

Laparoscopic Roux-en-Y Gastric Bypass Utilizing the Triple Stapling Technique

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ABSTRACT

Objective: To evaluate the outcomes of a single surgeon's experience with laparoscopic Roux-en-Y gastric bypass (LRYGB) utilizing the triple stapling technique for creation of the jejunojejunostomy.

Methods: A retrospective review of patients who underwent LRYGB utilizing the triple stapling technique for creation of the jejunojejunostomy (JJ) between 10/01 and 12/04 was performed.

Results: LRYGB was performed in 435 consecutive patients. The mean age was 41 years (range, 14 to 68), and 82% were female. Mean initial body mass index was 50 (range, 35 to 91). One conversion to open (0.2%) was necessary. Mean operating time was 144 ± 26 minutes. Mean length of stay was 2.3 ± 1.5 days. There were 3 leaks at the gastrojejunostomy anastomosis (0.7%). No leaks occurred at the JJ anastomosis. One patient underwent revision of the JJ (0.2%) secondary to obstruction of the JJ on upper gastrointestinal study. Intraluminal bleeding occurred in 21 patients (4.8%). Patients required blood transfusion of 2.2 ± 1.1 units (range, 0 to 5), but none required surgical or endoscopic intervention. Mortality occurred in 2 patients (0.5%). Mean excess body weight loss was 72% at 1 year.

Conclusion: Construction of the jejunojejunostomy uti-

lizing the triple stapling technique is expeditious, safe, and associated with minimal complication.

Key Words: Minimally invasive surgery, Gastric bypass, Triple stapling technique, Gastrojejunostomy, Jejunojejunostomy, Stricture.

INTRODUCTION

The gastric bypass in its various forms has been performed since 1967.¹ In 1991, the National Institutes of Health issued a consensus statement advocating surgery as the most consistent and effective therapy for morbid obesity.² Since then, obesity has become an epidemic with obesity rates of more than 20% in many states.^{3,4}

With the advent of the laparoscopic technique in 1994,⁵ bariatric surgery has continued to expand dramatically from 6868 cases in 1996, 45473 cases in 2001, to 103 000 cases by 2003⁵⁻⁷ Improved results have been documented with increased hospital volume⁸ and surgeon experience.⁹

Many methods for laparoscopic construction of both the gastrojejunal (GJ) and jejunojejunal (JJ) anastomoses have been described.^{5,9,10-17} We describe our technique to minimize stricture or obstruction particularly of the JJ anastomosis. This represents a follow-up to our prior report describing the triple stapling technique for the jejunojejunostomy in 256 patients without incidence of obstruction or leak.¹⁵

METHODS

A retrospective analysis of patients from 10/01 to 12/04 who underwent laparoscopic Roux-en-Y gastric bypass (LRYGB) utilizing the triple stapling technique was done. Preoperative evaluation included routine ultrasonography of the gallbladder and esophagogastroduodenoscopy beginning in 10/03. The LRYGB was performed by or under the supervision of the principal author CTF at a university affiliated program that maintains a fellowship in minimally invasive surgery. The technique for LRYGB by CTF has been previously described.¹⁵

Briefly, a 25-mm circular EEA anvil (US Surgical, Norwalk,

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CT) was introduced transorally and brought out through the gastric pouch staple line after creation of an approximately 15-cc to 30cc lesser curvature based gastric pouch. The triple stapling technique (TST) for the jejunojejunostomy (JJ) was performed by utilizing 2 firings of a 45-mm to 2.5-mm stapler each 180 degrees apart followed by closure with a final 45-mm or 60-mm to 2.5-mm stapler (US Surgical, Norwalk, CT) or (Ethicon, Cincinnati, OH). The gastrojejunostomy (GJ) was created using an antecolic antegastric right oriented roux limb. The GJ anastomosis was tested intraoperatively with both air insufflation and methylene blue dye. Laparoscopic suture repair was used if a leak was demonstrated.

Patients were ambulated later on the day of surgery unless they were admitted to the intensive care unit (ICU). Deep venous thrombosis prophylaxis was done using postoperative enoxaparin. A water soluble upper gastrointestinal (UGI) radiological study was done on the morning of postoperative day 1. Demographic data, body mass index (BMI), operative data, and postoperative course were documented. Follow-up was carried out at 1 week, 1 month, 3 months, 6 months, 1 year, and yearly thereafter.

RESULTS

Laparoscopic gastric bypass was performed in 435 patients between 10/01 and 12/04. Patients' mean age was 41.1 years (range, 14 to 68), mean BMI was 49.7 (range, 35 to 91) and 82% were females.

One conversion to open (0.23%) was necessary secondary to severe adhesions in a patient with 3 prior abdominal operations. Mean operating time (excluding concomitant procedures) was 144±26 minutes. Estimated blood loss was 92±91 mL (range, minimal to 600 mL). Concomitant procedures performed included hiatal hernia repair in 16 patients (3.7%), cholecystectomy in 27 (6.2%), near total gastrectomy in 1 patient with a gastrointestinal stromal tumor, partial gastrectomy in 1 patient with an antral polyp, splenectomy for idiopathic thrombocytopenic purpura (1), partial left hepatic lobectomy for a symptomatic hemangioma (1), and partial small bowel resection (2) secondary to an unreducible intussusception (1), and jejunal diverticulum (1).

Postoperative day 1 UGI testing was negative in all cases. Ultimately, however, 3 leaks occurred at the GJ anastomosis (0.7%). All 3 patients underwent reoperation on postoperative day 9. Despite prolonged hospitalization, all 3 patients survived.

No leaks occurred at the JJ anastomosis. One patient with

a history of non-Hodgkin's lymphoma in remission (0.2%) had emesis and underwent repeat UGI that exhibited lack of progression of contrast beyond the JJ. The patient required revision of the jejunojejunostomy on postoperative day 6. The patient continued to deteriorate with very high fevers. He underwent further reoperation twice with fascial biopsies and washout; however, he eventually died on postoperative day 10. Autopsy did not reveal an intra-abdominal or systemic source of infection or rhabdomyolysis.

Intraluminal bleeding occurred in 21 patients (4.8%). Patients required transfusion of an average of 2.2±1.1 units (range, 0 to 5), but none required surgical or endoscopic intervention. Mean length of stay was 2.3±1.5 days.

Mortality occurred in 2 patients (0.5%). The first was described above; the other was a 68-year-old patient with renal failure on dialysis who underwent an uneventful surgery but died later the day of surgery from a cardiac arrhythmia.

Pulmonary embolism occurred in 5 patients (1.1%); none were fatal. Clinically evident deep venous thrombosis occurred in 7 cases (1.6%). GJ stenosis occurred in 4 patients (0.9%) and responded to endoscopic dilatation. In no circumstance was reoperation necessary.

Mean excess body weight loss was 72% at 1 year. Reoperation secondary to inadequate weight loss was required in 1 patient. The gastric pouch was made smaller and the patient subsequently had adequate weight loss.

DISCUSSION

The availability of laparoscopic bariatric surgery and its many benefits has been instrumental in the dramatic increase in the number of procedures.^{3,6,7,18} The learning curve has been stated as 100 cases⁹ while Nguyen et al⁸ have shown improved results with higher volume hospitals (>100 cases per year) with regard to length of hospital stay, morbidity rate, and mortality rate.

Many methods have been described for the construction of the jejunojejunostomy.^{12,15,19} Most authors utilize a double stapling technique that places the Roux limb at risk for stenosis and obstruction. Alternatively, many authors utilize a single stapling technique and subsequently close the enterotomy with a running suture. Leakage or dehiscence may occur with the use of absorbable suture.¹²

We feel that the best method to minimize the risk of stenosis, obstruction, or leak is the above-described triple stapling technique. Creation of a wide side-to-side jeju-

nojejunostomy and closure of the enterotomy in the center of this anastomosis has minimized the risk of stenosis or obstruction. It must be emphasized that particular attention must be given to avoid including the posterior wall when closing the enterotomy with the last firing of the stapler.

It remains unclear whether the cause of the afferent Roux limb obstruction in this series was due to obstruction from a technical error or possibly secondary to an obstructing clot.^{11,20} This patient had an unusual course with very high fevers reaching 107°F despite negative cultures, muscle, and fascial biopsies and a negative autopsy. The patient's prior history of non-Hodgkin's lymphoma may be related to the patient's deteriorating course and intense systemic inflammatory syndrome response. We have thereafter been cautious in performing LRYGB in patients with a prior history of treated malignant blood diseases.

We did not encounter any instances of internal herniation that we are aware of. Internal herniation has been documented in up to 4.5% of cases after laparoscopic retrocolic Roux-en-Y gastrojejunostomy.^{11,13,16,22} Champion and Williams²¹ documented a markedly reduced incidence of small bowel obstruction after changing from retrocolic to antecolic Roux-en-Y construction. The orientation of roux limb in antecolic Roux-en-Y gastric bypass has been shown to have significant impact. Changing from left to right orientation has decreased the rate of internal herniation from 9% to 0.5%.¹⁷ The transection of the jejunal mesentery with only 1 staple firing also pulls the JJ cephalad juxtaposed closely to the GJ anastomosis anterior to the colon and may also further reduce the likelihood of internal herniation. The absence of internal herniation in this series is therefore likely due to all of the above-mentioned factors.

In addition, no leaks have occurred at the JJ. Because leaks and anastomotic dehiscence as far as 7 weeks postoperatively¹² have been reported with the use of absorbable sutures, many authors have recommended the use of nonabsorbable suture to close the enterotomy defect. Leaks may also occur if the staple lines are too close together or are placed parallel to each other, thus resulting in ischemia with subsequent necrosis. The triple stapling technique utilizes coaxial followed by a perpendicular staple line and is therefore consistent and reproducible in avoiding ischemia and may be quicker in completing the JJ.

Intraluminal bleeding occurred in 21 patients (4.8%). Studies reveal a 1.1% to 3% incidence of gastrointestinal bleeding after laparoscopic gastric bypass.^{19,23} The cause of the higher incidence of GI bleeding in this series is unclear

because endoscopy is not used postoperatively secondary to concerns of disruption of the fresh anastomoses. We have altered our DVT prophylaxis regimen as enoxaparin is now given beginning 12 hours postoperatively. It is too early to know whether this will result in lower GI bleeding rates. Nevertheless, the intraluminal bleeding resolved spontaneously in each case with or without transfusion. In no case was reoperation necessary.

We only encountered 4 cases (0.9%) of GJ anastomotic stenosis. These were all amenable to endoscopic dilation without the need for reoperation. Studies typically document a 1.6% to 20% stenosis rate.¹⁹ In a study by Go et al,²⁴ a stenosis rate of 6.8% occurred at an average of 7.7 weeks (range, 3 to 24) postoperatively. Endoscopic dilatation was utilized an average of 2.1 times to relieve the stenosis with an ultimate 95% success rate and 3% complication rate that included 1 perforation. Utilizing a 25-mm circular EEA anvil placed transorally and brought out through the gastric pouch staple line may have resulted in the low stenosis rate seen in this series.

CONCLUSION

LRYGB is a safe and effective procedure. Construction of the jejunojunction utilizing the triple stapling technique is expeditious, safe, and associated with minimal complications.

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