THE TECHNIQUE OF GASTROJEJUNOSTOMY.

BY WILLIAM J. MAYO, M.D.,

OF ROCHESTER, MINNESOTA,

Surgeon to St. Mary's Hospital.

THE mortality of gastrojejunostomy is no longer the question. The results are as good as can reasonably be expected, and depend more upon the condition of the patient when operated upon than the technical difficulties of the operation itself.

This is particularly true of the posterior-suture operation, of which variety we have made 136 in 16 months with but one death. These results are not exceptional and have been and are being duplicated by many others. Neither need we consider those serious cases of regurgitant vomiting of biliary and pancreatic secretions during the first week (vicious circle), as this complication has practically disappeared with the evolvement of better methods.

While we therefore can congratulate ourselves upon the immediate safety of the operation itself, we are not yet free from certain embarrassing complications which may arise some days or weeks later. The most common subsequent condition is the chronic regurgitation of bile which comes on at intervals in a small percentage of patients. The symptoms vary from a temporary burning in the stomach, due to the entrance through the fistula of biliary and pancreatic secretion, to the most distressing vomiting of great quantities of such fluids. Ochsner has pointed out that if this complication develops it is usually within ten weeks of the operation. On reoperation the condition is found to be due to a partial kinking or obstruction from twisting, adhesions or other cause, just as the acute " vicious circle " was due to early and more complete obstructions.

Since January 1, 1905, Dr. Charles H. Mayo and myself

have discarded all "loop operations" with or without entero-anastomosis or closure of the pylorus, the anastomosis being made as close to the origin of the jejunum as possible. The results as compared with all previous methods in our hands have been infinitely better in every respect. The few "loop" operations that have been performed during this time have been to meet special indications.

From January 1 to July 1, 1905, there were 56 of these "no loop" operations with but one death, which occurred in a patient practically moribund at the time of operation. Two patients, however, developed chronic bile regurgitation of a serious character. These two cases are the ones referred to in a paper on "Chronic Ulcer of the Stomach and First Portion of the Duodenum," read before the American Medical Association, July, 1905, and published in the *Journal of the American Medical Association,* October 19, 1905. Each had gained in flesh and weight, being relieved of former symptoms, but in each occasional regurgitation of quantities of biliary and pancreatic secretions was a source of great discomfort and considerable disability. Reoperation in both cases during the past summer showed that the cause of the trouble was an angulation of the jejunum at its gastric attachment.

In all of the 56 cases referred to the anastomosis of the jejunum to the stomach was made in the line of peristalsis, that is, the proximal portion of the jejunum was attached to the posterior gastric wall to the left and above, and the distal end of the jejunum to the right and lower part of the stomach. In this partial twisting lay the secret of the complication. (Fig. 1.)

The question at once arises. Is the idea of continuity of peristalsis between the stomach and jejunum a matter of theory or has it some practical significance? The writer has gone over in a large number of living subjects the anatomy of this region, and the anatomical facts can be briefly stated as follows:

For convenience we will take the origin of the jejunum as being at the point in which the duodenum passes through

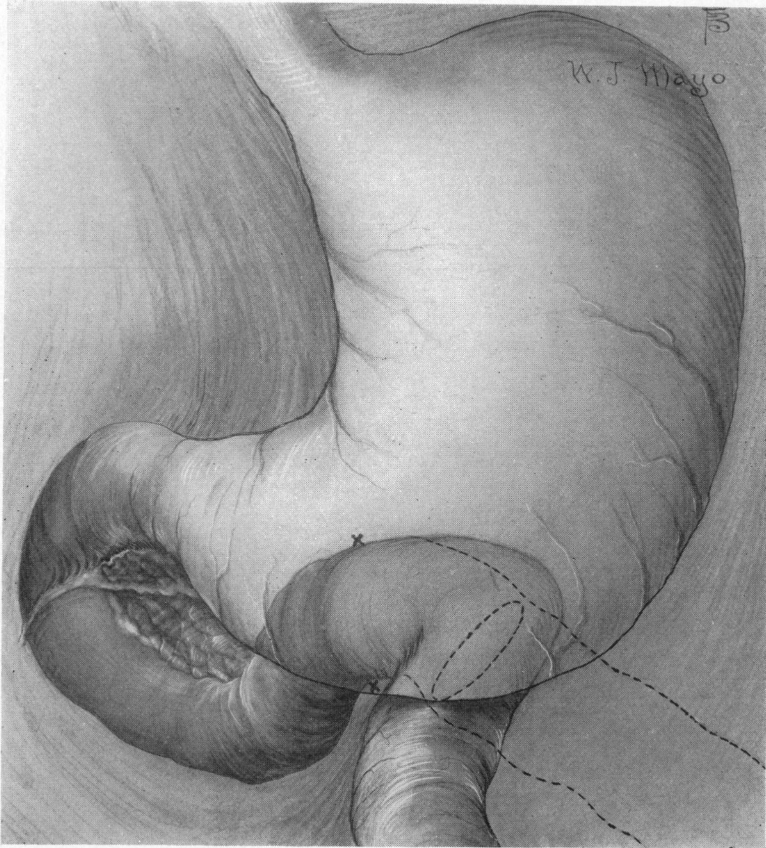

FIG. 1.—Showing kink in jejunum resulting from changing normal direction of its uppermost portion, in "no-loop" gastro-jejunostomy after posterior method.
X and x mark commencement of jejunum.

the transverse mesocolon. The distal end of the duodenum lies behind the stomach when the latter is moderately distended and about one and one-half inches to the left of the middle line and one and one-half to two inches above the umbilicus. Its horse-shoe shape has its concavity directed to the left and upward and its exit is within about two inches as high as the pylorus. The transverse portion of the duodenum passes forward over the prominent vertebral column and backward to the left side of the spine to the opening in the transverse mesocolon. The terminal inch which marks the duodenojejunal juncture is directed upward and to the left, the mesentery of the proximal jejunum lying behind and the free surface of the intestine directed forward. The jejunum from its origin drops at once into the left abdominal fossa. Not only does it pass to the left but it gravitates backward into the left kidney pouch underneath the splenic flexure of the colon, so that at a point four inches from its origin it lies on a plane to the left and posterior. This can be shown in a very practical way by drawing the transverse colon out through the abdominal incision, pulling it upward and to the right until the mesocolon is taut. This brings the beginning of the jejunum into view. It will readily be seen therefore that if the attachment is made to the stomach so that the proximal portion of the gastrojejunostomy is to the left and above, and the distal portion is directed to the right and below, we have introduced two serious displacements. The jejunum no longer falls in the normal manner to the left and backward, but is artificially caused to pass not only to the right but forward as it must ride the vertebral column or the structures immediately contiguous.*

The active propulsion of the stomach lies in the pyloric end in that part bounded above by the horizontal portion of the lesser curvature. The five-sixths lying to the left has mainly storage function and its muscular action is less forceful. The proper site for the gastric incision is to the left of this point

* For variations in the origin of the duodeno-jejunal angle see Mumford, Fustut and Cunningham.

on a line with the longitudinal part of the lesser curvature with its lower end at the bottom of the stomach (under the cardiac orifice).

The writer has been unable to see that it made any difference in the results of a "no loop" gastrojejunostomy whether the peristalsis of the stomach is the same as that of the intestine or not, as, with the exception of a tendency to contraction, there have been no complications introduced that have been other than intestinal in origin.

Since the first of July, 1905, we have abandoned reversing the jejunum and in a larger number of cases (65) we have had not a single case of trouble and no death. We apply the jejunum to the posterior wall of the stomach from right to left exactly as the intestine lies under normal conditions. The distal portion of the jejunum passes from the bottom of the stomach directly back into the left fossa as occurs normally (Fig. 2).

The two accompanying drawings by Miss Byrnes from sketches by Dr. John F. Binnie from actual operations at our hands explain the mechanical conditions very perfectly. It is hardly necessary to say that the idea of the reversal of the peristalsis is not original with us, but will be found in the literature on this subject to have been advocated at various times. As a matter of fact, in this operation it is of no importance.

With any "loop" operation (four inches or more in length) the objections which we here make to the mechanics are not so apparent, but mechanical difficulties of some kind are so frequently introduced as to render gastrojejunostomy with entero-anastomosis the method of choice with the larger number of operators.

The "no loop" operation directed to the left, as outlined above, has given us vastly better results than any other method with which we have become acquainted.

Steps of the Operation.—For benign disease the abdomen is opened from three-fourths to one inch to the right of the

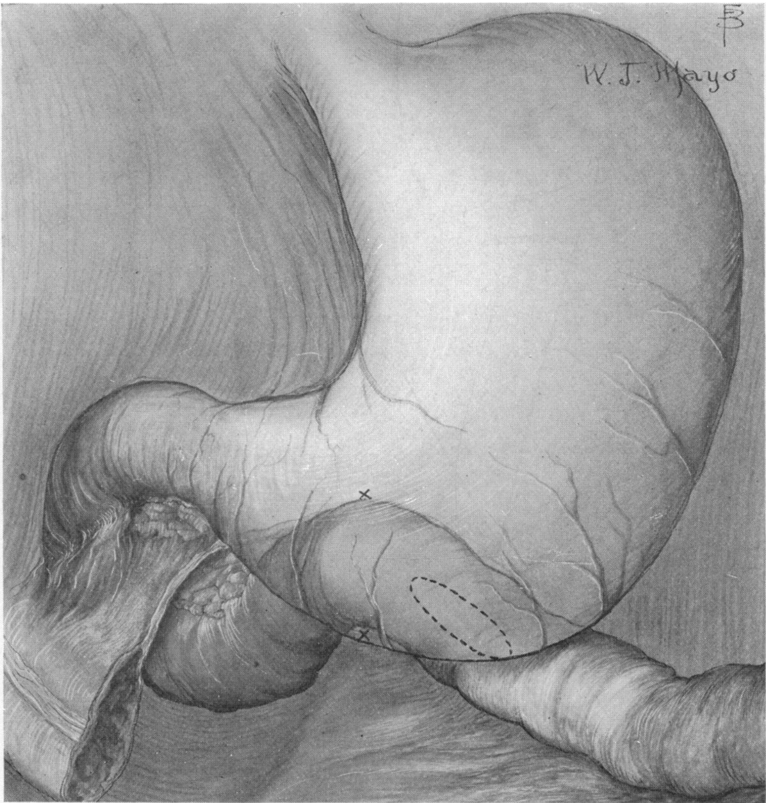

FIG. 2.—Showing NO kink in jejunum resulting from PRESERVING normal direction of its uppermost portion, in "no-loop" gastro-jejunostomy after posterior method.

X and x mark commencement of jejunum.

median line, splitting the fibres of the rectus muscle. The transverse colon is drawn out of the abdominal incision and by a steady traction to the right and upward the mesocolon is brought out until the jejunum comes into view, and the intestine is grasped at a point three or four inches from its origin. On drawing the jejunum tight the fold of peritoneum which covers the ligament of Treitz (a small band containing muscle fibres) is developed. This peritoneal band has its origin on the transverse mesocolon and extends down on to the beginning of the jejunum, acting as a suspensory ligament; it will be found to lead to the base of the vascular arch of the middle colic artery, and accurately marks the place where the transverse mesocolon is torn through to secure the posterior wall of the stomach. The stomach is drawn through this opening and the anastomosis performed, beginning at a point one inch above the greater curvature on a line with the longitudinal portion of the lesser curvature and ending at the bottom of the stomach, two and one-half inches to the left. To secure a proper low point a small opening is made in the gastrocolic omentum and one-half inch of the anterior wall pulled through behind. Having these features in view a considerable portion of the posterior wall is drawn into a pair of light elastic curved holding clamps. We prefer the Doyen. The handles lie to the right and about transverse with the axis of the body. Beginning one and one-half to three and one-half inches from its origin the jejunum is drawn into a similar pair of clamps with handles to the right. It will thus be seen that the left low point on the stomach lies in the tip of the clamps and the distal point of the jejunum lies also to the left. By placing the two clamps side by side the operation is completed in the usual manner by two-row suturing, chromic catgut-suture being used for the inner through-and-through mucous stitch, as silk or linen may hang ulcerating for months before passing away. In applying this suture on the posterior row behind we use the Connell or buttonhole suture. On the anterior we use the method advised by Dr. Charles H. Mayo, which con-

sists in entering the needle on the peritoneal side through to the mucous and directly backward from mucous to peritoneum on the same side. By doing this alternately, first on one side and then on the other, with this first chromic catgut-suture the peritoneal surfaces are rolled into contact, the parts to be united are held firmly in apposition, and the hemorrhage checked. The outer row consists of No. 1 celluloid linen (Pagenstecher), which we have used with great satisfaction since it was introduced for this purpose by Mr. Robson. It is very strong, smooth and has no capillarity. Flattening the intestine (Cannon and Blake) should be avoided by grasping the intestinal wall close to the margin of the incision with the suture so as to turn in a narrow seam from the intestinal side. On the gastric side on the contrary, there need be no hesitation in taking a free grasp of the tissues. The rent in the mesocolon is fastened to the suture line with three or four mattress-sutures of linen. This should grasp the peritoneal coat close to the margins of the rent in such manner that when tied all the raw surfaces shall be turned in behind the stomach, and the peritoneum folded smoothly against the gastrojejunostomy opening so that there shall be nothing to cause adhesions to form between the mesocolon and the jejunum beyond the anastomosis.

This short communication is to supplement the paper on "Gastro-enterostomy" read before the American Surgical Association, July, 1905, and published in the ANNALS OF SURGERY, Nov. 1905, in which article credit has been given to originators and promoters of useful suggestions in perfecting this operation.