

lesion, and that its presence in the body exposes the patient to a certain risk of infection.

In general, therefore, resection, if successful, yields better results than elimination, but the latter operation is less dangerous. If the condition is such that resection can be performed without technical difficulties and the patient's strength permits, it should be carried out. If the small intestine alone is involved, the stenosed portion should be resected. If there are several stenosed portions near one another, it is better to make a single resection of the whole. In such a case Köberle resected with success 205 cm. (82 inches) of small intestine. The ends of the small intestine should be united circularly by a Murphy button or by suture. If there is suspicion of stenosis lower down, the button should not be employed. If the cæcum and ileum are involved and the tuberculosis as yet is not too extensive, resection may be performed and followed by entero-anastomosis; or the anastomosis may be performed and the resection left for a later operation. If the portion of ileum which is involved is too extensive to warrant resection, the ileocaecal tumor may be removed and stenosis of the ileum higher up avoided by entero-anastomosis.

If the ileocaecal tumor is the only lesion, the surgeon may be in doubt as to whether it is tuberculous or carcinomatous. Under such circumstances extirpation is positively indicated. This had best be performed in two steps, as described on page 207. Extirpation of the cæcum is made easier by this method of procedure, since its elimination from the fecal current is usually followed by a marked decrease in the inflammatory swelling. Still, this method of operation requires that the anastomosed ends of intestine be dropped back into the peritoneal cavity. Mikulicz prefers the method of operating described on page 476, by which the involved portion of intestine is loosened and brought outside of the peritoneal cavity, and at a later date is excised extra-peritoneally.

The results of operation are as follows: In 50 cases of total resection collected by Hofmeister there were 68 per cent. of cures, 2 per cent. of failures, and 30 per cent. of deaths. Thirteen patients were operated upon for simple stricture; 8 of these died and 3 recovered. Conrath mentions 48 cases of resection with immediate suture of intestine; 8 patients died and 1 lived with a fistula. Five times extirpation was followed by the establishment of a fecal fistula; 2 of these patients died.

Permanent results of operation are estimated with difficulty because of the late nature of the trouble. Conrath is able to make a report in regard to 30 of 47 patients who recovered from operation: 11 of them died after periods varying from one month to four years, 10 of them with pulmonary tuberculosis; in 1 case the cause of death was unknown. Two of the 19 patients living at the time of report showed symptoms of recurrence, 1 six months and 1 six years after operation; 1 suffered from pulmonary tuberculosis; 16 were apparently healthy at periods from one to seven years after operation.

Entero-anastomosis was performed in 10 cases with 10 recoveries,

1 of them being with a fecal fistula. One patient died some years later of pulmonary tuberculosis. The rest were alive at various periods up to four and a half years. In some cases the tumor had entirely disappeared. Incomplete elimination of intestine was performed in 1 case and complete elimination in 7 cases; 2 of these patients died.

ACTINOMYCOSIS OF INTESTINE.

The frequency with which the intestine is involved in human actinomycosis is shown by Illick's collection in 1892 of 421 cases: in 218 of these the disease involved the head and the neck, in 85 the abdomen, in 58 the lungs, in 11 the skin, and in 6 the tongue. The primary seat of the disease was not stated in 29 cases. Since that time Herz has collected 64 additional cases of primary actinomycosis of the abdomen. In cases of abdominal actinomycosis the fungus almost always enters the tissues through the alimentary canal, although in a few cases it has extended to the abdomen by continuity from the lungs or œsophagus. The patient swallows some article of food, especially some cereal, which contains the specific organism of the disease. Such particles of food lodging in the intestine, and usually in the appendix vermiformis, are the starting-point of the trouble. In other instances the disease has been traced to ingestion of imperfectly cooked flesh of some animal suffering from actinomycosis. In rare cases actinomycosis of the mouth is transplanted to the lower portion of the alimentary canal. The persons affected by actinomycosis are for the most part country residents of the male sex, between the twentieth and fortieth year of life.

The contents of the stomach and small intestine seem not to be favorable to the development of actinomycosis. At any rate, it usually develops in the lower portion of the alimentary canal. At the time of operation or autopsy the lesions are found so widespread that it is impossible to state just where the disease began. Grill collected reports of 111 cases of abdominal tuberculosis in which the patients were treated surgically. The starting-point of the disease was said to be in the stomach once, in the small intestine 6 times, in the cæcum and vermiform appendix 16 times, in the colon 8 times, and in the rectum 7 times. The probable origin of the disease was given in 57 additional cases as 44 times in the cæcum and 13 times in the rectum. The fungus rarely develops in the mucous membrane, but passes this and spreads in the submucosa, where it forms flat whitish rows or nodules which often lead to ulcers. Ultimately the process spreads to the serosa. In other cases the organisms penetrate the whole thickness of the abdominal wall and develop in the peritoneal cavity.

Actinomycosis of the intestine is a chronic inflammatory process which is associated with an abundant production of new tissue, and also with active tissue-destruction. Sometimes the process comes to a standstill or is completely recovered from; at other times it continues actively. The actinomycosis in other organs, for example, the tongue

or skin, often exists for a long time as a non-inflammatory tumor. This is rarely the case with intestinal actinomycosis because mixed infection soon occurs. When parasites reach the peritoneal cavity, they spread rapidly in the serous and subserous tissue setting up adhesions everywhere. Sometimes they penetrate the posterior abdominal wall and sometimes the anterior abdominal wall with the formation of numerous fistulas. The disease is not at all limited by the anatomical structure of the tissues. It penetrates without difficulty fasciæ, muscles, and even bones, and therefore runs an extremely aggressive course in counterdistinction to tuberculosis.

The color of the granulations is in many cases characteristic of actinomycosis. They have frequently a peculiarly active bright-red appearance and bleed at the slightest touch. The purulent discharge is usually thin, less often stringy, and frequently contains the characteristic granules. The parasites of actinomycosis may spread throughout the body not only by continuity, but also through the bloodvessels. They do not seem to enter the lymphatic channels, and swelling of the lymph-glands is to be set down to a mucous infection.

Symptoms.—The clinical course of abdominal actinomycosis is distinctly chronic like that of actinomycosis in other portions of the body, although on account of mixed infection it may take on a more acute character. Grill divides the disease into three periods: the initial period, which is usually latent, the period of tumor-formation, and the period of suppuration and fistulas. The first symptoms of the disease are rather indefinite, such as intestinal catarrh, more or less acute or chronic at intervals. These symptoms may last for some weeks or months before a tumor appears. Sometimes catarrh is wanting and tumor is the first symptom noted. The tumor, as stated above, is usually in the ileocæcal region. It varies in size and in the freedom with which it can be moved. It is usually attached to the abdominal wall, or it may infiltrate the wall. In the latter case it feels very hard and is poorly marked off from the surrounding tissue. There is little pain and little tenderness on palpation, although exceptions to this are mentioned. At this stage of the disease the trouble may be mistaken for chronic appendicitis, or an abscess or sarcoma of the abdominal wall. In some cases the adhesions due to abscesses are wanting and the tumor maintains its mobility until it reaches a large size. When the abdominal wall is involved, fluctuation can sooner or later be made out; and if the mass is not incised, one or more fistulas develop spontaneously. These are usually in the ileocæcal or right inguinal region.

The pus which is discharged has the characters above described. Sometimes it is mixed with feces. Sometimes one may seek in vain for the parasites in the pus. Under such circumstances bits of granulation-tissue should be examined, as they usually contain the parasites. Culture of these parasites is unsatisfactory since the culture preparations are soon overgrown by bacteria.

Actinomycosis, even when it forms a distinct tumor, rarely produces symptoms of intestinal stenosis. The general health of the

patient is none the less affected. There is more or less fever which is of no regular type, and if high is probably due to mucous infection. The nutrition of the patient suffers, not so much on account of the primary lesion as on account of the chronic suppuration. A marked degree of marasmus follows, and finally amyloid degeneration. Sometimes the percentage of hæmoglobin is very low.

One of the most serious complications which befall a patient with actinomycosis is a fecal fistula. This is, however, relatively rare, on account of the tendency to adhesions and the complicated course of the fistula. For the same reason diffuse peritonitis is not a common accident, and the abscesses break usually not into the free peritoneal cavity, but into the bladder or kidneys or pleura. The liver is a common seat of metastasis. General miliary infection of the body is rare.

Diagnosis.—The diagnosis of actinomycosis of the intestine, and especially of the ileocæcal region, cannot be made with certainty until the disease breaks through the skin or some of the characteristic fluid is obtained for examination. It may be suggested by the chronic course, the ill-defined infiltrating tumor with areas of softening. If the tumor is well defined, and has no areas of softening, and there is no infiltration of the abdominal wall, a differential diagnosis between this and other intestinal tumors cannot be made. If the actinomycosis is situated in the region of the cæcum, it must be differentiated from carcinoma, from tuberculosis, from chronic appendicitis, or, if the abdominal wall is involved, from abscess and tumor of the abdominal wall. (See the description of actinomycosis of the abdominal wall given on page 132.) If there is a retroperitoneal tumor, it must be differentiated from lesions of the kidney, of the vertebral column, of the ileum, and of the retroperitoneal glands. If there are fistulas with diffuse infiltration, one has to differentiate actinomycosis from tuberculous fistula starting from the intestine or peritoneum or bones, and from syphilitic processes.

Prognosis.—The prognosis of abdominal actinomycosis if left to itself is bad. Spontaneous cure has never been observed. Internal treatment by potassium iodide is equally unsatisfactory. Sooner or later the patient dies from marasmus or some complication of the disease, although he may live for two years or longer.

Treatment.—The treatment is purely surgical. The character of the operation must depend upon the extent of the process and the general condition of the patient. Even though the patient is strong, it will rarely be possible to resect the whole of the affected intestine.

The simplest surgical treatment is the opening of the various abscesses. This has the effect of allowing the escape of pus, and the presence of air seems to limit the growth of the parasite, which is an anaërobic bacterium. For this reason the various fistulas should be split up as far as the function of the parts involved will permit. If there are intraperitoneal abscesses, they may be shut off from the peritoneal cavity to be opened at a later date. Partial excision and curetting may also be employed. In every case of actinomycosis whether

an operation is performed or not, the patient should be given potassium iodide to the extent of 3 to 5 grammes (45 to 75 grains) daily. Numerous experiments upon animals and observations upon men have shown that potassium iodide is not a specific against actinomycosis; and further, that it has no influence either upon the growth of the parasite or its virulence. Its favorable action is exerted upon the diseased tissue. It favors softening of the affected tissue, limits extension of the process, and facilitates external rupture of abscesses. Naturally it increases the resorption of inflammatory products. The parasites are thus deprived of their means of subsistence and die, and are either resorbed or discharged through the fistula in the case of abdominal actinomycosis. The administration of potassium iodide is often followed by pain, tenderness on pressure, and fever.

While treatment by potassium iodide is not of itself sufficient to cure a patient suffering from abdominal actinomycosis, it is a distinct aid to surgical treatment in that it exerts a favorable influence upon portions of the disease not accessible to the surgeon's knife. It is in other cases an excellent preparatory treatment for operation.

This action of potassium iodide is not sufficiently specific to serve as a means of diagnosis, although it is very suggestive in cases in which there is no suspicion of syphilis.

Treatment by iodide and by operation combined has saved a considerable number of patients. Thus, in Grill's collection of 111 patients who were treated by operation, 45 died, 22 recovered, 10 were improved, and the remainder were either under treatment at the time of report or had been lost sight of. Some patients were cured in whom the disease had existed as long as two years.

EMBOLISM AND THROMBOSIS OF THE MESENTERIC VESSELS.

Injuries of the mesentery are spoken of on page 272, and tumors on page 386. The only other processes of surgical interest are disturbances of the circulation due to embolism or thrombosis and contraction the result of mesenteric peritonitis. The latter occurs usually in the mesosigmoid. The mesentery may be the seat of adhesions due to peritonitis and which may interfere with peristaltic motion. The circulatory disturbances of the mesentery produce symptoms which are so like those of intestinal lesions that an error in diagnosis is easily made.

The blood circulation in the intestine is abundant, and in the mesentery the vessels anastomose in three lines of arches; therefore embolism or thrombosis of the branches of the mesenteric arteries does not usually interfere with the intestinal circulation. If the superior mesenteric artery itself is obstructed, the blood-supply of the intestine can be maintained only through the gastroduodenal artery on one side and the inferior mesenteric artery on the other side. If the inferior mesenteric artery is included, the blood-supply can be kept up by the superior mesenteric and the middle and inferior hemorrhoidal arteries.

The obstruction of the superior mesenteric seriously threatens the life of the intestine. This is not to be wondered at when one considers that the blood to reach the intestine through the anastomosing channels must pass for two or three feet through a relatively narrow network of vessels. Experience has shown that the stoppage of the superior mesenteric produces a hemorrhagic infarct in a considerable portion of the small intestine. Even embolism of certain branches of the artery may produce a hemorrhagic infarct. If the circulation of blood can be restored through the anastomosis, the infarcts will gradually disappear, otherwise there will be necrosis of intestine with its natural consequences. The latter is almost always the case when the trunk of the superior mesenteric artery is occluded. It does not so readily follow occlusion of the inferior mesenteric. Even a small infarct may terminate in perforation, while in other cases a much larger infarct may be followed by recovery. In rare cases obstruction of the arterial vessel is not followed by venous congestion, and in such circumstances an anæmic infarct and gangrene will be the result.

Embolism may be due to septic processes, to endocarditis, to arteriosclerosis of the cardiac valves, aorta, etc. Thrombosis may be due to local arteriosclerosis, syphilis, traumatism, rupture of an artery, hæmatoma, or injury of a vessel during operation.

Embolism of the mesenteric arteries produces usually an intense colicky pain. This may be followed by hemorrhage and diarrhœa, or by ileus. The blood oozes from the mucous membrane which is involved in the infarct and becomes mixed with the intestinal contents. This hemorrhage may be so profuse as to cause death from anæmia. If the infarct is situated high up, the blood may be vomited. In a small majority of cases the disturbance of nutrition of the intestinal wall brings about paralysis and rapidly developing ileus. Even the swollen infarct which extends throughout the whole circumference of the bowel may set up paralytic ileus. In such cases there is no discharge of blood from the rectum, but instead there are the usual complete obstruction and other symptoms of ileus. The vomiting may be bloody in character. No good explanation of this has been given. Sprengel suggested that hemorrhagic infarct was followed by intestinal hemorrhage, and anæmic infarct by ileus without hemorrhage. It is, however, certain that ileus may be produced by a hemorrhagic infarct, and the ultimate outcome of both types of the disease is the same.

If the resection is re-established, the patient recovers, otherwise necrosis of the intestine and peritonitis, either before or after perforation, are the inevitable results.

The prognosis of embolism of the mesenteric arteries is unfavorable. However, it is but right to give the patient the benefit of operation, especially as in most cases ileus from other causes cannot be excluded. The surgical treatment of these cases is difficult. In the first place, the diagnosis is uncertain. If there is profuse intestinal hemorrhage with diarrhœa under circumstances which make the development of embolism or thrombi possible, a probable diagnosis can at

least be made. If no previous history of trouble can be obtained, or if there is ileus without hemorrhage, a correct diagnosis is unlikely to be made. Even when one hits upon the correct diagnosis, it is impossible to say whether spontaneous recovery will follow. On the other hand, if one waits until necrosis and possible perforation have developed, the patient's chances for recovery are greatly reduced.

Nor is it possible to say how extensive an infarct there may be. The only hope of the patient lies in resection of the affected bowel, and until the abdomen is opened one cannot know whether resection is possible. If the whole small intestine is involved, radical operation is naturally useless. When the abdomen has been opened, the surgeon will still have to decide whether he will remove all of the bowel which is infarcted, or only such portions as seem likely to become gangrenous. If the patient's condition forbids an extensive operation and the portion of intestine which is affected is situated low down, the establishment of an artificial anus above it may be advisable. Thus far the results of operation have been discouraging, as few patients have recovered.

Obstruction of the mesenteric veins has the same significance as obstruction of the arteries. Such obstruction is almost invariably due to thrombosis, as embolism can then only occur by reason of a reversed blood-current. Only a few cases have been noted, most of them due to enteritis occurring in patients who suffered from sclerosis of the liver. The first result of a complete venous stasis is œdema of the affected portion of the bowel followed by an arterial infarct whose anatomical and clinical consequences are those which have been described above, namely, hemorrhage, diarrhœa, or ileus. The result is usually necrosis of the mucous membrane, less often gangrene of the whole wall of the intestine.

If the portal vein becomes occluded by a thrombosis, the stomach, intestine, etc., will be the seat of an infarct, and to the symptoms thereby caused will be added ascites, compensatory dilatation of the anastomosing veins (*Caput Medusæ*), splenic tumor, and necrosis of the pancreas.

CHAPTER XVI.

INTESTINAL OBSTRUCTION, OR ILEUS.

BY PROF. H. SCHLANGE.

THE term ileus is used not to indicate a special pathological condition, but a group of symptoms among which four are especially prominent: namely, stoppage of the fecal stream, abdominal pain, vomiting of material which contains bile and feces, and meteorism. The existence of ileus is always serious, since it indicates the presence of an obstruction to the fecal stream which may quickly terminate the patient's life.

Pathology.—Ileus is called dynamic when it results from failure of peristaltic action, and mechanical when it is due to some closure of the intestinal lumen.

DYNAMIC ILEUS.—In this variety of ileus there is paralysis of the longer or shorter portion of the intestine. Not every apparent or real paralysis of the abdominal muscles leads to ileus. The effect may be transitory. Such reflex paralysis may be observed after incarceration of a testicle in the inguinal canal, contusion of the abdomen, operation upon hemorrhoids, etc. There is also a hysterical intestinal paralysis which need not be here considered. True dynamic ileus may be brought about by extensive operations upon the mesentery, by the reposition of large strangulated hernias, or by embolism of the mesenteric arteries. In some diseases of the central nerves defecation is so impaired that large masses of feces collect in the colon and bring about dilatation and paralysis which may lead to ileus. Nothnagel says that distention of the intestine with gas may produce paralysis, and it seems probable that in some instances paralysis is due to the action of bacteria, although no evidences of peritonitis are present. But the most important cause of all is acute peritonitis. Chronic peritonitis causes trouble less by paralysis of the intestine than by the kinks and narrowings which are due to adhesions, or by the pressure of exudates outside of the intestine.

Just why inflammation of the peritoneum should cause paralysis of the intestine is still a matter of dispute. Stokes claims that the inflammation of the serosa extends to the deeper layers of the intestinal wall, and that the paralysis is due to the œdema which accompanies it. Nothnagel explains the paralysis by reflex action. He shows that in the beginning of subacute peritonitis peristaltic action may be abnormally increased. The absorption of gas from the intestine is lessened or stopped by the peritonitis, and in consequence the