

Original Research

Stomach-partition as bridge to curative treatment in locally advanced gastric cancer: a case series

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Introduction

Globally, gastric cancer is frequently diagnosed at an advanced stage. Current multimodal treatment, including perioperative systemic therapy and radical resection, offer the best chance of survival. Patients with distal tumours often present with gastric outlet obstruction (GOO), with consequent reduction or impossibility of an adequate oral intake. The aim of this study was to evaluate the use of stomach-partition gastrojejunostomy (SPGJ) to restore oral intake in patients with locally advanced antral tumours as part of multimodal treatment, with a curative intent.

Methods

This is a case series of patients with GOO syndrome due to non-metastatic distal gastric tumours, who underwent SPGJ, as a bridge to curative treatment, between 2015 and 2021. Baseline clinicopathological characteristics including age, nutritional status, body mass index and performance status were evaluated. Obstructive symptoms were graded according to the GOO Scoring System and evaluated before and after the surgery. The primary outcomes were: surgical complications, mortality and length of hospital stay.

Results

This case series included 12 patients who underwent open SPGJ. Most patients were male (9/12) and with a mean age of 69 and a mean BMI of 23.4. GOO scores improved in all patients. Postoperative complications occurred in four patients (40%), requiring surgical intervention in one case, for intra-abdominal bleeding. One patient died during the early postoperative period due to complications of aspiration pneumonia and another patient two months later due to cardiac failure. The mean length of hospital stay was thirteen days. Chemotherapy was administered to 8 (67%) patients, of whom five (63%) later underwent radical resection. Median survival times were 30 months.

Conclusion

Stomach-partition gastrojejunostomy seems a safe and feasible option to restore short-term oral intake in patients with clinically significant gastric outlet obstruction, this might improve the number of eligible patients to complete the recommended treatment and consequently improve oncological outcomes and quality of life.

INTRODUCTION

Despite its declining incidence, gastric cancer (GC) remains the fifth most diagnosed malignancy worldwide.¹ The life-time risk remains between 1 and 3% in most European countries and as high as 5–20% in some parts of Asia.² The high incidence of GC in Japan and other eastern Asian countries prompted the establishment of countrywide screening programs to detect early and treatable cancers. Nowadays, mortality rates are considerably lower, reflecting the impact of diagnosis and treatment of early-stage GC. In fact, stage IA (intramucosal carcinoma) represents about 50% of GC in Japan and these are almost all resected using

endoscopic treatment.³ In contrast, Western surgical and population-based series show that most patients present with tumour that has penetrated the submucosa, thus increasing the risk of lymph-node metastasis and diminishing the likelihood of prolonged disease-free survival.⁴ The frequently advanced stage at diagnosis may account for the worse survival in the West⁵ but other factors likely contribute. The 5-year overall survival rate of patients receiving curative gastrectomy without adjuvant treatment was reported at approximately 70% in Japanese and Korean trials^{6,7} and only 23–35% in Western trials.^{8,9} This difference in outcome led to different intensities and strategies of systemic therapies.

In Europe, peri-operative chemotherapy has been the standard for patients with locally advanced GC, since ECF (combination of epirubicin, cisplatin, and 5-FU) was first reported to prolong overall survival from 23% to 36% over surgery alone, in the UK MAGIC trial.¹⁰ More recently, the FLOT regimen (5-fluorouracil, folinic acid, oxaliplatin, and docetaxel) had even better pathological response rates, higher R0 resection rates and better overall survival.¹¹ The European Society for Medical Oncology treatment guidelines¹² give a strong recommendation for perioperative chemotherapy for patients with stage 1B or greater resectable GC. FLOT is now the recommended standard of care for patients who can tolerate a perioperative three drug combination regimen.⁵

There are no pathognomonic symptoms associated with GC, although those who present with significant symptoms frequently have advanced disease.¹³ Patients with proximal tumours may present with dysphagia or pseudo achalasia, whereas patients with distal tumours (26%) often present with obstruction and associated nausea and emesis. Malignant gastric outlet obstruction (GOO) is characterized by the mechanical obstruction of the pylorus or duodenum due to tumour compression/infiltration, with consequent reduction or impossibility of an adequate oral intake.¹⁴ Its incidence varies between 14.9% and 35% in patients with distal GC,^{15,16} and it may also complicate other locally advanced gastrointestinal neoplasms, such as in the peri-ampullary region.¹⁷ Effective treatment of GOO is essential either for patients who have to face oncological therapy regimens, as for those at late stage of disease, who only require supportive care aimed at improving quality of life.¹⁴

In patients with unresectable carcinoma, a bypass procedure has traditionally been considered the palliative surgical procedure of choice, through a conventional or partial stomach-partition gastrojejunostomy (PSPGJ), open or laparoscopic.¹⁸ The first report of gastric partition was presented by Devine *et al*¹⁹ in 1925, in the setting of obstruction caused by a complex duodenal ulcer. Few years later, Maingot *et al*²⁰ reported the use of this technique for malignant obstruction. In both cases, gastric partition was complete, leading to inadequate drainage of the gastric fluids from the excluded stomach (closed loop syndrome) and the risk of stump blowout,²¹ afterwards it was presented a modification of Devine's procedure, whereas a small communication between the two gastric chambers avoided the closed loop associated complications. Additional advantages include maintained endoscopic access to the tumour and biliary tree, as well as decreased ulcerogenesis, as the gastric acid continued flowing to the antrum, inhibiting gastrin secretion.²² Less invasive approaches have been proposed, such as endoscopic stenting, placement of a nasojejunal tub and feeding jejunostomy. Nevertheless, few randomized clinical trials have been conducted to compare these different approaches,^{23,24} and there is still uncertainty about the best strategy to choose.

Previous studies have compared SPGJ with GJ in patients with gastric outlet obstruction due to unresectable disease, in a palliative context,²⁵ as well as derivative surgery vs other palliative options.^{26,27} The aim of this study was to

evaluate the use of stomach-partition gastrojejunostomy (SPGJ) to restore oral intake in patients with locally advanced antral tumours as part of multimodal treatment, with a curative intent.

METHODS

PATIENTS

We identified all patients undergoing SPGJ for symptomatic distal gastric adenocarcinoma, mainly with outlet obstruction syndrome and/or severe anaemia between 01-01-2015 to 31-07-2021 in a secondary-level hospital. We defined symptomatic disease when patients had gastric outlet obstruction and/or severe anaemia, defined as Hb lower than 13.0g/dL in men and lower than 12.0 g/dL in woman. From eligible patients, we included all adult patients who had non-metastatic disease on CT scan and where the intention of the surgery was to allow the continuation of the standard treatment, that in our institution, for patients with locally advanced non-metastatic gastric cancer under 80 years old, is to start with neoadjuvant chemotherapy followed by surgical complete. We defined this when the indication for surgery was to restore adequate oral intake and improve or maintain their functional status, the preferential method was the performance of SPGJ determined by the tumour board. We excluded patients with non-resectable disease.

All patient data were retrospectively collected from medical records, including patient demographics, and performance status, evaluated by Eastern Cooperative Oncology Group (ECOG).²⁸ Symptoms, including anorexia, weight loss, nausea and/or vomiting and fatigue, and tumour characteristics related to histological subtype were also collected. Patient's nutritional status was evaluated with their weight in kilograms and body mass index (BMI) which were measured before the surgery and 30 days after surgery.

Food intake was evaluated using the GOO scoring system²⁹ and was recorded preoperatively and at the time of discharge. GOOSS was scored as follows: 0 = no intake, 1 = liquids only, 2 = soft food, and 3 = low residue or full diet. We considered any patient with a score ≤ 2 (only tolerating soft food) as having GOO. We compared the preoperative and the discharge score.

OUTCOMES

The primary outcomes were postoperative complications at 30 days, evaluated by the *Clavien-Dindo* Classification,³⁰ mortality at 30 days and length of stay, considering the day of surgery as day zero. The secondary outcomes included diet tolerated after the procedure, weight gain, chemotherapy and surgical resection completion, and overall survival at 4 years.

SURGICAL TECHNIQUE

The stomach was partitioned in the caudo-cranial direction, 3-5 cm proximal to the lesion in the large curvature, using a 60 mm linear cutting stapler and preserving a narrow

Table 1. Clinical and pathological characteristics of the patients (n=12)

ECOG PS	0	7 (70%)
	1	1 (8%)
	2	1 (8%)
	3	3 (25%)
Histological subtype	Intestinal	7 (58%)
	Diffuse	4 (33%)
	Mixed	1 (8%)
cT	2	1 (8%)
	3	1 (8%)
	4	10 (83%)
cN	Positive	12 (100%)

tunnel in the lesser curvature side. Subsequently, an antecolic gastrojejunostomy was fashioned between the posterior wall of the gastric body and the antimesenteric edge of a proximal loop of jejunum, about 20 cm from the ligament of Treitz. In some cases, Roux-en-Y reconstruction was performed. A nasojejunal feeding tube was routinely placed to provide enteral feeding in the first postoperative days.

DATA MANAGEMENT AND ANALYSIS

All data were collected by reviewing electronic health data records and was recorded using Microsoft Excel (Redmond, WA, USA). The data collection documents were kept in a secure, password protected document which was not accessible without access to the hospital system. All data will be destroyed after 5 years.

ETHICS

This case series was registered as an audit in the respective hospital; no identifiable data was collected from any of the included patients.

RESULTS

Between 2015 and June 2021, 19 patients underwent SPGJ for symptomatic distal gastric adenocarcinoma, mainly with outlet obstruction syndrome and/or severe anaemia. Of this group, 12 patients had resectable non-metastatic tumours.

A total of 12 patients underwent SPGJ due to gastric outlet obstruction, in the setting of resectable non-metastatic gastric adenocarcinoma. The majority were male (75%) and the median age was 69 years (range 48-86). Demographic and tumour characteristics are showed in [Table 1](#). Obstructive symptoms were predominant, although three patients (25%) also presented tumour-related bleeding, resulting in severe anaemia.

Operative outcomes are demonstrated in [Table 2](#). Postoperative complications occurred in four patients (40%), requiring surgical intervention in one case, for intra-abdominal bleeding. None of the patients presented anastomotic

leakage of gastric suture lines. One patient died during the early postoperative period due to complications of aspiration pneumonia and another patient two months later due to cardiac failure.

Chemotherapy was administered to all remaining 8 (67% of series) patients, of whom five (42%) later underwent radical resection. One patient refused resection surgery and the other two showed disease progression under preoperative systemic therapy.

As showed in [Table 3](#), evolution of nutritional values was overall favourable. More than 70% presented improved body weight at one-month postoperative follow-up. Likewise, haemoglobin levels increased, with no patients revealing severe anaemia. All patients were discharged with tolerance of oral intake to low residue or full diet. During follow-up, there was no recurrence of obstructive symptoms.

The median overall survival of the entire series was 30 months (range 0-60). The data collection started from 2015 up to 2022 as stated before, with a follow-up period until 2025. From the total of 5 patients that successfully underwent radical resection, 4 of them are still alive.

DISCUSSION

Ishida *et al*³¹ have recently reported a case of laparoscopic SPGJ performed before neoadjuvant chemotherapy in a patient with advanced GC and GOO. To our knowledge, our short series is the first describing the use of SPGJ in a curative setting, allowing perioperative chemotherapy and adequate surgical resection in non-metastatic, obstructing (albeit resectable) distal gastric tumours.

Advantages attributed to partition should be considered.^{21,22,25,32} First, patients can rapidly resume oral intake after surgery, recovering their functional and nutritional status. This was evident in our series, where all patients were discharged under low residue or full diet and the majority showed increased body weight as soon as one-month postoperatively. Secondly, subsequent surgical resection is simplified and abbreviated in time, by preserving the gastrojejunostomy already constructed during the first procedure. When compared to conventional GJ, gastric emptying is improved. Finally, reduced tumour bleeding due to less

Table 2. Operative Outcomes (n=12)

Surgical reconstruction	Billroth II	3 (25%)
	Roux-en-Y	9 (75%)
Time to enteric feeding (median)	5 [1-29] days	
Time to oral intake (median)	7 [0-40] days	
Length of stay (median)	13 [6-49] days	
Morbidity at 30 days	CD I-II	4 (33%)
	CD ≥ III	1 (8%)
Mortality at 30 days	1 (8%)	
6-mo survival rate	9 (75%)	

Table 3. Evolution of nutritional values and GOOSS (n=10)

Parameters	Pre-operative	1-mo postoperative
Body weight, median (range)	65 (39-70) kg	70 (40-74.5) kg
Weight gain	7 (77.8%), mean +3.4 kg	
BMI, median (range)	23.4 (15.2-27.3)	23.5 (15.6-28.1)
BMI increase	7 (77.8%), mean +1.1	
Haemoglobin, median (range)	10.4 (7.6-14.7) g/dL	11.0 (9.3-14.6) g/dL
Albumin, median (range)	3.3 (2.1-4.8) g/L	3.5 (2.6-4.4) g/L
GOOSS		
0 = no intake	1 (11.1%)	0
1 = liquids only	3 (30%)	0
2 = soft food	6 (66.7%)	0
3 = low residue or full diet	0	10 (100%)

contact with ingested food, leads to fewer blood transfusions and increased fitness. The improved nutritional and haematological status enable an early start of neoadjuvant chemotherapy, with increased tolerance and quality of life. Excluding the two patients who died, all started and tolerated subsequent systemic therapy. Five of them later underwent gastric resection.

Another option in patients with locally advanced but resectable distal GC would be “direct” distal gastrectomy, followed by adjuvant chemotherapy. However, this strategy would fail to deliver the most effective treatment available. Treatment with chemotherapy before surgery increases the chance for curative resection, eliminates early microscopic spread and allows an *in vivo* response assessment of treatment. Besides, in the common setting of obstruction and bleeding, the risk of surgical morbidity is higher due to malnutrition and anaemia.

We believe SPGJ may be the first step of a standard strategy for advanced gastric cancer with GOO, when chemotherapy followed by curative resection is indicated. Nevertheless, we recognise that a laparoscopic approach to the procedure would be less invasive and potentially reduce morbidity as well as length of stay. Our results are also limited as they were obtained from retrospective data, in a sin-

gle centre. Our case series is short and without a comparison arm. Further studies are warranted to determine the exact oncological benefit of SPGJ in advanced distal gastric cancer with GOO, particularly in this context of resectable disease. Our group is planning a prospective comparison of long term-outcomes between patients following perioperative chemotherapy and radical gastrectomy whether or not SPGJ is performed first, in a wider sample of patients.

CONCLUSION

Current multimodal treatment including perioperative systemic therapy and surgical complete offers the best chance of survival in locally advanced gastric cancer. Stomach-partition gastrojejunostomy seems a safe and feasible option to restore short-term oral intake in patients with clinically significant gastric outlet obstruction, allowing them to subsequently undergo the most effective treatment available, thus theoretically improving oncological outcomes, as well as quality of life.

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