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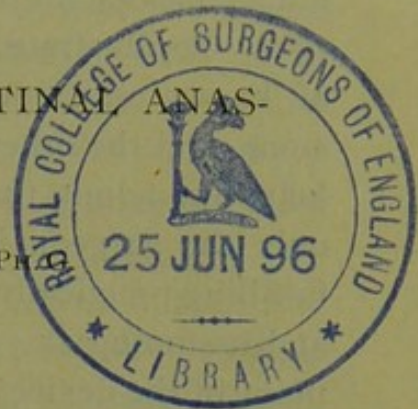
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MODERN METHODS OF INTESTINAL ANASTOMOSIS.

BY AUGUST SCHACHNER, M. D., PH.D.,
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If the direct results of all of Professor Senn's labors were to be proven erroneous he would, by the matchless impression which his efforts have indirectly created, nevertheless stand as one of the most forcible figures in the surgery of the nineteenth century. Indirectly these efforts are more responsible than those of any other single surgeon, or perhaps a number of surgeons, for the establishment of one of the most brilliant schools known in the entire history of surgery. Many valuable and ingenious suggestions, ideas, and devices have been given us by others, and since the time of Senn's first labors in this direction; but who can prove that in the absence of Senn we would still have made the same rapid advances which we have made and which we believe to be due to that fruitful tide which has been created and kept alive by the energies of this surgeon.

Viewing the question of intestinal surgery from a general standpoint we see an almost equal division, with one side in favor of devices of one variety or another, and the other side in favor of methods involving the suture alone. In America there seems to be a predominating influence in favor of some character of device, while among the European surgeons many brilliant efforts have been made in behalf of the suture *per se*. As to which will gain the final supremacy, or as to whether there ever will be such a condition as a final supremacy, it is difficult to foretell; but, speaking in general, we can not deny that, all things being equal, we

must consider the suture as the more surgical method of the two. To illustrate further, if we were to select two methods of known and equal safety, the one involving the suture alone, and the other involving the device alone, we can not help but admit that in the one which involves the suture only the surgeon is the complete master of the situation, fulfilling practically to the end the whole object of the method and assuming the responsibility of the final result, while in many of the devices the most important feature of the method is carried out by the chosen device, thereby becoming, so to speak, the chief factor in the method and assuming the major portion of the shifted responsibility.

The truth is, that in order to intelligently understand one another and to thoroughly appreciate the details of this important question we must divide the cases requiring intestinal interference into two classes, namely, the *planned* and *emergency* class. In the planned cases we presume to know before the operation is begun the tolerance of the subject and about the character of the interference. While our aim is not only to save life, which it is unnecessary to say is at all times and under all circumstances the chief and sole aim of the surgeon, but we desire to save life with the best subsequent result. In emergency cases the condition of affairs may compel the surgeon to select methods which have as their sole aim the bridging of the subject over the impending crisis without any special reference to the subsequent condition. In short, measures which would be thoroughly undesirable in the planned case may become eminently justifiable in an emergency case. Present indications point to the fact that the time is not far distant when we will be able to operate upon all the planned cases by the suture alone, and that the devices will practically be relegated to those cases of an emergency character.

The chief advantage which the devices have over the suture is the saving of time. That this is a considerable

advantage no one will deny, but we believe that the saving of fifteen or twenty minutes does not always justify us in closing our eyes to the sutures and to select an otherwise inferior method. In fact, as it has already been pointed out by others, the saving of this time does not in many cases make any material difference.

Another argument that we frequently hear during discussions on this subject, is that sutures would be justifiable in the hands of certain operators and equally unjustifiable in the hands of others. Surely this can not be considered in any but the light of a very lame argument. While every one must admit that all can not possess the same standard of operative skill, yet still every one who pretends to perform intestinal operations should possess at least the necessary skill to satisfactorily carry out such measures which the exigencies of the case demand, whether it be suture or device. Mr. Maunsell is quite right when he refers to our training as being too much of a "bookish" nature. We are too anxious to learn the art of surgery from a well-written piece of paper instead of from an actual manual training. We are too ready to consider as beneath our dignity a few lessons which a first-class tailor might probably give us in the art of sewing.

The success of Lawson Tait—who, according to his own confession, has served his apprenticeship at the lathe, the bench, and the forge—no doubt is largely dependent upon his remarkable operative skill. The art of surgery can be elevated to a degree of perfection only by careful cultivation in its fundamental principles, and cultivation which should never have its commencement upon such precious material as the human subject.

Apart from all this, however, it must be apparent to even a casual observer that *hard* and *fast* lines governing every case can never be laid down, and that after all every case must more or less be a law unto itself, and the key to the success-

ful management of any of the cases depends upon the correctness of the operator's judgment and the perfection of his operative skill.

Next to the question of deciding between the use of the suture or the mechanical device is that of selecting the lateral or the end-to-end method of establishing the intestinal continuity. In many cases the choice of method is out of question, but where the conditions tolerate a preference it should always be given to the end-to-end method as the most natural way of establishing the communication. Not alone is this the most natural way, but by this method there is practically no subsequent contraction, which always occurs by the lateral method, as is illustrated by the following cases reported by Abbe :

“ Three of the author's (Abbe) cases of lateral anastomosis illustrate the subject admirably. In the first, done in 1888, between the ascending and transverse colon, Senn's plates were used—the patient dying six months after operation. The aperture, which was one inch and a half in length, had contracted to three fourths of an inch, and was sufficient for its purposes only when laxative medicine was constantly given. In the second case, the patient dying six months after anastomosis with catgut rings, the opening had contracted from one inch and a half down to half an inch. In the third case, eight months after lateral anastomosis of the sigmoid by suturing, the aperture contracted from three inches to one and a half. This was perfectly competent to do the functional work of the bowel.” (Annals of Surgery, vol. 15, p. 391.)

In a number of resections, some of which were performed in connection with this paper, but most of which were made about two years ago, there was a turning in of enough of the intestinal wall as to almost create a perfect diaphragm, and at the end of several months there was but the slightest amount of annular constriction remaining, while, if but a

small amount of the intestinal wall is inverted, the seat of operation can in many instances never be made out.

Where lateral anastomosis is indicated time can often be saved by the use of mechanical devices, such as the clamp devised by Dr. H. H. Grant.

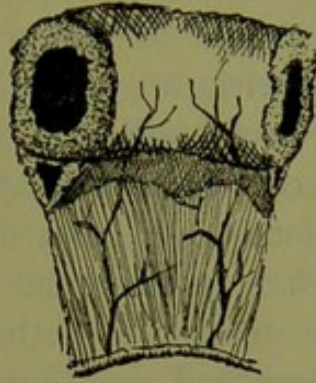


FIG. 1.—Showing the absence of the serous covering at mesenteric border of the intestine.

The distribution of blood and the arrangement of the serous covering of the gastro-intestinal tract, while known to every medical individual, have hardly been presented with the emphasis with which they deserve. The blood-vessels, as we all know, practically take their origin from the curvatures of the stomach in supplying that organ with blood. From the curvatures the vessels space off toward a point midway between these two borders, leaving a strip devoid of any vessels which are likely to cause any troublesome hemorrhage. When possible the operative measures should always be carried out as near as permissible to this point. In the intestine the corresponding point is located just opposite the mesenteric attachment, and should for this as well as any other reason, when allowable, be given the preference in all operative interference.

To thoroughly understand the arrangement of the serous covering of the intestines we have but to throw a bandage over some cylindrical body, drawing the two overhanging ends fairly taut. By this means will readily be seen a tri-

angle, the walls of which are formed by the bandage, and the base being occupied by the lower border of the cylinder. It will be noticed that this narrow strip of the intestinal wall is partially devoid of serous covering and that the triangle is occupied by connective tissue and important vessels which parallel the intestine. In all operative measures this portion of the intestine should be given a wide berth; and, should any interference with this part of the intestine become necessary, it should always receive the most watchful attention that its closure becomes perfect and that no unnecessary disturbance with its blood-vessels may occur.

The present condition of intestinal surgery has reached such a standard as to demand something more than mere novelty from any new method, and those which now occupy the surgical world can be conveniently arranged as follows:

1. *Mechanical Devices.* (a) Dawbarn's Potato Plates; (b) Abbe's Catgut Rings; (c) Senn's Decalcified Plates; (d) Von Baracz's Turnip Plates; (e) Murphy's Button.

2. *Sutures.* (a) Woelfler's Method; (b) Maunsell's Method; (c) Jessett's Method; (d) Paul's Method.

To go into details with any of the above methods is not only unnecessary but would occupy more time and space than would be expected. In fact, we almost believe that the sutures alone require any special attention so far as any description is concerned, since the others have already received sufficient attention in the pages of current literature to make any further descriptive remarks unnecessary.

The chief objections that have been raised against the Senn plates and Abbe rings are that often they are difficult to obtain or prepare, and in their safety are hardly superior to the plates prepared of potatoes or turnips.

Against the plates prepared of potatoes or turnips have been urged the objections that they are large and somewhat clumsy, and by their size they excite peristalsis and produce, as has been said, "a tugging at the wound." The advantage

of these plates, however, can readily be seen. They are easily prepared and from material that is readily obtainable, besides being absorbable in their nature.

The latest and one of the most brilliant of the devices that have been offered is the button devised by Dr. J. B. Murphy, of Chicago. While the button has passed through a most brilliant probationary period of existence, its final scope of usefulness yet remains to be outlined. So far the objections which have been urged against the button are :

1. The contraction of the opening, especially in a side-to-side anastomosis.

2. The button acting injuriously by assuming the rôle of a foreign body.

3. The possibility of the button causing trouble by becoming arrested at the ileo-cecal valve.

4. The chances of the button dropping in the wrong direction, that is, into the stomach in a gastro-enterostomy, or into the isolated loop of the intestine in an intestinal anastomosis.

5. The possibility of the button not disengaging itself or of becoming arrested in some part of the intestinal tract.

6. "It makes the patient dependent upon the craft of the cutler rather than the skill of the surgeon."

7. The chances of the necessary pressure atrophy in failing to liberate the button.

The arguments for and against the first six of these objections have been reviewed in a paper read before the Louisville Academy of Medicine in the beginning of the year, and were published in the May number of the *Medico-Surgical Bulletin*. As for the seventh objection, we have not been able to learn of any case in which the pressure atrophy failed to liberate the button; but this did occur in an experimental operation in which the button was used in performing a cholecyst-duodenostomy. This operation was performed in February, and the dog was sacrificed in June. Upon examination the button

was still firmly enclosed in its original position, but presented a very corroded appearance. While, as we have said, it is impossible to establish the limit of usefulness to which the button may be subjected, there are at least two operations that seem particularly adapted for its use, that is, cholecyst-duodenostomy and end-to-end anastomosis. In the lateral anastomosis the opening which even the oblong button can supply is rather small when we consider the subsequent contraction which follows this operation.

"*Gastro-pylorotomy.* (Maunsell.) If the disease is confined to a very small portion of the pyloric end of the stomach, it may be excised completely.

"On account of the abnormal semi-fixed condition of the greater portion of the duodenum, the application of this

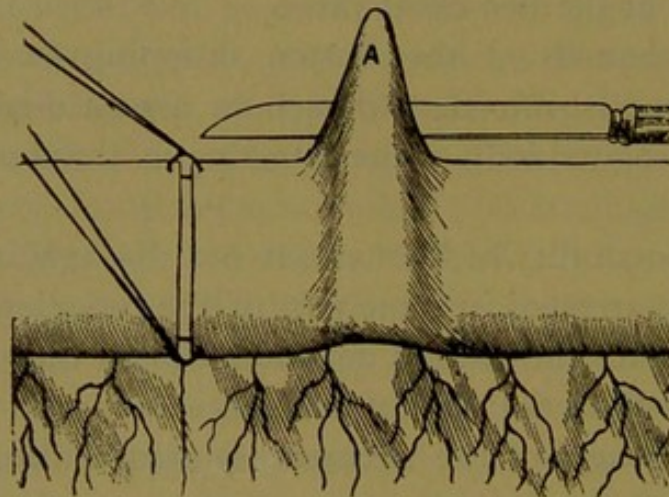


FIG. 6.—*Circular Enterostaphy.* Longitudinal section (about an inch and a half long) with tenotomy knife, of that portion of the larger segment of gut which is opposite to its mesenteric attachment. This opening should be made about an inch from the severed end of the larger segment of the bowel; its length depends on the size of the gut to be invaginated. In performing this part of the operation, pinch up the coats of the intestine between the finger and the thumb, and divide with a tenotomy knife or a pair of scissors.

operation is limited to cases where there is only a small amount of disease confined to the pyloric end of the stomach.

"When there is extensive disease confined to the pyloric end of the stomach and the upper portion of the duodenum,

it may be deemed prudent for many reasons not to attempt the removal of the mass.

"Under these conditions gastro-jejunostomy or gastrointestinal anastomosis may be performed in the following manner:

"1. Draw out a portion of the jejunum as close as possible to the duodenum, empty it of its contents by gently squeezing it, and apply the sponge clamps in the usual manner.

"2. Gently draw the greater curvature of the stomach into the wound.

"3. Place the jejunum along the greater curvature of the stomach and proceed to unite them in whatever position they lie naturally, with least strain or kink.

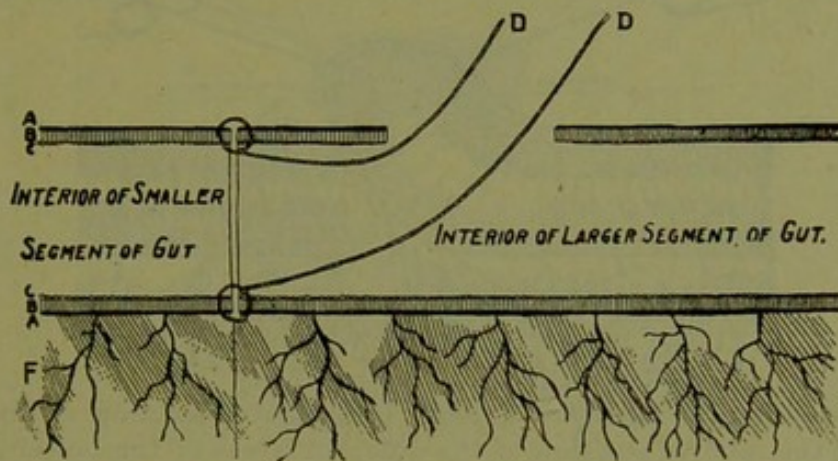


FIG. 7.—*Circular Enterorrhaphy.* Longitudinal section of gut showing: *AA.* Peritoneal coat; *BB.* Muscular coat; *CC.* Mucous coat; *DD.* Temporary sutures passed into the bowel, and out through the longitudinal slit made in larger segment of gut; *F.* Mesentery.

"4. The opening in the longitudinal axis of the jejunum should be slightly over an inch long and in that portion of the gut most distant from the mesentery. The corresponding opening in the stomach should be in the line of its greater curvature and one inch above it.

"5. Unite the corresponding extreme ends of the wounds in the jejunum and stomach with temporary sutures passed through the entire thickness of the walls of the stomach and

jejunum, leaving the ends of the sutures long. Make an opening in the center of the stomach sufficiently long to permit the easy invagination of the corresponding openings in the stomach and jejunum.

“6. Having invaginated the two openings, sew them up all around as previously described, passing the needle through all the coats of the intestine and stomach.

“7. Now retract the firmly approximated openings to their normal positions and sew up the longitudinal slit in the stomach with a continuous suture passed through its peritoneal and muscular coats.

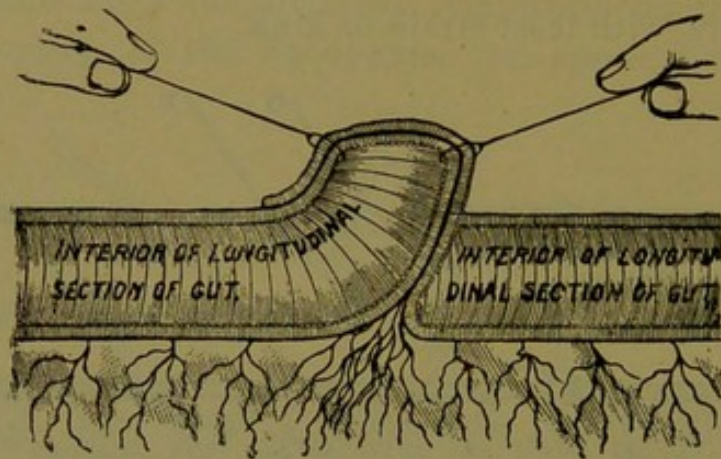


FIG. 8.—*Circular Enterorrhaphy*. Longitudinal section of intestine, showing the relative position of the different layers of the bowel invaginated at the longitudinal slit.

“Withdraw invagination and sew up the slit in the center of the stomach with a continuous suture.

“*Ileo-colostomy*. If the diseased cecum, ileo-cecal valve, and appendix can not be safely excised owing to old-standing recurrent inflammation having firmly matted the bowel to the right ureter and the iliac vessels (as I have seen on several occasions), perform ileo-colostomy:

“1. Empty the diseased cecum and colon end of ileum.

“2. Apply the sponge clamps to the healthy ileum and colon four inches off the disease.

" 3. Invaginate the cut end of the ileum attached to the cecum and sew it up with a continuous suture.

" 4. Make a slit on the convex surface of the colon sufficiently long to just receive with very slight constriction the cut end of the ileum; secure with two temporary sutures, leaving the ends long.

" 5. Make a slit in the colon an inch higher up or an inch lower down in the cecum, whichever is most convenient for the invagination.

" 6. Pass a dressing forceps through the slit and seize the two ends of the temporary sutures.

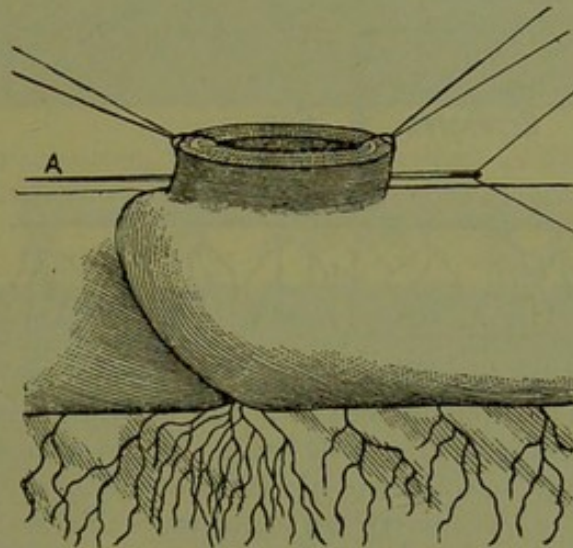


FIG. 9.—*Circular Enterorrhaphy*. Invaginated gut, showing the two peritoneal surfaces in juxtaposition all around. *A*. Needle passed through both sides of the bowel, including all the coats—introducing two sutures with one passage of the needle.

" 7. Drag the invaginated cut end of the ileum and its corresponding opening in the colon out through the slit.

" 8. Suture carefully all around and pull back to its normal position.

" 9. Sew up the longitudinal slit with a continuous suture.

" Clamp the ileum and colon; completely excise the diseased cecum and appendix.

“Insert the cut end of the ileum into the healthy colon two inches above its cut end. Apply the two temporary sutures and invaginate them through the cut end of the colon; sew up all around; withdraw the invagination. Finally close the cut end of the colon with a continuous suture, having invaginated it within itself to the extent of an inch.

“*Ileo-sigmoidostomy.* This operation may be performed where the seat of obstruction is located low down in the colon near the sigmoid flexure. An artificial anus leaves a man in a loathsome condition, and should only be made in

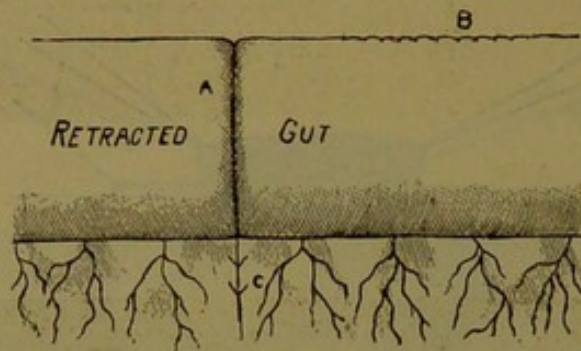


FIG. 10.—*Circular Enterorrhaphy.* A. Line marking junction of both ends of bowel, the peritoneum well turned in, and the sutures and knots all inside the gut, making an almost invisible air- and water-tight joint; B. Longitudinal slit in bowel, sewn up with continuous suture; C. Sutures in the mesentery, seldom necessary to put more than one or two.

cases of obstruction from disease below the sigmoid flexure of the colon.” (American Journal of Medical Sciences, vol. 103, p. 245.)

In describing Jessett’s operation I take the liberty of borrowing the author’s description as given in his article upon ileo-colostomy and gastro-enterostomy respectively in the *Lancet*, February 14, 1891, and October 14, 1891. In his description of the ileo-colostomy he remarks:

On August 3d, with the assistance of Dr. Hayes and Dr. Purcell, Dr. English giving the anesthetic, I opened the abdomen by an incision about three inches long over the right linea semi-

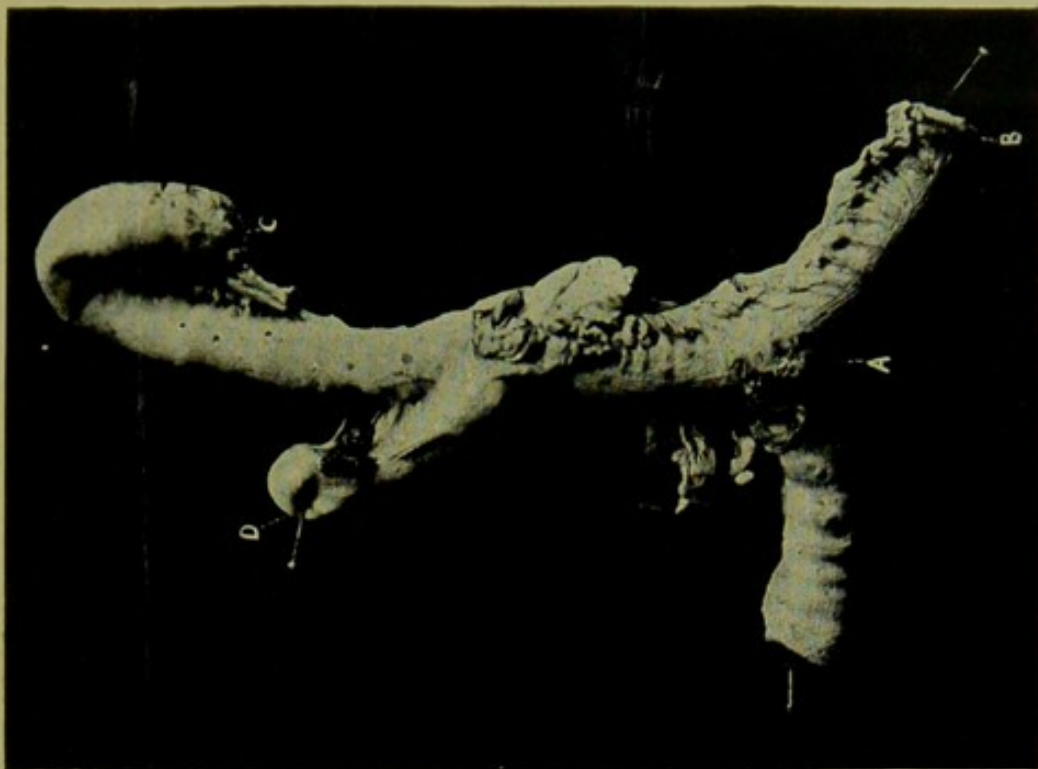


FIG. 2.—Ileo-colostomy by Maunsell's method. *A.* Site of implantation; *B.* Colon; *C.* Invaginated ileum; *D.* Appendix vermiformis.

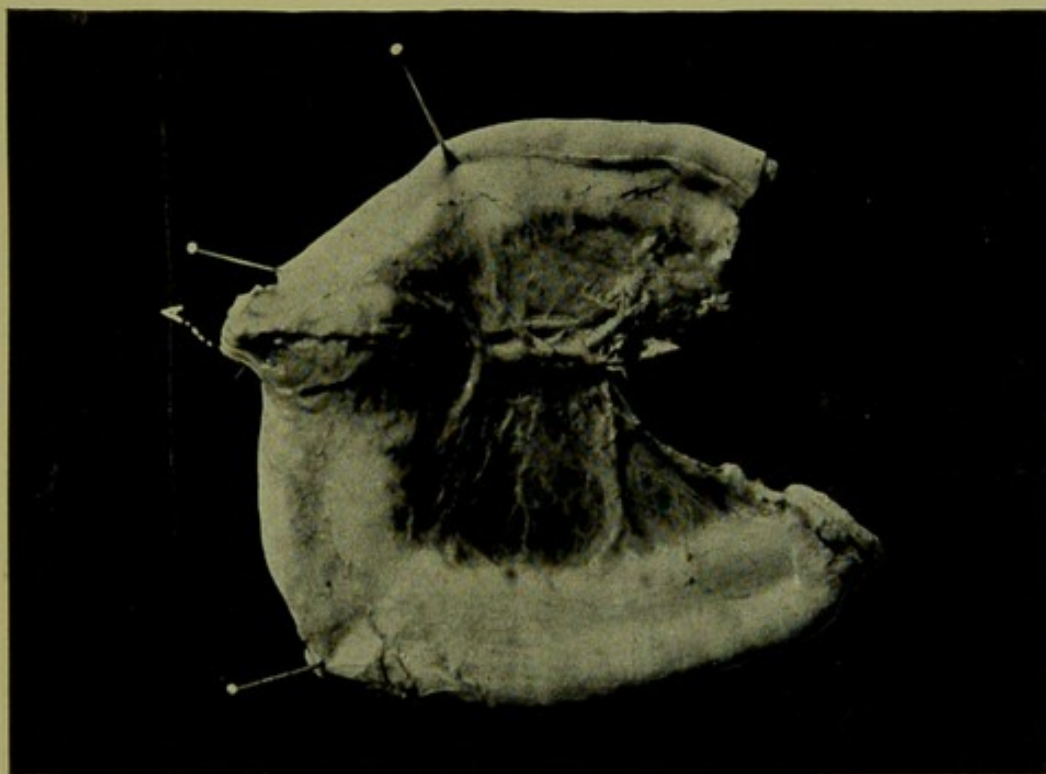


FIG. 3.—Intestinal resection by Woelfler's method. *A.* Site of operation.

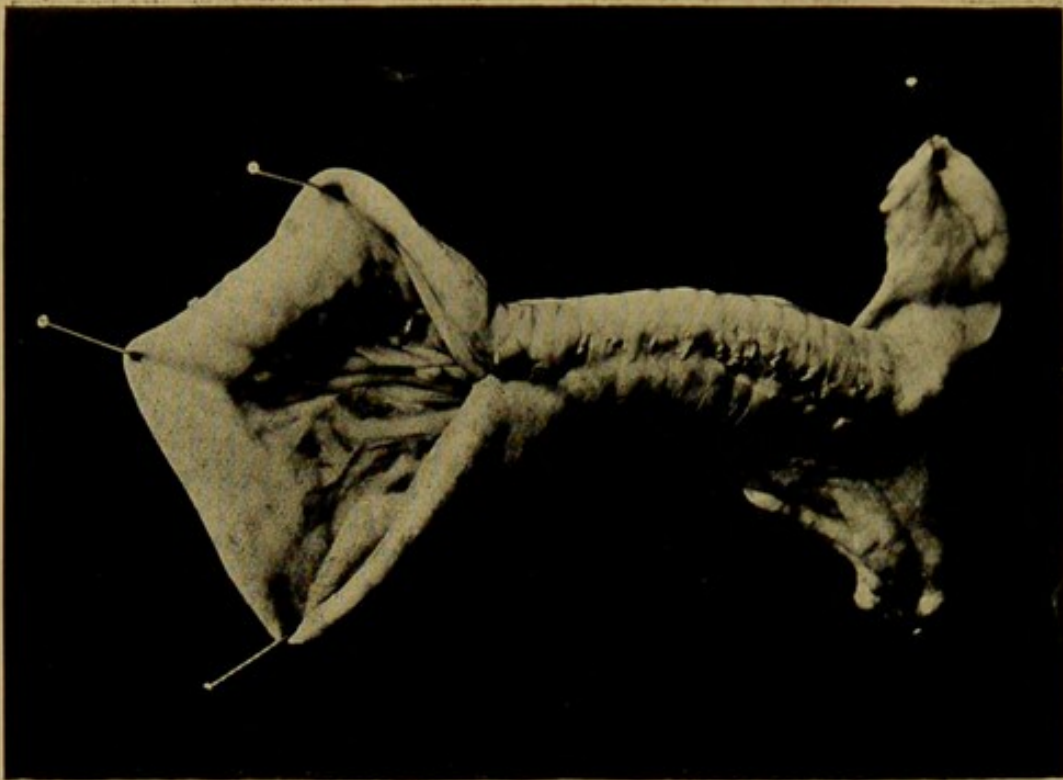


FIG. 4.—Abbe's method of lateral anastomosis by sutures.

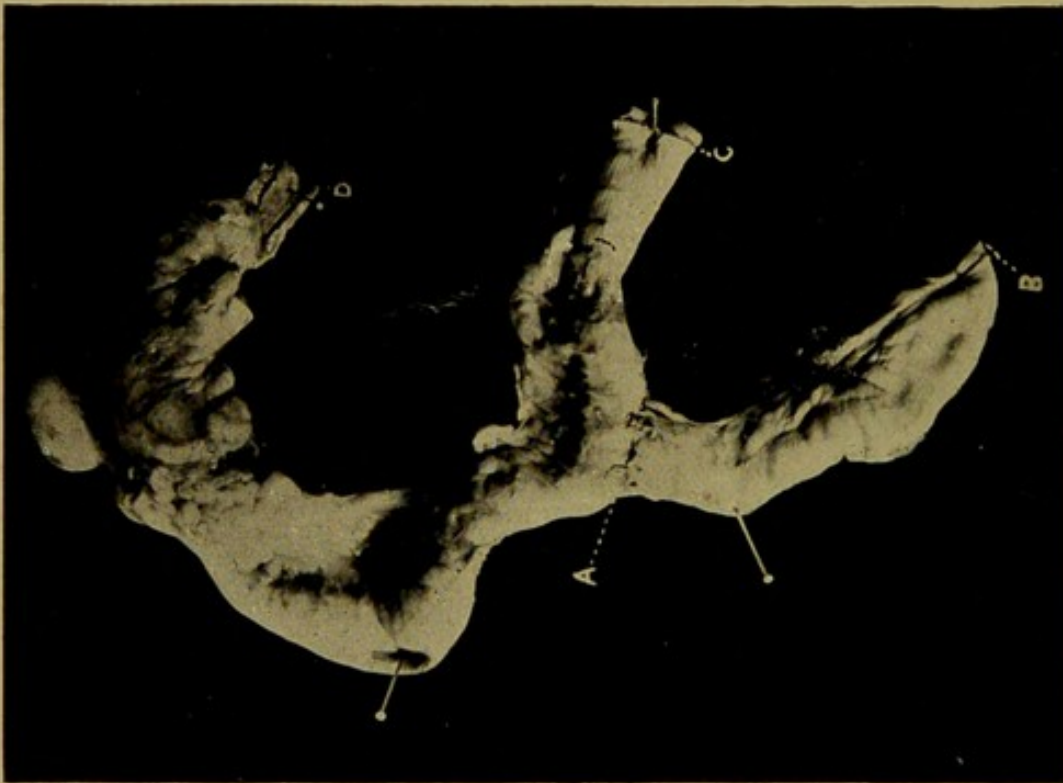


FIG. 5.—Ileo-colostomy by Jessett's method. *A*, Site of implantation; *B*, ileum; *C*, colon.

lunaris, all bleeding points being caught with pressure forceps. I opened the peritoneum along the whole length of the incision, and immediately came down upon a large mass of disease extending from the cecum nearly as high as the transverse colon. It being quite impossible to remove this, I determined to divide the ileum and implant the proximal end into the transverse colon. Passing the index finger of the left hand along the inner side of the cecum, a portion of ileum close to the ileocecal valve was easily drawn out of the wound. I then passed two pieces of india-rubber cord lightly around the intestine, about four inches apart, the piece on the distal end being placed about two inches from the ileo-cecal valve. I next divided the intestines completely across between the two india-rubber ligatures, caught up and ligatured all bleeding points and washed the

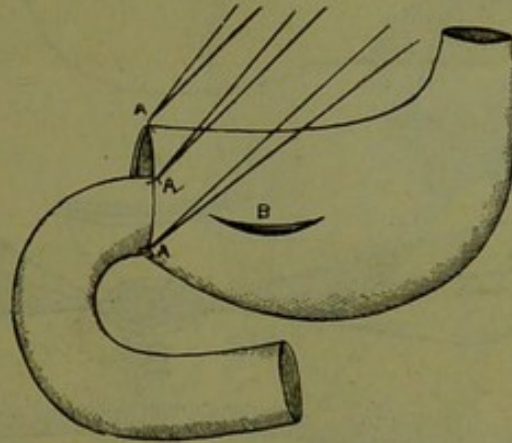


FIG. 11.—*AAA*. Temporary sutures with ends intact, uniting cut surfaces of stomach and pylorus; *B*. Longitudinal slit in stomach, made by pinching up its coats between the finger and thumb, and transfixing with a tenotomy knife. Through this opening the invaginated cut ends of the pylorus and stomach are passed, when they can be sewn up from the inside and then retracted to their normal position, the longitudinal slit being sewn up with a continuous suture. (Maunsell.)

divided ends thoroughly. The cut end of the distal part of the ileum was inverted and closed by stitching together the peritoneal covering with a fine silk suture.

The next step in the operation was to line the proximal end of the divided intestine with a thin band of india rubber, about half an inch wide, which was fastened by a continuous catgut suture to its cut edge. Two chromitized catgut sutures, about eighteen to twenty-four inches long and armed at each end with

a needle, were next passed through the india-rubber band and all the coats of the intestine from within outward. The posterior threads were passed one on either side of the mesentery, and the anterior threads at equal distances apart through the convex surface of the bowel. A portion of the transverse colon was next brought out of the parietal wound and a longitudinal incision made in its convex surface. The long sutures connected with the ileum were then passed through the serous and muscular coats of the colon, the anterior threads about half an inch apart at the end of the opening in the colon, and the posterior threads at a similar distance at the other end. The open end of the ileum was then thrust through the slit and the sutures firmly tied, thus preventing the possibility of the bowel

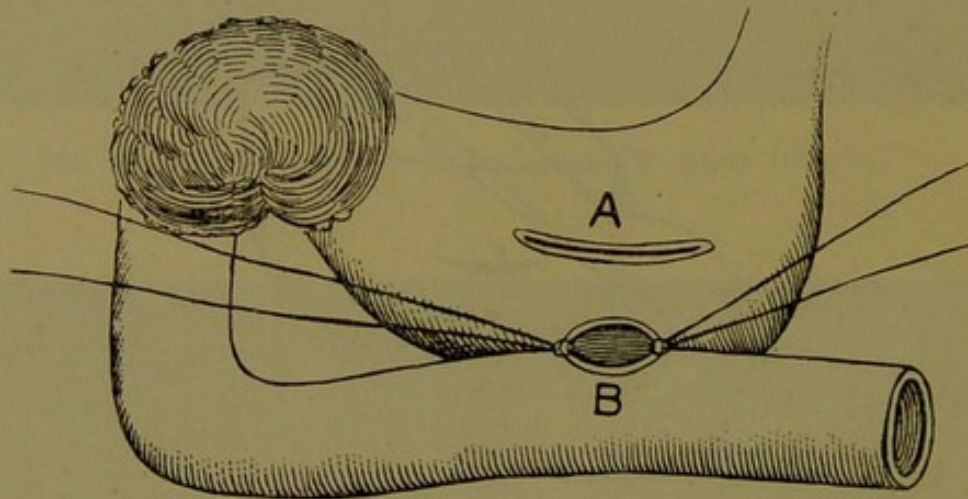


FIG. 12.—A large cancerous mass involving the pyloric end of the stomach and the upper part of the abdomen. *A*. Opening in the center of the stomach (where the vessels are very small) through which the corresponding openings (united by temporary sutures, *B*), made in the longitudinal axis of the upper end of the jejunum and in the line of the greater curvature of the stomach, may be invaginated and sutured round in the usual manner from the inside. (Maunsell.)

slipping out; two Czerny-Lembert sutures, one on each side, were introduced, passing through the serous and muscular coats of the colon and small intestine, and tied firmly. An omental flap was finally fastened round. The parts were thoroughly cleansed and dropped back into the abdomen and the parietal wound closed and dressed in the usual way. The operation lasted about one hour.

The patient stood the operation very well, and was returned to bed and ordered to be fed with nutritive enemata and zymized meat suppositories for the first twenty-four hours.

August 4th. Motion passed naturally by the rectum to-day, and continued to do so daily. No tenderness over the abdomen, excepting over the original tumor, the outer and lower side of which is brawny, and had all the appearance of deeply seated cellulitis.

August 5th. I visited the patient with Dr. Hayes, and found the bowels had acted naturally and well and the wound looked

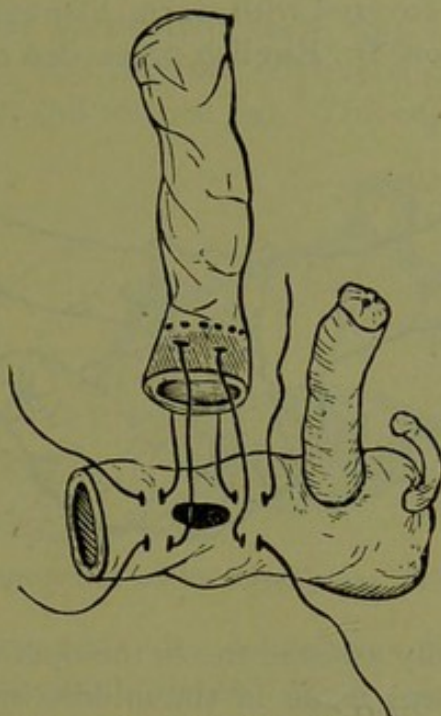


FIG. 13.—Jessett's Ileo-colostomy.

healthy. A large abscess was pointing at the upper part of the thigh; this was freely opened, letting out a large quantity of stinking pus; this was kept syringed out and drained. The patient takes his nourishment well, and is kept up with brandy, champagne, beef tea, etc. The patient had not sufficient vital power left to resist the constant drain of the abscess, and died on August 16th, thirteen days after the operation.

Remarks: Had this patient been operated on earlier I am convinced that his life might have been materially prolonged. So far as the operation was concerned it was all that could have been desired. There was no peritonitis, and feces passed freely

from the day of the operation until his death, nearly a fortnight after. This being the case, this operation must commend itself to all surgeons as being far preferable to any operation which has for its aim merely the formation of an artificial anus or a fecal fistula. In my experimental research, published in July, 1889, I had not one death after the operation I have described.

The details of his gastro-enterostomy, given in his own language, are as follows :

Operation, August 4th. Two hot-water cushions being placed on the table and covered with warm blankets, and the patient being placed thereon, Dr. English proceeded to administer ether,



FIG. 14.—Jessett's Ileo-colostomy.

and Mr. Elam kindly assisted me in the operation. An incision three inches long was made in the middle line from the umbilicus upward through the abdominal parietes, which were so very thin that the peritoneum was cut down upon directly, and no bleeding points required catching. The peritoneum was divided the whole length of the parietal incision and caught in three places on each side with pressure forceps. The tumor in the pylorus was seized and readily brought out through the wound. It being found to be perfectly free from all surrounding organs I determined to remove it. A cloth wrung out in warm carbolized water was packed around the growth, which was found to extend for about four or five inches along the walls of the stomach. I next, with an aneurism needle armed with a No. 1 chromic gut, ligatured the vessels running along the larger and smaller curvature of the stomach, a little to the left of the point

at which I proceeded to make the section, and with a pair of broad ligament forceps I clamped that portion of stomach on the duodenal side of the proposed section. I then tore through with my finger the lesser omentum, and, Mr. Elam firmly holding the stomach, I proceeded to cut it across between his finger and the clamp forceps with scissors, catching up each bleeding point as it was divided with the pressure forceps. The growth with the pylorus being thus severed from the stomach was allowed to hang loosely out of the wound, covered with a cloth soaked with warm carbolized water. The vessels in the divided edges of the stomach were now quickly ligatured with catgut, and, as it was found that there was a quantity of fluid in the stomach, this was carefully siphoned off by means of a rubber stomach-tube and washed out. The edges of the stomach

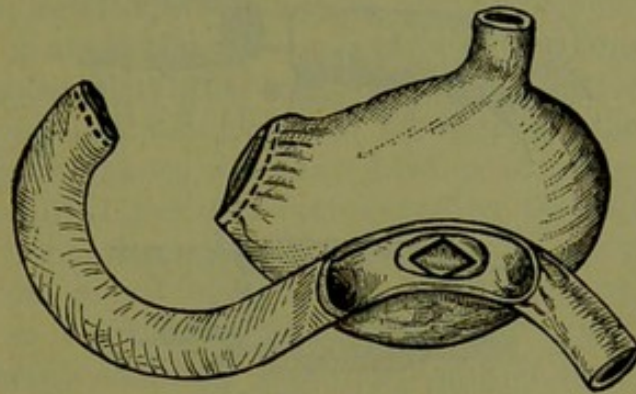


FIG. 15.

were next united by means of a continuous chromatinized catgut suture passing through all its coats. A second line of quilt sutures of No. 1 chromatinized gut were now passed through the serous and muscular coats about an eighth of an inch from the edges; the ends of each pair of these sutures when passed were secured by clamp forceps, to allow of all the sutures being inserted before tying. Nine of these sutures were introduced in all; as each of these were tied care was taken to thoroughly invert the cut edges of the stomach so as to assure a good surface of peritoneum being approximated. When all these sutures were tied and the union appeared complete, I allowed the stomach to drop back into the abdomen. I next passed an india-rubber ligature lightly round the duodenum about two inches from the pylorus, and clamped that portion of the duodenum close to the pyloric orifice with the forceps, and divided it between the

forceps and the elastic ligature, leaving as much of the duodenum as I could with safety. The pylorus and growth were now free excepting at their attachment to the great omentum. This I transfixed with No. 4 Chinese silk and ligatured in the same manner as an ovarian pedicle (Fig. 4), and removed the growth by cutting the omental attachment across with scissors. The

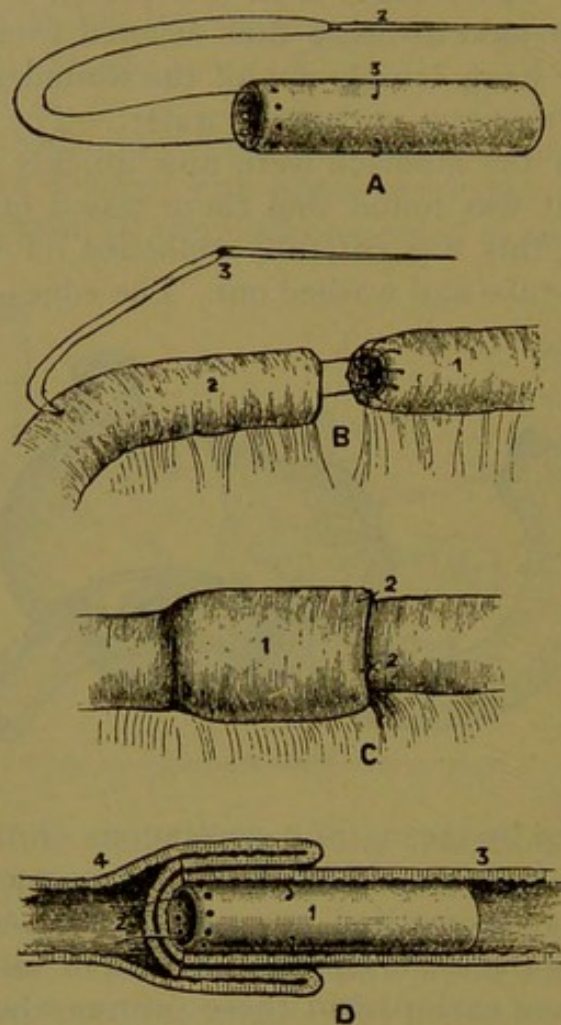


FIG. 16.

divided end of the duodenum was then united by means of a continuous chromatinized catgut suture passing through all its coats and a second row of quilt sutures of No. 1 chromatinized gut, in the same manner as that described for the union of the divided end of the stomach, and allowed to drop back. The rubber ligature was now removed from the duodenum, a sponge was introduced into the cavity, and the first part of the operation thus completed.

I then proceeded to perform gastro-enterostomy. I first pushed the transverse colon and omentum over to the right and passed the index finger of my right hand over it, and caught up a loop of the jejunum close to its origin and drew it out through the wound. The stomach was again withdrawn and an opening made into it about an inch and a half long, parallel to and about an inch from the parallel curvature and two inches from the divided end. A decalcified bone plate, threaded with two lateral chromatinized catgut ligatures and two longitudinal No. 1 silk ligatures, was introduced. The lateral ligatures were passed through all its coats about an eighth of an inch from the divided edge. The ligatures were given to an assistant to hold, while I proceeded to introduce a similar bone plate into the jejunum. Before doing this two india-rubber ligatures were passed round the intestine almost four inches apart and fastened lightly. An opening in a longitudinal direction, about an inch and a half in length, was made in the convex surface of the jejunum between the india-rubber ligatures, and a bone plate introduced, the lateral catgut sutures being passed through all the coats of the bowel. The two plates were now held in accurate apposition by Mr. Elam, while I tied the corresponding ligatures of the two plates. In tying the upper lateral ligature a considerable portion of mucous membrane prolapsed and was with difficulty got into place, so I cut it off with scissors, after which the upper edge was readily made to go into its proper position. (Fig. 5.) A row of quilt sutures, five in all, were introduced along the upper edges and ends of the plate, and the parts, being thoroughly cleansed, were dropped back. The sponge which had been placed at the cavity left by the resection of the pylorus was removed, and, all being dry, the abdominal wound was closed with silk-worm gut sutures in the usual manner, the wound dressed with sublimate gauze, and a large pad of wool and a many-tailed bandage firmly applied. The patient was then returned to bed.

The patient bore the operation exceedingly well; the only time that her condition appeared to give anxiety was after the division of the stomach and stitching up the duodenal opening. During the latter part of the operation she rallied a great deal. The operation lasted one hour and forty minutes. The portion of stomach and pylorus removed measured about six inches in length and four inches from above downward at the gastric end. The specimen was shown at the Clinical Society with the patient. It contained a mass of growth which was firm and not

ulcerated, and which almost completely obstructed the orifice of the pylorus. There were no adhesions. The patient made a good recovery.

Paul describes his method as follows :

The bowel being ready to receive the tube, its full length is introduced into the proximal end, the cut margin of which is sewn to the tube through the perforations with a fine, continuous chromic gut suture (*B*). For this purpose a sewing-needle is used, which, in passing, is made to dip more deeply into the mucous than the peritoneal coat. It is not sufficient to take the muscular and mucous coats only, as the attachment to the tube is then not sufficiently secure. When sewing the mesenteric border of the bowel to the tube care should be taken to pick up the severed edges of the mesentery with the point of the needle, as this is the point most likely to give way, and the mesentery should not be allowed to drag in the least degree from the cut edge of the bowel. Next the needle of the traction thread is slipped along a director about three inches down the distal segment of the bowel and pushed through its wall. Then the distal is sewn to the proximal end by a chromic gut suture all around, the needle piercing the musculo-serous coats only, great care again being taken to fix the mesenteric edge securely. With the same thread the opening in the mesentery can be drawn together. Now an assistant takes the traction threads and steadily resists the operator as he draws the distal end of the bowel back over the tube, thus invaginating the proximal end and producing the appearance seen in the engraving (*C*). The parts are retained in position by a few Lembert sutures, one on either side of the mesentery, and others as they appear necessary. Lastly, the traction sutures are cut off and the openings closed with Lembert stitches. For the human bowel I have had made tubes one and one half inches long, with diameters varying from one half inch to three fourths inch and one fourth inch in thickness. (London Lancet, May 30, 1891.)

In closing I beg leave to submit for further consideration the following conclusions :

1. The highest degree of vascularity in the intestine is in the region of its mesenteric border, and the lowest degree is at a point just opposite the mesenteric border.

2. The highest degree of vascularity in the stomach is along its curvatures, and the lowest degree is at a point midway between its curvatures. Throughout the entire intestinal tract there is an absence of the serous coat at the mesenteric border.

3. In view of the diminished vascularity and the constant presence of the serosa at a point midway between the curvatures in the stomach and opposite the mesenteric border in the intestines, these regions should be regarded as *the lines of safety*, and when permissible should always be given the preference in all operative measures.

4. The dangers of sepsis, hemorrhage, peritonitis, and non-union increase in direct ratio as we recede from the lines of safety.

5. The strength of a continued or Glover's suture is measured practically by its weakest stitch; if this tears, the remaining stitches are all more or less loosened and the end nearly always defeated.

6. Barring certain exceptions the continued or Glover's stitch is the most rapid, most uncertain, and most uneven stitch that can be applied.

7. No method of intestinal resection, however simple it may be, will receive full justice in the hands of even the most ingenious surgeon at its first performance. For this reason it should be the duty of all those expecting to engage in such work to thoroughly train themselves in intestinal operations in a practical way, either on lower animals or upon the dead subject.

8. The end-to-end method of restoring the continuity of the intestine in resections is attended with the least contraction and affords the most natural restoration of the intestinal canal.

9. The opening in all lateral anastomosis should be abundantly large (four inches) to allow for subsequent contraction, which always takes place to a considerable degree.

