



may be below Poupart's ligament, or it may be at the umbilicus or in the lumbar region. The fistulous tract thereby produced is often tortuous, and spontaneous recovery of the patient is delayed or never occurs.

Often only a part of the contents of the abscess is discharged or some portion which remains behind again becomes encapsulated and an abscess results.

In some cases the pus has eroded the wall of the internal iliac artery, or the circumflex iliac artery, and has produced severe hemorrhage. A more frequent complication is thrombosis and rupture of a vein giving rise to suppurative thrombophlebitis. This is an accident which is more likely to occur in slowly progressing cases in which the quantity of pus is small. The affected vein may be a branch of the portal vein or a radicle of the inferior vena cava. Such venous invasion will result in numerous pyæmic abscesses in the liver, retroperitoneal glands, spleen, kidneys, or lungs, or in endocarditis, meningitis, abscess of the brain or parotid gland, or other metastatic abscess. Non-suppurating thrombophlebitis of the right iliac vein may also be produced with the well-known consequences.

All of the complications above mentioned may be produced without extension of the inflammation to the general peritoneal cavity. Unfortunately in many cases protective adhesions fail and a diffuse peritonitis results. There are in many cases of circumscribed appendicitis symptoms of diffuse peritoneal irritation, such as general abdominal distention and tenderness. The intestine may be hyperæmic, and there may be a slight serous exudate. Such a condition is quite different from diffuse peritonitis, and must not be confounded with it. In favorable cases these symptoms of peritoneal irritation will disappear in a few days.

In other cases of appendicitis the inflammation almost from the start will spread rapidly throughout the free peritoneal cavity. This is usually due to perforation or gangrene of the appendix, so that a considerable quantity of infectious and perhaps unusually virulent material finds its way into the cavity of the peritoneum. In these cases of severe septic or purulogangrenous peritonitis one is often astonished to find that there is very little inflammatory infiltration in the region of the cæcum. This failure of protective adhesions may be due to the rapidity of the disease or to the nature of the parasite. In other cases adhesions form, but they prove insufficient to confine a rapidly growing abscess, so that the abscess breaks through them and produces suppurative peritonitis often with fatal result. The most favorable form of diffuse peritonitis is the so-called fibrinosuppurative peritonitis of the progressive type. In this form the inflammation extends step by step until the pus occupies a considerable portion of the peritoneal cavity or is disposed in solitary abscesses which are shut off by adhesions between the coils of intestine.



## SYMPTOMS.

For the sake of clearness, it is well to group symptoms which may arise during an attack of appendicitis under three heads: *a.* Symptoms which are due to disease of the appendix itself. *b.* Symptoms which are associated with the peri-appendicular inflammation. *c.* Symptoms of diffuse peritonitis or other outcome of the trouble.

*a. Symptoms of Appendicitis when the Inflammation is Limited to the Appendix.*—The pathological changes which take place in the appendix during an attack of inflammation of this organ are, as stated above, a severe catarrh with hemorrhage or ulcers of the mucous membrane. A rapid restoration of the normal condition is interfered with by the stenosis which these lesions produce, so that the course of the trouble is apt to be marked by exacerbations when stenosis interferes with the discharge of secretion, alternating with periods of improvement when such discharge takes place. It is well, therefore, to separate the symptoms into those which exist during an acute attack and those which exist in the intervals between attacks.

There are certain symptoms which may be regarded as preceding a first attack. These are transitory colicky pains in the abdomen, slight disturbances of the stomach, intestine, liver, kidneys, or bladder, without visible cause therefor, pains which are often called rheumatic, or nervous, or hysterical, or which in women are frequently referred to the pelvic organs. If one makes a careful examination of such a patient, he will usually find the appendix vermiformis somewhat tender on pressure. These symptoms may or may not precede the first attack. The latter is marked by an intense, sudden boring pain in the abdomen which cannot be localized, or is referred to the epigastric or umbilical region. There is often nausea and vomiting or diarrhoea. If one makes a diagnosis solely on the statement of the patient, he may easily mistake the attack for one of gastric catarrh, indigestion, etc. Sonnenburg says that nausea and vomiting invariably occur after the pain in appendicitis, whereas in gastritis or enteritis the reverse may be true. The abdomen is often evenly distended, though different portions of it may be more sensitive to pressure. The complete extension of the right thigh is avoided by the patient. There may or may not be fever. The latter may be preceded by a chill. Usually the disturbance of the general condition of the patient does not last long, and on the following day the temperature may be normal while the meteorism and tenderness on pressure vanish. The more careful examination of the abdomen which is thus permitted will usually show that the inflammation is located in the ileocaecal region. Pressure in this region may be very painful. Gentle palpation will usually reveal the situation of the thickened appendix, or one may detect only a sense of resistance due to the swollen appendix and the inflammation in its immediate neighborhood. The diagnosis is then sufficiently clear. Diseases of the pelvic organs can ordinarily be eliminated by a careful pelvic examination.

In a few days, or at the most a week, the patient is usually so far recovered that all subjective disturbances have disappeared. It is, of course, important to know whether the patient is permanently cured or whether the disease is likely to recur. No one can give a definite answer to this question. If the attack was due to an accidental swelling of the mucous membrane or to obstruction by a fecal concretion, the passing of the cause may be followed by a complete restoration to health; but, as shown in the preceding pages, there are usually important anatomical changes of a permanent character which are increased by the first attack on account of the doubtful condition in which such an attack frequently leaves the appendix, so that it is usual for the patient to suffer from a second attack within a period of weeks or months, or in a few cases years. Neither is it by any means certain that the second attack will prove as mild as the first. If a second attack occurs, it is usually ascribed by the patient to some traumatism or an error in diet, or exposure to cold.

Even in the interval the patient is not entirely free from symptoms. These are usually of the character described above as prodromal symptoms, and there is besides a feeling of heaviness or weight in the sacral region which is more or less constant. Sometimes these slight subjective symptoms, combined with a fear of recurrence, cause the patient to lead the life of a chronic invalid and prevent him from taking active exercise and interest in matters outside of himself which are so essential for healthy existence.

There are, however, cases in which the patient feels absolutely well after a first attack and believes himself permanently cured until suddenly a new attack dispels this illusion.

*b. Symptoms of Appendicitis accompanied with Peri-appendicular Tumor and Abscess Formation.*—The intensity of the symptoms in this form of disease is naturally greater. There are severe pain in the whole abdomen, chill and fever, repeated vomiting, possibly of a bilious character, diarrhoea followed by obstipation, and often such symptoms of collapse as cyanosis, perspiration, and small rapid pulse. The abdomen may be distended or the abdominal wall may be contracted as hard as a board. The slightest touch on the abdomen causes pain and the patient carefully avoids any unnecessary motion. It is evident that there is a diffuse affection of the peritoneum of a serous or serofibrinous or fibrinopurulent character. If the condition of the patient gradually improves, and the abdominal tenderness disappears except in the neighborhood of the caecum, the diagnosis of appendicitis is evident, and that of diffuse suppurative peritonitis can be ruled out. Such a stormy attack makes probable the formation of an appendical abscess. This is usually due to perforation of the appendix, although an equally violent attack may be the result of an infection spread through the lymph-channels.

When the pain has become limited to the region of the caecum and the spasmodic contraction of the abdominal muscles has somewhat subsided, palpation of the abdomen will reveal the presence of a tumor



about the appendix. This varies in size from that of an egg to that of the fist. The mass is tender on pressure, hard, immovable, and the skin may be already affixed to it and somewhat œdematous. In some instances the centre of the swelling projects beyond the normal level of the skin. A like swelling may be sometimes seen in simpler cases of appendicitis due to a serofibrinous exudate which does not contain bacteria. Such a swelling rapidly diminishes until only a thickened appendix with some adhesions is left to mark its presence. If the swelling is due to pus, it does not disappear, but remains tender, or its tenderness may even increase for four or five days. Meantime the swelling remains stationary or increases in size, and the œdema of the skin becomes more evident. This is sufficient proof of the existence of pus, although fluctuation is obtained only in occasional instances.

The temperature and pulse curves are important, although there is no distinct type characteristic of the disease. As a rule there is more or less fever. Exceptions have been reported, but they are extremely rare. The temperature reaches 39° or 40° C. (102°–104° F.) at the first, to fall to normal in two or three days if the attack is a simple one. If the temperature remains at about the same height for five days, the presence of an abscess is practically certain. There are also cases of abscess in which the temperature becomes normal in four or five days, and then gradually or suddenly rises again. The pulse curve for the most part corresponds to the temperature curve. Indeed, the variations in the pulse are a more sensitive indication in some cases than variation in the temperature. A rapid pulse is always a suspicious symptom. In describing the symptoms of appendicitis it has been assumed that the appendix is situated in its normal position. If it is so situated that an abscess forms by the outer margin of the cæcum, the area of induration will reach the iliac spine. On the other hand, an abscess may be formed so far inward as to reach the median line. If the appendix is situated behind the cæcum, a retrocæcal abscess may be formed. In this case the anterior abdominal wall will not be affected and the abscess will be covered with resistant intestine. If the pus extends upward to the liver, the lumbar region is generally tender and the right thigh is flexed and adducted. Pus in the pelvis produces disturbances of the bladder, and not infrequently annoying tenesmus or intense sacral pain. Examination by rectum or vagina ought never to be omitted. If there is pus in the pelvis, a tender resistant mass can be felt in Douglas's pouch. If the inflammation from the appendix has extended to the tube and ovary or has proceeded in the reverse direction, an exact diagnosis may be difficult.

The abscess may extend into the sac of a right inguinal hernia or an unusually long appendix which reaches into a hernial sac may become inflamed. In such circumstances the symptoms will resemble those of acute strangulation.

c. **Termination of Appendicitis in Diffuse Peritonitis and other Complications.**—Abscess around the appendix may in certain in-

stances terminate in spontaneous cure. The pus may become sterile and be resorbed. It is also conceivable that the pus may discharge from the appendix into the cæcum even after the appendix has perforated. Rupture of the abscess into the cæcum or rectum will more promptly relieve the symptoms. The pus will then appear in the stools for one or more days. Cure may also follow the discharge of pus into the bladder, uterus, or vagina, or through the skin, but the relief of an abscess in these cases is often merely temporary, and it either re-forms or a fistula persists. The development of subphrenic abscess and right-sided pleurisy is another termination which has been spoken of.

Rupture of an abscess into a vein may produce suppurative thrombosis and pyæmic metastatic abscess, or the patient may die of sepsis.

The abscess may become surrounded by such a mass of cicatricial tissue that the condition simulates the infiltration of actinomyces. Such a condition is accompanied by slight or no fever, but the patient will be anæmic and will show loss of strength.

By far the most important complication of appendicitis is diffuse inflammation of the peritoneum. This may take place before adhesions have formed around the appendix or the pus may break through such adhesions and spread the infection beyond them. (See page 355.)

The tendency of appendicitis to recur after spontaneous recovery has been already spoken of. Unfortunately it is not possible to say in a given case whether or not a recurrence is to be expected. Rotter treated 221 patients, 47 of whom had had previous attacks, equal to 21 per cent. Statistics of Sahli show that 20.8 per cent. of 4593 cases were of the nature of recurrences. The probability of recurrence may therefore be given as about 20 per cent. Rotter says that in most recurrent cases there is a second attack, but that it is rare to have more than one recurrence and that this single recurrence may usually be looked for within a year, and very seldom after two years. Autopsies show that perforation does not take place in more than one-half of the recurrent cases.

#### DIAGNOSIS.

In most cases of appendicitis, whether acute or chronic, the diagnosis is easily made from the symptoms described in the preceding pages; but if the appendix is not in its usual situation one may be misled, especially in the beginning of the affection. The differential diagnosis must include renal or biliary calculus, perforation of the stomach, diseases of the pelvic organs, and intestinal strangulation and obstruction. Sometimes the question may lie between indigestion and appendicitis, or acute intestinal catarrh, or fecal impaction, or some form of intoxication. If the appendical tumor has existed a long time, one will have to consider the possibility of ileocæcal tuberculosis and malignant new growth. The flexed position of the thigh suggests psoas abscess or hip disease.

In other instances diseases of the urinary bladder or rectum and



neuralgia will require exclusion. It is a safe rule to consider the possibility of appendicitis in every case of abdominal trouble not clearly due to something else. The appendix may be the starting-point of an abdominal abscess wherever placed, as well as the cause of sepsis or pyæmia of obscure origin. The presence of dulness in the cæcal region on light percussion, a sense of resistance and increased tenderness when the cæcal region is gently palpated, will suffice to make the diagnosis certain in many cases. Any superfluous palpation should be avoided not only because it is painful, but also because it is capable of rupturing existing adhesions or perforating the appendix.

Puncture to prove the existence of an abscess is an unwise procedure. If the abscess is large, it is unnecessary; if the abscess is small, the point of the needle may miss it. It is in any event a painful procedure, and carries with it the risk of spreading the infection.

Tuberculosis of the appendix is in the majority of cases simply one manifestation of tuberculosis which is widely scattered through the organism or at least through the intestinal tract. If the ileocæcal region alone is involved, the slow course of the disease and its mild symptoms will suggest its true nature. Swollen and caseous retroperitoneal glands may be palpable. The symptoms are mild until stricture or adhesions bring about stenosis. For other symptoms of tuberculosis the reader is referred to page 320.

Actinomycosis often begins in the appendix or its neighborhood, but the course of this disease is so typical that it can scarcely be mistaken for appendicitis. The pallor of the patient, and the extensive infiltration of the abdominal wall which has developed without any acute symptoms, fail to distinguish this disease from appendicitis. At a later period there are fistulas and abscesses. (See page 326.)

#### PROGNOSIS.

In speaking of the prognosis of appendicitis one must distinguish between the particular attack and the whole course of the disease. Any statistics to be of value must be collected with this in mind, and statistics intended to show the prognosis of a single attack ought to separate slight attacks from severe ones. Rotter follows this plan, and reports that of 110 patients with slight or circumscribed appendicitis 2 died and 8 were operated upon, leaving about 90 per cent. in which spontaneous recovery occurred. In 9 cases in which appendicitis was complicated with diffuse peritonitis there was not a single spontaneous recovery. The significance of recovery from a particular attack has been discussed in the preceding pages. Moreover, the mortality of appendicitis is doubtless greater than appears from statistics, for the reason that the diagnosis made in fatal cases—for example, ileus, diffuse peritonitis, chronic pyæmia, abscess of the liver, etc.—does not show that the origin of the trouble may have been in the appendix.

While it is doubtless true that the majority of attacks of appendi-

citis are recovered from without operative treatment, yet every attack must be looked upon as serious the prognosis of which is in doubt. A favorable outcome cannot be assured until the inflammatory process is plainly limited to the cæcal region and the inflammatory tumor begins to diminish in size. Even then one should bear in mind that the period of recovery is uncertain, and that another attack may occur at any time.

#### TREATMENT.

Appendicitis is now generally recognized as a disease which should be treated surgically, or at least one in which surgical treatment should be constantly under consideration. Formerly operation was looked upon as a last resort. Fortunately the advantages of early surgical interference are now generally understood. In the early stages of the disease before the diagnosis is certain the patient should be kept absolutely at rest, and should be given a restricted fluid diet, a moderate amount of opium, and, if necessary, morphine to control the pain. Ice or hot cloths should be applied to the abdomen. Cathartics and large rectal injections are inadvisable since they stimulate peristaltic action and may drive fluid fecal matter through the perforated appendix. These measures will be successful in bringing many patients through an attack of appendicitis; but as one never knows when a serious complication may arise, the patient should be removed to a hospital unless his surroundings permit the speedy performance of an operation should such become necessary. If the patient is moved, he should be kept constantly in a horizontal position upon a bed or stretcher so as to avoid any jarring or straining of the abdomen.

It is generally agreed that an appendical abscess demands operation in order to draw off the pus, and by removal of the appendix to provide against a recurrence of the trouble. Some surgeons advocate an early operation because its risk is slight. Dangerous complications are thereby avoided and subsequent formation of a fistula or a hernia is less likely. Other surgeons postpone operation until there is a definite abscess, which they open, at the same time removing the appendix if it is easily accessible. Otherwise they postpone its removal for four or six weeks until the symptoms of inflammation have subsided. While both sides to the controversy support their positions by the favorable results of their respective treatment, the principle which underlies an early operation is logically right, and is likely to prevail. As an early operation to succeed requires a certain amount of dexterity and experience, those who are not fortunate enough to possess these requisites will subject their patients to less risk if they postpone operation until an abscess has formed.

Experience has shown the value of certain methods of procedure which are well worth consideration:

1. There is a relatively large group of cases of appendicitis in which the attack is from the start of slight character. Since the gen-



It is well to remember that it may be adherent to the underlying bowel; therefore it is safer to tear through the peritoneum with forceps. As soon as this is done foul-smelling yellowish or greenish pus mixed perhaps with bits of fecal matter may be evacuated. If the abscess is more deeply placed and covered with adherent loops of intestine and omentum, the safest way to reach it is by following the lateral abdominal wall. When one reaches the cæcum, the abscess will usually be opened. In this manner one may avoid an unnecessary opening of the free peritoneal cavity. The incision in the peritoneum is extended to 6 cm. (2.4 inches) and all pus is wiped away with sterile gauze. The abscess cavity is next explored with the finger for the purpose of finding any accessory cavity. Great care should be taken not to break through adhesions into the free peritoneal cavity. The appendix will usually be found either free in the abscess cavity or easily separable. If not, its position may be known by the direction from which the pus comes, by the position of the fecal concretion, or by changes in the peritoneum, which are most marked in the neighborhood of the appendix.

It is important to disturb as little as possible the cæcum and large intestine. If the appendix cannot be seen, it may be felt as a firm round cord in which the perforation is often palpable.

When the appendix has been found, the surrounding intestines are gently pressed back with retractors, any remains of pus are sponged away, and if the adhesions are broken through at any point, the free peritoneal cavity is protected with a gauze compress over which a blunt retractor is placed. By proceeding in this manner the peritoneal cavity can be protected from infection and the removal of the appendix is facilitated. This organ and its mesentery are often greatly thickened by inflammation, but their isolation is not difficult if the attack is a primary one, since the adhesions will be merely fibrinous. The appendix if partially necrotic is easily broken. When it has been isolated, its mesentery is ligated and cut through. The serous coat of the appendix is next divided about 1.5 cm. (0.75 inch) from the cæcum and pushed back to the cæcum like a cuff. The bared appendix is then ligated close to the cæcum and cut off close to the ligature. Any portion of membrane which projects from this ligature is snipped off with scissors, the stump of the appendix is wiped dry, and the cuff of its serous coat is drawn over it and fastened with a silk suture, if stitches will hold in its tissue. By proceeding in this manner one almost always avoids the formation of a fecal fistula.

If the tissue is too rotten to permit of the treatment above described, simple ligation and excision of the appendix must suffice. If perforation occurs, it is usually delayed for a few days until the wound is protected by granulations; or the stump may be stitched into the incision in the peritoneum so as to protect the peritoneal cavity from feces in case perforation occurs.

The cavity of the abscess is again wiped with dry gauze, which is preferable to wet gauze or irrigation, and a medium-sized drainage-tube is inserted to the stump of the appendix and surrounded by tampons

of iodoform gauze. These tampons should be loose unless there is risk of prolapse of the intestine; in that case they should be packed in firmly.

The avoidance of subsequent hernia in the cicatrix at the operation is worth considering, since this is a trouble which in its simplest form causes the patient a great deal of inconvenience. A ventral hernia is apt to develop if the layers of the abdominal wall, and especially the fascial planes, are not firmly united. It is obvious that the risk of hernia is greatly increased by the use of tampons. When such a wound is left to granulate, muscles and fascia retract so that the cicatrix is formed of connective tissue and skin only. Yet it is desirable, or perhaps necessary, to keep the wound open in order to insure its healing; therefore in cases in which operation has been performed early and the abdominal walls have been found only moderately oedematous, and the quantity of pus has been small, one may sew up at least half of the wound in layers with catgut and silk. Union will ordinarily follow such a suture, although the edges of the wound are contaminated during operation. The tampon in the rest of the wound should be removed early—on the second or third day after operation—and replaced by a smaller one. In two or three days more, if the wound is granulating nicely, it may be closed by deep and superficial sutures except at one small point where a slender drain is left in place. This drain is removed in ten days after operation, and in two weeks the wound will be found firmly united. The patient as a precautionary measure should remain in bed during the third week. If the abscess is very large and has already involved the anterior abdominal wall, the secretion from the wound will be proportionately great and a large tampon necessary. In such circumstances the wound must be left open or stitched only at its ends. Additional stitches may be inserted later when the condition of the wound permits.

When it is necessary to drain the wound for some weeks, the normal layers of the abdominal wall will retract widely. The only method to prevent a hernia in such circumstances is to dissect away the scar-tissue, expose the healthy edges of the muscular and fascial planes, and suture them exactly. It is better not to postpone this second operation too long since every week may add to the strength of the adhesions between the intestine or omentum and the cicatrices of the wound.

The success of radical operation is usually striking. The pains stop at once and the temperature falls quickly to normal. The patient should be kept upon a fluid diet for a few days. No medication is necessary, but for four or five days the bowels should be moved by glycerin suppositories or some similar measure. The patient should be kept in bed until the edges of the wound are firmly united. In uncomplicated cases the patient will be able to go out completely cured in from three to five weeks. But for a much longer period he should avoid any activity which will markedly increase abdominal pressure or lead to stretching of the scar. An abdominal bandage as a prophylactic measure is not recommended.



The abscess may not be confined to the region of the appendix, but may extend upward between the colon and the side of the abdomen, so that a counteropening in the lumbar region may be required for drainage. Indeed, in cases of extensive cellulitis and intense inflammation it may be desirable to prolong the anterior incision transversely into the loin. The treatment of a subphrenic abscess due to appendicitis is spoken of elsewhere.

Abscess in the pelvis may be opened according to its situation by an incision either above or below Poupart's ligament. In such cases the superficial abscess may be a continuation of one in Douglas's pouch, or it may be separated from it by adhesions between the intestine or parietal peritoneum. Examination per rectum will show whether or not there is a second deeper abscess to open. If there is such a deep abscess which cannot readily be reached by separating adherent intestine from the anterior and lateral pelvic walls, it should be opened from below—that is, through the posterior vaginal vault in women and through the anterior wall of the rectum in men and young girls. In other cases the diagnosis may be confirmed by puncture; and if pus is found, the needle will serve as a guide to the instrument with which the abscess is opened—a probe-pointed knife or a pair of curved artery-forceps. In this manner the free peritoneal cavity is saved from contamination with pus and the abscess is opened at its most dependent portion. If an opening is made large enough to admit the finger, no drainage-tube or gauze is necessary. If a deep abscess is opened anteriorly, the use of rubber drains can scarcely be avoided, and the patient should be placed several times daily upon his side, or, still better, upon his face so as to facilitate the escape of pus. In this manner a perfect closure of the abscess cavity is almost certain to be achieved in a few weeks.

**Removal of the Appendix in the Interval.**—This operation is only to be performed in hospital or where all the facilities for careful aseptic operating are at hand. The patient should be prepared by baths and laxatives and a general anæsthetic should always be given. Different sorts of incisions are used by different surgeons for the purpose of gaining more space for the operation. The oblique incision above described is sometimes employed, also a median incision and one along the outer border of the rectus muscle. Sonnenberg draws the skin well inward so that the incision through the muscle may later be covered with normal skin. This protection is of doubtful value, especially as hernia rarely follows a properly performed operation.

In order to have a definite direction for the incision, Beck has recommended that it be made in a line drawn from the symphysis pubis to the tip of the eleventh rib. Such an incision will be parallel to Poupart's ligament, and will be situated one-third of the distance from the anterior superior spine to the umbilicus. The incision may well be 12 cm. (4.8 inches) in length. The usual plan is to divide all of the muscular layers in the same direction. It has been suggested

to separate the fibres of the different muscles without cutting any of them, but this method fails to give sufficient room in difficult cases. The peritoneum should be divided with caution because intestine frequently adheres to it. Firm adhesions will be found if an appendiceal abscess has been previously drained without removal of the appendix. In such a case it is advisable to open the peritoneum to the side of or above the old scar in order to separate the adhesions from within the peritoneal cavity. This may be done by a sharp or blunt dissection.

The appendix can usually be seen or felt. The best guide is the muscular band of the descending colon, for the three bands unite at the point of attachment of the appendix. (P. Müller.) Therefore if one follows the colon to its termination in the cæcum and draws the latter upward, the origin of the appendix will be exposed. If the adhesions are recent or slight, they may be torn through with a piece of gauze or a blunt instrument. The mesentery of the appendix should be ligated in one or more places before it is cut through, as it contains a fair-sized artery. When this has been done, the appendix can be lifted partly out of the wound, and its removal is thereby facilitated. Before the lumen of the appendix is cut into, the surrounding parts should be protected from infection by pads of sterile gauze. A sterile gauze bandage may be used to tampon the surrounding wound. An artery-clamp should be fastened to every tampon so that the latter will not be left in the abdominal cavity.

The serous coat of the appendix should be divided circularly at a distance of 1 to 1.5 cm. (0.4 to 0.6 inch) from the cæcum and pushed back like a cuff. The mucous membrane of the appendix is then ligated with silk close to the cæcum and the appendix is cut through close to this ligature. Care should be taken that its contents do not soil the wound. The stump of the appendix is then cleansed, any surplus of mucous membrane is removed, the stump is buried, and the serosa is closed over it by a double row of fine silk stitches.

If this closure is perfect and the removal of the appendix has been accomplished without tearing apart extensive bleeding surfaces, the parts may be restored to their normal positions and the peritoneum and layers of the abdominal wall sutured with buried catgut and superficial silk stitches. Such a wound should heal primarily and leave no trace of hernia.

If the removal of the appendix is not so satisfactory—for example, if the serous coat is scanty or brittle, so that it cannot be closed over the stump—it may be necessary to cover it with its mesentery or to invaginate it in the cæcum. In such a case the sutured stump must not be dropped back into its normal position, but must be fixed in the peritoneal wound so that if perforation occurs the intestinal contents shall find an easy escape.

If the conditions are as above described, the removal of the appendix is a simple procedure for a skilled operator. Extensive and firm adhesions may make the operation extremely difficult. The appendix may be so buried in cicatricial tissue that it is scarcely to be



recognized, and can only be dissected free with great care and considerable force. One should avoid tearing adherent intestine or stripping off its outer layers. This accident is likely to be followed by a fecal fistula which does not readily heal.

If the appendix is so surrounded by adherent intestinal coils that their injury is likely to follow attempts at its removal, the operation had better be given up. Sometimes the appendix is so closely adherent to the wall of the cæcum that it appears almost a part of it and cannot with safety be separated from it. In such a case the appendix may be split lengthwise and its mucous membrane removed and ligated at its junction with the cæcum and the wound in the appendix sutured. This procedure is very simple and avoids the severe hemorrhage which frequently follows rupture of extensive adhesions.

The operation should always be carried out with the least possible risk to the patient, since operation in the interval is never absolutely necessary. On this account it is better not to close the abdominal wound completely unless the conditions within the abdomen are satisfactory. Otherwise a tampon should be left reaching to the suture-line. This can be removed in five days if it is evident that the suture over the appendicular stump has not given way. Such tamponade is also necessary if there is extensive raw surface or if some focus of suppuration left by the acute attack of appendicitis is discovered. When the tampon is finally removed, the wound in the abdominal wall may be closed by secondary suture.

Removal of the appendix in the interval, if carried out in accordance with these directions, has practically no danger excepting that which accompanies the administration of the anæsthetic.

The patient should remain in bed three weeks in order to give the cicatrix time to become firm. If, in spite of this precaution, the scar shows a tendency to hernia, the patient should wear a well-fitting abdominal bandage.

The directions here given are sufficient for the performance of an appendical operation. At times complications will be found which must be met in accordance with general surgical principles. Space does not permit a detailed description of their treatment.

## CHAPTER XVIII.

### TUMORS OF THE STOMACH AND INTESTINE.

BY PROF. DR. J. V. MUKILICZ AND DR. W. KAUSCH.

#### TUMORS OF THE STOMACH.

**Tumors of the Stomach other than Carcinoma.**—Tumors of the stomach other than carcinoma are rare. The various connective-tissue tumors, such as fibroma, lipoma, fibrolipoma, myoma, and lymphadenoma, have more pathological than surgical interest since they are usually small and give rise to no symptoms unless they are situated near the pylorus or unless they project in the form of a polyp into the lumen of the stomach. A myoma of the stomach may project into its cavity or grow upward. Such a tumor may become as large as the fist or even larger. It grows slowly and gives rise to few symptoms. It may ulcerate and cause severe hemorrhage. On account of the uncertainty of diagnosis radical operation should be performed even though it seems probable that the tumor is not carcinoma.

Sarcoma constitutes from 5 to 8 per cent. of all primary tumors of the stomach. Metastatic sarcoma in the form of lymphosarcoma or melanosarcoma is commoner than primary sarcoma. It may occur at any age, but from the forty-fifth to the sixtieth year is the usual period. It shows no predilection for the orifices of the stomach. A microscopic examination may be necessary to differentiate between carcinoma and sarcoma. The latter grows usually from the submucous, subserous, or muscular layer. The tumor may be either round-celled, or less often spindle-celled, or very rarely a lymphosarcoma. The average duration of life after the first symptoms of sarcoma are noted is about one year. Sarcoma may reach considerable size. One weighing twelve pounds has been removed. Sarcoma grows more slowly than carcinoma and less often ulcerates, but usually no differential diagnosis can be made until the tumor is exposed. The only treatment is a thorough removal of the growth, which is very likely to recur.

Adenoma occurs in the stomach, and especially in its pyloric portion. There may be a single tumor, or more commonly several. In the latter case they are usually polypoid. A simple adenoma does not extend beyond the submucous tissue. An adenoma may interfere with the functions of the stomach, especially if it is situated near the pylorus. For this reason, and also because of its tendency