

very rare. In the normal condition of the biliary ducts a stone larger than a cherry cannot pass through them into the duodenum. A larger stone can only enter the intestine by rupture of the wall of the duct or of the wall of the gall-bladder, and if commencing necrosis causes the affected wall to adhere to the intestine the rupture will take place without discharge of fluid into the peritoneal cavity. Sometimes this occurs without special symptoms, and sometimes there are symptoms which cannot be distinguished from those of cholangitis or of local peritonitis. When the fistula has once been established, it gives rise to no further symptoms, and the abnormal opening into the intestine does not seem to injure the biliary passages, although, as shown by recent examination by Radziewski, intestinal bacteria penetrate to the finest radicles of the biliary tract. Probably the continuous flow of bile protects the liver from serious infection. Such a fistula, as far as known, has never given rise to surgical operation for its relief. If the bile passes directly into the large intestine, the absorption of fat from the food may be much reduced.

Fistulas between the rectum and some portion of the genital tract are not uncommon. These are discussed in another section of this book. Pregnancy is the commonest cause of genital fistula, which opens above the rectum. Many of these fistulas result from operations performed during labor and others from inflammation which attacks some adjacent portion of intestine and sets up a fistula. Others come from operations performed for the removal of tumors, etc., and still others from disease of a pelvic organ or intestine, for example, tuberculosis.

Narath, who searched the literature on this subject up to 1896, found records of 14 cases of fistula between the intestine and uterus. In 10 of these the fistula opened into the small intestine, once into the small intestine and cæcum and three times into the sigmoid colon. He found 25 cases of fistula between the vagina and intestine, in 23 of which the small intestine was involved. The portion of the small intestine involved in these cases was almost invariably the ileum.

Diagnosis.—The presence of a fistula between the intestine and genital organs is shown by the discharge of fecal matter from the latter. This of itself is disagreeable to the patient, and in addition there may be a serious loss of nutritive material if the fistula is high up. The diagnosis is usually not difficult. Palpation and inspection will show whether the fistula connects with the vagina, and if not, it probably opens into the uterus, as an opening into a Fallopian tube is extremely rare.

A fistula between the kidney and the duodenum may lead to death from starvation. A fistula communicating with the colon is not so serious. Both of these conditions are extremely rare.

Chavannaz collected reports of 95 fistulas between the bladder and intestine. The portion of intestine involved was, 43 times the rectum, 14 times the sigmoid colon, 8 times some other portion of the colon, 8 times the small intestine, 4 times both the colon and small intestine, and once the appendix. In 18 cases it was uncertain what portion

of the intestine was involved. The cause of the trouble was, 5 times tuberculosis, 9 times some other inflammatory process, 4 times carcinoma, and twice trauma.

The establishment of a fistula between the sigmoid flexure and the bladder in case of carcinoma of the former organ is by no means rare. The fistula may reveal itself by the sudden development of cystitis or by the passage of gas with the urine. In some instances the passage of gas with the urine is noticed before the carcinoma of the intestine has been suspected. When the disease has gone thus far, radical operation is, of course, impossible.

The result of a fistula between the intestine and bladder may be the discharge of urine into the intestine or feces into the bladder. Sometimes there is a flow in both directions. The presence of more or less urine in the intestine does not excite serious symptoms. If it is discharged into the lower intestine, it passes out of the anus, and if it is discharged into the upper intestine it is partly resorbed. If it is discharged into the duodenum or stomach, it may excite vomiting. If renal calculi exist, they may pass with the urine through the fistula. Morris mentions a case in which they were discharged from the mouth, the nose, and urethra.

The escape of feces into the urinary passages is a much more serious matter. Inflammation is set up in the bladder and the infection soon spreads to the ureters and then to the kidneys, for the description of which the reader is referred to the sections devoted to these organs.

Diagnosis.—The diagnosis of a fistula between the intestine and bladder is often easily made either macroscopically or microscopically. If the fistula discharges feces sporadically, none may be in the urine at the time of examination, and the diagnosis may therefore be in doubt. The facts that the urine has a fecal odor and that gas is passed from the bladder are not alone sufficient for the diagnosis of fecal fistula since the urine may possess these characteristics although an actual communication with the intestine does not exist. In doubtful cases test-substances, such as lycopodium or raw starch, may be swallowed and sought for in the urine. If the current in the fistula is from the bladder to the intestine, the patient may be given methyl-blue or some other substance which is eliminated through the kidneys, in order to see if it will appear in the feces.

Treatment.—The treatment of an internal fistula is similar to that of an external one. If the patient suffers from incontinence or is threatened with starvation, an attempt should be made to close the fistula. Small fistulas usually close spontaneously. If they open into the vagina or some other accessible organ, they may be touched with caustic or a plastic operation may be performed. The treatment of fistula between the rectum and bladder or vagina is discussed in connection with the diseases of the rectum. Treatment in all other cases should be by laparotomy. The affected organs should be separated one from the other and each closed by suture. Sometimes an additional operation

must be performed, such as circular resection of the intestine, intestinal anastomosis, nephrotomy, nephrectomy, etc. The surgeon must always be sure that the feces and urine can pass through the natural channels or else he must devise some new way for their escape.

The separation of the intestine from the other hollow organs may present such difficulties that it may be better to close either one or both ends of the adherent portion of the intestine, thus separating it at one or both ends from the rest of the intestine. Operation for internal intestinal fistula should only be undertaken when the cause of the fistula is capable of being overcome. Thus, if a fistula is due to an inoperable carcinoma or tuberculosis, it had better be left alone.

STENOSIS OF THE PYLORUS.

Stenosis of the pylorus gives rise to a more or less pronounced group of symptoms which are not wholly separable from the disease which produces the stenosis. This topic is properly considered in a surgical text-book since internal remedies are rarely sufficient to effect a permanent cure except perhaps in cases of pyloric spasm, a condition which is not thoroughly understood. Surgical treatment by removing or circumventing pyloric stenosis has won many striking successes; therefore a mechanical stenosis of the pylorus may well be considered as a surgical disease.

In speaking of stenosis of the pylorus reference is made to any narrowing whether it be situated exactly at the pylorus or below it, but not below the papilla of Vater. The chief causes of such narrowing are scars the result of caustics or ulcers, fresh ulcers, and new growths, usually of the nature of carcinoma. Occasionally a foreign body becomes wedged in the pylorus, or the pylorus is partially obstructed by external compression or external adhesions. There are also congenital anomalies and instances of muscular spasm. From the nature of the case pyloric stenosis is in most instances a slowly progressing affection, with periods of comparative quiet and possibly of improvement.

Symptoms.—Dyspepsia is one of the chief symptoms of stenosis of the pylorus, and is marked by anorexia, nausea, coated tongue, eructations, bad taste in the mouth, etc. These symptoms are partly due to the overfulness of the stomach or its delay in emptying itself, and are partly due to a catarrh of the mucous membrane which sooner or later develops. The catarrh may be the direct result of obstruction or it may be due to an ulcer or cancer which causes the obstruction. Pyloric stenosis is not of itself painful, but the patient usually experiences a feeling of weight in the epigastrium and more or less pain when external pressure is made. This pain on pressure is diffuse and not circumscribed, as is almost always the pain due to ulcer. If the stenosis is an accompaniment of recent ulceration, there may be a point in the back painful to pressure. Otherwise this sign is wanting. Sometimes the active peristaltic motions of the stomach are painful. Vomiting is

always present if the stenosis is well marked, and it is often produced by a moderate degree of stenosis. It may be due to an unnatural distention of the stomach or to irritability of the mucous membrane as a result of the catarrh, etc. In extreme cases vomiting continues even though the stomach is empty. A patient whose stomach is overloaded may vomit early in the morning food eaten the preceding day, or, indeed, the food vomited may have been eaten several days before. This one symptom alone is not sufficient to establish a diagnosis of overdistended stomach since particles of food may remain hidden for some days in the pouches of the ulcerating tumor and later be expelled by vomiting.

The motor function of the stomach is disturbed. The retention of food may be slight, or it may be complete, so that nothing passes the pylorus. Such absolute retention is rarely seen since the trouble develops gradually, and before retention becomes absolute the patient usually dies. Therefore complete pyloric obstruction is an acute trouble. (See page 294.)

For convenience motor insufficiency is divided into degrees. In the first grade digestion is delayed, but early in the morning the stomach is found empty. In the second grade it still contains food ten or twelve hours after the meal; that is to say, it never completely empties itself. This disturbance of motor function depends partly upon the size of the pylorus and partly upon the power of the muscles of the stomach. These patients suffer greatly on account of the atrophy which affects the gastric wall as a result of catarrh. The loss of muscular power is more marked in malignant than in benign stenosis. There is often a disproportion between the degree of anatomical stenosis and the loss of muscular power. The overloading of the stomach often results in dilatation of the stomach or ectasia, as it has sometimes been called.

The terms dilatation of the stomach and motor insufficiency of the stomach are by no means synonymous since there may be great loss of muscular power even in a small stomach. An example of this is a diffuse cancerous infiltration without enlargement of the stomach. In other cases a stomach which exhibits motor insufficiency may be much shrunken. There are also instances of dilated stomach in which there is no muscular insufficiency. Such a condition is common in diabetes.

A dilated stomach usually sinks toward the lower abdomen, a condition known as gastrectasia. If the gastrectasia is of high degree, the abdomen presents a characteristic appearance. The mesogastrium or hypogastrium contains the much distended organ, while the epigastrium sinks in above the transversely placed lesser curvature. This condition can often be observed without artificial distention of the stomach, although such artificial distention makes the appearance more striking. In some cases a sort of vicious circle is found. The distended and sunken greater curvature of the stomach dragging upon an adherent pylorus produces a kink which increases the degree of stenosis, and this leads again to increased distention and sinking of the stomach. Splashing sounds often accompany pyloric stenosis and may

be the source of great annoyance to the patient. These signs have little weight in diagnosis unless they are heard at a time when the stomach should normally be empty. Then they are indicative of motor insufficiency.

Like other hollow muscular organs, the stomach attempts to overcome the stenosis by increased muscular effort. This increased peristalsis may be of two kinds. The usual form is an increased normal peristalsis, the waves of which proceed from left to right, and which are produced spontaneously, or may be called forth by massage or tapping upon the stomach. The thinner the abdominal wall the more readily such increased peristaltic action can be observed. As normal peristaltic motion of the stomach can scarcely be detected even in very thin persons, a well-marked peristaltic wave may always be regarded as pathological. The other form of increased peristaltic action is rarely seen. It is a sort of stiffening of the gastric wall which comes on spontaneously or as a result of irritation, and may involve the whole stomach or only part of it. Such a condition manifests itself by the convexity communicated to the abdominal wall, while the tension of the stomach can easily be detected by palpation. In a few minutes this rigidity subsides or passes into peristaltic waves. Sometimes the two forms of peristaltic action coexist or one follows the other. This gastric rigidity is often painful while the increased peristaltic action in the form of waves rarely causes pain.

The increased capacity of the muscular wall results in hypertrophy within certain limits. Sooner or later the hypertrophy gives way to dilatation.

Increased peristalsis is almost invariably a sign of pyloric obstruction, although in rare instances it may have a purely nervous origin. Still, the absence of increased peristalsis is no proof that stenosis does not exist. Such an increased peristalsis may already have passed into one of atony or the atonic condition may have developed directly as a result of stenosis without an intermediate hypertrophic stage.

Stenosis of the pylorus is not in itself palpable, although the condition which leads to it may be. Stenosis may be accompanied with increased, normal, or decreased acidity, or there may be an absence of free hydrochloric acid. This depends not upon the stenosis, but upon the condition of the mucous membrane of the stomach. If the degree of motor insufficiency is slight, the stomach will often produce great quantities of acid secretion. If hydrochloric acid is absent, lactic acid develops sooner or later even though the patient has no carcinoma. If there is well-marked atrophy of the mucous membrane, a state of achylia gastrica may be brought about. Mechanical obstruction leads to an increase in bacteria. As long as the gastric contents contain hydrochloric acid the ferments found are chiefly yeast and *sarcinæ*. When hydrochloric acid is absent, lactic acid ferments are also present.

The effects of pyloric stenosis upon the general system are due to the decreased absorption of nourishment. Food which does not pass the pylorus but remains in the stomach and undergoes degenerative

changes, is of little value to the body since the stomach has scarcely any power of resorption. Furthermore the decay of the gastric contents produces poisonous substances which exert an unfavorable influence upon the body. Thus the patient loses weight, especially on account of the reduced absorption of fluid, while the secretion of the stomach is increased. This anhydræmia, as the decrease of fluid in the body has been called, is shown by dryness of the skin and mucous membranes, diminution in the quantity of urine, and the high specific gravity of the same. The quantity may be less than 300 c.c. in twenty-four hours. The patient suffers from thirst which the overfull stomach cannot relieve. In spite of the bad appearance presented by the patient his blood may contain a normal or even an increased percentage of hæmoglobin, a fact which is explained by the decrease in the fluids of the body. This is even the case when the stenosis is due to carcinoma. The stools are scanty and hard and the patient complains of obstinate constipation.

Diagnosis.—The various symptoms described above suffice in most cases to establish a diagnosis of pyloric stenosis. Stagnation of the gastric contents is shown by passing a stomach-tube before food has been taken in the morning and by examination after breakfast and after a test-meal. The degree of stagnation can always be known. The methods of examination are spoken of in Chapter XII. The degree of anatomical stenosis is not of practical importance. Prognosis and treatment rest rather upon the functional disturbances of the digestion as shown not only by the condition of the stomach, but also by the condition of the whole body; therefore such symptoms as emaciation, anhydræmia, and ischuria are fully as important as the more strictly local symptoms.

There are two conditions which must be differentiated from pyloric stenosis. One is the so-called idiopathic or atonic insufficiency, and the other is a neurotic pyloric spasm. A differential diagnosis between idiopathic insufficiency and pyloric stenosis cannot be made with certainty, but this is of no great practical importance since the idiopathic insufficiency occurs very seldom, and when it does occur it will usually be treated surgically by the creation of a more favorable exit for the gastric contents, that is to say, by a gastro-enterostomy.

Pyloric spasm will be accompanied by other well-marked symptoms. This condition is also one of extreme rarity, and if it leads to the same disturbances as a true stenosis of the pylorus, it requires the same sort of treatment, namely, that the abnormally contracted pyloric muscle should be overcome by pyloroplasty or gastro-enterostomy.

Prognosis and Treatment.—If the pyloric stenosis is of slight degree, it may produce a number of unpleasant symptoms, but does not harm the general organism. If it is of severe degree, the injuries which it exerts upon the general organism are marked and tend to increase as a rule. Internal treatment, gastric lavage, forced feeding, rectal feeding, electricity, and massage all fail to cure well-developed pyloric stenosis; consequently surgical treatment is absolutely indicated if

there is motor insufficiency of the stomach and the general health is affected.

If the stenosis is of slight degree, treatment will depend a good deal on the cause of the stenosis. If carcinoma is suspected, operation should be performed at once, whereas if the stenosis is due to a recent ulcer medicinal treatment should be employed. When this fails and the condition of the patient is growing worse, operation is indicated.

The aim of surgical treatment should be to overcome the cause of the trouble when this is possible. Stenosis due to carcinoma and to benign ulcer is spoken of on pages 320 and 376. If the stenosis is due to external compression, for example, that caused by an adherent gall-bladder, or if it is due to kinking and adhesions, the mechanical cause should be removed. If this is not possible, the harmful effects of the stenosis may be overcome by gastrojejunostomy (page 428), or, in rare cases, by gastroduodenostomy (page 427). If the stenosis is a purely cicatricial one, or is due to spasm of the pylorus, either a pyloroplasty (page 423) or gastro-enterostomy may be performed. Pyloroplasty is preferable when the conditions are such that it can be easily and safely performed. A successful pyloroplasty restores the physiological conditions. Gastro-enterostomy produces a new outlet to the stomach which may act perfectly or it may produce new difficulties. Cases of ulcer of the jejunum following gastro-enterostomy show that this organ sometimes suffers from the direct flow into it of the acid gastric contents. In hyperacidity of the stomach this is a real objection to gastro-enterostomy if pyloroplasty is technically feasible.

Hour-glass Stomach.—Stenosis of the body of the stomach is a condition which in rare cases is congenital. Its usual cause is an extensive ulcer or the scar which results therefrom. The symptoms of hour-glass stomach are stagnation of the food together with the various results which may follow delayed digestion, and which have been spoken of in detail in this chapter. The farther the stenosis lies from the pylorus, the more striking will be the difference, shown by physical examination, between this condition and that of pyloric stenosis. But in many cases the diagnosis of hour-glass stomach, if made at all, will be more or less a probable one. Indeed, the differential diagnosis between this condition and that of stenosis of the pylorus has little practical importance since in either case operation is indicated and the operator will have to be guided by what he finds after the abdomen is opened. Hour-glass stomach may be treated by gastro-anastomosis or gastropasty or gastro-enterostomy, or a combination of the last-named two operations. (See page 427.)

Acute Pyloric Obstruction.—This condition as compared with chronic stenosis is extremely rare. It may be produced by a foreign body or by a kink, but the obstruction under such circumstances is likely to be incomplete. Sometimes operation upon the lower biliary passages is followed by acute obstruction of the duodenum due to a deeply seated tampon. The results of such obstruction are dilatation

of the stomach with continuous vomiting, symptoms which rapidly subside if the tampon is removed.

By far the commonest cause of acute pyloric obstruction is acute gastric dilatation. If the stomach is abnormally low in the abdomen and its dilatation reaches a certain degree, a kink is produced at the pylorus which may absolutely prevent the escape of gastric contents into the intestine. Such a kink may occur at a point where the movable superior portion of the duodenum joins the fixed descending portion, or it may occur at a point where the superior mesenteric vessels cross the inferior portion of the duodenum. If the dilated stomach pushes the small intestine firmly downward, the mesentery may so press upon the duodenum as to obstruct its lumen.

The causes of acute gastric dilatation which have been noted are overfilling of the stomach, narcosis, especially in operations upon the biliary passages, lesions of the spinal cord, and external compression by a band, plaster-of-Paris jacket, etc.

If the pylorus is obstructed, the stomach may become enormously dilated in a short time. It may extend to the symphysis. The muscles of the stomach, already weakened and overdistended, are unable to empty the organ. It has been suggested that there is a valvular obstruction of the cardia, but this seems doubtful since the most extreme cases are accompanied by repeated vomiting. If the obstruction is at the point where the mesenteric vessels cross the duodenum, the vomitus will contain bile. Unless the obstruction is speedily relieved the patient will die.

Treatment.—The treatment of acute gastric dilatation consists in the emptying of the stomach by means of a tube, which alone will suffice in many cases to relieve the obstruction. Elevation of the pelvis or a knee-chest position of the patient is often of service by bringing the small intestine up out of the pelvis. In view of the extreme paralysis of the gastric muscles it is doubtful whether gastro-enterostomy is indicated.

Wiesinger observed a case of volvulus of the stomach with obstruction of both the cardiac and pyloric orifices, which he relieved by operation.

CHRONIC INTESTINAL STENOSIS.

Certain symptoms follow gradual obstruction of the intestine whatever may be its cause. These symptoms are often so prominent that they mask other symptoms due to a particular lesion. These symptoms of chronic intestinal stenosis are of the greatest importance since they form a clear indication for operation irrespective of the nature of the lesion. When the abdomen has been opened, it will usually be possible to recognize the cause of stenosis, and accordingly to perform resection of the intestine, entero-anastomosis, elimination of a portion of intestine, or to establish a fecal fistula, etc.

A moderate contraction of the intestinal lumen may give rise to no

symptoms whatever, and will not therefore be recognized unless it is complicated by kinking or adhesions, etc. Under such circumstances a moderate degree of stenosis may be suddenly changed to a complete obstruction which will produce the symptoms of acute ileus. For the sake of convenience the causes of chronic intestinal stenosis may be divided into those which act from within the intestine and those which act upon it by pressure from without. In the former class are cicatrices following ulcers, tumors, foreign bodies, and muscular spasms, and in the latter class tumors outside the intestine, abscesses, kinking, and adhesions. Just how soon the stenosis begins to obstruct the fecal stream depends partly upon the character of the feces, whether fluid or solid, and partly upon the power of the intestinal muscles. Thus in the small intestine the stenosis may reduce the lumen to the size of a lead pencil without producing symptoms. When the stenosis becomes so marked that the fecal stream is interfered with, the intestine above it gradually dilates and there follows hypertrophy of the muscular walls due to increased peristaltic action. This hypertrophy of the musculature shows itself very promptly, in some cases within a few days, and it may suffice to overcome the obstruction for a long time. This condition is exactly similar to eccentric hypertrophy of the heart. It has, of course, its limits, and if the stenosis is permanent or progressive, as is usually the case, the intestine above the stenosis will become enormously dilated and its wall although thickened will be partially paralyzed. As a result of circulatory disturbances ulcer may develop and may lead to perforation.

The length of intestine which is involved in hypertrophy and dilatation varies greatly, as does the degree of dilatation. The portion of intestine below the stenosis shrinks on account of the limited quantity of feces which passes through it. Thus either the small or the large intestine may appear no greater than the little finger. In rare cases the lower portion of the intestine is also dilated.

The symptoms due to intestinal stenosis vary according to the portion of intestine affected. They will be described under the three headings of stenosis of the duodenum, stenosis of the small intestine, and stenosis of the large intestine. Stenosis of the rectum is described in Volume V.

Stenosis of the duodenum produces symptoms which differ according as the stenosis is above or below the papilla of Vater. If it is above this papilla, the flow of bile and pancreatic juice is not interrupted, whereas if it is below the papilla, these fluids will flow, at least in part, into the stomach. If the stenosis is at the papilla, the flow of bile and pancreatic juice may be partially or wholly interfered with.

The symptoms of suprapapillary stenosis are almost identical with those of pyloric stenosis. The upper portion of the duodenum dilates, and this dilatation extends to the pylorus and later to the stomach. As the secretion of the portion of the duodenum above the papilla is not especially characteristic, the contents of the dilated stomach will

not differ from those of the stomach which is dilated as a result of pyloric stenosis. This is true whatever the cause of the stenosis.

In infrapapillary stenosis more or less of the bile and pancreatic juice will find their way into the stomach and will give to its contents well-marked characteristics. It is very significant of this form of stenosis, if when the stomach has been washed out and the water is returning clear it suddenly becomes tinged with bile, although no pressure has been made. If the stenosis is of marked degree, a diminution of the bile and pancreatic juice may be noted in the stools. If the stenosis is of mild degree, it is well-nigh impossible to distinguish it from suprapapillary stenosis.

Papillary stenosis when well developed gives rise to characteristic symptoms. This is especially true of carcinomatous stenosis. There will be icterus of a chronic character, although the symptoms of obstruction in the liver and gall-bladder are slight or wanting. Bile may be diminished or wholly wanting in the stools. The obstruction to the flow of pancreatic juice may lead to glycosuria and the stools will show evidences of faulty pancreatic digestion. This condition must be differentiated from cholelithiasis, carcinoma of the gall-bladder, and carcinoma of the pancreas.

Stenosis of the upper portion of the jejunum produces essentially the same symptoms as infrapapillary duodenal stenosis. The farther down it is situated, the more prominent the intestinal symptoms become and the less prominent the gastric symptoms. The symptoms of chronic gastric retention will not be present unless there is a high degree of stenosis. Temporary retention of food in the stomach with vomiting may be due to the fact that chronic intestinal stenosis becomes temporarily a complete stenosis. Under such circumstances the contents of the intestine above the stenosis may pass into the stomach and be vomited. The stagnation in the intestine leads to abnormal bacterial development, and this gives to the vomited material a strong fecal odor. Intestinal stenosis may produce vomiting by reflex action even though there is no gastric retention. Thus vomiting may accompany attacks of colic. Material vomited from such a cause will come only from the stomach and duodenum. Stenosis of the small intestine gives rise to such dyspeptic symptoms as loss of appetite, eructations, bad taste in the mouth, coated tongue, etc. A patient with intestinal stenosis usually learns that hearty eating brings on an attack of colic, and therefore limits his diet as much as possible though his appetite is good.

The most important symptoms of intestinal stenosis are the visible dilatation and increased peristalsis of the portion of the intestine above the stenosis. When the stricture is situated very high up, the portion of intestine above it is too short to permit of marked dilatation, since the fluid easily regurgitates into the stomach. Such regurgitation is more and more difficult the farther the stenosis is removed from the stomach. Local meteorism is therefore produced. This may be diffuse or distinctly local. Sometimes the exact outline of the intestine may be made out, especially if the abdominal walls are thin or the recti

muscles are widely separated. The distinctness with which the intestinal coils may be seen or even felt depends not only upon the degree of dilatation, but also upon the contraction of the intestinal wall. This contraction may occur in waves corresponding to normal peristalsis. These waves begin at about the same point, and all end at a definite point, which is, of course, the point of stenosis. The contraction may also be of a tonic character. This tonic contraction takes place as follows: The larger or smaller portion of intestine whose outline was not previously visible becomes suddenly uniformly contracted and feels to the palpating finger quite distinct and hard. This contraction is generally accompanied by colicky pain. After a few seconds, or in some cases a few minutes, the intestine gradually loses its rigidity and the pain disappears. Sometimes as the contraction passes off a distinct gurgle is heard. Such tonic contraction may be caused by striking or rubbing the abdomen, by the ingestion of food, or by psychic influence. Often the patient will describe these attacks with such exactness that a diagnosis of intestinal stenosis is readily made.

The tonic contraction is relieved by the passage of intestinal contents through the stenosed portion, or more frequently by regurgitation. The affected portion of intestine lies quiet until the peristaltic action above drives into it additional fecal matter, and this in turn excites tonic contraction.

Pain of a colicky character is the common accompaniment of tonic contraction. It is not invariable, and it may also occur without visible contraction of the intestine.

The intestinal contraction above described is the most important symptom of intestinal stenosis. It is not an absolute sign, however, since in certain cases of neurosis peristaltic action may be increased and tonic contraction may also occur. But in such circumstances the portion of intestine affected will vary from time to time, while in intestinal stenosis the portion affected is always that immediately above the stenosis. Furthermore, in neurotic contraction dilatation of the intestine will be wanting.

If the dilated intestine is so situated that it can be carefully examined, it will be found to be markedly tympanitic in the period of contraction. Sometimes it can be sharply differentiated from the surrounding coils of intestine by reason of its clear high note, which is similar to that of a dilated stomach. A second indication of dilatation is the splashing sound which can be obtained in the interval between contractions. This is a sound which occurs in the intestine under no other condition except perhaps in acute enteritis, and then it will not be constant in the same place.

Stenosis of the small intestine has no influence upon the character or form of the stools. Their amount and frequency depend upon the degree of stenosis. Constipation is the rule. If diarrhoea is present, it is due to an accompanying catarrh of the large intestine. If the stenosis is situated near the cæcum, diarrhoea may alternate with constipation just as it often does in stenosis of the large intestine.

The urine is scanty and concentrated on account of the interference with intestinal resorption. The quantity of indican in the urine is increased in most cases. From such increase it is not possible to draw reliable inference as to the site or degree of such stenosis.

Stenoses of the small intestine may be multiple, in which case there will be a series of hypertrophied and dilated portions causing the intestine to resemble a string of sausages. Multiple stenoses cannot be differentiated clinically from a single stenosis.

Stenosis of the large intestine, if situated in the neighborhood of the ileocæcal valve, produces symptoms which are similar to those of stenosis of the small intestine because the lower portion of the ileum is involved in the obstruction. A differential diagnosis will therefore depend upon the presence of a palpable obstruction, which in the case of cæcal stenosis can almost always be made out.

Stenosis of the lower portion of the large intestine is characterized by slight symptoms. The intensity of peristalsis of the small intestine is about twenty-five times that of the large intestine. Any obstruction therefore in the small intestine excites the most powerful peristaltic action. Such is not the case in the large intestine, where even a high degree of stenosis may produce no other symptoms than constipation and slight meteorism. Every surgeon of experience must have opened the abdomen for acute ileus and found to his surprise a stenosis of the large intestine which apparently had lasted for months with few symptoms until the obstruction became complete. Careful examination of such a patient will show, however, a local meteorism in both lumbar regions if the obstruction is in the sigmoid colon or rectum. The stools are always altered. There may be obstinate constipation or diarrhoea, or one condition may alternate with the other. The diarrhoea is due to catarrh of the large intestine which is the result of the retention of feces above the stenosis. Small quantities of mucus and fluid portions of the feces constantly pass the stenosis. This fact should be borne in mind so that the mistake shall not be made of diagnosing stenosis as simple colitis. A ribbon-like condition of the stools may be produced by stenosis in the rectum or lowest portion of the sigmoid colon. The presence of pus, blood, or fragments of tumor is of far greater importance in indicating the nature of the stenosis. If the stenosis is accompanied with ulceration, the stools usually have a most offensive odor. Distention of the rectum with air or water is a valuable means of diagnosis. (See page 36.)

Treatment.—The effect of intestinal stenosis upon the general condition of a patient depends in great measure upon the character of the lesion. The treatment of a cicatricial stenosis may be quite different from that demanded by a tuberculous or carcinomatous stenosis. Intestinal stenosis may injure the patient by depriving him of nourishment and causing pain. Furthermore if the stenosis is a narrow one, it carries with it the risk of acute ileus, while in the dilated portion of intestine ulcers may form which in their turn may lead to perforation and peri-