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UPPER GIT SURGERY

Peptic ulcer disease-related gastric outlet obstruction – does surgery still play a role?

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Background: Gastric outlet obstruction (GOO) due to peptic ulcer disease (PUD) has seen a global decline, with endoscopic management now considered first-line therapy. Modern surgeons have limited exposure to PUD GOO, with a lack of recent literature and contemporary guidelines to aid in surgical decision-making. This study aims to review a cohort of PUD GOO patients with specific focus on those needing surgical intervention.
Methods: All patients managed for PUD GOO at a single South African centre over a four-year period were included. Those requiring surgery were sub-analysed and multivariate analysis performed to identify factors associated with increased morbidity.
Results: A total of 84 PUD GOO patients were included. Forty-five were selected for endoscopic balloon dilatation (EBD), with only 21 (46.7%) successfully managed with EBD. Thirteen patients required only medical therapy, eight were selected for upfront surgery and 18 patients were managed with stenting. A total of 31 patients (36.9%) required surgery, with 33 separate operations performed (12 resections and 21 bypass operations). The surgical procedure performed was the only variable shown to be significantly associated with postoperative morbidity, with both pyloroplasty and partial gastrectomy having higher complication rates when compared to gastro-jejunal bypass (50.0% and 66.7% vs 5.6%, OR:17.0 and 8.5, $p = 0.016$ and $p < 0.001$ respectively).
Conclusions: In our setting obstructed PUD often requires surgical management. The choice of surgical procedure should be individualised. Due to the multifactorial complexity of these patients, they are best managed in multidisciplinary team settings with input from dieticians, endoscopists and surgeons.
Keywords: peptic ulcer disease, gastric outlet obstruction, surgery

Introduction

Despite a significant reduction in the global incidence of peptic ulcer dis ease (PUD), ulcer complications still occur. These complications remain relatively common in low- to middle-income countries (LMICs).[1,2] Currently the published literature on complicated PUD mainly focuses on bleeding and perforation, with less focus on obstructing ulcer disease.[3,4] Gastric outlet obstruction (GOO) secondary to PUD is decreasing with most papers addressing GOO in the context of malignancy.[5] While medical management may resolve obstructive symptoms from PUD-related localised acute oedema, chronic fibrotic stricturing due to scarring and fibrosis requires further intervention. Current management algorithms recommend endoscopic balloon dilatation (EBD) as first-line option with excellent results being reported and seldom need for surgical intervention.[6,7] Contemporary data on surgery following failed medical and endoscopic therapy for PUD GOO is lacking.

This study aims to review the incidence and management of a contemporary cohort of PUD GOO patients at a tertiary level hospital in South Africa, with special reference to those failing endoscopic management and requiring surgical intervention.

Methods

All adult patients (18 years and older) with PUD GOO managed in the Surgical Gastroenterology Unit, Groote Schuur Hospital and University of Cape Town, between 1 March 2018 and 28 February 2022 were included. Patients with confirmed malignancy, non-PUD causes of GOO (e.g. corrosive ingestion history or pancreatitis) and non-mechanical obstruction (i.e. gastroparesis) were excluded. Patients who subsequently required surgical intervention for GOO where sub-analysed. Patients were identified from an established and ethically approved prospective endoscopy registry (HREC/REF:031/2015) and data were exported and retrospectively analysed. This study was approved by the University of Cape Town Human Research Ethics Committee (HREC/REF: 247/2021).

Patients are managed with a step-up approach, starting with medical therapy, including identification and eradication of Helicobacter pylori, twice daily proton pump inhibitor (PPI) use, nutritional optimisation, and risk factor modification. Patients are generally reviewed within two–four weeks and, if there has been no significant clinical improvement, medical therapy is considered to have failed, and they are considered for intervention. Patients with incomplete obstruction who are still tolerating a soft or fluid diet are optimised with oral nutritional supplementation, while those with features concerning for complete obstruction are

admitted for enteral feeding via an endoscopically placed nasojejunal tube, which may require balloon dilatation to allow passage of the tube or parenteral nutrition, if enteral access cannot be achieved. Patients who fail medical therapy progress to endoscopic management. When presenting with clinically symptomatic obstruction, progression to endoscopic or surgical management may be expedited. Endoscopic therapy involves graded balloon dilatations with an initial starting diameter (usually 10–12 mm) as determined by the endoscopist. The balloon diameter size is sequentially increased according to endoscopic response at two weekly intervals. Through-the-scope balloons are inflated under both endoscopic vision and fluoroscopy for 30 seconds per dilatation session.

Failure of adequate endoscopic or clinical improvement results in progression to surgery; a period of nutritional prehabilitation by enteral or parenteral nutrition follows prior to surgery. Intraoperative decisions regarding resection versus bypass surgery are made on an individualised patient basis, taking multiple factors into consideration. Patients with a massively dilated stomach, intraoperative concern of malignancy (despite negative endoscopic biopsies), and those with chronic pain from the ulcer will more likely be selected for resection. Postoperatively, all patients are offered endoscopic surveillance, initially at three–six-month intervals and thereafter annually.

Patients with a poor performance status, who are not deemed fit enough for repeat endoscopic dilatation sessions or surgery are considered for endoscopic stenting on an individualised basis. Fully covered self-expanding metal duodenal stents with a 120 mm length are preferentially used (which require securing with an over-the-scope clip to prevent migration). In cases with severely limited life expectancy, an uncovered stent may be used.

The following definitions were used:

GOO – clinical symptoms of GOO accompanied by endoscopic findings of retained gastric content with a visible stricture at the pyloric channel or proximal duodenum, an inability to pass a standard gastroscope through the stricture, and/or evidence of GOO on radiological imaging.

Peptic ulcer disease gastric outlet obstruction (PUD GOO) – GOO with endoscopically visible ulceration and malignancy excluded histologically. All strictures were biopsied to exclude malignancy. Patients with prior surgery for PUD with subsequent representation with GOO from stomal ulceration, were also included.

Successful resolution of GOO – clinical resolution of symptoms without the need for further intervention after last endoscopic or surgical intervention. If endoscopically evaluated after intervention, gastric stasis should be resolved and a standard gastroscope should be easily passed through the stricture.

Endoscopic failure – lack of clinical improvement or persistent evidence of endoscopic gastric stasis despite repeated EBD sessions (clinical failure) or an inability to obtain guidewire access across the stricture endoscopically (access failure).

Helicobacter pylori positive – documented positive rapid urease test (RUT) or positive histology.

Morbidity was defined as any complication occurring during the follow-up period and was not limited to in-hospital or 30-day morbidity. This allowed inclusion of specific chronic complications, such as post-gastrectomy syndromes or obstruction recurrence. Patient performance status was assessed as per the Eastern Cooperative Oncology Group (ECOG) Performance Status Scale,[8] while no specific frailty score was used to assess frailty.

Variables assessed for association with increased postoperative morbidity included patient demographics (age and gender), risk factors for PUD (H. pylori, nonsteroidal anti-inflammatory drug [NSAID] use, and smoking), upfront surgery versus initial successful EBD, number of EBD sessions (divided into ≤ 2 sessions and > 2 sessions, based on prior positive association reported by Perng et al.[9]) and surgical procedure performed. Procedures were divided into four groups as follows – gastro-jejunal bypass, pyloroplasty, partial gastrectomy and total gastrectomy. Partial and total gastrectomies were further grouped as "all resections" and gastro-jejunal bypasses and pyloroplasties grouped as "all bypasses."

Statistical analysis

Data exploration and analysis were done using Microsoft Excel and IBM SPSS Statistics (version 28.0.1.1). Both the general PUD GOO cohort and the sub-cohort requiring surgery were described with basic descriptive statistics. Means with standard deviation were used for parametric data and median with interquartile range for non-parametric data. Multivariate analysis was then performed on the surgery group to identify any factors associated with increased complication rates – categorical variables were compared using Pearson's chi-square test or Fisher's exact test for expected values < 5. Analyses of complications in the surgical procedure groups were performed using the Kruskal-Wallis test to allow for comparison of four groups with non-parametric data. Further post-hoc multiple comparison analysis using a two-tailed Mann-Whitney U test was performed on any groups shown to be statistically significant. A p-value of < 0.05 was considered statistically significant.

Results

A total of 84 patients with benign GOO from PUD, who were all commenced on appropriate medical therapy, met the inclusion criteria, of which 31 (36.9%) ultimately required surgical management, equating to a mean rate of 21.0 patients with PUD GOO and 7.8 patients progressing to surgery per year. The total cohort included 12 patients (16.7%) with prior surgery for complicated PUD. Forty-three (51.2%) patients were female, and the mean age was

Table I: Risk factors for peptic ulcer disease (PUD)

PUD risk factors (n = 84)	
Any risk factor identified	63 (75.0%)
No risk factor identified	21 (25.0%)
Single risk factor identified	29 (34.5%)
Multiple risk factors identified	34 (40.5%)
Specified risk factors	
H. pylori positive	*18 (21.4%)*
Cigarette smoking	*52 (61.9%)*
Regular NSAID[a] use	*28 (33.3%)*
Recreational drug use	*6 (7.1%)*

[a]Nonsteroidal anti-inflammatory drug

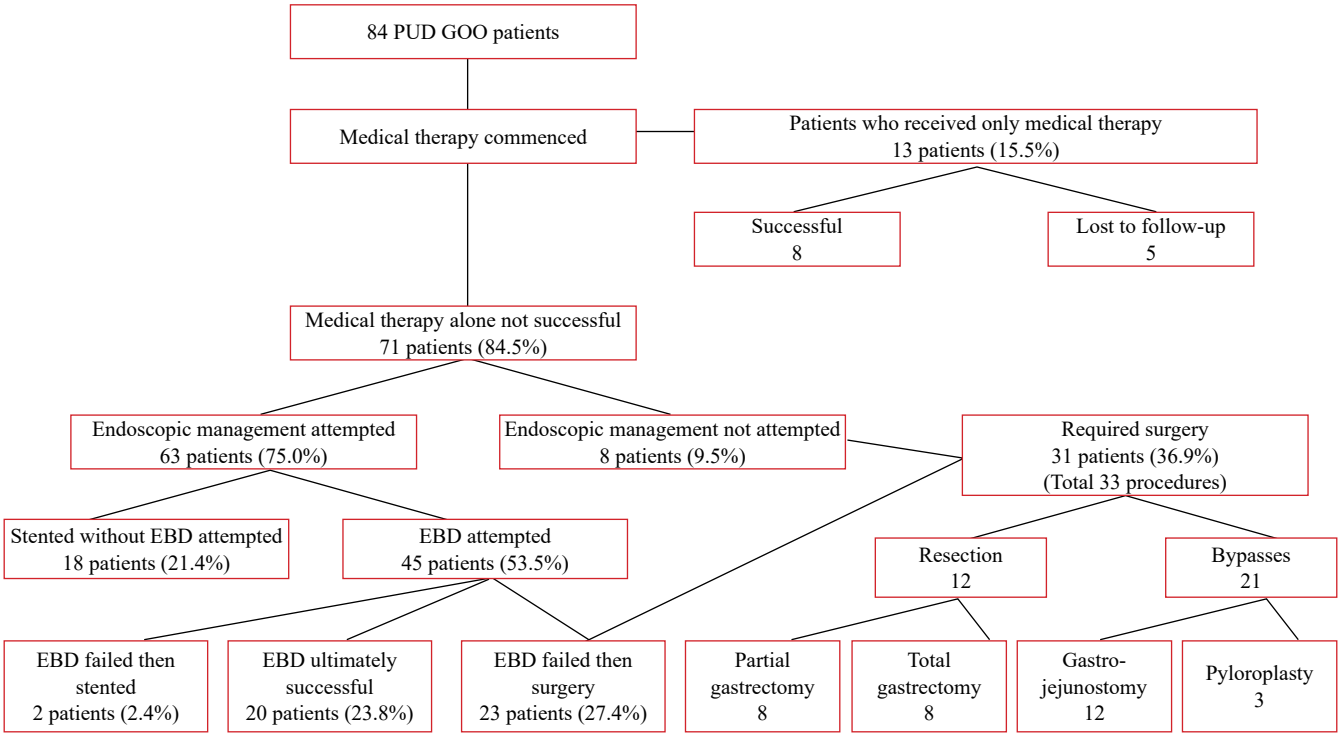

Figure 1: Initial management overview of all patients managed with PUD GOO; PUD – Peptic ulcer disease, GOO – Gastric outlet obstruction, EBD – Endoscopic balloon dilatation

54.5 (± 13.4) years. Forty-eight patients (57.1%) had at least one documented comorbidity. Sixty-three patients (75.0%) had at least one documented risk factor for PUD, and 34 patients had multiple risk factors. The main risk factors for PUD were H. pylori infection (21.4% H. pylori positive), regular NSAID use, recreational drug use (amphetamines and heroin) and cigarette smoking (Table I).

Most patients (63 patients, 75.0%) underwent endoscopic treatment – EBD in 45 (53.5%) and stenting in 18 (21.4%) (Figure 1). Of the 45 patients selected for EBD, 20 had sustainable positive results. Other than endoscopic failure, the only complications of EBD recorded in this cohort were two episodes of bleeding, one managed conservatively and one requiring an endoclip. There were no perforations from EBD in this cohort. The patients treated with stenting were all frail with poor performance status, making them unfit for repeated EBD sessions or surgery. Of these 22 patients, eleven had acute resolution of the GOO but were then lost to follow-up, six died with the stent in-situ, but with the GOO resolved, two were subsequently managed with surgery and three had definitive, long-term resolution of the GOO from the stent. In all three, the stents migrated distally but the pyloric channel and duodenum were widely patent on endoscopy, with two of these stents passed in the stool and one requiring a laparotomy to retrieve the stent causing a small bowel obstruction. Thirteen patients (15.5%) were managed with medical therapy alone, while eight patients (9.5%) underwent upfront surgery. The reasons these patients were chosen for surgery without attempting endoscopic management first included – patient preference for surgery (n = 1), concomitant small bowel obstruction from NSAID use requiring surgery anyway (n = 1), concerns of malignancy despite initial benign histology (subsequent confirmation of benign disease on the resected specimen) (n = 1), and concomitant pyloric channel fistula with concerns of safety regarding EBD (n = 1). The remaining four patients had a significant component of gastric dilatation and stasis from prolonged obstruction and attempts at EBD were deemed to be futile (Figure 2).

In total, 31 patients (36.9%) required surgery and underwent a total of 33 surgical procedures. Indications for and type of surgery are outlined in Table II. A gastro-jejunal bypass was performed in 18 (54.5%) patients, all of which were performed as Roux-en-Y gastro-enterostomy configurations (no loop gastro-enterostomies, with or without Braun entero-enterostomies were performed in this cohort). Four patients underwent completion total gastrectomy after

Figure 2: Barium contrast meal of severely dilated stomach from peptic ulcer disease gastric outlet obstruction

Table II: Surgery cohort – reasons for needing surgery and types of operations performed

Reasons for needing surgery (*n* = 31)	
Endoscopic failure – clinical failure	8
Endoscopic failure – access failure	7
Endoscopist's decision	5
Stent complication	2
Patient choice	2
Non-functional gastric remnant	2
Concern of malignancy	3
Other	2
Operations performed (*n* = 33)	
Resections	12
Completion total gastrectomy	*4*
Partial gastrectomy - Roux-en-Y	*4*
Partial gastrectomy - Billroth I	*4*
Pyloroplasty	3
Pyloroplasty - Jaboulay	*2*
Pyloroplasty - Heineke-Mickulicz	*1*
Bypass	18
Bypass Roux-en-Y gastro-jejunostomy	*18*

prior partial gastrectomy complicated by stomal ulceration and the remaining partial gastrectomies were completed by either Roux-en-Y or Billroth I reconstructions.

There were no mortalities in the surgery group. Seven postoperative complications were documented (complication rate 21.2%) including one superficial surgical site infection, one patient with post-gastrectomy bile reflux gastritis (necessitating revision surgery), four with recurrent GOO (three successfully managed with EBD and one requiring revision surgery) and one with a duodenocutaneous fistula following duodenal stump blow-out which was managed conservatively.

Comparison of numerous variables (age, gender, PUD risk factors, upfront surgery versus successful initial EBD and number of EBD sessions) with postoperative morbidity failed to show a statistically significant association, except for the type of surgical procedure (Table III). Complication rates were higher in the resection group, but did not reach statistical significance. Compared to gastro-jejunal bypass, partial gastrectomy (50.0% vs 5.6%, OR: 17.0, $p = 0.016$) and pyloroplasty (66.7% vs 5.6%, OR: 8.5, $p < 0.001$) had statistically significant higher complication rates.

Discussion

With improved medical therapy of the underlying aetiological agents of PUD and increasing endoscopic management of benign GOO, the role of surgery has diminished significantly in the last few decades. However, in our patient cohort a third of patients still required surgical intervention. Most international descriptive series are more than two decades old.[9-12] In a randomised controlled trial of 90 patients from Chile by Csendes et al.,[11] published 30 years ago, three different surgical options for benign PUD GOO (gastro-jejunostomy with highly selective vagotomy [HSV] vs. Jaboulay pyloroplasty with HSV vs antrectomy

Table III: Multivariate analysis of numerous variables for postoperative complication rate

Variable assessed		Complication	*p*-value	
Age category	< 50 years (*n* = 19)	6 (31.6%)	0.101	
	≥ 50 years (*n* = 14)	1 (7.1%)		
Gender	Male (*n* = 19)	4 (21.1%)	0.652	
	Female (*n* = 14)	3 (21.4%)		
Known PUD[a] risk factor	No (*n* = 10)	2 (20.0%)	0.648	
	Yes (*n* = 23)	5 (21.7%)		
H. pylori	No (*n* = 24)	5 (20.8%)	0.635	
	Yes (*n* = 9)	2 (22.2%)		
NSAIDs[b]	No NSAIDs (*n* = 25)	6 (24.0%)	0.444	
	NSAID User (*n* = 8)	1 (12.5%)		
Smoker	Non-smoker (*n* = 14)	4 (28.6%)	0.321	
	Smoker (*n* = 19)	3 (15.8%)		
Upfront surgery vs successful initial EBD[c]	Upfront surgery (*n* = 21)	5 (23.8%)	0.494	
	Successful initial EPBD (*n* = 12)	2 (16.7%)		
No. of EBD sessions	≤ 2 sessions (*n* = 9)	1 (11.1%)	0.735	
	> 2 sessions (*n* = 8)	1 (12.5%)		
All resections vs all bypasses[#]	All bypasses (*n* = 21)	3 (14.3%)	0.198	
	All resections (*n* = 12	4 (33.3%)		
Type of surgery	Bypass gastro-jejunostomy (*n* = 18)	1 (5.6%)	Bypass vs pyloroplasty	< 0.001
	Pyloroplasty (*n* = 3)	2 (66.7%)	Bypass vs partial	0.016
	Partial gastrectomy* (*n* = 8)	4 (50.0%)		
	Total gastrectomy (*n* = 4)	0 (0.0%)	Pyloroplasty vs total	0.025

[a]PUD – Peptic ulcer disease, [b]NSAIDs – Nonsteroidal anti-inflammatory drugs, [c]EBD – Endoscopic balloon dilatation. [#] "All resections" include partial and total gastrectomies and "all bypasses" include gastro-jejunal bypasses and pyloroplasties. *Partial gastrectomy includes both Billroth I and Roux-en-Y reconstructions.

with selective vagotomy) were highlighted, with outcomes favouring bypass surgery and HSV. From Turkey, Iliklerden et al.[13] in 2021 reported on only nine patients requiring surgery over an eight-year period.

Although the problem of complicated ulcer disease in sub-Saharan Africa (SSA) is reasonably well-described, with historical studies from the 1960s already highlighting the challenges of surgical decision-making,[14] contemporary data on PUD GOO from the last two decades are significantly limited. A systematic review by Rickard, looking at surgeries performed for all PUD complications in an SSA cohort, showed that 30% were performed for obstruction.[2] A more recent study from Rwanda reported on a total of 82 patients with GOO, of whom one-third were due to benign disease.[15] Twelve patients required subsequent surgery. In a study from Tanzania, Jaka et al.[16] reported on a total of 184 patients with GOO (28% due to PUD) of whom 168 (91.3%) were managed surgically. It appears PUD GOO is more common in SSA with surgery more readily performed than internationally.[5,9,10,13]

In our study, 20% of patients had postoperative complications. Gibson et al.[10] reported a 16% morbidity rate in 24 patients requiring surgery for benign GOO. Patients with partial gastrectomy were more likely to develop complications. Gastro-jejunal bypass operations, where the surgeon deals mainly with healthy tissue and avoids the "difficult" duodenum, seemed to give better outcomes with fewer complications. However, with bypass surgery the offending ulcer is left in-situ, which is problematic when there is concern of an underlying malignancy or when there is a component of chronic pain attributed to the ulcer. Furthermore, many patients with chronic GOO may develop an element of irreversible gastroparesis, which is often poorly addressed without a resection. If risk factors remain unaddressed, these patients are also at risk of stomal ulceration and recurrent obstruction.

Our EBD clinical success rate of < 50% success is lower than reports in the literature where success rates as high as 98% have been reported.[7] Possible reasons for the lower success rate may include patient factors, such as untreated risk factors for PUD, non-compliance/poor efficacy of medical therapy, and possible worse nutritional status at presentation. Technical factors such as insufflation duration may also play a role, although there is little definitive evidence to guide this. Although not the main focus of this study, the group of patients receiving pyloric stents must be briefly discussed. The role of stenting in benign disease is currently controversial and not defined. A large proportion of patients present to us in a delayed fashion and are thus found to have severe nutritional deficiencies and poor baseline functioning at presentation. Temporary stenting was useful to re-establish gastric emptying early as part of the prehabilitation process before surgery. Where patient factors precluded surgical or repeated endoscopic interventions, a permanent stent was placed.

Our study has numerous limitations, including the retrospective nature of the data, a limited follow-up period and limited numbers. In addition, risk factors were assessed at initial presentation and not at subsequent visits. Intraoperative decision-making as regards resection versus bypass procedures was made on an individualised basis at the time of surgery by the surgeon performing the procedure and infers an inherent bias in the two groups.

Despite the success of first-line endoscopic therapy in patients with complicated, obstructed peptic ulcer disease, some will require surgical management, particularly in LMICs where conservative management is often sub-optimal. The choice of surgical procedure should be individualised. With the decline in benign gastric surgery since the introduction of PPIs and successful treatment of H. pylori, experience in the management of these difficult patients is lacking, especially in newly qualified surgeons. Due to the multifactorial complexity of these patients, they are best managed in multidisciplinary settings with input from dieticians, endoscopists and surgeons.

Conflict of interest

The authors declare no conflict of interest.

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Informed consent

Specific informed consent was not obtained for this study, however all patients contributing data into the electronic registry used for this study gave informed consent.

Ethical approval

This study was approved by the Human Research Ethics Committee of the University of Cape Town (HREC REF:247/2021).

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