

cells being swollen and cloudy and filled with much mucus. In the glandular epithelium it may be impossible to distinguish between the chief and the parietal cells. All the cells may be more or less cloudy, fatty, or granular and shrunken, the chief cells being those usually most affected. The capillaries are dilated, and in the interstitial tissue one sees collections of small round cells, due to inflammatory infiltration.

SYMPTOMS.—The symptoms may occur with or without fever.

Subjective Symptoms.—There is usually general malaise, perhaps headache and dizziness; the patient complains of anorexia, increased thirst, a sense of pressure and fullness in the epigastrium, eructations of a gas which is either tasteless or bitter; there is a pappy taste in the mouth, and nausea is usually present. In most cases there is some vomiting of a foul, very acid, bitter material, consisting of more or less undigested food remnants and much mucus. There may be bile. Such a vomitus has a very marked acid reaction, though the HCl acidity is usually diminished, and there may even be no free hydrochloric acid; very often the three organic acids—lactic, butyric, and acetic—are found.

If a test breakfast is given after the first violent attack is over, one will find the bread after one hour almost unchanged, very much mucus present, and a greatly diminished secretion of hydrochloric acid.

Objective Symptoms.—These are not specially characteristic; the tongue is usually coated, and it may be indented by the teeth; if fever is present, there may be herpes labialis. There will be some tenderness in the gastric area, and perhaps fullness from distention. The intestines are sometimes involved in a severe case, and there may be constipation or diarrhoea. A more or less subicteroid condition may be added. The pulse is increased in rapidity and is small in volume. The urine is diminished and the specific gravity increased.

COURSE.—Sometimes vomiting affords immediate relief; at other times the vomiting and the symptoms are concurrent. Not infrequently involvement of the intestines follows that of the stomach, and then after a preliminary constipation there is more or less persistent diarrhoea for one or more days.

The intensity varies, and in the milder cases there is even no vomiting. On the other hand, in those cases which are somewhat more severe, rigor may be present, with fever and herpes.

DIAGNOSIS.—An obvious cause is usually the important factor, and in addition the vomiting of coarse undigested food after some hours, with much mucus and organic acids, suffices to render the diagnosis easy.

The differential diagnosis concerns gastric ulcer, biliary colic, gastralgia, with increased hydrochloric acid, the onset of some acute infectious disease—more especially typhoid fever and pneumonia—and lastly, the gastric crises of tabes dorsalis. The individual symptoms and the course of the disease usually suffice for a diagnosis.

PROGNOSIS.—The prognosis is good. There may, however, be recurrences in susceptible individuals, which, when they occur frequently, increase the liability to a chronic gastritis with secondary dilatation.

TREATMENT.—Prophylactic.—This is of especial importance in children, inasmuch as an improper diet is the frequent cause of gastritis at that age. It is important, therefore, to avoid overloading the stomach, especially with sweets, fruits, cakes, and other foods which cause fermentation and more or less acute dilatation of the stomach. Some authors have laid stress on the importance of avoiding uncooked fruit, which is especially irritating to the stomachs of the young.

Direct Treatment.—The condition often subsides of its own accord without any further interference, and nature, by inducing vomiting and a subsequent anorexia, carries out the two main therapeutic essentials. When vomiting has not been induced, emetics often give relief, though lavage is, perhaps, the more thorough method of treatment. It is specially useful in children, in whom lavage, by means of a catheter or properly devised tube

and funnel, gives more rapid relief than any other treatment. It may be necessary to employ lavage with the patient in various postures in order to insure a thorough cleansing of the stomach, and this process should be repeated several times if symptoms of discomfort and distress indicate its use.

If an emetic is desired or necessary, apomorphine is doubtless the best one for the purpose. Drugs are otherwise rarely necessary, while dieting, on the other hand, is of the utmost importance. The diet should be such as to protect the injured mucosa and give rest to the functional action of the stomach. For this reason it is well to give the stomach complete rest at first for some hours, after which time the thirst may be relieved by chopped ice, or by swabbing out the mouth with water or a suitable mouth wash. Small quantities of effervescent waters or cold, weak, unsweetened tea may be sipped. It is especially important that any fluids given at this time should be administered in small amounts.

When food is finally given, it should be given in fluid form. Milk diluted with lime water or soda water, and broths, with perhaps the yolk of an egg, may then be tried, and, after this, more solid diet may be gradually administered.

If purgation is desired, calomel may be used in small doses and combined with bicarbonate of soda. This is particularly useful if an enteritis is also present.

For the anorexia which accompanies and follows this disease a few drops of hydrochloric acid, as recommended by Riegel and Ewald, may be administered—eight to ten drops of the dilute HCl are placed in a wine-glass of water and taken in sips before each meal. Narcotics are rarely necessary, but if required they may be given in the form of suppositories.

SEVERE TOXIC GASTRITIS.

This is merely a more aggravated form of the simple gastritis. It must be remembered that all toxic gastritides, however, are not necessarily severe, though, as many hold, nearly all gastritides are usually toxic. The severe and toxic gastritis, however, is usually caused by the voluntary or involuntary ingestion of concentrated mineral acids—carbolic acid, caustic alkalis, the poisonous metals, such as arsenic, phosphorus, mercuric chloride, calcium chloride, potassium cyanide, etc., and also the essential oils.

SYMPTOMS.—The symptoms vary according to the quantity of poison taken and according to the position of the patient at the time—that is, whether standing up or lying down; in other words, these symptoms vary according to the portion of the alimentary tract against which the irritant comes in contact.

The most striking symptoms are pain and vomiting. The pain is usually complained of all the way down from the pharynx to the stomach, and especially along the line of the sternum; it is severe and burning in character.

Vomiting usually occurs soon, especially if something has been present in the stomach at the time. It is often repeated, and, as characteristic of the disease, it brings no abatement of the symptoms. Mixed up with more or less foodstuff, there are usually blood, mucus, and perhaps portions of mucous membrane.

The facies is usually anxious and pale, and there is profuse sweating; the pulse is small, rapid, and compressible; the extremities are cold, perhaps cyanosed, and the respirations are shallow, rapid, and thoracic (because pain impairs the movements of the diaphragm).

Examination of the abdomen shows nothing characteristic apart from great tenderness, and, if the condition has been extreme, there may be signs of perforation and peritonitis; but this latter occurs only in the severer forms of the disease.

There are all degrees of this form of gastritis; it may be mild with only a few hours of pain, or there may be signs of general intoxication with hæmaturia, icterus, etc. The results are, mainly: stenosis of the œsophagus

from subsequent cicatrization; atrophy of the mucous membrane; chronic gastritis, etc.

MORBID ANATOMY.—This varies according to the nature of the case and the extent of the damage; there are always hyperæmia, hemorrhages, and swelling of the mucous membrane, with fatty degeneration of the glandular epithelium, more especially in phosphorus poisoning. Where the erosion has been great there is sloughing, and there may be perforation, or, later, severe hemorrhages, with scars and contractions (stenosis, hour-glass contraction, etc.). The secretory changes are usually great; there is marked diminution of the hydrochloric acid, and there may be gastrectasis.

DIAGNOSIS.—This is based on the sudden severe gastric signs in an otherwise healthy individual, while the poison, or its effects, are usually found on the lips or in the mouth.

TREATMENT.—This consists of lavage, when it is not otherwise contraindicated, and the use of an antidote. If a somewhat longer protection of the gastric mucosa is indicated, rectal feeding may be employed. Special treatment may be required to deal with the sequelæ of the disease.

PHLEGMONOUS GASTRITIS.

Interstitial Purulent Inflammation.—This is a very rare disease, and commences primarily in the submucosa, going through the thickness of the various parts of the stomach. It seems to be sometimes primary, the exact cause, however, being hard to find. More often it is secondary, *i.e.*, metastatic from some other primary focus. It may be diffuse until the whole wall of the stomach is involved to a greater or less degree; or it may be circumscribed, an abscess being thus formed.

MORBID ANATOMY.—The submucosa, especially at the pylorus, is thickened and infiltrated with pus or seropus, and this usually extends more or less to the muscle. The mucous membrane is almost always involved, though often very slightly, and one sees signs of infiltration between the glandular loops. The mucosa is thickened, hyperæmic, ecchymotic; the epithelium is granular or shows fatty degeneration, and there is a small-celled infiltration between the glands. In some cases there are perforations going through the whole stomach (the appearance of a sieve), or ulcers of varying extent may be found.

There are often adhesions with the neighboring organs, and, according to the extent of the pathological changes, the results vary widely. Purulent peritonitis is a not infrequent termination, though infiltration may extend into the duodenal wall or up into the œsophagus, and thrombi may form in the surrounding veins where one or other of the different varieties of pus organisms may be found.

ETIOLOGY.—As a primary affection, we are totally ignorant of the direct cause beyond the fact that it must be a micro-organism. On the other hand, phlegmonous gastritis is secondary to cancer and ulcer of the stomach, to the various general infections, such as pyæmia, variola, scarlatina, etc.

SYMPTOMS.—The symptoms are nearly always acute. The onset is sudden, and there may be a chill, but in no sense are the early symptoms characteristic. It is true that there are severe gastric symptoms, the fever is high, perhaps 105° F., and there are general malaise and severe prostration. Vomiting is nearly always present and persistent, and the vomitus contains mainly mucus or bile.

One never, or hardly ever, gets pus in the vomitus until the abscess has opened into the stomach shortly before death. The case thus often resembles acute poisoning. The pains are very severe, extending over the whole gastric area; there are meteorism and signs of a general or local peritonitis. The fever is usually persistent, septic in type, and there are sometimes repeated rigors.

The pulse, as one might expect, is increased in rapidity, small, and may be irregular. The course of the disease throughout indicates severe general disturbance; the

vomiting gradually diminishes toward death. With the development of the disorder there may be coma or delirium, and, following upon this, collapse and death, with or without signs of general peritonitis.

The duration is rarely ever longer than two weeks, being usually fatal within the first week. Where the disease is localized an abscess forms and the condition may last somewhat longer, but in other respects there is no difference between the symptoms of the diffuse and those of the circumscribed variety.

DIAGNOSIS.—The diagnosis is never certain, and one usually labors over the differentiation between a general peritonitis and a toxic gastritis.

PROGNOSIS.—Ninety-five per cent. of those cases which are recorded have been fatal. That cases have recovered has only been proven by anatomical preparations, indicating the previous existence of a phlegmonous gastritis.

CHRONIC GASTRITIS.

This consists of a prolonged alteration of the mucous membrane of the stomach resulting in changes in the gastric digestion. The alteration is mainly in the secretions, there being an abundance of mucus and sometimes a stagnation of food.

ETIOLOGY.—The condition may be primary or secondary.

Primary chronic gastritis sometimes follows the acute, though this is uncommon. On the other hand, all the cases of acute gastritis, if persisting for a long period, may assume a chronic form. Thus, for example, dietetic errors, with reference to the manner of eating and chewing of food; the irregularity of meals; overloading of the stomach, especially with indigestible food; the presence of faulty teeth, acting as an impediment to proper digestion—all these separately or combined may induce in time chronic gastritis. Alcohol, especially if undiluted, particularly brandy, is another important cause. Other toxic causes are tobacco, especially if chewed to excess, tea and coffee, spices, certain drugs, drastic purgatives taken too frequently and in too large doses—all of these act as etiological factors, and they are all more potent when combined with a sedentary life.

Secondary chronic gastritis is associated with various diseases of the stomach and the general system; thus, with carcinoma ventriculi, with gastrectasis and adenoma of the stomach, more rarely with ulcer. Diseases of the heart and of the liver, in which passive congestion of the vessels in the stomach are a frequent accompaniment, act as important factors in inducing a chronic catarrhal inflammation of the mucosa.

To a less extent are renal and pulmonary diseases (especially tuberculosis) responsible; still, in certain constitutional diseases, more especially in anæmia, chlorosis, leucæmia, diabetes, and gout, the malady is not uncommon.

MORBID ANATOMY.—The mucous membrane is swollen, thickened, and covered with a layer of tenacious mucus; its color is either dark red or grayish-red, especially around the pylorus.

Microscopical examination of the mucus overlying the mucosa shows that it contains epithelium, which is mostly broken down, and perhaps blood corpuscles; the mucous membrane itself may present isolated hemorrhages, loss of epithelium and erosion; according to the degree of inflammation, one sees degeneration or fibrosis.

The superficial epithelium undergoes more or less mucoid degeneration; the glands are enlarged, partly cystic from retention, and degenerated, while the interglandular tissue shows small-celled infiltration. The capillaries and lymphatics are dilated; the submucosa shows thickening here and there, and sometimes the productive fibrosis results in the formation of warty and polypoid excrescences—what is known to the French as *état mamelonné*.

Pyloric stenosis sometimes occurs as a result, and especially if there is much hypertrophy of the muscular coat.

Cirrhosis of the stomach is a special form of this chronic

gastritis, and if advanced it may lead to degeneration and atrophy of the muscular coat.

The final stage in chronic gastritis is an atrophy of the mucous membrane, and this may result in the practical failure of all gastric secretion.

The size of the stomach varies. When there has been serious disease, the organ as a whole may appear shrunken. On the other hand, when the muscular coat has been the one chiefly involved, dilatation of the stomach may be observed.

SYMPTOMS.—The disease may remain for some time latent, or the symptoms may at first be insignificant and then gradually become more pronounced. This stage may continue indefinitely, or, again, the mild symptoms may alternate with periods of complete health. It is well recognized, at all events, that changes in the symptoms from time to time are quite frequent.

Early Signs.—As a rule, chronic gastritis develops slowly; slight dietetic errors cause some discomfort in the epigastrium, with the signs of fulness, pressure, and, perhaps, even pain, either when food is present or when the stomach is empty. There is usually anorexia, together with a bad or a sour taste in the mouth. Flatulence is common and often very troublesome, though the explosion of wind (which is odorless, as a rule) tends to relieve the oppression in the epigastrium and lower part of the thorax. There are nausea, and later on, as a rule, vomiting, which occurs either at the height of digestion or sometimes early in the morning (the result of a pharyngitis, mucus from the throat being swallowed during sleep). Thirst is usually added, and there is a general indisposition for any exertion. The nervous system suffers, too, and neurasthenia is apt to develop; dizziness is not uncommon, more particularly during the digestive period.

Well-Developed Cases.—In these the appetite varies; there is usually, however, anorexia, with satiety after only a little has been eaten. Voraciousness is uncommon, though a special desire for acid, sharp and spicy foods is well known, and often increases with the development of the malady. A disgust for meats is frequent in the well-developed cases. Thirst likewise varies; sometimes it is increased, though not nearly so much as in the case of acute gastritis. There is sometimes a bad taste in the mouth, though this varies; it is usually due to stomatitis or to a chronic pharyngitis. The breath may be foul from the same cause. Salivation or dryness in the mouth may be present. The tongue is furred or red and often sore at the edges.

The dyspeptic signs vary largely according to the secretory or motor disturbance which is present. The quantity and quality of food are of great importance to the patient. Fluids are well borne, as a rule, but solids seem to increase the symptoms. The usual dyspeptic signs—*e.g.*, fulness, oppression, flatulence, eructations, etc.—are common. Water brash is not uncommon; so, too, is cardialgia. Not infrequently there is true pain in the stomach, which, however, disappears rapidly under suitable treatment. Nausea occurs either early in the morning or at the height of digestion, though this symptom is not by any means so common as in carcinoma.

Vomiting is frequently present, though much less common than in acute gastritis. It may be slight or severe, and often occurs in the early morning (vomitus matutinus potatorum), at which time it consists of saliva that has been swallowed and of mucus coming from an old pharyngitis. Such vomitus is apt to be alkaline in reaction. If the vomiting occurs after meals, it takes place usually about an hour and a half after food has been ingested. It is made up of undigested food remnants and thick, ropy mucus, bile, and the various products of fermentation, yeasts, etc. Sometimes the mucus is extremely elastic and tenacious, due, it is thought, to the mucus fermentation of carbohydrates.

General Symptoms.—Constipation is the rule; it sometimes alternates with diarrhoea. The nervous symptoms consist of dizziness, anxiety, hypochondriasis, lack of energy. There is inanition, especially among those who

are poor and uncleanly, and whose mouths are never properly cared for. Where the intestines are unable to take on the functions of the stomach, malnutrition is very common. The urine varies; urates are often present in large amount.

Although palpitation is not uncommon, the heart, as a rule, presents nothing abnormal.

Physical Examination.—Inspection reveals nothing unless there be stenosis of the pylorus or idiopathic dilatation of the stomach, when inflation or insufflation will demonstrate the increased size and altered position of the organ. The lower border may reach much below the umbilicus.

Palpation shows some tenderness, as a rule, and there may be a succussion splash if atony be present.

The test meal reveals the presence of undigested coarse food with much mucus.

The motor power is either normal or diminished, according as to whether the muscle is in a healthy condition or atonic. When atony exists, the quantity of the test breakfast will be abnormally great and usually contains much mucus.

The results of a chemical examination vary according to the state of the secretory functions. As a rule free hydrochloric acid is diminished or absent. In some cases, on the other hand, there is hyperacidity, pepsin is less in quantity, and the labzymogen is either diminished or absent. Unless atony be present there are usually no organic acids to be found, though sometimes one may find butyric, acetic, and the volatile fatty acids; likewise, though uncommonly, lactic acid.

COURSE.—It is usually of long duration. There are remissions and exacerbations, especially with errors in diet. If taken within a reasonable time and properly cared for, chronic gastritis may be quite readily cured. Recurrences are frequent, however, and alcoholics (in whom the disease is especially common) are very liable to have relapses through repeated indiscretions.

The secretory power is injured, but this may be repaired much more readily indeed than can the motor power when once severely affected. Weakening of the muscular coat results in gastrectasis, which, if of long duration, causes general malnutrition and aggravates the gastritis.

Atrophy of the mucous membrane is extremely uncommon, and the condition known as achylia gastrica cannot be said to be of frequent occurrence.

DIAGNOSIS.—This cannot be made from the symptoms alone, though the long course of the malady, with the above-described signs and symptoms, may aid greatly in the diagnosis. It is essential to examine the stomach contents chemically after a test meal if one would desire any accuracy in his methods of diagnosis.

The *differential diagnosis* concerns, first of all, the distinction between the primary and the secondary forms of gastritis, which latter accompanies hepatic, cardiac, and other diseases. There may be some difficulty in excluding a pure neurosis, in which, however, the effect on nutrition is not so serious, and in which there is usually less mucus in the stomach contents. The symptoms, too, are more variable: there is more neurasthenia; and the symptoms are not always digestive in point of time, nor is it always solid foods alone which cause distress. There may be, on the other hand, a nervous subacidity, and the motor power of the stomach may be somewhat impaired by a long-standing neurosis.

The age of the patient is of some importance, inasmuch as a gastritis is not common before thirty, and a neurosis may occur at any age.

In making the distinction from carcinoma it is often quite difficult to determine in the early stages the true nature of the disease. Frequent examination of the stomach contents is necessary; hydrochloric acid is usually absent, and the peptic power is usually diminished early in carcinoma and late in chronic gastritis. Carcinoma is a disease of comparatively short duration, and one must further take into consideration all the various signs and symptoms.

Atrophy of the gastric follicles is determined only by the complete absence of gastric secretions, and is an occasional sequel to chronic gastritis.

Amyloid disease of the gastric mucosa may simulate chronic gastritis, but the differentiation is easily made if amyloid disease be found in other organs and if a suitable cause thereof be present.

There should be no difficulty in distinguishing gastric ulcer from chronic gastritis, inasmuch as the clinical pictures are entirely different.

PROGNOSIS.—The mild cases of chronic gastritis are easily cured. In the more serious cases, on the other hand, especially where the secretion is much diminished and there is atony, the condition is less favorable. When pyloric stenosis is present or atrophy of the mucous membrane or great dilatation of the stomach, the condition may be looked upon as very serious as regards the cure, though the menace to life is not necessarily great. The prognosis should be based less upon the general condition than upon the outlook for securing a sufficient supply of nourishing food, upon the condition of the secretions and the enzymes, and upon the motor power, and, lastly, upon the condition of the intestines, which, if in a healthy state, may largely replace the functions of the stomach. It is well to warn one's patients that relapses are quite frequent, and that exacerbations and remissions are the rule rather than the exception.

TREATMENT.—A detailed diagnosis is essential to the proper carrying out of the treatment of a case of chronic gastritis. Secondary gastritis must be treated according to the cause, which will involve the therapeutics of the lungs, heart, liver, or general constitution. In the primary cases, on the other hand, the treatment concerns prophylaxis, palliative and curative measures. The curative measures are mechanical, dietetic, and medicinal, and for this reason it is necessary to have a detailed diagnosis of the condition.

One must consider the cause of the disease as well as the condition of the secretory and motor functions and the quantity of mucus present. Prophylaxis is of some importance, and one should, therefore, remove any external conditions which tend to bring on or aggravate the malady. Excesses of all kinds must be guarded against; bad habits cured; the patient should be taught to eat slowly, to chew his food well, and carefully to select his diet both as regards quantity and quality.

The actual treatment is chiefly mechanical and dietetic, and drugs play a comparatively unimportant part. The mechanical treatment consists mainly in the use of lavage. It is necessary that the stomach should be clean before any food enters, and for this reason one must remove any mucus which covers up the superficial epithelium and prevents proper action of the digestive juices. Lavage may be carried out in the early morning or, in bad cases, six hours after dinner (which is usually taken at midday), and the evening meal should be as light as possible. Under ordinary conditions one may wash the stomach out with simple lukewarm water. If, on the other hand, much mucus is present, sodium chloride may be added, or, if there be much fermentation, boric acid. According to the severity of the case, lavage should be done daily, or every second day, for a few weeks, and on each occasion it should be continued till the water returns from the stomach quite clear.

When atony or much fermentation is present this may require some patience.

When, for one reason or another, lavage is impossible one may employ "natural lavage" by means of frequent administration of mineral waters of various kinds, especially the saline waters, with carbonic acid; those, for example, from Saratoga, containing sodium chloride (Hathorne, Congress Springs), are often beneficial in relieving the stomach of its mucus and inducing a combination of the organic acids. And, again, the alkaline sulphates, such as are combined in Carlsbad waters, are useful for this purpose as well as for relieving the constipation. According to the condition of the secretions and the motor power, the use of these waters should vary.

They should be taken cold, where motor insufficiency exists with diminished secretion and constipation. Where, on the other hand, there is irritation in the stomach with diarrhoea, they are best taken hot. Whenever atony exists it is well to remember that only small quantities should be taken at a time. In addition, daily cold baths or shower baths with subsequent friction of the skin are of great benefit. Where pain or great discomfort is present, a wet compress may be placed upon the epigastric area and covered with oil silk.

Electricity is of very doubtful value, though the proper regulation of rest and exercise, which latter should always be moderate, is of the greatest importance.

Dietetic treatment is of prime importance, though often hard to regulate because of individual preferences. The diet must be administered with some regard to the severity of the case; but in all instances the food must be easily digested, and for this reason must require but little on the part of the gastric juice or muscular action of the organ. It must be, further, non-irritating.

When only the scantiest diet is tolerated, milk, preferably diluted with lime-water, may be given at regular intervals, and this, while the patient is at rest, may suffice, provided he can be induced to take from one to two quarts *per diem*. We may say, however, that in the large majority of instances a mixed diet, selected with reference to the needs of each case, is advisable.

When the motor power of the stomach is demonstrated to be normal, one may administer albumens, starches, and fats. If, on the other hand, it is deficient, it is wiser to exclude the fats. When, again, the secretory power of the stomach is defective, a mixed diet is very easily given so long as the motor power remains unimpaired, for the intestines will perform the secretory functions of the stomach. In all cases, however, albuminous food should be finely divided. Starches should form the bulk of the food in those cases in which the hydrochloric acid is deficient, and those starches should be selected in which there is less residue after digestion is complete.

Fats are imperative when malnutrition exists, and for these cases butter and cream form the most easily digested varieties. It is thus essential where possible to give a mixed diet, non-irritating, finely divided and containing as much nutriment as possible within the smallest compass.

In severe cases one may give, in addition to the milk, gruel, milk soups, light puddings, rice, arrowroot, toast, and then eggs. In some cases light meats, if tender, may be added; but it is not wise to add spices nor any rich sauce. The craving which many patients with a chronic gastritis have for spicy things, under the impression that they will stimulate the functions of secretion, are usually not good indications of the best method of treatment.

Of the lighter meats, etc., calves' brains, sweetbreads, chicken, fish, minced beef, are those most preferable.

Alcohol is best avoided unless in the form of very light wine. The quantity of water taken with the meals should be restricted, unless there be hyperacidity, in which case it is well to dilute one's food moderately. Instead of ordinary water, Radnor, Apollinaris, or other effervescent alkaline waters, may be tried with benefit.

The determination of the proper number of meals per day is based upon the condition of the motor power. If this be good, three meals a day may suffice. Where, on the other hand, there is atony, four or five meals, each small in quantity, are more advisable. Coffee, tea, and cocoa may be given except in those cases in which hyperacidity exists. As the patient improves, such vegetables as spinach, carrots, maize, potatoes (mashed), and macaroni, may be added in small quantities and gradually. In severe cases maize, semolina, and the like may be added. Bread should be stale and not hot. When constipation is marked, it may be well to give stewed fruits, such as apples, prunes, etc. When, on the other hand, diarrhoea is present, stewed blueberries are often very efficacious.

Medicinal Treatment.—Inasmuch as hydrochloric acid is deficient in the course of most cases of chronic gas-

tritis, one may add with some benefit a few drops after each meal. One-half drachm of dilute hydrochloric acid in a tumblerful of water, to be sipped at intervals for an hour after each meal, may be prescribed. On a scientific basis there is little to be gained from the use of pepsin, though practically one frequently does find that its employment seems to afford considerable aid to digestion. Pancreatin in doses of fifteen grains is perhaps better, and should be administered with soda, though rationally this should not be prescribed unless there is some evidence of atrophy of the gastric follicles. After all, these artificially prepared ferments are of little use when one realizes that the intestines carry on the defective actions of the stomach.

It seems of prime importance, however, to give some stomachic before each meal, and for this purpose one may try either dilute nitromuriatic acid, in doses of m. x. to xv. , or nux vomica, quassia, gentian, or condurango.

In many cases the greatest relief from the more acute suffering incident to chronic gastritis is a pill consisting of silver nitrate gr. $\frac{1}{4}$, Pulv. opii gr. $\frac{1}{4}$, and extract of hyoscyamus gr. ss.

Where fermentation is an annoyance the diet should be carefully looked into; one may sometimes add thymol, or carboic acid, to the other modes of treatment. For a distinct pyrosis, bismuth subnitrate and sodium bicarbonate, of each ten grains, combined with three to five grains of calcined magnesia, will usually afford relief.

For persistent vomiting lavage is the most rapid means of giving relief. When this is impracticable, a careful adjustment of the diet, with perhaps the administration of one or other of the usual drugs for that purpose, may give benefit.

Constipation is one of the greatest annoyances in these cases. It is well that the patient should develop great regularity in his habits, going daily to stool at regular hours, whether or not there be need therefor. As soon as possible there should be added to his food vegetables containing much cellulose, also stewed fruits, especially a combination of figs and prunes; or in the early morning he should drink cold water or eat a fresh orange; and only in aggravated cases should we resort to either purgation or enemata.

Where purgation is necessary, it is a difficult matter to determine what drugs should be employed; only the mildest forms of purgatives should be given, and of these rhubarb, aloes, and cascara are probably the most beneficial. The use of Carlsbad salts in the morning, as already indicated, is another efficacious means of treatment in aggravated constipation.

VIII. GASTRIC ULCER.

(Synonyms: Round Ulcer of the Stomach, Peptic Ulcer, Simple Ulcer, Perforating Ulcer, etc.)

DEFINITION.—It is a destruction of the mucosa and sometimes of the deeper layers of the stomach wall, of the nature of a degeneration or necrosis; it leaves an open loss of substance, usually round or oval in shape, with clear-cut edges. Such ulcers may be acute or chronic, with or without tendency to cicatrization and healing. In both forms there may be hemorrhage and perforation.

STATISTICAL.—In Berthold's Berlin series ulcer was present in twenty-seven per cent. of all autopsies; in other series the percentage is much less. Thus, in Thüringen it is reported as being ten per cent.; and in F. P. Cantlie's statistics from the Royal Victoria Hospital, of Montreal, gastric ulcers formed 0.004 per cent. of all cases admitted.

ETIOLOGY.—*Age.*—It is most common between twenty and thirty years of age, though it may occur in childhood, even in infancy, and is seen not infrequently in old age. Kundrat found small superficial ulcers, of recent formation, quite frequently in children, but these are doubtless of a different nature from the true round ulcer. The average age at the Royal Victoria Hospital was twenty-seven and one-half years.

Sex.—It is commoner in females.

Occupation has a doubtful relation to ulcer. According to some authorities cooks are predisposed, as are also those who work in glass and porcelain factories, metal turners, tailors, and shoemakers. In Payne's statistics only three out of fifty females are cooks.

It is doubtful whether *trauma* bears any relation to gastric ulcer. *Chlorosis* and *anæmia* are predisposing factors, and *vice versa*, chronic ulcer often leads to anæmia. Again, gastric ulcer is often falsely diagnosed as mere chlorosis, especially as hyperacidity is common in chlorotic girls.

Dietetic Errors.—Alcohol is not a cause of true gastric ulcer. Vegetables and indigestible foods are considered by some as frequent antecedents.

Poisons are not a cause.

Infections.—Tuberculosis, syphilis, trichinosis, and infections generally are a frequent cause of gastric ulcer, but not of those having the characters of the ordinary round ulcer. That an ulcer occurs in other affections does not imply that the gastric round ulcer has the same etiology, nor can we infer, from the mere facts that ulcers are found lying opposite to one another, and that they manifest an oedematous condition of their immediate surroundings at the time when perforation occurs, that they owe their origin to an infection. These ulcers are purely necrotic in all their typical pathological characters.

PATHOGENESIS.—It would seem that the two main factors are: (a) Some interruption to the circulation going to the stomach, or anæmia. (b) Hyperacidity. It is probably the increased hydrochloric acid which keeps the ulcer chronic. In anæmic conditions the vessel walls are liable to changes, especially fatty and atheromatous. Normally, the gastric juice does not digest the mucous membrane, because the blood furnishes the neutralizing element. When ulcer occurs, we conclude that:

1. There is increased hydrochloric acid, and it is not sufficiently neutralized by the blood.

2. The circulation is in one way or another restricted, so that neutralization is impossible.

3. The blood shows diminished alkalinity.

The second of these is doubtless of greatest significance, though proof of the real pathogenesis is absolutely lacking.

MORBID ANATOMY.—*Situation.*—These ulcers exist wherever gastric juice flows. The posterior surface is the commonest site, ulcers being found there in 42 per cent. of all cases, especially near the pylorus. In 15.6 per cent. the pylorus is the site, while in 26 per cent. of all cases the ulcer exists either in the lesser curvature or in the pylorus. They are on the anterior wall in 4.9 per cent., on the greater curvature in 2.4 per cent., and at the cardiac end in 0.2 per cent.

Number.—These ulcers are usually single, but sometimes they are multiple. In one of Berthold's cases there were thirty-four. When multiple, they may all seem to be of the same duration, or some may be in a state of healing, while others seem to be quite recent.

Shape.—The more acute ulcers are punched-out in appearance, round or oval, and sharp in outline, while the chronic ones are shelved or terraced, the widest diameter and greatest loss of substance being at the mucosa, the ulcers becoming gradually narrower as one approaches the serosa (funnel-like). This would seem to correspond to the distribution of the blood-vessels. Orth has drawn attention to the fact that these ulcers are often oblique, *i. e.*, their long axis corresponds to the direction taken by the blood-vessels. Often these older ulcers are irregular in outline, spread out, and, with the mucosa, rolled inward and thickened at the edges. Cicatrization may often be seen progressing at various portions of the walls. The muscles beneath are shrunken. The floor is smooth and grayish-brown or red, rarely ragged.

Size.—The usual size varies from 2 cm. in diameter to 3-4 cm. In some instances, however, they may be as small as 1 cm., or as large as 10 cm., in diameter, and sometimes the ulcers form a ring more or less completely surrounding the organ.

Healing and cicatrization are common. Scars vary

in size, and—according to their size and situation, and to the amount of contraction which followed the healing process—they may or may not cause perceptible deformities in the organ and corresponding functional disturbances. The deformities thus caused comprise hour-glass contraction, pyloric stenosis and gastrectasis, and cardiac stenosis. The process of healing begins with proliferation of the adjoining fibrous and glandular tissues, and finally, when healing is complete, the central portion is occupied by fibrous or adenoid new growth consisting of cylindrical cells arranged about a lumen, no opening existing toward the stomach cavity and no secretion flowing from the cells. Fibrous tissue replaces lost muscle cells. Sometimes healing leaves, in the vicinity of the ulcer, chronic inflammatory areas which tend to erosions and recurrent bleeding. This may be serious, and even fatal, if large vessels are involved.

SYMPTOMS.—There may be no characteristic symptoms, the first discovery of a gastric ulcer being made unexpectedly at the autopsy. Then, again, the first evidence may be a sudden or perhaps fatal hemorrhage; or the peritonitis following a perforation may give the first indication to patient or physician that an ulcer has been present. The symptoms may simulate spinal disease, hysteria, hyperacidity, and only upon the appearance of more serious signs does the diagnosis become clear.

Dyspeptic Signs.—When the symptoms are marked there is a sense of weight and pressure coming on in one-half to two hours after meals—after a time becoming more aggravated. These may be the only signs throughout the whole disease, or others may and usually do follow. Pain develops, and then follows vomiting during the digestive period; the pains are in the area of the stomach, often of a piercing nature and felt in the back, and a small localized area of tenderness can be detected. There are often signs of hyperacidity, such as acid eructations and heartburn. The tongue, though often coated, is usually clean, red, and moist. The appetite varies, and, though it is usually good, patients fear to eat because of the chance of inducing pain. Thirst may be present. One or more hemorrhages may occur, and pallor usually becomes marked, with perhaps weakness or collapse. The stools may contain blood, and there is usually constipation, due to the anæmia, the nature of the food, the lack of exercise, and the vomiting. Remissions and exacerbations occur, and the disease may run on for a very long period.

The general condition remains good, as a rule, though the anæmia and emaciation are sometimes marked. Nervousness, melancholia, headache, and dizziness are common; so, too, is amenorrhœa or dysmenorrhœa. Fever is usually absent unless complications arise—especially peritonitis, and sometimes hemorrhage. The urine is lessened in quantity when vomiting occurs or when less nourishment is taken. It is usually less acid, especially when there is gastric hyperacidity.

Special Symptoms.—*Pain* is described as boring, burning, gnawing, rarely lancinating or cramp-like, and radiates often to the back. It is paroxysmal, and may be at times excruciating. It occurs during digestion, either at once after taking food or at the height of digestion. The hyperacidity increases it. When the ulcer is at the pylorus, the pain may not appear for from three to four hours after meals, and will thus lead one to suspect a duodenal ulcer. It is distinctly aggravated by a large amount of food or by food that is solid. On the other hand, the pain is relieved by rectal alimentation. It is frequently localized, and nearly always referred to the same spot, while pressure of the hand or clothing usually aggravates it. It may or may not be altered by a change of posture. The most tender spot is usually in the epigastrium below the xiphoid cartilage, or it may be located to the left of the spine between the seventh and twelfth dorsal vertebrae. It is an important diagnostic feature that the tenderness of the stomach corresponds to the seat of pain after eating, and that the situation of this tenderness rarely varies during the whole course of the malady. The cause of the pain varies, it being due

sometimes to the food, sometimes to the gastric movements or to involvement of the peritoneum. Scars do not usually cause pain unless there are adhesions.

Vomiting is less constant than the pain. Cantlie found it in seventy-nine out of eighty-five of his cases in Montreal. There may be merely nausea and flatulence, and never any vomiting, or the vomiting may appear only at intervals of a week or more. The vomiting occurs sometimes immediately after taking food, but usually one, two, or three hours later—during digestion, and generally at its height. The pain is relieved by it. To a great extent the onset of vomiting depends on the quality of the food; it occurs less often after taking fluids than after taking solids, and especially coarse heavy foods.

The vomitus varies according to the food and its sojourn in the stomach. Digestion is usually quick, and albumens are well divided on account of increased hydrochloric acid. At other times the food is quite undigested, and the vomitus is acid and "puts the teeth on edge."

Hæmatemesis occurs in more than twenty-five per cent. of all cases of gastric ulcer. In the statistics of University College Hospital the percentage was eighty-four; at the Royal Victoria Hospital sixty per cent. had hæmatemesis. It is well to remember the other causes, especially erosion of the mucosa elsewhere than in the stomach, with oozing of blood which may be fatal and which may show no signs at autopsy of its origin. There is also the possibility that the hemorrhage may be dependent upon some circulatory disturbance, especially mitral stenosis, or upon cirrhosis of the liver, splenic anæmia, leukæmia, uræmia, tabes dorsalis, fraud, etc.; and one must include in the diagnosis of hæmatemesis the previous taking of wine, iron, coffee, fruit juices, etc., which may simulate altered blood. The history, too, must be carefully taken to insure the gastric origin, and the mouth, throat, and lungs must be thoroughly examined, as well as the liver, spleen, and blood.

In hemorrhage from the stomach the source is usually arterial, the vessel becoming eroded during the development of the ulcer. Hæmatemesis occurs in about one-third of all ulcer cases. The blood is usually dark in color, the hæmoglobin being changed to hæmatin by the hydrochloric acid. Few corpuscles are then left unaltered, and the vomitus may resemble coffee-grounds, though it may have a brighter color if a large vessel be eroded and if the blood be vomited quickly after it escapes from the vessel. The matter vomited, which may be copious in quantity, contains coagula and bits of food, and is acid in reaction, but not foamy.

The hemorrhage may be fatal at once, without any blood being ejected from the stomach—as, for example, when a comparatively large artery is eroded. This, however, rarely happens; usually, when there is a serious hemorrhage, the patient vomits a large amount of bloody fluid, becomes pale, cold, semi-conscious, and complains of dizziness and headache. The pulse is rapid and small, and there is a warm feeling in the epigastrium. Sometimes the hemorrhages are oft-repeated in spite of care, and sometimes again one or more insignificant ones take place, and then they cease altogether. Some of the blood gets into the intestine, and during the next day or two the feces are black, or brownish-black, with a shining surface. This color is due to the intimate mixing of blood and chyme in the small intestines.

Sometimes all the blood escapes per rectum, and there is no hæmatemesis. This occurs where bleeding is more gradual, and there is thus less tendency to vomiting.

Tests for the presence of blood, especially in the feces: Teichmann's test with hæmin crystal formation is sometimes unsatisfactory, and one may not obtain the crystals. The spectroscopic is better. Weber's test is the most reliable. It is made as follows: Rub up a little of the feces with water, to which has been added one-third volume of glacial acetic acid; shake out with ether, and, on its clearing up, take a few centimetres of the ethereal extract and treat it with ten drops of tincture of guaiacum and from twenty to thirty drops of turpentine; a blue-violet color results if blood is present.