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Laparoscopic Gastrojejunostomy for the Treatment of Gastric Outlet Obstruction

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ABSTRACT

Background and Objectives: Laparoscopic gastrojejunostomy (LGJ) has been proposed as the technique preferred over open gastrojejunostomy for relieving gastric outlet obstruction (GOO) due to malignant and benign disease. This study investigates the feasibility and safety of LGJ for GOO.

Methods: A retrospective review was performed of patients who underwent LGJ at Mount Sinai Medical Center from 2004 to 2008. Patient's operative course and long-term outcomes were collected.

Results: Twenty-eight patients were reviewed (16 had malignancy, 7 had PUD, 3 had Crohn's disease, and one had obstruction of unclear cause). Average operative time was 170 minutes, and estimated blood loss was 80cc. One case was converted to open; another had stapler misfiring. Patients regained bowel function at a median of 3 days and remained in the hospital for a median of 8 days. There were 4 major postoperative complications (14%): 1 anastomotic leak and 1 trocar-site hemorrhage requiring reoperation and 2 gastrointestinal bleeds requiring endoscopic intervention. There were 5 minor complications (18%), including a partial small bowel obstruction, 1 patient developed bacteremia, and 3 patients had delayed gastric emptying. One patient had persistent GOO requiring reoperation 3 months later.

Conclusion: LGJ can be performed for GOO with improved outcome and an acceptable complication rate compared to the open GJ reported in the literature.

Key Words: Gastrojejunostomy, Laparoscopic gastrojejunostomy, Gastric outlet obstruction, Peptic ulcer disease.

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INTRODUCTION

Gastric outlet obstruction (GOO) can be a consequence of advanced stages of several disease processes. Historically, peptic ulcer disease (PUD) was the primary and most common cause of GOO.[1–3] In the modern era of proton-pump inhibitors and eradication of *H. pylori*, GOO from PUD is a rare occurrence, and most are now due to periampullary malignancies.[4,5] The aim of surgery, especially for patients with advanced malignancies, is to re-establish oral intake and stabilize and improve quality of life.[6–8] Different modalities have been described for treating GOO. Open gastrojejunostomy (GJ) has been the traditional surgical approach.[9–11] However, patients with an open laparotomy, compared to laparoscopic surgery, tend to experience more pain and stay for a longer postoperative course in the hospital. With the prevalence of minimally invasive surgery, laparoscopic GJ has been proposed as a preferred technique to minimize patient morbidity and mortality.[10,12]

There is a paucity of data on the operative details and postoperative course of patients with laparoscopic gastrojejunostomy. This study aimed to investigate the feasibility and safety of laparoscopic gastrojejunostomy in relieving GOO in patients with malignant and benign disease.

METHODS

A retrospective review of patients who underwent laparoscopic gastrojejunostomy at Mount Sinai Medical Center, New York, New York, from 2004 to 2008 was performed. Cases were identified through the use of a hospital database. Records were reviewed with respect to patient demographics and outcomes, medical history, presenting symptoms, diagnostic workup, operative details, postoperative course, and pathologic characteristics. Long-term outcome and survival were determined by using the Social Security Death Index and hospital records. Institutional review board approval was obtained for this study.

Operative Technique

In this study, the abdomen was entered using either Veress needle insufflations or the Hasson technique. In gen-

eral, between 4 to 5 trocars were placed in the upper abdomen under direct vision, with 1 to 2 of these trocars being 12mm in size and the rest being 5mm. After placement of trocars, the greater curvature of the stomach was identified. The majority of the surgeries were antecolic GJ, given the increased risk for internal hernia with retrocolic GJ. The gastrocolic omentum was opened using an ultrasonic or Harmonic scalpel. The lesser sac was entered, and the distal stomach was identified. The position on the distal stomach for creation of the GJ was based on surgeon's preference. A loop of small bowel approximately 30cm to 50cm distal to the ligament of Treitz was chosen for the gastrojejunostomy. A laparoscopic stay suture was used to align the small bowel segment in an antecolic manner to the anterior or posterior wall of the stomach. Enterotomies were then made with cautery in both the jejunum and stomach. Two to 3 staplers were used to create the anastomosis. The common enterotomy was closed laparoscopically with 2 layers of sutures. A subsequent esophagogastroduodenoscopy and air leak test were performed in every case.

Complications

The complication rate was classified as 30-day postoperative complications, and separated into major and minor complications. A major complication was defined as any postoperative complications that were life threatening or required endoscopic or surgical intervention. Minor complications were those that were moderately severe but not life-threatening, such as infection, fever, or delayed gastric emptying (defined as the inability to tolerate liquid PO >7 days after surgery). These parameters were similar to ones used in prior studies on laparoscopic GJ.[13] In addition, the 30-day mortality rate was recorded.

RESULTS

Demographics

A total of 28 patients were reviewed. Average age was 68 (range, 25 to 99), and 64% were female. A CT was obtained in most of these cases, and sometimes an upper endoscopy was performed to make the diagnosis of gastric outlet obstruction.

Sixteen patients had malignancy as their cause of GOO, 7 patients had peptic ulcer disease, 3 patients had Crohn's Disease, and 1 patient had an obstruction of unknown cause **(Table 1)**. While all patients had symptoms of gastric outlet obstruction, 13 (46%) had gastrointestinal bleeding or were guaiac positive at the time of admission. Comorbidities were common with hypertension, coronary artery disease, diabetes, COPD, and HIV present in 67%, 33%, 15%, 11%, and 4%, respectively. Forty-four percent of patients with malignancy were immunosuppressed from chemotherapy, and 66% of Crohn's patients were on steroids at the time of surgery. Overall, 36% of patients were of poor nutritional status (albumin<3.0) perioperatively, with an average albumin level of 3.4 **(Table 2)**. Two patients were on preoperative TPN. One patient with metastatic colon cancer had been on TPN for 2 months prior to surgery, and postoperatively was discharged home tolerating a diet without TPN. The second patient had gastric cancer and had been on TPN preoperatively for 1 month; she was discharged home tolerating a diet without TPN. Twenty-four of the cases (86%) were elective, while 4 were gastric outlet obstructions requiring emergent surgery. For the elective cases, the duration of obstruction ranged from 1 week to 6 months.

Table 1.
Cause of Gastric Outlet Obstruction

Cause	No. of Patients	% of Total Patients
PUD	8	29%
Crohn's Disease	3	11%
Obstruction of Unknown Cause	1	4%
Malignancy	16	57%
Colon cancer	2	
Pancreatic cancer	4	
Gastric cancer	3	
Duodenal carcinoid	1	
Small bowel cancer	3	
Gallbladder cancer	2	
Neuroendocrine	1	

Surgical Outcomes

The average operative time was 170 minutes, with an average estimated blood loss of 80cc. Average ASA score was 3. There was no significant difference in outcomes due to surgeon's operative experience. Only one case was converted to open GJ after extensive adhesions were encountered, resulting in enterotomies. Another case had stapler misfire, which required an additional 2-layered suturing reinforcement of the anastomosis. Intraoperative esophagogastroduodenoscopy for this patient confirmed patent anastomosis without leak.

Table 2.
Patient Demographics

	No. of Patients	% of Patients
Age		
Average	67	
Range	25–99	
Sex		
Female	18	64%
Male	10	36%
Comorbidities		
Hypertension	18	67%
CAD	9	33%
DM	4	15%
COPD	3	11%
HIV	1	4%
GI Bleed or Guaiac Positive on Presentation	13	46%
Immunosuppressed	9	32%
Malignancy	7	44%
Crohn's Disease	2	66%
Poor Nutritional Status (albumin <3.0)	10	36%

Table 3.
Surgical Outcomes

Intraoperative	
Operation duration (average) (min)	170
ASA Score (average)	3
Estimate Blood Loss (average) (cc)	80
Conversion to open	1
Intraoperative complications (total)	2
Enterotomy	1
Stapler misfiring	1
Postoperative	
Length of stay (median, in days)	8
Regain of bowel function (median, in days)	
Liquid PO	3
Flatus or BM	3

Postoperatively, the median time it took patients to regain their bowel function was 3 days. They were placed on a clear diet by day 3 and on a regular diet by day 5. The median postoperative length of stay was 8 days (range 2 to 83) **(Table 3)**.

A total of 9 early postoperative complications occurred, requiring 2 reoperations and 2 endoscopic interventions. Two patients had bleeding from the gastrojejunostomy site on postoperative day 2 and 7. One was an arterial bleed at the gastric side of the anastomosis on postoperative day 2 that was controlled by epinephrine injection. The second patient had metastatic cholangiocarcinoma and PUD and was found to have a bleeding duodenal ulcer and small ulcer near the GJ anastomosis. Both of these areas were injected with epinephrine and electrocauterized.

Two of the 28 patients (7%) required reoperations. One patient had an anastomotic leak requiring open repair of GJ on postoperative day 5. This patient had an arduous postoperative course complicated by septic shock, respiratory failure necessitating a tracheostomy, and formation of an enterocutaneous fistula that was repaired 3 weeks later. She ultimately improved and was discharged to subacute rehabilitation 10 weeks after her initial surgery. The second patient had trocar site hemorrhage on postoperative day 3 and was taken back to the operating room.

The patient with the intraoperative misfiring of the stapler tolerated a regular diet initially, but then vomited on postoperative day 10 and developed a partial small bowel obstruction. The cause of this obstruction was unclear, but the symptoms resolved with 3 days of nasogastric tube decompression. This patient was discharged home on postoperative day 14 tolerating a regular diet.

The 5 patients described above had delayed gastric emptying due to their complications. In addition, 4 more patients had delayed oral intake postoperatively (>7 days). These 4 patients had prolonged postoperative ileus and were eventually able to tolerate a regular diet on postoperative day 8, 9, 11, and 28 **(Table 4)**.

There was one long-term failure of GJ. A patient with cholangiocarcinoma was discharged home tolerating a GI soft diet, but returned 3 months later with persistent GOO. He required an open jejunostomy tube and a gastrostomy tube for decompression.

DISCUSSION

Different modalities have been described for the treatment of GOO from advanced malignancy and benign disease. Open GJ used to be the only method to relieve GOO. Since the introduction of endoscopic stenting and laparo-

Table 4.
Postoperative Complications

	No. of Patients	% of Total
30-Day Postoperative Complications	9	
Major complications requiring intervention	4	14%
Trocar site bleed	1	
Anastomotic leak	1	
UGI bleed	2	
Minor complications	5	18%
Low grade SBO	1	
Delayed gastric emptying (>7 days)	4	
Long-term Complications		
Dysfunction of GJ	1	4%

scopic surgery, less invasive approaches are now more commonly being used. In this study, we reviewed our institution's experience of laparoscopic gastrojejunostomy as a treatment modality for GOO.

The operative time for laparoscopic GJ was on average 170 minutes, which was slightly longer than time for an open GJ procedure reported in literature (average, 115 minutes).[14–16] This was to be expected, because laparoscopic GJ is technically more difficult than open surgery. This operative time was also likely surgeon- and patient-dependent. Prior studies[16] have shown that operative time decreases as individual surgeons become more experienced. In addition, patients who were obese, had prior surgeries, or had significant disease burden in the area would require a longer time for dissection. As anticipated, the estimated blood loss was nominal for laparoscopic GJ (average, 80cc), and considerably less than that with open procedures. Previous studies[12,15,17] had shown that open GJ could have an estimated blood loss of between 140cc to 270cc.

The median length of postoperative hospital stay found in this study was 8 days, which is shorter than the reported length of stay for open cases. Jeurnink et al[13] performed a systemic review of published series on GJ between 1996 and 2006. Of the 297 cases of GJ, 226 patients had open GJ, and their average length of stay ranged from 8.5 days to 24 days. Patients in this study had a median time to solid food intake of 5 days, which was comparable to that of laparoscopic GJ cases cited in the literature. Alam et al[18] and Kazanjian et al[19] both reviewed patients with GOO secondary to inoperable cancer and found the median time to solid food after laparoscopic GJ to be 4 days. In contrast, open GJ generally required 7 days before a patient could resume solid food.[15] These data show that laparoscopic GJ can achieve excellent results with reduced intraoperative blood loss, earlier recovery of oral feeding, and shorter length of stay than open GJ can. For patients with malignancy as their underlying cause of GOO, laparoscopic gastrojejunostomy, as expected, did not improve their overall survival. The lifespan for these patients ranged from 3 months to 1½ years after laparoscopic GJ. However, laparoscopic GJ did allow for earlier recovery and shorter length of stay in the hospital. In addition, open surgery always carries the risk of development of an incisional hernia postoperatively. In this study, none of the patients had a documented incisional hernia that required repair on follow-up.

In a group of 28 laparoscopic GJ, the major complication rate was 14%, which is comparable to the complication rate in prior laparoscopic GJ studies, and comparable to, if not better than, that of open GJ. In the Jeurnink et al[13] systemic review of open and laparoscopic GJ, major complication was defined in similar terms as those used in our study. They found a major complication rate of 0% to 31% after laparoscopic GJ, and 0% to 88% after open GJ. In this study, the most common complication was delayed gastric emptying. Guzman et al[12] also found delayed gastric emptying as the most common complication in 4 of their 20 patients (20%) after laparoscopic GJ. Brune et al[20] also had similar results, with delayed gastric emptying in 3 of 16 patients (18%).

Our study has several limitations. This was a review of our institution's experience with laparoscopic GJ for GOO, and these results may not apply to other institutions. However, our results were similar to results of prior studies on laparoscopic GJ that suggest that laparoscopic GJ has better outcomes than open GJ has. A second study will be needed to compare laparoscopic GJ to case-controlled open GJ cases. This will allow for a direct comparison of the perioperative variable and outcome of open versus laparoscopic GJ for patients with similar underlying causes of GOO and comorbidities. In addition, further study should examine the efficacy and feasibility of laparoscopic GJ in patients with different underlying disease processes.

CONCLUSION

Laparoscopic GJ has become more recognized as an acceptable alternative to open GJ for the treatment of GOO. This study supported the applicability of laparoscopic GJ

in relieving GOO for patients with benign and malignant disease. Patients in this study had reduced intraoperative blood loss, earlier recovery of oral feeding, and shorter length of stay than patients who underwent open GJ. Laparoscopy was safe and carried a comparable, if not lower, morbidity and perioperative mortality compared to that reported in open GJ studies.

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