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Comparison of Proximal Versus Total Gastrectomy in the Surgical Treatment of Proximal Gastric Cancers

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ABSTRACT

Objective: The shift in stomach cancer localization has led to new perspectives in the treatment of proximal one-third of the stomach cancer, focusing on the type of resection between total gastrectomy and proximal gastrectomy. We compared the results of patients with proximal gastric cancer, which were treated either with PG or TG regarding postoperative complications, symptoms of reflux esophagitis, the number of dissected lymph nodes, short-term survival, and the compliance to the postoperative planned diet.

Materials and Methods: This study included 58 patients who underwent surgery for proximal gastric adenocarcinoma. Of the patients, 32 patients underwent total gastrectomy, while 26 patients underwent proximal gastrectomy. The total and proximal gastrectomy groups were retrospectively compared concerning the number of lymph nodes dissected, postoperative reflux symptoms, dietary compliance, and short-term survival.

Results: Reflux symptoms were seen in 10 patients (31.2%) who underwent total gastrectomy versus in 12 patients (46.1%) treated with proximal gastrectomy ($p=0.08$). Mean number of lymph nodes dissected was 24.6 ± 13.5 in patients treated with total gastrectomy, whereas 18.8 ± 6.1 in patients who underwent proximal gastrectomy ($p=0.06$). Dietary compliance was better in the PG group ($p=0.03$), while no significant differences were detected between groups about postoperative complications and short-term survival.

Conclusion: In the surgical treatment of proximal gastric cancers, proximal gastrectomy performed using an anti-reflux technique, maybe an alternative to total gastrectomy, providing better functional results without compromising oncologic principles.

Keywords: Proximal gastrectomy, total gastrectomy, surgical oncology, biliopancreatic reflux

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INTRODUCTION

Gastric cancer is one of the most frequently seen types of gastrointestinal system tumors, and it is estimated to be the fourth most common cancer and the second leading cause of cancer death worldwide (1, 2). Surgical treatment forms the basis of a multidisciplinary treatment approach. The incidence and localization of stomach cancer show significant geographical variations. While there has been a marked decline in distal gastric cancers, the incidence of proximal adenocarcinomas of the gastric cardia has been increasing, particularly in the Western countries (3–6). The shift in gastric cancer subsite has renewed interest in the management of upper third gastric cancer with a focus on the optimal extent of resection, i.e., proximal (PG) or total gastrectomy (TG) (7).

Supporters of TG have argued that complete resection can achieve a longer tumor-free distal resection margin along with an easier and more radical lymphadenectomy, which translates into a better curative effect (7). Alternatively, others emphasize that PG achieves a survival rate equivalent to that of TG, with the added advantage of preservation of the physiologic function of the gastric remnant. There are many reports in the literature demonstrating that the oncological results of PG concerning lymphadenectomy, oral resection margins, morbidity, recurrence and survival, are comparable with the results of TG (8–10).

Although anastomosis of esophago-gastrostomy is easier and less morbid compared to esophagojejunostomy, PG has a major concern; the risk of reflux esophagitis as a result of direct anastomosis between the esophagus and the remnant stomach. Many surgical procedures that have dealt successfully with this concern have been described in the literature (11–13).

This study aims to compare the results of patients with proximal gastric cancer treated with either PG or with TG concerning postoperative reflux symptoms, complications, the number of lymph nodes dissected, short-term survival, and the compliance to the postoperative planned diet.

MATERIALS and METHODS

This retrospective study enrolled 58 proximal gastric adenocarcinoma (adenocarcinoma of the proximal one-third

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Table 1. Distribution of the data by groups and p-values

| | Group TG (n=32) | Group PG (n=26) | p |
|---|-----------------|-----------------|-------|
| Age * | 62±15.5 | 61.7±12.9 | 0.989 |
| Reflux symptoms, n (%) | 12 (54.5) | 10 (45.5) | 0.08 |
| The mean number of resected lymph nodes* | 24.6±13.5 | 18.8±6.1 | 0.06 |
| Compliance with the postoperative diet, n (%) | 24 (51.1) | 23 (48.9) | 0.03 |
| Complication (free fluid), n (%) | 3 (60) | 2 (40) | 0.820 |
| Mortality n (%) | 9 (60) | 6 (40) | 0.662 |

*, Independent sample – t-test; p<0.05 significantly

of the stomach or gastroesophageal junction) patients with similar demographic and tumor-related characteristics, who underwent either total or proximal gastrectomy for the treatment between January 2013 and 2016. The study protocol was in accordance with the ethical principles of human medical research of the Helsinki Declaration. Informed consent was obtained from all the study participants. Patients were divided into two groups, according to the type of surgery as PG group and TG group. All the operations were performed by the same surgical team. PG entailed resection of the tumor-free distal esophagus, the upper and middle third of the stomach with adequate margins. The lymphatic dissection was almost the same in both groups except the stations 4d and 6. Lymphatic tissues that constituted station 4d were dissected around the right gastroepiploic vessels without compromising the flow at the root of the vessels. Proximal 1/3 of these vessels from their take off were preserved as the principal blood supply of the remnant stomach since the right gastric artery was severed at its origin to further mobilize the distal third of the stomach for tension-free anastomosis. The station 6 was left intact in the PG group. In the TG group, after resection and lymphatic dissection, digestive tract continuity was restored by an end-to-side esophagojejunostomy with a 25 mm circular stapler.

In patients undergoing PG, pyloroplasty was routinely carried out, and esophagogastrostomy anastomosis was performed throughout the opening of the pyloroplasty with 25 mm circular stapler. The circular stapler was inserted through the pyloroplasty site and the head of the circular stapler was guided to the posterior wall on the lesser curvature side of the remnant stomach. The center rod is pierced through the posterior wall, 2 cm from the lesser curvature and approximately at least 3 from the top of the remnant stomach. By this maneuver, the greater curvature near the top of the remnant stomach, similar to a tongue-shaped flap, lying on the anastomosis helps to prevent excessive reflux symptoms. Additionally, a seromuscular anchoring suture was made between the top of the remnant stomach and the lower esophagus on both sides to wrap the lower esophagus in a semicircular fashion and to establish an acute angle at the esophagogastrostomy to further prevent regurgitation. In eight patients, due to the shortage of the remaining gastric tissue, we could not perform this anti-reflux anastomotic modification and direct esophagogastrostomy anastomosis with circular stapler was performed. The pyloroplasty opening was then repaired with absorbable 3/0 running suture.

Heartburn, regurgitation of food or sour liquid, increased salivation, sore throat, and chronic coughing were considered reflux symp-

toms and the presence of biliopancreatic reflux was verified with the upper endoscopic examination. The patients in both groups were given a postoperative diet starting on the 3rd day with water, tea, and smooth fruit compote. On the 4th day, smooth soups, purees, and milk puddings were added and on the 5th day, a diet close to normal was planned to be taken as six meals per day. The intake of dairy products and cereal derivatives were increased gradually. The patients were also evaluated regarding compliance with this planned diet.

The patients were followed up in the medical oncology clinic for one week after discharge from the surgical clinic, and if there were no complaints, follow up visits were scheduled at 3-month intervals for the first two years and then 6-month intervals.

The data obtained in this study were evaluated using Statistical Package for the Social Science (SPSS) version 20. Histogram, q-q plots and Shapiro-Wilk's test were applied to assess the data normality. Levene test was used to test the homogeneity of variances. To compare differences about mean among two groups, Student's t-test was performed for quantitative variables, while Pearson χ^2 analysis was carried out for qualitative variables. Survival was calculated using the Kaplan-Meier method. Log-rank analysis was used to evaluate survival between groups. Multivariate analysis was performed using the Cox proportional regression model. P-value of less than 0.05 was accepted as statistically significant.

RESULTS

TG group consisted of 32 patients with a mean age of 62±15.5 years, and 26 patients with a mean age of 61.7±12.9 years were enrolled in the PG group. Reflux symptoms were seen in 10/32 patients in the TG group and 12/26 patients in the PG group, with no statistically significant difference between the groups (p=0.08). In all patients with reflux symptoms, refluxed biliopancreatic fluid was evident in the upper endoscopic examination.

The mean number of lymph nodes removed was 24.6±13.5 in the TG group and 18.8±6.1 in the PG group. The difference between the two groups was not statistically significant (p=0.06). In the comparison of the two groups concerning postoperative complications, no statistically significant difference was found (p=0.820). The most common complication in both groups was free fluid accumulation in the left upper quadrant, which was treated using conservative methods without the need for drainage (three patients in the TG group, two patients in the PG group) (Table 1).

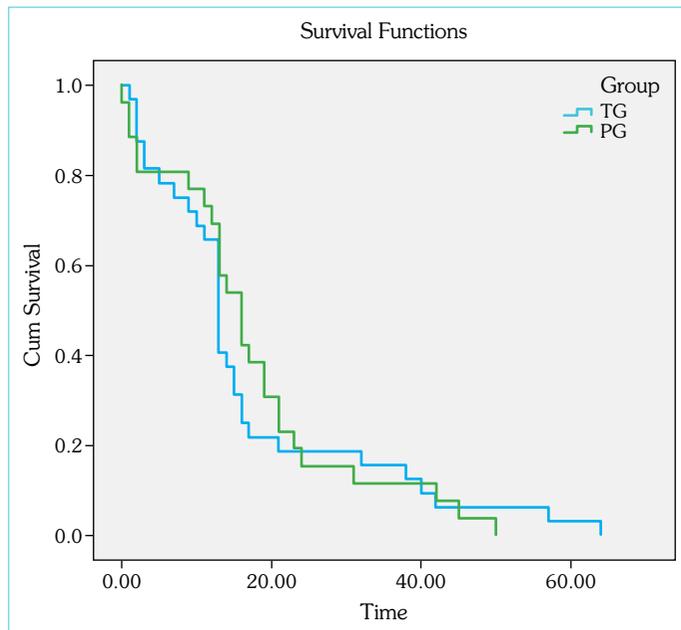


Figure 1. Kaplan-Meier survival curves for proximal and total gastrectomy groups

Compliance with the postoperative diet was evident in 24/32 patients in the TG group and 23/26 in the PG group. This difference between the groups was statistically significant ($p=0.03$). In the evaluation of short-term survival, mortality was seen in nine patients in the TG group and six patients in the PG group, at a median follow-up period of 13 months without a statistically significant difference ($p=0.662$) (Table 1). No statistically significant difference was found between two groups concerning survival ($p=0.802$, Fig. 1).

DISCUSSION

Although there is a well-documented shift from distal to proximal lesions, the optimal treatment for these proximal tumors is still a matter of debate. Although advocates of total gastrectomy (TG) emphasize the potential benefit of more radical lymph node dissection (8), proximal gastric cancers rarely metastasize to the lymphatic stations in the vicinity of the distal stomach, especially to the supra and infrapyloric lymph node stations and the surgical dissection of these stations has a very little contribution to the treatment of the patients (9, 14). Additionally, in tumors with cardia localization, the distal lymph node stations, especially station number 6, are not included within the D2 dissection limits. Regarding concerns about impaired dissection during proximal gastrectomy, the clearance of the lymphatic tissue around the station 4d may raise some questions. However, Kurokawa et al. (15) demonstrated that lymph node involvements in stomach cancers with proximal localization are primarily in station number 8, followed by stations 1, 2, 3, 5, 7, 9, 12, 13, and 16. Lymphatic dissection along the greater curvature was done according to D2 dissection principles except the preservation of 1/3 proximal of the right gastroepiploic artery as the principal source of blood supply of the remnant stomach. The perivascular lymphatic dissection of this short segment of the right gastroepiploic artery and vein along their length, beginning from their origin, was relatively easy and quick, which made the

optimal clearance of station 4d possible. Any avascular adhesive bands that appear to be fixing the pylori and the duodenum in the region of the hepatoduodenal ligament should be dissected for liberal mobilization of the duodenum. Ligation and severing of the right gastric artery at its root enhanced and facilitated this dissection. The gained additional mobility rendered the repositioning of the remnant stomach much more secure while pulling it up to the distal esophagus without any tension for the anastomosis.

In the current study, the mean number of lymph nodes removed was 24.6 in the TG group and 18.8 in the PG group, and the difference between the groups was not statistically significant. The main reason for the number of lymph nodes less than 25 in both groups can be explained by that D1 dissection was applied to seven patients in the TG group and to five patients in the PG group because the intraoperative determination of small peritoneal metastases could not be detected preoperatively with imaging methods. In the literature, many studies have demonstrated that although fewer lymph nodes have been harvested in the PG than the TG, no statistically significant difference was found between the two surgical procedures regarding survival rates; the extent of resection has not affected the outcome once adequate resection margins have been reached (7, 9, 16, 17). The results of these studies were harmonious with our manuscript. Moreover, even the dissected lymph node numbers have been statistically different between the groups; they did not lead to the altered survival. Therefore, the discrepancy between the two groups regarding the dissected lymph node numbers may not have any impact on clinical significance.

Reflux esophagitis is a major concern after PG. In several studies addressing this concern, it has been reported that direct anastomosis between the esophagus and the remaining stomach may lead to significant gastroesophageal reflux, esophagitis, and stricture at varying degrees (18, 19). Reflux symptoms after PG are one of the leading causes of pain and impaired quality of life after surgery in patients with gastric cancer. The use of various surgical anti-reflux methods has been recommended, including valvuloplasty plus fundoplasty, gastric tube reconstruction, jejunal interposition and jejunal pouch placement (20, 21). Although these procedures are complex and time-consuming, they are generally successful in reducing reflux symptoms. In the current study, reflux symptoms were determined in 46.2% of the PG group and in 31.3% of the TG group after the operation. In eight of the 12 patients with reflux symptoms in the PG group, as there was an insufficient length in the remaining stomach, the anastomosis was performed in an end-to-end fashion with the esophagus. Of the 18 patients, in whom anastomosis was carried out with the addition of an antireflux modification, reflux symptoms were observed in only four patients (22%). We think that the extrinsic pressure from the top of the remnant stomach and formation of an acute angle at the esophagogastrostomy site helped prevent reflux esophagitis. From the evaluation of relevant current literature and the results obtained in the current study, one may suggest that the frequency of postoperative reflux symptoms in patients following PG could be effectively reduced by surgical antireflux techniques without compromising the principles of surgical oncology (12, 21).

Many studies have reported that quality of life, especially in the early postoperative period, was much better for PG patients compared to those for TG patients. The early period is very impor-

tant, because, unfortunately, long-term survival is extremely low in gastric cancer patients. The results of the current study were consistent with the findings in the literature, as the time to oral feeding and reaching the target oral calorie intake was observed to be achieved more quickly with fewer problems in the PG group (8, 13, 22, 23). Moreover, since duodenal transit was preserved, the adverse effects of by-passing the duodenum were not documented. In a study by Nakane et al. (13), they reported that 14 PG and pyloroplasty patients showed better diet intake, recovery of body weight and gastric evacuation than patients without PG. We performed a pyloroplasty procedure in all PG patients with similar concerns to avoid pyloric function impairment and difficulties in the gastric evacuation that could be mainly caused by vagotomy. They also added that, as seen in the current study, the incidence of reflux symptoms were only higher in patients undergoing PG without any additional surgical modification to prevent reflux.

Aside from its retrospective nature, there were some additional limitations in the current study; the most important one is the low number of patients in both groups. The main aim of the study was to compare PG versus TG in operated gastric cancer patients with regards to reflux symptoms and the number of dissected lymph nodes. Although there were no statistically significant differences between the two groups (p-values were 0.08 and 0.06, respectively), these values may change and reach statistical significance if the number of patients increases. Therefore, the results of this single-center and retrospective study should be prospectively reevaluated with further similar studies, including larger numbers of patients.

CONCLUSION

In the surgical treatment of proximal gastric cancers, PG was performed with an anti-reflux technique, which may be an alternative to TG, providing better functional results without compromising oncologic principles.

Ethics Committee Approval: The Yozgat Bozok University Clinical Research Ethics Committee granted approval for this study (date: 10.10.2018, number: 2017-KAEK-189_2018.10.10_08).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

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