

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

intestine becomes overdistended and paralysis may follow. Ileus may follow circumscribed as well as diffuse peritonitis. Sometimes the circumscribed peritonitis affects only the portion of the intestine in its immediate neighborhood.

MECHANICAL ILEUS.—In mechanical ileus the lumen of the bowel may be closed by pressure from without, or by some obstacle within it. In the former case the term strangulation is often used, and in the latter case obstruction. Strangulation of the intestine is a condition

FIG. 82.

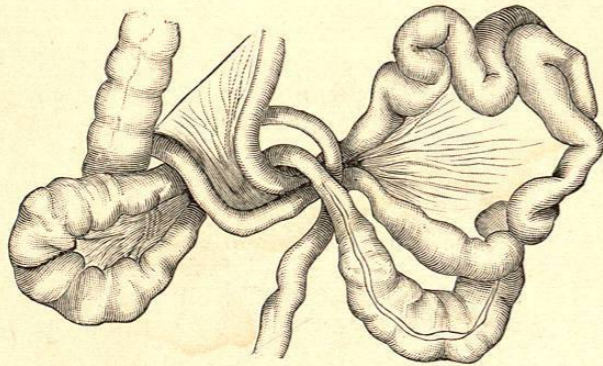
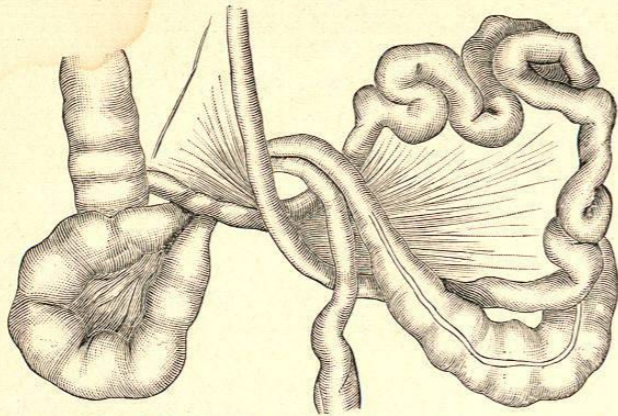


FIG. 83.

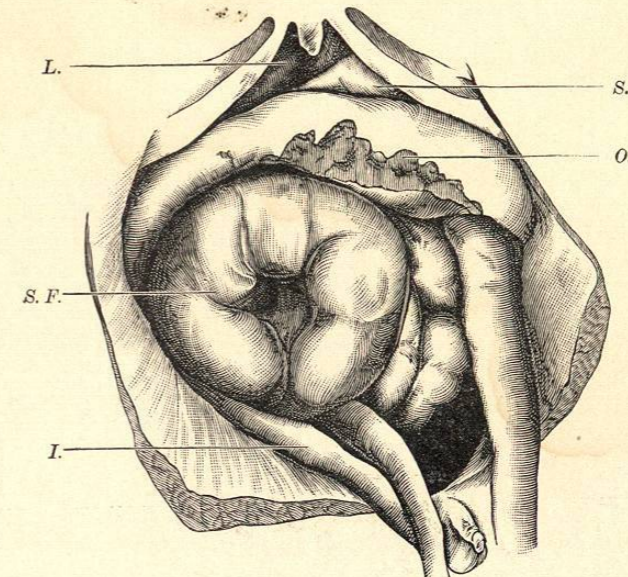


FIGS. 82, 83.—Two forms of obstruction due to a combined volvulus of a coil of ileum and a long sigmoid flexure. (Küttner.)

in which the affected portion of intestine, together with its mesentery, is so pressed upon that not only is the lumen of the intestine obliterated, but the circulation is also interfered with to a dangerous extent. This condition is clearly seen in strangulated intestinal hernia. Strangulation may be due to bands or cords, the result of peritoneal adhesions which may be found in any portion of the abdominal cavity, and are of variable size and thickness. Portions of intestine may be

changed by peritonitis until they become like cords and may lead to strangulation. The tip of the appendix or of the Fallopian tube, or of Meckel's diverticulum, may also produce strangulation. A rent in the broad peritoneal adhesions, or a gap in the omentum or mesentery due to faulty development or traumatism, may produce intestinal strangulation. The same is true of a rent in the uterus, or bladder, or suspensory ligament of the liver, or the broad ligament of the uterus, or the parietal peritoneum. An external hernia may become strangulated. The situation of such hernias is sufficiently indicated by the

FIG. 84.



Volvulus of sigmoid flexure after its passage through an opening in the mesentery: *L.*, liver; *S.*, stomach; *O.*, omentum; *S. F.*, sigmoid flexure; *I.*, small intestine. (Grüber.)

names—obturator, ischiatic, perineal, lumbar, rectal, vaginal, intercostal, diaphragmatic. An internal hernia may also become strangulated in the foramen of Winslow in the intersigmoid space, in the peritoneal pockets about the cæcum, or in those about the duodenum and jejunum. The results of such internal strangulation are similar to those of external strangulation. In strangulation by a band a short portion of intestine is usually caught between the band and the posterior abdominal wall. The ileum is usually the portion of intestine that is strangulated in both external and internal hernias. On account of its long mesentery this portion of intestine may find its way to any part of the abdominal cavity.

Strangulation due to twist of an affected bowel upon its axis is called volvulus. According to Rokitansky, this twist may take place in three ways:

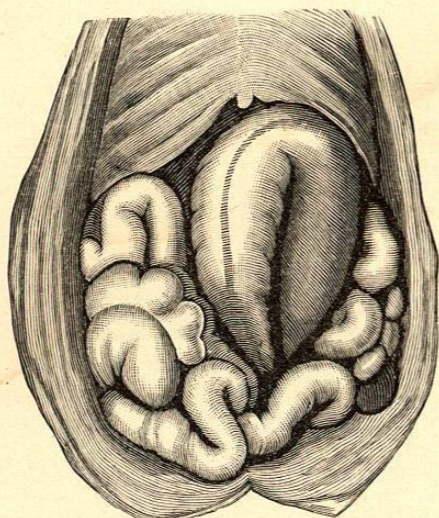
1. The portion of intestine may twist through a half circle or a whole circle around its own long axis.

2. The mesentery or a portion of it may twist with the attached intestine through a half circle or whole circle, or more than a circle. This twist is therefore around the axis of the mesentery.

3. A portion of intestine together with its mesentery may twist around another loop of intestine. (Figs. 82 and 83.)

The sigmoid flexure is by far the most frequent seat of volvulus. In its typical form the flexure has a long mesocolon with a short attachment to the posterior wall of the abdomen, so that it is easy for it to twist about the axis of the mesentery. This twist may result from external violence, as a fall or jar, or it may be due to overdistention

FIG. 85.



Volvulus of the sigmoid flexure. (Curschmann.)

of the bowel with fecal masses. v. Samson has shown that a twist of 180 degrees will not produce strangulation in a normal sigmoid flexure. Symptoms first arise when the twist has reached 270 or 360 degrees. (Figs. 84 and 85.)

Volvulus of other portions of the colon is not likely to occur unless the mesocolon is abnormally long. Volvulus of the small intestine may occur when the whole portion of small intestine which in any way becomes strangulated in addition twists around its mesenteric pedicle. An abnormal length of mesentery, or a shortening of its attachment to the posterior abdominal wall, predisposes to volvulus of the small intestine. Such a condition may be congenital or may be the result of peritonitis, or the fixation of a loop of intestine for a long time in a hernial sac.

Ileus may be produced by obstruction of the lumen of the intestine either from within or by a slowly developing pressure from without.

Foreign bodies, biliary calculi, intestinal calculi, and fecal masses may produce obstruction. (Fig. 88.) Usually the obstructing object is as large or larger than a walnut, but instances have been reported in which a small stone by producing local contraction of the muscles has obstructed the lumen of the bowel. Obstruction of this character may occur in any portion of the small intestine, especially at the ileocaecal valve. True intestinal calculi or enteroliths form gradually in the large intestine, and especially in the caecum. The nucleus of such a calculus may be some small indigestible object which has been swallowed, and the bulk of the calculus is made up of calcium, ammonio-magnesium phosphate, and organic substances. In cases of habitual constipation with atony of the intestine hard masses of feces may collect in the large intestine until they completely block its lumen. Overloading of an intestinal coil wherever found may predispose to a kink or a volvulus. Furthermore, chronic distention often leads to dynamic ileus.

The lumen of the bowel frequently becomes obstructed by intestinal carcinoma. The growth is usually situated in the colon or rectum. Sarcoma and lymphosarcoma rarely reduce the lumen of the bowel sufficiently to produce obstruction.

Other diseases may bring about chronic ulceration and stricture; for example, tuberculosis either in the small or large intestine, or, less often, dysentery, or the ulcers due to fecal masses. Syphilis is frequently the cause of stricture in the rectum. Stricture may develop in a loop of intestine which has been incarcerated in a hernial sac, perhaps as a result of circular gangrene of the mucous membrane. Any intussusception may go on to spontaneous cure after the invaginated bowel has sloughed away, but stricture is likely to result.

Tumors in the neighborhood of the intestine, and especially those of the uterus and ovary, may compress the intestine and obstruct its lumen.

Invagination (intussusception) of the intestine sometimes produces symptoms of obstruction, sometimes of strangulation. Invagination is a displacement of a portion of intestine by which the upper part of the bowel is invaginated into the lower. In a few instances the relation of the affected parts of the intestine is reversed and the upper part is carried downward outside of the lower part. The commonest seat of this trouble is the ileocaecal region, since here occur 52 per cent. of all cases and 70 per cent. of the cases which occur in infancy. Invaginations of the small intestine constitute 30 per cent. of all cases and those of the colon 18 per cent. In ileocaecal invagination the ileocaecal valve marks the summit of the displacement, while the invaginated small intestine may extend for a great distance into the colon, and has even protruded through the sphincter ani. In other invaginations of the small intestine the lower portion is usually involved, while invagination of the sigmoid flexure is more common than that of other portions of the colon.

The invaginated bowel drags after it the mesentery, consequently the mesenteric side of the invagination is somewhat concave and the

whole swelling is kept nearer the vertebral column than would otherwise be the case. The longer the invagination, the more marked are these characteristics. If the pressure upon the invaginated bowel and its mesentery is slight, they become first hyperæmic and then œdematous, especially at the summit of the invaginated portion. If the stricture continues, hemorrhages take place into the tissue and into the lumen of the bowel. In chronic cases the swelling gradually disappears and the permeability of the intestine is to a certain extent restored. If the case is an acute one and more severe, the arterial and venous circulation are entirely shut off and gangrene results. The invaginated portion is naturally the first to suffer from the gangrene. It may be separated from the rest of the intestine and be passed from the rectum in pieces measuring from a few centimetres to 3 metres (120 inches). Such a discharge of gangrenous bowel will usually take place during the first month, but in some cases it has occurred six months or even longer after the first symptoms of intussusception.

The immediate danger of invagination lies in the risk of perforation of the neck of the bowel and resulting peritonitis. In the chronic form of the trouble there is risk of death from inanition, and even in the fortunate cases in which the invaginated bowel sloughs away life may be threatened by a resulting stricture.

Symptoms.—The general symptoms of ileus are obstipation, abdominal pain, meteorism, and vomiting. Obstipation needs no explanation. The pain is due to irritation of the peritoneal nerves, and the meteorism is due to the development of gases in the stagnant contents of the intestine. Mere stagnation of the fecal stream is not sufficient to explain this formation of gas. It is a pathological symptom due to degenerative changes in the intestinal contents, and also due to the decreased absorption of gas by the intestinal wall. To explain the fecal vomiting, it is not necessary to suppose that reversed peristaltic movement takes place. When the stomach has been emptied by violent vomiting, it is easy for the contents of the small intestine to overflow into it. These contents have a foul and often fecal odor, and in some instances have been said to contain formed fecal masses. These were probably, however, milk coagula or other portions of food which were stained with bile. From the character of the vomitus it is absolutely impossible to determine the situation of the obstruction in the intestine. Attention has been called to the increased amount of indican in the urine during ileus. This is due to the absorption of putrefactive albuminous matter from the small intestine. It can be found as early as the second day in case the small intestine is the seat of obstruction, but it does not occur, or at any rate not for several days, if the obstruction affects only the large intestine. It also occurs with a variety of other diseases which bring about putrefactive changes of the contents of the small intestine, so that while it is not a symptom without value, too much stress must not be laid upon it.

Diagnosis.—In most cases of ileus the diagnosis is apparent. The difficulty consists in the determination of the site and cause of the



Ulceration and Perforation of the Ileum, eight days after Complete Obstruction. The necrotic mucous membrane was somewhat greener when first exposed.

ileus; but in the majority of cases it is unnecessary to do more than to determine whether the ileus is dynamic or due to strangulation or obstruction. In certain cases naturally one or more of these causes may act in combination.

The first step is a careful examination of the patient. While the attention is especially directed toward the intestine, the other organs both within and outside of the abdomen should also be examined. The demonstrable changes in the intestine are modifications in its form and in its mobility. Numerous observations as well as experiments upon animals have established the following facts:

1. In acute peritonitis the wall of the affected intestine is paralyzed. This portion of intestine becomes distended with gas and its mobility is limited.

In acute circumscribed peritonitis the paralysis and dilatation do not reach their maximum so that slight peristaltic motion may be observed in the affected intestinal coils. Acute diffuse peritonitis when of a severe type produces a dilatation of the intestine which is only limited by the space within the abdominal cavity. The paralysis is complete and there is no motion whatever.

2. When a coil of intestine with its mesentery is strangulated, there follows an acute swelling of the affected portion, as is regularly seen in operations upon strangulated hernias. The distention of the strangulated intestine, if it occurs in the general peritoneal cavity, is extreme, far greater than is possible in a closed hernial sac. As the loop of intestine is mechanically fixed at a point of constriction, it cannot move and all peristaltic motion is stopped by the alterations in the circulation and innervation. This is true even if the affected intestine is a metre in length. There is a discharge of fluid from the strangulated intestine which is often seen in a hernial sac, and the quantity of which within twelve hours may be so considerable that it is noticeable in the peritoneal cavity.

The condition of the rest of the intestine is likewise characteristic. The bowel below the affected portion is empty and contracted, and remains so. The bowel above the affected portion is more or less distended according to the time of observation. In general, it is true that it gradually fills with fluid and becomes distended with gas. The greater the portion which is strangulated and the more perfect the strangulation and the greater the shock, the greater the delay in the distention of the bowel above. In such circumstances the distention may be only moderate after a period of twenty-four hours. In these severe cases death results early unless it is averted by an early operation, so that one will rarely see an extreme distention of the afferent bowel.

If only a small loop is strangulated and the strangulation is perhaps incomplete, the intestine above the strangulation becomes sooner or later greatly dilated. In these milder cases life may be prolonged for several days. The upper intestine is not at first completely paralyzed, but shows peristaltic motions and slight tonic contractions which may come on spontaneously or as a result of external irritation. Gradually the

effluent intestine becomes distended, and this distention is almost always palpable before it becomes visible to the eye. It is always a suspicious symptom when one is able to feel the outlines of individual portions of the intestine.

If the strangulation leads to peritonitis, a resulting paralysis of the intestine does away with intestinal motions and gradually obscures the contour of single dilated intestinal coils.

3. In obstruction of the intestine the portion of bowel below the obstruction is empty and collapsed, while that above the obstruction is very full. This distention decreases from the point of obstruction toward the stomach. As long as there is no peritonitis, peristaltic action continues in the distended intestine, but is of varying intensity. If the obstruction is superimposed upon an existing stenosis due to a tumor or gradually narrowing stricture, etc., the muscular coat of the bowel above will have become hypertrophic. Therefore in such a case the peristaltic action following obstruction will be exaggerated. (See page 295.)

Diagnosis and Treatment of Dynamic Ileus.—Whenever a patient is seen who is suffering from ileus the surgeon should put to himself the question: Is peritonitis present? In most cases the answer to this question will not be difficult. If the abdomen is everywhere sensitive; if there is absolute constipation and continuous vomiting of a biliary or fecal character; if a patient is restless and has an anxious, drawn countenance and hollow, lifeless eyes; if the respiration is of a costal type and somewhat rapid, and there are a moderate elevation of temperature and a small, easily compressible and frequent pulse; if there are great thirst and decreased excretion of urine; if there is a uniformly distended barrel-shaped abdomen without visible or palpable intestinal coils, and if no peristaltic action can be heard, the picture of diffuse peritonitis is typical. The absence of distinct coils of intestine is a most significant sign. It indicates an extensive intestinal paralysis such as accompanies acute diffuse peritonitis. There are other symptoms that are by themselves less reliable. The temperature is uncertain. In most cases of acute peritonitis there is moderate and sometimes high fever. There are also cases in which the temperature is normal or even subnormal. While therefore in doubtful cases the presence of fever is suggestive of peritonitis, its absence is no proof that peritonitis does not exist.

The next question of importance is, What is the origin of the peritonitis? This cannot be determined by direct examination in most cases because the meteorism makes impossible palpation of the abdominal organs. The history of the disease may, however, throw light upon the origin of the inflammation. It may indicate the existence of appendicitis, or it may show that an ulcer of the stomach or intestine existed for a long time before the acute attack (due apparently to perforation) came on. If no such evidence is furnished by the history, one has to think of mechanical obstruction or strangulation of the bowel.

The better developed the peritonitis, the less is the chance of saving the patient by surgical interference; and if the patient is already septic with greatly decreased arterial pressure, it is better to look upon the case as hopeless, and not to subject the patient to a surgical operation. This is more fully discussed on page 174.

If the peritonitis follows a mechanical ileus and the patient is seen sufficiently early, the treatment should be that which is proper for a patient suffering from ileus in spite of the unpleasant complication of peritonitis.

Slight and circumscribed inflammations of the peritoneum may produce the symptoms of ileus, at least for a time. In such cases the diagnosis is suggested by the occurrence of the trouble in the neighborhood of the organ which is often the starting-point of circumscribed peritonitis; for example, the appendix, the gall-bladder, or a tube or ovary. The severe symptoms of collapse which accompany diffuse peritonitis and strangulation of the intestine will be wanting. The loops of intestine which are involved are plainly distended and usually movable. Pressure upon them does not increase their tension since their contents can easily escape, usually with a gurgle, into the adjacent portion of intestine. Absolute rest, a suitable diet, and opium suffice in many of these cases to bring the patient again to a condition of health, provided the cause of the trouble does not extend further.

The symptoms of ileus may accompany hysteria, fecal impaction, diseases of the spinal cord, etc. The diagnosis may be a difficult one. Treatment of these cases is described in books on internal medicine.

Diagnosis of Ileus due to Strangulation.—If existing ileus can be shown to be mechanical rather than dynamic, it is important to determine whether it is due to strangulation, since strangulation of a loop of intestine may produce gangrene in twenty-four hours. In some cases it does not act so quickly because the strangulation is not complete, or is intermittent, so that it obstructs the lumen of the bowel but does not shut off its blood-supply, and gangrene does not follow even after a lapse of weeks. In such cases the original hyperæmia and swelling of the intestine may subside, but traces of the trouble will persist in the form of adhesions between the affected intestine and the surrounding organs.

Cases of strangulation vary greatly in severity, and no one can say what the outcome of even a slight attack will be. The danger to the patient is not merely in possible gangrene, but rather in the peritonitis which results from the passage of bacteria through the damaged wall of the intestine before it actually becomes gangrenous. Experiments upon animals show that this bacterial exodus may occur within eight hours. The time depends largely upon the degree of strangulation. It is partly on this account that operations performed in the first or second day after attack show far better results than those performed upon the third day or still later. This point should be impressed upon the minds of family physicians, who first see the majority of these patients. If the diagnosis of strangulation can be made and an oper-

ation performed within forty-eight hours, the risk of gangrene and infection is pretty nearly avoided. If three days have passed without relief, the patient is almost certain to die from one or other of these causes.

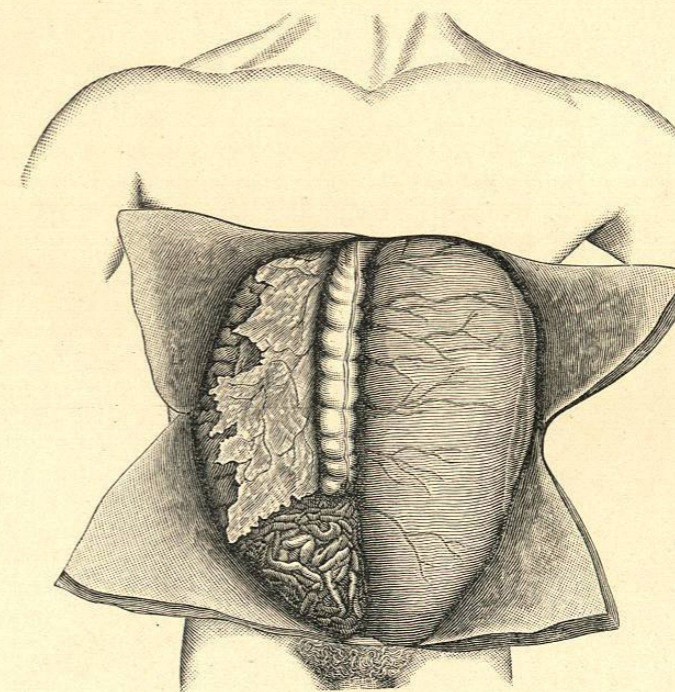
The mechanism of strangulation is so uniform that the symptoms in most cases are fairly typical. A patient in full health is suddenly seized with a more or less intense pain and feels that he is very sick. There are often symptoms of shock, which may increase during the following day or days. Such collapse is said by Bönnecken and Riechel to be due to the escape of bacteria and other products into the peritoneal cavity. These substances when resorbed produce the symptoms of collapse. Soon after the strangulation the symptoms of ileus appear. There are nausea and vomiting, first of gastric contents and then of biliary and finally of fecal fluid. Rectal tenesmus may be an early symptom. If feces are present in the lower bowel, they may be expelled, but later neither gas nor feces pass per anum. Soon the outline of the abdomen begins to change, and its shape should be carefully noted. Aimless palpation of the abdomen causes the patient great pain and yields comparatively little information; and even the most intelligent examination is unsatisfactory if the abdominal walls are extremely thick or if the abdominal muscles are firmly contracted. In the more favorable cases in which the abdominal wall is relatively thin the affected loop of intestine, whether strangulated by a band or by a twist around its own axis, will be found greatly dilated and marked off from the rest of the coils of intestine which are displaced by it. Sometimes the distended intestine may be recognized by the eye as a thick transverse cylinder, or its outline may be curved or bent upon itself. As the intestinal wall is paralyzed, it does not show the slightest motion even when struck. If no such appearance is evident to the eye, the open hand should be lightly passed over the abdomen and then gentle pressure be made in perpendicular and transverse directions. The results of percussion are unsatisfactory. However, one can frequently make out the presence of free fluid at an earlier period than might be expected.

When the conditions above described are found to be present, a diagnosis of strangulation is reasonably certain. True, the intestine may be dilated as a result of peritonitis or of long-standing fecal impaction. But in peritonitis the distention of single loops of intestine is never so distinct, and in fecal impaction the distended intestine is not paralyzed and its peristaltic action is very active.

When a diagnosis of strangulation is made, an immediate laparotomy is indicated. While it is true that a half turn of the sigmoid flexure may produce symptoms of ileus without seriously threatening the life of the patient, and while it is equally true that strangulation of the sigmoid can often be diagnosed by the small quantity of water which the rectum will hold, still a diagnosis made thus externally is too uncertain, and it is better to open the abdomen in every case in which strangulation exists. (Figs. 86 and 87.)

Unfortunately the diagnosis is by no means always as clear as indicated above. Symptoms of strangulation may have lasted, say, for twelve hours; the most careful examination of the abdomen fails to reveal the presence of any distended motionless loop of intestine, the abdominal distention is slight or wanting, and there are only indefinite abdominal pains referred to the umbilicus or to the left iliac region. All the sites of external hernia are examined and found normal. Examination of the region of the appendix throws no light on the trouble. Nothing abnormal is felt through the rectum or vagina

FIG. 86.



Volvulus of the sigmoid flexure. (Küttner.)

except possibly a little tenderness on the left side. The urine does not show any marked increase of indican, which, of course, could not be expected within twelve hours. Still, the patient is plainly seriously ill. What shall be done? There clearly exists the possibility of intestinal strangulation, and hence the patient must be sent to a hospital or kept under observation where an operation can be performed at any time. An immediate operation is not advised. If the pain is intense, morphine may be given subcutaneously, but one should not wash out the stomach and then give large doses of opium in order to stop peristaltic action. This drug will not overcome strangulation if such exists, and it may still further obscure a sufficiently difficult diag-