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Triple-Stapling Technique for Jejunojejunostomy in Laparoscopic Gastric Bypass

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Since its introduction in 1994,[1] laparoscopic gastric bypass has become an increasingly popular procedure for the surgical treatment of morbid obesity. In fact, it has been stated that the most prevalent laparoscopic bariatric procedure in the United States is the gastric bypass.[2] Multiple studies have demonstrated the safety and efficacy of this procedure.[3-5] One well-designed prospective randomized study by Nguyen et al[6] comparing the laparoscopic approach with the open approach showed a shorter convalescence, a shorter hospital stay, and less blood loss with the laparoscopic gastric bypass. In addition, the patients who underwent this procedure had more rapid improvement in their quality of life and an amount of weight loss comparable with that of the patients in the open group.

BACKGROUND

Various techniques have been described for the construction of both gastrojejunostomy and jejunojejunostomy. It appears that there has been a shift to staple construction of anastomosis because of the convenience and ease of stapling devices compared with intracorporeal suturing. Our experience, however, has raised some concerns about the double-stapling technique for the construction of jejunojejunostomy, as described previously.[4] Nguyen et al[7] have also noted significant issues with the double-stapling technique for anastomosis. In their 80 patients, they noted 5 complications specific to the construction of anastomosis (1 intraoperative and 4 postoperative). The authors recommend closing the remaining common enterotomy via simple interrupted suture closures. Stenosis of this anastomosis may occur when the common enterotomy, used for the initial placement of the endoscopic stapler, is closed with another reload of the stapler. If this second placement of the stapler is not done correctly (transversely), it is possible to cause stenosis at the afferent limb (**Figure 1**). As a result of these authors' experience[7] and our own, we abandoned the double-stapling technique and closed the enterotomy with 2 layers of sutures until we developed the following technique.

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OPERATIVE TECHNIQUE

Our overall technique for laparoscopic gastric bypass will be reviewed only briefly because the focus of this article is the construction of the jejunojejunostomy. The procedure is performed with the patient in the lithotomy position. Six trocars are placed (3 at the midline, 2 in the left upper quadrant, and 1 in the right upper quadrant). The stomach is dissected at the lesser curvature to preserve the vagal innervation of the pylorus. The width of the gastric pouch is created with 1 firing of the stapler (3.5-mm staples with a 45-mm-long stapler) transversely from the lesser curvature. The remaining staplers are fired cephalad with the end point being the angle of His. An anvil from a 25-mm circular stapler is placed transorally into the pouch, as described previously by Mathews et al.[8]

After the creation of the pouch, the omentum is divided with the harmonic scalpel for an antecolic gastrojejunostomy. Then the ligament of Treitz is identified, and the small bowel is marked 50 cm distally. The small bowel is divided with 2 firings

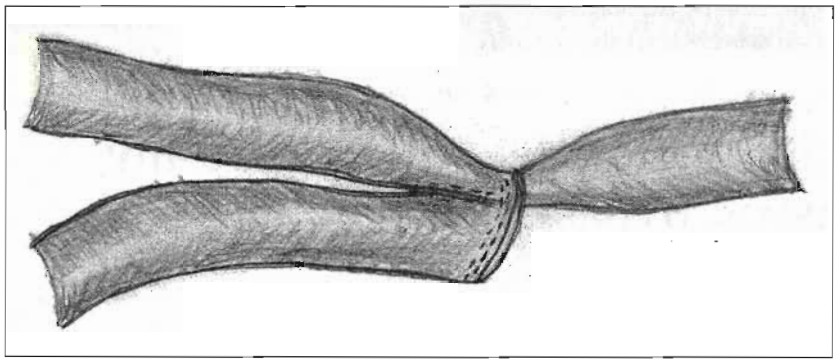

Figure 1. Diagram demonstrates the stenosis that can occur when using the double-stapling technique.

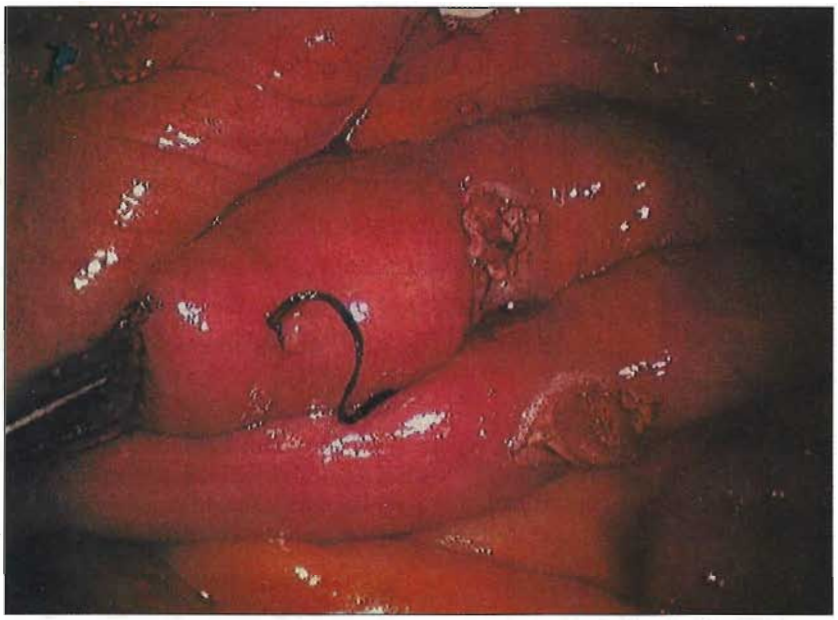

Figure 2. Two enterotomies are placed in each limb of the bowel. The enterotomy in the limb from the duodenum is placed 5 cm from the transected end.

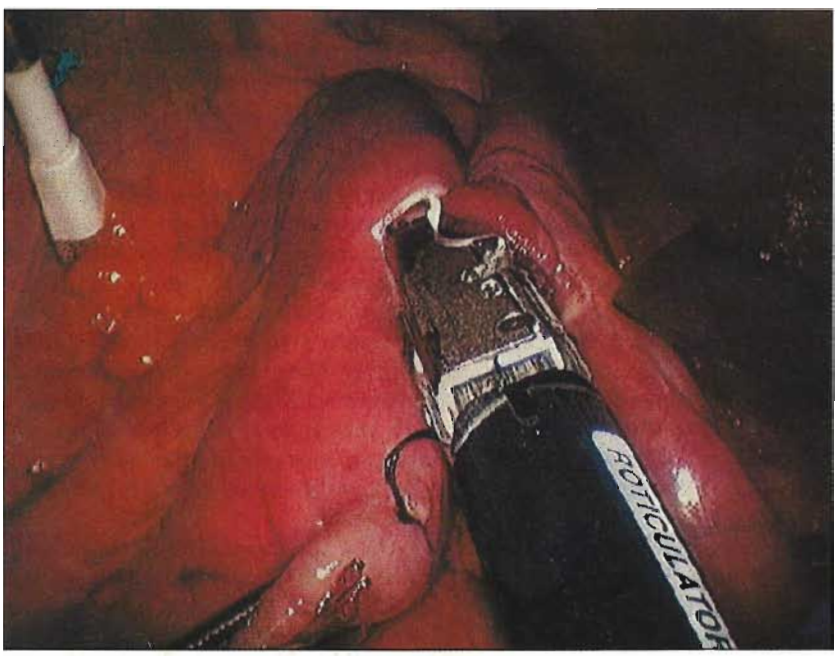

Figure 3. A laparoscopic linear cutter (from the umbilical port) is placed into the antimesenteric side of the 2 limbs.

of the 2.5-mm endovascular stapler (1 for the bowel and 1 for the mesentery). Depending on the size of the patient, an appropriate length of the distal small bowel is measured. This loop of bowel is placed next to the proximal end of the divided small bowel to perform the jejunojejunostomy. An enterotomy is created at the antimesenteric border of each loop of bowel. The enterotomy in the proximal side of the cut small bowel is performed approximately 5 cm proximal from the cut end (**Figure 2**). A laparoscopic 45-mm-long linear cutter stapler (with 2.5-mm staples) is placed into each limb, with the stapler entering the umbilical port (**Figure 3**). After ensuring proper antimesenteric placement in both limbs of the jejunum, the stapler is fired. The small bowel is rotated approximately 90° and cephalad (**Figure 4**). Another stapler is placed into the common enterotomy 180° from the position of the first firing, enlarging the anastomosis (**Figure 5**). Again, the stapler is verified to be at the antimesenteric side of both limbs of the bowel. This stapler enters from the farthest left lateral port. The bowel is kept in this position so that another reload of the stapler (**Figure 6**), entering from the umbilical port, can be used to close the common enterotomy (**Figure 7**). Care is taken to include little of the bowel in the closure and to ensure that the stapler is placed transversely. A clip is placed on the anastomotic site for radiological identification.

After the creation of the jejunojejunostomy anastomosis, the Roux limb is brought between the divided omentum, anterior to the colon and distal stomach, to the gastric pouch. A 25-mm circular stapler is used to create the gastrojejunostomy. The anastomosis is tested with both dye and air. All port sites with fascial defects greater than 5 mm are closed. No gastric tubes or drains are used. Patients undergo extubation and are then transferred to the surgical floor. On postoperative day 1, an upper gastrointestinal contrast study is performed to evaluate both the gastrojejunostomy and jejunojejunostomy. Most patients are discharged on the following day.

We have now used the triple-stapling technique in 256 patients for the construction of jejunojejunostomy in laparoscopic gastric bypass surgery with excellent results. Postoperative contrast studies have demonstrated no evidence of leakage or stenosis. Although it may be difficult to fully evaluate distal anastomosis with a contrast study (especially in patients with long Roux limb reconstructions), the clip placed at the anastomosis assists in localizing it.

None of the patients have required a subsequent operative procedure because of leakage or stenosis at the site of the jejenunojejunostomy. No clinical evidence of late stenosis of the jejenunojejunostomy site has been noted with follow-up ranging from 2 weeks to 1 year (median follow-up period, 6 months).

COMMENT

This technique provides a large patent anastomosis with a low risk of stenosis. Even with great care, the double-stapling technique can create stenosis at the proximal aspect of the Roux limb (Figure 1). This stenosis can translate into clinical problems, as described previously.[7] Although the double-stapling technique has been used successfully by some surgeons,[4] the concern for subclinical problems still exists. With the triple-stapling technique, the need for an "antiobstructive" stitch (as initially described by Brolin[9] and used in laparoscopic gastric bypass surgery by Schauer et al[4]) is eliminated.

Our clinical method of performing laparoscopic gastric bypass surgery now consists of either closing the enterotomy with sutures or using the triple-stapling technique. The extra expense of 2 reloads of the stapler can be justified by the operative time saved by avoiding a 2-layer hand-sewn closure of the common enterotomy. This technique also allows for a reasonable margin of error if (1) extra bowel is placed in the jaws of the stapler; (2) the stapler is not placed transversely across the bowel; or (3) the common enterotomy is large. Any of these situations would create a problem for the double-stapling technique.

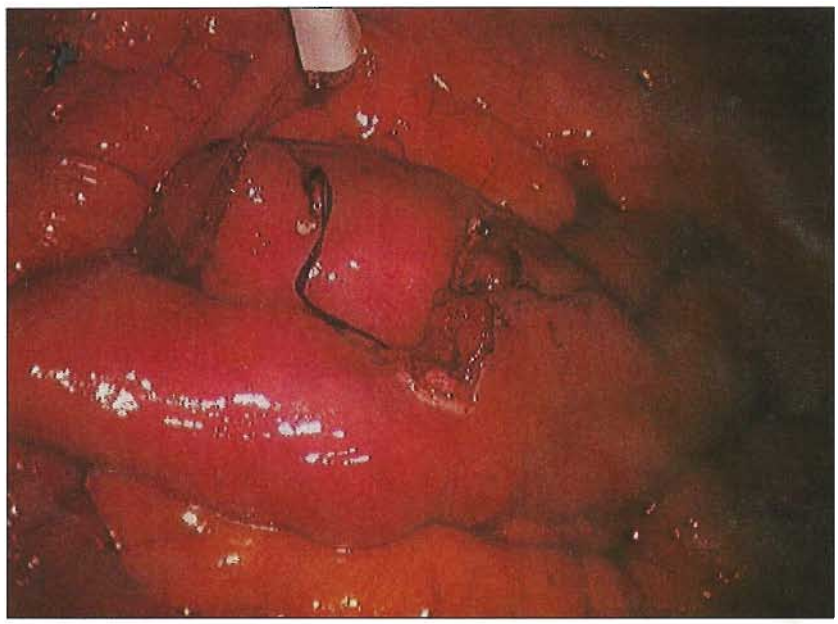

Figure 4. To position the bowel, it is rotated 90° and cephalad.

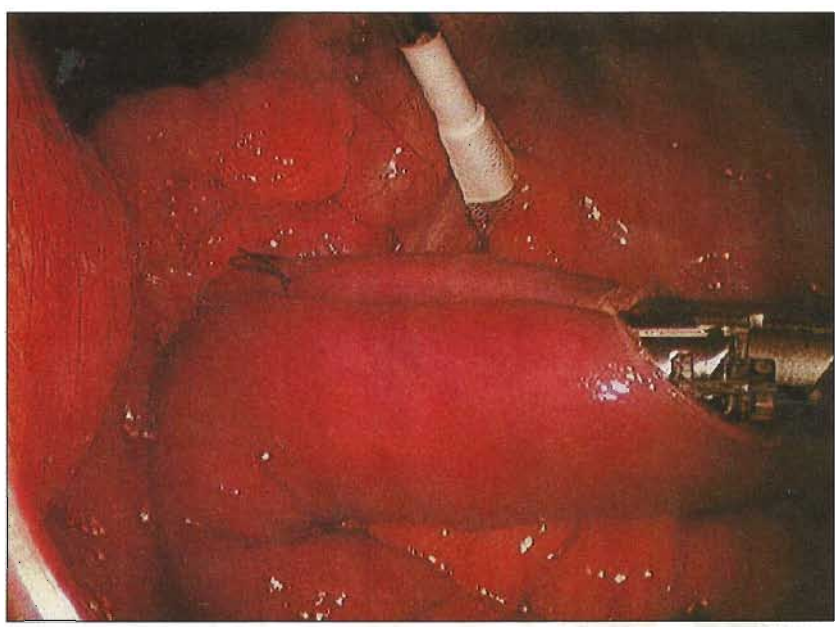

Figure 5. A laparoscopic linear cutter (from the left lateral port) is placed into the antimesenteric side of the 2 limbs. This firing is 180° from the firing position of the original staper.

Notably, the first 2 staples need to be fired on the antimesenteric border of the small bowel to avoid ischemia. Concern for the risk of devascularization exists during any anastomotic formation. If the first 2 staple lines are not placed on the antimesenteric side, the third staple line could cause devascularization, ischemia, and eventually leakage. If both staple lines are on the antimesenteric side of the bowel and the third staple line is placed perpendicular to those lines, devascularization is unlikely because each corner will be receiving its blood supply from the mesenteric side of the bowel, which should be intact.

The technique we have described can be performed with either laparoscopic or open gastric bypass surgery. In fact, we have used the triple-staple jejunojejunostomy for the formation of Roux-en-Y reconstructions in other gastrointestinal procedures. This method may also be used with enteroenterostomy in cases of malignant obstruction. The triple-stapling technique ensures a large patent anastomosis with a low risk of

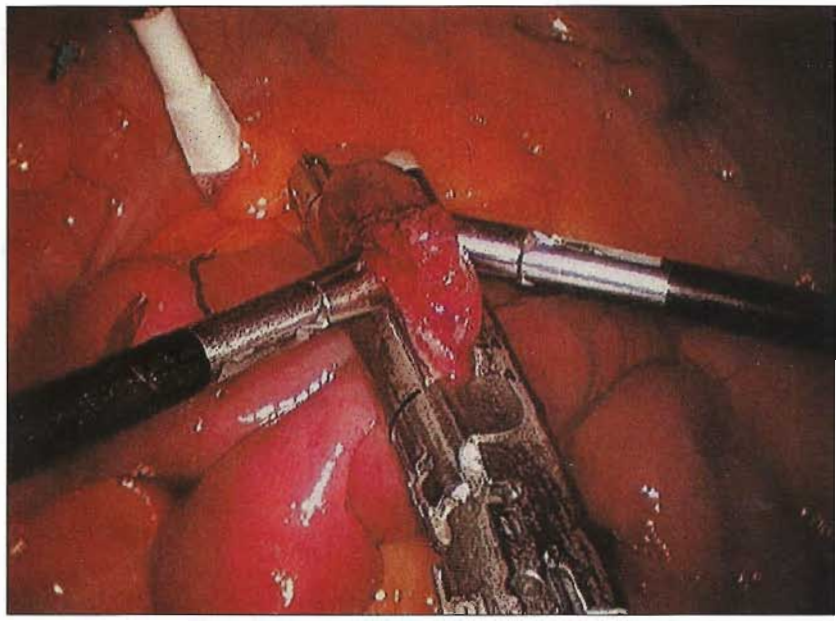

Figure 6. Another laparoscopic linear cutter (from the umbilical port) is used to close the common enterotomy.

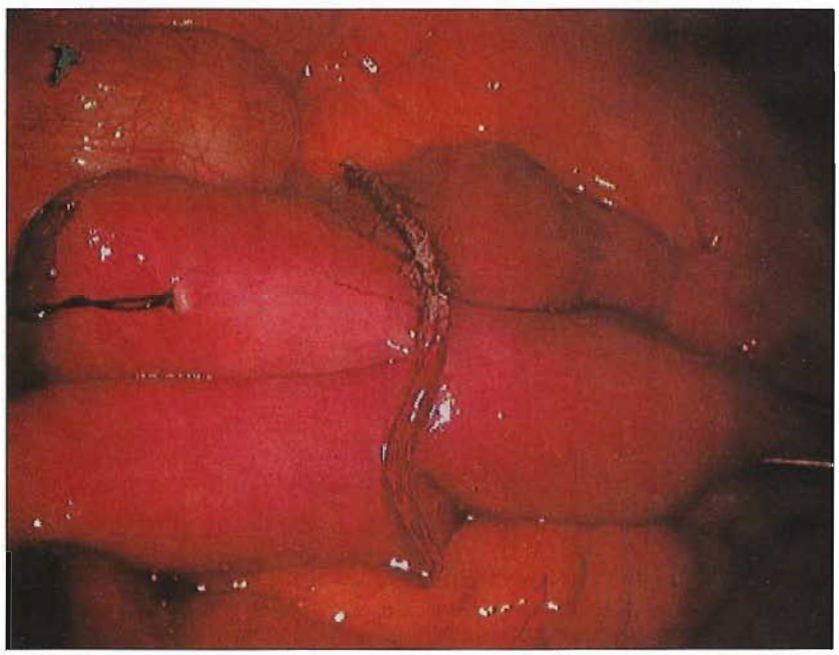

Figure 7. Anastomosis is demonstrated with no evidence of stenosis.

narrowing or obstruction due to postoperative edema or technical error.

By introducing this technique and combining it with the stapled gastrojejunostomy, we offer a relatively "sutureless" laparoscopic gastric bypass. Avoiding intracorporeal suturing may make this technically challenging operation easier for those who are in the early part of the learning curve for laparoscopic gastric bypass. However, the ability to suture is an important part of any gastric bypass procedure, even when using the triple-stapling technique. In many situations, laparoscopic suturing may be mandatory. Misfiring of the circular stapler or endoscopic staplers, tension on the gastrojejunostomy, leakage of the gastrojejunostomy, and inadvertent enterotomy are all clinical scenarios in which laparoscopic-suturing skills are needed to effectively perform laparoscopic gastric bypass surgery. It would be unwise to attempt a laparoscopic gastric bypass without the ability of advanced laparoscopic-suturing skills.

We have described a simple technique to create a laparoscopic jejunojejunostomy with a low risk of stenosis. This method of construction of the side-to-side (functional end-to-side) jejunojejunostomy accomplishes 3 major goals. First, the technique allows for a large patent anastomosis with almost no risk of stenosis. Second, a secure anastomosis is created. Finally, the anastomosis is performed in an expeditious manner. The triple-stapling technique is a safe, effective alternative that may be used in laparoscopic gastric bypass surgery or for any condition requiring enteroenteric anastomosis.

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