Partial stomach-partitioning gastrojejunostomy and the success of this procedure in terms of palliation

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BACKGROUND: In the 1990s, partial stomach-partitioning gastrojejunostomy (PSPG) was introduced. Benefits of this method are that it preferentially shunts food away from the obstructed duodenum or pylorus, thus reducing reflex emesis.

METHODS: A retrospective review of patients undergoing PSPG for malignant obstruction from 1999 to 2011 was performed. Ability to tolerate oral intake in the postoperative period and at last follow-up was the criterion for a successful bypass.

RESULTS: Fifty-five patients with locally advanced or metastatic tumors underwent PSPG. The median follow-up period was 8 months. No patient developed signs of gastric outlet obstruction after PSPG. Seventy-five percent of patients had pancreatic or duodenal and 25% had nonpancreatic cancers. Nine patients developed postoperative complications. The perioperative mortality rate was zero. Median overall survival was 9 months. All patients were tolerating an enteral diet on the day of discharge, and as of the last follow-up, 95% were tolerating their enteral diets.

CONCLUSIONS: This and a previous study from the authors’ institution show that PSPG is a good alternative for palliative bypass in the setting of malignant gastric outlet obstruction over classic gastrojejunostomy.

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such as duodenal stump closure problems, duodenal stump leak, hemorrhage, and rupture. Antral exclusion is another alternative that was used for the management of complicated duodenal ulcer disease in the 1920s and subsequently was used for the treatment of unresectable antral cancers in the 1930s. With this method, the distal stomach is completely divided from the proximal body, and an anastomosis is performed between the proximal stomach and the jejunum. The complications are similar to antrectomy, with the addition of the ulcerogenic retained antrum.

GOO may result in nausea and vomiting, leading to dehydration, metabolic abnormalities, pain, and cachexia, severely reducing patients’ quality of life. The different options available for the palliation of these symptoms and signs are bypass surgery, enteral stenting, decompressive gastrostomy, jejunostomy, and total parental nutrition. Providing enteral nutrition seems to be superior to intravenous hyperalimentation in terms of (1) activation of the gastrointestinal tract immune system; (2) the ability to take oral antineoplastic medications; and (3) safe and simple home management.

Kaminishi et al in the late 1990s introduced partial stomach-partitioning gastrojejunostomy (PSPG), which divides the lower part of the stomach and connects the jejunum to the proximal part of the stomach while maintaining a tunnel that is 2 to 3 cm in diameter in the lesser curvature. They concluded that the benefits of this method are that it minimizes food contact with the tumor while maintaining normal gastric emptying, allows endoscopic evaluation of the tumor, and shunts food away from the obstructed duodenum or pylorus, thus reducing reflex emesis. It allows for acid entry into the antrum, such that stimulation of gastrin and consequent ulcer formation are minimized.

We adopted this operation in 1999 for all patients with unresectable upper gastrointestinal malignancies who presented with GOO or had radiographic evidence of GOO with impending symptoms and were not candidates or failed endoscopic stenting procedures. We examined our experience with PSPG and the success of this procedure in terms of palliation.

Methods

Institutional review board approval was obtained for a retrospective analysis of all patients referred to our institution, Fox Chase Cancer Center, with GOO treated with PSPG from February 1999 to May 2011. Inclusion criteria included GOO treated with PSPG with or without biliary bypass, with a minimum follow-up period of 12 weeks. GOO in our cohort was defined as any recurrent symptoms of dyspepsia, such as nausea, early satiety, and vomiting, that impeded patients from obtaining adequate nutrients via the enteral route and led to significant weight loss and failure to thrive. Electronic medical records were reviewed.

Patient demographics, characteristics of their tumors, preoperative symptoms, type of operation performed (antececollic vs retrocolic gastrojejunostomy), postoperative complications, date of discharge from the hospital, and date of last follow-up visit were recorded. Success of the procedure in palliating symptoms was defined as the patient’s ability to tolerate enteral feedings (oral solid or liquid nutrition) on the day of discharge and at the last documented follow-up visit.

Survival was defined as the time from diagnosis of malignant GOO to death from any cause. Event-time distributions were estimated using the Kaplan-Meier method. Chi-square analysis was used to investigate whether distributions of the categorical variables differed from one another, and \( P \) value < .05 were considered significant. Cumulative survival data were analyzed using the Kaplan-Meier estimation method.

PSPG was performed by 1 of 2 surgeons from our surgical oncology department and has been previously described. Briefly, the procedure required the application of a linear stapler (Multifire GIA 60-3.8 Auto Suture [blue load]; US Surgical Corporation, Norwalk, CT) partitioning the lower third of the stomach from the greater curve to a point located approximately 2 cm from the lesser curvature at the incisura angularis. The lumen of the lesser curve opening is about 2 to 3 cm in diameter. A nasogastric tube was placed distally along the lesser curvature through the aperture to make sure that the residual lumen is sufficient enough to accommodate an endoscope for surveillance of the tumor and reflux of bile or pancreatic juice if a biliary bypass was not performed. The partitioned proximal portion of the stomach was anastomosed to the proximal part of the jejunum (Fig. 1). Antecolic or retrocolic gastrojejunostomy was then performed on the basis of surgeon preference. Operative biliary drainage when necessary was performed in the standard fashion using a Roux-en-Y hepaticojejunostomy.

Results

Fifty-five patients with locally advanced or metastatic tumors, 34 men (62%) and 21 women (38%), underwent PSPG during the study period, with a median follow-up duration of 8 months (range, .56 to 110 months). During this time interval, no patient developed symptoms or signs of recurrent GOO after PSPG. Seventy-five percent of patients (\( n = 41 \)) had pancreatic or duodenal and 25% (\( n = 14 \)) had nonpancreatic cancers. Table 1 shows the distribution between pancreatic and duodenal cancer as well as the different types of nonpancreatic cancers. The most prevalent symptom (Table 2) was weight loss, which was seen in 30 patients (55%), followed by abdominal pain, which was seen in 25 patients (45%). The most prevalent sign was jaundice, which was seen in 19 patients (35%).

Twenty-four patients (44%) underwent single bypass procedures (PSPG), and 31 patients (56%) had double bypass procedures (PSGJ and hepaticojejunostomy) (Table 3).
The double bypass group was made up mainly of patients with either pancreatic (n = 26) or duodenal (n = 30) malignancies. The median overall survival (OS) in the double bypass group was 7 months (range, 6 to 10 months), compared with 10 months (range, 5.0 to 21 months) in the single bypass group. Two patients with double bypass did not have pancreaticoduodenal malignancies: 1 had metastatic breast cancer, and the other had a cholangiocarcinoma. Patients with pancreaticoduodenal tumors were more likely to require preoperative biliary stent placement compared with nonpancreatic tumors (15 vs 1, \(P = .03\)). Of the patients who had preoperative biliary stent placement, 14 (25%) had double bypass and 2 (4%) had single bypass (\(P = .002\)). The reason for performing the double bypass was left to the discretion of the surgeon on the basis of the performance of the stent before surgery.

<table>
<thead>
<tr>
<th>Tumor type</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pancreatic</td>
<td>37 (67%)</td>
</tr>
<tr>
<td>Duodenal</td>
<td>4 (7%)</td>
</tr>
<tr>
<td>Nonpancreatic</td>
<td>14 (25%)</td>
</tr>
<tr>
<td>Colon</td>
<td>5 (9%)</td>
</tr>
<tr>
<td>Gastric</td>
<td>4 (7%)</td>
</tr>
<tr>
<td>Gallbladder</td>
<td>2 (4%)</td>
</tr>
<tr>
<td>Cholangiocarcinoma</td>
<td>1 (1.8%)</td>
</tr>
<tr>
<td>Bladder</td>
<td>1 (1.8%)</td>
</tr>
<tr>
<td>Breast</td>
<td>1 (1.8%)</td>
</tr>
</tbody>
</table>

**Table 1** Distribution of pancreatic and duodenal cancers and nonpancreatic cancers

Twenty-eight patients (51%) had retrocolic gastrojejunostomy, and 27 patients (49%) had antecolic gastrojejunostomy. No difference in complication rates between the antecolic and retrocolic procedures was noted. No perioperative deaths or deaths within the first 30 days occurred after the operation. Postoperative morbidity was 16%, with 9 patients developing complications, 1 of them developing multiple complications (Table 4). The median operative time and blood loss in our cohort were 145 minutes (range, 50 to 259 minutes) and 100 mL (range, 5 to 700 mL), respectively. Patients stayed in the hospital for 4 to 25 days (median, 7 days).

Median OS for the study population was 9 months (range, 6 to 10) (Fig. 2), and 1-year and 2-year OS was 31 and 8 months, respectively (Table 5). Nonpancreatic malignancies had better 1-year survival, 2-year survival, and OS (54, 23, and 13 months, respectively) compared with pancreaticoduodenal malignancies (22, 3, and 7 months, respectively) (Fig. 3). Six patients were alive at last follow-up. Three of them had their operations performed in the past 1.5 years. Median weight on the day of surgery was 69 kg (range, 53 to 124 kg); at 1 month, the median weight was 66 kg (range, 51 to 120 kg); and at the last clinic visit, the median weight was 66 kg (range, 40 to 120 kg). Oral intake (sips of clears) was started on the first postoperative day if clinically feasible and advanced slowly on the basis of individual tolerance. All patients (n = 55) were tolerating an enteral diet on the day of discharge, and as of the last follow-up visit, 95% (n = 52) were tolerating their enteral diets. Only 2 patients (4%) required supplemental total parenteral nutrition to help maintain their weight; 1 had a cholangiocarcinoma and underwent a double bypass with a retrocolic reconstruction, and the other had a neuroendocrine tumor of the pancreas and underwent PSPG with no biliary bypass with an antecolic reconstruction.

**Comments**

The incidence of GOO in patients with peripancreatic tumors has been reported to be between 15% and 20%. Approximately 5% to 10% of patients with carcinomas of the head of the pancreas are resectable at the time of presentation. When confronted with a patient with GOO,
the question of performing a palliative bypass is answered very easily, but when the patient does not have obvious GOO, many surgeons do not believe that routine prophylactic gastrojejunostomy should be performed. Retrospective analysis of series from the past 3 decades and prospective randomized trials of endoscopic palliation have demonstrated that in 10% to 20% of patients with unresectable pancreatic cancer, late GOO will develop, requiring bypass. Morbidity and mortality in these patients is higher when they are treated for the late obstruction rather than if they are treated in a preventative setting during their initial exploration.

Lillemoe et al, in a study of 194 patients with unresectable periampullary carcinomas, showed that 19% of patients who did not undergo prophylactic gastrojejunostomy developed GOO requiring surgical intervention. Huser et al systematically reviewed retrospective and prospective studies, as well as a meta-analysis of prospective studies, on the use of prophylactic gastroenterostomy for unresectable pancreatic cancer. In patients who had prophylactic bypass procedures, the chance of developing GOO during follow-up was significantly lower (odds ratio, .06; 95% confidence interval, .02 to .21; \( P < .001 \)) than when no palliative procedure was performed. Rates of postoperative DGE were similar in both groups (odds ratio, 1.93; 95% confidence interval, .57 to 6.53; \( P = .290 \)).

Level 1 and 2 evidence is available to help answer the question of which bypass procedure for GOO is the best palliative operation, but the numbers are small, leaving room for debate.

An important concept in the management of cancer patients is the role of operative palliation. Defined as an operation without curative intent, it should be designed to give durable relief of cancer-related symptoms in an attempt to improve quality of life while not necessarily increasing survival. Upper gastrointestinal malignancies, which can lead to gastric outlet and duodenal obstructions, often require palliative interventions. GOO can lead to poor oral intake secondary to nausea and vomiting, dehydration, and cachexia, which severely reduce patients’ quality of life and often can hasten death. Approximately 50% will present with nausea and vomiting, even if a mechanical obstruction cannot be shown radiographically.

The palliative operation performed at our institution was described by Kaminishi et al. According to their research, 88% of patients were tolerating oral feedings at 2 weeks after PSPG, compared with 31% who underwent CGJ (\( P < .05 \)). Our study was not designed to compare PSPG with any other palliative operations, but it did show that all of our patients (\( n = 55 \)) were tolerating an enteral diet on the day of discharge, and 95% (\( n = 52 \)) were tolerating their diets as of the last follow-up visit. Although we did not assess quality of life, we can infer that because of their ability to tolerate oral feedings, these patients’ quality of life was improved.

Kaminishi et al reported that PSPG had a significantly higher survival rate compared with CGJ. They reported mean 1-year survival rates for PSPG and CGJ of 43% and 8%, respectively (\( P < .05 \)), with mean survival times of 13 months in the PSPG group and 6 months in the CGJ group (\( P < .05 \)). Kwon and Lee reported a median survival time of 4 months for the CGJ group and 7 months for the PSPG group (\( P = .046 \)). In another study by Kubota et al, the median survival time of patients undergoing PSPG was 7 months. Our study, with a median follow-up period of 8 months, showed that the median OS for patients undergoing PSPG was 9 months (Fig. 2), and 1-year and 2-year OS were 31 and 8 months, respectively (Table 4).

We did not compare OS in patients undergoing PSPG with other bypass procedures, and one must keep in mind
that all the studies mentioned were retrospective, with inherent biases.

Our median operative time was 145 minutes, which is more than what is reported in the literature for regular open CGJ. Maetani et al.\(^2\) reported an operative time of 118 minutes, while Fiori et al.\(^2\) reported an average operating time of 93 minutes. Our operative times were longer because 56% of our patients (n = 31) underwent double bypass procedures. Some investigators have used postoperative weight loss as an indirect variable predicting quality of life on the basis of the fact that for patients with unresectable gastric cancer, food uptake is among the most important issues, and the amount and quality of food uptake are closely related to changes in weight.\(^2\) Kwon and Lee\(^2\) compared the rate of postoperative weight loss in patients undergoing CGJ with those undergoing PSPG (9.3% decrease for the CGJ group and 3.1% decrease for the PSPG group, \(P = .067\)). The difference was not statistically significant but showed a trend that patients with PSPG had less postoperative weight loss and tolerated oral feeding better than patients with CGJ. We did not show a significant decrease in preoperative weight compared with 1 month after surgery (69 vs 66 kg), and weight did not continue to decrease, as seen with the median weight (66 kg) at the last clinic visit.

New technologies, including expandable endoluminal stents for enteral use, have shown favorable results as a palliative intervention in patients with GOO.\(^2\) Stenting procedures have enabled earlier food intake, as shown by Kubota et al.,\(^1\) in whose study initiation of food intake occurred at 6 days in the PSPG group and at 4 days in the stent group (\(P = .001\)). They also showed that the numbers of patients taking regular meals at 2 weeks after treatment were 12 of 16 patients in the PSPG group and 1 of 9 patients in the stent group (\(P = .008\)), which may lead to better quality of life. The results of the SUSTENT study showed that despite slow initial symptom alleviation, CGJ was associated with better long-term results, and it was recommended as the treatment of choice in patients with life expectancies \(\geq 2\) months compared with endoscopic stent placement.\(^3\)

Some patients with advanced gastrointestinal malignancies may require a biliary bypass (endoscopic stent placement or hepaticojejunostomy) as well as a gastrointestinal bypass for palliation. In our study, 56% of patients (n = 31) had double bypass procedures (PSGJ and hepaticojejunostomy; Table 5). The double bypass group was made up mainly of patients with either pancreatic (n = 26) or duodenal (n = 30) malignancies. This might explain the higher incidence of jaundice in this group of patients and the lower median OS, 7 months in the double bypass group compared with 10 months in the single bypass group. Patients with pancreaticoduodenal tumors were more likely to require preoperative stent placement compared with nonpancreatic tumors (15 vs 1, \(P = .03\)). The efficacy of a double bypass procedure for palliation will depend on both patient-related and tumor-related factors.

There were limitations to our study. It was a retrospective study, which can lead to systematic errors, including selection bias based on our population and measurement bias, because we did not perform any quality-of-life assessment. PSPG was performed as an open procedure because of the nature of our patient population, but this procedure can be performed completely laparoscopically. We cannot say whether outcomes would have been better if we had performed this procedure laparoscopically. Currently at our institution, we have adopted the laparoscopic

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**Table 5** Overall survival in the study population

<table>
<thead>
<tr>
<th></th>
<th>1 y (%)</th>
<th>2 y (%)</th>
<th>Median survival (mo) (range)</th>
<th>(P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All patients (n = 55)</td>
<td>30.5</td>
<td>8.1</td>
<td>9 (6.3–10.1)</td>
<td>.02</td>
</tr>
<tr>
<td>Single or double bypass group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single (n = 24)</td>
<td>43.4</td>
<td>19.3</td>
<td>10.1 (5.0–20.7)</td>
<td></td>
</tr>
<tr>
<td>Double (n = 31)</td>
<td>21.1</td>
<td>0</td>
<td>7.4 (6.1–10.0)</td>
<td></td>
</tr>
<tr>
<td>Pancreatic, duodenal, or nonpancreatic group</td>
<td></td>
<td></td>
<td></td>
<td>.10</td>
</tr>
<tr>
<td>Pancreatic (n = 37)</td>
<td>21.8</td>
<td>3.1</td>
<td>7.4 (5.7–10.1)</td>
<td></td>
</tr>
<tr>
<td>Duodenal (n = 4)</td>
<td>25</td>
<td>0</td>
<td>8.2 (6.1–20.7)</td>
<td></td>
</tr>
<tr>
<td>Nonpancreatic (n = 14)</td>
<td>53.9</td>
<td>23.1</td>
<td>13.1 (3.6–23.1)</td>
<td>.03</td>
</tr>
<tr>
<td>Pancreatic/duodenal or nonpancreatic group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pancreatic/duodenal (n = 41)</td>
<td>22</td>
<td>2.8</td>
<td>7.4 (6.1–10.05)</td>
<td></td>
</tr>
<tr>
<td>Nonpancreatic (n = 14)</td>
<td>54</td>
<td>23</td>
<td>13.1 (3.6–23.1)</td>
<td></td>
</tr>
</tbody>
</table>
However, this study will likely never be performed. Retrospective and prospective data from studies showing which procedure will allow better palliation of obstructive symptoms with minimal perioperative morbidity. This cohort of patients who underwent PSPG for malignant GOO is the largest reported in the literature.

Conclusions

PSPG provides excellent palliation for patients with advanced gastrointestinal malignancies, with low perioperative morbidity, and avoids the complications of DGE and bleeding from the primary tumor that are often seen with other procedures. It is an alternative for palliative bypass in the setting of malignant GOO over CGJ.

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References


