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Proximal Gastrectomy Is a Viable Alternative to Total Gastrectomy in Early Stage Proximal Gastric Cancer

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ABSTRACT

Background: Total gastrectomy with Roux-en-Y esophagojejunostomy is a life-extending procedure for patients with nonmetastatic proximal gastric and gastroesophageal junction adenocarcinoma, yet it can be a life-altering procedure with negative impact on quality of life.[1] Perioperative recovery often involves the need for supplemental nutrition (either enteral or parenteral). Furthermore, long-term effects of early satiety, dysphagia, sustained weight loss, and difficulty in maintaining a healthy weight, dumping syndrome, and intestinal overgrowth are not unusual. Although the alternative of untreated cancer is clearly unacceptable, these lifestyle consequences are not benign.

Methods: A retrospective review of patients who had undergone laparoscopic total and proximal gastrectomy for gastric adenocarcinoma was conducted. Patient demographic data, pathologic parameters, and short-term and long-term clinical data were compared between total gastrectomy and proximal gastrectomy cohorts.

Results: Seventeen patients were included in the study: 13 had undergone laparoscopic total gastrectomy (LTG) and 4 had undergone laparoscopic proximal gastrectomy (LPG). Patients who had LPG, given the nature of the procedure, were confined to early stage (up to T2) tumors in the gastric cardia or GE junction. Patients who had LTG tended to be larger, later stage tumors (but not exclusively). The mean operative time was greater for LTG than for LPG (247 ± 54 versus 181 ± 49 min, respectively, $P = .036$). Length of hospital stay (9.0 ± 3.2 versus 5.0 ± 0.8 days, $P < .001$) and readmission for postoperative complication (38.5 versus 0%, $P = .009$) were also higher in the LTG group. There was no significant difference in terms of mean estimated blood loss or blood transfusion rates, overall complications, or anastomotic stricture requiring endoscopic dilation between the patients who underwent LTG and those who underwent LPG.

Conclusion: In early stage tumors (T1b or T2), proximal gastrectomy (PG) should be considered to mitigate diminished quality of life. PG with esophagogastrostomy, which can easily be performed minimally invasively, can be more tolerable for the patient, with no anatomic basis for dumping syndrome or small intestinal bacterial overgrowth (SIBO), and a greater reservoir for more normal meal habits when compared to total gastrectomy (TG) with Roux-en-Y reconstruction.

Key Words: Gastric cancer, Total gastrectomy, Proximal gastrectomy.

INTRODUCTION

There is a growing body of evidence that very early gastric cancer, stage T1a, is safely and successfully treated by endoscopic resection techniques such as endoscopic submucosal dissection (ESD).[2–6] For more advanced staged tumors in the prepyloric region, antrum or distal body, a distal gastrectomy with lymphadenectomy is appropriate. For more broad-based or larger tumors in the proximal stomach or at the gastroesophageal (GE) junction, a total gastrectomy is often necessary. TG, in comparison to partial gastrectomy, harbors a greater risk of postoperative complications as well as a

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dramatic change in eating habits for the rest of the patient's life.[7] Analogous to endoscopic resection for T1a tumors, early gastric cancers (T1b, T2) may be treated by parenchymal-sparing surgery as well. Although not popular in the West, proximal gastrectomy has been reported in the Eastern literature to have acceptable oncologic outcomes as well as higher quality of life.

PATIENTS AND METHODS

Study Population

All patients who underwent total gastrectomy with Roux-en-Y esophagojejunostomy or proximal gastrectomy for gastric adenocarcinoma at Columbia University Irving Medical Center, New York, by a single surgeon between Jan 2013 and Sep 2020 were reviewed for this series. All procedures were performed laparoscopically. Patient demographics, intraoperative and postoperative data, neoadjuvant and adjuvant treatment, and pathologic analysis were obtained by retrospective review of the electronic health records. Preoperative variables obtained include gender, age, body mass index (BMI), American Society of Anesthesiologists (ASA) classification, and the Charlson Comorbidity Index (CCI) [https://www.mdcalc.com/charlson-comorbidity-index-cci]. In addition, preoperative tumor characteristics including endoscopic ultrasonography (EUS) staging (if available) as well as neoadjuvant therapy were included. Operative variables included type of operation, tumor location, operative duration, estimated blood loss (EBL), intravenous (IV) fluid volume infused, and blood transfusion. Pathologic variables included tumor grade, greatest dimension, involvement of the gastroesophageal (GE) junction, margin status, number of lymph nodes harvested, number of positive lymph nodes, human epidermal growth factor receptor 2 (HER2) expression, combined positive score (CPS), mismatch repair status, and tumor node metastasis (TNM) stage according to American Joint Committee on Cancer (AJCC) guidelines.[8] Postoperative data included length of hospital stay, need for supplemental nutrition after discharge (enteral via jejunostomy tube or parenteral), postoperative surgical complications (Clavian-Dindo classification),[9] and adjuvant therapy. Specific long-term considerations for this analysis included the incidence of anastomotic stricture, number of endoscopic dilations for stricture, postoperative weight loss, and BMI 6 months after procedure.

Patient Selection

Patient selection for either LPG or LTG was based on recommendations by the surgeon considering tumor stage. If a LPG was recommended the option of a LTG was also offered. The advantages, disadvantages, and possible complications of both treatment modalities were clearly discussed with the patients. Dietary counseling including expectations for diet advancement were given by a registered dietitian (RD) before surgery and followed subsequently after discharge. All patients were educated on the types of food and beverages to consume after surgery, and patients who were planning to undergo a LTG were aware a feeding tube would be placed during surgery. Written informed consent was obtained from all patients before the operation. Patients with tumors staged T4 or greater, or those with geographic location distal to the cardia were not offered LPG. Patients were not excluded based on demographic factors, such as age, BMI, or previous surgery. All surgeries were performed by the same surgeon, with a standardized procedure. All patients underwent the appropriate preoperative imaging to assess tumor resectability and stage. Neoadjuvant chemotherapy was recommended for all tumors staged T2 or greater on endoscopic ultrasound.

Operative Technique

All procedures were performed minimally invasively with laparoscopic techniques, and all included adequate lymphadenectomy.[10] After induction of general endotracheal anesthesia the patient is placed in supine position. Steep reverse Trendelenburg is utilized to aid in exposure of the operative field. The lead surgeon stands on the patient's right side, the assistant surgeon on the patient's left side. Pneumoperitoneum to 15-mm Hg is established via Veress needle technique in the left upper quadrant, below the costal margin in the midclavicular line. A 5-mm trocar is placed on the patient's right upper abdomen in the midclavicular line, between the umbilicus and costal margin. A 30-degree laparoscope is introduced and the hepatic and peritoneal surfaces are inspected for occult tumor deposits. Two additional 5-mm trocars are placed on the left side under direct vision, and a 15-mm trocar is placed in the supraumbilical position. A self-retaining liver retractor is placed in the subxiphoid position to retract the left lobe of the liver anteriorly. **Figures 1** and **2** show the trocar placement scheme for LTG and LPG, respectively.

For LPG, if the tumor is not obvious on inspection of the serosal surface of the stomach, a diagnostic upper

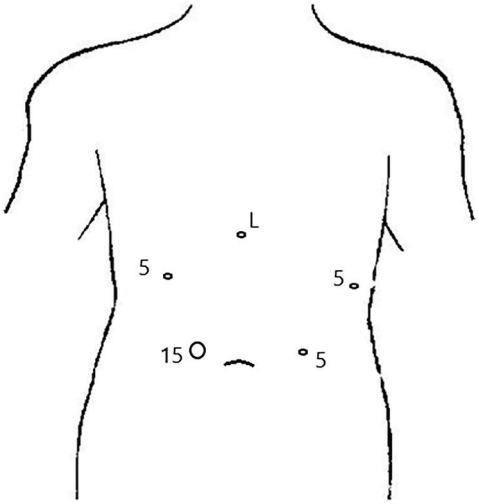

Figure 1. Intraoperative trocar placement for laparoscopic total gastrectomy. "5" denotes a 5-mm trocar, "15" denotes a 15-mm trocar, and "L" denotes a self-retaining liver retractor. The 15-mm trocar is just to the right of midline to facilitate comfortable Roux limb reconstruction (jejunojejunostomy). The 15-mm trocar incision is enlarged at completion of the case for specimen extraction.

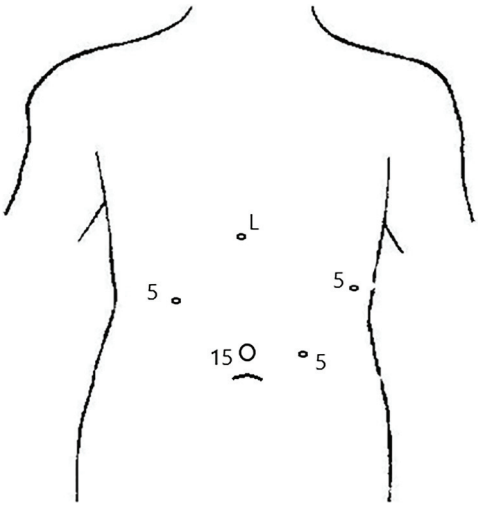

Figure 2. Intraoperative trocar placement for laparoscopic proximal gastrectomy. "5" denotes a 5-mm trocar, "15" denotes a 15-mm trocar, and "L" denotes a self-retaining liver retractor. The 15-mm trocar is midline and supraumbilical. The 15-mm trocar incision is enlarged at completion of the case for specimen extraction.

endoscopy is performed for localization and resection planning. The lesser sac is entered through an avascular plane in the gastrocolic omentum at approximately the midbody of the stomach. The dissection is carried proximally with a laparoscopic vessel sealing device (Ligasure LF1937 Maryland Jaw Laparoscopic Sealer/Divider, Covidien/Medtronic, Minneapolis, MN, USA), dividing the short gastric vascular bundles, to liberate the proximal greater curve of the stomach to the angle of His. In like fashion the lesser curve of the stomach is mobilized by entering the pars flaccida and carrying the dissection through the lesser curve fatty tissues to the gastroesophageal junction. The peritoneal reflection at the gastroesophageal junction is incised and the distal esophagus mobilized carefully to avoid entering the pleural cavity. The dissection is carried as far proximally as possible to ensure adequate mobility of the esophagus and a tension-free anastomosis, generally to the level of the pulmonary veins. Adjoining lymphatic tissue is dissected to remain with the specimen.

Distally the point of resection is approximately one-fourth distal to the GE junction, encompassing the cardia and proximal fundus, with goal of negative surgical margins. The stomach is divided with a linear stapler with successive firings of 40.5-mm staple loads (Echelon Flex PSEE60A, Ethicon US LLC, Somerville, NJ, USA). The esophagus proximal to the point of resection (just proximal to the GE junction) is sutured on the right and left to the crura of the diaphragm to avoid retraction into the mediastinum once the esophagus is divided. The left gastric vascular bundle is divided with a 20.5-mm staple load, dissecting this lymph node station to be included with the specimen. The esophagus is divided with a linear stapler with a 30.5-mm staple load. The specimen is placed in a specimen pouch for later retrieval.

At this point an adequate lymphadenectomy (AL) per 2020 NCCN guidelines (16 or more lymph nodes) [National Comprehensive Cancer Network guidelines version 3.2020 Gastric Cancer] is performed, skeletonizing the common hepatic, splenic and left gastric (if not removed with division of the left gastric vascular bundle) arteries by clearing them of surrounding fatty lymphatic tissues (D2 lymph node dissection). This is easily achieved with electrocautery using a hook device. This surgeon favors this approach over other energy devices as thin amounts of tissue can be safely and methodically divided, reducing the chance of injury when compared to using a jawed device such as bipolar shears or ultrasonic shears. This lymphatic tissue is removed separately from the gastric specimen.

The reconstruction then ensues as follows. An esophagogastrostomy is created between the distal esophagus and

the proximal stomach along the greater curve using a linear stapling technique. A gastrotomy is created along the greater curve approximately 6 cm from the staple line. The esophagus staple line is excised with shears. The stomach is brought to lie posterior to the esophagus without tension, and the stapler is inserted into the esophageal opening and the gastrotomy. The stapler is then fired. The resulting common enterotomy is then closed in handsewn fashion in one layer with a braided absorbable suture (2-0 Polysorb, Covidien/Medtronic, Minneapolis, MN, USA). Endoscopy is performed to assess for intraluminal bleeding, patency of anastomosis, and air insufflation test for leak. After final inspection of the peritoneal cavity for hemostasis, the trocars and liver retractor are removed and the abdomen is allowed to desufflate. The 1-mm trocar site is enlarged to accommodate removal of the specimen. The specimen is inspected for negative gross surgical margins of at least 5 cm. The fascia at the specimen extraction site and the skin incisions are reapproximated in usual fashion.

For LTG, upper endoscopy prior to resection is generally not required. An omentectomy is performed with the vessel sealing device. The proximal gastric dissection and division of the esophagus is identical to LPG. Distally the dissection is carried to the first portion of the duodenum, which is divided with a linear stapler with a 30.5-mm load reinforced with buttress material (Seamguard, WL Gore and Associates, Newark, DE, USA). Care is taken to include lymphatic tissue around the cardia, greater and lesser curvature, and supra- and infrapyloric nodes. The specimen is placed in a specimen pouch for later retrieval. Completion of lymph node dissection is conducted as for LPG.

The reconstruction requires the creation of a Roux limb. The jejunum is divided about 40 cm distal to the ligament of Treitz with the linear stapler with a 20.5-mm staple load. A jejunojejunostomy is created between the proximal divided limb and a point on the jejunum about 40 cm distal to the point of division, with a linear stapler. The common enterotomy is closed with a linear stapler. The mesenteric defect is closed with running absorbable suture (absorbable suture should cause sufficient tissue reaction to permanently close the defect, even after the suture material dissolves; in contrast, a nonabsorbable suture may present a lead point for further intussusception or bowel obstruction) . The distal end of the divided jejunum is brought to the esophagus in an antecolic fashion. Antecolic is preferred over retrocolic to decrease the potential for internal hernias; in the nonobese patient tension on the anastomosis has not proven to be an issue. An anastomosis is created using a single layer of running, braided absorbable suture (3-0 Polysorb, Covidien/Medtronic, Minneapolis, MN, USA). Endoscopy is performed to inspect the intraluminal surface of the anastomosis for bleeding, assess for patency of the anastomosis, and perform a leak test with air insufflation.

A feeding jejunostomy tube is placed distal to the jejunojejunostomy. A 12 French pediatric MIC gastrostomy tube (Kimberly-Clark/Avanos, Alpharetta, GA, USA) is placed through the abdominal wall and then directly into an enterotomy. The jejunum is secured with four silk sutures to the anterior abdominal wall. The tube is secured to the skin with nylon sutures. Specimen extraction and closure proceed as with LPG.

Postoperative care included an opiate-sparing strategy for pain management, venous thromboembolism prophylaxis, a proton-pump inhibitor for LPG, and gradual resumption of an oral diet. Patients were offered a low sugar clear liquid diet the first operative day, and advanced to a low-sugar pureed diet as tolerated. Routine fluoroscopic examination of the anastomosis is not performed postoperatively (intraoperative leak test is performed on all patients prior to close). Most LTG patients (11/12) were started on continuous jejunal tube feeds on the first postoperative day at 10 mL/hour. The enteral nutrition rate was advanced as tolerated towards the goal rate, determined by the RD. Tolerance to oral diet and tube feeds were assessed by the presence of nausea and/or vomiting and bowel function. Patients with a feeding tube were discharged with enteral nutrition cycled overnight and instructions to eat a low-sugar pureed diet during the day. After discharge, patients met with the RD to continue advancing diet to low fiber, and eventually regular. In the cohort of patients with a feeding tube, once they were able to meet >/= 60% of their estimated nutrient needs by mouth, as determined by the RD, enteral nutrition was stopped and the feeding tube was subsequently removed.

Statistical Analysis

All statistical analyses were performed with Stata statistical software (StataCorp LLC., College Station, TX, USA). All data were summarized as mean ± SD or medians (interquartile ranges, IQRs) for continuous variables or as frequencies and percentages for categorical variables. Patients who underwent LTG were compared with those who underwent LPG using *t* tests on the continuous data (run with unequal variances due to small sample size) and Fisher's exact test for categorical variables.

Table 1.
Demographic Characteristics and Preoperative Factors of All Unmatched Patients Who Underwent Laparoscopic Total Gastrectomy (LTG) or Laparoscopic Proximal Gastrectomy (LPG)

	LTG (n = 13)	LPG (n = 4)	*P* Value
Age, years (mean ± SD)	64.8 ± 14.4	64.0 ± 8.9	0.445
Sex, n (%)			0.367
Female	5 (38.5)	2 (50.0)	
Male	8 (61.5)	2 (50.0)	
BMI, kg/m^2 (mean ± SD)	27.0 ± 4.6	28.4 ± 8.2	0.388
ASA score, n (%)			0.129
Class I	0 (0.0)	0 (0.0)	
Class II	5 (38.5)	1 (25.0)	
Class ≥ III	8 (61.5)	3 (75.0)	
Charlson comorbidity index (mean ± SD)	5.4 ± 1.9	4.5 ± 1.0	0.128
Preoperative EUS stage			
N/A	3	2	
T1	0	0	
T2	2	2	
T3	4	0	
T4	4	0	
Neoadjuvant chemotherapy			0.455
No	7 (53.8)	2 (50.0)	
Yes	6 (46.2)	2 (50.0)	

Differences with *P* values < .05 ($P < .05$) were considered statistically significant.

RESULTS

Comparative Analysis between LTG and LPG Groups: Unmatched Patients

Of the 17 patients included, 13 underwent LTG and 4 underwent LPG. The LPG patients all occurred in the last four years of the seven year timeline. The detailed demographic characteristics of the patients in the two groups are shown in **Table 1**. There were no significant differences in sex, mean age, BMI, ASA classification, or median CCI between the two groups. Criteria for consideration of LPG was in part a lower preoperative T stage, thus the propensity for higher EUS T stage in the LTG group. Neoadjuvant chemotherapy was offered to all patients with biopsy-proven adenocarcinoma with endoscopic T stage 2 or greater and this was not significantly different.

Perioperative Outcomes

Perioperative outcomes are presented in **Table 2**. The LTG group had a significantly longer operation time than the LPG group (247 ± 54 versus 181 ± 49 min, respectively, $P = .036$). Length of hospital stay was also greater for the LTG group (90.0 ± 30.2 versus 50.0 ± 0.8 days, $P < .001$). In addition, readmission for postoperative complication was higher in the LTG group (380.5 versus 0%, $P = .009$). Immediate postoperative complications (<90 days) included superficial wound infections in two LTG patients, and poor tolerance of oral nutrition requiring readmission in three LTG patients. Four of the LTG patients required anastomotic dilation within the first 90 days postop. Two of the LPG patients required endoscopic dilation, both greater than 90 days from surgery. There were no anastomotic leaks or thrombotic events in either group. There was no significant difference in terms of mean estimated blood loss or blood transfusion rates, overall complications, or anastomotic stricture requiring endoscopic dilation between the patients who underwent

Table 2.
Perioperative Outcomes of All Unmatched Patients Who Underwent Laparoscopic Total Gastrectomy (LTG) or Laparoscopic Proximal Gastrectomy (LPG)

Characteristics	LTG (n = 13)	LPG (n = 4)	*P* Value
Operative time, min (mean ± SD)	247 ± 54	181 ± 49	0.036
Transfusion, n (%)			>0.999
No	13 (100)	4 (100)	
Yes	0 (0)	0 (0)	
Length of hospital stay, days (mean ± SD)	9.0 ± 3.2	5.0 ± 0.8	<0.001
Complications, n (%)			>0.999
Grade 0-I	13 (100)	4 (100)	
≥Grade II	0 (0)	0 (0)	
Readmission due to complication, n (%)			0.009
No	8 (61.5)	4 (100)	
Yes	5 (38.5)	0 (0)	
Anastomotic stricture requiring dilation, n (%)			0.367
No	8 (61.5)	2 (50)	
Yes	5 (38.5)	2 (50)	

LTG and those who underwent LPG. Mean length of follow-up for LPG was 20.5 months, for LTG it was 32 months.

Pathologic Findings

The pathological characteristics of the patients are summarized in **Table 3**. As expected from patient selection characteristics patients who underwent LPG tended to have smaller (20.2 ± 0.8 cm versus 40.6 ± 40.3 cm), lower grade tumors (G2: 25 versus 150.4%; G3: 50 versus 690.2%), although the AJCC T stage, as well as N stage, was not significantly different between the two. Other tumor characteristics including HER2 status, combined positive score (CPS) for PDL1, and involvement of the gastroesophageal junction were not significantly different. The LTG specimens had a larger number of total harvested lymph nodes (27 ± 14 versus 18 ± 2, $P = .016$). The pathological results showed no difference in the rate of complete (R0) resection as all patients had an R0 resection.

DISCUSSION

Advances in the understanding of gastric cancer risk and screening, as well as in systemic therapies, have led to an improved prognosis for many patients afflicted with the disease. For nonmetastatic but diffuse cancers one critical part of treatment may need to be total gastrectomy, a life-extending but significantly life-altering procedure. Historically in the Western world localized proximal cancers were often treated with total gastrectomy, as misconceptions of functional and oncologic outcomes drove a more morbid operation.[11] Yet in cases of early stage cancers of the cardia, a proximal gastrectomy may be appropriate. A deterrent to Western surgeons from adopting this technique includes lack of experience, as relatively fewer tumors would be appropriate for a proximal resection. In addition, a plethora of complicated reconstruction techniques emerging mainly from the East likely also discourage Western surgeons from considering this option.[12–15]

In this small case series we compared the perioperative factors as well as pathologic characteristics between LTG and LPG, including the need for endoscopic dilation for severe anastomotic stricture. We found that there did not appear to be any significantly different oncologic or early functional outcomes for LPG for a selected group of early-stage tumors, with obvious benefits of shorter duration of operation, decreased length of hospital stay, and no need for enteral (nonoral) supplementation. The authors recognize that patients with more advanced stages of cancer,

Table 3.
Pathologic Findings of All Unmatched Patients Who Underwent Laparoscopic Total Gastrectomy (LTG) or Laparoscopic Proximal Gastrectomy (LPG)

Characteristics	LTG (n = 13)	LPG (n = 4)	*P* Value
Tumor size, cm (mean ± SD)	4.6 ± 4.3	2.2 ± 0.8	0.048
Involves gastroesophageal (GE) junction, n (%)			0.370
No	11 (84.6)	3 (75)	
Yes	2 (15.4)	1 (25)	
Tumor grade, n (%)			0.046
G1	0 (0)	0 (0)	
G2	2 (15.4)	1 (25)	
G3	9 (69.2)	2 (50)	
HER2, n (%)			0.085
No	7 (53.8)	3 (75)	
Yes	2 (15.4)	0 (0)	
CPS (combined positive score), n (%)			0.454
< 1	1 (7.7)	1 (25)	
> 1	5 (38.5)	2 (50)	
Number of harvested LN, n (mean ± SD)	27 ± 14	18 ± 2	0.016
Resection margin status, n (%)			>0.999
Negative (R0)	13 (100)	4 (100)	
Positive (R1)	0 (0)	0 (0)	
AJCC 7th T stage, n (%)			0.413
T1 (a + b)	3 (23.1)	1 (25)	
T2	1 (7.7)	1 (25)	
T3	5 (38.5)	1 (25)	
T4	3 (23.1)	1 (25)	
AJCC 7th *N* stage, n (%)			0.063
N0	7 (53.8)	3 (75)	
N1	1 (7.7)	1 (25)	
N2	1 (7.7)	0 (0)	
N3 (a + b)	3 (23.1)	0 (0)	

AJCC, American Joint Committee on Cancer.

who underwent LTG, were likely more prone to complications than patients with lower stages of cancer and underwent LPG. Importantly all resections were R0, as one cannot compromise complete surgical resection of cancer in favor of any other purported benefit when the cure is the goal. In addition, all resections yielded an adequate number of lymph nodes for proper staging per AJCC guidelines. Our experience also shows that with reasonably aggressive but not onerous remnant and esophagus mobilization a straightforward direct anastomosis is entirely possible with resection of the proximal one-fourth (cardia) of stomach. In this series the LPG anastomosis was a linear stapled technique with a hand-sewn closure of the common enterotomy, although other techniques including circular stapled or totally handsewn are certainly applicable. In terms of function, the

esophagogastric anastomosis appears to be no more prone to stricture than the esophagojejunal anastomosis, and both can be ameliorated with consistent endoscopic dilation when symptomatic. Clear benefits for proximal gastrectomy as described include decreased duration and complexity of operation with no need for a Roux reconstruction, as well as decreased length of hospital stay. Although quality of life analysis was not the intent of this report, most authors have reported better quality of life after PG when compared to TG,[16–19] where PG patients had a higher incidence of reflux but a better overall QOL score using the Post-Gastrectomy Syndrome Assessment Scale (PGSAS)–45.

It should be mentioned that this case series inherently holds selection bias, and a randomized comparison was not the goal of this report. Although these results are not a rigorous, generalizable study, we intend to present a potentially more favorable option to be considered when surgically treating early, proximal gastric cancers.

CONCLUSION

This single-center, single surgeon case series comparing laparoscopic total gastrectomy to laparoscopic proximal gastrectomy demonstrates that LPG may be considered a safe alternative to LTG in relatively early proximal gastric cancer. Although the readmission rate for LTG was higher, the overall complication profile between the two was similar, including need for anastomotic dilation for stricture. Importantly pathologic results were not impacted by choice of resection. Longer term results including recurrence and cancer-free survival are not explored in this manuscript, although certainly if early recurrence (which is not predicted based on pathology) were noted in the LPG group, application of this technique would need reassessment.

In summary, this case series, although not a rigorous, matched comparison of two techniques, offers the possibility of LPG as a viable alternative to LTG in certain cases of early proximal gastric cancer, with or without the application of neoadjuvant chemotherapy. In this case series LPG had shorter procedure time, shorter length of stay, and lower readmission rate. Straightforward direct esophagogastric anastomosis is likely a reasonable option for reconstruction in early cancers where an R0 resection can be achieved with a resection of the cardia. Further studies validating and comparing various methods of reconstruction after proximal gastrectomy are needed, particularly from Western centers, where proximal gastrectomy is possibly applied much less frequently than in the East. Future studies should be directed toward determining which early gastric cancers would be amenable to endoscopic techniques, where morbidity is potentially much smaller. Certainly at this time it total gastrectomy with Roux-en-Y esophagojejunostomy remains the gold standard for advanced proximal gastric cancer.

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