

THE QUARANTINE IN ABDOMINAL SURGERY*

ROBERT C. COFFEY, M.D., F.A.C.S.

PORTLAND, OREGON

THE quarantine in abdominal surgery implies the setting apart of a segment of the abdominal cavity so that peritoneal absorption and subsequent morbidity may be limited. The peritoneal cavity is a closed lymph sac which has facilities for absorbing large quantities of fluid very rapidly. A virulent infection generally distributed over the peritoneum is absorbed into the circulation with amazing rapidity. Hence, the ominous significance of the term "general peritonitis."

Most of the preparation of the food which sustains life is done within the gastrointestinal tube. Great activity and freedom of motion is necessary for the proper functioning of the organs constituting this tube. The free movement of these various organs or parts of this canal on each other is made possible by the peritoneum. It secretes a fluid which acts as a lubricant and thereby permits these movements without friction. The introduction of any agent which injures the peritoneum results in adhesions and limits these movements. Every effort should be made to limit the absorbing area of peritoneum exposed in case of infection and also to limit the area of morbidity which may result from such infection.

The quarantine principle is nature's own plan for accomplishing this and the peritoneum is the most efficient of all the body tissues in furnishing material for rapid construction of a quarantine wall. The peritoneum has the faculty of secreting or pouring out most efficient reparative material in great quantities when emergencies arise. For instance, if the appendix becomes infected or gangrenous, the peritoneum begins at once to secrete fluid which contains not only leucocytic warriors

to fight the infection but plastic material for building a wall around it. Loops of bowel, omentum or any other movable intra-abdominal structures within reach of the involved area are brought to the field and cemented together by the thickening of this lymph. If the parts can be put at rest and the infection is not too aggressive, the area is soon effectively quarantined. Likewise, when an infection of the uterus extends into the tubes, or through the uterine wall, lymph is poured out in the neighborhood, which soon thickens and seals the ends of the tubes to the ovary or to other peritoneal tissues in the neighborhood. Intestines surround the pelvic organs and help to form the structures of a quarantine wall. Hence, it has long been known that the most important medical treatment of an infective or traumatic abdominal condition is production of absolute rest by every available means so that an effective quarantine wall may be constructed with the least possible interruption. To this end, food is kept out of the stomach, the stomach is washed, fluids are supplied in some other way, and peristaltic movements are stopped by large doses of opiates. Any foreign body introduced into the peritoneal cavity, or any traumatized area in which the normal epithelial lining of the peritoneum has been destroyed, is immediately quarantined in the same way.

Many times efforts of nature are entirely successful in quarantining a serious source of infection and are usually successful in healing a traumatized area. When nature fails, the aid of a surgeon is required. Nature may entirely fail, may be but partially successful or may leave bad after-results. In the case of a large source

* Submitted for publication April 8, 1929.

of infection, such as follows perforation of some of the abdominal organs, for example the stomach or duodenum, nature

entirely or to repair the diseased area completely. In such case, it becomes his duty to establish a surgical quarantine of this diseased, infected or traumatized area. By a proper quarantine, he may separate or segregate the diseased area entirely from the rest of the peritoneal cavity. In thus quarantining the disease, he is able also to drain the quarantined area separately, for this segment is extra-peritoneal in effect.

The importance of the quarantine principle was recognized by Mikulicz more than thirty years ago when from a thickness of gauze he made a sac into which he packed long strips of gauze laid in the sac back and forth like the folds of a fan, thereby interposing a large pack of gauze between the free peritoneal cavity and the diseased area. When it was desired to remove the pack, it was only necessary to withdraw this long strip of gauze which had been folded in the sac, thus leaving the empty sac as the only part of the drain in actual contact with the peritoneal surfaces. The late Joseph Price of Philadelphia, also Deaver, was very fond of using these large packs of gauze. In that stage of the development of abdominal surgery, this form of drainage properly used was a great life saver but it had serious drawbacks. The large amount of gauze within the abdomen produced an outflow of serum in proportion to the amount of surface of peritoneum thus contacted by the gauze. The relatively small piece of gauze coming out through the wound was soon blocked by the discharging debris. As a result, a large quantity of serum often accumulated around the gauze. Therefore, extensive adhesions were likely to follow such a drain. Furthermore, the removal of the sac containing the gauze strip sometimes broke down the plastic wall which nature had formed around it.

As modern surgical technique developed, the crudeness of this form of drain became more and more apparent. The pendulum swung to the other extreme, so that such able authorities as the late John G. Clark

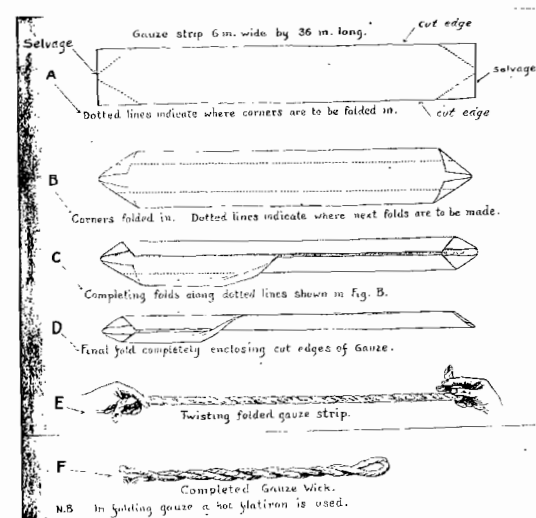


FIG. 1. Preparation of gauze wicks.

is usually inefficient. If the infection or invading enemy is limited in quantity but is very aggressive, as is the case in perforating appendicitis, nature's efforts to form a quarantine may be thwarted unless augmented by measures to stop peristalsis. When nature has been successful, usually a very strong wall is formed by an excessive amount of reparative material. The tissues within the enclosure of this wall often become necrotic and an abscess may be formed which may later be drained. After such repair, adhesions represent the residue of reparative material which has not been absorbed after the need for the wall has passed. These adhesions may result in troublesome morbidity.

The weakness of nature in defending herself is that she has no way of mechanically disposing of an enemy except to starve it or absorb it. Therefore, her first action is always to quarantine it. The primary function of the surgeon is to remove the infection or offending body from the abdominal cavity by mechanical measures or to repair the traumatized area. Many times it is not possible for the surgeon to remove the source of infection

of Philadelphia and Yates of Milwaukee there was any excuse for drainage because brought out very convincing experimental this greatly reduced the postoperative evidence to prove that abdominal drainage anxiety.

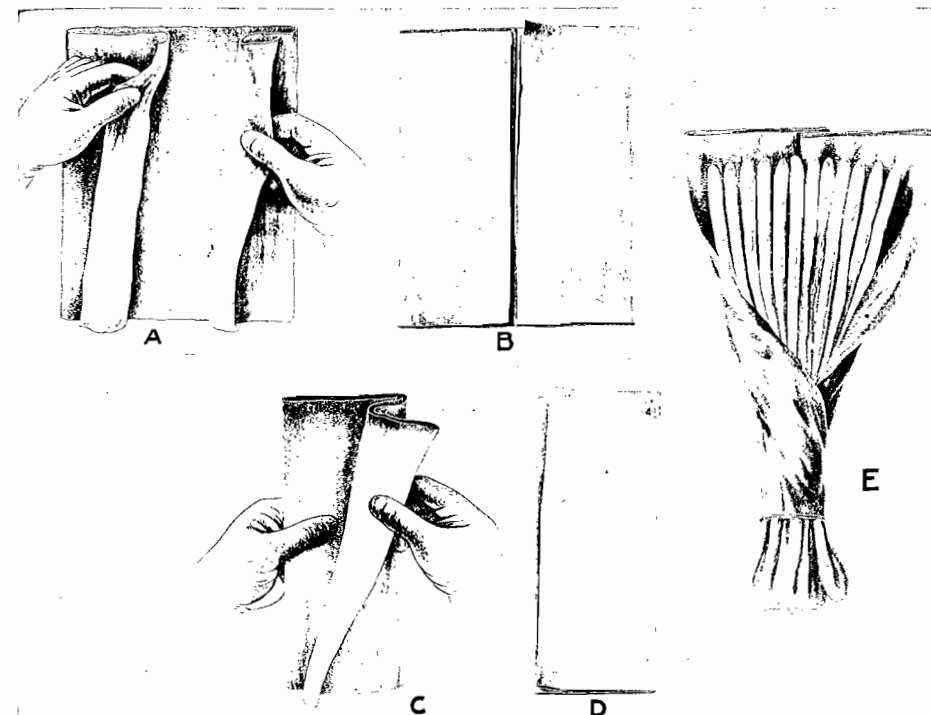


FIG. 2. Preparation of gutta-percha tissue. a, b, c, d folding gutta-percha. e Structure of quarantine. Relation of gutta-percha to wicks.

should be largely abandoned. Gauze drainage within the abdomen practically passed out of use, chiefly because it had been improperly used, for I think no one now would think of using gauze drainage directly in contact with intestines or omentum, except in rare emergencies.

About twenty-five years ago it was my fortune to do a great deal of my surgery in private houses in remote districts in which there were no trained nurses and relatively few doctors who had an adequate conception of asepsis or the after-care of abdominal cases. It was necessary to take a surgical nurse and all the equipment necessary to do an aseptic operation. Not the least important and hazardous part of such an operation was the after-care with the surgeon often far away. I soon learned that it was advisable to drain in every case in which

The Mikulicz drain was gradually abandoned and in the place of the large gauze pack was substituted a drain made up of a number of small wicks of gauze laid straight and altogether surrounded by sheets of rubber tissue. This greatly simplified the matter and made it safe for the local physician or nurse attendants to remove the wicks at the end of the first week and to remove the rubber tissue a week later. The results in these cases were so remarkably good as regards immediate mortality and postoperative morbidity, that the rationale of this particular type of drain became the subject of a good deal of experimental research and study. As the years went by, opportunity came for re-opening in cases in which this type of drain had been used, with the amazing revelation that there was almost a total absence of post-

operative adhesions, in direct contrast to results following the ordinary small tube drain or cigarette drain. Analysis of the

of an outside rubber tissue covering. The second is met by carefully arranging gauze wicks around the infected area. The



FIG. 3. Placing of wicks in quarantining pelvic organs.

mechanism of the drain brought forward the fact that its principal merit was that it was not simply a drain but a quarantine which segregated the diseased area from the remainder of the peritoneal cavity. Such a structure to be workable must possess the following qualities:¹

1. The surface on the side of the general peritoneal cavity must be smooth and inoffensive to the abdominal organs coming in contact with it.
2. It must remain accurately in place.
3. It must provide ample drainage of the infected or injured segment.
4. It must be so constructed that it may be removed with the least possible trauma.

The first requirement is met by the use

¹ While all the principles of this quarantine have been used for twenty-five years in literally hundreds of cases and the quarantine has been roughly described in other articles on drainage, the full illustrated technique for the preparation and application of the quarantine was first published in *Annals of Surgery*, 85: 808, 1927.

gauze, being porous, rapidly fastens itself to the tissues where it is placed and thus anchors the quarantine. The third (ample drainage of the segregated area) is provided by gauze leading to the surface. Fourth, this gauze must be arranged in small wicks laid straight so that one may be withdrawn at a time without disturbing the defensive wall that nature has placed around the quarantine.

A very important detail is the construction of a wick that is strong and that at the same time has no ravelling edges. Such a wick is made from strips of gauze 5 or 6 inches in width, cut across a 30 inch bolt of gauze following a drawn thread. We have used Seabury and Johnson's Monitor gauze because of its strength. The steps in constructing this strip into a wick are shown in Figure 1. It will be seen that the ends of the wicks are formed by the two selva edge of the bolt of gauze. All the cut edges are securely turned in and ironed with a flatiron and

the wicks twisted. The two ends are then brought together and again twisted. Six of these double wicks are placed in a

wound make two wicks to be removed. Twelve wicks of this kind are sufficient for holding a quarantine in place and

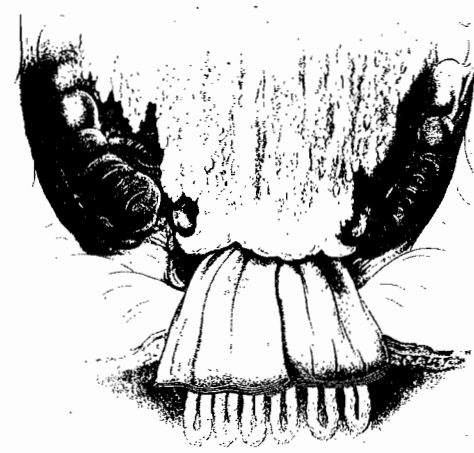


FIG. 4. Quarantine in place, showing two folds of gutta percha separating wicks from intestines.

package for sterilization. When unfolded for use, the two ends of the wick are untwisted from each other, but the pressing



FIG. 6. Quarantine with wicks in appendix abscess cavity surrounded with gutta percha and leading from posterior wall to abdominal wound through peritoneal cavity.

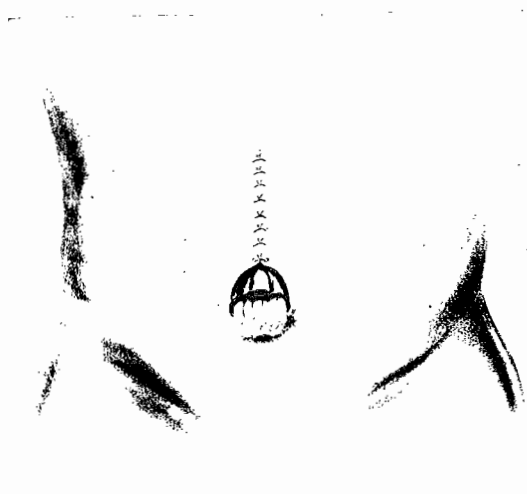


FIG. 5. Quarantine emerging through abdominal incision as large cigarette drain.

and twisting used in the preparation prevents the wick from unfolding and exposing the raw edges. When put into place, each wick is laid separately, bringing the middle or loop to the surface. After the loop is cut, the two ends left in the

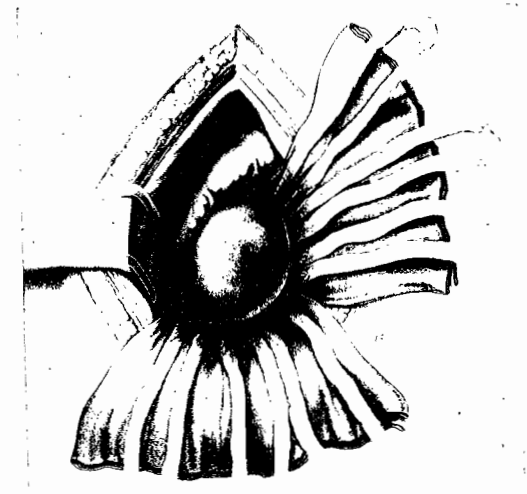


FIG. 7. Under local anesthesia, abdomen has been opened, intestines packed away and wicks placed in contact with posterior parietal peritoneum in front and back of gall bladder. Rubber tissue sheets placed external to it. Gall bladder is first aspirated, then split, contents removed. Opening in gall bladder left open either with or without drainage tube. Used in case of serious septic infection of gall bladder in feeble or seriously ill patient.

draining the area. When these twelve wicks are massed together, brought to the surface and surrounded by four thicknesses

gutta percha is prepared and preserved as follows:

Gutta percha, after it is cut in the

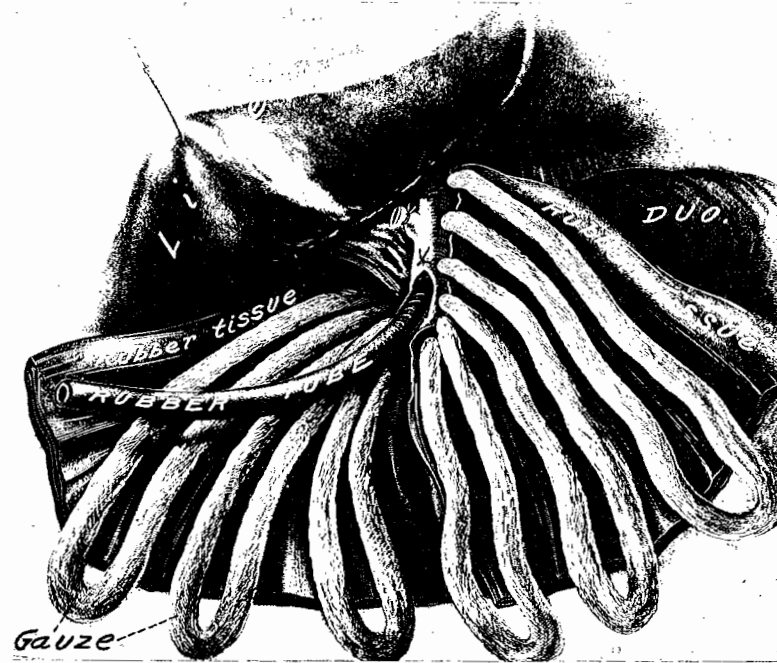


FIG. 8. Septic gall bladder has been removed, common duct has been split and emptied of stones, pus and other debris. Three double wicks are placed at entrance of foramen of Winslow external and posterior to duct. Three double wicks have been placed internal to duct. Two sheets of rubber tissue placed to surround wicks.

of rubber tissue, a made-in-cigarette drain approximately an inch in diameter is the result. The lower end is spread out in the shape of a fan (Fig. 2e) to surround the area to be quarantined.

The gutta-percha covering is constructed as follows: Seabury and Johnson extra-heavy tissue is used. It comes in bolts 5 yards long, 36 inches wide. This bolt is cut longitudinally into three strips 1 foot wide by 5 yards long. Each strip is cut in 18 inch lengths making ten pieces of tissue 12 by 18 inches. Each piece is folded in its long dimension to four thicknesses, making a four-ply sheet of rubber tissue 12 inches long, 4½ inches wide, in which all cut edges are turned in, leaving none but folded edges exposed. By this method of folding, the greatest strength of the gutta percha fiber is longitudinal and therefore the sheet will not tear transversely. Aseptically the

desired length, is put in 1:1000 bichloride and allowed to stand over night. It is then dried with sterile linen and folded, making it ready for use. It is kept in a glass jar which has been autoclaved or boiled. This is done with sterile gown and gloves.

It is easier to apply a rubber tissue covering in two pieces of 4½ inches' width than in one of 9 inches' width. Therefore, two pieces are always used, three if necessary to cover in the gauze effectively.

Meticulous care in the placing, as well as removing, of the quarantine is important. With long-handled forceps, the tip of each wick is placed where it is to remain in arranging the quarantine as shown in Figure 3. After the wicks have been laid straight, the sheets of four-ply gutta-percha tissue, described in Figures 2 and 4, are arranged so as to separate the gauze from the free peritoneal cavity. As the

quarantine passes through the abdominal wall, the rubber tissue completely surrounds the gauze forming a cigarette drain at this point which is spread out so as to surround the quarantined area at the bottom. The abdominal wall should not be drawn too tightly around the drain. The wicks are removed one at a time one week after they are placed. This may be done without anesthesia but a light gas anesthesia, lasting only a minute or two, is preferable. No force should be used in removing these wicks. With a pair of thumb forceps, each wick is pulled upon lightly to determine which one may be removed with least force. One week after the wicks have been removed, the sheets of gutta percha are easily removed altogether without gas. No other drainage is inserted after the gutta percha has been removed.

Speaking in terms of general principles, we have the following indications for the use of the quarantine in abdominal surgery:

1. Infected organs which tend to produce a peritonitis by contact or discharge but which organs are not to be removed.

2. Intra-abdominal abscess so located that the wall is exposed to the intra-abdominal viscera and where the discharge must be conducted across the free peritoneal cavity after drainage is established.

3. An open viscus which because of the presence of infection or for other reason it is impractical or undesirable to close at the time.

4. Large denuded bleeding or infected areas where it is impossible to cover with peritoneum.

5. Extensive recurrent adhesions which disturb the function of abdominal organs.

The specific indications for the quarantine are:

1. After operations for pelvic accumulation of pus (Figs. 3, 4, 5).

2. Septic infection following miscarriages and criminal abortions. Fever and other evidences of infection disappear almost magically after introduction of the simple quarantine.

3. Acute gonorrhoeal salpingitis in the

early stages while pus is exuding from the ends of the tubes but before the tubes have sealed firmly. Quarantine stops peritonitis

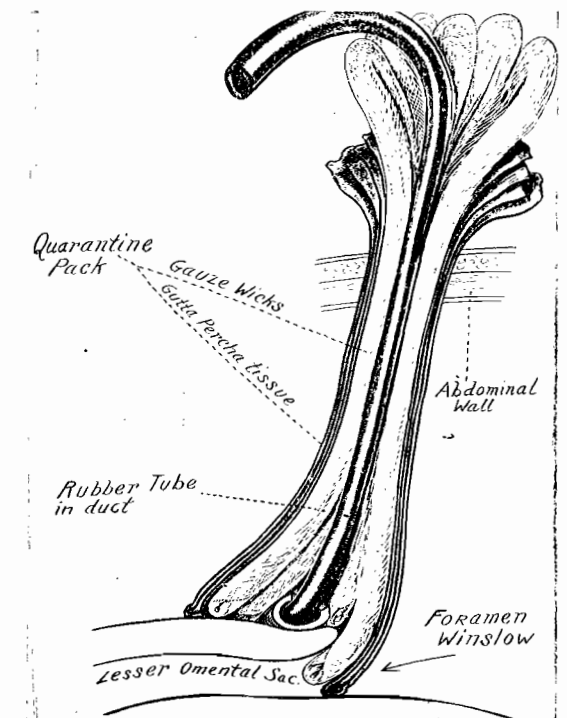


FIG. 9. Quarantine in place, showing section of quarantine as it passes through abdominal cavity from back to front.

and relieves symptoms immediately. We have never had to reoperate upon a case if the quarantine was placed before the tubes were sealed.

4. Extensive pelvic adhesions in which great disturbance is produced by attachment of the intestines to the pelvic organs. Cutting and separating the adhesions followed by the interposition of a quarantine gives most gratifying results.

5. Postoperative ileus in which the intestines have attached themselves to the pelvic organs the first two or three postoperative days. A quarantine placed early, separating the intestines from the pelvic organs, gives immediate and complete relief.

6. In a well-formed appendix abscess beneath the end of the cecum in which it is necessary to drain through the free perito-

neal cavity, the ends of the wicks are placed in the abscess cavity and the end of the rubber sheets extending farther have occurred after a gall-bladder operation.

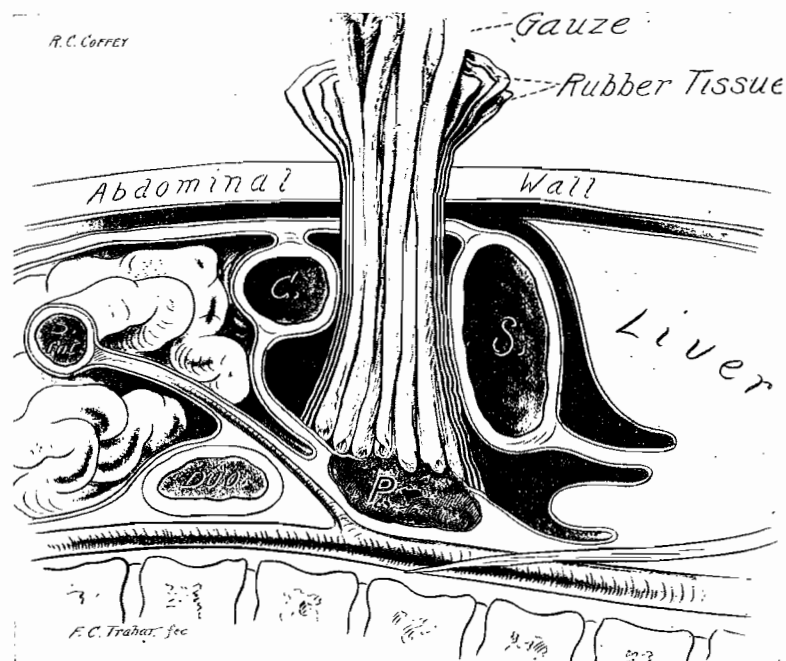


FIG. 10. Drainage of ruptured pancreas or in pancreas drained for acute pancreatitis.

down surround the abscess cavity and the gauze. Postoperative intestinal obstruction which follows the small cigarette drain in such cases is practically unknown if the abscess cavity has been quarantined. (Fig. 6.)

7. Septic or gangrenous gall bladder occurring in the aged may be quarantined and the gall bladder emptied under local anesthesia with relatively no shock to the patient. (Fig. 7.)

8. Common-duct operations in which there is pus in the field or in the ducts. A tube in the proximal duct with a quarantine surrounding the hole in the duct, and the area generally, effectively removes any danger of immediate infection and leaves a postoperative field remarkably free from adhesions. (Figs. 8 and 9.)

9. Quarantine is well adapted to surround a field from which a septic gall bladder has been removed.

10. Quarantine is very efficient in preventing the reformation of adhesions which

11. Our greatest success with rupture

of the pancreas or acute pancreatitis with fat necrosis has been to push back the peritoneum covering the pancreas, place gauze wicks in contact with the denuded pancreas, surround the wicks with rubber tissue producing the quarantine. The drainage passes through the entire depth of the abdominal cavity without producing fat necrosis of the tissues as it passes through.

12. To surround two parallel intubated ends of intestines which have been brought out through a septic wound as an emergency and which are later to be closed by the Mikulicz plan.¹

13. To hold back intestines from screened radium which has been placed within the abdomen for the treatment of cancer which cannot be entirely removed surgically.²

¹ See *Annals of Surgery*, June, 1927, article on Application of the Principle of the Quarantine in "Abdominal Surgery," Figs. 17 and 18.

² See *Northwest Medicine*, March, 1927, article on "Treatment of Cancer," Fig. 1.

14. Quarantine with multiple wicks is the only system of drainage which has been successful in the operation which

The protected quarantine herein described, which was devised twenty-five years ago to meet the conditions arising

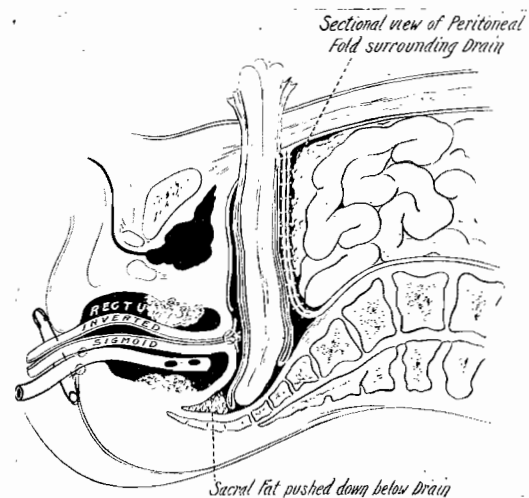


FIG. 11. Large quarantine drain placed in pelvis after first stage of operation for removal of cancer of rectum.¹

we have described in "Principles of the Operation for Carcinoma of the Rectum."¹ We know of no one who has been successful with this type of operation for cancer of the rectum who has tried to substitute a small drain of any kind for the quarantine as shown in Figure 11.

15. We were never able to get uniform success in the operation of transplantation of the ureters until we adopted the quarantine of the lower pelvis which both kept the intestines from the infected area and permitted of retroperitoneal drainage. (Fig. 12.)

¹ *Surg., Gynec. & Obst.*, 38: 723, 1924.

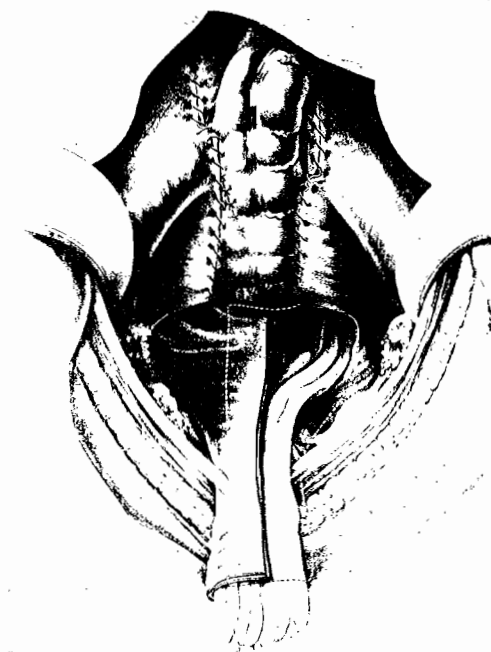


FIG. 12. Quarantine placed in operation for bilateral transplantation of ureters by tube technique.¹

from diversified surgical conditions treated before the development of the modern hospital, has been constantly used during the intervening years in a great many and a great variety of cases. I believe it to be the most important principle which has entered into my surgical practice, both as regards the saving of lives and eliminating morbidity.

¹ *Surg., Gynec. & Obst.*, 47: 593, 1928.

