1903

Modern Surgery - Chapter 27. Diseases and Injuries of the Abdomen - Operations upon the Abdomen

John Chalmers Da Costa
Jefferson Medical College

Operations upon the Abdomen.

Abdominal Section (*Celiotomy; Laparotomy*).—There are many different methods of opening the abdomen. The plan selected depends upon the nature and the situation of the disease, and upon the inclinations and the custom of the operator. The abdomen may be opened to attack a recognized seat of disease or to determine what the disease is and where it is situated. Abdominal section performed for the latter purpose is spoken of as exploratory section or exploratory incision.

Of recent years, exploratory operations have become extremely common; and many abdominal conditions would be unrecognized without such exploration, or would be recognized at so late a period as to be beyond the reach of surgery, by the time the diagnosis had been made. This is notably true of the surgical diseases of the stomach. The surgeon should, however, not be too radical in employing exploratory operations. The fact that he can explore with such comparative impunity does not release him from the obligation to endeavor by every proper method to make a diagnosis before resorting to operation. I fancy that of recent years the belief that it is almost waste of time to make prolonged efforts to diagnosticate many intra-abdominal troubles, because the solution is so much easier by section, has become so common as to have led young and unskilled operators to perform section in cases in which the diagnosis might have been made without this procedure.

Before opening the abdominal cavity for exploratory purposes or to gain access to some area of abdominal or pelvic disease, the patient is carefully prepared as for any other operation. In an appendicitis case the patient is moved with the utmost care and is prepared for operation most gently, because of the possible danger of rupturing an abscess. In an emergency case no prolonged or complicated method of cleansing can be employed. The abdomen and loins are scrubbed carefully with soap and water, special attention being given to the umbilicus; the pubic region is shaved, the soapsuds are washed away with sterile water, the surface is gently scrubbed with alcohol and then with a hot solution of corrosive sublimate (1 : 1000), and is covered with gauze wet with the sublimate solution. Whenever there is time it is eminently desirable to prepare the patient the day before. The instruments required depend upon the nature of the case. As a rule, there are required scalpels, scissors, a dry dissector, two pairs of dissecting forceps, hemostatic forceps, pedicle forceps, Hagedorn needles, calyx-eyed intestinal needles, a needle-holder, drainage-tubes, gauze pads, gauze for sponging, silk, catgut, silkworm-gut, the Paquelin cautery, an electric light, also an instrument and a saline solution for hypodermoclysis or intravenous infusion. Always count the instruments, sponges, and pads, and write down the number, and count them again after operation. This rule is adopted so that no instrument, sponge, or pad will be left in the abdomen. The abdominal pads and sponges are not used when dry. Dry sponges injure the peritoneum and favor the subsequent development of adhesions (Sanger). The pads and sponges should be wrung out in hot normal salt solution before being used.

Operation.—An anesthetic is given. In some cases the patient is placed

recumbent; in others, is put in the position of Trendelenburg (Fig. 367). The patient is to be carefully protected from cold, the extremities and the chest are covered with blankets, and sterilized sheets are placed well around the field of operation. The parts are sterilized anew immediately before operating. The surgeon steadies the skin of the belly with the fingers of his left hand, and, holding the knife free in the right hand, makes an incision. For purposes of exploration the incision is made about two inches in length, and it is lengthened if it is found necessary. The abdomen may be opened in the median line above or below the umbilicus. This incision is advantageous for operations on the pelvis, for general exploration, and for certain procedures upon the stomach, the intestines, and the left lobe of the liver. The closure of such an incision, however, lacks strength, as compared with the closure of an incision where strong muscles will overlie the scar through the peritoneum and the transversalis fascia. Incision through the semilunar line is practised by a number of operators. A favorite incision is through the rectus muscle. The fibers of this muscle are separated, the structures beneath it are divided, and, after the completion of the operation, the deeper structures are sutured and the parts of the separated muscle are allowed to fall together. The scar resulting from such an incision is well supported and solid, hence the likelihood of hernia developing is diminished. A good method in some cases is to open the sheath of the rectus muscle, retract the entire muscle aside, incise the posterior portion of the sheath and the structures back of it, and, when the operation has been completed, allow the entire muscle to come back into place, and thus strengthen the deep-seated scar. When the abdominal trouble is in a region that admits of it, I almost invariably go through the rectus muscle or retract the entire muscle. Besides these methods, there are special incisions, suitable for particular cases: An incision along the costal margin, for reaching the gall-bladder; an incision shaped like the italic letter "f," for the same purpose; special incisions for certain operations upon the stomach, for abdominal nephrectomy, etc. Some operators have even used a transverse incision in certain pelvic operations.

Fig. 367.—The Trendelenburg position.

In an operation through the median line the first cut goes to the aponeurosis of the external oblique muscle. Clamp the vessels. Do not hunt for the linea alba below the umbilicus, but go right through or between the recti muscles. Above the umbilicus the linea alba is very distinct and the surgeon often cuts through it. Divide the transversalis fascia, beneath which is a little fat, and expose the peritoneum. The latter structure is recognized by its glistening appearance, by the ease with which it can be pinched up between the finger and thumb, and by the readiness with which its opposed surfaces may be made to glide over each other. On identifying the peritoneum, catch it at each side of the incision with forceps, raise a fold, nick it with a knife, and open it with scissors to the length of the external wound. To prevent stripping of the peritoneum a good plan is to anchor it to the belly-wall with a stitch on each side of the incision. Through the wound thus made the abdomen and its contents are explored, the trouble located,

and determination made as to whether or not further operation is advisable, and, if it is advisable, what form it shall take. It may be necessary to enlarge the wound. This is done by placing the index and middle fingers of the left hand in the belly, with their pulps against the peritoneum, in the line where the surgeon will cut, to serve as supports to the scissors and as guards to intraperitoneal structures. The scissors are introduced and the wound is enlarged upward, around the umbilicus if necessary. As soon as the incision is complete it is a good plan to push a large pad into Douglas's pouch and leave it there until the operation is finished, when it must be removed. Slender adhesions are broken off with the finger or are pushed off with gauze; firm adhesions are tied in two places and cut between the ligatures.

The toilet of the peritoneum is important after the operation is completed. Following a clean laparotomy, when but little blood has flowed into the cavity, flushing is not required; if much blood has flowed or if septic matter has passed into the peritoneal cavity, after removing the sponge from Douglas's pouch flush the belly thoroughly with hot normal salt solution, empty out most of the fluid, but let a pint or more remain in the abdomen. The retention of the saline fluid in the belly minimizes shock. It is absorbed with great rapidity after the operation if the patient is placed with his head lower than his feet, because in this position the saline fluid gravitates to the diaphragmatic region, where absorption is very active. If there is widespread infection, eviscerate, wipe out the peritoneum with pads soaked in hot normal salt solution, and wipe the intestines carefully, slowly returning them as they are wiped. Extravasated septic matter is apt to collect in the peritoneal fossæ and between the liver and diaphragm, and these regions must be carefully wiped or irrigated. In some cases it is desirable to drain through a lumbar incision. Rutherford Morison has pointed out that a lumbar opening into the right kidney pouch will drain a fossa which holds over a pint of fluid, and which, when the patient is recumbent, is the most dependent portion of the peritoneal cavity. In some cases a drainage-opening is made on each side of the belly or above the pubis, or through the vagina. In septic cases it may be advisable to drain with several pieces of iodoform gauze instead of inserting tubes. In most instances drainage is not needed, but it must be used in septic cases and when hemorrhage has been severe. We may drain by a rubber tube, strands of gauze, or a glass tube. If a glass tube is used, it is introduced at the lower angle of the wound and reaches the bottom of the pouch of Douglas. This tube is repeatedly emptied during the progress of the case by means of a syringe. Before closing the wound arrest hemorrhage and count the instruments and sponges.

It is highly important that an abdominal incision shall be accurately closed, for any failure of neat approximation will, in all probability, result in the formation of a hernia through the cicatrix. Various methods have been employed. Probably the majority of operators use layer sutures, sewing up the peritoneum with a continuous suture of catgut, and the aponeurotic layers with the same material or with chromic catgut, and closing the skin with either interrupted sutures of silkworm-gut or a subcuticular stitch of catgut, silkworm-gut, or silver wire. Other operators close the peritoneum with a continuous suture of catgut, then pass silkworm-gut

sutures through all the other structures, leaving them for the time untied; put in layer-sutures of catgut or of chromicized catgut, and then tie the silkworm-gut sutures. A layer suture makes a beautifully neat approximation, and is frequently quite satisfactory; but I have become persuaded that the dead space, so often left unobliterated when this method of suturing is employed,—a space in which blood and inflammatory exudate may gather,—is a danger to the future integrity of the wound. The combination of a dead space with catgut, a material that is always somewhat uncertain, is an unfortunate one from the surgical point of view. Recently I have returned to the use of the through-and-through suture, applied according to the method of Dr. Joseph Price. This suture is inserted with the straight needle, is composed of silk or of silkworm-gut, is put in close to the margin of the skin, gathers up a great deal more muscle than skin, and then passes close to the margin of the cut peritoneum and transversalis fascia. When these sutures are adjusted, the peritoneal edges are brought into accurate and firm apposition, the peritoneal surface is overlaid with abundant muscle, the skin-edges are brought into neat approximation, and the formation of a dead space is rendered impossible. When passing the sutures have a gauze pad under the wound and be very careful not to include bowel or omentum. It is necessary to tighten and tie most carefully to prevent omentum being caught in the loop of the stitch. After closing a laparotomy wound, dress with aseptic gauze and wood-wool, and apply a flannel binder. In badly infected cases the wound is often kept open.

If a two-inch incision was closed without drainage and primary union takes place, the patient can usually sit up in from ten days to two weeks. A larger incision offers greater danger of subsequent hernia, and the patient should be kept in bed for three weeks. If the wound was kept open for drainage, a prolonged retention in bed may be necessary. In a case in which an incision of considerable length was made, an abdominal support should be worn for a variable time. It limits the movements of cough, laughter, etc., and *reminds* the patient of the necessity of caution in lifting, hurrying, etc.

After-treatment.—The after-treatment depends somewhat on the case, but certain general rules can be laid down. The late J. Greig Smith said many wise things, and among them this: "A golden rule in the treatment of cases of celiotomy is to let the patient alone. Everything approaching to meddlesomeness is to be condemned. The patient must not be upset by fussy applications of tentative therapeutics; when an emergency arises, it is to be met, promptly and decisively, by a method which has been approved trustworthy" ("Abdominal Surgery"). In many cases, immediately after the operation the patient must be treated for shock by methods previously set forth. The treatment of vomiting resulting from the administration of an anesthetic is discussed on page 877. If vomiting persists during the third or fourth day, it is probably due to the development of inflammation which has caused intestinal paresis; and if it is so produced, medicine is practically useless. In this condition there is usually marked tympanitic distention, and vomiting is, in a sense, a relief. Nothing should be given by the mouth, and the patient should be fed entirely by enemata. The insertion of a rectal tube and its retention for a considerable time may

afford relief. Lying on the side is more comfortable than recumbency. Washing out the stomach from time to time gives great comfort and is often of real service.

In the average case of celiotomy, in which persistent vomiting does not occur, the question of feeding is of much importance. Usually, for the first twelve or twenty-four hours, nothing is given by the mouth but small quantities of hot water. The day after the operation, if everything is satisfactory, food is given to the patient. In many cases, however, food is not given by the stomach for forty-eight hours and the patient is fed by the rectum during the wait. He should not be given milk, because it will not be easily digested, may lead to nausea, and causes flatulence. Peptonized milk, if the patient will take it, does not possess these hurtful qualities. At first albumin-water or liquid beef peptonoids should be given and later Valentine's meat-juice, beef-jelly, broth, etc. Food is given every third or fourth hour, and stimulants are administered if required. After the first twenty-four or forty-eight hours considerable quantities of plain water or Poland water should be taken, when possible, to favor elimination by the kidneys. Hot coffee is not only a stimulant, but is an excellent diuretic. The urine is always scanty after an abdominal operation, and a normal daily amount is not voided for ten days or more. Solid food is not given for seven or eight days. The patient is apt to suffer greatly from thirst, in spite of the hot water given during the first twelve to twenty-four hours. It does not do to give any considerable amount of hot water, and cold water and ice are inadmissible and tend to induce nausea and vomiting. Thirst can be much mitigated by enemata of water. J. Greig Smith recommended an enema composed of from 4 to 20 ounces of tepid water and some brandy. Usually, after the first twenty-four hours, a sufficient amount of liquid can be given to keep the patient free from actual distress.

The bladder must be watched to see that retention does not occur. If retention occurs, a clean catheter must be used at regular intervals. If tympanitic distention occurs after forty-eight hours a saline purgative should be given and it should be followed by an enema of turpentine. The rectal tube is frequently of signal service in such cases. If obstruction develops it is treated as directed on page 719.

In any ordinary case after operation the bowels should be moved after forty-eight hours as a prophylactic measure against distention, peritonitis, and obstruction. From four to eight ʒj doses of Epsom salts are given, in hot water, the solution having been filtered through gauze. The saline is followed by the administration of an enema consisting of soap, water, and half an ounce of castor oil. Should opium be given? Never as a routine, and not to secure sleep; but if the patient is in pain which not only harasses him but causes him to turn and shift in torturing restlessness, one or possibly two hypodermatic injections each containing gr. ¼ of morphia can be given with confidence that the good will overbalance the harm.

Operation for Acute Appendicitis.—Before operating try to locate the situation of the appendix, and the relation the area of infection bears to the ascending colon. The incision should be over the seat of disease. In the rare left-sided cases and in median cases the incision is on the left side or median. In some cases where the appendix is posterior the cut may

be in the loin. In one case, I opened a purulent collection through the rectum. In the vast majority of cases the incision is made in the right iliac region.

In acute appendicitis when there is not thought to be a distinct abscess the incision usually made is two inches internal to the anterior superior iliac spine and perpendicular to a line drawn from the spine to the umbilicus (Fig. 368). The skin incision is usually three inches in length, the upper third of the incision being above the omphalospinous line; the incision in the peritoneum is from two to three inches in length, but if there are many adhesions it may be necessary to make it much longer. The oblique incision may be carried out as advised by McBurney, the muscles being separated by blunt dissection. By this method very few nerve-fibers are divided, and hence the operation is not followed by marked muscular wasting, a condition which strongly predisposes to hernia. Further, as Van Hook points out,* the oblique incision enables the surgeon to reach freely all the ordinary areas of appendix trouble, the wound is parallel with the lines of traction of the abdominal muscles and does not tend to gap widely. In an acute case I make an oblique incision, but cut the muscles. In an interval case I separate the muscular fibers. After opening the peritoneum examine very gently to detect the situation of the appendix, and if there are or are not adhesions. In a very recent case and in a very acute case there will probably be no adhesions unless there have been previous attacks. Surround the region of infection with strips of iodoform gauze, each strip being two and one-half inches wide, fifteen inches long, and four layers in thickness. The edges of the wound should be lifted up by retractors and the strips inserted around the cut, between the parietal peritoneum and intestines and to a distance of three inches from the wound. Strips of gauze are passed, when possible, below the appendix to prevent entrance of infected material into the pelvis, and a

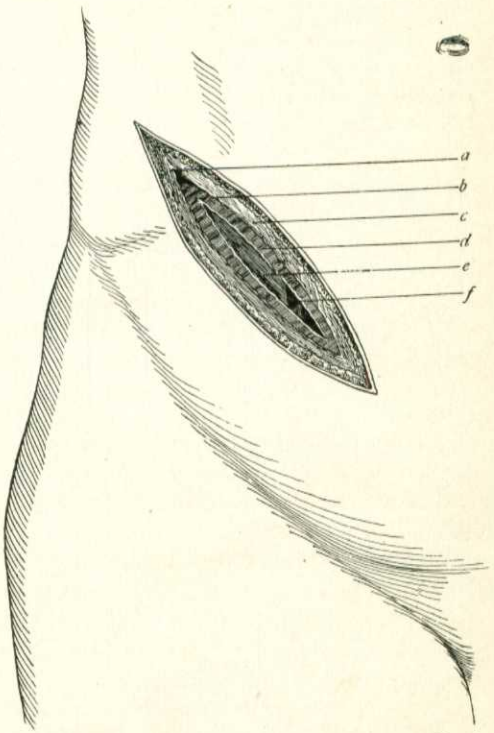

Fig. 368.—Resection of the vermiform appendix, incision through the abdominal wall: *a*, External oblique muscle; *b*, internal oblique muscle; *c*, aponeurosis of external oblique; *d*, aponeurosis of internal oblique; *e*, peritoneum; *f*, outer border of rectus abdominis muscle (under it the deep epigastric vessels) (Kocher).

* Jour. Amer. Med. Assoc., Feb. 20, 1897.

piece is pushed upward toward the liver (Van Hook). Over the iodoform gauze which it may be necessary to leave in place after the operation, gauze pads are packed. The appendix is sought for by finding the colon. The colon is found by following the parietal peritoneum with the finger. The course of the finger is first outward, next backward, and finally inward; the first obstruction it encounters is the colon. The fact that it is the colon can be confirmed by finding the longitudinal bands. The anterior longitudinal band leads directly to the appendix. Pass the finger down to the head of the colon, find the appendix, usually posterior and internal, and lift it and the head of the colon into the wound. In some cases it will be advisable to deliver the head of the colon from the belly (Fig. 369); in other cases this will not be necessary. If adhesions exist, they must be gently and carefully broken up. Many surgeons tie the meso-appendix and neck of the appendix with two strong silk ligatures (Fig. 370), cut off the appendix and the meso-appendix below the ligatures, cauterize the cut surface and interior of the stump with pure carbolic acid, and invert the stump

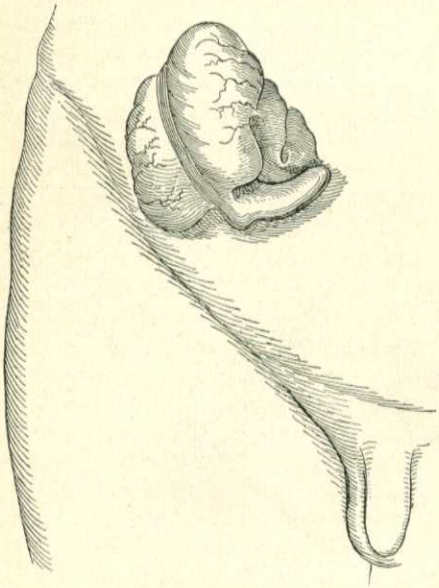

Fig. 369.—Radical operation for appendicitis (Kocher).

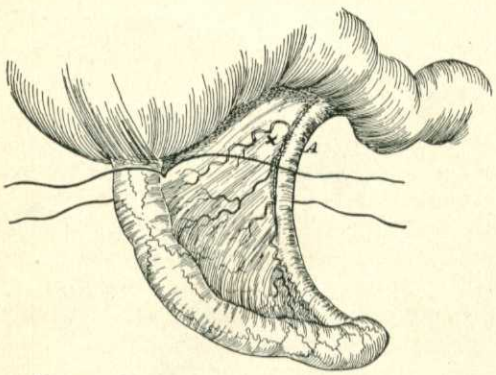

Fig. 370.—Ligation of appendix and meso-appendix.

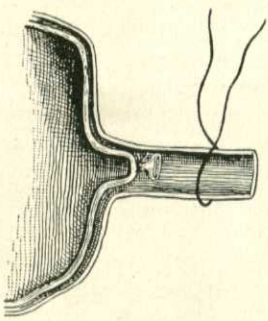

Fig. 371.—Barker's technic of operation for removal of the appendix.

into the coats of the colon by Lembert sutures. An excellent method is to turn up a cuff of peritoneum, pull down the other coats, ligate at the base, cut through the tube, let the musculomucous stump retract, and tie or

suture the peritoneal cuff over the stump. This plan was devised by Barker (Fig. 371). Another method is to encircle the appendix with a ligature, as is shown in Fig. 370, pass the second ligature through the meso-appendix at *x*, tie both ligatures, cut off the appendix and meso-appendix below the threads, suture the fringe of the meso-appendix, and cauterize and invert the stump of the appendix. Some remove the appendix by an elliptical incision around its base, and close the colon-wound by Lembert sutures. I always remove the appendix completely by this method. To leave a septic stump produces post-operative pain and may lead to infection, adhesions, or continued ill-health. Dawbarn surrounds the appendix with a continuous Lembert purse-string suture of silk. This is inserted in the superficial layers of the cecum, half an inch from the appendix. The appendix is divided so as to leave a stump never shorter than half an inch. The lumen of the stump is gently stretched by inserting a pair of mouse-tooth forceps and opening the blades. The stump is then invaginated into the cecum—that is, it is turned "outside in." The sutures are tightened, and while this is being done the mouse-tooth forceps used in effecting inversion are withdrawn. Finally, the sutures are tied (Robt. H. M. Dawbarn, in "Internat. Jour. of Surg.," May, 1895). The retained bit of appendix drains into the colon. If there is no pus or no extravasated feces, if the peritoneum is not seriously affected, if the appendix is not gangrenous or perforated, and if there is no pus within the appendix, remove the pads, irrigate with hot salt solution, remove the strips of gauze, and close the wound. If any of the above conditions were found, remove the infected pads, but leave the iodoform strips in place to limit infection and secure drainage. Pass sutures through the wound-edges, tie some of the sutures and leave some untied until the gauze is removed at a later period (Van Hook).

If an operation is performed in a distinct interval, pus is absent and the surgeon can proceed without apprehension. If there is any question of the presence of pus, surround the region with gauze, as suggested above, before breaking down adhesions and liberating the appendix. An interval operation should not be performed until three weeks after an attack. In an interval case McBurney proceeds as follows: He makes the skin incision in the direction of the fibers of the external oblique muscle, separates the fibers of this muscle by blunt dissection, retracts them, separates the fibers of the internal oblique and the transversalis muscles in the same way and retracts them, and opens the transversalis fascia and peritoneum. No muscle-fibers are cut, and hernia is not apt to follow. Such a wound is closed as follows: a continuous catgut suture for the peritoneum, sutures of kangaroo-tendon for the transversalis fascia, the muscles are restored to place, the aponeurosis of the external oblique is sutured with kangaroo-tendon, and the skin is closed by a subcuticular stitch.

If an *abscess* is believed to exist, make an incision parallel with Poupart's ligament and over the area of dulness on percussion (Willard Parker's oblique incision). If the abscess is adherent to the anterior abdominal wall, such an incision will not enter the free peritoneal cavity. If, after opening the abdomen, an abscess is thought to exist, although it is not adherent to the anterior abdominal wall, surround the abscess with gauze before opening it, as directed under acute appendicitis. The gauze is placed under the margins of the

incision in the peritoneum all around the appendix area; a piece is carried toward the pelvis and another piece toward the liver. Overlay this gauze with gauze pads (Van Hook). Adhesions are broken through with the finger, and when pus appears it is at once wiped away. Remove the appendix in most cases, but not in all. If the appendix lies loose in the abscess-cavity, if it is sloughed off or but loosely attached to the abscess-wall, remove it. If the appendix is firmly fixed in the abscess-wall and must be dug out of a mass of inflammatory material, do not remove it. To remove it under these circumstances may rupture the wall and disseminate the pus into regions not protected by pads and gauze. Deaver, Murphy, and others tell us to always remove the appendix. I do not believe this to be a safe rule to follow. To insist on removing the appendix may cause death. When the appendix is left, it usually sloughs away. It is true a fecal fistula may result, but this usually heals spontaneously. Even if a fecal fistula forms and does not heal, the surgeon acted properly in not removing the appendix, because a fecal fistula may be remedied by another operation. It is rarely that secondary abscess forms, and there are not a great many cases recorded in which an appendix has subsequently given serious trouble when left after operation. In fact, in many cases the appendix is destroyed or obliterated by inflammation. In some cases, however, a secondary operation will be required because of a fecal fistula, a persistent sinus, or an acute inflammatory attack. When Deaver decides to remove such an appendix he makes an incision in the median line of the abdomen, packs around the periphery of the abscess with gauze, opens the abdomen by another incision, removes the appendix, disinfects, inserts drainage, and then removes the surrounding gauze and closes the median incision. Irrigation should not be employed in appendicular abscess. The force of the stream may break down barriers of lymph and spread infection. After the evacuation of the pus, whether the appendix was removed or not, take out the pads, but leave the long strands of iodoform gauze in place (Van Hook). Introduce iodoform gauze into the abscess-cavity and insert a rubber tube, partially suture the wound, and dress with dry gauze. In forty-eight hours all the strands of gauze are removed and fresh pieces are inserted for drainage. After this period the gauze drain is changed daily. An interval case should be up and about in from ten days to two weeks after operation. An abscess case may require a much longer time for complete recovery. A fecal fistula sometimes results in cases in which the appendix was not removed, and occasionally forms when it was removed. Morris maintains and proves that these large pieces of iodoform gauze sometimes cause intestinal obstruction and sometimes iodoform-poisoning, but the risk, it seems to me, should be taken.

Mortality after Operations for Appendicitis.—The interval operation is practically without mortality. In over 1000 cases Treves had 2 deaths. In acute cases the mortality is large. In 100 consecutive cases collected by Hearn and operated upon in the Jefferson Hospital by Keen, Hearn, and DaCosta, there were 8 deaths. As previously stated, Maurice H. Richardson reports a death-rate of 18 per cent. in 750 cases. Deaver reports from the German Hospital 144 cases with a mortality of 17.8 per cent. He eliminates one death from diabetes, one from pneumonia, and one from phthisis, and estimates his personal mortality at 15.9 per cent. (Deaver and Ross, in

"Jour. Amer. Med. Assoc.," Oct. 5, 1901). In 124 cases (including all chronic cases and those acute cases in which the inflammation had not extended beyond the peritoneal coat) there was 1 death. The usual causes of death are intestinal obstruction, septic peritonitis, septic endocarditis, pylophlebitis, hepatic suppuration, metastatic abscesses, endocarditis and gangrene of the bowel.

Enterorrhaphy, or Suture of the Intestine.—Surgical opinion has greatly altered in regard to this operation since the day when John Bell wrote his famous attack on Benjamin Bell. John Bell said: "If in all surgery there is a work of supererogation, it is this operation of sewing up a wounded gut." To-day we know that if in all surgery there is a proceeding of imperative necessity, it is the sewing up of a wound in the intestine. To perform this operation, take fine sterile silk and thread a thin, round, straight calyx-eyed needle with it (Fig. 372). This needle is very useful, as it can be threaded rapidly by pushing the calyx eye down upon the silk thread while the latter is kept taut. *Lembert's suture* (Figs. 373, A, 379, and 380) was introduced in 1823. Lembert used it on animals, but never on man. It is inserted at right angles to the wound. It goes down to, but not through, the mucous membrane. It is formed by picking up a fold of the intestine (one-twelfth to one-

Fig. 372.—Eye of the calyx-eyed needle.

Fig. 373.—Enterorrhaphy: A, Lembert's suture; B, Dupuytren's suture.

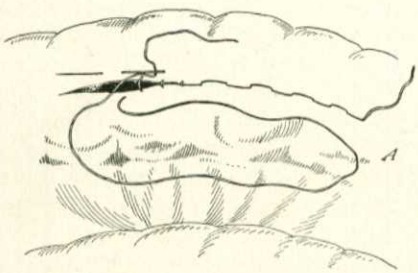

Fig. 374.—Cushing's right-angled suture (Senn).

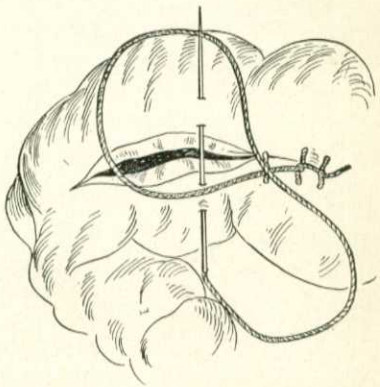

Fig. 375.—Ford's stitch, showing a Lembert insertion and the needle passed so as to tie a single knot by drawing it on through.