

The first step in the series of changes occurring in the catarrhal form is an intense hyperæmia, the mucous membrane being of a deep reddish color, with here and there blackish points. The redness is not universal, but at the summits of the mucous folds. This congestion is not limited to the mucous, but extends also to the submucous connective tissue. As a result of this congestion there is over-production of mucus, which is found adherent, but not closely, to the membrane, and the follicles enlarge from an accumulation of their contents, while just around them is a girdle of enlarged vessels. The submucous tissue thickens greatly, and is infiltrated with serum, and this infiltration extends to the muscular layer. Softening of the mucous membrane now ensues; it undergoes disintegration and gradual detachment, leaving still adherent here and there portions of membrane with ragged edges, and a coating of fibrinous pellicle, still in place. The follicles resist the destruction from softening longer than other portions of the membrane, but finally they slough out. The disintegration of the mucous membrane is the result of an enormous multiplication of pus-cells within the interstices; the pressure is increased by the swollen vessels, and rapid necrosis (softening) ensues. Recovery readily takes place in the cases of catarrhal inflammation before the softening begins, and after softening if the destruction is not extensive. Repair is effected by cicatrices, which are much smoother, and, of course, devoid of gland-structures, and are therefore easily recognized. In the fibrinous or diphtheritic dysentery the alterations of structure are very different. The initial change, as in the catarrhal form, is an extensive hyperæmia, but, instead of being confined to the summits of the folds, (valvulæ conniventes of the small intestines, and the folds from contraction of the muscular layer in the large) there is a universal deep, bluish-red congestion of the lower end of the ilium, and the whole of the colon. Extensive extravasations of blood infiltrate the whole tissue of the mucous membrane, but it is especially invaded and transformed by a fibrinous exudation. The proper structure of the mucous membrane disappears entirely, except remains of the tubular glands, and it presents internally a reddish-white surface, variegated with irregular blackish and reddish figures. The result of these changes is to convert the membrane into a dense, parchment-like, and rather unyielding tissue, composed largely of the deposited fibrin. If death do not take place when the alterations of the mucous membrane have reached this point, gangrene ensues. Although the ultimate changes in the two forms of dysentery are so distinct, yet in most cases the alterations found *post mortem* are made up of both forms, the catarrhal and fibrinous. Those parts of the intestinal wall affected by the fibrinous inflammation are thicker and more prominent than those attacked by the catarrhal. Hence the surface is uneven, the fibrinous parts dark from the presence of extravasated blood, or reddish-white where the fibrin predominates. Local gangrene patches appear, in size from

a copper cent to a silver dollar; the membrane disintegrates and is detached in considerable sloughs, leaving deep excavations which extend deeper by succeeding necrosis to the peritoneum. The purulent infiltration in those parts, the seat of catarrhal inflammation, also leads to extensive destruction of the submucous layer and large excavations beneath the mucous membrane, which is either detached as a whole, or in turn yields to necrosis. These more superficial catarrhal excavations contrast strongly with the dark-red or blackish sloughs of the fibrinous.

The extent to which the intestine is involved varies greatly. The rectum, the cæcum, or the sigmoid flexure, may be alone involved; the whole of the large intestine, the disease beginning below and extending upward, may be invaded. Repair is possible only when a small extent of the mucous membrane has been destroyed by gangrene. When the morbid process is arrested, the sloughs separate, granulations spring up, and the excavations are closed by cicatrices, which by subsequent contraction may seriously encroach on the lumen of the bowel. The structural alterations are not limited to the mucous, submucous and muscular layers. When the ulcers reach the peritoneum, this membrane becomes cloudy, then intensely injected, and fibrinous exudation forms and adhesions are contracted to neighboring surfaces. When perforation ensues, a limiting inflammation may cut off the injured parts from the general cavity, and form a purulent collection, or general peritonitis may ensue if the shock does not terminate the history of the case.

The mesenteric glands are enlarged, hyperæmic, and softened, and often are broken down into abscesses. The liver is very commonly the seat of numerous small abscesses, from embolic obstruction of the radicles of the portal vein. The lungs present in their dependent parts the changes of hypostasis. The heart is small, flabby, and its muscular tissue more or less fatty.

**Symptoms.**—In the epidemic form, dysentery may begin suddenly, without any preliminary symptoms, and with great violence, but in the endemic and sporadic form, and in the milder cases during epidemics, there is usually a prodromic or preliminary stage. There is more or less catarrh of the intestines, diarrhœa, chilliness followed by feverishness, toward evening especially, and that state of general discomfort known as *malaise général*.

In the mildest cases of dysentery there is no fever, but when the symptoms are at all pronounced there is fever of a remittent type, the exacerbation occurring toward evening. The type of the fever is, of course, determined by the extent of the local lesions.

When actual dysenteric symptoms come on, which happens in two or three days after the first of the prodromic period, very decided abdominal pain is felt along the course of the descending colon and about the sigmoid flexure, and is increased by pressure at these points. These

abdominal pains, felt also somewhat about the umbilicus, are described by the term *tormina*—"colicky pains." There is pain of a burning character in the rectum, but especially a sense of the presence of a foreign body, with the desire to strain for its expulsion. The patient resorts again and again to the close-stool, and makes strong efforts at expulsion, but instead of any fæces being discharged he only brings away some jelly-like matter—mucus—either alone or tinged with blood, and occasionally a hard ball of fæces (*scybala*), but without any relief. The feeling of bearing down (*tenesmus*) and the burning pain felt in the rectum and through the hips continue as before, so that he finds it impossible to quit the stool, or returns every few minutes, and each time he sinks back to bed exhausted and unrelieved. At the beginning, before the characteristic dysenteric stools appear, there are loose fecal evacuations containing mucus, voided with great pain. Presently, however, fæces are no longer present in the evacuations; they consist of a grayish, tough, transparent mucus in pellets or small masses, containing here and there whitish granules, which have been likened to grains of sago. On the second or third day, blood appears in the stools, and the *débris* of epithelium are mixed with the mucus. In the mildest cases, the course of the disease is ended with these manifestations. These do not differ from the mildest cases seen during the existence of an epidemic; on the other hand, the most formidable, the fulminant cases, may occur sporadically. In the more pronounced examples, after three or four days, severer symptoms make their appearance—the amount of blood discharged increases; not only the *débris* of epithelium, but the pellicular neo-membrane (an exudation) and necrosed parts of the mucous membrane are now to be detected in the stools. The stools have no longer any fecal odor, but are very fetid from the presence of gangrenous portions of mucous membrane. The grayish, transparent mucus gives place to a puriform fluid, and there is not only considerable admixture of blood, but a good many clots of pure blood are also discharged, and indeed a real hæmorrhage may occur. A stool may consist of a bloody, purulent fluid and *scybala*, and the next be composed largely of an extremely fetid, brownish fluid containing bits of neo-membrane and masses, often of considerable size, of decomposing gangrenous sloughs of the mucous membrane. Sometimes a cast of a part of the bowel, consisting of the mucous membrane in a complete cylinder, all of its parts distinct enough for recognition, will be discharged. These ought not to be confounded with the infinitely rarer accident of a slough of the bowel itself, several feet in length, cast off by intussusception. As has already been pointed out, in the catarrhal form of dysentery, deep-seated suppuration in the submucous layer sometimes extends widely, and the mucous membrane sloughs off before it has had time to become gangrenous. During the *tormina* nausea is often felt, and vomiting occasionally occurs. In the

severe cases, vomiting is constantly present and adds materially to the gravity. The vomited matters consist of articles of food and drink, of gastric mucus, and ultimately of biliary matters from the gall-bladder. The bladder in severe cases is also affected by tenesmus. The urine is scanty, high-colored, and very acid, and therefore irritating, and so sensitive does the bladder become that a few drops of urine present in it excite the tenesmus, and in the straining both the bladder and the rectum are simultaneously affected. The frequency of the stools represents pretty nearly the gravity of the case. In the mild cases there may be ten to twenty daily; in the severe cases forty or fifty, and in the fulminant they may reach a hundred or more. Lessened frequency is a good indication when the character is improved. The amount discharged is small unless hæmorrhage occurs. Artificial distinctions based on the character of the stools have been made, but these have no practical importance. It must be obvious that a disease affecting so large a part of the intestinal mucous membrane, and of so formidable a character in itself, must quickly impair the bodily forces. Even in the mild cases considerable emaciation occurs and the return to health is slow. In the severe cases, systemic infection results from the products of decomposition and from the gangrene, and they wear the aspect peculiar to this state. The weakness early reaches the point that the patient is unable to leave the bed; the evacuations pass without his control; the anus and neighboring parts become excoriated and bed-sores quickly form. The face wears an anxious expression and is pinched; the skin is dry, harsh, and wrinkled; the pulse small, quick, and feeble. With the most painstaking care the person and bedding of the patient will be fouled with the discharges and emit a horribly fetid odor. From this condition of depression the case passes into the stage of collapse, when the pulse ceases at the wrist and the heart beats very feebly, an obstinate hiccough comes on, the skin is covered with a cold sweat, the hands and feet become cold and livid; the face is shrunken, the eyes deeply sunk, the voice husky. In this condition the patient usually betrays a singular apathy, although the mind remains clear until the failure of oxygenation of the blood causes carbonic-acid poisoning and stupor. The state of collapse may not come on in this gradual way, but the patient pass suddenly into it, by reason of perforation of the bowel and the resulting shock followed by peritonitis. Death does not necessarily ensue immediately after the symptoms of collapse have been fully developed. The patient may remain in this low state for several days, now presenting delusive appearances of improvement, now declining. Various complications may arise during the course of dysentery. Thrombosis of the intestinal veins, or a form of phlebitis, or the absorption and deposition of some unknown morbid material, may excite inflammation and abscess of the liver. This is a common accident in tropical regions and in the interior

of the American Continent. Hepatic abscess is, however, more frequently due to the milder than the severer forms of dysentery, because of the destruction by gangrene and the rupture of vascular communication, which takes place in the latter. It follows disease of the rectum much more commonly than of the colon or cæcum, because of the greater abundance of large vessels in the latter and the comparative sluggishness of the blood-current. Besides abscess of the liver, purulent collections are sometimes found, as the author has seen, in the lymphatics at the root of the lungs and elsewhere. Peritonitis is a usual complication, not due necessarily to perforation, but to the extension of the ulceration to the peritoneum. Increased tenderness of the abdomen and an exacerbation of the systemic symptoms are evidences of the onset of this complication.

**Course, Duration, and Termination.**—In the mild cases the disease usually begins with diarrhœa; tormina and tenesmus are felt about the second day, when also mucus appears mixed with fæces. About the third day the more characteristic stools are seen, and the disease has attained its height on the fifth and sixth days, when improvement begins, and convalescence is established about the eighth day. The signs of improvement are, a diminution in the number and frequency of the stools, the reappearance of fæces, and the disappearance first of the blood and next of the mucus. In the more severe cases the duration is more protracted. The maximum in the intensity of the symptoms continues for several days; the state of adynamia is more serious and prolonged, and the return toward health may be by almost insensible gradations, lasting several days. The prodromic period in such cases will be about three days, the fully developed period will range from four days to a week, and the period of gradual improvement will last about the same time, so that the whole duration of such a case will be about three weeks, while the convalescence will require a month for full restoration to health. The termination may be in partial recovery, or in chronic dysentery. When this is the case, the more severe symptoms subside, the stools improve in character, but they never become entirely healthy, and the general condition is more favorable. Now fecal stools, with only a little mucus and blood, are passed, but these may be succeeded by evacuations entirely of pus and blood. With this varying fortune the case may proceed for months, even years, the patient in a feeble state, emaciated, and yet able to keep out of bed, or so reduced as to be unable to sit up except for a little while every day. The prolonged suppuration in these cases induces amyloid degeneration of the liver, spleen, and kidneys, the ultimate result being albuminuria and anasarca.

Another mode of partial recovery is narrowing, contraction, and deformation of the bowels, the effect of which is to impair assimilation and nutrition, so that after a period of improvement a progressive loss

of flesh and strength is observed, and ultimately death occurs by exhaustion.

**Prognosis.**—Opinions must be expressed with caution in the early stages of dysentery, for it is not then possible to estimate correctly the extent of the inflammation, nor its form. A favorable prognosis can be given in those cases which continue mild, and even in severe cases, if the signs of collapse are absent. Whenever the symptoms begin with great violence (fulminant form) a guarded prognosis is judicious. If the symptoms of collapse are persistent, especially if gangrenous sloughs appear in the stools, an unfavorable opinion must be given. In severe and protracted cases that are apparently improving, the probability of a partial recovery should not be lost sight of.

**Diagnosis.**—The symptoms are so characteristic that a differentiation is rarely required, except as between simple and acute catarrh of the rectum (proctitis) and dysentery proper. The dysenteric symptoms in proctitis are much less severe; the discharges consist of mucus and muco-pus, sometimes intermixed with blood, but never the foul discharges of dysentery, the shreds of false membrane, the gangrenous sloughs, etc., which constitute so characteristic an evacuation. In croupous enteritis, which is as rare as dysentery is common, there are discharges of shreds of pseudo-membrane with tormina and tenesmus, but the attacks are paroxysmal, the evacuations continue the same, and the subsequent history is widely different from that of dysentery.

**Treatment.**—As in this disease the nutrition of the body suffers severely, the right use of aliment is important from the beginning. If the stomach is irritable, milk, with one fourth lime-water, is the best food. If there is but little nausea, and especially if the digestion remains good, the patient can take milk, eggs, beef-juice, ice-cream, boiled custard, oyster-soups, mutton, chicken, and beef broth, and similar articles, but solids and aliments generally leaving much residuum, and especially coarse articles, are highly objectionable, because they increase by friction the irritation of the inflamed membrane. Where there is much depression of the powers of life, egg-nogg (milk, egg, and brandy) may be freely given, and champagne be used to allay vomiting.

Of medicinal measures, the treatment by saline laxatives is of the highest importance. Bretonneau, preceptor, and Trousseau, pupil, strongly urged the sulphates, and the author is convinced that the sulphate of magnesia in solution with dilute sulphuric acid is entitled to the first place as a remedy. It must be given in laxative doses, and at the right time—that is, before the mucous membrane has begun the process of disintegration. It serves a triple purpose: it empties the canal of retained fæces; it lessens hyperæmia by setting up an outward diffusion; its after-effect is astringent and sedative. Next to the sulphate of magnesia, and by many given the first place, is ipecac. The experience with this remedy, ancient and modern, is now so great that the limit of its curative power is well and accurately defined. It

is applicable to the first stage of dysentery, before the mucous membrane is stripped off. It must be given, according to recent Indian experiences, in which the author in the main concurs, in scruple to drachm doses, every four to six hours. The effects to be derived from it are these: The first doses empty the stomach thoroughly, then a tolerance is established, and the considerable doses prescribed are carried quietly by the stomach, but act on the intestinal canal, producing copious bilious evacuations, so characteristic as to be called "ipecac-stools"; after the purgative action ceases a calmative and astringent action continues. The utility of ipecacuanha ceases with the production of the characteristic stools, and very decided amelioration in the remediable cases usually follows. There is one form of dysentery, above all others, in which the ipecac-treatment is signally beneficial—the puerperal. The author has witnessed some remarkable cures in cases of puerperal dysentery, a disease which is well known to be very dangerous to life. As regards the dose, the large quantity of a drachm prescribed by our Indian colleagues seems unnecessary in our temperate climate. It will usually be necessary to give twenty grains at a dose. It is best administered in milk, and is better borne if some aromatic powder is added to it. The next remedy in point of efficiency for the treatment of the first stage of dysentery is castor-oil, administered in purgative doses, for the purpose of ridding the canal of acrid and fermenting materials, and of retained feces, and to secure the after-quietude which succeeds to the action of a purgative. After using one of the agents of the cathartic group as above directed, what remedies are most appropriate for the treatment of that condition in which either purulent or fibrinous infiltration, or both, is taking place? Under these circumstances an emulsion of oil (almond-oil) and turpentine is very serviceable, and combined with opium, if the pain be very severe. When destruction of the mucous membrane is beginning, the most effective remedies are corrosive sublimate, sulphate of copper, sulphate and oxide of zinc, acetate of lead, bismuth, arsenic, etc. Of this formidable list, sulphate of copper and arsenic are most effective. They ought to be combined with opium. The author has had excellent results from the use of Fowler's solution, one drop, and deodorized tincture of opium, five to twenty drops every three hours. Sulphate of copper must be given in small doses (one twentieth of a grain) every three hours, with morphine (one eighth to one twelfth of a grain). Bismuth in large dose (ʒj—ʒij) every four hours is sometimes beneficial, especially if administered with carbolic acid. When there is much fetor and sloughs are threatening, good effects are obtained from naphthaline (two grains every three or four hours), carbolic acid, thymol, etc. Numerous vegetable astringents, owing their therapeutical power to the tannic acid which they contain, have been much employed, with more or less advantage, but they are not equal to the mineral astringents. Applications to the rectum and colon are un-

questionably useful. By the method of irrigation the whole of the colon may be safely reached. Excellent results are obtained by washing out the bowels with warm water (100° to 105° Fahr.). The patient is placed on his right side, the thighs well flexed on the pelvis, the hips elevated and brought to the margin of the bed, the chest and head on a lower level. The anal tube is inserted two or three inches, and the reservoir is placed at a sufficient height to insure the passage of the water. Various demulcent applications may also be made in this way. Very great relief is afforded by the injections of starch and laudanum after an evacuation, or especially after irrigation and washing out the bowels. Much emphasis should be put on the employment of nitrate of silver enemata. They possess a high degree of utility if efficiently administered. A tube which is not acted on by the silver salt should be passed carefully up to the sigmoid flexure, and about eight ounces of a strong solution of silver nitrate (ʒj—ʒj to the ounce) should be thrown up. The time for performing this is after sufficient quiet has been obtained by the hypodermatic injection of morphine. So rapidly is the insoluble chloride of silver formed that no ill results can follow the strongest solution employed for this purpose; but, if there be any reason to apprehend mischief, a solution of common salt may be injected immediately after the silver.

If the injections are, for any reason, inadmissible, suppositories of cacao-butter containing morphine, morphine and tannin, morphine, or opium and acetate of lead, etc., can be used instead. Lately injections and suppositories of fluid extract of ergot, and of ergotin, have been used, and apparently with good results. Ergotin has been given internally, and, in some epidemics, with an apparent utility which the physiological effects probably warrant. It is difficult to understand how it can accomplish anything when in the catarrhal inflammation the mucous membrane is infiltrated with pus, and in the croupous with fibrin. After the use of the saline laxative, or the ipecac, the morbid process continuing, is there no means of securing that quietude of the intestine which will permit the mineral astringent to act on the diseased surface? The author believes that we possess such an agent in the hypodermatic injection of morphine. He therefore urges, from the point of view of personal experience, this means of treatment. Besides giving the remedies an opportunity to act on the diseased surface, the morphine injections suspend that violent reflex peristalsis which does so much injury to the diseased mucous membrane. External applications, if not curative, are grateful. The cold wet pack, the ice-bag, and other cold applications, are sometimes preferred; but generally warm—rather hot—applications afford more relief. The turpentine stupe is generally more useful than other warm applications. With the beginning of the symptoms of collapse, active stimulation may be necessary. The best form of stimulant is cognac brandy, as it is at the

same time astringent. Beef-juice and brandy, milk and brandy, and egg-nogg, are combinations of food and stimulant most generally useful. As already indicated, the strength must be supported from the outset by suitable nutriment. It is necessary to keep the person of the patient and the bedclothing clean. The discharge should be removed from the apartment as soon as passed, and should be thoroughly disinfected before going into the common receptacle. A strong solution of sulphate of iron is a cheap and effective agent for this purpose. Some tincture of iodine exposed in a saucer is an excellent deodorizer for the apartment of the patient.

#### ULCERS OF THE INTESTINES.

**Forms.**—Ulcers of the intestinal canal exist in three forms :

Ulcers from mechanical irritation.

Ulcers from thrombosis or embolism.

Ulcers from tuberculous deposit.

There are duodenal ulcers, cæcal ulcers, and rectal ulcers, and the chief cause is cirrhosis of the liver ; hence it is convenient, in the description, to study these ulcers, according to their anatomical position, going from above downward.

**The Nature, Symptoms, and Treatment of Ulcers of the Duodenum.**—The first or transverse part of the duodenum is the almost exclusive seat of the ulcer. The pathological history of this ulcer is the same as the corresponding ulcer of the stomach. The great factor in its causation is thrombosis, or embolic obstruction of a vessel. An admirable instance of this accident (the embolus in position, the ulcer forming) has been reported,\* confirming clinically that which had previously been demonstrated by pathological experimentation. When the blood-supply has been cut off from a part of the mucous membrane, the digestive juice, no longer opposed by the alkaline stratum beneath, dissolves or digests the membrane, and an ulcer is formed. At first it is a round, smooth, sharply defined ulcer, but the inflammation which is lighted up cuts off the action of the gastric juice from the adjacent healthy tissues, by a deposit of new material of a granulation-tissue structure, and especially protects the bottom of the excavation ; otherwise perforation would quickly ensue in most cases. As the layers of the duodenum are invaded, not all at once, but successively, and as the distribution of the vessels is fan-shaped, it is obvious that the resulting ulcer must have shelving margins and a stratified appearance. The term "crater-like" aptly enough describes its characteristics.

This description of the process by which duodenal ulcers are formed can be applicable to ulcers situated in the first part of the duodenum

\* Merkel, "Wiener Presse," various numbers in 1866.

only, for, soon after the acid contents of the stomach reach the vertical part, they begin to have an alkaline reaction. It is in the first part that the ulcers are found, and they are sometimes partly in the stomach and partly in the duodenum. They are usually single, and occasionally multiple. The cause that gives origin to one may produce several (emboli), so that it is not uncommon to find gastric and duodenal ulcers existing at the same time. As regards the relative frequency in the occurrence of ulcers in the stomach and duodenum, respectively, they are found in the former organ thirty times more frequently than in the latter. The duodenal ulcer is found between thirty and forty years of age in a great majority of cases, and becomes very rare after sixty (Krauss).\* As to sex, the preponderance is in favor of males, and is so extraordinary in proportion as fifty-eight to six. Accident in the collection of cases had something to do with these figures. Besides the causes already mentioned, burns of the skin, especially of the chest and abdomen, have induced ulceration of the duodenum. The burns must be of considerable extent to bring it about, sufficient to cause a reflex spasm of the vessels, thus permitting the gastric juice to act on the membrane. If the ulceration reaches the peritoneum adhesions may be contracted to neighboring organs, to the stomach, pancreas, gall-bladder, etc., and fistulous communications may be established ultimately between them. In the process of widening of the ulcer, a vessel may be opened and hæmorrhage result, a very common symptom, occurring in one half of the cases. By perforation a local peritonitis may be set up, adhesions contracted, and a cavity containing sero-purulent fluid, shreds of tissue, etc., formed ; or the general cavity of the peritoneum may be entered and general peritonitis excited. When an ulcer of the duodenum heals, the puckered cicatrix which results may induce remarkable changes. Contraction of the pyloric orifice and dilatation of the stomach will be results of the cicatrization of an ulcer situated at the entrance to the duodenum ; if lower down, the lumen of the bowel will be encroached on, and dilatation occur above the contraction. An ulcer may be so situated that the pancreatic and common duct of the liver will be obstructed with the usual results of such obstruction. Ulcers of the duodenum situated near the pyloric orifice will be accompanied by some of the symptoms of a gastric ulcer situated at or near the pylorus. Vomiting is a pretty nearly constant symptom, coming on several hours after eating. Tenderness to pressure, and, when the ulceration approaches the peritoneal surface, rather exquisite tenderness, is felt in the position of the duodenum. Attacks of gastralgia, of enteralgia rather, and of a severe character, occur under the same circumstances as gastralgia in stomach-ulcer. The pain is distributed through the solar plexus and the hepatic plexus also, and is of a very depressing kind, the

\* "Das perforirende Geschwür im Duodenum," Berlin, 1865, p. 24.