

vomiting of blood, but it is never great in amount, and all the symptoms subside in a few days, the patient being free from any disturbance of the stomach afterward. In cancer, the age of the subject, the emaciation and cachexia, the tumor and enlarged lymphatic glands, the vomiting of coffee-ground and blackish and brownish-black material, instead of the red or brownish-red blood in large amount in ulcer, are the most characteristic differences. It is more difficult to separate chlorosis with amenorrhœa from ulcer of the stomach, because these subjects have the distress after food, the vomiting, and vicarious menstruation by the stomach. Under these circumstances of inevitable doubt, it were better to decide by therapeutic means. The case may be treated as one of gastric ulcer by an absolute low diet; if it is a case of ulcer, it will improve under this method; if a case of chlorosis, it will get worse—then a resort to iron and mineral acids will bring about a decided change for the better.

Prognosis.—Although the cure of ulcer may be confidently expected in favorable cases, yet such are the dangers from perforation and hæmorrhage that the prognosis must be regarded as serious. When tuberculosis and endocardial lesions exist, the gravity of the case is correspondingly increased.

Treatment.—The first and most important consideration is to give the stomach rest, which is accomplished by reducing the food taken to the minimum. An exclusive milk-diet accomplishes this object, while at the same time it contains the necessary alimentary principles for the support of the body. All rough, harsh, and coarse ingesta, such as oatmeal, brown-bread, and fruits, irritate the surface of the ulcer, and increase the existing ulceration, and retard healing. Starchy and saccharine foods are objectionable because they ferment, producing acid which is very irritating to the ulcerated surface. Milk should be given systematically—one gill (four ounces) every three hours, day and night, during waking, and it acts better if taken hot, 110° to 115° F. If it cause a sensation of heaviness or uneasiness, nausea or vomiting, the addition of lime-water will enable it to be better borne. The meat solution so strongly advocated by Leube, or that of Valentine, can be substituted for milk, if the latter prove repugnant to the patient or can not for any reason be used. To aid in supporting the powers of life, rectal alimentation may be employed. Foster proposes to relieve the stomach entirely for a time, supporting the powers of life by rectal alimentation, since the healing process is greatly promoted by giving the organ some days of absolute rest. The discovery of the utility of defibrinated blood, as a means of rectal alimentation, made by Dr. Smith, of New York, has added to our resources. The method consists simply in defibrinating the blood as soon as drawn at the shambles, and in injecting from three to six ounces morning and evening. If rectal alimentation is not employed exclusively, it should be

combined with the milk regimen—for, the richer the condition of the blood, the more rapidly and perfectly can repair take place. As the destruction of the mucous membrane was originally brought about by the solvent action of the gastric juice, and as the irritation caused by this is the chief obstacle to healing, it is important to diminish the acidity and to keep the surface of the ulcer clean. These purposes are now accomplished by mechanical means, by irrigation of the cavity of the stomach by the siphon or the stomach-pump, as the same process is employed in other stomach-diseases; but caution is necessary in the use of the pump, lest the tube might cause a perforation. The same object may be accomplished by medicinal means—by the free use of the alkaline mineral waters. As regards the strictly medicinal remedies, the most important is arsenic in small doses, one to three drops of Fowler's solution three times a day. Next, named in the order of their relative importance, are oxide and nitrate of silver, in half-grain doses three times a day, and bismuth in fifteen-grain doses. If there be much pain, morphine in the hypodermatic mode; but, if the alimentation is proper, pain will hardly require attention. The regimen advised should be pursued for several weeks, or until such improvement is manifest as to indicate that cicatrization is pretty well advanced, when the diet may be very carefully enlarged by the addition of rice, soft-boiled eggs, animal broth, etc.; but the patient should be impressed with the importance of a simple dietary ever after.

Various new remedies have been used successfully in recent years. Resorcin is proposed for its local action, and exalgine for analgesic power—the former makes a superficial caustic action which prepares for healing, and the latter acts as a local anodyne, removing the irritability which is the chief cause of pain and nausea.

Two accidents in the course of stomach ulcer may require prompt action and the use of efficient means of treatment—hæmorrhage, perforation. In the former we have the application of ice to the epigastrium, large draughts of hot water, and sometimes of ice water in alternation. It is true that hot water is more effective in many instances; when so, it should be persevered in, and the cold stopped. To get the best results from hot water, there should be short intervals between the applications, so that the reactive contraction of the arterioles may take place.

For the relief of hæmorrhage certain systemic means are available. First, for immediate action at the point of injury: such astringents as tannic acid, and the various vegetable remedies containing it, are first in utility; but if the flow is strong and the state of the patient threatening, the more powerful astringents—tincture of the chloride of iron, solution of pernitrate, etc.—must be resorted to. The action of these iron salts on the blood coagula must not be overlooked,

for when given in quantity, they form a hard mass sometimes difficult to dislodge, and hence increase the hæmorrhage.

To maintain a constant impression on the bleeding vessels, remedies that lessen their caliber, and at the same time slow the heart, are of decided benefit. Digitalis, aconite, ergot, and veratrum viride, especially the last, when the circulation is active, and barium chloride when there is a relaxed and atonic state of the vessels.

CARCINOMA OF THE STOMACH.

Etiology.—The points of election for the development of cancer in the intestinal canal, named in the order of their relative frequency, are the stomach, the rectum, the cæcum, the flexures of the colon. Of all the organs of the body, the stomach is most frequently the seat of cancer—more frequently than the uterus, which comes, strictly, next. As regards age, the majority of cases occur at fifty, but the disease may appear at any time from forty-five to sixty. It is very rare from thirty to forty. According to some authorities, cancer attacks the male sex by preference, but careful investigation shows that this view is erroneous, and that the two sexes are about equally affected. The well-to-do classes are said to be more liable to the disease than the poor, and the obese, hearty feeders, rather than the abstemious, but these are doubtful propositions.

Predisposition and heredity play an important part in the causation of cancer; they are, doubtless, the most influential factors. The inherited tendency may not be traced sometimes, when it exists, because of the behavior of the cancer-germ, skipping over one or more generations and appearing in subsequent ones. All other presumed moral and dietetic causes are rather fanciful.

Pathological Anatomy.—The forms of cancer occurring in the stomach are the following: scirrhus, or fibroid; medullary, or encephaloid; and the gelatinous, or colloid. As regards the site, the points of election are in sixty per cent. at the pylorus; in twenty per cent. at the lesser curvature; and in ten per cent. at the cardia. In the process of growth, extension is more apt to be vertical than transverse; but, when the growth is about the cardia or the pylorus, the new formation takes an annular direction, causing stenosis.

The initial changes in the development of cancer of the stomach are an increased vascularity and the presence of numerous white blood-corpuscles in the cylindrical epithelium of the gastric glands—as in ordinary inflammation—but the changes soon take a special direction and character. Rapid proliferation of the cells of the cylindrical epithelium occurs, and assumes a downward direction, penetrating the mucosa, the sub-mucosa, to the muscular layer, into which ultimately long, fibrous bands project. In the loose, submucous connective tissue

the growth is most rapid, and here the nodules form in greatest numbers. The so-called cancer-cells—groups of proliferating cylindrical epithelial cells—lie imbedded in a fibrous stroma, made up from the connective tissue of the mucous membrane. Within and about the stroma an infiltration of small cells appears, and out of or within these are formed numerous minute vessels. Thus, in a short time from the beginning of the process, all of the anatomical elements of the mucous membrane are appropriated by the new formation. In the course of development of scirrhus, the connective-tissue element, the fibrous stroma, takes on a preponderating growth over the epithelium cells and the small cell infiltration, with its newly formed vessels.* It is in consequence of this preponderance of the connective-tissue element, whether in distinct nodules or in a dense annular mass, that it presents such a cartilaginous appearance on section. A large part of the stomach may be converted into a mass of scirrhus, of one or two inches in thickness, with nodules and protuberances of greater thickness projecting into the cavity. A dense mass, of half to an inch in thickness, much less nodular, may surround the pylorus or the cardia, leaving a considerable part of the mucous membrane of the stomach free from disease. No part of the mucosa exists after the cancer is developed; hence the internal surface of the stomach at that point is the surface of the cancer only, which is usually in an ulcerating state.

Medullary cancer, or encephaloid, differs from scirrhus in the less growth of the fibrous stroma, and in a much more luxuriant proliferation of the small cells and their associated vessels. Hence this form of the disease is softer, more vascular, and possessed of a greater power of rapid growth. Some parts of this form of cancer may, and usually do, retain the characteristic fibrous stroma of scirrhus. The internal or gastric surface usually consists of projecting nodules of softened cancer elements, which are easily detached and bleed readily. The ulceration which occurs in the exposed surface within the cavity of the stomach really consists in a process of fatty degeneration, the disintegration being produced by the solvent action of the gastric juice and the mechanical action of the food.

Colloid cancer differs from the other varieties in that a gelatiniform degeneration of the cancer cells takes place, giving the peculiar colloid appearance. The distention of the alveoli by this material dilates them so that they are larger than in other forms. This variety differs from the others also in that it is more widely diffused through

* Waldeyer, Virchow's "Archiv.," vol. xli, p. 470, and vol. lv, p. 67, "Die Entwicklung der Carcinome." Also Förster, "Lehrbuch der path. Anat.," pp. 110-115, by Siebert, Jena, 1873. Rindfleisch, "Text-Book of Pathological Histology," Lindsay & Blakiston, 1872, p. 375, confirms Waldeyer's account of the origin of cancer in the mucosa. See also Rokitsansky, and especially the great work of Cruveilhier, "Traité d'Anatomie Pathologique," where colloid will be found admirably delineated.

the mucous membrane, and through neighboring organs, and is slower and longer in growth. It is also less common.

Cancer, like ulcer, by setting up local peritonitis leads to the formation of adhesions, which affect the shape, position, and motions of the stomach. Adhesions may fix the pylorus in or about its true position, but, when unattached, the weight of the cancerous mass may drag it down, even as low as the hypochondrium, and thus constitute a movable tumor. When the annular deposits form at the pylorus, a stenosis of the orifice and dilatation of the cavity are results. When the same formation occurs at the cardia, the stomach very much contracts, and the œsophagus immediately above dilates. In the vicinage of the connective-tissue bands, which stretch out through the subjacent elements, especially the muscular, considerable hypertrophy of these muscular elements at first results, but atrophy, from pressure of the newly formed connective tissue, finally occurs.* Those portions of the mucous membrane uninvaded by the cancer elements suffer chronic catarrh, in consequence, doubtless, of the continued hyperæmia. That from such a state of the mucous membrane cancer may develop, is a popular notion, not supported by any scientific data. It is true that hyperæmia of the cells of the cylindrical epithelium is apparently the starting-point of the development of cancer, but this hyperæmia is due to some peculiar irritation of the tissue. Cancer has developed from an old ulcer in some rare instances, but some remnant of gland-tissue must have remained.

Cancer of the stomach is usually primary, and in most of the cases is confined to that organ. It is rare, indeed, for the stomach to be secondarily affected; but the author has seen a case in which cancer of the gall-bladder was followed by secondary deposits in the pylorus—an altogether unique case. In less than half the cases, cancer involves other organs as well as the stomach, and notably the liver, which is affected in about one fourth. Secondary deposits in the liver less often occur when the cardia is involved than when the lesser curvature and the pylorus are the sites of cancer.

The principal complications of cancer of the stomach are fatty heart, thromboses, pneumonia, tuberculosis, etc.

Symptoms.—In a few rare cases cancer has proceeded from its inception to its termination in the death of the patient without causing any distinctive symptoms. These are examples of cancerous infiltration of the mucous membrane in the greater curvature, the orifices being unaffected. In the first stage, before a tumor can be detected or the cachexia is evident, the symptoms present are those of a dyspepsia, which gradually assumes a more aggravated character. There is a good deal of pain from an early period, felt in the epigastrium usually,

* Luton, "Cancer de l'Estomac," "Nouveau Dict. de Méd.," Paris, 1871.

and increased by pressure, by food, and is also felt posteriorly. The pain is nearly constant, and, although at times more severe, there are not, as a rule, those violent paroxysmal attacks so often found in ulcer. The pain is acute, often burning, sometimes lancinating, but by no means invariably so; again, it is a sense of soreness and not severe pain; rarely it is entirely absent, according to Brinton, in eight per cent.*

The disorders of digestion increase with the duration of the disease; the appetite declines; distress after eating becomes greater; then attacks of acidity and pyrosis, with regurgitation of an acrid, acid liquid, come on. Emaciation and loss of weight proceed at a uniform ratio. If annular deposits have been occurring at the cardia, the patient early becomes conscious of a difficulty in getting food into the stomach, but he almost invariably refers the obstruction to a point higher up. As the case advances, the alimentary substances pass slowly down to the cardia, where they are arrested for a minute or more, some portions trickling through into the stomach, the rest slowly returned by regurgitation, with a distinct gurgling noise. Considerable pain is experienced—a burning pain usually—when the substances swallowed reach the cardia, and as they pass through it into the cavity. This passage through the narrowed orifice is, as a rule, distinctly recognized and accurately described. When the liquid or solid is disposed of, either by regurgitation or by entrance into the stomach, there is a feeling of relief, and the stomach digestion goes on with the ordinary facility. In cancer of the cardia, but a small portion of the mucous membrane is destroyed—the deposits being annular—and, as death takes place earlier by inanition than in any other form, there is not much interference with digestion, and these unfortunates suffer horribly from hunger. The epigastrium contracts and is drawn in toward the spine, owing partly to the exceeding general emaciation, and partly to the extreme contraction of the stomach.

The absence of hydrochloric acid from the gastric juice, as a symptom which must possess great value if correct, has been much discussed of late. It has been held that this sign is infallible; then, that there are so many exceptions as to destroy its value for diagnosis. The latest researches tend to show that the acid is absent in cases of cancer, but it is also absent in other states of the system. Wolff and Ewald † assert that the acid is absent from the gastric juice of old people. In a case of cancer, Hoonigmann and Noorden ‡ found the merest trace of acid. These facts show that this sign can not yet be relied on. Some of the difficulties attending the solution of the question are the chemical methods, for they are not only uncertain in themselves, but require high skill in application. The test lately proposed by Günzberg, one of the simplest, is as follows: Dissolve 2 grammes (30 grs.) of phoro-

* "Medico-Chirurgical Review," vol. xx, p. 479. Also Brinton, "Diseases of the Stomach."

† "Centralblatt. f. d. Therap.," 1888.

‡ "Zeit. f. klin. Med.," 1888.

glucine and vanilline, 1 gramme (15 grs.), in 30 grammes (1 oz.) of absolute alcohol. To a few drops of this solution add the same quantity of the filtered stomach-juice. The mixture should be evaporated in a porcelain dish over a spirit-lamp, but should not boil. So small a quantity of hydrochloric acid as 1 in 10,000 will be detected by the formation of crystals of a red color, or if half as strong streaked with red.

It is said that in cases of cancer there is not enough acid present to turn methyl-violet blue. This reaction necessarily has a limited scope, and is not final as to the character of the acid.

The subject must be regarded as yet *sub judice*, although the facts warrant the statement that in cases of cancer of the stomach in persons of middle age the absence of hydrochloric acid may be regarded as a diagnostic sign of real value, but not conclusive.

In the other forms of cancer, instead of arrest at the cardia, the patient feels no distress until the alimentary materials reach the stomach, when nausea and other distresses begin. Vomiting is one of the most constant symptoms, occurring in three fourths of the cases. At first the patient brings up in the morning, with a good deal of straining, some tough, glairy mucus, and, it may be, a little bilious matter. Presently the vomiting comes on after eating; if the cancer is situated just below the cardiac orifice, and does not constrict it, pain, nausea, and vomiting, begin almost immediately after the food is swallowed. If the posterior wall is affected only, vomiting may not occur until late in the disease, and then may not be a very pronounced symptom. When the pylorus is affected, vomiting is a pretty nearly constant symptom, but it does not occur until some time after the food has reached the stomach—as a rule, not until two or three hours have elapsed. The vomited matters consist at first of the food in various stages of solution, then of mucus, containing sarcina and other minute organisms, and when the case is pretty well advanced there appear small brownish or brownish-black or chocolate-colored masses, of small size usually, which consist of decomposed blood. Vomiting ultimately occurs without the presence of food: it is then the form of vomiting entitled *vomiting of irritation*. Hæmatemesis is a frequent but not a constant symptom, occurring in somewhat less than half the cases (forty-two in one hundred, according to Brinton). If, however, the vomited matters were carefully searched for altered blood, it would probably be found present in nearly all cases. If the spectroscope were employed to examine all suspicious-looking particles, the absorption-bands between C and D, characteristic of hæmatin, would be often seen. Vomiting of blood in large quantity, as occurs in ulcer, is quite exceptional in cancer. Usually the blood is derived from small capillaries, but now and then sloughing takes place, and a vessel of considerable size is opened. The author has observed in some cases an enormous quantity of chocolate-colored, homoge-

neous, granular material, discharged both by vomit and by stool, in cases of cancer at the pylorus. The condition of the bowel is that of torpor, but toward the end ichorous matter passing down the intestine excites diarrhœa.

In one third of the cases observed by the author, salivation (not mercurial) was a symptom, and was either constantly or periodically present. The saliva had the ordinary appearance. The tongue is red at the tip and pointed, and is usually glazed.

The cachexia induced by cancer is characteristic. With the progress of emaciation, decline of strength is to be expected, but the subjects of the cancerous cachexia have an extraordinary sense of fatigue, which is felt when no exertion is made. The action of the heart is feeble, the pulse small, weak, and quick; the respiration somewhat hurried. The least exertion increases the number of the heart-beats and the respiration movements. The skin is thin, dry, harsh, and inelastic. The complexion is pallid, earthy, and bronzed, combined—a fawn color—and is strongly suggestive of the malady. Toward the end, œdema of the ankles appears—a mechanical result of the thromboses. The cachexia, though it may be late, never fails to come on.

A tumor is found in the proportion of eighty to one hundred cases. In some situations the tumors can not be felt, as when at the cardia, or in the lesser curvature, for here they are covered in by the left lobe of the liver. In other situations they may usually be detected by palpation—suitable attention being given to all the sources of error. The variety of cancer does not necessarily affect the question of a tumor; but a colloid growth may be diffused through the walls of the stomach, giving to the sense of touch the impression of thickening, and not of a defined tumor. On palpation, the tumor, if it exist, is felt to be hard, somewhat irregular, and nodular, if scirrhus, but softer and more elastic, yet well defined, if encephaloid or colloid. Even when in a position to be felt, it may elude search by reason of distention of the stomach, or of adhesions which may change the shape and position of the organ, or the presence of fluid in the peritoneal cavity—a result of the pressure of secondary deposits in the liver. Tumor of the liver, of the pancreas, movable kidney, aneurism, may be confounded with tumor of the stomach, and must be kept in view when making a diagnosis by exclusion. The relation of the tumor to the movements of the diaphragm should be noted; for a tumor of the stomach does not descend when the lung is inflated with air. When the pylorus remains free the weight of the neoplasm causes it to fall down, sometimes as low as the hypochondrium, and it continues movable. Tumors of the liver and spleen descend on full inspiration, but the pyloric tumor when adherent retains its position, and when movable is not influenced by the respiratory movements. When a scirrhus lies upon the aorta, a pulsation is communicated to it, but it is not an expansile pulsation, and there are none of the other signs of aneurism, yet mistakes of diagnosis are not infrequent.

Like ulcer, cancer may result in perforation and general peritonitis; in the formation of fistulous communications with the walls of the abdomen, externally; with the transverse colon, when there will be stercoraceous vomiting; with the thoracic cavity; but these are comparatively rare complications. Occasionally a large vessel is laid open, and death ensues from sudden and large hæmorrhage. In accordance with its nature, cancer tends to spread to contiguous parts by reason of immediate vascular communication. The cancer elements are much more frequently deposited in the liver than in any other organ. Ascites, icterus, thrombosis of the portal vein, etc., are the most important results of the implication of the liver. Extension of the disease also occurs by the lymphatics, and large nodular masses of degenerating mesenteric glands may be felt through the thin parietes of the abdomen during the life of the patient. The cervical lymphatics, just above the clavicle, also sometimes enlarge and afford valuable indications of the nature of the malady, even early in the course of the disease.

Tuberculosis of the lungs is a frequent complication of cancer of the stomach.

Course and Duration.—Cancer of the stomach is an essentially chronic disease. The average duration, according to Brinton, is one year; but the cases differ in duration according to the anatomical site. Named in the order of their fatality they stand as follows: cancer of the cardia, of the pylorus, of the lesser curvature, of the greater curvature. The maximum duration is three years.

Diagnosis.—The differentiation is to be made between chronic gastric catarrh, chronic ulcer, and carcinoma. In the early stages of ulcer and cancer it may be impossible to separate them from chronic gastric catarrh; but as these cases progress the points of difference become distinct. The following considerations will enable a correct differentiation to be arrived at: chronic gastritis may occur at any age; there is rarely any severe pain, and it is diffused over the whole organ; vomiting is only occasional, and then of alimentary matters, as a rule; there is no important variation in the body-weight, and no progressive emaciation. In ulcer the pain is severe, localized to a small point in front and behind; there is much vomiting and hæmatemesis, the blood coming up in considerable quantity, little or not at all altered. The subject of cancer is well advanced in life (from forty to sixty); the pain has a lancinating character, and is felt in one place, which is the same for each case, but differs in different cases; there is vomiting, especially vomiting of chocolate or coffee-ground masses of decomposed blood; above all, the presence of a tumor. The presence of an excess of *indican* in the urine has been held to be diagnostic, but, as Jaffé* has shown—and this observation has been confirmed by Hoppe-Seyler—the quantity of this substance is much increased in carcinoma of the liver, in obstruction of the intestines, and other diseases.

* "Centralblatt f. d. med. Wissenschaften," p. 2, 1872.

Treatment.—Although cancer of the stomach is incurable, much may be done by treatment to render the patient's decline tolerable. The first and most important point is to regulate the diet. By the withdrawal of solid food, and the substitution of milk alone, or milk and beef-juice, the greatest relief is afforded, and for a time there may be a gain in weight, but of course this is not long maintained. If the diet is restricted to the articles mentioned, it should be supplemented by that important means of rectal alimentation, the injection of defibrinated blood. The burning pain is much diminished by washing out the stomach once a day with the stomach-pump, especially in dilatation from stenosis of the pylorus. By removing acrid and acid matters in this way, much straining efforts at vomiting will be saved.

Of all the remedial measures proposed there is no prescription which is so generally useful in these cases as equal parts of pure carbolic acid and tincture of iodine, of which one or two drops may be administered in water three times a day. For the vomiting only, a solution in cherry-laurel water of carbolic acid, or a combination of carbolic acid with bismuth in an emulsion, will be found effective. Nitro-glycerin, benzine, and bisulphide of carbon have been used, with advantage, to allay nausea and vomiting. The most effective means to relieve pain is the hypodermatic injection of morphine. The stomachal administration of the same agent is inefficient, owing to the diminished absorption power of the organ. Laudanum by enema, morphine in the form of suppository, or the endermic use of morphine, are preferable to the stomach administration. Great care is necessary in the prescription of anodynes, for the need grows rapidly, and the consumption becomes enormous, reducing the patient to a mental and moral weakness dreadful to contemplate.

Arsenic, in the form of Fowler's solution, one or two drops, three times a day, has considerable power to allay pain, and is not without influence in retarding the growth of epithelial cancer. As respects the power to relieve pain, the physiological basis for its employment is the action of arsenic, in toxic doses, on the nervous system of animal life. It has been repeatedly observed that sometimes, in large doses, no vomiting was produced, but coma and insensibility followed. A great many facts have now been accumulated, proving that cancer of epithelial origin may be greatly retarded in its growth by the persistent use of moderate doses—two drops of Fowler's solution *ter in die*.

The author's considerable experience in the treatment of carcinoma of the stomach warrants the statement that the best results are obtained by the persistent use of carbolic acid and iodine, in the form advised above, and of arsenic, in the form of Fowler's solution. It may not be needless to observe that these agents should not be given in one prescription—the carbolic acid and iodine together, the Fowler's solution at another time.