

lymphogenous, and has the character of a tuberculous periangiocholitis. In very rare cases the infection may take place through the bile ducts themselves. In the great majority of these cases, however, the tuberculous process begins around the bile duct and invades its mucosa only secondarily. Hematogenous hepatic tubercles may or may not be associated with this condition.

The liver and the peritoneum may be involved at the same time, but this organ is rarely involved from the latter or from the omentum.

In experimental hepatic tuberculosis in animals the process runs a more acute course, being characterized by larger areas of necrosis.

The clinical symptoms of hepatic tuberculosis are slight, and the condition can but rarely be distinguished from the miliary or chronic process with which it is associated. The occurrence of icterus or the rapid development of a painless ascites points to the development of tuberculosis of this organ. In children the organ may become enlarged and sensitive. *Aldred Scott Warthin.*

MICTURITION, DISORDERS OF.—Given normal urine and a normal genito-urinary tract, micturition is accompanied and followed by no other sensation than one of relief, and is performed normally from four to twelve times in twenty-four hours, depending upon the temperature and humidity of the air, the amount of exercise taken, the intensity of the mental occupation and the degree of anxiety which it entails, the volume of water drunk, and—to a less extent—upon the kind of food ingested.

Many of the disorders of micturition are directly augmented or exaggerated by excessive acidity of the urine on the one hand, or excessive alkalinity on the other; a few of the disorders are directly caused by these conditions.

With rare exceptions the several disorders are interdependent and correlative. No one disorder may be said to occur alone.

For convenience in reference, the disorders of micturition are given alphabetically; but the several possible causes of each disorder are arranged as nearly as possible according to the relative frequency of their clinical occurrence.

Diminished Stream.—This disorder may be either (1) temporary, or (2) constant until relieved by surgical intervention.

1. When temporary or of short duration a diminution in the size of the stream points to a transient obstruction, e.g., congestion at some point or zone in the urethra or a urethral spasm.

As a result of inflammation, any part of the urethral canal may become swollen to the extent of obstructing the urinary stream to a greater or less extent. Thus we may have a diminished stream due to a severe acute urethritis affecting the anterior urethra, with or without involvement of the posterior urethra. It may also be observed in connection with an acute prostatitis.

Any lesion of the urethra—e.g., organic stricture, especially if irritable, or a granular patch—is capable of exciting urethral spasm, especially in neurotic individuals. The diagnosis must be made partly by exclusion, but chiefly by exploration of the urethra with a bougie-à-boule, sound, and endoscope.

2. A diminished stream which either shows no tendency to grow larger or undergoes a progressive further diminution in size, points to an organic obstruction. In all cases of this nature of long standing the resulting atony of the bladder plays an important though secondary part in the character of the stream.

Organic stricture, when neglected, gives a stream which tends constantly but slowly to diminish in size. If the stricture be situated at or near the meatus the stream will be small and scattering, but forcible; if it be situated deeper within the canal, the forcible projection will be lacking. When the stricture becomes inflamed from any cause, the diminution progresses rapidly and may persist until complete retention results.

Prostatic enlargement has among its early symptoms a diminution of the urinary stream. As micturition begins, the stream is small and feeble, sometimes dribbling; it then becomes larger and, except in the later stages of enlargement of the prostate, attains a fair volume and force, only to become again small and feeble and usually dribbling as the act is completed.

Chronic contraction of the prostatic fibres surrounding the neck of the bladder gives the same symptoms as does commencing enlargement of the prostate. In the differential diagnosis the chief point is the age of the patient; in many cases the diagnosis cannot be made without an exploratory perineal section.

Periurethral abscess may cause a narrowing of the urethra and thus diminish the stream; when situated in the bulbous portion the abscess may cause acute retention.

A partial plugging of the urethra by a small calculus arrested on its way from the bladder produces a diminution of the stream that becomes more marked as inflammatory congestion advances. If the calculus is rough there will follow an oozing of blood from the meatus, unless the urethral mucous membrane happens to be deeply cicatricial at the point of arrest. Palpation along the course of the urethra—per rectum for the posterior portion—rarely fails to detect the calculus. Instrumental exploration usually is conclusive.

A partial plugging of the outlet of the bladder by a pedunculate tumor or a small movable calculus will give rise to a diminished stream accompanied by symptoms more or less pathognomonic of the lesion present. The diagnosis is materially aided by the fact that immediate relief is obtained by dorsal decubitus or by the dislodgement of the obstruction by means of a sound or searcher.

Urethral polypi diminish the stream in proportion to their size. When they are very small there may be no symptom except hemorrhage.

Dribbling.—In addition to the dribbling that characterizes the first and second forms of incontinence, and which is sufficiently described in subsequent paragraphs, still other types of dribbling may be recognized. Thus we have:

1. The involuntary, painless escape of a few drops of urine at the end of micturition.

2. The voluntary, not always painless, escape of a few drops of urine at the beginning of micturition.

3. The urine is voided in drops throughout micturition.

(1) In prostatic enlargement the dribbling of a few drops of urine at the end of micturition is a common and early symptom. It is independent of the degree of vesical atony which may be present; in fact, it may exist without the presence of any vesical atony whatever.

In chronic urethritis (anterior or posterior or both) the dribbling, when present, is constant until the muscular tone of the urethra has been restored.

In stricture of the urethra of large calibre the final drops of urine are caught behind the stricture and dribble out into the clothing.

In chronic contraction of the prostatic fibres surrounding the neck of the bladder the dribbling at first is an intermittent symptom; later, it is constant.

(2) In prostatic enlargement the voluntary and not always painless escape of a few drops of urine occurs at the beginning of micturition. It is preceded by hesitancy and gradually gives way to the full stream, which in turn dies away and ends with dribbling.

(3) In filiform stricture of the urethra, if it has existed for a relatively short period of time, and consequently is associated with only slight atony of the bladder, the stream is of a dribbling character, and is produced with more or less effort.

In acute prostatitis (including prostatic abscess) and in acute seminal vesiculitis the urine is voided in drops when retention threatens, either from mechanical obstruction or as the result of reflex irritation.

Frequency and Urgency; Pain and Tenesmus.—Frequency of urination may be normal, or physiologic, within wide limits. It is abnormal, or pathologic, when

accompanied by urgency, pain or tenesmus, or when due to a tangible, pathologic condition or to that obscure pathologic state called a neurosis. Frequency rarely occurs without at least a trace of urgency; frequency and urgency are practically never without a degree of initial or terminal pain and tenesmus. Frequency due to quantity alone is not included, it being dependent, strictly speaking, upon a disorder of elimination.

In acute posterior urethritis, when this is severe, frequency and urgency are marked; a lesser grade gives only frequency; the mildest grade of all does not occasion any disorder of micturition. In every case of acute posterior urethritis a digital rectal examination should be made to ascertain whether acute prostatitis and acute seminal vesiculitis are present.

In chronic posterior urethritis there is, in most cases, a very trifling frequency which shows a tendency to increase and may become complicated by urgency, as well as occasionally by pain and tenesmus, during an exacerbation of the local congestion. In a few cases frequency is constant, and is accompanied by more or less urgency and slight initial and terminal pain, with very moderate tenesmus.

In organic urethral stricture the frequency is due to the maintenance of a chronic posterior urethritis. Usually it is diurnal only. Later on, chronic partial retention is added, and, the symptoms becoming exaggerated by the congestion due to this retention, urgency and possibly pain and tenesmus develop.

In acute prostatitis and acute seminal vesiculitis (including prostatic abscess) there may be, in the early stage, simply increased frequency, but usually both this symptom and urgency coexist from the outset, and with them are associated more or less pain and tenesmus. Very rarely there is no disorder of micturition. Digital rectal examination affords the only means of establishing the diagnosis.

In chronic prostatitis and chronic seminal vesiculitis a slight, uncomplicated, diurnal increase in frequency is a characteristic of the disease. It tends to increase and urgency develops during the occasional mild exacerbations to which the coincident posterior urethritis is liable.

In prostatic enlargement, uncomplicated increase in frequency, especially if nocturnal, in a man forty-five years of age or older, who gives no history of a previous increase in frequency, is pathognomonic of the early stages of this affection. The frequency increases with the enlargement, and sooner or later becomes diurnal as well. Still later it becomes complicated by urgency and pain, and then by tenesmus, all of these depending upon the degree of prostatitis and urethrocystitis that have developed, and in some cases (especially those of an advanced type) upon the presence or absence of a calculus.

All varieties of acute cystitis cause increased frequency of micturition. If the inflammation be severe, or if it centre about the neck of the bladder, as it commonly does, there will be extreme frequency with urgency, which latter symptom may amount to a slight incontinence on occasions. There will also be pain and tenesmus, the latter sometimes amounting to strangury. As a rule, however temporary relief quickly follows the terminal pain and tenesmus.

In chronic cystitis frequency of micturition may be absent during the quiescent periods and during mild exacerbations. Urgency is rare. Unusual frequency with urgency, pain and tenesmus, denotes a sharp exacerbation. Oft-recurring exacerbations in cases with little or no prostatic enlargement furnish strong presumptive proof of the presence of a calculus in the bladder; and when such exacerbations occur in cases in which the prostate is enlarged, they indicate either that a fresh infection has taken place, or that there is a calculus in the bladder, or both. When a sharp hæmaturia accompanies the exacerbations a differential diagnosis will be required between ulceration—simple, gonorrhœal, or tuberculous,—a calculus, and a neoplasm.

When a calculus is present in the bladder, diurnal rather

than nocturnal increase of frequency is a characteristic of the condition. Micturition is usually accompanied by pain, sometimes also by tenesmus, depending upon the size of the calculus, the character of its surface, and the degree of cystitis. Thus the increased frequency may become practically incontinence. The terminal pain is referred usually to a point about an inch back from the meatus. When the calculus is small and mobile, and therefore capable of rolling against the vesical outlet, there occur sudden attacks of increased frequency, urgency, pain and tenesmus, with a minimum of cystitis. Recumbency lessens the suffering; occasionally it gives complete relief. Exercise, especially that which jolts the pelvis, aggravates the symptoms.

In pyelitis, when acute and of high grade, the frequency, urgency, pain, and tenesmus referred to the neck of the bladder, may simulate vesical calculus. Chronic pyelitis gives at most a slight increase in frequency of micturition.

The presence of a small tumor in the bladder, if it be seated at a point remote from the outlet, may not affect micturition. In a case of this character an uncomplicated hæmaturia is the only symptom that would point to the presence of the tumor. Larger tumors produce increased frequency which is in direct proportion to their size; they also produce urgency, pain, and tenesmus, all of which symptoms depend for their severity upon the location and mobility of the tumors. This applies also to polypi in the prostatic urethra.

In ulcer of the bladder, simple, gonorrhœal or tuberculous, urgency depends upon the proximity of the ulcer to the vesical neck. If it be situated within the neck, there will be more or less pain and tenesmus, sometimes initial as well as terminal, with more or less hæmaturia.

In vesical tuberculosis an otherwise unaccountable increase in frequency, diurnal and nocturnal, is an early symptom. Cystoscopy often aids in the diagnosis. Later, the presence of urgency, pain, and tenesmus, and their severity, depend upon the proximity of the lesion to the vesical neck and upon the extent of the lesion independently of its location. In advanced cases the pain and tenesmus usually are very severe and may be accompanied by hæmaturia. A negative examination for tubercle bacilli in the urine is not conclusive.

In renal tuberculosis, renal calculus, and ureteral calculus, when not complicated by cystitis, these affections may give rise to an uncomplicated diurnal increase in frequency. Renal colic, due to any one of the above causes or to movable kidney, may be accompanied by reflex increase in frequency, urgency, pain, and tenesmus.

Among the acute symptoms associated with intermittent hydronephrosis there is usually more or less increase in frequency of micturition, often accompanied by urgency, pain, and tenesmus; the severity of these symptoms depending upon the cause of the hydronephrosis. As the attack subsides and the pent-up urine is liberated, there is likely to be a slight, uncomplicated, transient increase in frequency due to the sudden increase in the quantity of the urine.

In tuberculous prostatitis the incipient stage and occasionally a more advanced stage give, as a rule, no urinary symptoms. When the disease is well advanced it causes increased frequency and more or less urgency, accompanied by terminal pain and tenesmus so sharp as to simulate vesical calculus. The diagnosis is established by exclusion and by the discovery of nodules in the prostate on digital rectal examination. A negative examination for tubercle bacilli in the urine is not conclusive.

Increase in frequency of micturition occurs as a neurosis in young and neurotic individuals, and possibly also in neurasthenic men. The increased frequency is diurnal and may become exaggerated by the large quantity of urine which these patients sometimes excrete. In some cases any attempt to postpone the act of micturition causes severe pain. The differential diagnosis between this neurosis and incipient vesical tuberculosis is sometimes difficult without the aid of cystoscopy.

In hernia of the bladder, before cystitis has developed, increase in frequency is the only urinary symptom. The pathognomonic signs are: a more or less tense, fluctuating tumor in the usual site of an inguinal hernia; its disappearance under gentle manipulation while the patient is recumbent; his ability to rise and void another volume of urine, although he emptied his bladder immediately before the reduction; and, finally, the reappearance of the tumor when the bladder is distended with fluid.

In contracted bladder the increase in frequency is as pronounced during the night as it is during the daytime. When the contraction is due to interstitial changes following long-standing chronic cystitis from any cause, or when it is due to advanced tuberculosis, progressive or stationary, there are increased frequency, some urgency, and more or less terminal pain and tenesmus.

Two very rare conditions—a congenitally small bladder and an undeveloped bladder due to a long-neglected incontinence in childhood that has resulted in the habit of frequent micturition—give equal diurnal and nocturnal increase in frequency as the only symptoms so long as there are no complications.

In chronic lesions of the spinal cord, a degree of increased frequency, which may well be described as an irritability of the bladder, is common in the earliest stages. Later on, there occurs an increase in frequency which is dependent upon distention of the bladder.

Hesitancy or Slowness in Starting the Stream.—As a pure neurosis hesitancy is very common; it is seen in the difficulty which certain patients experience when they attempt to urinate in a hurry or in the presence of others.

In prostatic enlargement hesitancy is an early and practically constant symptom. In chronic contraction of the prostatic fibres surrounding the neck of the bladder it is equally common.

In acute inflammatory conditions of the urethra hesitancy is due either to urethral spasm as such, or to an inhibitory effect through fear of the *ardor urinae*.

Chronic lesions of the urethra—*e.g.*, granulations or an irritable stricture—sometimes produce a momentary urethral spasm.

In acute and chronic inflammatory affections of the prostate and seminal vesicles hesitancy may result either from the slight mechanical obstruction offered or from a slight urethral spasm.

Painful diseases of the rectum—*e.g.*, ulcer, fissure, or inflamed hemorrhoids—not infrequently produce a momentary urethral spasm.

Incontinence.—Three forms are recognized: 1. A constant, passive, more or less continuous flowing away of the urine. 2. An involuntary escape of a few drops of urine on occasions. 3. An inability to retain sufficient urine in the bladder to constitute an act of micturition, or the constant voluntary—sometimes involuntary—emptying of the bladder by the expulsion of a few drops very frequently. (The nocturnal enuresis of children is not included, as it does not come properly under the title of this article. See *Enuresis*.)

1. This first form is true incontinence. Ordinarily it occurs under only two conditions: (a) overdistention of an atrophic bladder; (b) atony of the vesical sphincters, with or without atrophy.

Prostatic enlargement is the most classic cause of overdistention with atrophy and therefore of true incontinence in a man past the age of fifty-five. The incontinence is chiefly, if not wholly, nocturnal. Filiform stricture of the urethra, if of long standing and associated with marked atony of the bladder, bears the same relation to true incontinence in younger men. Here the incontinence is chiefly diurnal, and often alternates with acute retention.

Among the diseases of the spinal cord locomotor ataxia (*tabes dorsalis*) and other scleroses often cause atony of the bladder, thus permitting overdistention and true incontinence. Spastic contractions of the vesical sphincters will foster the overdistention; sensory disturbances causing anaesthesia of the region will augment the incon-

tinence. On the other hand, the reverse—*viz.*, atony of the sphincters and hyperaesthesia—may obtain.

2. This form of incontinence presents many grades and is a symptom of several different lesions. The occasions on which it occurs are: exacerbations in the causative lesions, and any sudden unusual pressure upon the bladder, such as takes place in coughing, sneezing, jumping, or lifting a weight. The causative lesions are: chronic posterior urethritis; ulcers near the neck of the bladder, simple, gonorrhoeal, or tuberculous; vesical calculi; vesical tuberculosis, especially when affecting the neck, whether with or without ulceration; renal tuberculosis ("slight incontinence with frequency, in the absence of other lesions, is strongly suspicious of renal tuberculosis"); contracted bladder due to anteaecedent extreme pericystitis or interstitial cystitis; chronic prostatitis; slight atony, or "relaxation," of the vesical sphincters without atony of the bladder.

3. This is the least characteristic form of incontinence. It is merely an extreme frequency with uncontrollable urgency, and is therefore complicated by more or less pain and tenesmus. The lesions that cause it are: severe acute posterior urethritis; acute cystitis; a large rough, movable calculus, or a collection of faceted calculi, occupying the cavity of the bladder and partially distending it; a small, rough calculus, lodged in the prostatic urethra; renal calculi, causing attacks of severe colic.

Interrupted Stream.—This is also known as the "stammering stream."

The causes of this disorder operate either (1) mechanically, by intermittent obstruction, or (2) reflexly, by intermittent excitation of the vesical sphincter. Under the first class are: Prostatic enlargement; chronic contraction of the prostatic fibres surrounding the neck of the bladder; a small, rounded, mobile calculus; a pedunculate tumor; a blood clot. Under the second class are: Acute, subacute, and chronic urethritis; stricture of the urethra, both of large and small calibre; neurasthenia and neurotic tendencies.

Retention.—Confusion arises from the use of the word retention when suppression is meant. Retention of urine applies only to its discharge from the bladder, while suppression of urine applies only to its excretion by the kidneys.

Retention is due either to a mechanical obstruction, which prevents the escape of urine from the bladder, or to a diminished expulsive power on the part of this organ: this latter condition being due in turn to impaired innervation of the muscle coat, or possibly to some actual lesion of the muscle. In obstructions of long standing the retention is due to a combination of both these factors, for the hypertrophy which developed in the wall of the bladder as a result of its early efforts to overcome the obstruction finally gives way to an atrophy, the degree of which is in direct ratio to the chronicity of the obstruction.

I. Acute Retention.—The cause may be (a) organic obstruction; (b) spasmodic obstruction; (c) a combination of both; (d) a sudden impairment of the bladder function, with or without spasm of the sphincter.

(a) The following are among the more important organic obstructions: a stricture of small calibre, when inflamed by sexual and alcoholic excesses, by excessive coffee drinking, or by exposure to cold and wet; a prostatic enlargement, when acutely congested or inflamed—a condition to which it is peculiarly liable after any excesses in venery, eating, and drinking, and as a result of constipation; acute prostatitis, simple or gonorrhoeal, especially when resulting in an abscess that is pointing toward the bladder; a rupture of the urethra, complete or partial; plugging of the internal meatus, *e.g.*, by a small, movable calculus, a pedunculate vesical tumor, or a blood clot; and, finally, periurethral abscess, especially when located in the bulbous portion. Among the rare organic obstructions should be mentioned: Acute posterior urethritis, severe acute seminal vesiculitis, tuberculous prostatitis, and papilloma of the urethra.

(b) Spasmodic obstruction—*i.e.*, obstruction caused

by spasm of the sphincter—occurs under the following circumstances: in acute anterior urethritis, occurring either independently or in connection with an existing urethral lesion (*e.g.*, a stricture or a granular patch); when the urethra is the seat of a comparatively slight trauma, inflicted by a blow, by rough instrumentation, or by irritating injections; when there are rectal lesions, including fecal impaction and even constipation of only two or three days' standing; after operations, minor as well as major, on the urethra or on the rectum or some contiguous region, whether performed under local, spinal, or general anaesthesia; in the presence of shock, post-operative or traumatic; as a result of enforced postponement of micturition, especially if there is present any lesion of the urethra, prostate, or seminal vesicles; * in exhausting diseases, such as typhoid fever, pneumonia, peritonitis, and meningitis; in vesical tuberculosis; in pyelitis, simple, gonorrhoeal, tuberculous, or due to a calculus (the last-named occasionally causes acute retention instead of the more usual frequency and urgency of micturition); in hernia of the bladder—a rare occurrence; and, finally, in neuroses and neurotic conditions in general.

(c) A combination of organic and spasmodic obstructions is observed in severe acute posterior urethritis, when the swelling is extreme and when spasm is excited. It is also observed in severe acute prostatitis and in seminal vesiculitis.

(d) Sudden impairment of the bladder function, with or without spasm of the sphincter, may be observed in rupture of the bladder, whether intra- or extraperitoneal, and also in those injuries or diseases of the central nervous system which result in the production of a sudden hemiplegia or paraplegia, with or without coma.

II. Chronic Retention.—This is either partial or complete. Chronic partial retention results when only a portion of the urine is spontaneously voided, the rest remaining in the bladder as "residual urine." Chronic complete retention exists when all spontaneous micturition has been lost and all the urine has to be drawn by catheter.

In prostatic enlargement there is at first only partial retention. This advances to complete retention if, the true state of affairs not being recognized, the bladder is allowed to become atonic through overdistention. Thus arise the cases of chronic complete retention which have apparently assumed this character from the outset. An intercurrent acute retention is often the first symptom for which the patient seeks advice, he having disregarded the symptoms of the partial retention.

The remarks made in reference to prostatic enlargement in a preceding paragraph apply with equal appropriateness to chronic contraction of the fibres surrounding the neck of the bladder. This chronic contraction, however, is less frequent than prostatic enlargement, and consequently it gives rise less often to chronic complete retention.

In filiform stricture of the urethra the chronic retention is only partial; it will disappear after appropriate treatment of the stricture unless the latter has been neglected for many years.

In chronic prostatitis, in tuberculosis of the prostate, and in vesical tuberculosis a small quantity of residual urine is an almost constant objective symptom.

As further causes of chronic retention may be mentioned: habitual failure to empty the bladder completely by reason of hurry or indifference; and frequently repeated prolonged postponement of micturition, thus causing frequent overdistention.

While the retention which originates in some chronic lesion of the spinal cord is only partial, it is nevertheless characterized by a large volume of residual urine—from five to twenty ounces. In the mild cases the amount of the residual urine will fluctuate even under the best conditions, often falling to two ounces. On the other hand,

* In these cases the spasm is usually of short duration, and it is rarely found necessary to resort to the use of the catheter in order to secure relief for the patient.

the amount is fairly constant in the more advanced cases, and the retention is associated with frequency, or with incontinence, or with both. *James Pedersen.*

MOUTH, DISEASES AND INJURIES OF.—I. STOMATITIS.—"This word, which from its derivation signifies inflammation of the mouth, is held to include inflammatory affections of the cavity of the mouth as far back as the soft palate. Any abnormal condition of an inflammatory character which involves the gums, the tongue, or the inner surface of the cheeks, is included, therefore, under the designation of stomatitis. Experience shows that there is little tendency toward limitation to any one of these structures—usually the entire cavity of the mouth partakes of the diseased condition.

"The affections included under this name are, in great part, limited to the age of childhood. Adults are never the subjects of certain forms of the disease, and seldom suffer from any variety of it, save as part of some other morbid condition. Not infrequently, however, stomatitis is nothing more than a part of such general condition. Diphtheria sometimes involves the mouth as well as the tonsils, pharynx, and palate; inflammation, with pustulation in the mouth, may occur in smallpox, varioloid, and varicella; facial erysipelas often presents an inflamed condition of the mouth; measles, Röhtheln, and syphilis are accompanied by characteristic mouth affections; and many drugs, such as mercury and iodine, in addition to the mineral and other stronger acids, produce an abnormal condition." (From former edition of REFERENCE HANDBOOK.)

It must be remembered that in children there is a tendency to put anything and everything—all germ-laden—into the mouth; hence one reason why stomatitis is so much more common at that age. The troubles incident to the period of dentition have also a causal relation to stomatitis.

As remedies for stomatitis in general, the following have been used. As mouth washes, in the form of solutions: Potassium permanganate, gr. ij. to ʒi.; potassium chlorate, gr. x.-xx. to ʒi.; boric acid, saturated solution; carbolic acid, one-per-cent. solution; hydrogen dioxide, 15 vols. per cent.; silver nitrate, gr. x.-xx. to ʒi. Also the solid stick of silver nitrate may be employed; and potassium chlorate may be given internally in doses of gr. v.-vii. q. 4 h.; in the case of children, however, the latter remedy must be used with care. Tonics of iron, quinine, nuxvomica, and cod-liver oil are required. The diet must be liquid, either warm or cold, and must be generous and sufficient; chipped ice and iced water are acceptable to the patient. The mouth must be regularly washed or, if that is not possible, sprayed. If the gums are spongy, they should be painted with tincture of myrrh.

2. CATARRHAL STOMATITIS.—(*Synonyms*: Acute stomatitis, Erythematous stomatitis, Pultaceous stomatitis, Simple stomatitis, Superficial stomatitis.)

Etiology.—It most commonly occurs in infants and children, but it is also found in adults. The most common cause is an irritant either chemical or mechanical, such as overheated or too highly spiced food, acids, alkalies, very hot beverages, broken or carious teeth, and the excessive use of tobacco or alcoholic drinks. In the case of infants irritation caused by a coral, by difficult dentition, by a poorly developed or unclean nipple, or by a feeding bottle which has not been properly cleansed, may produce stomatitis. An excess of sugar or starchy food, and also exposure to cold, are causative factors in some cases.

Symptoms.—These are the classical symptoms of inflammation: redness, first in patches, later more general; swelling, chiefly of lips, cheeks, gums, and tongue, the latter often showing the impression of the teeth; disordered secretion—in the adult the mouth is at first dry, later there is an increased flow of saliva with secretion of considerable mucus; at the same time the breath is fetid, and in children there is dribbling accompanied with considerable tenderness, so that the infant refuses to nurse or

to allow the mouth to be cleansed. In adults the pain is as a rule slight, though it may be considerable, and, in conjunction with the dryness of the mouth seen in the early stages, renders mastication difficult. The disorder usually lasts about a week. In this form of stomatitis there is no ulceration.

Prognosis is good in acute cases, but infants are liable to suffer from inanition owing to the pain experienced in taking food. In chronic cases, generally due to alcohol or tobacco, the offending substance must be withdrawn.

Treatment is chiefly hygienic; whenever possible the causes must be removed and strict cleanliness insisted upon. In mild cases mouth washes of borax, of potassium chlorate, or of sodium bicarbonate may be useful; in the severer forms silver nitrate in one-per-cent. solution should be applied. At the same time general treatment in the shape of tonics and salines must not be overlooked. In infants the feeding apparatus must be kept scrupulously clean.

3. **CROUPOUS OR MEMBRANOUS STOMATITIS** is an inflammation of the mouth with the formation of a false membrane of a yellowish-white or grayish-white color. The disease may be diphtheritic or it may be due to gonorrhoea or syphilis; it is also caused by extremes of temperature (as frost-bite) and by chemical irritants. This form of stomatitis is much the same as diphtheria, but without the Klebs-Loeffler bacillus. The pseudo-membrane is apt to ulcerate and become detached from the subjacent tissue which then shows marks of erosion.

Treatment.—If the inflammation is due to diphtheria, give antitoxin; in most other cases the treatment is the same as in other forms of stomatitis, and consists of good food, proper hygiene, antiseptic and astringent mouth washes, tonics, and stimulants.

4. **ULCERATIVE STOMATITIS**.—(*Synonyms*: Fetid stomatitis, Phlegmonous stomatitis, Stomacace, Putrid sore mouth, Phagedenic gingivitis.)

This form of stomatitis is a serious condition in which there is a superficial necrosis of the mucous membrane of the mouth, with subsequent ulceration.

Etiology.—The disease is probably caused by a micro-organism, though none has as yet been isolated. It is generally found in children between the ages of four and fourteen; it may be epidemic, and is apt to accompany or follow improper feeding, infectious diseases, also poisoning by mercury, arsenic, lead, or phosphorus. Unhygienic surroundings and any local irritations are potent factors in this as in the other forms of stomatitis.

Symptoms.—The gums of the lower jaw chiefly, are spongy, painful, swollen, and bleed readily; later on, the cheeks and lips become affected. The gums also recede from the teeth, which become loosened and may fall out; ulcers may also occur round the sockets of the teeth, and a purulent fluid forms between the gums and the teeth, as well as between the teeth. There are profuse salivation, very fetid breath, and swelling of the neighboring lymph glands. In chronic cases the periosteum of the lower jaw becomes involved, and areas of necrosis ensue. There is great debility, and nausea and diarrhoea, caused by swallowing the profuse fetid saliva, are also apt to be present.

Treatment is on the same lines as in other forms of stomatitis. On account of the disagreeable odor of the breath the patient should be isolated. Mouth washes are required, but in case potassium chlorate is used care must be taken that no untoward results occur, particularly in children. Hydrogen peroxide or dioxide makes an admirable mouth wash.

5. **BEDNAR'S APHTHÆ**, also called *Plaques pterygoïdiennes*, or *aphthæ of the palate*, is a variety of ulcerative stomatitis. It is sometimes of traumatic origin, being due to pressure. It occurs generally in bottle-fed children who have unhygienic surroundings and are badly cared for, and is caused by the pressure on the hard palate of an artificial nipple or of the nurse's finger, or of a swab used in cleaning the child's mouth. But in breast-fed children it may also be found; it is then caused by the pressure of the infant's tongue on the thin mucous mem-

brane, during the act of nursing. As a rule the affection is of a mild character, and is found on the hard palate near the alveolar process, but in badly neglected cases the ulceration may be both deep and extensive. In mild cases no special treatment is required beyond the removal of the cause; while in more severe cases a five-per-cent. solution of silver nitrate should be applied.

6. **APHTHOUS STOMATITIS**.—(*Synonyms*: Follicular stomatitis, Vesicular stomatitis, Herpetic stomatitis, Aphthæ, Canker.)

In this form of stomatitis, which is more common than the catarrhal variety, the mucous membrane of the mouth is hyperæmic and is characterized by grayish or yellowish vesicles which are liable to ulcerate, and are chiefly found on the margin and frænum of the tongue, and on the cheeks; also on the inner surface of the lower lips, near the junction with the gums.

Etiology.—It is probably due to some specific germ, but none has yet been isolated. It is found most commonly in children, and, if not idiopathic, is due to improper food, indigestion, one of the fevers, lack of hygiene and general uncleanness of the mouth.

Symptoms.—The child is fretful on account of the pain; dull and feverish; the mouth is hot; the saliva flows freely and may irritate or excoriate the chin and neck. The ulcers described above are surrounded by red areolæ and bleed readily if any attempt is made to remove the grayish-white base. The process lasts about a week.

Prognosis is good. The sores may be treated with silver nitrate; local washes of potassium chlorate or potassium permanganate should be used; food, tonics, and stimulants are required.

7. **PARASITIC STOMATITIS**.—(*Synonyms*: Mycotic stomatitis, Stomatocystosis, Thrush, Muguet, Soor.)

Thrush is one form of parasitic stomatitis, but it is the most important variety. The disease is due to a vegetable parasite, and consists of white flake-like patches on the mucous membrane of the mouth and tongue. These patches consist of epithelium, leucocytes, and the spores and filaments of a fungus. The fungus or mould has been described as *oidium albicans*, *saccharomyces albicans*, *oidium lactis*, *mycoderma vini*, and *monilia candida*. The fungus displays remarkable polymorphism, having a great tendency to spore formation in a solid medium, and to filament formation in a liquid medium. The fungus tends to grow rapidly, particularly upon an unclean surface. The spores lodge between the epithelial cells; then separating the different layers and destroying the superficial layer they penetrate down into the connective tissue. The disorder is apt to become epidemic in institutions where there are many children, being transmitted by unclean feeding apparatus. The spots or patches look like curdled milk, but are covered with epithelium and are readily removed without bleeding, being thus differentiated from aphthous or follicular stomatitis.

Etiology.—The disorder is found generally in childhood, and occurs in the debilitated or uncleanly, more particularly in bottle-fed infants. It is apt to follow catarrhal stomatitis; and the growth of the fungus is favored by mouth breathing and by the restricted movements of the tongue which are necessitated by many forms of stomatitis.

Symptoms.—The symptoms are as a rule slight and much like those of catarrhal stomatitis. The saliva is acid and decreased in quantity; and the mouth is apt to be dry.

Treatment, as in other forms of stomatitis, consists in absolute cleanliness, the employment of mouth washes of an antiseptic character, the observance of a proper hygiene, and the administration of good food, tonics, and stimulants.

8. **GANGRENOUS STOMATITIS**.—(*Synonyms*: Noma, Cancrum oris, Water cancer.)

This is an uncommon but very formidable complaint, and is almost invariably found in young children. It is favored by poor hygienic conditions, lack of food, and general enfeebling diseases. It may follow an ordinary ulcerative stomatitis, but the two conditions are very

different. Probably some micro-organism is the cause of the disease, but so far it has not been isolated. Cancrum oris must not be interpreted as an ordinary gangrene of a local character, for the blood supply of the face is far too good to allow of such a supposition. Characteristics of this disease are: (1) that it begins on the inside of the cheek; (2) that it is almost always unilateral, though cases have been reported in which both cheeks were attacked; (3) that it perforates the whole thickness of the cheek; and (4) that it is rapidly fatal. At first there will be observed a small red swelling on the inside of the cheek, often opposite the opening of Stenson's duct. This small swelling gives place to a large, rapidly growing ulceration and is followed by gangrene. The destructive process begins from within and works outward. The whole thickness of the cheek is soon involved; it becomes brawny, and the outside is red and glazed; perforation soon occurs. The breath is fetid, the teeth fall out, the jaw becomes necrosed, and the whole process is marked by the extraordinary rapidity with which it advances, a rapidity so great that in from one to two weeks the patient dies either from exhaustion or from pyæmia. "The intelligence remains generally undisturbed, and the little patients do not seem to be greatly alarmed, but rather apathetic. The temperature and respiration become influenced principally because of, and in proportion to, the inflammation of the lungs, which is frequently a precedent and concomitant condition. This associated pulmonary inflammation is, however, never of the sthenic type of simple acute lobar pneumonia." (From former edition of REFERENCE HANDBOOK.) "Diagnosis in the later stage is rendered unmistakable by the ulcer, nodule, slough, and perforation. The early stage is to be distinguished from malignant pustule (anthrax). The latter begins as a pustule upon the outside of the cheek, often at the site of an abrasion; it is far more common in adults, and the anthrax bacillus is discoverable in the pustule and blood." (Thompson's "Practical Medicine.") There is very little pain, but much prostration, and generally there are nausea and diarrhoea.

The *prognosis* is bad; different writers place the death rate at between eighty and ninety-five per cent.

Treatment to be of any use must be vigorous and early. Free extirpation or the application of the cautery should be early resorted to; there should be frequent applications of hydrogen dioxide, and tonics and nourishing food should be administered every two or three hours.

9. **MERCURIAL STOMATITIS**.—(*Synonym*: Mercurial ptyalism.)

This is an inflammation of the mucous membrane of the mouth and gums, due to the use of mercury; it is rarely found in syphilis.

Symptoms.—The patient complains of a metallic taste, tenderness of the gums which are also unusually red, and increased flow of saliva; the tongue becomes swollen and there is difficulty in both mastication and deglutition. The salivation is apt to be extreme; and the odor of the breath is most offensive.

Treatment.—Those working in mercury should cleanse both mouth and teeth frequently; and those taking the drug should at once discontinue its use. The best remedies are salines, alkaline drinks, and atropine to arrest the flow of saliva. During convalescence tonics will be required.

10. **PTYALISM, OR SALIVATION, AND XEROSTOMIA** have been described in Vol. VII. of the REFERENCE HANDBOOK, under the heading *Salivary Glands, Diseases of*; it only remains here to outline the treatment of the former condition. When ptyalism is produced by the administration of mercury, as is (or was) generally the case, the use of that drug should be discontinued, the mouth should be washed with astringent lotions such as alum or potassium chlorate, and potassium iodide should be given internally. Mercurial salivation can often be prevented or diminished by devoting proper care and attention to the condition of the patient's mouth and teeth; it has been asserted that the administration of small doses of

potassium chlorate in conjunction with the mercury will also lessen the likelihood of salivation. In ptyalism from other causes the tincture of belladonna has been recommended in doses of $\text{m} \times \text{i} \text{d}$.

11. **ANGINA LUDOVICI**, or Ludwig's angina, is the name given to an infective inflammation of the floor of the mouth, and of the cellular tissue beneath the deep cervical fascia. It generally begins in the submaxillary glands, and is due to an infection with one or more varieties of the pus-producing bacteria—probably the streptococcus pyogenes—and is accompanied by much swelling and infiltration of the mouth, tongue, throat, and neck. There are severe pain and dyspnoea, the latter being often caused by œdema of the glottis. The patient finds great difficulty in opening his mouth, in talking, and in masticating and swallowing his food. Sloughing of the soft parts is apt to ensue and is called *cyanche gangrenosa*.

Prognosis is not good.

Treatment consists in the employment of antiseptic measures and in making a prompt and free incision into the involved tissue, generally in the median line. Tracheotomy may be demanded for œdema of the glottis. Tonics and nourishing food are indicated. (See also Vol. VI., p. 593.)

12. **PERLËCHE** is a contagious disorder consisting of fissures at the angles of the mouth. The trouble is found chiefly in children, and is very painful. It is probably caused by a micro-organism; Le Maistre reporting a streptococcus, and Raymond a variety of staphylococcus in connection with this disorder. It lasts for from ten to twenty days, and is bilateral, beginning at the angles of the mouth, and spreading along the border of the lips. The lips swell and are painful, and are apt to ulcerate. The skin around the mouth is not often attacked, but the mucous membrane is involved and the epithelium becomes white and sodden and is then desquamated. Pain and itching are present, and the child licks the parts to relieve the pain and burning; hence the name, from the French *perlèche* (= to lick). The disease is spread by drinking-vessels. Treatment consists in cleanliness and the use of astringent lotions of alum, copper sulphate, or even nitrate of silver. A dusting powder of bismuth subnitrate may be used; and, as a prophylactic measure, children should have their own cups to drink out of.

13. **RIGA'S DISEASE** occurs as a gray ulcer with an irregular border situated under the tongue, near the frænum. It appears about the period of first dentition, and lasts for a variable period, usually about a year. It has been found almost epidemic, certainly endemic, in Southern Italy. Its origin is most likely traumatic. The treatment is that of catarrhal stomatitis.

14. **SALIVARY CALCULUS** may occur in the excretory duct of any of the salivary glands, but is most frequently found in Wharton's duct. It consists of phosphate and carbonate of calcium together with sodium chloride and magnesium. After such a concretion is formed, it may either remain in the gland, or be discharged through the duct, or it may obstruct the duct. In the two former conditions it gives no trouble, but in the last case it gives rise to pain and swelling of the gland with which it is connected; the swelling is always increased on taking food. Careful palpation along the course of the duct will help in making a diagnosis; and, except in mumps, pain and swelling in a salivary gland should always suggest salivary calculus.

Treatment consists in making an incision into the duct, either in the distended portion only, or in its whole length from the outlet to the obstruction. If left untreated the duct may burst, with formation of a salivary fistula.

15. **SALIVARY FISTULA** is an abnormal opening of the duct of a salivary gland, and may be either internal or external, according as it opens on the inside of the mouth or on the outer surface of the cheek. Such a fistula is due to wounds of the duct, or to a rupture of the duct from suppuration or calculi. The parotid gland is the one most commonly affected. Internal salivary fistula is of comparatively little consequence, as the saliva flows into

the mouth. But in external fistula the flow of saliva on the cheek causes considerable discomfort.

Treatment.—If a calculus is present it must be removed. Then find the internal opening of the duct, and see if it is patent; if it is not patent, an artificial internal fistula must be made; and the edges of the external fistula can be touched with a cautery or pared, and closed with a twisted suture.

16. **TONGUE-TIE** is practically a congenital shortening of the frænum linguæ. The tongue cannot be protruded beyond the teeth; and suction and, later, articulation are interfered with. The proper treatment is division of the frænum, generally on the notched shield which forms the handle of a grooved director. Care must be taken to avoid wounding the ranine arteries. Blunt-pointed scissors should be used, and the points directed toward the floor of the mouth and away from the under surface of the tongue. Often the frænum is simply nicked with the scissors and the operation completed with the finger nail.

17. **PYORRHOEA ALVEOLARIS**, or Rigg's disease. In this condition there is found a shrinkage of the gums and alveolar border, together with separation of the gums from the teeth, which become loosened and may fall out. It is due to an inflammatory condition of the gums combined with bacterial infection and an excess of tartar. General cleanliness is indicated, with removal of the tartar; antiseptic and astringent mouth washes and general tonics should also be prescribed. Treatment may have to be continued for a long time as the condition is often intractable; and the patient may expect to lose some of his teeth.

18. **ALVEOLAR ABSCESS** is the result of inflammation and suppuration in connection with the fang of a carious tooth. It may occur in either jaw. Pus forms in the socket of the tooth and either finds its way out by the side of the tooth or through the gums, in which latter case it is called a gumboil or parulis; occasionally it strips the periosteum from the bone and forms an abscess of large size, and may even produce necrosis of the jaw. The first indications of the trouble are pain and a feeling as if the tooth were a little longer than normal. If the abscess is allowed to remain, there may be severe constitutional symptoms. Incision is indicated, and if it be delayed the tooth becomes loosened and exfoliation of the periosteum with necrosis may occur. In the upper jaw pus from a neglected alveolar abscess may burrow into the antrum of Highmore and set up suppuration there, or it may discharge by way of the nose. In the lower jaw the pus may travel downward and point and burst in the neck.

Treatment consists in disinfection of the mouth, incision of the gum, and extraction of the tooth. As a prophylactic, children should be taught to use a tooth-brush, and their teeth should be regularly attended to by a competent dentist.

19. **EPULIS.**—This term is applied to a tumor growing from the fibrous tissue of the gum or from the alveolar periosteum. The name is derived from *ἐπί* and *ὄψλον*, and means literally a tumor situated "on the gum." There are two varieties: the simple or fibromatous, and the malignant or myeloid. They generally attack the lower jaw.

Simple or fibromatous epulis appears as a rounded, smooth mass, sometimes lobulated or sessile; it is firm or elastic to the touch, and of a color varying from pinkish to deep red. It is generally due to carious teeth and is more apt to be formed on the outer border of the gums, though it may appear between two teeth, causing more or less displacement, and also on the inner surface of the gum. It is covered with epithelium, and may contain a few spicules of bone derived from the maxilla. The presence of the latter is much more common in the malignant or myeloid variety.

Treatment consists in the free removal of the tumor together with any teeth, stumps, or bone that may appear to have some causal relation to the growth. It is well, therefore, to extract a tooth on each side of the epulis, to cut through the whole thickness of each al-

veolus vertically with a small saw, and then finally to join these incisions at their lower ends by a horizontal incision made with a chisel. Thus the continuity of the jaw will remain notwithstanding the fact that a quadrangular piece of bone has been removed.

Malignant or Myeloid Epulis.—This is really a myeloid sarcoma and springs from the alveolar process. The chief distinction between these two varieties is pathological; the clinical picture being much the same as in the simple variety, except that the mucous membrane covering the tumor is more apt to ulcerate, and there is always a connection with the underlying bone. The treatment, too, is the same, only the malignant variety sometimes requires very energetic and radical treatment.

20. **WOUNDS AND INJURIES OF THE MOUTH** have, for the most part, the same features as are presented in wounds and injuries elsewhere. The blood supply of the mouth being particularly abundant, there is apt to be profuse hemorrhage, but this same abundant blood supply causes the processes of repair and healing to be very rapid. Hemorrhage from the mouth is due to wounds, injuries, purpura, biting the tongue, plethora, scurvy, and the hemorrhagic diathesis; it is best controlled by the application of cold or pressure. In slight cuts of the lips a little cotton soaked in collodium makes a good protective and also stops the bleeding. In wounds of the mouth we must remember that the buccal cavity always contains bacteria capable of producing infection, and therefore asepsis is not attainable; but antiseptic mouth washes should be used as frequently as possible.

21. **BURNS AND SCALDS OF THE MOUTH.**—These are generally caused by accident, and are due to hot liquids introduced into the mouth, to chemicals (acids and alkalies), or to inhalation of hot air or steam. They are most commonly met with in children, owing to their greater liability to drink out of the spout of a kettle or teapot. Adults are more likely to suffer in explosions, under which circumstances they may inhale steam or ignited gas. The inside of the mouth and pharynx are involved, and œdema of the glottis is a probable complication. The symptoms are intense burning pain, dyspnoea, suffocating cough; the lips and mucous membrane of the mouth are either white, sodden, puffy, and blistered, or the mouth may escape and show little or nothing of the hurt. In this latter event the glottis may be scalded, when the edges of the epiglottis will be scorched and the larynx also involved.

Treatment is the same as that for burns in other parts of the body: (1) *constitutional*, to combat shock and to keep up the patient's strength; and (2) *local*, in the form of mild antiseptic mouth washes and cool mucilaginous drinks. For œdema of the glottis tracheotomy may be required. There may be cicatricial contractions resulting in great deformity, and, for the relief of this deformity, extensive plastic operations are often performed.

22. **ERRORS OF DEVELOPMENT.**—The chief of these are harelip and cleft palate, both of which are considered in other parts of the REFERENCE HANDBOOK. Among the other defects, of which mention may be made here, are the following:

Astomia, or absence of the mouth; this, of course, is incompatible with life.

Atresia oris differs from the above in that there is a buccal cavity, but no external opening. This defect is generally combined with other errors of development. The line of the closure is more or less apparent, and the membrane may be thin or tough and dense. As in similar conditions elsewhere incision is required, but care must be taken lest the freshened edges grow together again.

Microstomia, or congenitally small mouth, is a milder form of atresia oris, and is due to the fact that the parts that form the lips have fused to a greater extent than normal, thus causing stenosis of the buccal orifice. The mouth may be so small that the infant cannot nurse. In such a case it must be enlarged sufficiently and the mucous and cutaneous borders stitched together.

Macrostomia, or congenitally large mouth, is gene-

rally unilateral, and is said to occur more frequently in females. It is found in connection with other developmental errors, and is usually due to the non-union of the mandibular and maxillary processes, or to the persistence of the lachrymal fissure. The treatment consists in paring and uniting the edges of the cleft sufficiently to reduce the mouth to normal dimensions.

R. J. E. Scott.

In preparing this article use has been made of the following: The former edition of the REFERENCE HANDBOOK; Ziemssen's "Cyclopaedia"; Reynolds' "System of Medicine"; Pepper's "System of Medicine"; Allbutt's "System of Medicine"; Keating's "Cyclopaedia of the Diseases of Children"; Thompson's "Practical Medicine."

MULTIPLE (CEREBRO-SPINAL) SCLEROSIS.—(Synonyms: Disseminated sclerosis; Insular sclerosis.)

DEFINITION.—This disease may present manifold symptoms, the most common of which are paresis, with muscular rigidity and exaggerated tendon reflexes as in spastic paralysis, tremor brought on by voluntary movements, nystagmus, scanning speech, amblyopia, apopleciform attacks, and impaired intellect. The anatomical basis of the disease consists of disseminated patches of sclerosed tissue in various parts of the central and peripheral nervous systems.

ETIOLOGY.—An hereditary influence has been traced in a few instances. Charcot states that the disease occurs most frequently in females, but a number of other observers do not concur with him in this view. It occurs most frequently between the ages of fifteen and thirty; occasionally in young children; rarely, if at all, after forty.

Traumatic influences, such as blows on the head, concussion of the whole body, exposure, hardship, overwork, and profound emotional disturbance, may all be mentioned as occasional exciting causes. In a number of instances the disease developed after the existence of an acute disease, typhoid fever, variola, etc.

SYMPTOMS.—The area of diseased tissue may be located in any part of the nervous system and there may be quite a number of affected areas. Furthermore, the disease may be of various degrees of severity, and the symptoms, which are but the expression of the locality and intensity of the disease, may make the most varied clinical pictures. There may be an entire absence of symptoms of disease of the nervous system, although nodules of sclerosed nerve tissue are found post mortem; or the disease may simulate various different organic or functional nervous diseases. But, nevertheless, the sclerosis seems to have a predilection for certain parts of the nervous system, and we find, accordingly, in many cases similar, and almost characteristic, clinical manifestations.

A cerebral and a spinal form of multiple sclerosis are sometimes spoken of, but usually both brain and cord become involved in the disease, though it may have been present in the one some time before it developed in the other. Generally the spinal cord is first affected.

The disease usually begins very insidiously and is slow in its progress; in rare instances it has an abrupt beginning, perhaps is ushered in by an apopleciform attack. The earliest symptoms may be of cerebral origin, such as headache, vertigo, ataxic gait, and slight psychic disturbances; or there may be a slight tremor in one or both hands; but more frequently the symptoms are those of spastic paralysis.

At first there is weakness of one leg, then of both, attended by some difficulty in walking. Gradually, with increasing paresis of the limbs, there appear muscular rigidity, especially brought on by active or passive movements, exaggerated tendon reflexes, spastic gait, and, finally, rigid contractures of the limbs. The paresis, and, to a less extent, the muscular rigidity, etc., at a later period affect the upper extremities, and to these is subsequently added another motor symptom—one of the most prominent and characteristic of this disease—the so-called intention tremor, *i. e.*, tremor during the performance of a voluntary act. Before it is otherwise

noticeable, it may be observed in the handwriting or other delicate movements of the fingers, especially if the act is slowly performed. The writing, if carefully observed, will be seen to be full of small indentations which occur with great regularity, indicating that the tremor is rhythmical. When the tremor is well marked any voluntary movement will cause it to appear, and it may be seen to some extent during rest. A common method of eliciting the symptom is to ask the patient to put a glass of water to his lips. The tremor increases and the oscillations of the hand are greater as the latter approaches the mouth. The trembling may become so violent that all the water is thrown out of the glass. When the patient is sitting quietly either there is no tremor, or slight movements of the head and trunk may be observed. If he now perform a voluntary act, as lifting an arm, the tremor in the head and trunk increases at the same time that there is tremor of the acting member. When he attempts to walk there may be such violent tremor of the limbs and trunk as to make walking, or even standing, almost impossible. On the other hand, when the patient lies down and every part is well supported no tremor appears. None is observed during sleep. It is increased by emotional excitement.

All the voluntary muscles may be thus affected, the head as well as the trunk and limbs. Tremor in the face is less commonly seen, though there may be irregular movements, choreic in character.

The distinctive features of the tremor are that it is rhythmical, and that it occurs only with muscular efforts. A very few cases have been reported in which it continued even in rest, but such cases are exceedingly rare. The tremor is not found in all cases. It probably depends on the locality of the disease. It also disappears in any part when the latter has become completely paralyzed.

The tremor can usually be easily distinguished from that of other diseases. In paralysis agitans, in the beginning (and it is only then that the two diseases could easily be confounded), only a few fingers are affected, and the oscillations are fine and very rapid. At the same time the tremor has somewhat the character of coordinated movements. Thus the movement of the thumb upon the fingers has been likened to that of counting money, rolling pills, etc. The tremor of multiple sclerosis is large and coarse, with no appearance of coordinated action. In paralysis agitans, furthermore, the tremor is, to some extent, controlled by voluntary movement, and increases with rest, and the head is very rarely affected. When the tremor is violent it may have the appearance of the movements of chorea. But the latter occur during repose as well as during volitional acts, and they cause an intended movement to be made very irregularly; on the other hand, in multiple sclerosis the general direction of any movement is maintained, but the line of movement is an undulating one, the undulations playing equally up and down along the central line of direction.

The next two symptoms seem to be similar in character to the tremor. The first is nystagmus, a very common symptom, and of value in diagnosis. When not otherwise noticeable, it may be made manifest by movements of the eyes, strong convergence, or forced movements in some direction. The other symptom is scanning speech. Other changes of speech are sometimes present, but this is the most common and most characteristic, and, therefore, of high diagnostic value. The speech is slow and dragging, each syllable being pronounced separately as in the slow scanning of verse, and, therefore, termed scanning speech. If the patient attempts to speak more rapidly, his words are likely to be so jumbled together as not to be at all understood. The voice is monotonous to the highest degree. There is often tremor of the lips at the same time, and, on laryngoscopic examination, there has been found to be diminished tension of the vocal cords.

Other ocular symptoms besides nystagmus are frequently found. Double vision, due to paralysis of some

of the external muscles of the eye, occurs, just as in locomotor ataxia, either as a transient symptom at an early period of the disease, or as a permanent condition at a later stage. Amblyopia is also a common symptom. Generally there is only impaired vision, not complete blindness. The ophthalmoscope reveals, in these cases, a discoloration of the discs, due to a degree of atrophy of the optic nerves.

Headache and vertigo are often present, both in the early and in the later stages of the disease. The vertigo often occurs in paroxysms. Occasionally it is due to the double vision, but more frequently it is quite independent of the latter condition.

The mental symptoms often play an important rôle. Sight psychic symptoms may be manifested in the beginning of the disease if the latter first affects the brain, but the graver symptoms are, usually, late manifestations. Change in disposition, irritability, loss of self-control, a tendency to laughing and crying, are common conditions. A certain impairment of intellect—weakened memory, a degree of apathy, etc.—is also not uncommon. But a high degree of dementia is rare. It is likely to occur only when the disease begins at an early age and there is arrested development of the brain, or when the pathological process is very acute. Different forms of insanity are sometimes observed, most frequently melancholia, occasionally delusional insanity.

Apoplectic seizures, like those seen in general paralysis, are important symptoms. They occur, according to Charcot, in one-fifth of all cases. After slight prodromal symptoms, headaches, etc., coma develops within a few hours, the temperature rapidly rises, often reaching 104° or 105° F., and at the same time the face is flushed and the pulse rapid. Hemiplegia, with flaccidity of the paralyzed muscles, is soon observed. Within a day or two consciousness returns, the temperature falls, and, within a comparatively brief period, the paralysis disappears. Such attacks may occur every few months, or very rarely. They usually leave the patient in a permanently worse condition, thus marking the progress of the disease. Sometimes the patient dies in the attack. These seizures are very much like those of apoplexy, but post-mortem examinations reveal no anatomical basis for them.

In the foregoing have been given the most common symptoms of multiple sclerosis, those found in the majority of cases. But, on account of the distribution of the diseased areas, various other symptoms may be manifested. Thus the disease may attack the posterior columns of the cord, and ataxia, pain, anesthesia, paresthesia, etc., will be present; or it may involve the gray matter, when atrophy and paralysis of muscles will ensue. Or the disease may involve the whole thickness of the cord and produce the symptoms of transverse myelitis. When the posterior as well as the antero-lateral columns are affected, many of the appearances of spastic paralysis are likely to be absent, especially the exaggerated tendon reflexes. Symptoms referable to the bladder and to the rectal and genital functions are also likely to appear. If the disease involve the nuclei of the facial, hypoglossal, and pneumogastric nerves, the ordinary symptoms of labio-glosso-laryngeal paralysis will be manifested, and various local cerebral symptoms may appear, according to the location of the foci of disease.

The course of the disease is a very chronic one. Charcot has divided it into three stages—a division applicable to those cases which present the common clinical picture.

The first stage is from the beginning of the disease to the period of complete disability from paralysis and contractures of the limbs. This stage may last for from two to six years or longer. The symptoms are very slow in their progress. They begin as spinal or cerebral, but both sets of symptoms appear before this stage is terminated. There is often an arrest of the symptoms, or even improvement, which indefinitely prolongs this stage, and may give rise to delusive hopes of complete restoration to health.

The second stage, that of the fully developed disease,

may last also for from two to six years. There seems to be little change in the patient during this period, and, though entirely helpless, he seems not to suffer in general health.

The third stage is that of decline. The general health is affected, there are loss of appetite, wasting, etc. Cystitis, decubitus, pyæmia, etc., may hasten the end. Or the latter may be due to an increase in the bulbar symptoms, or to an apoplectic attack. More frequently a fatal termination is caused by an intercurrent affection—pneumonia, typhoid fever, or, above all, phthisis.

The average length of the disease is from six to eight years. In rare cases it terminates in a year or two; occasionally it lasts twenty years.

MORBID ANATOMY.—The pathological changes can usually be seen by the naked eye. They consist of numerous patches or nodules of sclerosed tissue scattered throughout the nervous system. The nodules vary in size from merely microscopical proportions to an object as large as a chestnut or larger; they are rounded or irregular in shape, and may often be seen on the surface as slight prominences or depressions, but are found in larger number when sections of the brain and cord are made. Their color is mostly of a gray or reddish-gray; they are translucent, and have a firm, often cartilaginous, consistence. Many of the nodules are of the same color as the surrounding tissue, and are only distinguished by their consistence. In rare instances a few may be softer than the normal tissue, probably indicating recent disease; most of the nodules, on the other hand, are firmer than the normal tissue, doubtless being of very old standing, for such cases come to the post-mortem table only after the disease has existed a long time. The nodules seem to be quite distinctly circumscribed, but the microscope reveals the fact that they merge imperceptibly into the healthy tissue. They are also quite distinct, as a rule, though occasionally they blend into one another. In rare instances there has been found, in both the brain and the spinal cord, a diffuse sclerosis which, to some extent, has united the scattered nodules. On the other hand, secondary degeneration seems rarely, if at all, to develop from the disseminated disease.

The number of nodules found in a single instance may be very small, or may run into hundreds. Their distribution in the cord is very irregular. In some sections they may be found in the anterior, in others in the posterior, columns; in still others in the gray matter, or they may involve all these parts in the same section. Usually a large number of nodules are found in the medulla, pons, and crura cerebri. It is very rare that these parts are found free from disease. In the hemispheres the walls of the ventricles, corpus callosum, and centrum ovale are favored seats of the disease. In the latter two localities the nodules are often quite large. Usually nodules are also found in the large ganglia, while the cortex generally escapes. But few nodules are, as a rule, found in the cerebellum, and these in the central white matter. Similar nodules may be found in the nerves, most frequently in the optic nerves, but occasionally in the hypoglossal, the nerves of the eye, and the roots of the spinal nerves.

The microscopical appearances are those of interstitial myelitis. The nodules are mostly new connective tissue composed of very fine wavy fibrilla. But in this new tissue the axis cylinders of the nerve fibres can usually be found in large numbers, though their medullary sheaths have disappeared. This is especially true of the nodules in the spinal cord.

At one of the meetings of the Society of German Naturalists and Physicians, Adamkiewicz expressed the opinion that the disease is not interstitial, but develops primarily in the nervous tissue, beginning in the medullary sheaths of the nerves. He bases his opinion upon results obtained by a new method of staining the nervous tissue. His view is altogether at variance with that formerly held, and may be looked upon with doubt, at least until further corroboration is forthcoming.

MORBID PHYSIOLOGY.—Many of the symptoms are

easily explained by the lesions found: psychic symptoms by disease of the hemispheres, bulbar symptoms by lesions of the medulla, muscular atrophy by lesions in the anterior cornua, anesthesia and ataxia by disease of the posterior columns, spastic paralysis by disease of the antero-lateral columns—in some instances cerebral lesions may produce the same symptoms,—while amblyopia and some other symptoms are often due to nodules in the nerves themselves.

The long retention of the axis cylinders accounts for the usual presence of paresis rather than paralysis, for the anesthesia being slight, for the amblyopia rarely advancing to complete blindness, etc. (In locomotor ataxia there are also numerous axis cylinders in the sclerosed area, and the symptoms usually point to only a partial loss of function.) Charcot attributes the tremor to the same condition. He supposes that the axis cylinders continue to carry voluntary impulses, but, because they are bared of their medullary sheaths, they carry them in an irregular, jerking manner, and hence the oscillations in the voluntary movements. While this must be considered a mere theory, we can speak with more positiveness of the location of the lesion as a cause of the tremor. It seems to be due to nodules in the medulla and pons, or, at least, in the basilar portions of the brain. In a few cases, in which the disease was limited to the cord, no tremor was observed. On the other hand, when tremor was observed during life nodules were always found in the medulla and pons; when it was not observed, these parts were not affected to any extent.

With a considerable degree of doubt, we may attribute the nystagmus to lesions in the corpora quadrigemina, the scanning speech to lesions in the medulla, the vertigo to lesions in the medulla or cerebellum. A satisfactory explanation of the apoplectic attacks has not yet been given.

DIAGNOSIS.—In some instances a diagnosis is made with the greatest ease, in others it is almost impossible to make a diagnosis. The most common clinical picture—paresis of the extremities with exaggerated tendon reflexes, intention tremor, nystagmus, scanning speech, amblyopia, etc.—is so characteristic that it cannot be mistaken.* But some of the most characteristic symptoms may be wanting, and then the diagnosis is much more difficult. In this case the indications of multiplicity of lesions and the very chronic course of the malady must be the guides to diagnosis. When the disease is limited to the spinal cord one can scarcely do more than guess in distinguishing it from other forms of myelitis. In such cases one must be on the lookout for cerebral symptoms. Optic atrophy is often a valuable diagnostic symptom, not only in this instance, but in excluding hysteria or other functional diseases which may simulate multiple sclerosis.

When the sclerosis affects only the brain it may present some of the manifestations of brain tumor. Here, too, the indications of a multiple lesion and the very slow course of the disease may clear up the diagnosis. But there is another important distinction, in that brain tumors produce to a large extent general symptoms, those of intracranial pressure, such as severe headache, convulsions, and double optic neuritis; while sclerosis produces merely local symptoms, those indicating the loss of function of the part affected by the disease.

The tremor of alcohol, lead, and mercurial poisoning might be mistaken for this disease, but concomitant symptoms and the history of a cause will establish the diagnosis. The tremor of paralysis agitans, with which this disease was formerly confounded, is easily distinguished by the appearance of the tremor, its being controlled to some extent by voluntary effort and increased during rest, and its very rarely affecting the muscles of the head and neck. Furthermore, paralysis agitans is

rarely found in persons under forty years of age, while multiple sclerosis rarely occurs after thirty, and, apart from the tremor, the symptoms of the two diseases are quite different.

PROGNOSIS.—Charcot believes that the disease may sometimes be cured, but the opposite view is generally entertained, though its arrest and even improvement for a number of years have been observed. It usually runs a very protracted course. When at its inception it manifests itself in various parts of the nervous system at the same time, it is likely to run a more rapid course. The occurrence of apoplectic seizures, cystitis, bulbar symptoms, etc., indicates the approach of a fatal termination.

TREATMENT.—The same treatment is applicable as in other forms of chronic myelitis. (See *Spinal-Cord Diseases* in Vol. VII.) Philip Zenner.

NERVI.—The town of Nervi stands upon a narrow, shelf-like plateau which intervenes between the base of an outlying spur or side range of the Apennines and the shore of the Mediterranean Sea, at a point some six miles distant from Genoa, in a southeasterly direction. The general trend of the coast line along what is known as the Riviera di Levante, or Eastern Riviera, between Genoa and Spezia, is from northwest to southeast; but, as in the case of the Western Riviera, the regularity of the line is frequently interrupted by the occurrence of bays, which are guarded by rocky headlands, jutting into the sea from the main chain of the Apennines, just as similar headlands along the Western Riviera reach down to the sea from the Maritime Alps. The scenery along this coast is consequently very similar to that of the Western Riviera, and, as the writer can testify from personal experience, it is exceedingly picturesque and beautiful. The width of the little plateau upon which Nervi is built does not exceed a quarter of a mile; its elevation above sea-level is very inconsiderable, and probably does not exceed one hundred feet. The shore line at Nervi runs nearly due east and west; the spur or side chain of the Apennines already mentioned, consisting of three separate mountain peaks, extends parallel with the shore, immediately back of the town. The most westerly and terminal peak of this side range is only about seven hundred or eight hundred feet high, and it is covered to its top with a growth of olive trees; the other two peaks are much higher (about twenty-five hundred feet), and their summits consist of bare rock.

The town of Nervi has a population of a little over three thousand, and it is built, in the straggling fashion so familiar to travellers who have visited the Italian coasts, along the old Genoa and Spezia post road. At this point the road does not skirt the shore, but hugs the base of the hills, so that the town stands close under the shelter of their steep slope, and is effectually protected from northerly winds. From easterly winds it is, in common with all points along the Eastern Riviera, protected in great measure by the main chain of the Apennines. The northeast wind is not effectually kept out, but gains access through gaps in the hills, and is sometimes strongly felt at Nervi. "The northwest wind," says Dr. Sparks, "is also not unknown, and Dr. Thilenius says of it, 'The most dangerous wind and the wind which is always the most violent, is the cold, cutting, dry, and bitter northwest.'" The warm, damp, relaxing "scirocco" wind, blowing from the southeast, is also of frequent occurrence.

The rainfall at Nervi is heavier than along the Western Riviera. The average fall in each of the six colder months of the year, derived from seven years of observation, is quoted by Dr. Sparks from Dr. Thilenius as follows: November, 6 inches; December, 4.88 inches; January, 4.78 inches; February, 3.23 inches; March, 4.49 inches; April, 2.20 inches. In the winter of 1876-77 the number of rainy days, including days on which slight showers occurred, during the months of December, January, February, and March, was 48. At Mentone, during the same period, 27 such days occurred (Sparks). This

* Schuler reported a case of tumor of the right hemisphere, in the neighborhood of the island of Reil, which produced the typical clinical picture of multiple sclerosis, and Westphal reported two cases with similar histories, in which no pathological changes were found post mortem. But these are such rare occurrences as not materially to impair the diagnostic value of this clinical picture.