The difficult choice between total and proximal gastrectomy in proximal early gastric cancer

Ji Yeong An, M.D., Ho Geun Youn, M.D., Min Gew Choi, M.D., Jae Hyung Noh, M.D.*, Tae Sung Sohn, M.D., Sung Kim, M.D.

Department of Surgery, Samsung Medical Center, Sungkyunkwan University School of Medicine, 50 Ilwon-dong, Gangnam-gu, Seoul, Korea 135-710

Abstract

BACKGROUND: Surgical results including postoperative complications, prognoses, body weight changes, and nutritional statuses were compared in patients with early gastric cancer in the upper third of the stomach who were treated by total gastrectomy or proximal gastrectomy.

METHODS: The authors reviewed clinicopathologic features, postoperative complications, survivals, body weight changes, and biochemical markers after surgery in 423 patients who underwent total or proximal gastrectomy for early gastric cancer in the upper third of the stomach.

RESULTS: The proximal gastrectomy group (n = 89) had smaller tumors, shorter resection margins, and smaller numbers of retrieved lymph nodes than the total gastrectomy group (n = 334). N stages and 5-year survival rates were similar after total and proximal gastrectomy. Postoperative complication rates after total gastrectomy and proximal gastrectomy were 12.6% and 61.8%, respectively, which was significant (P < .001). Rates of anastomotic stenosis and reflux esophagitis were 6.9% and 1.8% after total gastrectomy and 38.2% and 29.2% after proximal gastrectomy, respectively. The parameters that reflect nutritional status (ie, body weight, serum hemoglobin, total protein, albumin, glucose, and cholesterol) were similar in the proximal and total gastrectomy groups at 6, 12, 24, and 36 months postoperatively.

CONCLUSION: Although the surgical safeties and curabilities of proximal and total gastrectomy were similar, proximal gastrectomy was found to be associated with a markedly higher rate of complications such as anastomotic stenosis and reflux esophagitis and to provide no benefit in terms of postoperative weight loss. The authors conclude that proximal gastrectomy is not a better option for upper-third early gastric cancer than total gastrectomy.

© 2008 Elsevier Inc. All rights reserved.

KEYWORDS:
Early gastric cancer; Upper-third stomach; Proximal gastrectomy; Total gastrectomy
tomy overweight the functional drawbacks of esophageal reflux, which substantially affects quality of life.\textsuperscript{4} Because the prognosis of early gastric cancer is excellent, interest has been directed at improving quality of life and on the use of minimally invasive treatment, which would appear to favor proximal gastrectomy in patients with early stage proximal gastric cancer. However, the decision as to whether to perform total gastrectomy or proximal gastrectomy is problematic because little comparative information is available on these 2 modalities in terms of quality of life, function preservation, weight loss, changes in biochemical markers, and long-term complications. In particular, body weight loss is an important problem in gastrectomy patients. In this study, surgical results, such as postoperative complications, prognoses, body weight changes, and nutritional statuses, were compared in patients who underwent total gastrectomy or proximal gastrectomy.

Patients and Methods

Patients

Between 2000 and 2005, 423 patients underwent proximal or total gastrectomy at the Samsung Medical Center for upper-third early gastric cancer at histological stage I or II (T1N0M0, T1N1-2M0, according to the sixth edition of the International Union Against Cancer classification).\textsuperscript{5} Patients with endocrine disorders such as diabetes, thyroid or pituitary disease, moderate to severe cardiovascular disease, pulmonary or renal disease, liver cirrhosis, another malignancy, a combined operation, and a previous operation history were excluded. There were 334 total gastrectomy patients and 89 proximal gastrectomy patients.

Surgical approach

All operations were performed with curative intent. Proximal gastric cancer was defined as adenocarcinoma of the upper one third of the stomach or of the gastroesophageal junction. Proximal gastrectomy (including D1 + \( \beta \) lymph node dissection) involved resection of the proximal half of the stomach via an abdominal approach with intrabdominal esophagogastric anastomosis using a circular stapler (diameter 25 mm). Gastric tube reconstruction was performed broadly as previously described.\textsuperscript{2,4} After total gastrectomy with D2 lymph node dissection, esophagojejunostomy (using a circular stapler, diameter 25 mm) was used routinely for Roux-en-Y reconstruction. Proximal and distal resection margins were evaluated intraoperatively to confirm freedom from disease in all patients.

The evaluation of clinical parameters

Clinical features, the variables of each type of operation (eg, sex, age, tumor size, histological type, length of resection margin, numbers of retrieved, and metastatic lymph nodes), postoperative complications, and survivals were analyzed based on information obtained from medical records. The changes in body weight and biochemical data were compared with the extent of gastrectomy at 3, 6, 12, 24, and 36 months postoperatively. Patients were routinely followed at our outpatient clinic at 3, 6, and 12 months postoperatively and annually thereafter. Anastomotic stenosis and reflux were diagnosed based on symptoms and endoscopic findings. When patients complained of dysphagia during postoperative follow-up and a 9-mm diameter endoscope could not pass the esophagojejunal or esophago gastric anastomosis, anastomotic stenosis was diagnosed. Reflux was diagnosed when evidence of regurgitation of duodenal contents into the remnant stomach or jejunum with subsequent reflux into the esophagus was found by endoscopy. Twenty-four-hour pH monitoring was not performed routinely in patients with esophageal reflux.

Statistical analysis

Categorical variables were compared by using the chi-square test, and continuous data were compared by using the Mann-Whitney \( U \) test. Data are presented as means ± standard deviation. Survival curves were calculated by using the Kaplan-Meier method for the 2 study groups (in months) from primary surgical treatment to final follow-up or death. \( P \) values of <.05 were considered significant throughout.

Results

Patient characteristics

Table 1 summarizes clinicopathological factors in relation to operation type. No significant association was found between operation type and sex, age, histological type, or Lauren classification. However, tumor size, proximal and distal resection margins, numbers of retrieved lymph nodes, and adjuvant therapy were found to be significantly different in the 2 groups. In detail, the mean tumor size was larger in total gastrectomy patients (4.0 ± 2.7 cm for total gastrectomy and 2.5 ± 1.5 cm for proximal gastrectomy; \( P < .001 \)), and more lymph nodes were retrieved (39.1 ± 13.2 for total gastrectomy and 22.4 ± 7.1 for proximal gastrectomy, \( P < .001 \)). Of the 334 patients who underwent total gastrectomy, 40 (12.0%) experienced lymph node metastasis, whereas only 3 (3.4%) of the 89 patients who underwent proximal gastrectomy experienced lymph node metastasis.

Postoperative complications

The overall postoperative complication rate after total gastrectomy (12.6%) was significantly lower than after
proximal gastrectomy (61.8%) \((P < .001)\) (Table 2). Anastomotic-site stenosis was the main complication after total gastrectomy and occurred in 6.9% of patients, whereas esophageal reflux occurred in 1.8% of these patients. Other complications after total gastrectomy included ileus, intra-abdominal abscess, anastomotic (esophagojejunostomy) leakage, pancreatitis, and pneumonia. In the proximal gastrectomy group, 38.2% of patients experienced anastomotic stenosis, which presented as dysphagia; 29.2% of patients suffered from duodenogastroesophageal reflux; and 11.2% experienced anastomotic stenosis with esophageal reflux. In addition, there was 1 case of postoperative ileus, 1 case of anastomotic leakage, and 3 patients experienced wound problems. Thirty-three patients with esophagogastric anastomotic stenosis and 20 patients with esophagojejunal anastomotic stenosis underwent successful balloon dilatation. Other complications, not mentioned earlier, were treated conservatively. No postoperative mortality occurred.

### Changes in body weight and biochemical markers during follow-up

Parameters reflecting nutritional status (ie, body weight) and serum hemoglobin, total protein, albumin, glucose, and cholesterol were checked at 6, 12, 24, and 36 months postoperatively (Table 3). Body weights were similar in the 2 study groups during follow-up. Moreover, although serum hemoglobin levels were significantly lower in the total gastrectomy group at 12 months postoperatively (12.3 \pm 1.8 mg/dL versus 12.8 \pm 1.7 mg/dL, \(P = .02\)), thereafter, they were similar in the 2 groups. Other parameters (ie, total protein, albumin, glucose, and cholesterol) were similar in the study groups.

### Survivals

After a median follow-up of 40 months, overall 5-year survival rates in the total gastrectomy and proximal gastrectomy groups were 99.2% and 98.5%, respectively (\(P = .57\)).

### Comments

Proximal gastrectomy was introduced to improve patient performance status by conserving half of the stomach, and, thus, it was widely believed that proximal gastrectomy reduces postoperative weight loss.\(^1\) In addition, proximal gastrectomy in the upper third of the stomach was believed to be appropriate in terms of both its radicality and safety.\(^1,3\) However, in the present study, we found that only 1 patient in each study group succumbed to disease recurrence and that at 5 years group survival rates were comparable. In addition, we found that proximal gastrectomy was associated with a markedly higher complication rate and that it provided no benefit in terms of postoperative weight loss.
Although proximal resection margins were shorter for proximal gastrectomy, intraoperative frozen biopsies confirmed disease-free resection margins. In addition, fewer lymph nodes were retrieved per patient in the proximal gastrectomy group because of different lymph node dissection extents. However, in view of the low frequency of lymph node metastasis and excellent survival in early gastric cancer, proximal gastrectomy with less than D2 lymph node dissection appears to be reasonable.

As stated earlier, rates of complications, such as anastomotic stenosis and reflux esophagitis, were markedly higher in the proximal gastrectomy group. Of the 89 patients who underwent proximal gastrectomy, 38.2% suffered from dysphagia because 3 of 4 arteries are sacrificed to conduct cervical esophagogastronomy, whereas we performed proximal gastrectomy by sacrificing 2 of these arteries. The previously mentioned findings encourage us to speculate that inflammation at anastomotic sites, caused by reflux, is associated with a high rate of esophagogastronomy-site stenosis rather than a decreased vasculature.

Although nutritional status is usually evaluated by using clinical assessments and anthropometric tests, clinicians tend to rely on body weight as a measure of nutritional status. In the present study, body weights decreased to 87.4% and 86.4% 3 years after total and proximal gastrectomy, respectively, which was not significant. In addition, hematologic parameters, such as hemoglobin, total protein, albumin, glucose, and cholesterol, were similar in the 2 study groups throughout follow-up. Other nutritional indexes, such as body mass indexes, triceps skin fold thicknesses, midarm muscle circumferences, and calorie intakes, were not evaluated in the present study. However, collectively, our data suggest that proximal gastrectomy offers no advantage over total gastrectomy in terms of weight preservation. Although body weight changes are a matter of grave concern after gastrectomy, other factors, such as patient satisfaction, food intake, discomfort after a meal, appetite, alimentary symptoms, and physical activity, also contribute to quality of life. Moreover, Shiraishi et al\textsuperscript{2} reported that 45% and 100% of patients experienced reflux symptoms after total gastrectomy and proximal gastrectomy, respectively, and Katsoulis et al\textsuperscript{4} reported that 45% and 100% of patients experienced reflux symptoms after total gastrectomy and proximal gastrectomy, respectively. Others concluded that reflux after proximal gastrectomy was worse than after total gastrectomy and suggested that proximal gastrectomy should be avoided in adenocarcinoma of the gastric cardia, except in early cancer.\textsuperscript{7} In our study, balloon dilatation was found to effectively manage anastomotic stenosis in most patients, which concurs with other reports,\textsuperscript{8,9} and reflux symptoms were relieved by medication. However, reflux remained in 50% of proximal gastrectomy patients.

The factors of anastomotic stricture development are postoperative complications, such as anastomotic leakage, infection, poor vascularity, and fistula formation of the upper part of the gastric tube.\textsuperscript{10,11} Pierie et al\textsuperscript{8} concluded that poor vascularization of the gastric tube and anastomotic leakage are associated with anastomotic stricture development because 3 of 4 arteries are sacrificed to conduct cervical esophagogastronomy, whereas we performed proximal gastrectomy by sacrificing 2 of these arteries. The previously mentioned findings encourage us to speculate that inflammation at anastomotic sites, caused by reflux, is associated with a high rate of esophagogastronomy-site stenosis rather than a decreased vasculature.

Table 3 Changes in body weight and biochemical markers during postoperative follow up after total or proximal gastrectomy

<table>
<thead>
<tr>
<th></th>
<th>Preoperative</th>
<th>6 Months</th>
<th>1 Year</th>
<th>2 Years</th>
<th>3 Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TG</td>
<td>100</td>
<td>88.1 ± 7.3</td>
<td>88.3 ± 7.9</td>
<td>88.4 ± 8.3</td>
<td>87.4 ± 7.8</td>
</tr>
<tr>
<td>PG</td>
<td>100</td>
<td>85.9 ± 5.6</td>
<td>86.1 ± 7.5</td>
<td>86.5 ± 5.5</td>
<td>86.4 ± 4.8</td>
</tr>
<tr>
<td>Hb (mg/dL)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TG</td>
<td>13.7 ± 1.6</td>
<td>12.4 ± 1.7</td>
<td>12.3 ± 1.8</td>
<td>12.1 ± 1.9</td>
<td>11.8 ± 1.8</td>
</tr>
<tr>
<td>PG</td>
<td>13.5 ± 1.4</td>
<td>12.4 ± 1.4</td>
<td>12.8 ± 1.7*</td>
<td>12.6 ± 1.8</td>
<td>11.8 ± 1.9</td>
</tr>
<tr>
<td>TP (g/dL)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TG</td>
<td>6.9 ± 0.6</td>
<td>6.8 ± 0.4</td>
<td>6.9 ± 0.4</td>
<td>7.0 ± 0.4</td>
<td>6.8 ± 0.6</td>
</tr>
<tr>
<td>PG</td>
<td>6.9 ± 0.4</td>
<td>6.8 ± 0.4</td>
<td>6.9 ± 0.5</td>
<td>6.9 ± 0.4</td>
<td>7.1 ± 0.2</td>
</tr>
<tr>
<td>Alb (g/dL)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TG</td>
<td>4.1 ± 0.3</td>
<td>4.2 ± 1.0</td>
<td>4.1 ± 0.3</td>
<td>4.1 ± 0.4</td>
<td>4.0 ± 0.5</td>
</tr>
<tr>
<td>PG</td>
<td>4.1 ± 0.3</td>
<td>4.0 ± 0.3</td>
<td>4.1 ± 0.2</td>
<td>4.1 ± 0.3</td>
<td>4.1 ± 0.1</td>
</tr>
<tr>
<td>GIs (mg/dL)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TG</td>
<td>100.6 ± 25.9</td>
<td>95.6 ± 29.1</td>
<td>93.0 ± 19.0</td>
<td>92.6 ± 16.5</td>
<td>96.7 ± 23.2</td>
</tr>
<tr>
<td>PG</td>
<td>109.5 ± 48.0</td>
<td>111.3 ± 49.8</td>
<td>97.7 ± 21.8</td>
<td>89.0 ± 8.0</td>
<td>91.0 ± 10.2</td>
</tr>
<tr>
<td>Chol (mg/dL)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TG</td>
<td>180.1 ± 33.3</td>
<td>162.0 ± 32.7</td>
<td>162.0 ± 27.3</td>
<td>165.1 ± 27.8</td>
<td>165.1 ± 28.0</td>
</tr>
<tr>
<td>PG</td>
<td>175.4 ± 35.0</td>
<td>167.1 ± 26.5</td>
<td>163.0 ± 25.1</td>
<td>168.7 ± 33.1</td>
<td>172.0 ± 23.9</td>
</tr>
</tbody>
</table>

Hb = hemoglobin; TP = total protein; Alb = albumin; GIs = glucose; Chol = cholesterol; TG = total gastrectomy; PG = proximal gastrectomy.

Values were calculated using the Mann-Whitney U test.

*p < .05.
reported quality of life scores after total and proximal gastrectomy and found no significant difference between the 2.

In conclusion, proximal gastrectomy was found to be associated with markedly higher postoperative complication rates, particularly of anastomotic stenosis and reflux esophagitis. Moreover, it appeared to offer no benefit in terms of weight loss versus total gastrectomy. Thus, although the surgical safety and curability of proximal gastrectomy are similar to those of total gastrectomy, we cannot conclude that proximal gastrectomy presents a better option than total gastrectomy for proximal early gastric cancer.

References