually subside in about fourteen to twenty-one days. There is no disease more often attended with relapses.

Subacute form. All the symptoms are less pronounced. The case may drag on for weeks or months and finally become chronic. In children, it may be associated with pericarditis or endocarditis.

The **complications** include endocarditis, most frequent in youth, affecting oftenest the mitral valve, in about half of the cases; pericarditis, less frequent but insidious; myocarditis, slight or profound; pleurisy; chorea; hyperpyrexia, most common in a first attack, often attended by delirium and coma; skin eruptions as sudamina, miliaria, "pelioses" or small red petechial spots around the ankles and purpura, pharyngitis, and tonsillitis.

The heart should be examined daily. Murmurs of hemic or organic origin are often heard.

The blood pressure is high.

The urine is scanty, highly colored, often loaded with urates, chlorides diminished or absent, acetonuria is present, and the reaction is markedly acid.

Blood. There is an excess of fibrin but the coagulation time is increased. Red cells show a moderate anemia, being reduced to 3,000,000 cells or less. The lowest count is at the height of fever and regeneration begins with defervescence. It is rare to find nucleated redds. Hemoglobin falls to 55% or 75%. The moderate leucocytosis runs parallel with the severity of the disease. The proportional relations of the various leucocytes are well maintained. The eosinophiles are absent at the outset, present during the disease, and increased during convalescence.

The saliva may become acid and contain an excess of sulphocyanides.

Treatment. The patient must be absolutely at rest in bed, warmly covered. "I usually treat these cases from one to four times a day in the acute stage of the disease, paying particular attention to the eighth to twelfth dorsal. Once a day in these treatments I gently relax and spring the entire spine. Plaster bandages and splints of various kinds may be used, but I personally use snug muslin bandages with plenty of cotton under them, especially protecting the areas where the large blood vessels lie. . . . Manipulation of any kind in the stage of acute inflammation is absolutely contraindicated. After the acute inflammation has subsided passive movement of the joint and massage above and below the joint certainly aid in the reparative processes and help to prevent the formation of pseudoankylosis which sometimes follows in severe cases. . . . The next consideration is the tendency to endocarditis and pericarditis. Osteopathic treatment to the areas of the spine corresponding with the innervation of the heart tends to heighten the vitality and resisting power of these tissues. I usually apply the ice bag for four four-hour periods with intervals of two or three hours, and this application may be increased or lessened depending upon the severity of the cardiac symptoms."—A. D. Becker.

The diet should be fluid during the acute stage. Milk diluted with mineral water, lemonade, barley water, chicken broth should be given at regular and short intervals. The thirst should be fully satisfied. During convalescence, the diet should be more ample but nutritious, using red meat very sparingly.

Prognosis. Recovery is the rule in uncomplicated cases. When death occurs, it usually depends upon hyperpyrexia, cardiac complications, or cerebral endarteritis. Sudden death is due to myocarditis. Recurrences are best prevented by eliminating all predisposing causes.

Sequelæ may in a large measure be prevented by proper treatment from the beginning of the trouble.

CHAPTER XLVII

DISEASES DUE TO SPIROCHÆTES

RELAPSING FEVER

(*Febris recurrens*; famine fever; bilious typhoid fever; spirillum fever; seven-day fever)

Relapsing fever is an acute, infectious, contagious, epidemic, self-limited, febrile disease, characterized by a febrile paroxysm lasting about six days accompanied by high fever, and severe pains in the legs and head; this declining by crisis is succeeded by an afebrile period of the same duration, which in turn is followed by a relapse similar to the first seizure.

Etiology. The disease is caused by the spirillum or spirochæta obermeieri. The predisposing factors are overcrowding, bad hygiene, filth, poor food, impure air and destitution. Structural causes include lesions either bony or muscular interfering with nutrition and with circulation through the spleen and liver.

It is transmitted by fomites, by personal contact and probably by bed-bugs.

Diagnosis. The incubation is from five to eight days, sometimes from one to twenty-one days, with some complaints of malaise, lassitude and fleeting pains.

The invasion is sudden with heavy chill and temperature to 105° to 106° F. on the first or second days, soft pulse, 110 to 130, hemic murmur, frontal headache and vertigo, lancinating pains most marked in the calves of the legs, anorexia, nausea, and vomiting, intense thirst, tongue with a marked white fur, bowels constipated and great physical weakness.

The sense of fullness in the upper abdomen is due to the enlargement of the liver and spleen. Catarrhal jaundice is common.

About the seventh day the symptoms are aggravated, temperature reaches 107° to 108° F., the pulse 120 to 130, there may be slight delirium, and death seems imminent when sweating takes place, the bad symptoms rapidly abate, and the crisis is established. Within a few hours the patient feels comparatively comfortable and is ravenously hungry.

On the fourteenth day the symptoms all recur, perhaps intensified, these continue for about four days when second crisis is passed.

From one to five relapses are recorded. These occur at about seven day intervals.

Malignant form (Bilious typhoid fever; septic-bilious relapsing fever). The intensity of the symptoms of the ordinary form, with bilious or bloody vomiting, diarrheic stools containing bile-pigments, jaundice on the fourth to sixth day, and delirium indicate this form. More serious symptoms are collapse, purple nose, weak pulse, rigidity of the abdominal muscles, tenderness in the epigastrium, and cold, clammy skin. The mortality is high. Recovery takes place rapidly within two days if at all.

Pregnant women usually abort. Other complications are bronchitis, pleurisy, jaundice, albuminuria and hematuria, paralysis, ophthalmia, pneumonia, dysenteric diarrhea, and hemorrhages, all rare.

Blood. The examination of a fresh smear obtained during a febrile paroxysm will show the spirochæta obermeieri. During the afebrile periods, peculiar, highly refractive bodies resembling diplococci are found. These are thought to be spores and are especially numerous just before an attack.

Serum diagnosis is by Lowenthal's reaction which resembles Pfeiffer's phenomenon rather than agglutination. Leucocytosis is usually present.

Treatment. Immediate isolation and disinfection are necessary to prevent the spread of the disease. Put the patient to bed in a clean, well-ventilated room. Give a general manipulative treatment adjusting such structures as need it. Pay particular attention to the liver and spleen. Keep the excretory systems active. Look carefully to the lumbar region for lesions and relax carefully to control the pain.

The diet must be liquid and easily digested as the digestive powers are low from lack of food.

Careful nursing is necessary. Treat the symptoms as they arise.

Prognosis. In simple cases, recovery is the rule.

Prophylaxis. Isolation of suspected cases, disinfection of the patient, his excretions, and all articles used by him is necessary.

SYPHILIS

Syphilis is a chronic infectious disease due to the presence of the *treponema pallidum* (spirochæta).

Etiology. The *treponema pallidum* is a spirillum about one-half micron or less in thickness and from eight to forty or more microns in length. It may be transmitted from one person to another by direct contact or by intermediate objects. It may be transmitted by the ovum or the spermatozoon to the embryo and

thus it is a hereditary, infectious disease, the only one which is certainly recognized.

History. The site of the infection shows the **primary lesion** which is called a chancre. This begins as a small red pustule, which rapidly increases in size, then breaks down in the center forming a small ulcer. The margins of the sore are undulated and the ulcer extends somewhat beneath this undulated edge, giving a characteristic appearance to the chancre. Occasionally this ulcer is very small and may not attract attention. In about three fourths of all cases the ulcer is situated upon the genitalia, and is acquired through illicit sex relations. In Russia, about three fourths of all cases are acquired through kissing, and the chancre is situated upon the lip. Surgeons and obstetricians may suffer infection upon the fingers. The use of vaccine from the sores of vaccination may be a means of transmitting syphilis. Rarely the infection may be carried by intermediate objects, as the bed clothing, the common use of a fountain syringe, public drinking cups, public towels, and in other ways too numerous to mention. The favorite site of the chancre is a mucous membrane, though, as has already been suggested, it may appear upon the skin anywhere in the body. Chancre heals usually within a few days. The neighboring lymphatic glands are usually swollen, and this increase in size usually persists.

The **secondary stage** appears from six weeks to six months after the primary lesion. There is a slight fever, rarely above 101° , with a general feeling of malaise and other vague symptoms. Aching in the bones is rather characteristic. The lymphatic nodes over the body generally enlarge. A slight anemia is frequently present. Within a few days or weeks of these prodromal symptoms, the **eruptions** occur. Those upon the skin are extremely variable. An erythematous eruption is usually first and is most abundant upon the chest, other parts covered with clothing and occasionally the forehead. A papular eruption is very common, the papules are of various sizes and appear chiefly upon the flexor surfaces. **Mucous patches** appear upon the mucous surfaces. The distribution of the syphilids is usually very symmetrical. The outlines are rounded, and may present a map-like appearance with a coppery tinge. Later eruptions may be pustular or tubercular. These are usually gregarious and symmetrically placed. Other symptoms which occasionally appear during the secondary stage are alopecia, laryngitis, iritis, choroiditis, retinitis and other vague and apparently causeless inflammations of the mucous membranes of the body, the nails, the hair and the skin. The secondary stage may last a few months to a year, when the symptoms disappear. There is one form called **late secondary syphilis** in which the symptoms of the secondary stage may not appear for several years after the primary lesion. Usually the patient enjoys good

health for some months or years after the conclusion of the secondary stage, but this is not invariably true.

The **tertiary stage** is characterized by the appearance of a peculiar skin eruption. This is pustular at first, the pustules break and form ulcers with hard and sometimes laminated scabs. Syphilitic tubercles are especially characteristic of the tertiary stage. Both of these lesions in healing leave scars which frequently are of a coppery color, due to the stain of extravasated blood. Gummata are typical of the syphilitic manifestations, and consist of lymphoid, plasma and epithelioid cells with leucocytes. Great masses of these cells undergo fatty degeneration and ultimately a gummy or pasty mass results. These may break down with extensive ulceration or they may be slowly absorbed with no particular ill effects. No organ of the body is free from invasion by the gummata. When they occur upon bones, they may be very painful, but generally it is characteristic of the syphilitic lesion to cause little or no sensory disturbance. Amyloid degeneration, fibrosis, and arteriosclerosis are important constitutional changes following syphilis.

Syphilis of the **bones** includes synovitis, arthritis and the effects of the osseous nodes and gummata around the joints. The arthritis associated with osteomata is associated with very severe nocturnal pain. The joint symptoms are rather characteristic of the secondary stage, but are often present in the tertiary.

Syphilis of the **kidneys** usually appears in the tertiary stage. It includes amyloid degeneration, chronic and interstitial neuritis and gummata. Syphilis of the **spleen** and other lymphatic glands includes amyloid degeneration and vascular lesions. Syphilis of the **mouth** and of the **rectum** are not uncommon and are associated with ulcers whose effects may be fatal. In the case of the rectum a gradual stenosis may lead to death. Syphilis of the **lungs** is extremely rare. Fibrous infiltration or interstitial pneumonia or gummata may be present. Pulmonary syphilis is not easily distinguished from pulmonary tuberculosis except by finding the infectious agents. Both infections may be present in any case. Syphilitic endocarditis and myocarditis cannot be certainly diagnosed ante-mortem. Syphilitic **endarteritis** and gummatous periarteritis are important factors in the pathology of atheroma and aneurysm. (q. v.)

Syphilis of the liver may be congenital or acquired. The disease is manifested in its congenital form, either as a diffused cellular infiltration which produces at first enlargement and hardening, later, atrophic changes and irregularities; or as a gumma.

Acquired hepatic syphilis may show itself as diffused interstitial hepatitis, single or multiple gummata, amyloid disease, endarteritis, or chronic fibrous perihepatitis. Jaundice in the course

of syphilis and severe pain may be present. Symptoms of portal obstruction may occur as in ordinary cirrhosis, or, sometimes, the symptoms suggest abscess or cancer. The diagnosis is made by the history, and the results of the Wassermann or other specific tests. The outline of the liver is irregular and the enlargement is not uniform. If the gummata are accessible to palpation, they appear like flattened hemispheres, sometimes several being made out on the surface of the enlarged organ. If no syphilitic history is obtained, scars in the throat, nodes on the bones, or other signs of syphilis may be found.

Syphilis of the heart is a rather uncommon manifestation, usually affecting the myocardium with gummata or diffused fibrosis, or more rarely amyloid infiltration, and is occasionally a cause of aortic regurgitation, the heart usually not enlarged, and clinically manifested by rapid, irregular pulse, palpitation, dyspnea, and sometimes anginoid attacks.

Syphilitic Laryngitis. A common manifestation of this disease appears as a diffuse nondistinctive catarrhal laryngitis or as mucous patches, three to nine months after infection, or as gummata, either in acquired or congenital syphilis. The main symptoms are slight hoarseness and cough, somewhat painful deglutition, expectoration of free muco-purulent discharge streaked with blood or blackened shreds from an ulcer, and syphilitic evidences elsewhere in the body. Laryngeal examination shows superficial whitish ulcers in secondary syphilis. Small, round, symmetrical gummata rapidly becoming deep, punched-out, dark red, somewhat indurated ulcers with a mucopurulent secretion and necrosed tissue mark the third stage or there are deformed cicatrices, producing more or less stenosis. The mucosa is hyperemic and injected. There is more or less tenderness on pressure with the deep ulceration. The history, peculiar lesions, Wassermann reaction and other laboratory tests distinguish this from tubercular laryngitis, although tuberculosis may be present elsewhere in the body. Under treatment for the underlying condition, the ulcers heal rapidly, but the resulting cicatrices may impair the voice.

Syphilis of the Central Nervous System. The effects of syphilis upon the central nervous system are extremely variable. Gummata may appear anywhere upon the meninges and within the nerve matter. The symptoms thus produced resemble those produced by tumors of any kind in the same locations. The dura is especially subject to a gummy pachymeningitis. The symptoms produced in this way are chiefly due to pressure upon the nerve trunks. The syphilitic lesions of the blood vessels lead to profound injury in the brain and spinal cord. Thrombosis or obliterating endarteritis occurring in the brain leads to infarction. The

infarcted area undergoes digestion and softening. The examination of the syphilitic brain usually shows thickened gummy dura mater, a thickened milky-looking pia-arachnoid, and adhesions are likely to be found between these layers of the meninges and the brain itself. The blood vessels are tortuous and irregular. Capillary hemorrhages are frequent. Succession of aneurisms may cause certain arteries to resemble a chain of beads. Areas of softening or areas in which marked overgrowth of neuroglia has occurred may be present. Gummata may be single or multiple, large or small.

The **parasyphilitic** diseases occur several years or two or more decades after the primary lesion. The symptoms of this, which is sometimes called the quaternary stage, are usually limited to the central nervous system and are due to various degenerations in the nerve matter. Locomotor ataxia, taboparalysis, and paralytic dementia are the most common of the parasyphilitic diseases. It is frequently the case that these diseases appear in patients in whom the primary and secondary manifestations were very trivial. Indeed it is not rare to find these diseases occurring in patients who had not previously known themselves to have been infected and yet in whom the laboratory examinations have demonstrated almost certainly the usual cause of these diseases. There is some reason to believe that either by some specific reaction or as the result of some internal secretion the nerve cells are able to either neutralize the effects of the syphilitic poison or to deter the rapid multiplication of the treponema. Either because this antitoxin-producing activity exhausts the neurons or because the onset of a less vigorous time of life prevents the neurons from continuing these protective activities, the nerve cells and fibers do undergo degeneration at almost any time after middle life. Cerebral syphilis which usually occurs during the tertiary stage may be associated with a most complicated disease picture. Paralysis either sensory or motor or of the Brown-Sequard type, epileptic attacks, many hysterical phenomena, paralysis either of the upper or lower neuron type, retinal hemorrhages, atrophy of the optic nerve are only a few of the effects of syphilis in the brain. The gumma in the brain presents all of the symptoms of the ordinary brain tumor.

Hereditary Syphilis. Except for chancres the symptoms already mentioned appear in hereditary syphilis. Very frequently the products of syphilitic conception die very early in pregnancy. A considerable percentage of those born at term are born dead and of those born living about one fourth die within the first half year of their existence. Of those who live, many are mentally deficient, epileptic or become subject to the parasyphilitic diseases rather early in life. The newborn child may be greatly emaciated

and may or may not suffer from any one or more of a long list of skin and mucous lesions. Most of the children born alive are, however, born plump and apparently perfectly well. Any time within the first few months of life a coryza first appears, this gives the symptoms of an ordinary bad cold and the child has snuffles, skin lesions appear usually within a few days, the liver and spleen enlarge, and other symptoms of the secondary stage appear. The child is fortunate if these are fatal. If recovery occurs from these symptoms, or if they have not appeared at all, the later symptoms of inherited syphilis may be expected, such as an earthy tint of the skin, retarded growth, imperfectly developed scalp, a general infantile appearance throughout childhood, a boat-shaped skull and deformities of the bones. The results of peritoneal inflammations are very common. Scars upon the skin with rounded or map-like outlines are usually located around the mouth and nose, upon the palate or over the lumbo-sacral region.

Hutchinson's Triad includes the Hutchinson teeth—that is, incisors which are very thin and with crescent-shaped notches in them; otorrhea, with deafness; and interstitial keratitis and iritis, affecting the eyes in succession.

Diagnosis. The diagnosis of syphilis may be extremely difficult or very easy. For many reasons patients often deny the existence of the disease and conceal as much as they can any history which might lead to its diagnosis. This difficulty would be made greatly less if the fact that syphilis is very frequently contracted innocently could be impressed upon the people in general. The examination of the skin should show the characteristic scars in the locations already mentioned. Examination of the serum expelled from the tonsil usually shows the presence of the *treponema pallidum* during the primary and secondary stages. The fact that the syphilitic eruption usually causes neither pain nor itching should be borne in mind. The Wassermann method with its modifications and the Noguchi test are fairly reliable, especially if the same findings are reported from two or more different tests. The cerebrospinal fluid probably shows lymphocytosis throughout the lifetime of a syphilitic patient. In congenital syphilis, the X-ray may show characteristic changes in the bones, especially in the radius and the fibula.

Treatment. The use of mercury and the iodides was long considered absolutely satisfactory and specific for syphilis. Since the vogue of the newer arsenic preparations, the evils of the older methods have been rather freely discussed. The arsenic is intended to kill, or to prevent the multiplication, of the *treponema*, without injury or at least with little injury to the body. The ignorant use of these methods is to be condemned—if they are the best

things for the patient, he should be referred to specialists in this line of therapy, if this is possible.

The value of the nondrug methods is yet to be seen. All such methods are based upon securing the greatest possible efficiency of the organs of elimination, with good body nutrition.

Oxygen Treatment. The *treponema pallidum* is absolutely anaerobic. Cultures must be very carefully protected from oxygen, or they die speedily. This fact has been made the basis for a method of treatment. The attempt is made to facilitate the oxidation processes to the utmost extent. This is done by means of breathing exercises, which not only oxygenate the blood but also provide good circulation through the red bone marrow and exercise good effects upon digestion; by increased muscular activity, as in rowing or football, and hard work, as digging, etc.; by a diet largely of green vegetables and iron-containing foods, including a moderate amount of red meats but little starch or fats; by full water drinking, and the use of such fruits as have a diuretic effect. Citrus fruits are especially commended. Active elimination of all toxins is to be promoted by baths, enemas, massage, outdoor living, and the drinking of much water. Alcohol is forbidden, both on account of its effect upon the nerve tissue and also because of its effect in using up the oxygen and the water which are needed in destroying and eliminating the infectious agent. Tobacco is forbidden on account of the effect upon the body, and smoking on account of the carbon dioxide which is thus taken into the body. Excesses of all kinds are forbidden, both on account of their direct injury upon the nerve and other tissues, and also because they diminish the oxidation processes, and lessen the elimination of toxins.

Prophylaxis. Prevention is difficult on account of the fact that the disease is so frequently contracted as the result of illicit sex relations. The fact that it is so often contracted innocently is forgotten, whereas that fact should be especially emphasized, in order that concealment, with its opportunities for spreading the disease may be superseded by better sanitary methods. Any other contagious disease, hidden as a crime, would certainly spread much more rapidly; syphilis, recognized as an infection presumably the result of accident, could be controlled much more easily than when, as now, it is held to be proof of immorality of a certain type. The discussion of methods dealing with what is generally called the "social crime" is beyond the scope of this book; the solution of the problems connected with this aspect of human life will solve many other problems, as well as those of syphilis.

Marriage should be forbidden until at least two, and better four, years after active symptoms have disappeared. The danger to the wife includes that of the disease itself, and also the risk of

the miscarriages due to the death of embryo or fetus, and other obstetrical complications due to the effects of the disease. Still births and early death, inherited syphilis, and many deformities of body and brain, without the active manifestations of the syphilitic disease, are some of the effects produced upon the offspring of syphilitic parents.

HEMORRHAGIC JAUNDICE

(Weil's disease; acute hemorrhagic icterus)

This disease is becoming more frequently reported among soldiers. It may be identical with acute febrile icterus (page 566). Hemorrhagic jaundice is an acute infectious disease characterized by hemorrhages, fever, muscular pains, jaundice and usually very rapid recovery after several weeks' apparently very severe illness.

Etiology. The infectious agent is the spirochete *icterohemorrhagica* (spirochete *nodosum*). It is present in considerable numbers in the urine of those affected. It spreads with ease as the result of trench life, during the war; the use of bathing pools, or other insanitary conditions.

Diagnosis. The symptoms are as given in the definition. Nephritis, urticaria, cerebral symptoms, as coma, delirium, and other complications may be present. The stools are pale; the infectious agent may be recognized most easily in the urine. Injection of the urine into guinea pigs produces the disease. The spirochetes can be isolated from the blood and urine of the pig.

Treatment. This is symptomatic and palliative. The patient must be removed from unclean surroundings, the excretions carefully disinfected, and the fever treated as in other infectious diseases.

Prognosis. In uncomplicated cases recovery begins at about the fifth week; convalescence is rapid. The illness may persist for two months or more. In severe attacks death may occur from exhaustion, during coma or delirium, or from hemorrhages.

CHAPTER XLVIII
DISEASES DUE TO ANIMAL ASSOCIATES

PLAGUE

(Bubonic plague; black death; oriental plague; pest or pestis)

Plague is an acute, infectious, contagious disease, occurring in epidemics, characterized by great virulence and rapid course, accompanied by an inflammation of the lymph glands (buboes) or by pulmonary inflammation, and due to the presence in the blood and tissues of the bacillus *pestis*.

Etiology. The predisposing causes are insanitary conditions, filth, overcrowding, and warm weather. It is transmitted chiefly by fleas which spread the disease among rats, mice, cats, and ground squirrels and to man. These animals die of the disease in large numbers. They have the disease in a chronic form, living months, and spreading the infection widely. "Every city should be surrounded by a wide zone entirely free from these animals."—C. A. Whiting.

The contagion seems to be in the skin, the mucous membranes of the nose and pharynx. The incubation is two to five days.

Diagnosis. Premonitory symptoms are absent or very slight. Invasion is usually sudden with very high fever which drops with the appearance of the buboes, profuse sweating, unquenchable thirst, repeated attacks of vomiting, diarrhea or constipation, headache, suffusion of the eyes, sometimes rigors, great prostration and lassitude, delirium. Ecchymoses and petechial spots are common. The face has an anxious or dazed expression, the speech is thick and indistinct, the hearing dulled, the gait staggering, and the tongue is swollen, furred, dry and brown.

The Bubonic form occurs in 78% of cases. Buboes appear in the groin, axilla, or near the jaw on the second to the fifth days. They are usually single, large and very tender. There is enlargement of the spleen. In favorable cases the convalescence begins slowly from the sixth to the tenth day, but the buboes continue to enlarge, break down, and are discharged in the form of puslike material and sloughs, lasting for weeks.

In the **Pneumonic form** there are no buboes. High fever, prostration, cough, profuse, watery, blood-stained sputum which is almost a pure culture of the bacillus, and moist rales are characteristic. The physical signs are not proportionate to the severity of the symptoms. The mortality is very high.

In the septic or septicemic form the patient succumbs in three or four days from the intense virulence. The buboes do not appear. The ambulatory (*pestis ambulans* or *pestis minor*) is marked by a few days of fever and swelling of glands in the groin. The symptoms are very mild. These cases are a great danger to the community as the bacilli are contained in the urine and stools and hence spread the disease.

Blood. Bacillemia occurs. There is a leucocytosis of 20,000 to 30,000 cells during the active stage. Both polymorphonuclears and lymphocytes are increased. The eosinophiles are normal or decreased.

Agglutination of the plague bacillus occurs. It is rather difficult to obtain as a mild degree of spontaneous agglutination is liable to occur with normal blood.

Treatment. The treatment is mainly symptomatic. The cough, fever, and toxemia must be met here, as in other diseases. A very nutritious diet, mainly liquid, must be given. Fruit and vegetable juices with plenty of water must be given freely during the fever. A diet of fresh pineapple has been recommended.

Prognosis. The mortality is high in all forms. Death occurs on or about the third day, or later from exhaustion or complications. Recovery begins about a week from the onset.

Prophylaxis. Rigorous isolation is continued for a month after recovery. Disinfection of all excreta, discharges, clothes, and utensils must be thorough. Rats, mice and ground squirrels must be exterminated as far as possible and their bodies burned. Special care must be taken at seaports. Attendants and housemates of a patient must be disinfected and quarantined for ten days.

HYDROPHOBIA

(Rabies; *lyssa humana*)

Hydrophobia is an acute infectious disease, occurring in animals but communicable to man by inoculation and characterized by intense tonic spasm beginning in the larynx; delirium, coma and usually death.

Etiology. The infectious agent is probably a protozoan, which appears in the large ganglion cells of the brain, as one of the "Negri bodies." The same organism, though less easily recognizable, is found in the saliva and elsewhere. It is transmitted by the bites of infected animals, and the organism follows the nerve trunks to the cord and brain. Bites upon the face thus result in more certain and more speedy appearance of the symptoms, both on account of the plentiful nerve supply and the short distance

the infection has to travel in order to reach the brain. The bite of an animal known to be suffering from rabies is not always followed by the appearance of the symptoms. The bite of an animal not suffering from rabies cannot possibly produce the disease. Children are more susceptible than adults.

Diagnosis. Under ordinary circumstances, when there is reason to suspect rabies in a dog or cat, it is much better not to kill the animal, but to keep it alive, confined in a large, comfortable cage, where it can be watched and well cared for. If it shows no sign of further disease, or if symptoms of some other disease appear, the animal is evidently not rabid. If the animal dies, or has been unwisely killed, the brain should be placed on ice and sent to the nearest pathological laboratory for examination. The finding of the Negri bodies in the large ganglion cells of the hippocampus major, the cortex, or elsewhere is positive. Portions of the brain and cord, or a small amount of saliva, inoculated into the meninges of rabbits, cause characteristic lesions. This may be done when for any reason the brain examination is not satisfactory.

The incubation period is usually about six weeks. Rarely, the disease appears a few days, rarely a year, after the infection. The wound may heal nicely. At the end of the incubation period, the wound or its scar becomes inflamed and painful, and may suppurate. The patient becomes anxious and irritable and the tension of the laryngeal and pharyngeal muscles causes dyspnea, dysphagia and hoarseness or dysphonia. About a day after the beginning of these symptoms, the second or stage of excitement begins. Hyperesthesia is marked; a slight sound, especially of running water, a draft of cool air, or a ray of light may precipitate convulsions. These are tonic, rarely clonic, and may cause death from asphyxia. The dysphagia and hypersecretion of saliva cause frothing at the mouth. The convulsive action of the muscles of the jaws may cause clicking noises and the hoarseness of the voice, with dysphonia, may suggest barking or snapping, but attempts to imitate the barking or manner of a dog prove the absence of rabies, and suggest hysteria (lyssophobia, pseudohydrophobia, q. v.). During this stage the temperature may be normal or to 103° F. The pulse is irregular, and finally the spasms appear spontaneously. Suicidal attempts with or without melancholia, are frequent. After one to three days the spasms cease gradually, and the third, or paralytic stage appears. Unconsciousness supervenes, the heart gradually fails and death follows in six to twenty hours. Recovery from typical rabies has never been reported.

Treatment. Prompt and thorough cauterization of the wound with caustic potash or actual cautery is indicated. The Pasteur treatment must be begun early if at all. The patient should be sent to the nearest institute for treatment if this is to be given.

The wound should be kept open and drained for six weeks. After the disease appears darkness and quiet are necessary. Chloroform is needed for the spasms. The absolutely fatal prognosis, after the disease has manifested itself, should indicate the free use of every method possible to relieve the suffering. No cases are reported in osteopathic literature.

Prophylaxis. Dogs harbor and transmit several dangerous infections, besides rabies, and their existence should be permitted only under strict supervision. In country places, healthy dogs may be useful. Sick dogs are always dangerous, especially to children. There is no room for dogs in crowded places, and the sooner the sentimental petting of dogs is superseded by a saner sentiment in favor of cleanliness, the better for the human race. Squirrels, rats, and other rodents may have the disease in a mild form, and may transmit it to human beings or to dogs in the severe form. Nothing but the total extermination of these animals, especially in cities, should be considered.

The few dogs that are allowed to live should be muzzled when in cities or in the presence of strangers. Ownerless dogs should be humanely killed; in suspicious cases they should be kept under observation a few weeks before death.

TETANUS

(Lock-jaw; trismus; cephalic tetanus)

Tetanus is a specific, infectious disease, caused by the bacillus tetani and characterized by severe, persistent tonic spasms of the muscles, especially those of the jaw.

Etiology. The exciting cause is the bacillus tetani of Nicolaier, which usually gains entrance to the system through some small wound, especially a puncture wound, and produces a toxalbumin of extraordinary virulence which travels to the central nervous system along the motor nerves. The bacillus multiplies in the intestinal tract of the horse and retains vitality in the soil for many years.

The forms depend upon how affected and the part affected.

Idiopathic tetanus occurs when no open wound is discoverable.

Traumatic tetanus occurs when an open wound is found.

Tetanus neonatorum attacks newborn infants.

Lock-jaw or trismus affects the jaw alone.

In **Cephalic tetanus** the throat and face are affected.

Diagnosis. The onset is sudden with stiffness of the neck, tongue, and jaw. There are headache, gastric disturbance, and

languor. Opening the mouth and deglutition become difficult but not painful; the stiffness increases, extending to the spinal muscles, abdomen, and legs, which are finally held in a firm spasm. Orthotonos, opisthotonos, pleurothotonos, or emprosthotonos have occurred. The symptoms vary in degree and severity. The jaw may be firmly locked or may yield to forced extension. (Lock-jaw or trismus.) The muscles of the face may be involved so that the angle of the mouth is drawn out and the eyebrows are raised (risus sardonicus). Spasm of the pharynx and esophagus may occur, especially if there are injuries to the fifth cranial nerve.

Associated with these tonic convulsions is intense pain, especially if the chest muscles are involved. The paroxysm may be excited by any slight sensory impression, as a draught of air or the slamming of a door. The tension may be relieved so that the patient is able to walk around but relaxation is never complete and the patient walks as if his legs were wooden. The spasms vary in frequency from a few minutes to several hours apart, ceasing during sleep.

The fever is slight, or to 110° to 112° F. just before death; the pulse is small and frequent during a paroxysm; perspiration is excessive; the bowels are constipated and the urine is febrile. The mind is clear throughout.

Death usually occurs within four days from exhaustion. Chronic tetanus presents similar symptoms but less marked and develops more slowly.

The toxin appears to be excreted by the kidneys.

The exudate from the initial wound contains many bacilli.

Treatment. Free incision and thorough disinfection and cauterization of the wound is absolutely necessary and the wound must be kept open until the base heals. The patient is put into a quiet, darkened room with all sources of irritation excluded. Strong, thorough treatment of the cervical region is indicated. Deep, steady pressure of the nerve centers controlling the affected muscles will shorten the spasm. The hot or continuous neutral bath may be used. All the excretory organs should be kept active.

Liquid food only can be given. It may be necessary to resort to rectal or nasal feeding if the spasms are too much localized.

Anti-tetanic serum is on the market, but its use should not be attempted by the general practitioner. If it should be decided, in any case, to employ this method, only someone who has made especially careful study is able to secure the maximum of good with the minimum of danger.

Prognosis. The mortality in traumatic cases is 80%, in idiopathic, 50%. Fatal cases usually die within 6 days. Favorable features are: childhood, slight fever, localized spasms, and longer incubation period.

Prophylaxis. Every wound, especially of a puncture character, should be immediately cleansed and antiseptically dressed. Those inflicted around stables or from rusty nails must be opened thoroughly and kept open until all danger is past.

The increased use of automobiles instead of horses is an important factor in lowering the death rate from tetanus.

FOOT AND MOUTH DISEASE

(Epidemic stomatitis; aphthous fever)

Foot and mouth disease is an acute, specific, infectious disease of cattle, sheep and pigs, which may be communicated to man by the ingestion of dairy products from diseased cattle or by direct inoculation; characterized by a vesicular eruption of the membranes of the mouth and by constitutional symptoms. The exciting cause is unknown. The incubation period is from three to five days.

Diagnosis. The onset is marked by chilliness and fever, digestive disturbances, salivation and the appearance of a vesicular eruption upon the lips, inside of the cheeks, and the pharynx. In children, a miliary or pustular eruption appears upon the skin, especially of the hands.

In severe cases, hemorrhages may occur. The duration is about a week.

Treatment. The treatment is that of stomatitis. Recovery is to be expected in a few days to a few weeks, according to the sanitary conditions.

Prophylaxis. Isolation of human patients and diseased cattle and quarantine of their attendants are important. During an epidemic, all milk should be boiled before being used.

ACTINOMYCOSIS

Actinomycosis is a chronic infectious disease occurring among cattle and pigs and affecting man, due to the presence and multiplication of the streptothrix actinomyces. The fungus is common on various grains as oats, barley, etc. It may be taken in with the food or be inhaled with dust from grain.

In animals it causes the disease known as "lumpy jaw." In man, it is most liable to attack the lungs, intestines, or liver, as well as the jaw and neck. but any organ may be involved. The skin is sometimes affected.

It leads to great connective tissue proliferation with the formation of nodular masses which may be mistaken for osteosarcoma. Ultimately, suppuration takes place and deep-seated abscesses are the result.

Diagnosis. The general features are irregular fever, depending largely upon the existence of suppuration and the location of the lesion.

Lumpy Jaw. There may be swelling of one side of the face, or enlargement of the jaw. The tongue may be involved, showing small nodular growths either primary or secondary to those of the jaw. An abscess forms which discharges the fungus in the pus.

Intestinal Actinomycosis. The symptoms are gastric disturbances, diarrhea, and localized pain or tenderness, with symptoms of pericecal abscess or appendicitis, perforative peritonitis, or hepatic abscess.

Pulmonary Actinomycosis is characterized by cough, fever, wasting, and a mucopurulent or fetid expectoration often containing the fungus. Irregular fever and offensive sputum, the physical signs of consolidation especially in the mammillary and axillary region and in the middle zone of the thorax may suggest tuberculosis. Actinomycotic abscesses form large cavities which may be diagnosed in life.

Lesions of other organs may be present with the pulmonary form as erosion of the vertebræ, necrosis of the ribs and sternum with nodular formation, subcutaneous abscesses and metastasis.

Cutaneous Actinomycosis is marked by a chronic ulceration resembling skin tuberculosis, with tumor growths which suppurate and leave open sores which may remain for years.

Cerebral Actinomycosis has the symptoms of brain tumor or abscess. The fungus may be found in the urine when the disease exists in the genito-urinary tract.

In the sputum, the fungus and small "sulphur" granules or thread-like particles of yellow color are found. Elastic fiber from the lung is never found. Pus containing the fungus may be discharged with the buccal secretion. The disease may affect the tonsil.

Treatment. Very little can be done after the disease has become established. Surgical evacuation of the pus when the abscess is localized and accessible, gives a fairly good prognosis. The treatment for pulmonary tuberculosis should be used in the pulmonary form. Sometimes the process may be kept very slow, and fairly comfortable existence prolonged for years.

Complete recovery is rare.

Prophylaxis. Persons caring for cattle should be very careful when they find one with "lumpy jaw" to see that it is treated and cured or else killed and the body deeply buried. When handling animals with this disease, they should use the utmost cleanliness. Chewing straws should be forbidden.

MILK SICKNESS

(Trembles)

Milk sickness is an infectious disease of cattle (trembles) communicable to man by the ingestion of the milk or flesh from the diseased animal, occurring in the new settlements of the Western states, and characterized by constitutional symptoms and a swollen and tremulous tongue.

Diagnosis. Prodromal malaise, headache, and anorexia are present. In a few days, a burning pain in the stomach, nausea, vomiting, excessive thirst, and obstinate constipation occur. The breath has a characteristic foul odor. The tongue is swollen and tremulous. In severe cases, there is restlessness, hebetude, coma or convulsions, with development of the typhoid state and ultimately a fatal result. Slight fever is usually present but may be absent. The duration is from three days to three or four weeks, averaging ten days.

Treatment. Full washings of the colon; the usual treatment for fever, and other symptomatic treatment are indicated.

Prognosis. Recovery is the rule but in grave acute cases death may occur in three days.

Prophylaxis. Cattle with trembles should be killed and the body buried or burned. The milk from the rest of the herd must be boiled, if used. Carefulness in caring for the sick animals, especially in thoroughly cleansing the hands, is necessary.

GLANDERS

(Farcy; malleus humidus; equinia)

Glanders is an acute infectious disease, occurring in horses, due to the bacillus mallei, and characterized by the formation of granulation-tissue nodules in the nostrils (glanders), or under the skin (farcy): sometimes occurring as an industrial disease in man, especially among grooms and stable-boys, and those caring for horses. It is caused by the discharges from an infected animal reaching an abrasion or a mucous surface. The incubation period is from three to five days.

Acute Glanders. There is redness and swelling of the nasal mucous membrane with burning and dryness, followed by the development of nodules which rapidly break down and discharge a fetid hemorrhagic or mucopus. Headache, painful deglutition, cough, fever, and prostration are later followed by the typhoid state and eventually terminate in death.

Twelve or fourteen days after the disease begins lumps arise just under the skin or in the muscles, and necrosing, discharge a bloody fluid containing the bacillus mallei.

Acute Farcy (glanders of the skin). The site of inoculation becomes inflamed, swollen and red. Neighboring inflamed lymphatics appear as small nodules, "farcy-buds." The constitutional disturbances include rigors and sharp fever. A local or general eruption appears; abscesses develop in the subcutaneous tissue, and muscles; the joints may suppurate and the internal organs become involved. This grave pyemia leads to death in the course of one to three weeks.

Chronic Glanders (or farcy). This form is characterized by the development of a local granuloma, which breaks down into an irregular ulcer with thickened edges and a foul discharge. The lymphatics also tend to ulcerate and the nasal mucosa may become affected. The disease may last for years but may take fatal, acute form at any time.

The **diagnosis** is difficult. It may be made by cultures from the discharge; by agglutination test, or by injection of some of the discharge into the peritoneal cavity of a guinea-pig.

Treatment. The indications are surgical attention, cleanliness of the nasal passages, and nutritious diet.

Prognosis. The acute form is fatal. The chronic form may recover with proper treatment.

Prophylaxis. Diseased horses should be killed and their bodies buried or burned, their stalls torn down, purified and entirely rebuilt. The use of mallein is used to detect glanders in animals.

ANTHRAX

(Charbon; malignant pustule; wool-sorter's disease; splenic fever; splenic apoplexy)

Anthrax is an acute specific infection due to the bacillus anthracis, essentially a disease of cattle and sheep but attacking man chiefly as an industrial disease, and characterized by a local or general type.

Butchers, tanners, wool-sorters, hair-combers, sometimes veterinary surgeons, and those who work in hides or who care for cattle and sheep are liable to infection. The bacilli may also be carried by flies.

The incubation period is one to six days. The mode of infection in man is through a wound or scratch on the skin, by the respiratory tract, or by the alimentary tract. The local form is found in two varieties, the malignant pustule and anthrax edema. The general form is named according to the organ attacked.

Malignant Pustule is due to skin inoculation, and occurs on exposed parts as the face, hands, neck, and lips. It begins with

prickling and burning, a small papule forms, becomes vesicular and surrounded by a dusky red indurated areola. The fluid of the vesicle passes quickly from clear to bloody and escapes, forming a dark scab at the summit. There may be a ring of vesicles around this eschar. It may then disappear or may extend, producing great induration and brawny edema. The lymphatic glands are swollen but there is little or no pain or distress, even when the case is severe. Prostration, sweats, splenic enlargement and other systemic disturbances may appear. The temperature is at first high but may afterwards be normal. Death may occur in three to five days or a slow recovery follow upon sloughing out of the eschar.

Anthrax Edema. The eschar and induration are absent, the constitutional symptoms are very grave; swelling is an extensive and spreading edema, beginning usually around the eyes. It is a pale red or yellowish swelling which may go on to gangrene. This form is much more fatal than the malignant pustule, the mortality being about 33%. The general form is rare in man.

Respiratory Anthrax (wool-sorter's disease). The primary lesion is usually in the trachea and the larger bronchi where there are patches of intense swelling of the mucous membrane with hemorrhages and ulcerations. Broncho-pneumonia, enlarged spleen and mediastinal glands are frequent. The disease begins with chill, fever to 103° F., headache, vomiting or diarrhea, and marked prostration. There are varying pulmonary symptoms—hurried breathing, great pain in the chest, and cyanosis. Delirium is common. Death usually occurs in three or four days. If the patient survives a week recovery may be expected.

Gastro-Intestinal Anthrax (mycosia intestinalis) gives rise to hemorrhagic lesions of the mucous membrane of the intestines, with enlarged mesenteric glands and spleen. Suggilations appear on the gums. There are symptoms of an intense poisoning—severe vomiting and diarrhea with possibly blood-streaked stools, and tumid abdomen. The pyrexia is slight and death is preceded by intense collapse in one to seven days. The bacillus anthracis is found in the blood, pus, exudate, serum, sputum, and elsewhere.

Treatment. The treatment is mainly surgical. The local lesion should be destroyed by caustic potash or the actual cautery; the swelling should be excised, if not too large. If large, crucial incisions are made and the parts cauterized with pure carbolic acid. The carbolic lotion should be injected into the surrounding tissues two to three times a day. The diet and other treatment depends upon the condition of each patient as found on examination.

Prognosis. If the pustule is promptly operated, recovery is the rule. Internal anthrax is usually fatal.

Prophylaxis. Prevent anthrax in animals by preventing the spread of infected material. Burn the bodies of dead infected animals unopened and under the supervision of the sanitary authorities. Those who work with animals should be taught the dangers of uncleanness, and every provision made for their personal hygiene.

OTHER DISEASES

Nearly all the worms that infest the human body are the gift of animals to mankind. Tapeworms, trichina and others are taken into the human body with raw or improperly cooked meat or fish. Sheep or rabbits distribute the microscopic eggs of flukes or coccidia in water or over vegetables, with fecal material. People who drink the water or eat the vegetables without cooking, become the hosts of these worms. Horses, cats and dogs carry round worms, and other worms, very plentifully. The microscopic eggs of these worms are scattered around with fecal material and also with the dust and hairs which have been contaminated with fecal material. By unwashed hands and in other ways, and by flies, the fecal material bearing the eggs reaches human food, and the eggs develop in human bodies.

Other less common diseases are splenomegaly and Leishmaniasis, derived from dogs, camels, and rats, probably by the way of fleas; and Malta fever, given by the goat in infected milk.

Domestic animals, as well as mosquitoes, flies, rats, and other insects carry infection from place to place with celerity.

CHAPTER XLIX

DISEASES DUE TO AGENTS YET UNKNOWN

VARIOLA

(Smallpox)

Variola is an acute, specific, infectious, highly contagious, epidemic disease, characterized by lumbo-sacral pains, vomiting, an initial fever lasting from three to five days followed by characteristic eruption. The maturation of the pustular stage is accompanied by a secondary fever during the presence of which grave complications are prone to occur. The secondary fever may not appear.

Etiology. The disease is caused by one or more specific agents whose nature is unknown but which retain virulence for a long time. There is no period of the disease after invasion when it is not contagious although it is most virulent during the suppurative period. It is spread by fomites, contact with the pustular contents, scabs or scales of desquamating skin. Unlike most erythematous diseases, it attacks all ages, classes and conditions of life.

Smallpox attacks those who are apparently of robust physique, though doubtless lowered vitality is one factor in predisposing to the disease. It is especially those who are most robust who are most frequently exposed to the infection. It is also true that a robust and florid appearance by no means denotes heightened vitality. Moderate drinkers, so-called, have often this florid appearance, and they are especially subject to infection from smallpox. They usually suffer the disease in more virulent form than do non-drinkers. One attack usually confers immunity.

The incubation period is from eight to sixteen days, not often attended by recognizable symptoms. The predisposing factors are: debility from illness or poor nourishment, alcoholism, unhygienic surroundings, muscular lesions of the occipito-atlantal and atlanto-axoidal articulations and such other contractions of the neck muscles as narrow the thoracic inlet, or interfere with metabolism in any of its phases. Fear must also be mentioned as a cause.

Pathology. Granular and fatty degeneration occurs in the liver, spleen, kidneys, and heart. Infiltration is found in the adrenal glands and the testicle. During the papular stage, there is local hyperemia of the papillae, with interstitial exudation and colliquative necrosis of rete cells, so that a vesicle is formed, peculiar in that it is transversed by delicate bands of epithelial cells. This, with the fact that coagulation-necrosis occurs mainly in the center,

gives it the umbilicated or depressed appearance. The contents of the vesicle are plasma, fibrin, and cell detritus. Leucocytic invasion converts vesicle into pustule. This has a more globular, elevated appearance than the umbilicated vesicle. Pyogenic organisms are found in the pus. When the inflammation injures the corium, scars are apt to result; this occurs when the skin is scratched. The actinic light rays increase this danger.

Diagnosis. The stage of invasion lasts about three days. It is characterized by sudden onset with violent chills and shivering, agonizing pains in the back and legs; intense headache mostly frontal, a temperature rapidly reaching 102° to 104° F., full, strong and rapid pulse, 100 to 140, uncontrollable vomiting, pharyngitis, face red, eyes bright, coated tongue, anorexia, constipation, sleeplessness, delirium, often copious perspiration, and extreme prostration. An "initial exanthem" clearing within 24 to 48 hours appears. It is either hemorrhagic or erythematous. About the third day, the true eruption makes its appearance, first upon the forehead and in the scalp, then the rest of the face, the backs of wrists, trunk, arms, and lastly the legs, most abundant upon parts exposed to the atmosphere. With the appearance of the eruption all symptoms abate, the temperature falls, and the patient may feel quite comfortable. The eruption consists of coarse, red spots upon the body, like flea-bites, rapidly becoming within twenty-four hours slightly raised red papules, feeling hard and shotty to the touch, and each surrounded by a broad red inflammatory band, the areola. Usually by the sixth day the papules become converted into umbilicated vesicles, at first clear, then turbid. They are hard and indurated to the touch, and on the eighth or ninth day they become pustular. The areola becomes much darker, and the temperature rises to 103° to 105° F., pulse 110 to 120. The other symptoms all reappear with salivation and delirium. Marked edema of the skin renders the face unrecognizable. The pustules are painful, especially in places where the skin is thickened. The maturation lasts about three days, when the fever falls by lysis. If fatal, death usually takes place about the tenth day, preceded by feeble and more rapid pulse, marked delirium, subsultus, and sometimes diarrhea. About the eleventh day, dessication begins, the pustules begin to dry, forming dark scabs which are tightly adherent. The fever and other symptoms subside but itching becomes annoying. The odor from the pustular stage on is a peculiar greasy one.

After the rupture of large pustules the centers frequently dry and sink in, often in the shape of a Maltese cross. This is most typically seen upon the backs of the hands and is pathognomonic. Toward the end of the third week the scabs fall, leaving red glistening pits which disappear or change into deep white striated scars. The hair falls but may grow again.

Secondary toxic or septic rashes appear during the stage of decrustation, sometimes with mild fever. They may be either scarlatiniform, morbilliform or hemorrhagic. The skin immediately surrounding the drying pocks is often exempt, leaving an anemic halo. This rash lasts about three days, and fades or desquamates. With the development of the skin eruption, an exanthem appears upon the mucous membranes of the body cavities, developing into ulcers. This may develop before the dermal rash and be of diagnostic importance.

VARIETIES

Variola Vera is the discrete form in which symptoms are of moderate severity and the pocks are separated by healthy skin.

Variola Confluens is characterized by the early appearance of the eruption, the coalescence of the pustules, marked prostration, noisy delirium, stupor, high, irregular secondary fever, profuse salivation, and sometimes uncontrollable vomiting and diarrhea. Death is apt to occur about the tenth day. If recovery occurs, convalescence is tedious and disfiguring scars are common in the most favorable cases.

Abortive Type. The prodromal phenomena are mild. The eruption either fails to appear by the fourth day or only a few pocks go through the regular metamorphosis, or the development of the pocks ceases in the papular stage.

Malignant Smallpox. Of this there are three forms.

Variola Pustulosa Hemorrhagica (black smallpox) is characterized by hemorrhages into the pocks and upon the mucous membranes of the entire body. Collapse, cardiac weakness and death are usual. The mind remains clear and the patient is conscious of his danger.

Purpura Variolosa (*variola purpurica*). On first or second day the prodromal exanthem rapidly becomes hemorrhagic and does not disappear upon pressure with the finger. Severe angina, hemorrhages from the gums, lungs, stomach, uterus, bowels, and urinary tract follow. Death occurs about the fourth day, preceded by signs of collapse, which has manifested itself by a relatively low temperature even before the pustule appeared. Some few hemorrhagic pocks occasionally appear. The diagnosis of the condition is by history of exposure to smallpox and the characteristic prodromes.

Corymbose Variola is a rare but severe form in which the pocks are arranged in grape-like clusters.

Varioloid (modified or mitigated smallpox; *variola benigna*; *variola modificata*). Persons exposed to smallpox sometimes suf-

fer from varioloid instead. Persons who have had smallpox may suffer from varioloid at subsequent exposure to smallpox. Vaccination appears to initiate an attack, in persons peculiarly susceptible, or as the result of improperly performed vaccination. The lesions remain in the epidermis, the course of the eruption is shorter, the papules vesicate by the fifth day, the process of suppuration is abridged, decrustation occurs rapidly with little or no scarring, and all symptoms are milder. There are various modifications.

Variola sine Exanthemate or variola sine variolis has the usual symptoms but no eruption or a very few pocks.

Variola Verrucosa. The large solid conical papules with small vesicles at their apices rapidly desiccate and form crusts and finally disappear without scars. Variola miliaris has very small yellowish vesicles.

Variola Cornea (horn-pox) is known by the hard mahogany crusts.

Complications. During the secondary fever, there may be broncho-pneumonia, pleurisy, dysentery; hemorrhages of all kinds, ulcerative eye, ear, and laryngeal conditions, purulent arthritis, orchitis, gangrene when the swelling is great and subcutaneous abscesses form, often attacking the penis and scrotum; erysipelas attacking the face, and rarely nephritis. During convalescence, carbuncles, boils and other subcutaneous abscesses are very common. Disturbances of the peripheral nervous system as neuritis, peripheral paralyses especially of the palatal muscles, neuro-retinitis, and otitis media are less common. The *sequelæ* most common are boils and abscesses, deep pitting, otitis media, blindness, and permanent baldness.

The urine has the usual febrile changes. The white blood cells reach 10,000 to 20,000 or more. Lymphocytosis occurs during pustulation; the polymorphonuclear cells are decreased to 40%, sometimes 12%; myelocytes and irritation forms are found. During the febrile stage, there is a polycythemia followed by an anemia to 3,000,000 or less during the pustular stage. Regeneration is slow, lasting about fourteen days. Normoblasts are rare except in the hemorrhagic forms. Exudate taken from the pustule shows streptococci, staphylococci, and pseudodiphtheria bacilli.

Smallpox may be confused with a long list of diseases, including varicella, measles, cerebro-spinal meningitis, scarlet fever, pneumonia, syphilis, typhus fever, and septicopyemia.

Treatment. The imperative demands of treatment are isolation, ventilation, cleanliness, and disinfection. When suspicious symptoms of smallpox are found, the proper authorities should be notified at once and the patient isolated. When the diagnosis is made, hair and beard should be cut very close.

The room should be well ventilated, the windows screened and slightly darkened by red curtains to exclude the ultra-violet rays of light. The temperature should be maintained at 65° F. All superfluous hangings, rugs, and furniture should be removed. The doorways may be protected by a sheet dampened with carbolic solution 1:60. The nurse must be of robust physique, preferably immune, and not afraid. Male nurses must have very short hair and no beard. Female nurses must have short hair or must wear a close cap. Absolute cleanliness is secured by plenty of baths, clean bed and personal linen, and careful nursing. The physician must put on a special suit with cap and gloves which he keeps in the house but not in the sick room.

Remove all bony and muscular lesions found and pay strict attention to the lower thoracic spine and ribs. No adjustment requiring difficult and painful technique is to be given after symptoms make their appearance. Reflex muscular contractions must be relieved as frequently as they recur. It is best to visit him from once to three times a day, treating the special symptoms as they arise.

"I have never yet seen the so-called 'fever of pustulation.' In every instance the fever has dropped when the eruption appeared, and has not recurred. This is probably due to the use of systemic antiseptics throughout the entire course of the disease. From the cases which I have had, I would say that osteopathic manipulation would be impossible. The eruptions are so numerous, and so sore, that it would be impossible to get the fingers on the flesh anywhere without interfering with them. The onset of the cases of small pox that have come under my observation, has been very much like typhoid fever, the slow pulse, step-ladder temperature, general aching, and malaise."—G. J. Conley.

Diet. During the period of vomiting, pellets of ice in the mouth are comfortable. Later barley or oatmeal water with lemon juice may be used. Plenty of water is a necessity. As the fever declines an easily digested and nutritious diet of milk, eggs, broths, beef juice or gruels may be given every three hours. During convalescence, a full, well-regulated, nutritious diet should be ordered.

The daily toilet consists in keeping the skin and the orifices of the body clean and soft. The nose is cleansed with glycerine, cold cream, or olive oil, which also keeps the crusts soft. The mouth and naso-pharynx may be cleansed with Dobell's solution, or any mild antiseptic. The eyes are washed with warm boric acid solution (gr. v to xx to the ounce), sterile water, or saline solution. Cold compresses applied over the eyelids assist in reducing the edema. A daily tepid sponge is necessary. Baths may be given of bichloride of mercury (1:20,000) or creolin (1:500). These assist in cleanliness and also aid in reducing the offensive odor.

Headache. Deep, steady digital pressure in the suboccipital fossa or at the eighth thoracic spine, the ice bag to the head or a mustard plaster at the back of the neck may relieve.

Vomiting. Thorough relaxation and adjustment in the great splanchnic and cervical areas, with deep, steady digital pressure in the occipital triangles or at the fourth and fifth dorsal vertebrae on the right side will usually control the condition.

Fever. The usual fever treatment of relaxing through the upper dorsal area, correction in the cervical region and deep, steady pressure in the upper cervical area are good. Warm sponging in lower grades of fever, the bath at 70° F., and the cold pack may be needed. If the temperature goes very high give a continuous cool colonic irrigation.

In **confluent cases**, the prolonged warm bath helps guard against septicemia, the pustules become softened and may be evacuated by gentle rubbing with gauze.

Pitting. Cold wet dressings of lint soaked in any comfortable, mildly antiseptic solution, or ice water and glycerine, are to be used on the face and hands to prevent pitting. Hot water dressings are more comfortable to some patients. It is better to protect the skin from the light, especially the ultra-violet rays. This must not lead to any lack of thorough ventilation, however. When the crusts are forming, keep them moist with vaseline, oil, glycerine, or carbolic acid in lanolin or vaseline.

Odor. The baths, the daily toilet, and the use of dusting powder or 5% iodoform powder, an open bottle of smelling salts or of weak ammonia, all are fairly good. Plenty of fresh air is best of all.

Cardiac Weakness. When the pulse is feeble and frequent, a general quieting treatment should be given, including relaxation of the cervical areas and the fourth and fifth dorsal segments. An ice bag in flannel directly over the heart may be used.

Diarrhea in children may be relieved by deep, steady pressure over the second lumbar vertebra. Enemas are useful.

Maniacal delirium is usually prevented by spinal extension, the prolonged warm bath and the cold pack, if given when signs of nervousness appear. Chloroform or morphia may be required in violent or suicidal cases.

Obstruction of the Larynx. This usually occurs from edema and may call for tracheotomy.

Bed-sores. If the patient becomes very much debilitated, he may become subject to bed-sores and abscesses even under the best of care. Placing him upon a water-bed or in a continued warm bath is indicated.

Convalescence is not to be considered complete until the skin is perfectly smooth and free from any trace of a crust.

Prognosis. The prognosis depends upon the age of the patient; complications; and the environment from which the patient comes, as well as the nursing. In varioloid the prognosis is recovery; in the discrete variety, good; in the confluent, grave, 50% die; in the malignant types, all perish. In those under five years and over forty the prognosis is grave. A filthy environment predisposes to complications. Recurrences seldom occur; a second attack is usually of the varioloid type.

Prophylaxis. The usual rules for the public care of smallpox are: rigid isolation, vaccination, disinfection of the skin and all fomites, and final fumigation. Quarantine of a suspected individual is sixteen days after exposure. Isolation is continued until the disappearance of every trace of eruption.

VACCINIA

(Vaccination; cow-pox)

Vaccinia is the reaction which follows inoculation with the vaccine virus or virus of cowpox. It is supposed to furnish variably effective immunity against smallpox. Many think it best to vaccinate in infancy after the sixth month, at the seventh or eighth year, at puberty, and thereafter at intervals depending on the prevalence of smallpox. The virus is prepared under sterile conditions from carefully selected and tested calves. It is put up under aseptic conditions in hermetically sealed capillary tubes or, in the old style, on ivory points.

Technic. The area selected is usually the left arm at a point above the insertion of the deltoid muscle. The leg is preferable in children or even in adults, as it is easier cared for. The point of election here is over the junction of the two heads of the gastrocnemius muscle.

The skin should be carefully washed with soap and water and then with alcohol.

Sterilize a needle or lancet and scratch an area about a quarter of an inch in diameter at the selected site, being careful not to produce bleeding but merely an oozing of pinkish lymph. Deposit the drop of virus upon the abraded area, rub in with the side of the needle, and let dry. Dress with a sterile gauze bandage wrapped several times around the arm or leg. Prevent the bandage from slipping by strips of adhesive plaster.

Diagnosis. If successful, on the third day a small red papule is seen, becoming an umbilicated vesicle on the sixth day and a pustule upon the eighth. The adjacent tissues are red and infiltrated. Tenderness and itching are present. The areola begins to fade by the tenth day. The pustule becomes a mahogany-brown crust by the fourteenth day and is detached by the twenty-third day. The resulting scar is circular, depressed, foveated, radiated,

and paler than the surrounding skin. This process is accompanied by varying symptoms. Slight fever, malaise, restlessness, glandular enlargement and other constitutional disturbances are often present. The younger the child after one month the less the disturbance. The axillary or the inguinal glands are often swollen.

Complications. Not all cases are so benign. Infection with pyogenic organisms results in abscesses, erysipelas, or tetanus, and various eruptions. Otitis media may leave deafness.

During the first three days, erythema, urticaria, vesicular and bullous eruptions, and invaccinated erysipelas may be found.

After the third day the commonest complications are urticaria, lichen urticarius, erythema multiforme, or accidental erysipelas.

About the end of the first week there may be generalized vaccinia, impetigo, vaccinal ulceration, glandular abscess, septic infections, or gangrene.

After involution of the pocks invaccinated disease, for example Hodgkin's disease, syphilis or tuberculosis, may appear, especially when human virus has been used or the technique faulty.

General Vaccinia (vaccinal eruptive fever; vaccinola): The eruption appears usually from the fourth to tenth day after vaccination, the lesions appear in crops successively, pass through the four stages of smallpox, and usually subside by the twenty-first day. The lesions may be few or numerous and appear upon any portion of the body. Fever may be absent or present but is usually proportionate to the extent of the eruption and the associated complications.

Sore Arm. The areola about the fully developed vesicle may spread over a considerable portion or the whole of the arm. It may give rise to a diffuse cellulitis. The arm is red, swollen, hot, and painful and there is apt to be some associated systemic disturbance. By traumatism to the vesicle, an ulcer may form. The areola may become hemorrhagic. Localized gangrene may occur.

Treatment. After vaccinating, the patient is told to return in seven days. The dressings are then removed and if successful, a pearl-like vesicle will be present. If it is broken by accident or by rubbing of the gauze, the free portions of the dressing are cut away and the adherent part left. A new gauze is applied in either case. In five or six days more, the dressing should again be changed and this changing continued at intervals until the crust falls, usually from the third to the fourth week after vaccination.

If no vesicle forms by the tenth or twelfth day the vaccination is unsuccessful.

Prognosis. Uneventful recovery is expected. Pitting from the generalized vaccinia; various constitutional diseases; paralyzes and

other maiming disabilities sometimes occur. It is not considered dangerous to life.

Sequelæ are usually prevented by using a pure vaccine and the use of aseptic methods and antiseptic care afterward, though these do occur sometimes under the best of care.

VARICELLA

(Chicken-pox)

Varicella is an acute, contagious, eruptive, mildly febrile affection, occurring principally among children; characterized by a moderate fever, the appearance on the first day of a maculo-vesicular rash which is repeated in successive crops, and the desiccation and falling of the crusts in three to five days.

Chicken-pox is an epidemic disease which spreads rapidly, is caused by an unknown organism, affects children under ten years the most frequently although adults may be attacked, is highly contagious but not inoculable, and confers immunity. It bears no relation to variola. The incubation period is from seven to seventeen days, usually fourteen days. Among predisposing causes we find the muscles in front of the neck and behind the jaw contracted, and muscular and bony lesions of the clavicle and ribs.

Diagnosis. The onset is sudden, with fretfulness, moderate fever, 99° to 101° F. persisting during the course of the disease, thirst, anorexia, constipation, sometimes vomiting, and furred tongue. The eruption comes out within twenty-four hours and may be the first symptom noticed or perhaps the child had been somewhat feverish and restless.

The eruption consists at first of hyperemic macules, then papular rose-colored spots, not hard, and rapidly converted into raised, flattened, ovoid, pin-head to pea-sized vesicles containing a fluid at first watery then pearly. They appear on the chest, neck, face, scalp, and then trunk and limbs in the order given, being most abundant upon the back. They number anywhere from eight to several hundred and are usually widely scattered. These vesicles are not umbilicated but some may have a slightly depressed center, are not loculated, are discrete, and appear in successive crops which require from three to six days to complete. The fresh roseolas are found between the drying ones so that by the fifth day one may find all stages of the eruption in a single case. There may be an efflorescence upon the mucous membrane of the oral cavity and of the pharynx causing slightly difficult deglutition. Sometimes a scarlatinoid rash precedes the true eruption. The itching is more or less intense. The vesicles always dry up, form yellowish spots of "dew drop" appearance, and a brownish crust which drops off leaving a slightly reddened, sometimes depressed

spot. Desiccation usually occurs by the third to fifth day although it may be present on the first or second.

Pitting may occur if the vesicles are scratched. Distinct umbilication is rare and pustulation is still more rare. Muscular tension of the cervical muscles, especially those in the front and around the angle of the inferior maxillary, clavicles bound down, and disturbed relations of the ribs are often found. Few complications occur. Severe itching may lead to scratching, scars or even ulceration. Gangrene around the vesicles (*varicella grangrenosa*) occurs in debilitated children, those tuberculous and congenital syphilitics. It is apt to be fatal. Slight enlargement of the lymph glands of the pharynx may persist. Furunculosis is not common except among those in very unhygienic surroundings. *Varicella bullosa*, nephritis and occasionally otitis media and bronchial affections may occur.

Treatment. The younger children should be put to bed until the crusts have formed. The older children may be allowed around the room. A light general treatment makes the little patient more comfortable and prevents complications.

"Be very careful and very thorough in your neck adjustments. Loosen the atlas and axis and draw forward the inferior maxillary from its pressure upon the vessels and nerves back of its angle. Draw the hyoid bone forward and secure good circulation of blood throughout the entire cervical region."—A. T. Still.

Give a bland easily digested diet. Overcome the constipation by splanchnic and abdominal manipulation and by laxative diet. During active eruption, do not use tub baths. Keep the nails short and very clean. Daily tepid sponging with either plain water or boric acid solution answers both as an antiseptic wash and bathing.

After the daily sponge and several times during the day as needed to control the itching, anoint with a 10% boric acid ointment or carbolized vaseline. When the scratching cannot be controlled the hands may be tied in muslin bags.

The ultra-violet rays of light seem to be especially irritating. The parts of the body exposed to light are more deeply scarred, as a rule. Hence, the use of a dull red light is often advised, in order to diminish the scar formation, as in smallpox.

The **prognosis** is invariably favorable unless serious complications arise which is seldom. Recurrences very rarely occur.

Prophylaxis. The child should be considered in quarantine for three weeks or until the skin is wholly clean.

SCARLET FEVER

(Scarlatina)

Scarlet fever is an acute, specific, contagious, infectious, erythematous disease of childhood, characterized by sudden onset

with vomiting, sore throat, punctiform eruption in the roof of the mouth, high fever, very frequent pulse, followed in twelve to twenty-four hours by a bright red punctiform rash, by a desquamation often in large flakes, by variable degrees of severity, and by the large number of complications and sequelæ, especially nephritis and inflammation of the serous membranes.

Etiology. The disease is due to an unknown agent. Bacteria and protozoa have been described by various bacteriologists. The virus is very resistant to heat, light, and drying. It is transmitted from child to child through unclean habits of eating and drinking. It first attacks the tonsils, later the other tissues, and leaves the skin and the mucous membranes with broken immunity to various other infections. The disease is epidemic, rarely sporadic. Contagion is carried by direct contact, fomites and by milk. The secretions of the respiratory tract, the desquamated epithelium, and articles used by the patient are infectious. Predisposing factors are: lesions both bony and muscular interfering with vitality, the autumn and winter, age between six months and ten years, puerperal women and open wounds.

Pathology. No specific lesions are found. No trace of the rash shows after death except in the hemorrhagic form. The anatomical changes in cases coming to autopsy are those of simple inflammation, follicular tonsillitis, or diphtheroid angina. Streptococci are abundantly found in the glands and foci of suppuration. The lymph glands and lymphoid tissue may show hyperplasia.

Diagnosis. Invasion is sudden, with usually vomiting, sometimes convulsions in the younger children; sore throat; intense fever, 103° F. or higher, on the first day; pulse 120 to 150 per minute, unduly rapid for the temperature; respirations increased; the glands at the angle of the jaws swollen; insomnia, and nocturnal delirium which disappears as the rash comes out. The skin and muscles of the back are hypersensitive to touch and to extremes of heat and cold.

At the end of the first day or a little later the rash appears. It is composed of scattered scarlet red points on a deep subcuticular flush, appearing first upon the neck and chest, spreading rapidly so that by the evening of the second day it has invaded the entire skin except for a circle around the eyes, nose and chin and is most intense upon the trunk and the flexor surfaces. The throat shows reddening of the pharynx and uvula, the tonsils enlarged and with often creamy-white patches covering the mouths of the follicles. The temperature persists and may even reach 104° to 105° F. Itching and burning are annoying at times. There may be considerable swelling of the skin.

The eruption reaches its height between the second and third days when it has a vivid scarlet hue unlike any other eruption, becoming darker each day until it may be bluish-red, when it

gradually fades and desquamation begins. During this time papules are often seen. Also sudaminal vesicles may develop so that the skin is covered with small yellowish vesicles upon the red background (*scarlatina miliaris*). A punctiform eruption in the arm-pits, groins, or roof of the mouth is considered positive proof of scarlet fever. There may be fine punctiform hemorrhages.

By the seventh or eighth day, the rash has disappeared together with the fever. The skin looks somewhat stained, is a little rough like "goose skin," and gradually the upper layers begin to separate, first about the neck and chest, and coming off in large lamellæ or flakes. This may repeat in individual areas. Casts of the fingers or toes may be shed. This process lasts from four to eight weeks.

The tongue at first is red at the tip and margins with a grayish-yellow or whitish fur in the center through which are often seen the swollen red papillæ, the "strawberry tongue." The "fur" desquamates upon the third or fourth day leaving a surface intensely red with markedly raised, swollen papillæ, the "raspberry tongue or cat tongue," lasting nearly a full week. The breath has a heavy sweet odor. There are several types of this disease.

Mild and abortive form (*scarlatina sine eruptione*). In this the rash may be scarcely perceptible, while the fever, sore throat, and strawberry tongue are present. Desquamation may occur and serious nephritis follow.

The **malignant forms** include **fulminant toxic or atactic variety**, in which there is onset with great severity, high fever 107° to 108° F., and extreme restlessness, headache, and delirium. Convulsions may occur, sometimes vomiting and diarrhea; initial delirium gives place to coma; dyspnea may be urgent; pulse very rapid and feeble, and death occur in twenty-four to thirty-six hours from the intense toxemia.

In the **hemorrhagic variety** there are hemorrhages into the skin, beginning with scattered petechiæ, becoming more extensive and ultimately involving the whole skin.

Severe epistaxis and hematuria are common. Death may take place on the second or third day. This is more common in enfeebled children although it may attack adults in apparently full health.

Anginose variety (*scarlatina anginosa*). The throat symptoms appear early and progress rapidly. Temperature to 105° to 107° F., cyanosis, diarrhea, rapid weak irregular pulse, and stupor occur. The fauces and tonsils are covered with a thick membranous exudate which may extend to the posterior wall of the pharynx, forward into the mouth, upward into the nasal chambers, and may occasionally reach the trachea and bronchi. The Eustachian tube and the middle ear are usually involved. The glands of the neck

rapidly enlarge and become the seat of brawny induration, and the inflammation extends beyond their limits. Necrosis occurs in the tissues of the throat, fetor is extreme, the constitutional symptoms are great and the child dies from toxemia. If he does not succumb, extensive abscess formation in the tissues of the neck takes place with sloughing and danger of hemorrhage from the opening of a large artery.

The **spinal examination** usually shows muscular contractions throughout the entire length but these are more prominent at the upper dorsal, in and around the eleventh and twelfth dorsal and in the upper cervical areas. Bony sublaxations may be found anywhere.

The physical examination has no special features. The spleen may be palpable but the liver is not often enlarged.

The **blood pressure** rises at first, thereafter it follows the pulse and temperature. After the seventh or eighth day, it may be below normal. Cases with albuminuria show hypertension and slowing of the heart action. With the subsidence of the kidney irritation the pulse rate is increased and the blood pressure returns to normal.

The **urine** shows the ordinary febrile character, being scanty and high colored. Slight albuminuria is rather common after the stage of eruption, even a few tube casts may be present without any serious irritation of the kidney. The examination should be made daily.

Blood. The red cells are moderately reduced to 3,000,000 or 4,000,000 per cmm. during convalescence. There may be some poikilocytosis and normoblasts are occasionally seen. Leucocytosis is early, 15,000 to 30,000 per cmm., falling with the decline of the fever usually by the fourteenth day, but may persist for weeks after the temperature is normal. The count runs roughly parallel to the temperature. Over 40,000 leucocytes per cmm. are of bad prognostic omen. Polymorphonuclear cells are increased to 80% to 90%; early returning to normal in favorable cases.

Eosinophilia is present in all but malignant cases. It reaches its maximum two or three days after the rash appears and returns to normal after the leucocytosis has disappeared. The early presence of eosinophilia excludes septic conditions. When these cells are absent in scarlet fever, myelocytes are to be found.

The symptom complex which is pathognomonic of scarlet fever is the changed condition of the tongue, the angina, the exanthem, and the fever. The diagnosis is not usually difficult, but may be confounded with the following conditions: acute exfoliating dermatitis, measles, r otheln, septicemia, diphtheria or antitoxin erythema, acute follicular (lacunar) tonsillitis, and the drug eruptions.

Treatment. Complete isolation with a competent nurse, a light, quiet, thoroughly ventilated room of a constant temperature (if

possible two rooms, one for day and the other for night; situated upon an upper floor), and suitable means for thorough disinfection of all articles used in the sick-room are essential elements of treatment. The child should wear its customary night apparel. The bed clothing should not be too heavy.

Thorough osteopathic treatment should be given along the spinal region from the atlas to the sacrum inclusive, to keep the muscles well relaxed, giving special attention to the relationship between the atlas and the occiput, the cervical vertebrae and the deep cervical muscles, especially those muscles at the angle of the inferior maxillary and those at the base of the occiput, also much attention to the renal splanchnics.

Adjust the clavicles by bringing fairly well forward to relieve any irritation that might be started in that area. Direct treatment to the abdomen should usually be given at each visit besides the work in the splanchnic area to keep the bowels, kidneys and liver active. Careful, deep work over the ureters is beneficial.

Diet. Water must be freely given. Pellets of ice to hold in the mouth are a comfort during the fever. Fruit juices, especially orange, are best during the fever. For infants, cut down their feedings to half, making the milk very thin with water or gruel. After defervescence, carefully increase to a light diet using sparingly of nitrogenous foods except milk. After four weeks in a usual case, gradually return to the ordinary food. This is a good time to make corrections in the ordinary diet if any are needed.

The **bowels** must be kept regulated. An enema is usually indicated after the onset of the disease. During the time when food is permitted, it should be of a laxative quality. A tepid sponge should be given at least once daily. The nose may be cleansed by instillation by means of a medicine dropper, using normal salt solution.

If the **throat symptoms** are mild, a gargle of normal salt solution is enough for cleanliness of the membrane. If the throat symptoms are too severe to permit the use of the gargle, or if the patient is too small to be taught to gargle or to wash the throat, irrigation may be employed.

The **teeth** should be thoroughly and carefully brushed twice each day. The **skin** must be kept comfortable. "Using carbolized water (1:40) to sponge the surface, followed by the application of cocoa butter, will tend to reduce the fever by soothing the cutaneous burning and irritation; and later when desquamation occurs limits the source of infection by preventing the diffusion of what would be dry scales in the air."—McConnell and Teall.

During **desquamation** after bathing the child should be thoroughly rubbed and then the oily application used. Besides the cocoa butter, cold cream (nonmedicated), liquid albolene, or the

like may be used. Olive oil and vaseline are usually irritating at this stage.

A temperature above 102° can usually be lowered by steady, deep pressure applied in the suboccipital region for a few minutes, then followed by relaxation of the back muscles from the first to seventh dorsal, by raising and spreading the ribs in that area especially the fifth and sixth, and attention to the fifth lumbar region. When the fever is rapidly rising but the child is not delirious a tub bath may be given. The cold pack may be used when the patient has pronounced delirium and nervous symptoms. The ice-cap is useful and may be used constantly in high fever.

Severe sore throat is usually relieved by the treatment given and the throat toilet. Treatment around the hyoid bone to relax the muscles and to correct maladjustments is needed. With the first sign of a swollen gland, begin treatment by crowding the tissues toward the gland but never working upon the gland itself. This secures drainage and relief unless malignant pyogenic organisms are present.

If pain is felt in the ear, attention must be given immediately. Upper cervical treatment consisting of correction of any deviation of the atlas or other vertebræ, relaxing the deep muscles at the angle of the jaw and relieving any impingements at the upper thoracic region must be thoroughly employed. If the pain is not bad, the nurse may be directed to use a drop of warm glycerine or oil in the external auditory canal. If there is reason to suspect the existence of surgical complications, an ear specialist should be consulted. The condition of the drum membrane should be examined every day. If the drum is bulging, deeply congested and the landmarks indistinct, paracentesis should be performed.

The heart should be examined daily. Vigorous treatment through the thoracic region is indicated, if cardiac symptoms appear, and the patient kept quiet and in bed.

If arthritis occurs the affected joint must be wrapped in flannel or in cotton wool, and the treatment given under Acute Rheumatism administered. If albuminuria increases, the condition of the kidneys must receive prompt attention. Look for lesions around the tenth to twelfth dorsal vertebræ or the ribs attached thereto, correct deviations, and keep tissues constantly relaxed.

After the temperature has been normal for ten days, the patient may be allowed to get up. For at least three weeks great care should be exercised to prevent exposure to cold or to other infections. Renal complications are most apt to occur during convalescence.

The patient must be seen from once to three times a day according to the severity of the case.

Prognosis. Epidemics differ in severity and in mortality. The mortality is greater in hospitals, among the poorer classes, and in children under one year of age. Very high fever, early mental disturbances, hemorrhages, intense diphtheroid angina, laryngeal obstruction and nephritis cloud the prognosis. Most cases recover.

Recurrences seldom occur. Sequelæ are frequent. These include nephritis, deafness due to otitis, cardiac lesions, rhinorrhea, otorrhea, and throat troubles. These should not occur in cases properly handled.

Prophylaxis. The child is infective for from eight to thirteen weeks, usually until after desquamation is complete. If left with any rhinorrhea, otorrhea, or throat trouble he is especially infectious, though he may seem in perfect health. The period of quarantine for suspected cases is ten days after exposure; if it develops the period of isolation is six weeks.

Complications. Patients who receive correct osteopathic treatment from the onset of the disease rarely suffer from complications or sequelæ. The following may occur:

Nephritis is most common in the second and third week of illness, rarely the fourth, but may develop as late as the sixth. The nephritis may be hemorrhagic, in which the urine is suppressed or there may be a very small amount of bloody fluid laden with albumin and tube casts; constant vomiting and convulsions follow and the child dies with symptoms of acute uremia.

In less severe cases there may be a puffy appearance of eyelids, slight edema of the feet, urine diminished in quantity, smoky, containing albumin and tube casts. The kidney symptoms dominate, dropsy persists and there may be effusion into the serous sacs. The condition may become chronic, the patient may succumb to uremia; in the majority of cases recovery takes place.

In the milder cases the urine contains albumin and a few tube casts, very rarely blood, and edema is slight or transient. Convalescence is scarcely interrupted, or serious symptoms supervene, or edema disappears and the child improves but remains pale and with a slight trace of albumin in urine for months, then recovery or chronic nephritis.

Severe scarlatinal pyemia may be attended with suppuration of one or more joints and is usually fatal.

Polyarthrits or true scarlatinal rheumatism occurs during the second or third week. Many joints are attacked especially the small joints of the hands. There may be inflammation of the tendon sheaths, heart may be involved, and the outlook is usually good for recovery.

Malignant endocarditis occurs in the severe septic cases, sometimes with a purulent pericarditis, and is fatal.

Severe toxic myocarditis is sometimes present, leading to acute dilatation and sudden death. **Simple endocarditis** is not uncommon and may give no symptoms. **Signs of slight enlargement** may persist after convalescence and **valvular lesion** may result. **Acute bronchitis** and **pneumonia** are not common. **Empyema** is an insidious and serious complication.

Otitis media is a common and serious complication owing to the extension of the inflammation through the **Eustachian tubes**. It is the most frequent cause of **deafness in children**. **Extension** from the middle ear to the labyrinth rapidly produces **deafness**, to the mastoid cells, **suppurative mastoiditis**. **From the necrosis** following middle ear disease there may be **paralysis of the facial nerve**, **thrombosis of the lateral sinus**, **meningitis**, and **abscess of the brain**.

The swelling of the neck may extend beyond the **lymph nodes**. This usually subsides within a few weeks, the **most extreme enlargement** gradually disappearing.

Acute phlegmonous inflammation (*angina ludovici*) may occur with widespread destruction of tissue. **Vessels may be eroded** and **fatal hemorrhage** ensue.

The **nervous complications** include **chorea**, **sudden convulsions** followed by **hemiplegia**, and **mental symptoms** as **mania** and **melancholia**. **Progressive paralysis of the limbs with wasting**, may simulate **infantile paralysis**.

Rare complications are: **edema of the eyelids without nephritis**, **symmetrical gangrene**, **enteritis**, **noma**, and **perforation of the soft palate**. The fever may persist after the eruption disappears and the child remain in a **septic state** (*scarlatinal typhoid*).

Relapses are rare. *Scarlatina* may coexist with almost any of the other acute infections. It lowers the resistance of the body to disease and is often followed by other acute infections or by **tuberculosis**.

MEASLES

(*Morbilli, rubeola*)

Measles is an acute, infectious, erythematous, contagious disease, characterized by an incubation period of about **ten days**; by **catarrhal symptoms of the naso-bronchial mucous membranes**; by a typical temperature curve; by the presence of **Koplik's buccal spots**; and by a **papular eruption** appearing upon the **fourth day** and terminating in a **branny desquamation**.

Etiology. The infectious agent has not been found. The disease occurs chiefly among children; is **epidemic** and rarely **sporadic**; is transmitted by the **respiratory secretions**, **fomites** and

through a third person; and is extremely infectious during the incubation and the eruption.

The incubation period is from seven to eighteen days. Cervical and upper dorsal lesions involving the vasomotors to the mucous membranes of the respiratory tract and to the lymphatics draining it are predisposing factors.

Diagnosis. Known exposure to infection or the presence of an epidemic are the only history factors.

The stage of invasion begins with chilliness or a decided chill, fever rapidly rising to 101° to 104° F. on the first day; pulse rate increasing with the fever to 120 to 140 times per minute; headache, muscular soreness, intense nasal, pharyngeal and laryngeal catarrh; photophobia with red watery eyes; sneezing and a croupy cough; hoarse voice, sometimes nausea and vomiting. Small, irregular spots of a bright red color, each having a bluish-white center, upon the buccal mucous membranes within the lips and upon the gums are called Koplik's spots. They appear upon the first day and fade upon the appearance of the dermal eruption, and are considered pathognomonic of measles. On the second or third day, the fever remits to normal or subfebrile. On the fourth day, the temperature rises again, increasing as the rash develops, to 104° or 105° F. and reaching its maximum on the sixth day when it falls by crisis; on the seventh or eighth day the temperature is normal. The eruption consists of small, dark red macules with minute papules in the center of each somewhat raised, arranged in crescentic groups, velvety to the touch, which may become confluent, and disappear on pressure.

They appear at the hair-line of the forehead and spread over the chest, trunk, and entire body. The eruption is attended by itching and burning, and develops completely in twelve to thirty-six hours, while the catarrhal symptoms still persist. About the ninth day the rash begins to fade, first from the face and neck, leaving a yellowish discoloration, and disappears entirely in a bran-like desquamation, which usually lasts several days to a week.

There are several varieties.

Measles without eruption (*morbilli sine exanthemati*, *morbilli sine morbillis*) is a form in which the symptoms are typical up to the eruptive stage but this fails to appear and convalescence is established.

Black, hemorrhagic or malignant measles is severe and fatal. The onset is usually violent with high fever and nervous symptoms. The eruption is bluish or purplish and fails to disappear upon pressure.

Other hemorrhages in the form of petechiæ, ecchymoses, or bleeding from mucous surfaces may occur. The patient is rapidly

exhausted, the pulse frequent and thready, the skin pale and cold and death ensues.

Adynamic measles is a serious type in which the symptoms are grave from the outset but without hemorrhages and the typhoid status is early present.

The most common complication is bronchopneumonia. Others are capillary bronchitis, otitis media, severe stomatitis and gastroenteritis.

The spinal examination shows cervical and upper dorsal contractions with lesions of the upper four ribs and clavicle. "During all examinations of such patients, I have found muscular contractions at the union of neck with the head."—A. T. Still.

The physical examination shows the buccal spots, a tongue coated with somewhat turgescient papilli, and the eruption.

The blood pressure is usually low. The urine shows no special changes except those of fever in general.

The blood shows leucopenia before and during the eruption, the eosinophiles are normal or usually diminished during the febrile stage or they may disappear altogether. The red cells are practically normal. The decided diminution of eosinophiles is of considerable diagnostic value. If there is increased inflammation of the mucous surfaces the fibrin content is increased. During convalescence the lymphocytes and large mononuclears are increased.

Treatment. As soon as a susceptible individual is exposed to infection, he should be isolated, watched and whatever is found improper in diet, hygiene, or structural relationships corrected.

On invasion, the patient should be put to bed in an isolated, well-ventilated room of constant temperature from which all hangings, rugs, and curtains have been removed. The windows should be shaded especially to prevent thin rays of light, and when artificial lights are necessary, these must be shaded.

The treatment includes the relaxation of the contracted muscles, adjustment of bony lesions as found, raising the ribs and increasing the mobility of the thorax and especially of the dorsal region. Manipulations which are very painful or difficult should be avoided during the progress of the disease. Dr. Still says, "The arms must be raised and the axillary regions freed at once and kept so."

"Isolation is of great importance, and should be carried out in every case. I would like to emphasize the importance of isolating practically all cases of coryza in localities where are cases of measles. If not measles, no harm is done; if the case is measles, then you have likely prevented the communication of the disease to several possible victims. . . . The room should be well ventilated with a temperature of about 70 degrees, avoiding direct draft on the patient: The diet should be that of any acute febrile condition, and I strongly advise during the height of the fever that nothing but water be admin-

istered. . . . Two or three treatments a day during acute stage have given me the best results in these cases. The treatment is confined almost exclusively to a light stimulation of the upper dorsal region with the patient lying on the back, and also a gentle but thorough relaxation of the cervical region with considerable traction of same. . . . During the fever, warm or even slightly cool sponge baths are beneficial, but no other bathing advised."—J. Ferguson.

In the beginning it is usually necessary to give an enema. The bowels must be kept open during the course of the disease by diet and manipulation. The diet during the attack should be light, suited to the age of the patient. Plenty of water is urgently required. The temperature is usually controlled by the treatment, but if it stays over 104° F. for an hour or longer and the physician cannot reach the patient, direct the nurse to give a tepid sponge bath of ten to twenty minutes' duration and repeat at intervals of two to three hours.

For the irritation of the skin, a tepid bath with water at 100° F. given twice daily should be used and the patient dried carefully and an application of cold cream, liquid albolene, or olive oil made over the entire body. The cough is best relieved by thorough treatment of the anterior and posterior thoracic regions and any subluxations of the upper ribs or clavicle corrected. Keeping the air of the room moist with vapor is agreeable to the congested mucous surfaces. During the waking hours, the eyes should be generously bathed every hour or two with a three per cent solution of boric acid using cotton which is destroyed after use. Dark glasses in a well-ventilated room are better than unaided darkness.

The mouth and nose must be carefully cleansed at regular intervals and the cloths burned. An otoscopic examination should be made every second day until the case is discharged. The condition of the lungs must be examined daily.

If the rash is slow in appearing and the child is very uncomfortable from the high fever (104° to 105°) a hot bath (105° to 110° F.) for three to five minutes will often bring out the rash and relieve the urgent symptoms.

During convalescence, the patient must be guarded against cold. Recovery is hastened by such treatment as is indicated by the conditions found on examination, and should be given two or three times each week.

Prognosis. Nearly all uncomplicated cases recover. In the hemorrhagic and adynamic forms, the majority succumb. One attack usually confers immunity. Second attacks probably never occur.

Sequelæ are frequent but are prevented by careful nursing during convalescence.

"In and of itself measles is usually not particularly serious, but the after-effects are so far-reaching and so serious that students of the history of med-

icine rank measles third among infectious diseases for causing death. During recovery from measles the patient stands in special danger from pneumonia, and pneumonia following measles is more dangerous than uncomplicated pneumonia. There is a considerable length of time during which he is particularly susceptible to tubercular infection. This is so often insidious, and its evidences are so obscure, that by the time the disease has fully developed one may have forgotten the mild attack of measles which really paved the way for the serious malady."—C. A. Whiting.

Prophylaxis. During an epidemic, all children should be guarded from exposure. If possible, each child should be examined in order to see that no lesions or other predisposing causes of lowered resistance are present. At any rate, when measles makes its appearance in any family, or when children are supposed to have been exposed, the treatment should be begun at once. There is no doubt, in the minds of those who have cared for children in this way, that the percentage of infection following exposure is lessened by beginning treatment before the onset of the disease; and also that when infection is found to be unavoidable, the disease runs a much milder course than is the case when the osteopathic physician is sent for only after the attack has made a pronounced beginning. Children known to be exposed should be at once isolated. After all catarrhal symptoms have disappeared the patient may be disinfected and removed to another room and the sick room thoroughly disinfected. The quarantine period is sixteen days unless modified by the health authorities.

To sum up the prophylactic measures, isolation, disinfection of fomites, skin and secretions from the nose and mouth, and the final disinfection of the sick room are necessary.

RUBELLA

(German measles; Rötheln; epidemic roseola; French measles; false or hybrid measles, or hybrid scarlatina)

Rubella is an acute, specific, infectious, contagious, eruptive fever; attended by mild fever, suffused eyes; mild cough; sore throat, but no catarrh; a macular, rose-red eruption on the throat, accompanied by swelling of the cervical lymphatic glands and by a rose-colored eruption of irregular size and shape appearing on the first day of the disease. There is hypersensitiveness in the suboccipital regions, and also in the midthoracic. Muscular contractions are not marked and chiefly affect the hyoid, mandibular and cervical groups.

The infectious agent is unknown, is carried by fomites, attacks children especially, and occurs in epidemics or sporadic cases. Children recovering from other infectious diseases are particularly susceptible. The incubation period is from five to twenty-one days and is without symptoms. One attack confers immunity.

Diagnosis. The onset is sudden with chilliness, mild fever 100° to 101° F.; slight headache; mild sore throat; pains in the back and legs; little or no coryza; swollen cervical and post-auricular glands, macular rose-red eruption on the throat constantly present; and the eruption of a dermal rash appearing upon the first, or rarely, on the fourth day. This consists of round or oval, slightly raised, pale pinkish-red pinhead to lentil-sized macules. These are discrete at first and afterwards may coalesce, especially on parts where pressure is exerted. It shows first upon the face, follows a wave-like progression extending to the body and limbs while fading upon the parts first affected and lasting in one region from a few hours to a half day. It extends over the whole body within twenty-four hours.

There is usually more or less itching. The rash may be the first symptom of disease noticed. After persisting for two or three days, the fever and eruption gradually subside together. The skin is slightly discolored, and slight desquamation is found.

Two varieties are described—the scarletiform resembles scarlet fever but is much milder; the morbilliform resembles measles.

The complications and sequelæ are rare; bronchitis, pneumonia, otitis media, and very rarely a false membrane on the throat may be found.

Treatment. The patient should be kept in a properly heated and ventilated room, and in bed for about two days. The main treatment is to the lesions found, if any, with careful treatment of the cervical lymphatics, general relaxation of muscles and freeing of the excretory channels. Such measures are usually sufficient.

The diet should be reduced and regulated according to the age of the patient and the severity of the symptoms. Free bowel movement must be secured. Tepid sponging once daily followed by an oily application on the itching parts is agreeable. Heat may be applied to the enlarged posterior cervical glands with relief.

Prognosis. Recovery is the rule. Relapses are more severe than the primary attack. They are prevented by good nursing. In unhygienic surroundings or if the child is delicate the outlook is more serious. Recurrences do not occur and sequelæ are absent.

Prophylaxis. The patient should be isolated for ten days after the appearance of the rash.

Like measles, this disease seems to lower the general resistance to other infections. For this reason, children recovering from this mild disease should receive especial care to protect them from other infectious diseases, and also to protect them from cold. Even more than under ordinary conditions, such children should be given plenty of fresh air, good food and suitable exercises.

EPIDEMIC PAROTITIS

(Epidemic parotiditis; mumps)

Epidemic parotitis is an acute, specific, infectious, contagious inflammation of the parotid and other salivary glands, characterized by pain, swelling, fever of a moderate degree and disordered function. There is a special liability to orchitis or to mastitis.

Etiology. The infecting agent probably enters through the excretory duct producing a catarrhal inflammation which rapidly extends into the interstitial tissues of the glands rather than the parenchymatous tissue. Congestion, swelling and infiltration with serous fluid take place with more or less infiltration of the adjacent connective tissues. The process rarely goes on to suppuration.

The disease occurs both epidemically and sporadically, with an incubation period of two to three weeks and on recovery usually conferring immunity although a second and a third attack have been known. Children between the ages of five and sixteen years are the most liable to the infection. Upper cervical lesions especially those of the atlas and axis are predisposing factors.

Diagnosis. Except in sporadic cases, there is usually a history of the disease in the family or in the neighborhood.

The invasion is rather sudden, with moderate fever usually below 102° F. with its attendant phenomena, dull pain and tension in front of the ear on one side, and stiffness at the angle of the inferior maxillary. Swelling appears which gradually increases until within forty-eight hours the whole cheek and neck is greatly enlarged, the face distorted and the lobe of the ear displaced by the infiltration beneath the sternomastoid muscle. If only one gland is involved at first, the second usually follows in a day or so although often in a lesser degree. The patient is unable to open his mouth without pain; acids or rarely sweets produce spasm of the jaw muscles; speech and even deglutition are difficult. The saliva is sometimes increased and at other times diminished. Salivation is frequent. The breath is foul and the tongue is furred. The submaxillary and the sublingual glands may enlarge also.

There is usually no change in the color of the skin covering the gland. The mucous membranes of the cheek and pharynx are reddened and there may be a slight angina. The tumor feels hard and doughy, not fluctuant, and is somewhat sensitive to pressure.

The spine often shows subluxations in the cervical region especially of the atlas and axis, perhaps upper rib lesions also. If the submaxillary gland is involved, the second and third dorsal vertebræ with their ribs may show maladjustment. These lesions may be secondary.

The symptoms persist for six to fourteen days, when the swelling diminishes and the patient rapidly recovers his health and strength.

If the temperature does not fall when the parotid symptoms decline some other involvement may be looked for—orchitis in the male, and mastitis, ovaritis or vaginitis in the female. This does not occur before puberty. When orchitis does occur, it is unilateral, increases for three or four days, and is usually followed by resolution. In severe cases atrophy may occur.

Treatment. The patient must be kept in a well-lighted, well-ventilated, evenly warmed room, away from other children; in bed if the temperature indicates.

The correction of all bony lesions found is indicated, paying particular attention to the cervical region especially the atlas and axis. The second and third dorsal vertebræ need attention from the influence of those nerves on the submaxillary glands. Upper rib lesions must be searched for also.

A liquid diet of fruit juices with water, thin gruels, milk and plenty of water is indicated.

The bowels and other excretory organs must be kept freely active. Tepid sponging allays the fever restlessness and keeps the skin active. The treatment making the patient the most comfortable is the relaxation of the deep muscles of the neck and shoulders and those under the angle of the jaw as well as relaxing contracted muscles wherever found. The very gentle relaxing of the tissues around the gland itself by crowding them toward the gland assists in relieving the tension by securing a better venous and lymphatic drainage.

Inhibition of the upper posterior cervical nerves by a few minutes' steady pressure assists in lowering the temperature. Raising and spreading the ribs from the second to the seventh gives relief.

Hot applications to the swollen gland are very soothing and may consist of hot fomentations, a hot salt bag, cotton wadding covered with oiled silk, or a hot water bottle.

A mild antiseptic mouth wash keeps the mouth in good condition.

Orchitis should not occur if the boy is kept warm and in bed. If it does, the best treatment is rest, support and protection with cotton wool, cold applications and the correction of any bony or muscular lesions affecting the pelvic viscera. Good drainage is best secured by support and manipulation.

Mastitis may occur, especially in girls nearing puberty. Rib lesions have been found present, and were considered responsible in a few cases. The treatment should include the correction of such lesions if this can be done without irritation to the inflamed

glands; the manipulation of neighboring tissues, with very gentle crowding of the normal tissue toward the inflamed glands, without exerting any pressure upon the gland itself, is usually helpful and comfortable. Free tissues back to axillary lymphatics.

Prognosis. The outlook for recovery is favorable. The disease usually confers immunity.

If the child has been kept clean and warm and had the proper care there should be no complications nor sequelæ. In the rare fatal cases, meningitis is the usual cause of death.

Rarely after very severe cases, permanent deafness has resulted from otitis media or interna. Sometimes a nonpurulent arthritis results. Chronic hypertrophy has been known. All of these cases were probably due to either an increased virulence or to bad hygiene.

Under osteopathic care the duration of the swelling, fever and pain has been markedly diminished.

Prophylaxis. Isolation, disinfection of the secretions of the upper air passages and a quarantine of twenty-four days is necessary.

Children should not be allowed to be exposed to this, nor to other contagious diseases. Each attack of any contagion is that much of sickness that ought to be avoided. It is not only the sickness itself that is to be avoided, but also the diminished vitality which follows recovery, and also the increased susceptibility to other, perhaps more serious, diseases that is produced by almost if not all of the ordinary "children's diseases."

GLANDULAR FEVER

Glandular fever is an infectious, sometimes epidemic disease of children, characterized by swelling and tenderness of the cervical lymphatics accompanied by high fever, and slight angina of the throat.

Etiology. Children between 7 months and 13 years, usually between 5 and 8 years, are predisposed. Rarely adults are affected.

Diagnosis. The onset is abrupt with pain in moving the head and neck, perhaps with nausea and vomiting and abdominal pain, temperature 101° to 103° F. of short duration, anginal symptoms are slight. On the second or third day, the characteristic tender glandular swellings appear, the carotid glands most frequently, the postcervical, next, axillary and inguinal, and occasionally the tracheo-bronchial and mesenteric glands; the size varies from that of a pea to that of a goose egg. The nodes are painful to the touch but the skin covering them is not involved. The subcutaneous tissues of the neck may be somewhat edematous and there may be a little difficulty in swallowing. The swellings per-

sist for from ten days to three weeks. Complications are rare but suppuration has occurred, otitis media, retropharyngeal abscess and hemorrhagic nephritis also occur rarely. The liver and spleen may be enlarged.

The **treatment** for infections in general must be modified to suit conditions as found. Usually it is best to avoid local manipulation until the glands have become free from fever and pain. Careful and vigorous treatment for increasing the mobility of the lower thoracic spinal column, raising the lower ribs, and such treatment for liver, spleen, kidneys and bowels as may be indicated on examination should be given. Very careful relief of tension of the tissues of the neck is sometimes indicated.

During the fever, the appetite is diminished. Fruit juices may be given freely; liquid foods may be given if the child becomes hungry. The usual methods of lowering the fever may be employed. The child should not be permitted to lie upon his back, nor to remain too long in any one position. Excitement must be avoided, in order to prevent the tendency, occasionally found, for cerebral symptoms to appear.

Prognosis. Recovery is to be expected, with no sequela.

CHAPTER L

TROPICAL DISEASES

BERI-BERI (Epidemic neuritis)

Beri-beri is an endemic and epidemic form of multiple neuritis of unknown origin, occurring in tropical and subtropical countries and characterized by paralysis and dropsy.

The disease is almost certainly due to a lack of vitamins in the food. In Japan and India, an exclusive diet of polished rice may be responsible; in other countries, other foods deficient in vitamins make the exclusive diet. Predisposing causes are the countries of Japan, Malay Archipelago, Burma, and Brazil; seaports of other countries where ships from these countries call; overcrowding, warmth, moisture and insanitary surroundings.

Inflammatory and degenerative changes are found in the axis cylinders and medullary sheaths of the peripheral nerves. In acute cases, the phrenic and vagus nerves suffer. Wasting, degeneration of muscular fibers, both voluntary and cardiac are present. In the "wet" form, edema and dropsy of the body cavities occur.

Rudimentary types are those in which paresis and paresthesia are present, dropsy is slight or absent, cardiac symptoms are trifling. The attacks may persist for months and recur with each warm season.

The acute pernicious or cardiac type is marked by symptoms of acute heart failure and ends in death, sometimes in a few hours or usually in a few weeks.

Epidemic dropsy is an affection endemic in India, resembling beri-beri closely and distinguished by fever, and a multiform eruption upon the face, body and limbs.

Treatment. Attention to the diet is important. Nitrogenous foods and the raw green vegetables should be freely given. Certain extracts from yeast contain the vitamins in a good form for immediate use.

Prognosis. Recovery is dependent upon the form of the disease and the celerity with which dietetic and sanitary conditions are corrected.

ACUTE FEBRILE ICTERUS

(Weil's disease; infectious jaundice; Feidler's disease)

Acute febrile icterus is a disease of Egypt, the tropics, and other climates in hot weather, of unknown origin, occurring spo-

radically and endemically; and characterized clinically by sudden onset with chill, remittent fever which tends to decline by lysis after a week or two, gastric symptoms, diarrhea, muscular pains and headache. On the third or fourth day a jaundice of varying intensity develops with prominent nervous symptoms and emaciation; delirium and coma in grave cases, with epistaxis, hematuria, and albuminuria.

It is most common in butchers, and in those who work in foul water or in sewage. *Bacillus proteus vulgaris* may be the infectious agent. (See also page 528.)

Treatment. The treatment must be chiefly symptomatic. Improved sanitary and dietetic conditions are important. Free drinking of pure water, with nutritious diet after convalescence is established promotes return of strength. Treatment to secure good circulation through the liver and intestinal tract is indicated.

Prognosis. Recovery is to be expected in about a month with a slow convalescence.

TROPICAL SLOUGHING PHAGEDENA

This is a disease of unknown origin which is marked by the appearance of a blister upon an extremity, which ruptures after a few hours, exposing a gray area of superficial gangrene tending to spread at the margins, the floor of which is of a dirty yellow color, and the odor extremely offensive; the systemic disturbance is slight. After a variable period, usually a week, the slough separates and heals without much damage to the deeper tissues.

SPRUE

(Psilosis)

Sprue is a tropical disease, and is found in this country in those who have been for some time resident in the tropics, especially in India, Japan, or China. It is a chronic or remitting inflammation of the intestine, probably microbic or parasitic, characterized by irregular bowel action, and the passage of copious, pale drab stools, yeasty and of sickly odor. Ulcerative stomatitis and anal sores are frequent. Constitutional weakness, irritability of temper, and loss of memory are common symptoms.

The mucous membrane of the intestines shows catarrhal, ulcerative and cirrhotic changes in varying severity.

No cases have been reported under osteopathic care. The treatment ordinarily recommended is hygienic and dietetic—rest, the milk diet, and freedom from nervous disturbances give the best results. The prognosis is doubtful.

MADURA FOOT

(Mycetoma; fungus foot of India; Pièd de Cochin)

Madura foot occurs throughout the tropics, endemic in India, and lately in Panama. It is caused by one or several of eleven or more varieties of streptothrix and related fungi. These enter the foot, rarely other parts, through an abrasion. Small round painless nodular swelling appears on the plantar or dorsal surface of the foot. After some months, these gradually

soften, leaving crater-like openings from which an oily, seropurulent material is discharged containing pinkish granular bodies (pale madura) or black granules like gunpowder (melanoid madura). Other nodules form on the skin and break down, while the deeper structures undergo degenerative changes until finally the diseased part becomes badly deformed, and the limb above wastes away, while the foot doubles in size and loses its natural contour. Systemic symptoms, except those due to a long-continued suppuration, are lacking.

Treatment. Amputation is the only treatment. Good shoes and cleanliness are the best preventives.

AINHUM

Ainhum (*Dactylolysis spontanea*) is an endemic disease of India, marked clinically by a very slow, painless, spontaneous amputation of one or more toes at the plantar fold, the little toe being the most frequently affected. Constitutional symptoms are absent. The disease lasts one to ten years.

GOUNDON

Goundon or big-nose is an African disease affecting mainly negro children and young adults, ushered in with headaches, hard symmetrical tumors slowly developing on the upper part of the nose, with fever and a purulent nasal discharge. After a few months, all constitutional symptoms subside but the tumors are permanent.

MILIARY FEVER

(Sweating sickness)

Miliary fever is an infectious disease occurring in epidemics, mainly in France and Italy, of unknown cause, and characterized by moderate fever, very profuse sweating, tenderness and sense of oppression in the epigastrium, on the third or fourth day the eruption of small, reddish macules in the center of which a vesicle appears, these followed by a scaly desquamation. The eruption is usually most profuse upon the neck and trunk.

In severe cases high fever, delirium, hemorrhage and extreme prostration or collapse may terminate in death.

Treatment. The treatment is that of acute infections. (q. v.)

YAWS

(*Frambæsia tropica*)

Yaws is a chronic infectious tropical disease caused by the spirocheta *pertensis* (*treponema pertenuis*). It is highly contagious through skin abrasions or wounds, has an incubation period of two weeks to two months, and is characterized clinically by the formation of peculiar somewhat raspberry-like *granulomata*. There is a week or so of prodromal malaise and sometimes fever, followed by the appearance of the eruption which at first consists of minute, itchy, subcutaneous papules which rapidly increase in size and protrude through the skin. The apex becomes yellowish and necrotic and later necrotic points may be seen around it. A

yellowish offensive oozing occurs which drying forms the crust. After a week the crust falls and healing takes place or ulceration occurs. The lesions are painless and occur in successive crops, thus making the disease last for months or years.

Treatment. The infectious organism greatly resembles that of syphilis, and the skin lesions bear certain resemblances to skin syphilis; the treatment employed for syphilis of the skin should be tried. The Wassermann reaction is positive, and the usual medical treatment is salvarsan.

Prognosis. Recovery usually occurs, after weeks or months of successive crops of the lesions. Children may die; older persons who are weakened, either by this or another disease, may die from exhaustion or mild intercurrent disease.

Prophylaxis. Isolation of patients is impossible in many tropical countries. Cleanliness must be constantly maintained scrupulously by those who travel in countries, or who are associated with persons newly arrived from the countries, in which the disease exists.

Gangosa is an ulceration of the palate, later involving the bones and cartilages of the nose; less often the eyes are also destroyed. The deformity is great; death is not expected. The disease lasts from several months to three years. Wassermann is positive; the usual medical treatment is that of syphilis (salvarsan), and there is some reason for considering the disease a tertiary stage of yaws.

TROPICAL DYSENTERY

(Bacillary dysentery)

Bacillary dysentery is an intestinal disease, usually acute, caused by the bacillus dysenteriae, and marked by an inflammation of the colon, fever, and other general symptoms.

Etiology. The exciting causes are the dysentery group of bacilli, including the Flexner-Harris group, the bacillus dysenteriae of Shiga and the bacillus Y of Hiss and Russell. The predisposing causes are hot weather and defective sanitation, especially in camps. The infection is conveyed by feces, soiled clothing, flies, and by contaminated soil and water. Convalescents may act as "carriers" of the disease.

Diagnosis. The incubation period is from two to eight days. In the acute form the onset is usually sudden or a previous slight diarrhea may have been present. There are frequent or incessant calls to stool with pain in abdomen, griping (tormina) and tenesmus. The stools are small, composed of a slimy mucus which within twenty-four hours becomes blood-stained. The passage of

a stool gives no relief; straining continues, and in grave cases from 50 to 200 stools in twenty-four hours occur. The constitutional reaction is marked by a slight or moderate fever 103° to 104° F., pulse small and frequent, great thirst, tongue dirty, white-furred; dizziness, dry skin, and the patient seriously ill within forty-eight hours. In milder cases, the urgency of the symptoms abates, the stools lessen, temperature falls, and within two or three weeks the patient is convalescent. In the graver cases, the patient may die of exhaustion, or the condition may rapidly assume a low and typhoid state, or death may result from pyemia or perforation. In fatal cases death usually occurs on the third or fourth days. The sub-acute or chronic form lasts weeks or years, the patient becoming much emaciated and having three to five stools in twenty-four hours, partly fecal, much mixed with mucus, occasionally with blood, and sometimes appearing like "frog's spawn." The appetite is poor, the tongue red and glazed, the anemia and emaciation progressive, and the patient has a shrunken and cachectic appearance. The spleen is not enlarged.

The complications include peritonitis, pleurisy, pericarditis, endocarditis, arthritis, rarely pyemia, anemia, and dropsy. Malaria and bacillary dysentery may coexist. Persistent dyspepsia and irritability of the bowels may follow.

The blood of a patient infected with an organism of the Flexner-Harris type will agglutinate a pure culture of the organism in a dilution of 1:1000 to 1500. In the case of the Shiga bacillus, agglutination is less complete.

A lesion, which may be either primary or secondary, is usually found at the third lumbar and should be immediately corrected. This will often subdue the pain and tenesmus. Careful relaxation of the sacral muscles followed by deep steady pressure over the third and fourth sacral foramina will give some relief. Hot fomentations may be used over the abdomen. The patient must stay in bed and be very quiet. The diet must be fluid at first, consisting of milk, egg-albumen, barley water, and chicken broth, etc. During the chronic form, the diet must suit the case, mainly liquids or semi-solid.

Prophylaxis. The stools should be disinfected as soon as voided. Good sanitation prevents the disease.

DENGUE

(Break-bone, neuralgic, dandy, or broken-wing fever)

Dengue is an acute, epidemic, infectious, febrile disease of tropical and subtropical regions, attended by two febrile paroxysms, the first characterized by high fever, severe and shifting pains in the muscles and joints and an erythematous rash, the **second**

paroxysm by milder fever, intense itching, polymorphous rash and disproportionate debility.

Dengue occurs sporadically, epidemically and pandemically, attacking persons of all ages and classes. Epidemics spread with great rapidity and suddenness. The agent is communicated by inoculation of infected blood or by bites of mosquitoes of varieties *Culex fagitans* and *Stegomyia fasciata*. The organism is not definitely known. The incubation period is from two to five days.

There are no characteristic morbid changes and it is rarely fatal.

Diagnosis. The symptoms set in abruptly with chilliness, intense headache, backache, severe pains in a single joint often extending rapidly to all the joints and bones and shifting from one to another; soreness at the seat of pain, particularly if in the head or eyeballs; temperature gradually rising to 103° to 105° F., even to 106° to 107° F., accompanied by slight nocturnal delirium; pulse rapid and full, respirations quickened; suffused bloated face with injected conjunctivæ; sore throat, thickly coated tongue; anorexia, marked thirst, nausea, vomiting and constipation, and a general erythematous rash. The painful joints may be red and swollen, or without much redness or swelling. After one to four days, the rash and fever subside, leaving the patient prostrated and stiff. After a remission of two to four days, there is a sudden milder return of fever, more pains, intense itching and a macular, rubeolar or vesicular rash, appearing first upon the palms and spreading over the arms, face, trunk, and lower limbs. This rash remains about two days, when it slowly fades and desquamates. The other symptoms disappear within eight days of the onset, but the patient is left in a state of mental and physical prostration disproportionate to the severity of the primary attack. The pains, especially those of the smaller joints, may persist for a long time so that the gait of a convalescent is stiff and affected.

The chief complications are insomnia, convulsions in children, and hemorrhages from mucous surfaces.

Sequelæ are few although atrophy of the muscles has occurred.

The spinal examination shows the cervical and lumbar regions to be more affected on the second day, while the lower dorsal seems to be worse on the third.

Treatment. Put the patient to bed in a suitable room protected from mosquitoes. Early treatment is important. Vigorous treatment of the sub-occipital, upper and lower dorsal and lower lumbar regions controls the large vascular areas of the lungs, the splanchnic region, and the lower limbs. The diet should consist of liquids and much water, preferably hot during the fever, or of splinters of ice in the mouth. During convalescence, the diet should be carefully regulated and nutritious.

The bowels must be kept active with as little disturbance as possible on account of the muscular pain. The high fever is best controlled by inhibition of the posterior cervical areas, tepid sponging and by ice-cap to the head. The pain is alleviated by correction of parts impinging on nerve tissues and by strong inhibition. A short hot bath or a continuous warm bath may give great relief. The entire spinal structure must be watched during convalescence when the object is to secure the best supply of blood to every part of the body through good food, plenty of fresh air, and unimpeded nerve supply.

Prognosis. The prognosis is favorable for recovery. Relapses are common even after two weeks from onset, hence the most careful nursing is necessary.

The disease does not confer immunity. The best preventive is to kill the mosquitoes in the territory affected. The rare sequelæ are prevented by carefulness on the part of physician, nurse and patient.

MALTA FEVER

(Mediterranean fever; rock fever; Neapolitan fever; undulant fever)

Malta fever is an acute, endemic fever of the south of Europe, characterized by an irregular course, undulatory pyrexial relapses, profuse sweats, rheumatic pains, and an enlarged spleen.

The exciting cause is the micrococcus melitensis. The predisposing factors are lesions of the skin and disturbed circulation through the intestinal tract. Youthful males are most often affected. The disease is especially frequent at Malta and Gibraltar. The goats of the district are largely infected and their milk contains the organism.

Diagnosis. Incubation is from six to ten days. There is a marked prodromal period with chilliness, lassitude, and general malaise, then a gradual rise in temperature to 104° F. or over, frequently remittent. Simultaneously, enlargement of the spleen and drenching sweats are accompanied by rheumatic and neuralgic pains, and constipation. There may be a slight cough and rales at the bases of the lungs. This stage may last from one to three weeks. The first period of apyrexia lasts a few days usually, and is succeeded by a relapse of several weeks. Another remission comes on longer than the first to be again followed by a relapse. The sweats continue and the patient becomes very weak. The main complications are arthritis, orchitis, and neuralgia.

Blood. Blood serum of patients affected by Malta fever shows agglutinating properties with a pure culture of the micrococcus melitensis, even upon marked dilution. There is leucopenia.

Treatment. The treatment is generally that of typhoid fever. The symptoms are to be treated as they occur. A thorough spinal treatment with correction of any subluxated vertebræ or other lesions will materially lessen the number of relapses.

Prognosis. The outlook is favorable for recovery. The mortality is about two per cent. The rare malignant cases usually succumb.

Prophylaxis. Do not drink goat's milk when traveling in Mediterranean countries. Goats brought to this country should be free from disease.

YELLOW FEVER

(Yellow jack; bilious malignant fever; typhus icterode; sailor's fever; black vomit)

Yellow fever is an acute, specific, infectious fever, of a limited geographical distribution; characterized by jaundice, albuminuria, and a tendency to hemorrhages, particularly from the stomach.

Etiology. The disease is caused by a specific poison, the micro-organism of which is unknown. The intermediate host of this unknown organism is the mosquito, *Stegomyia fasciata*, which communicates the poison by being inoculated with the blood or serum of an infected person in the first three days of the disease, not later. From ten to twelve days are required for incubation in the mosquito before its bite transmits infection, and from four to five days more after the bite before the symptoms develop in man.

The predisposing causes are a tropical climate, the warm months, tropical Atlantic seaports, and filthy insanitary urban conditions. One attack confers immunity as long as the subject remains in the infected section. Frost stops the epidemic.

Bony lesions affecting the liver and renal areas and the vagi are probably predisposing causes and are constant in affected persons.

Pathology. There is dissolution of the red blood cells, granular degeneration and areas of necrosis in the viscera, and general glandular involvement. The liver shows size about normal, color pale yellow with hemorrhagic spots, cells atrophied, with fatty degeneration. The kidney is in a state of glomerulonephritis, is much engorged, with cells full of fatty globules.

The stomach mucosa is injected and ecchymosed, coated internally with altered blood. "Black vomit" is found.

Diagnosis. The disease is ushered in either by a prodromal period with malaise, headache, and anorexia, or suddenly by chill, high fever, 104° to 106° F., with pains in the head, limbs, and back. The full and strong pulse, rapid at first, but later slowing with a steady or rising temperature, is characteristic. The tongue is pointed, red at the tip and edges, and furred in the middle. The stomach is irritable, and there may be simple vomiting. Albuminuria may be present upon the first day. The patients are restless,

anxious and extremely prostrated. There is constipation and a characteristic odor.

This stage lasts from one to four days. Slight jaundice or delirium may appear. The fever remits to 100° to 99° F., and symptoms abate. Crisis or a short lysis and recovery follow, or after a few hours the third stage appears. The symptoms return in an aggravated form followed by jaundice of a lemon yellow to dark orange brown, black vomit, at first watery, but later mixed with altered blood and like coffee grounds; highly albuminous scanty urine, or suppression; slowing pulse with a rising temperature; hemorrhages from mucous surfaces, epistaxis, hemorrhage from the bowel, metrorrhagia (pregnant women abort); collapse, shrunken features, cold surface, irregular respiration and sometimes death, the mind remaining clear to the end. Recovery may occur even after black vomit has appeared. The mental aspect is a peculiar alertness with unmistakable evidences of fear, even after the most serious symptoms have appeared.

The red blood cells are approximately normal; hemoglobin from 75 to 50 per cent; hemoglobinemia is recorded; leucocytosis may be present.

Treatment. Put the patient in a clean room, screened and well ventilated. Kill all the mosquitoes within it. The room and everything in it must be absolutely clean.

Thorough work upon the whole spine is necessary. Correct lesions if possible before the third stage begins. Specific lesions have been found at the eighth dorsal and second lumbar vertebræ. Headache is treated by deep steady pressure to the occipital nerves and by the ice bag to the head. Irritability of the stomach is relieved by the general treatment and by the use of ice in the mouth. The patient must have all the water he can drink without causing vomiting. Keep the skin, kidneys, and bowels active by direct treatment and by baths. The fever is treated as usual, by deep steady pressure in the occipital region, and in the lower dorsal area. Sponging and cool baths may be used. Suppression of the urine is treated by work over the kidneys, to the renal splanchnics, and by hot baths and packs. Enteroclysis is useful in uremia. During the period of depression, the heart must be carefully noted and the measures used to prevent any complication or failure. Especial attention must be paid to the third dorsal and to the occipito-atlantoid articulation.

During the acute stage the patient cannot take food. Water or ice is to be given freely. As soon as convalescence begins, milk diluted with lime water or peptonized milk may be slowly begun at regular intervals and given in small quantities. Gradually increase until the patient is taking a normal diet.

Prognosis. The disease seldom lasts more than a week. Unfavorable symptoms are high fever, collapse, black vomit, and suppression of the urine. Favorable indications are moderate fever, slight jaundice, ample flow of urine, and freedom from hemorrhages. Alcoholics and those exposed to hardships are apt to die.

Prophylaxis. The spread of the disease must be prevented by screening the apartments of the infected and the healthy and by screening the cisterns, and draining swamps or covering them with petroleum. Those who work in a fever district should at least spend the nights away from town, preferably at some height above the sea-level.

Quarantine is fourteen days after exposure or recovery.

CHOLERA

(Epidemic cholera; Asiatic cholera; malignant cholera; spasmodic cholera; cholera infectiosa)

Cholera is an acute, specific, infectious disease, endemic in India, epidemic elsewhere, characterized by violent vomiting, purging of peculiar "rice-water" stools, severe muscular cramps, and a condition of prostration followed by collapse and death or a reaction subsequently developing into the typhoid state, or recovery.

The exciting cause is the comma bacillus of Koch (cholera vibriones or spirillum), and its toxalbumin. It is feebly contagious, mainly by the stools. The bacillus may be conveyed by infected water, milk, vegetables washed in contaminated water, or flies.

Predisposing causes are uncleanliness, gastric and intestinal catarrh, the eating of unripe fruits and alcoholic drinks. One attack does not afford protection against another. Incubation is from three to five days.

Diagnosis. Symptoms differ in different cases and different epidemics. The stage of invasion may last from a few hours to a week. The disease begins with chilliness, excessive thirst, white coated tongue, unpleasant taste in the mouth, slight abdominal pain, weakness and diarrhea. From three to twelve copious, watery, fecal, yellow, alkaline stools are passed during the day, easily voided with force and only slight pain. The stools rapidly become whey-like, grayish-yellow and flocculent. Occasionally an erythematous rash is present.

During the stage of prostration or evacuative stage the temperature is subnormal and pulse weak. The stools rapidly increase in number, and are voided with rushing force. These consist of a quart or two of grayish or whitish "rice-water" fluid, accompanied by forcible vomiting first of the contents of the stomach with more or less bilious matter and afterward of the peculiar "rice-water"

fluid. The thirst is intense. Muscular cramps, most severe in the calves of the legs, occur in all parts of the body. This stage lasts from two to sixteen hours. The **stage of collapse** or **algid stage** follows. The stools, vomiting, and cramps continue. The appearance of the patient becomes frightful: the eyes are sunken, and surrounded by black rings; nose pinched and pointed; cheeks hollow, lips blue (*facies cholericæ*); the surface is cold and moist, the skin of the hands and fingers has a sodden appearance. The temperature rapidly falls to even 78° F. beneath tongue, while the rectal is 102° F. or more. The pulse becomes small and compressible, 100 to 120, barely perceptible at the wrist, and the heart beats scarcely recognizable. The voice is weak and husky, sepulchral (*vox cholericæ*).

Later the purging usually ceases but vomiting may continue. The tongue and breath are icy. The mind is clear but most patients are apathetic. The urine is markedly diminished and albuminous. Complete suppression, coma and death may follow within a few hours. This algid state or cholera asphyxia usually terminates in death in three or not more than twenty-four hours, but may be followed by the **stage of reaction**. This lasts a few hours, during which the temperature gradually rises, the pulse becomes fuller and stronger, countenance brighter, the stools more fecal, thirst lessens, and increasing urine is a good prognostic sign. The patient either enters upon a slow convalescence of several weeks or the typhoid state develops, prolonging recovery for several weeks or postponing death (cholera typhoid).

Infectious complications may arise as pneumonia, enteritis, recurrence of severe diarrhea or uremia with coma and death.

Other complications are: severe bed-sores, boils, abscesses, ulcers and gangrene of the extremities, bronchitis, pneumonia and pleurisy, suppurative parotitis, nephritis, corneal ulcers, profuse sweats, cutaneous eruptions. A tendency to diphtheritic inflammations of the mucous membranes of the colon, especially of the throat and genitalia, may appear. Pregnant women always abort. Painful tetanic spasms of the flexor muscles of the hands, forearms, legs and feet may occur on tenth to fifteenth days of convalescence.

Varieties of cholera include **cholericæ**, which progresses as far as the beginning of the collapse state when recovery begins; **cholera sicca**, in which death occurs before the diarrhea begins; and **cholera typhoid**, characterized by fever, dry brown tongue, feeble rapid pulse, delirium, coma and death. During the stage of reaction or during convalescence there may be erythematous, macular or purpuric eruptions.

Blood Pressure. This disease has probably the lowest blood pressure readings of any infectious disease. The blood pressure is a valuable guide in treatment in the stage of collapse and in com-

bating the post-choleraic uremia. A pressure below 70 mm. systolic is a dangerous symptom.

The urine is scanty and albuminous. The urea is slight, gradually increasing to enormous amount. Desquamating renal cells, fatty and hyaline casts are found. Large quantities of indoxyl and sulphates are generally associated with aromatic substances.

The stools are of low specific gravity, with much water, sodium chloride and mucin; are alkaline in reaction, and with a sugar forming ferment almost constantly present. The flocculent sediment contains epithelial cells and leucocytes, shreds of mucus, the comma bacillus in abundance, other bacteria, and sometimes blood.

Treatment. Arrest in the diarrheal stage is often rather easy, but in the stage of collapse is difficult. As soon as the least symptom of diarrhea occurs (in an epidemic) the patient is put to bed. General treatment is necessary but the main factor is to secure a normal circulation through the bowel by relieving the muscular contractions and adjusting the lumbar vertebræ. Thoroughly loosen up the spine from the lowest tip to the head.

No food is to be given during the prostration stage. Bits of ice in the mouth allay thirst; sometimes small quantities of hot water are more comfortable. During the reactive stage, food must be given sparingly but often, of peptonized milk, milk and lime water, or gruels. Vomiting is treated by the general work and by deep steady pressure at the fourth and fifth dorsal vertebræ on the right side. Lavage may be necessary. Cramps are best relieved by friction of the skin over the affected muscles. Fever rarely requires any special treatment.

During the stage of collapse heat must be applied externally by hot applications, hot bricks, bottles, or hot baths. Quick, stimulating movements given through the dorsal area, especially the third to fifth, increase respiration and cardiac action. Hypodermoclysis, enteroclysis or intravenous injection of hot saline solution may be necessary.

Colonic irrigation has been used with some success. Use one to three gallons twice daily of either hot soapy water or one per cent salt solution. Introduce a soft rubber tube through the rectum into the sigmoid, and if possible into the descending colon. Let the water flow very slowly.

Prognosis. The mortality is 20 to 85 per cent. Favorable indications are gradual development of the disease; good constitution and health, and good habits. Unfavorable indications are sudden severe onset in the very young or very old, and in patients addicted to various excesses, and amid insanitary surroundings.

Prophylaxis. Isolation should be prompt. Sterilization of all discharges with chloride of lime or carbolic acid, boiling of all bed,

table, and personal linen as soon after use as possible is necessary. In the event of death, wrap the patient in a sheet soaked in bichloride of mercury 1:1000 solution. Burial must be speedy and private. Attendants on cholera patients should avoid direct contact with other people; should wash their hands thoroughly after contact with the patient; and should protect hair, clothing, and shoes with some covering that may be easily discarded. Non-infected individuals in a cholera district should be instructed to use none but boiled water and milk, and to partake of light, easily digested food that has been kept protected from contamination by flies and other insects.

TROPICAL LIVER

(Active congestion of the liver, active hyperemia of the liver)

Tropical liver is very common in the tropics. It is due to faulty diet, especially overeating of protein food, abuse of alcohol, coffee and highly seasoned foods, lack of exercise, toxic and infectious processes. It is characterized by a sense of fullness in the right hypochondrium, disturbance of appetite and constipation. The patient is irritable and depressed.

The quadratus lumborum and the mid-dorsal muscles are rigid. The ninth and tenth ribs are approximated, especially on the right side. Pain in the back in the region of the seventh and eighth dorsal and under the shoulder blade may be very severe.

Treatment. Correct all lesions by giving vigorous manipulations. Give enema if necessary to cleanse the colon. Allow no food for a day or two, then give strict cellulose diet for at least one week. To prevent recurrence the etiological dietetic errors should be avoided and a suitable amount of exercise in the open air provided. In severe cases a change of climate must be sought.

The disease does not endanger life but lowers resistance to infection and diminishes efficiency and comfort.

(See also Part X, Animal Parasites.)

PART X

DISEASES DUE TO ANIMAL PARASITES

GENERAL DISCUSSION

The human body seems able to adapt itself to the presence of animal parasites, but only rarely to develop any specific toxin in the way of self-protection. This may be due, in part, to the fact that the inflammations set up by animal parasites are rarely profound, but are either very slow and chronic, or are absent altogether. With the human extravagance in regard to making provision, most bodies are able to act as free hotels for many, or for very large animal parasites, without being seriously affected by their presence. On the other hand, there are a few animal parasites which cause very serious, even fatal, symptoms.

In order to facilitate diagnosis, the following list of parasites is prepared:

The Digestive System.

Salivary glands—Echinococcus cysts.

Stomach wall—Pentastomum denticulatum and Echinococcus.

Intestines—Tapeworms, nearly all the nematodes and Rhizopoda. Almost any parasite may be an inhabitant of the intestines at some time.

Liver—Echinococcus; Distomum hepaticum; Coccidia; Pentastomum denticulatum; more rarely—Cysticercus cellulosa; Ascaris lumbricoides; Psorosperms.

Urinary System.

Kidneys and Ureters—Filaria; Distomum hematobium; Eustrongylus gigas; Ascaris lumbricoides.

Bladder—Echinococcus; Filaria; Distomum; Ova of Bilharzia.

Urethra—Eustrongylus gigas; Thread-worms; Larvæ of certain flies.

Respiratory System.

Bronchi—Echinococcus; rarely nematode worms.

Lungs—Echinococcus; Cysticercus cellulosa rarely; Strongylus longivaginus; Monas; Cercomonas; Coccidia; Pentastomum denticulatum; psorosperms; Distomum pulmonale.

Pleurae—Echinococcus and Psorosperms.

Medistinum—Echinococcus.

Circulatory System.

Heart—Pericardium, Cysticercus, Echinococcus, Trichina, Pentastomum denticulatum.

Myocardium—Echinococcus and Cysticercus.

Lymphatic vessels—Echinococcus and Filaria.

Lymphatic glands—Filaria, Trichina, Trypanosomes, Echinococcus, Cysticercus, Pentastomum denticulatum.

Blood.

Malarial organisms, Filaria, Piroplasma, Trypanosomes.

Nervous System.

Brain—In the pia and arachnoid, *Echinococcus* and *Cysticercus cellulosa*.
 Cord, the spinal dura—as above.
 Retina—rarely the *cysticercus*.
 Vitreous humour of the eye—*Filaria* and *Cysticercus*.

Genital System.

Prostate—*Echinococcus*.
 Scrotum—*Filaria* and *Echinococcus*.
 Membranes of the testis—*Filaria* and *Echinococcus*.
 Vagina—Larvæ of certain flies; *Oxyuris vermicularis*; *Ascaris lumbricoides*;
 Trichomonas vaginalis.
 Uterus—*Echinococcus*.
 Ovaries—*Echinococcus*.
 Mammary Gland—very rare—*Echinococcus* and *cysticercus*.

Miscellaneous.

Spleen—*Echinococcus*; *Cysticercus*; *Pentastomum denticulatum*.
 Pituitary body—rarely *Echinococcus*.
 Thyroid—rarely *Echinococcus*.
 Bones—*Echinococcus*; *Cysticercus cellulosa*.
 Joints—*Echinococcus*.
 Nose—Larvæ of certain flies.
 External ear—Larvæ of certain flies; *Ascarus folliculorum*.
 Muscles—*Trichina*.
 Skin—Hook-worm; *Medina* worm.

CHAPTER LI
PROTOZOAN INFECTIONS

MALARIAL FEVER

Malarial fever is a specific infectious disease caused by the presence in the blood of the plasmodium malariae and presenting clinically the following varieties: (1) periodically recurring paroxysms of intermittent fever; (2) continued fever with well-marked remissions; (3) certain pernicious, rapidly fatal forms; (4) a chronic cachexia with anemia and enlarged spleen.

Etiology. The disease is caused by the plasmodium malariae or hemamebae. There are three forms exciting disease in man as follows: plasmodium malariae, causing the quartan form; plasmodium vivax, the tertian; and the plasmodium precox or hemamebae, causing the estivo-autumnal form. The disease is spread by the bites of mosquitoes of the genus Anopheles which must themselves have been infected. Predisposing factors are exposure at night, a country with marshes, humidity, high temperature, absence of winds, and such other factors as favor the breeding of mosquitoes. Lesion of the eighth to the tenth thoracic vertebrae and ribs are constant.

The parasites are found in the red blood cells during paroxysms. The enlargement of the spleen is sometimes very great. In recent cases the organ is soft, in older cases, firm, "ague cake." Congestion of the liver is present. Anemia is usually marked.

Types of Intermittency. Tertian—When one group of tertian parasites is present, the paroxysms recur every third day; when two groups are present, double tertian or quotidian type is present, with chills every day. This is the most common type in the northern and middle states.

Quartan—When one group is present of quartan parasites the paroxysm recurs every fourth day; when two groups, it occurs for two days in succession, the third day none; when three groups are present, daily paroxysms occur.

The paroxysm is said to "anticipate" when it comes a little earlier each succeeding day; and to "postpone" when it comes on a little later.

Intermittent Fever. (Ordinary ague.) The paroxysm is usually preceded by a day or so of premonitory symptoms. The typical attack usually consists of three stages, a cold, hot, and sweating.

Cold Stage—The patient shivers violently, the teeth chatter, the skin is pale and cold, and the papillæ are raised (goose skin or cutis anserina), nails and lips are blue, the face anxious and the features pinched. There are often vomiting, thirst and hyperpnea. The temperature is much lowered externally but raised in the mouth and rectum to 102° to 104° F. The urine is pale, copious, of low specific gravity. This stage lasts from a few minutes to an hour or more. Towards the end the temperature may be 103° to 106° F.

Hot Stage—There is a gradual or sudden onset. The skin is hot, red, and burning, vomiting is increased, the carotids throb forcibly; headache is intense; there may be violent delirium. The temperature is often 106° F. or more, the pulse rapid and full, and epistaxis or diarrhea may occur. This stage lasts from one to many hours. The urine is scanty, of high specific gravity, large quantities of urates and urea, and albuminuria is frequent.

Sweating Stage—The sweating commences at the roots of the hair and soon becomes general and profuse. The pulse is softer, the temperature falls gradually, and the patient is restored to a normal condition. The urine is of high specific gravity, scant in quantity, the urates are more abundant than urea. This stage usually persists from two to four hours and is often followed by refreshing sleep.

Remittent Fever. (Bilious, tropical, marsh, bilious remittent, typho-malarial, or estivo-autumnal fever). This form is associated with the estivo-autumnal parasite, and is especially frequent in the tropics. It may be seen in the late summer and autumn in temperate climates.

The type is either definitely intermittent with irregular intervals between the paroxysms, or there may be continuous fever with well-marked remissions but no intermissions.

The symptoms common to both types are coated tongue, epigastric pain, anorexia, bilious vomiting, constipation or diarrhea, jaundice, a moderate cold stage, which does not recur with each paroxysm, an intense hot stage with intense headache and gastric irritation, and lastly an almost imperceptible sweating stage which may be absent. Either type tends to merge either into an ordinary intermittent attack or into a typhoid state of grave prognosis. As a rule, this fever lasts from seven to fourteen days. Both remittent and the regular intermittent type tend to spontaneous improvement, after several weeks of fever, the symptoms gradually disappearing and the patient thinking himself well. After weeks or months, a relapse occurs, to be followed by another and another, any of which may prove fatal or lead to malarial cachexia. Spontaneous recovery is uncommon.

Pernicious Malarial Fever. (Congestive fever; malignant intermittent fever; malignant remittent fever; congestive chills.) This form is due to the estivo-autumnal parasite and is comparatively rare. Predisposing causes are lesions producing a general lowered resistance and splenic area lesions, exposure to hardships, intemperance, previous attacks of malaria, or other exhausting diseases. The attacks are of sudden onset, of great severity, and of many forms. Hyperpyrexia has temperature of 107° to 110° F. or higher.

The cerebral type is due to plugging of the cerebral centers by the plasmodial emboli. Comatose, convulsive, and paralytic forms are described.

In the **algid** form no febrile reaction occurs after the chill; the body surface is intensely cold; the rectal temperature is 104° to 107° F., a cold sweat covers the body; the radial pulse is slow and feeble and often absent; thirst is intense; mind clear, the countenance death-like, and case ends in collapse.

The **algid** type is due to an accumulation of the parasites in the splanchnic vessels, with mild thrombosis in the vessels of the intestinal mucosa. Recovery from one or several attacks may occur, but any attack may be fatal.

Choleraic (Dysenteric, gastro-intestinal type) is characterized by stools containing bile, intense nausea, vomiting, purging, tenesmus, burning sensation in the stomach, frequent weak pulse, intense thirst, cold feet and hands, and face with shrunken features, cramps and marked depression. This lasts from one half to several hours.

Thoracic types are characterized by marked dyspnea, oppressed cough with blood-streaked sputum, frequent weak pulse, cold surface, terror stricken features, and intense pulmonary congestion.

Blackwater Fever. (Hemoglobinuric fever; malarial hemoglobinuria.) Occurs in tropical Africa, rarely in certain parts of India, and is endemic in the southern states. The predisposing causes are prolonged residence in malarial regions; repeated attacks of malaria which have led to anemia and debility; and "prolonged use of quinine."—R. Koch. One attack predisposes to another.

It is an acute hemolysis. The malarial parasites are absent or scanty in the blood during an attack or in the internal organs after death. Red corpuscles are rarely found in the urine, but hemoglobinuria is severe. There is cloudy swelling of the hepatic and renal cells, the skin and conjunctivæ are yellow or brown from jaundice.

It may commence as an ordinary malarial attack. In a few days a severe rigor occurs, the urine becomes very dark or black, is at first copious, later diminished or suppressed; there is yellow discoloration of the skin and sclerotics; bilious vomiting;

sharp pains in the loins and epigastrium; usually bilious diarrhea. The condition may either pass off in a few hours not to recur; there may be recurrences, or there may be no remission at all. Marked anemia and prostration develop and death is frequent. In the malarial region, the slightest chill or over-strain may provoke a recurrence.

Malarial Cachexia. Repeated or prolonged attacks of malarial fever lead to severe cachexia. It may be impossible to find the organism in the blood.

The peculiar characteristic features are: anemia, often intense; sallow, earthy skin; tendency to hemorrhages as epistaxis, purpura and retinal hemorrhages; irregular attacks of fever or of subnormal temperature; enlargement of the spleen and liver. Complications in the order of frequency are: orchitis, neuralgia, headache, paraplegia, enteritis, nephritis, rheumatism, typhoid fever, lobar pneumonia, jaundice and dysentery. The patients finally succumb to general weakness, tuberculosis, gangrene, or amyloid degeneration of the internal organs.

Diagnosis. Malaria is recognized by the symptoms peculiar to the types as given, and by the presence of the parasites in the blood.

Blood in malaria. Red cells are destroyed so the count is decreased after each paroxysm, but the number is almost restored before the next attack. The anemia is progressive. The cells contain granules and the parasite in its various forms. Some forms are free in the plasma. Melanin is the pigment free in the blood stream and in the organs in which the plasmodia collect. Hemoglobinemia may occur. In the estivo-autumnal form, the new cells are pale, varying in size and shape, nucleated reds are common, regeneration is slow. There is extensive necrosis and resulting induration of the bone marrow. The hemoglobin suffers more than the red cells and returns to normal much more slowly.

Leucocyte count is always subnormal, with a slight rise just before a paroxysm and then steadily decreasing until the temperature is lowest, sometimes to 1000 to 2000 cells per cubic millimeter. The differential count shows a relative decrease in the polymorphonuclears, an absolute increase in the large mononuclears, especially pronounced in the apyretic periods and usually absent in the fever period.

The diagnosis is made positive by finding the plasmodium malarie in the blood. Children may only show the enlarged spleen clinically.

Malaria must be distinguished from tuberculosis, pyemia or concealed suppuration, pyelitis, ulcerative endocarditis, and gallstones; the remittent type from typhoid fever; and the pernicious form from yellow fever.

Treatment. The most common lesions are found as lateral deviations between the seventh and twelfth dorsal and the fourth lumbar vertebræ with consequent displacement of the ribs in connection with the dorsal lesions. During the chill give vigorous treatment to the whole spinal column. Deep steady pressure at the eighth dorsal also assists in stopping the chill, or in lessening the next one. Raise the ribs over spleen and liver. Deep steady pressure to the suboccipital nerves reduces the temperature. Sponging is grateful to the patient. "I adjust all the bones of the neck because I wish to relieve the congestion of the cerebellum, medulla, and all the nerves above the diaphragm."—A. T. Still.

Muscular contractions with marked hypersensitiveness appear in the interscapular region just before the onset of the chill. Vigorous treatment relieving this tension, with correction of lesions and increase of spinal flexibility may prevent the entire paroxysm, or greatly diminish its severity.

During the sweating stage, deep steady pressure in the suboccipital fossa, treatment at the upper dorsal and first lumbar are all necessary. If no further symptoms are noted, the patient must be treated upon the third, fifth, seventh, fourteenth and twenty-first days as a prophylactic measure.

In blackwater fever, fluids should be given especially freely to flush the tubules and avert suppression. Special attention must be given to the renal splanchnic area and gentle direct treatment to the abdomen. In very serious cases, normal saline should be given subcutaneously or by rectum to make up the amount of fluid and avert collapse. On no account should the patient sit up owing to the risk of cardiac failure.

"When the patient has the quartan parasite, as soon as the temperature begins to fall I give him from two to six ounces of red meat juice, extracted from rare beefsteak, sometimes as much as five pounds in the first twenty-four hours following the chill. In almost all cases of quartan malaria the blood is built up sufficiently by the time they reach the second cycle to pass without the paroxysm, or chill. By the time for the third cycle, which is the seventh day, I always have built up the patient's resistance so as to enable him to pass by this cycle without any symptoms of malaria whatever. In cases of double or triple I find the same treatment causes about the same results. I do not give any other diet, except dry toast if they eat the beef instead of taking the juice. If they can take the steak I prefer their taking it, but almost all cases prefer the juice. * * * The treatment for the tertian type of malaria is practically the same as the treatment for the quartan.

"The estivo-autumnal type of malaria differs from the quartan and tertian types; first, in that the paroxysms are, as a rule, much more irregular; second, they are much longer in duration; third, the chills are more frequently absent; fourth, the fever is often irregular, intermittent, remittent, or continuous in character. This type very often takes the form of blackwater or hemoglobinuric type with hemorrhagic symptoms, with hemorrhage from nose, gums and bowels. The first thing to do in a case of hemorrhagic malaria is to put an ice bag on the abdomen, which will tend to control the hemorrhage from the kidneys. Give the patient all the red beef juice you can get him to take, provided he has not developed a very sick stomach; if so, give him high saline enemas

and in one half hour give him four ounces red beef juice per rectum. Repeat the feeding per rectum in four hours. As soon as he can retain anything on stomach give him all the juice he can take comfortably. Treat the liver thoroughly—at least three times in the first twenty-four hours. At the end of thirty-six hours the yellow cast will be very much lighter, which is a sure sign that the patient is getting better. Watch the urine closely. The third day there may occur a suppression. If so, give strong stimulation to the renal plexus through the abdomen, and be sure there is a thorough relaxation of the dorsal and lumbar muscles.

"It is an established fact that people in the malarial districts eat very little beef. I find that ninety-nine per cent of the cases of malaria never eat it, or when they on rare occasion do, it has been so overcooked that all the blood-building substances have been destroyed. The beef raw would be better in my opinion; although, the possible chance of getting a tapeworm or animal parasite is so considerable that I would advise that the beef should be heated to 250 degrees F."—E. C. Armstrong.

Prognosis. In the intermittent type the outlook is always favorable with treatment. The remittent type usually ends in recovery with treatment, but death may occur in very severe cases.

Prophylaxis is important. Properly screened windows and doors of all buildings are necessary, especially where malarial patients are ill. Wage a crusade against the larvæ of the *Anopheles*, by drainage of marshes and stagnant pools, by covering those recently drained and those undrained with a film of kerosene or crude petroleum. In tropical towns, those not native should live in a separate quarter and avoid being out at night. Isolation of the patient from mosquitoes prevents spread of infection and also reinfection of himself.

TROPICAL SPLENOMEGALY

(Kala-azar; dum-dum fever; tropical cachexia; piroplasmiasis)

This is a tropical disease occurring chiefly in India, Ceylon, China, and Egypt, caused by the parasite *Leishmania Donovanii*, which is conveyed by bedbugs and perhaps fleas, and is found in the spleen, liver, and bone marrow. It is a disease of rats and dogs also, and these perpetuate and transmit it. It is characterized clinically by great enlargement of the spleen and liver, anemia and leucopenia, hemorrhages from mucous surfaces and purpura; irregular fever, transitory edema, later muscular atrophy and great emaciation and cutaneous ulcers. An infantile form occurs in Italy and Greece.

Diagnosis is by hepatic puncture to find the parasite in the fluid.

Treatment. The prevention is of utmost importance. Cleanliness and the destruction of bedbugs and rats, isolation of the sick and their protection from bedbugs, are prophylactic. After the disease appears, treatment must be symptomatic and supporting.

Prognosis. Recovery is not to be expected. The disease may last for months or years, or be fatal within a few weeks.

CUTANEOUS LEISHMANIASIS

(Oriental sore; Biscra button; tropical ulcer; Aleppo, Delhi, or Bagdad boil; natal sore)

This is very common in Oriental countries; it seems to be limited to the countries in which the camel is used. The infection appears to be identical with that of kala azar, but it is less virulent. The possibility that it is the same organism, modified by its transmission through the camel, is of interest. The sores appear only upon exposed portions of the body, beginning as small red macules, which slowly increase in size and discharge pus. A crust forms, drops off, and exposes a granulating ulcer. The crusts keep forming and dropping off, leaving ulcers of increasing size, which after months or years heal, leaving a depressed scar and often great deformity.

One attack confers immunity. The diagnosis is made by the characteristic sore, and by finding the Leishman-Donovan bodies in the granulation tissue. The treatment consists in the surgical dressing of the sores, and such constitutional treatment as may be indicated on examination.

Prophylaxis. Any contact with persons suffering with sores upon them, in the tropics, or among people recently arrived from the tropics, should be surrounded with precautions. The hands must be well gloved, and thoroughly washed often. Travelers in tropical countries are to be careful, since they possess little or no immunity to many of these diseases. The bites of insects are especially to be avoided.

ROCKY MOUNTAIN FEVER

(Rocky Mountain spotted fever; tick fever)

Rocky Mountain fever is an acute infection caused by *piroplasma hominis*, and transmitted by the tick, *Dermacentor reticulatus*, and characterized by chill, fever, pains in the back and bones, and a characteristic eruption.

The disease is limited to the Rocky Mountains between 40° and 47° N., and is most prevalent at 3,000 to 4,000 feet elevation.

The disease confers immunity and this in animals is transmitted to their young. Incubation is from three to ten days.

Diagnosis. The disease begins with a chill, fever, 103° to 105° F., severe pains in the back and limbs, a rash appearing from the second to the seventh day which is macular, dark and becomes hemorrhagic. The skin is often swollen. At the height of the

fever, there may be delirium and stupor. Convalescence begins in the fourth week.

The history of exposure to the danger of tick-bite, with the symptoms, gives the diagnosis. The red blood cells show destruction; the hemoglobin diminishes rapidly, sometimes to fifty per cent.

Treatment. The symptoms must be treated as they arise. Warm continuous baths may control the pain and the delirium. Treatment to control the circulation, especially through the liver and spleen, is indicated. During convalescence the treatment for the secondary anemia, raising the ribs, is important and the diet should be rich in chlorophyll and nitrogenous foods.

Prognosis. Different localities give very different fatalities, totally apart from therapeutic considerations.

Prophylaxis. The destruction of the tick is difficult. The piroplasm is transmitted to the young ticks, and these transmit the disease. Persons who are much in the woods should protect themselves from danger of tick-bite, by thick clothing and shoes. As rapidly as possible, the tick should be completely exterminated.

FLAGELLATA

(Mastigophera)

These are unicellular organisms, microscopic in size. They are nucleated, and may be green, with chlorophyll bodies.

Trichomonas vaginalis is found in the vagina of both pregnant and non-pregnant women, especially if the secretions are acid, but may not cause any particular disturbance. Chronic vaginitis with pruritis was found associated with this organism in two P. C. O. Clinic cases.

Trichomonas intestinalis is associated with chronic diarrhea, especially in the tropics.

Trichomonas pulmonale have been found in the sputum in cases of gangrene of the lung and in pleural exudates.

Lambliia intestinalis inhabits the jejunum and duodenum causing a chronic diarrhea.

TRYPANOSOMIASIS

(Sleeping-sickness)

Trypanosomiasis is a chronic disease of tropical Africa and other countries, clinically marked by fever, wasting, lassitude, enlargement of the glands and a terminal stage of lethargy. The exciting cause is the protozoon, *trypanosoma gambiense*, which is conveyed by the tsetse fly. Natives of West African coast, Congo

basin, Uganda, and the course of the Niger are chiefly attacked, but Europeans are not exempt. The incubation time is unknown.

Diagnosis. The organism may be in the blood for years without symptoms. This form is marked by recurrent attacks of fever resembling malaria, with glandular enlargement, with intervals of apparent health.

In other cases there is lassitude from the first, with slow gait and speech, headache, and nocturnal fever. The glands are usually enlarged. Irregular edema and dropsy, anemia, fine tremors of the tongue and hands, and wasting lead into the terminal stage. There is gradually deepening coma (sleeping sickness), which may be accompanied by convulsions, paralysis, or bed sores. The duration of the disease varies from a few months to years, and death often occurs from an intercurrent affection.

Several species of trypanosomes have been described. In Brazil children are affected by the *Schizotrypanum cruzi*. It invades the thyroid, causing symptoms of acute myxedema. High fever, enlarged lymph glands, spleen and liver, meningitis or encephalitis, lead either to death or to permanent nervous lesions. Carriers of the disease may suffer slightly or not at all.

The protozoon is more readily found in the glandular tissue than in the blood.

Prophylaxis. The method of combatting the disease is war against the tsetse fly and protection from it.

PSOROSPERMIASIS

This disease in man is due to infection by *coccidia oviforme*, which is the cause of spotted liver of rabbits. It is rare in man, and is clinically characterized by intermittent fever, diarrhea, nausea, tenderness over the liver and spleen, and drowsiness, and pathologically by caseous foci with rings of congestion in the liver, spleen, and intestines resembling tubercles, but containing the *coccidia*. Death is inevitable when the disease is recognized.

Cutaneous psorospermiasis (*keratosis follicularis*) may greatly resemble, perhaps even may cause, neoplasms of the skin.

Treatment. Surgical removal of the skin lesions is indicated in favorable cases.

Prophylaxis consists in cleanliness. Especially when rabbits are allowed to run about in a vegetable garden, there is danger in eating raw vegetables or small fruits.

AMEBIC DYSENTERY

Amebic dysentery is an acute or chronic inflammation of the mucous membrane of the large intestine, caused by the ameba

dysenterix and characterized by fever, tormina, weakness, frequent watery stools containing gelatinous mucous masses, with a special liability to hepatic abscess.

Etiology. The exciting cause is either the *entameba tetragena* or the *entameba histolytica*. It is swallowed in contaminated water and upon uncooked vegetables.

Predisposing causes are lesions of the lumbar region, especially the third, fourth and fifth, which are usually far back on the sacrum, this posterior condition extending as far up as the tenth dorsal. Contractions occur all along the spinal musculature.

Diagnosis. The onset is gradual (a frequent and painless diarrhea following a period of ill-health) or abrupt, marked by the passage of many small, watery stools containing mucus but no blood, and alternating with constipation. The milder cases are attended by weakness and emaciation, and dull expression; pale and sallow skin, pale, flabby, moist, and slightly furred tongue, and insomnia. The temperature does not rise above 100 F., the pulse feeble, ranging from 70 to 90. The abdominal pain is constant, cramp-like, dull aching or burning, mainly in the upper quadrants.

Tenesmus is infrequent, but there is a burning sensation in the rectum and in the anus during and after passage of feces. The tendency to chronicity is great. In the grave form, the face is drawn, cyanosed or flushed, the expression anxious, the mind clear; there is anorexia, intense thirst, and sleeplessness with normal or subnormal temperature, small, rapid pulse, and free sweating. Retracted abdomen and greenish-yellow color of the skin with progressive anemia and emaciation may dominate the intestinal symptoms. Death may occur in a few days or at any time for months from hemorrhage, perforation, sloughing, hepatic abscess, or exhaustion.

The chronic form may follow the acute attack, or it may be chronic from the first. The symptoms resemble the bacillary dysentery but there is more definite tendency to alternating periods of diarrhea and constipation. The tongue is red, glazed and beefy. The appetite is capricious, the digestion is easily disordered. In the United States the patients retain their nutrition remarkably well in contrast to the marked emaciation of those in the tropics. Diarrhea may be the only symptom and characterized by great variation in character and frequency. Exacerbations may begin suddenly and subside in the same manner, lasting from two to ten days. The intermissions continue from one day to three weeks, during which feces are soft but contain mucus. This periodicity is most marked in cases with hepatic abscess. True relapses are common.

The complications include hepatic abscess and other abscesses with rupture usually into the lung. This is indicated by dry, hacking cough, sudden expectoration of diffuent, tenacious, alkaline,

frothy sputum with odor like "anchovy-sauce." This contains the amebæ with blood, bile constituents, and sometimes degenerated liver cells. Conjunctivitis or vaginitis may be due to direct infection by soiled fingers.

Diagnosis depends upon finding the ameba in the stools or pus by the microscopic examination preferably on a warm stage.

In the chronic form the urine is often albuminous and may contain casts. In the gangrenous form, there may be retention. Amebæ are not present unless the bladder becomes infected. There is varying anemia. Mild leucocytosis is the rule; sometimes eosinophilia is present. At first the stools are small, consisting of mucus, with more or less bright blood and small fecal masses, four to twenty or more each day. As ulceration advances, they become more copious and watery, feces and blood diminished, and containing gelatinous grayish masses about one to three centimeters in diameter. When sloughing occurs, shreddy masses of necrotic tissue are found.

Treatment. The first work in treatment is to adjust the lumbar vertebræ, especially the second and third. Other lesions are corrected as found.

There is nothing yet known which kills the amebæ with no harm to the patient. The only thing is to keep the intestinal tract clean, and to get rid of the amebæ with the feces. The fact of the frequent stools does not prove that retention is not occurring. Frequent washing of the colon helps to clear away retained masses, if these can be felt on palpation, or if the dysentery is not relieved, by the ordinary measures. The "drop method" may be employed if the usual enemas are irritating or unsuccessful.

Diet. In chronic cases, cellulose may be freely employed, if it does not precipitate a more acute attack. Probably there is nothing which is more completely and thoroughly cleansing to the entire intestinal tract than a full cellulose diet, with plenty of water drinking. Pineapple, apples, celery, lettuce, onions, raw cabbage, carrots, all should be eaten in abundance, and the amounts of proteid, carbohydrate and fatty foods kept to a rather low measure of the metabolic requirements of the body. The food must be liquid during an acute attack.

For the conjunctivitis or vaginitis, which may result from accidental contamination, frequent washing with any bland and non-irritating liquid is the best thing. The inflammation which may result from the infection is best treated by the usual osteopathic methods of treating simple inflammation of those membranes. Hepatic abscess, or the rare abscesses in other parts of the body, require surgical evacuation.

Prognosis. The majority of cases recover from the acute attacks. The chronic form may persist for years.

Prophylaxis. Especially since more frequent communication with tropical countries it is necessary to be sure of the purity and cleanliness of water and food supply. Cases in southern California have been caused by the ameba upon salad vegetables irrigated with contaminated water. Disinfect all stools and urine of patients.

MYIASIA

The larvæ of flies and other dipterous insects occasionally gain entrance into the human body, either with food or by direct invasion of the orifices or ulcers upon the skin. The screw-worm *compsomyia macellaria* is the most common in the United States. The larvæ of *dermatobia noxialis*, *lucilia serricata* and *lucilia cæsar* are occasionally found responsible for myiasia.

The destructive powers of these larvæ are surprising. They may invade the brain by way of the nasal passages and cribriform plate or the eye-ball from the conjunctiva, or the muscles, cartilages and bones from skin lesions.

The only efficient treatment is surgical removal of the infested tissues. If this is impossible recovery may occur as the result of the death of the parasite, but in most cases death of the patient is speedy and inevitable.

CHAPTER LII

NEMATODES

Nematode (threadlike) worms are round and usually very small. They include a number which produce diseases of varying severity, in the human race as well as among animals. They include the following worms:

Strongyloides intestinalis. (*Rhabdonema strongyloides*; *Anguillula intestinalis et stercoralis*.)

Filaria sanguinis hominis. (*F. Bancrofti*.)

Dranunculus or *filaria medinensis*. (Guinea worm; Medina worm.)

Trichocephalus dispar. (*Trichinis trichinora*; Common whip-worm.)

Trichina spiralis. (Flesh-worm; *Pseudalius trichina*.)

Ankylostoma duodenale.

Necator or *Uncinaria americana*.

Ascaris lumbricoides.

Oxyuris vermicularis. (*Ascaris vermicularis*.)

Ascaris alata. (*Mystax*.)

Nematodes rarely found as causes of disease in man in this country include the following:

Strongyloides intestinalis (*Anguillula stercoralis*) occurs chiefly in Asia, and is not known to be pathogenic to its human host.

Eustrongylus gigas is a very large round worm, about a meter long, which is very common in dogs and other carnivora, but is a rare parasite of man. It attacks the kidney, causing hematuria. The ova may be found in the urine.

Trichocephalus dispar or common whip-worm is common in Syria and Egypt, being an inhabitant chiefly of the cecum, appendix, and the large intestine, and rarely causing symptoms. It is about an inch long, the anterior half being thin and thread-like, and the posterior part much thicker.

Ascaris mystax (*Alata*) is two to three inches long, infests cats and dogs, rarely man.

Filaria sanguinis hominis infects the blood.

DRACONTIASIS

(Guinea worm disease; dracunulosis; medina worm disease)

This disease is due to infection by the persarum, or *dranunculus mediensis*. The worm passes one part of its existence in the cyclops, a crustacean. The disease is characterized clinically (about

a year after the ingestion of the polluted water) by the appearance of a small blister usually just above the ankle, the event ushered in with fever, sometimes urticarial rashes. The blister ruptures and through the small ulcer is seen the female worm's head with the coils felt like a bundle of cords beneath the skin. By playing a stream of water over the ulcer, the embryos are discharged and the worm leaves her host.

The patient is unable to walk but there are no other symptoms than the local irritation unless pyogenic infection occurs. There may be more than one extruding at a time. The male worm has not been found.

Treatment. The native treatment is unique but effective.

As the worm begins to leave she is wrapped about a small piece of smooth wood to prevent retraction, and day by day the patient winds a little more of the worm on the wood, being careful not to tear her, doing this until she is finally extracted.

Prophylaxis. In order to avoid this infection, it is necessary to avoid drinking water, or bathing in water, which might be the home of cyclops in tropical countries.

OXYURIS VERMICULARIS OR THREAD-WORMS

The male is one-eighth inch long with a curved tail; the female is about one-fourth inch, thin and thread-like with a tapering tail. They gain entrance to the body by water or upon salad vegetables, and inhabit the large intestine, especially the rectum and descending colon, and are often found around the anus.

Diagnosis. The patient is usually a child who is extremely restless and irritable; the sleep is disturbed; there is loss of appetite; there may be anemia of a more or less marked degree; vesical and rectal tenesmus and priapism may be present. Itching and erythema around the anus and perineum is very annoying, and if the worms reach the penis in boys, or the vagina in girls, may cause masturbation. This symptom is worse when worms come down and especially at night when warm in bed.

The pruritis leads to scratching, and thus the ova may become lodged around the finger nails. No unusual carelessness then is necessary to permit infection of the food, and thus the infection of others, or a second infection of the patient. The feces contain the ova in large numbers.

Treatment. Merely the repeated washing of the rectum with warm soapy water, or an emulsion of oil and soap, will usually clean the body of the worms. For more speedy relief, quassia decoction—about an ounce to a pint of water—may be injected into the rectum and left for a short time. This procedure may be repeated

once a week or so, until no further evidence of the worms can be found.

Usually spinal rigidity and lesions involving the lumbar vertebræ are found; the correction of these conditions promotes recovery from the malnutrition and nervous irritability due to the presence of the worms.

Prophylaxis. The carelessness associated with defecation, especially in children and in uncleanly adults, permits the spread of these organisms. The use of raw vegetables irrigated with sewage or grown in fields enriched with excrement is dangerous.

ASCARIS LUMBRICOIDES

(Common round worm)

The male is four to six inches long; the female is ten to sixteen inches, they resemble the ordinary earth-worm in appearance. They inhabit the small intestine but exhibit a marked tendency to wander to other parts.

Diagnosis. In children, who are usually affected, they produce many reflex symptoms as restlessness, irritability, twitchings, picking at the nose, grinding the teeth, foul breath, and often convulsions. Gastro-intestinal catarrh without any other cause is often present. Eosinophilia is present, and in some cases there is a marked anemia.

The stools show the adult worm, the ova, and sometimes both.

Treatment. Thorough treatment to the liver, correction of all spinal defects, and careful direct abdominal treatment is essential to provide a good blood stream freely circulating and good digestive juices which will make the intestines a poor place for the parasites.

Cleanliness must be insisted upon; correction of the whole hygiene and the diet is necessary for a complete recovery.

It is sometimes necessary to kill the parasites quickly. For this five drops of oil of wormwood, on a lump of sugar, taken after a fast of at least twenty-four hours, is usually efficient. Santonin is used, but sometimes produces symptoms of poisoning. No drug taken to kill the worms is apt to be effective unless the intestinal tract has first been pretty thoroughly emptied of its contents. Constant and thorough cleanliness is the important thing to prevent recurrence.

FILARIASIS

This is a disease of the tropics due to the presence of one of several filaria in the blood. These include filaria sanguinis hominis, both nocturna and diurna, and the less common filaria perstans, filaria demarquai and filaria Phillipinensis. The adult

forms, which live only in the lymphatic nodes, were called filaria Bancrofti and filaria loa. The latter is the cause of the Calabar swellings; its embryonic form is called filaria s. h. diurna.

Filaria s. h. nocturnis is the most common form; the embryos appear in the blood only at night. The embryos, sometimes the adult worms, may block the lymphatic vessels, even the thoracic duct. The mosquito, *Culex fatigans*, is the intermediate host.

The filarial embryos, after entering the mosquito's body, cast their sheaths and bore through the intestine of the insect, enter the body cavity, find their way to the head and there enter the proboscis. Hence they leave the insect when it bites a warm blooded animal or man. The filaria may live for years in the human body without causing symptoms. In other cases, they cause pain in the back, abdomen, or perineum, chiefly from lymphatic obstruction, and lead to various enlargements.

The filaria are found also in the glands, membranes of the testes, pelvis of the kidney, ureter, and bladder, and in the vitreous humor.

The disturbances produced by this nematode are as follows: chyluria (milky urine), sometimes slightly tinged with blood, is due to the rupture of obstructed lymphatic vessels into the urinary tract. The condition is usually intermittent. The patient may be inconvenienced only by the passage of the blood clots from the bladder and the uneasy sensation in the lumbar region. The urine is albuminous, contains fat granules and filariæ, and coagulates upon standing.

Lymph-scrotum is the condition found when the scrotal tissues are greatly thickened, the lymphatic vessels are prominent and may rupture, allowing the chyle to flow over the surface. Inflammatory complications are common.

Lymph vulva is analogous, in the female.

Elephantiasis (arabum) is, at least in some cases, due to this filaria.

Treatment. Methylene blue, which is practically harmless to the human body, is said to be destructive to the filaria. Surgery may be employed for the deformities. No treatment is of much value, except such as may be found necessary to promote the general health of the patient.

Prophylaxis. With the present increase in communication with tropical countries, a guard must be maintained against these infectious agents. Mosquitoes must be eliminated; while the specific mosquito may not live with us, yet it is never safe to depend upon future occurrences so far as biological laws are concerned. Drinking water must be known to be pure, or be boiled, especially in tropical countries. The presence of the worms in the urine suggests suitable disposition of this source of contagion.

TRICHINIASIS

(Trichinosis)

This is a disease chiefly affecting the muscles, due to infection by the *trichina spirilis*. The adult worms live in the intestines; the larvæ become encysted in the muscles. The diagnosis rests upon the symptoms, and upon finding the dead adult worm in the feces, or the embryos in a bit of muscle, excised for the purpose.

The pig is the most frequent intermediate host, though the rabbit, sheep, dog, rat, mouse, and other animals may harbor the worm. The pig may eat the flesh or excreta of the rat or another animal; the larval worms become fully developed in the stomach and intestine of the pig, produce hundreds of thousands of ova, and then the adult worm dies, the ova hatch, and the larvæ burrow out into the body, following the connective tissues, until they reach muscle. They become encysted, and their development ceases for a long time. If the pig is killed, the flesh eaten without being thoroughly cooked, the same story may be repeated in the body of a human host. The end of the story varies, for the human body is rarely eaten by others, and human excreta is usually not eaten by animals.

No definite symptoms are manifested unless a large number of the parasites are eaten, when after a few hours or days, there are symptoms of gastro-intestinal irritation with vomiting, diarrhea, and intense sweating, sometimes varying skin eruptions, and abdominal pain. Toward the end of the second week, great soreness and stiffness develops in the muscles; remittent fever appears; and a peculiar edema begins in the face and spreads to the skin over the affected muscles. Infection of the respiratory muscles may cause intense dyspnea. In long continued cases, the patient becomes emaciated and exhausted; the typhoid state may supervene; and death ensue. In mild cases, the symptoms subside in about two weeks. The disease sometimes appears in epidemics. The trichinæ may be found encysted in the esophagus, pericardium, and lymphatic glands.

The blood shows marked eosinophilia—perhaps above 30 per cent of the total leucocyte count. The affected muscles are tense, with a peculiar rubbery feeling on palpation. Adult worms, sometimes dead, may be found in the stools. A piece of an affected muscle may be excised for examination, when the larvæ will be found coiled up within the muscle fibers.

Treatment. When contaminated food is known to have been eaten, prompt emptying of the digestive tract is urgent. Vomiting may be compelled, if the food has been eaten just previously; urgent purgation, even with drugs, if not more than a few days have intervened since the food was taken. Treatment to facilitate the flow of bile into the intestines is indicated in order to destroy and digest the embryos before they have time to leave the intestinal tract.

After the embryos are once encysted in the muscles, they cannot be dislodged by ordinary means. Hot baths, massage, and local manipulation will aid in securing relief. If the life of the patient can be maintained until the larvæ are encysted, the prognosis is good, and further symptoms are not to be expected. If early diarrhea is present, the prognosis is much more favorable, as by it the embryos are removed from the system.

UNCINARIASIS

(European hookworm disease; miner's anemia; tunnel anemia (or cachexia); brickmaker's chlorosis; Egyptian chlorosis; ankylostomiasis; hookworm disease).

This disease results from infection by the hookworm, either the European type, *ankylostoma duodenale*, or the American form, *Necator Americanus*. The parasite is voided in feces, and, under proper sanitary conditions, dies. When feces are left unprotected, as is the case among the negroes and the poorer whites of the South, the worms with the dirt may be spread around over the ground, and become unrecognizable. Barefooted persons walking in this unclean place are apt to have abrasions upon the soles of the feet, and the worms enter the skin. Negroes harbor and transmit the disease, but suffer few or no symptoms. The skin becomes inflamed, and this is called "ground itch" or "dew itch." The worms are carried by the blood to the heart and lungs, are carried to the pharynx and then swallowed; pass through the stomach and attach themselves to the walls of the duodenum and the jejunum. The worm may be taken with food, or by the habits of the "dirt-eaters." Occasionally water containing the parasite is used in washing, when the worm gains entrance into the body through abrasions of the skin, or by way of the hair follicles or sweat glands. The worms not only feed upon the blood, but their presence is associated with a toxin, either from their own metabolism or from the intestinal bacteria, which enter the system by way of the wounds made by the worm. The coagulability of the blood is markedly decreased, and this adds to the anemia.

Diagnosis. A considerable number of parasites must be present to cause any symptoms. At the stage of incubation there may be gastro-intestinal irritation and perhaps fever. In an advanced condition, anemia is the most characteristic feature; lack-lustre eyes, dull heavy expression, skin of a dirty muddy hue or waxy white is present. Children are stunted in growth of mind and body. As the disease advances, the liver and spleen enlarge somewhat, there is effusion into the abdomen, and flatulent distention producing a pot-bellied appearance. Palpitation, shortness of breath, cardiac bruits due to severe anemia, and edema of the feet are not uncommon.

The blood shows severe secondary anemia, rarely the picture of pernicious anemia; erythrocytes may be less than one million, but are usually about half the normal count; hemoglobin may be one-tenth to one-half the normal amount. Leucocytosis is not common; eosinophilia is marked. The coagulation time is much increased.

The feces contain the ova, sometimes the adult worms. In doubtful cases, small masses of the feces may be incubated for one or two days, when the worms hatch and are easily recognized.

Treatment. The removal of the worms with the least possible harm to the body is indicated. Thymol is a poison which is not absorbed into the body, when carefully given, and which is very toxic to the parasite. The dose varies from eight grains for a child under five years of age, to forty-five for an adult. Thymol is soluble in fats and in alcohol, so that for a day before thymol is given, and for from one to four days after, no fats or alcohol should be taken. The best way to avoid poisoning by thymol is to give the patient charcoal, then no fat or alcohol is permitted until the treatment is completed. When the stools become black, the thymol is given, on an empty stomach. A purgative is given a few hours later. Enemas should be used very freely, in order to facilitate the removal of the injured or poisoned worms. Another dose of charcoal is given, and when the stools again become black, the patient may return to his ordinary diet. The denial of fats to the person so thoroughly accustomed to bacon three times a day is a factor met with difficulty, in dealing with patients of the ordinary class with the disease.

Prophylaxis is more important than treatment. The most urgent requirement is the establishment of proper methods for the disposal of feces, and the enforcement of some cleanly habit of defecation. Negroes present the most difficult problem, since they harbor the worm but suffer little or nothing from its presence. The ignorance and squalor that permits promiscuous defecation adds greatly to the difficulty of reeducation. Mines, brickyards, schools, camps, as well as homes, must be provided with latrines, and the disinfection of feces made compulsory. Railroad trains offer remarkable facilities for the spread of such diseases; fortunately for others, the persons who suffer most from hookworm do not travel very much.

Good, strong shoes must be worn in the infested districts, and the feet washed often. Great care must be taken to avoid any contact with the soil, especially in places possibly contaminated. Drinking water must be known to be pure, or else must be boiled. The entire problem is simply one of persistent cleanliness.

CHAPTER LIII

TREMATODES

Trematodes (Hole-borers) are so called because they enter the body itself, where they may cause fatal symptoms. They are rare in man, but many of them are common among sheep and other animals.

The following list includes the more common of the flukes which may invade the human body:

Distomum hepaticum. (Liver fluke; *Fasciola hepaticum*.)

Distomum pulmonale. (*D. westermanii*; fluke-worm of the lung; *Paragonimus westermanii*.)

Distomum lanceolatum. (*Dicrocoelium lanceolatum*.)

Distomum hematobium. (*Bilharzia*; *Hematobia thecosomum*; *Gynæcophorus*; *Schistosmum hematobium*.)

Distomum sinense. (*D. japonicum*; *Schistosma japonicum* or *S. cattoi*; *Apisthorchos sinense*.)

Other trematodes which may be found causing disease, usually of the liver, in man are: *Amphistoma hominis*; *distoma lanceolatum*; *distoma crassum*; *distoma sibiricum*; and *distoma spatulatum*.

These are all obstinate to treatment usually, are fatal, or persist through life, and gain access to the human body through uncleanly habits, or through drinking contaminated water, or eating contaminated food.

Distomum Hepaticum causes "liver rot" in sheep. In man it affects the liver, causing great bulging of the hepatic area, with tense abdominal walls. Emaciation, diarrhea, ascites, and death from weakness ensue. Treatment is useless, except for the relief of some symptoms.

The life history of this fluke illustrates fairly well the development of all flukes:

"Let us start the history with the mature fluke living in the liver of the sheep. Eggs are laid in large numbers in the biliary passages, and these find their way through the various bile channels into the intestine of the sheep. With the general debris of the intestine these eggs are expelled from the body of the sheep. Should they fall upon the dry earth, they soon perish, but if by chance they drop into the water, they soon develop into a free swimming ciliated worm which, after living for a short time in the water, enters the body of a snail. Here they reproduce themselves asexually and ultimately cause the death of the snail. If this occurs on the land, the young worms soon perish, but if the body of the dead snail falls into water, it quickly decomposes and the young worms are set free. After enjoying their freedom for a short time, they enter the body of another snail, where they again asexually reproduce. This second snail is not as a general thing killed, but it crawls up on the stalks of weeds and herbage growing in the water and there glues itself to the stem

of the plant. If by chance, this stem is eaten by a sheep and the snail swallowed, the parasites are set free in the stomach of the sheep after the snail is digested, and quickly passing through the stomach into the upper intestine, they make their way to the liver, there to begin the round of life again.

"It is practically certain that it is not absolutely necessary for the fluke to enter the body of its second host, and that if the second host is not readily at hand, the free swimming worms at length attach themselves to herbage growing in the water, and in this form they may be directly taken into the stomach of the sheep and the life cycle may be completed in this way. It is also quite certain that if they should be inadvertently swallowed by a human drinking the water, the person may thus become infected with these most dangerous parasites. For that reason all water to which sheep have access should be regarded with great suspicion."—C. A. Whiting.

Water cress, growing in streams to which sheep have access, may be sold for food. The danger of eating salad made from this cress is evident.

Distomum pulmonale causes endemic hemoptysis, a common disease of China, Japan, Korea, and Formosa, and occasionally observed in the United States. The embryo is probably ingested in water, finding its way to the lung where it matures, deposits its ova, and develops many cysts communicating with the bronchi.

The symptoms are a chronic cough with bloody expectoration containing the eggs, occasional hemorrhages, and frequently a secondary anemia. The diagnosis is made by finding the ova in the sputum.

Jacksonian epilepsy may result from cerebral invasion.

Treatment. No treatment is reported as useful.

Prognosis. Uncertain but not usually fatal unless from complications.

Prophylaxis. The only precaution is to be sure that the water source is uncontaminated when in those countries where this disease is endemic and in seaports by using boiled water.

DISTOMA HEMATOBIMUM

(Blood fluke; bilharzia hematobia)

Distomum hematobium causes endemic hematuria or distomiasis which is endemic in Egypt, prevails in South Africa, Arabia, Persia, and west coast of India, and imported cases are known in Europe and United States. The male is about one-half inch long, cylindrical, with a canal, the gynecophoric, in which the female is found. The way of entrance is unknown, but is probably by water or on green vegetables. It travels to the portal vein, where the young specimens are found uncoupled.

The males bearing the females creep to various parts of the body, especially the bladder, urethra, and rectum; the eggs are laid in the tissues but wander and escape in the urine. If the parasites are

present in large numbers, they give rise to inflammation and hemorrhages from the affected mucous membrane, causing endemic hematuria, or if the colon be affected, diarrhea.

These parasites may cause no inconvenience. The most frequent symptoms are irritability of the bladder; dull pain in the perineum, hematuria, chronic cystitis, a rather slight anemia, and if the rectum is involved, straining and tenesmus with the passage of blood and mucus. In severe cases, large papillomata and chronic ulcerative processes may be present. There may be a chronic vaginitis. Few symptoms are occasioned by the presence in the portal vein.

The complications are kidney and bladder calculi. Periurethral abscesses and perineal fistulæ may occur in chronic cases.

Diagnosis is readily made by finding the ova in the bloody urine, in the blood, or in mucus from the stools.

No treatment has been found useful.

Prognosis. The bilharzia may be present for years without producing serious damage. In slight infections the symptoms may disappear, especially in children.

Prophylaxis. Carefulness in regard to the drinking water and in the use of green uncooked vegetables is essential when there is any likelihood of infection.

Quarantine. A laboratory examination of the stools and urine of cases even slightly suspected when from these countries should be made at the immigration ports before these people are allowed to land.

HEPATIC DISTOMIASIS

This disease occurs extensively in Japan, China, India, and some other tropical countries. Imported cases have been reported in Canada and the United States. It is due to infection by the *Distomum siense*, and it usually affects children, especially several members of the same family.

The symptoms are irregular intermittent diarrhea, which may or may not be bloody; gradually enlarging liver, may be pain; an intermittent jaundice; not much fever; after two or three years, dropsy, anasarca, and ascites develop, and the patient becomes much reduced and progressively anemic. There is sometimes a localized epilepsy. The parasite lives in the intestinal canal.

Diagnosis is made by finding the ova in the feces.

Prognosis. Ultimately fatal. A transient improvement may take place, but recurrence comes and the patient dies after many years of illness.

CHAPTER LIV

TAPEWORMS

These are so called from their flat series of proglottids. These, usually called the body of the worm, are merely hermaphroditic units. The entire body of the tapeworm, properly speaking, is what is commonly called the head.

All tapeworms require two hosts for their development. In the carnivorous host the worm secures itself to the intestinal wall and lives upon the food of its host. The proglottids are formed and are lost in the feces. These are voided and male and female elements of the proglottid unite, either during the passage through the intestine or shortly after being set free. The proglottids of some species have the power of wandering a little way. Under favorable circumstances some herbivorous animal eats the vegetation upon which the proglottids have been deposited and the eggs are carried to the stomach of that animal. The eggs hatch, and the larvæ wander out of the digestive tract, into the muscles or other tissues of the new host. Here they encyst themselves, forming what is called a "bladder worm." There may be some muscular pain and fever during this invasion of the herbivorous host. In the course of time, this host is killed, or dies and is eaten by some carnivorous animal. The bladder worms, reaching the stomach of the new host, are set free by the digestion of the cyst, and go on their further development. They attach themselves to the wall of the carnivorous host, form proglottids, and follow in the steps of their ancestors.

In the human being, the worm is usually brought into the body with poorly cooked meat. The use of contaminated water, or the uncleanly habits of children who are allowed to have animal pets, may permit the eggs to be carried into the body, and the bladder worm type may thus be found in the human body. Vegetables which have been fertilized with excrement, or irrigated with sewage, may also be a source of danger. When the human being acts as the herbivorous host, the later development of the bladder worm is prevented, since the human body rarely serves as food for carnivorous animals.

Tapeworms are avoided by cooking all meat very thoroughly. Larvæ are avoided by cooking vegetables whose origin is not known to be wholesome.

The most common of the human tapeworms are:

Bothriocephalus latus. (*Tenia lata*; Broad tapeworm;
Dibothriocephalus latus; *Tenia grisea*.)

Tenia nana. (*Hymenolepis nana*.)

Tenia flavopunctata. (Hymenolepis diminuta or flavopunctata.)

Tenia lanceolata.

Tenia solium. (*T. vulgaris*; *T. cucurbitina*; Pork tapeworm.)

Tenia saginata or *medio-canellata*. (Beef tapeworm.)

Tenia ecchinoccus. (Bladder-worms; Hydatid ecchinoccus; Cysticercus.)

Tenia elliptica. (*T. cucumerina*; *Dipylidium caninum*.)

Diplogonoporus grandis and *sparganum mansoni* are found in the Philippines, and may invade this country later. *Tenia confusa* (Ward) has, so far, been found only in Nebraska.

Bothriocephalus latus is the largest tapeworm known, being sixteen to thirty feet long by one inch wide, with 3,000 to 4,000 segments. The head is small, oval or club-shaped, with a longitudinal groove on each side. It has no proboscis suckers nor hooklets. Each segment is bi-sexual. The intermediate host is some fish, as pike or turbot. It is found in Switzerland, northeastern Europe, and Japan, and among the Finns in the United States.

The general symptoms of *Bothriocephali* and *Teniasis* are: reflex disturbances as itching of the nose and anus, colicky pains, attacks of diarrhea, voracious appetite, mental trouble as melancholia, convulsions and occasionally reflex vomiting, loss of flesh, vertigo, grinding the teeth at night, and gastro-intestinal irritation.

The anemia due to this invasion is particularly severe. It shows a blood picture which is often not to be distinguished from that of pernicious anemia.

Tenia flavopunctata is about a foot long, and the eggs are larger than those of the nana. The head is small, clubbed and unarmed. The larvæ develop in the Lepidoptera.

Tenia lanceolata is 31 to 130 mm. long. The head is globular, very small, the rostellum is cylindrical with a crown of eight hooks. The ova have three envelopes.

Tenia solium, or pork tapeworm, is more common in Europe. It is six to twelve feet long, with 200 to 400 proglottids. The head has a projecting rostellum, upon the summit of which are 30 to 40 hooklets and four lateral suckers. The uterus has about twelve horizontal ramifications to a segment. The larvæ are the simplex scolex, which form the measles of pork (*cysticercus cellulosae*). The intermediate host is the pig.

Tenia nana is from two to three centimeters long by one-half millimeter broad with about two hundred segments. The head has four round suckers at the base of the rostellum which can be inverted. The intermediate host is unknown. It is especially common in children.

Tenia elliptica is five to eight inches long and one-fourth inch broad. The worm spends its larval stage in the bodies of dog-fleas and the adult stage in the intestines of the dog. Children playing with infected dogs can very readily become infected with the mature worm, or they may swallow the fleas.

Tenia saginata, or beef tapeworm, is the most common in this country. It is fifteen to twenty feet long, with a small head surmounted by four powerful sucking cups, but no rostellum or hooklets. The uterus is finely branched. The adult worm, strobile, lives in man and the embryo or scolex lives in cattle. The larvæ are *cysticercus bovis*.

Treatment. The different kinds are differently susceptible to substances poisonous to them, but often not poisonous to the host. The drugs usually used to kill them include santonin, extract of male fern, thymol, etc. A physical agent is found in flaxseed and pumpkin seed, which mechanically loosens the head and permits its elimination.

In any case, a day or a few days of fasting is required in order to remove the protecting food material from the worm, and to cause its weakening. Free flushing of the colon is useful, in order to encourage intestinal activity. Free drinking of water serves the same purpose, and also it keeps up the strength of the patient. The feces must be watched, in order to be sure that the worm is thoroughly removed.

A full cellulose diet, with fasting every other day, plenty of water and plentiful washings of the colon, sometimes lead to the evacuation of the worm, with no other anthelmintic.

Persons afflicted with tapeworm should thoroughly sterilize the stools and the clothing, carefully avoiding contamination of themselves or others.

HYDATID DISEASE

Tenia echinococcus is the smallest of human tapeworms. It is less than half an inch long, and has four segments, of which the last is mature. In this worm, the man acts as the vegetarian host; the dog, rarely other domestic animals, acts as carnivorous host. The ova, embryos, or proglottids are voided in the excrement of the dog, and are dried and blown by dust, or the fecal masses are handled by man, or in some other way the microscopic organisms reach the food of man, and are swallowed. The young larvæ undergo further development, push their way through the walls of the alimentary tract, and become encysted in other organs of the body. These cysts grow to considerable size; and the parasites multiply, producing daughter cysts; the ultimate lobulated cyst forms a hard tumor, filled with a fluid which contains the scolices and hooklets of the parasite. After multiplication beyond the nutri-

tive possibilities, the parasites may die, the cyst become thickened, the fluid dries, and ultimately only a hard, usually harmless tumor is left. The wall of the cyst may rupture, in which case serious symptoms are to be expected. Infection with pyogenic bacteria may cause abscess formation.

Diagnosis is made from finding hooks or scolices in the aspirated fluid.

The liver is far more often affected; the lungs and kidneys less often, and the brain and other organs only very rarely.

The only treatment is the surgical removal of the cyst, when this is accessible.

Prophylaxis. The disease is easily avoided. Dogs ought not to be permitted to live except under supervision. Those who care for dogs should keep them away from human food, and should be cleanly in their habits. Every bit of fecal material should be considered potentially dangerous. Dogs may be protected from infection by feeding them only meat that is known to be free from infection, and, for the most part, meat that has been well cooked. Dogs are too dangerous to be allowed to play with small children; if larger children are permitted to play with them, the most eternal vigilance must be observed in regard to cleanliness and health.

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