RESEARCH

The hidden endoscopic burden of Roux-en-Y gastric bypass surgery

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ABSTRACT

Background and aims Complication rates of Roux-en-Y gastric bypass (RYGB) vary from centre to centre, but anastomotic stricture is the commonest, and is managed in the majority by endoscopic pneumatic dilatation. The aim of this study was to assess the endoscopic burden of RYGB surgery.

Patients and methods All patients undergoing RYGB surgery over a 29-month period were included and were followed-up retrospectively and prospectively for a minimum of 180 days to monitor for endoscopic procedures performed in relation to the RYGB at Walsall Manor Hospital, UK. Five hundred and fifty-three patients underwent RYGB surgery during the study period.

Results One hundred and thirteen patients had 147 endoscopic procedures, including 65 pneumatic dilatations, at a cost to the NHS of £58 077 over a 29-month study period, with an average cost of £2003 a month, or £105 per RYGB operation performed. The anastomotic stricture rate for the group was 11.39%. The complication rate for dilatation of anastomotic strictures was 0%.

Conclusions RYGB anastomotic strictures can be safely managed by dilatation. If bariatric surgery is performed locally, then endoscopy departments must expect to factor in, not only the burden of dealing with actual complications, but also the burden of investigating for potential complications.

INTRODUCTION

The laparoscopic Roux-en-Y gastric bypass (RYGB) procedure for obesity is still a relatively new surgery, catering for the modern phenomenon of increasing obesity in western populations. It was first performed in 1993, and has been shown to dramatically reduce long-term mortality of these patients by up to 40%.^{1 2}

Complication rates vary, the most common of which is the anastomotic stricture. The incidence of anastomotic strictures in RYGB surgery varies from study to study, 3.7%, 7.8%, 9.4%, but can be as low as 0.8% and as high as 23%.^{3–7}

However, with these high levels of anastomotic strictures, there is an inevitable increased workload for gastroenterology departments, which is often not planned for.

This study was performed to assess the endoscopic workload to the endoscopy department in Walsall Manor Hospital in investigating and managing patients with potential complications of RYGB surgery.

PATIENTS AND METHODS

Study design and patient selection

All RYGB patients between 1 February 2008 and 31 June 2010 were retrospectively reviewed for endoscopic procedures and included in the study if the indication for an upper gastrointestinal endoscopy included persistent vomiting, dysphagia or postoperative upper gastrointestinal bleeding, that is an indication, that or the referral source, originated from the bariatric team. Those who underwent endoscopy had their reports reviewed and their postoperative discharge letters reviewed. The follow-up period was a minimum of 180 days and a maximum of 740 days.

RYGB

Patients are accepted for surgery based on a body mass index (BMI) of over 40, or a BMI over 35 with comorbid disease associated with obesity and failed medical therapy. All antecolic RYGB were performed using either a 25 mm stapler in open surgery and circular type, and a 45 mm stapler if the surgery was

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laparoscopic and linear. The roux loop was 1.5 m if the surgery was open, and 1 m if laparoscopic. Postoperatively, clear fluids are introduced immediately with a contrast study the following day.⁸ Discharge is usually at 48–72 h. Patients are advised on a fluid diet for 4 weeks, then pureed, and on to solids. All patients are routinely discharged home on proton pump inhibitor therapy for life, and non-steroidals were discontinued where possible.

Cost of endoscopy procedures

Upper gastrointestinal endoscopies were costed as per the department's standard figures at £175 for a diagnostic gastroscopy and £672 for a therapeutic gastroscopy based on an average use of consumables, with the single-use Quantum TTC Balloon Dilators (Cook Medical, USA) at £109 and single-use Quantum inflation device at £65.

Statistics

The Mann–Whitney U test was used for statistical testing of non-Gaussian distributed data.

RESULTS

Demographic data

There were 553 patients undergoing RYGB surgery during the period of the study, and 113 of them went on to have an upper gastrointestinal endoscopy. All the 113 endoscopy patients were discharged home after their surgical procedure on proton pump inhibitor therapy, which is standard for all RYGB patients. Five of these patients were on non-steroidal therapy at the time of discharge, four of whom developed strictures. Smoking rates were not consistently recorded, and are therefore not reported.

Endoscopy work

During this period, 113 patients had 147 endoscopic procedures, only 5 (3%) of which were performed as inpatients. The main indication for endoscopy referral is shown in table 1. Seventy-four percent of patients requiring therapeutic procedures indication was persistent vomiting, compared with 55% of diagnostic procedures ($p=0.053$), and 25% of therapeutic

patients presented with dysphagia compared with 37% of diagnostic patients ($p=0.203$).

Therapeutic work

Sixty-five procedures were therapeutic (44%), all of which were pneumatic dilatations, at a total endoscopic cost to the NHS of £58 077 over a 29-month operative study period. This was made up of £43 722 for therapeutic endoscopies, and £14 355 for diagnostic endoscopies, with an average cost of £2003 a month, or £105 per RYGB operation performed.

Of the patients with anastomotic strictures, 21 were women and 42 were men (1:2).

The delay in time from surgery to dilatation ranged from 4 to 506 days, 60% of cases occurred within 3 months, 78% within 4 months, 92% within 5 months and 95% within 6 months, with the remaining 5% occurring between 6 months and 17 months (figure 1).

Multiple dilatations

There were seven patients requiring multiple dilatations, 4 patients were men and 3 were women. One patient needed 3 dilatations, 6 patients required 2 dilatations, the rest just 1, and all were dilated from a range of 11 mm to 16 mm at the endoscopist's discretion, with the average size used being a 12 mm balloon.

Complications

There were no complications associated with any of the endoscopic procedures.

Redo surgical procedures

Five patients had a completely occluded anastomosis, and required a second surgical procedure, with a total anastomotic stricture rate for the entire RYGB surgical group of 11.4%. Of the complete occlusions, the range of time from surgery to diagnostic oesophago-gastroduodenoscopy (OGD) was 18–46 days, with a mean of 25 days; all these procedures were requested from an outpatient setting.

Diagnostic work

Eighty-two procedures were diagnostic (56%). Three of the upper gastrointestinal endoscopies were for haematemesis and due to acute ulceration at the

Table 1 Indication for upper gastrointestinal endoscopy

Indication	Therapeutic n=65	Diagnostic n=82	Early*	Late†	Inpatient	Outpatient
Persistent Vomiting	48	45	10	83	2	83
Dysphagia	16	30	0	46	0	46
Haematemesis	0	3	1	2	3	0
Melaena	0	1	0	1	0	0
Dyspepsia	1	2	0	3	0	3
Abdominal Pain	0	1	0	1	0	1

*Early 31 days, †Late >31 days.

Figure 1 Kaplan–Meier graph showing the timing of endoscopy over months post-RYGB surgery.

anastomosis, none of whom required endoscopic or surgical intervention, and one other procedure showed an anastomotic ulcer, giving a symptomatic ulcer rate of 0.7% for the entire RYGB group. There were no endoscopic complications in the diagnostic group either, and none of the remaining diagnostic procedures showed any abnormality beyond the expected postoperative changes.

DISCUSSION

The exact figures of anastomotic stricture and upper gastrointestinal endoscopies required for the entire surgical group will be underestimated, as the patients attending this centre for bariatric surgery come from over 18 primary care trusts, and a small number may opt to attend their local hospital for investigation and treatment of any postoperative complications. Although the bariatric team offer long-term follow-up to all their patients, and feel that the majority accept it, the study was limited, as no attempts were made to contact each individual patient to confirm that they had not received an endoscopic procedure elsewhere. However, these figures do represent the endoscopic burden to this centre; for this patient group, so far, this is especially relevant as, for the majority of this study period, only one surgeon was undertaking these procedures and now there are three surgeons dedicated for this.

Clearly, from the potential delay in development of an anastomotic stricture, there will be a few patients who require an endoscopy or pneumatic dilatation beyond the 180-day minimum follow-up period, again contributing to an underestimation of the workload derived from this patient group. However, this is the first study of its kind to attempt to calculate the burden to an endoscopy department at a bariatric centre, and as the stricture rate is similar to published work, it provides a reasonable representation and model for estimating future endoscopic workload to the NHS of bariatric surgery.^{3–7}

Given the high rate of complications of this surgery, surgeons performing these procedures need to focus on centres that are able to produce lower stricture rates for technique and methods in limiting stricture occurrence. Multiple studies have failed to identify any clinical factors that are associated with anastomotic strictures, and there is no statistical association or prediction of stricturing with age, BMI, intraoperative blood loss or non-steroidal anti-inflammatory drug use.⁷ More research is required into the factors that promote stricture occurrence, and into what the difference between developing a stricture within a 3-month period and those who develop one comparatively late. This may assist in identifying at-risk populations and, therefore, limiting the number of upper gastrointestinal endoscopies required to investigate postoperative vomiting. It has been demonstrated that proton pump inhibitor use reduces the incidence of stomal ulceration, and patients who do develop ulceration have lower pH levels in the proximal pouch.^{9–10} Currently, there are studies evaluating whether proton pump inhibitor use affects anastomotic stricture rates. Prospective analyses of different techniques have shown that performing the anastomosis across the staple line to form the gastric pouch is associated with significantly fewer strictures than anastomosis on the posterior aspect of the gastric pouch, ($p < 0.0001$, strictures 0.8%).³ One study has reported a lower stricture rate with a 25 mm circular stapler compared with a 21 mm stapler, which is standard in most studies (8.8% vs 26.8%, $p < 0.01$) without compromising weight loss.¹¹

Optimal referral and use of endoscopy to limit the number of diagnostic OGDs

Recommended dilating size of balloon, frequency and potential for complications

Indication for referrals in this study demonstrates that persistent vomiting, more so than dysphagia, is a better predictor of an anastomotic stricture, although comparison of therapeutic and diagnostic indications do not discern an immediate way of reducing diagnostic work. Endoscopic pneumatic dilatation of anastomotic strictures has been the standard management with reported success, although studies have reported a 2.2% and 2.4% perforation rate, whereas we report a 0% complication rate.^{12–14} Other potential complications include haematoma in the oesophagus.¹² The mean time to diagnosis in a recently published study was 3 months after surgery, with the majority of patients successfully treated with one (57%) or two (27.6%) dilatations, and shorter time to stricture formation predicting need for multiple dilatations, which may help guide referral for repeated procedures.⁴ In a small study, the majority of reported strictures developed at least 30 days after surgery ($n=11$), with a minority occurring within 30 days ($n=4$).⁵ Although other studies have reported a higher resolution with

one dilatation (86%).⁷ There is no recommended standard size of the dilating balloon, and dilatation involves balancing the risk of complications, that is perforation, with the wish to improve symptoms without impairing weight loss. In this centre, balloon size is an individual decision, often based on the severity of the stricture visually. Except in unusual circumstances, patients are dilated if the endoscope is unable to pass through the anastomosis freely, and each patient is dilated so that the endoscope can pass freely into both loops. No patients have been dilated beyond 14 mm, and the burden of repeat dilatation has not been higher than in other studies. There are studies reporting the use of 18 mm balloons, but no information is given on how these larger balloons impact on the effectiveness of the procedure, certainly in the future it would be of interest to gather information on the size of dilating balloons used, the subsequent ability and rate of weight loss, and the concurrent resolution of symptoms that led to dilatation in the first place.¹²

In this population, 20.4% of the RYGB population required an endoscopic procedure, and because of those patients referred for multiple procedures, the estimated number from each RYGB group requiring one equivalent upper gastrointestinal investigation or therapeutic intervention is 26.6%. Forty-four percent of these procedures are therapeutic, with the remaining 56% being diagnostic. The bulk of endoscopy costs is in those requiring therapeutic intervention due to the cost of consumables and the need for repeated dilatations. Other costs not financially accounted for in this study, but clearly significant, include the five revision surgery costs and the small number of procedures performed as inpatients, most of which were related to haematemesis and, therefore, an additional hospital admission or delayed discharge. If bariatric surgery is performed locally, then endoscopy departments must expect to factor in, not only the burden of dealing with actual complications, but also the workload related to investigating potential complications. However, the treatment and dilatation of anastomotic strictures is a safe procedure with a low complication rate, and the use of endoscopy both intraoperatively and postoperatively in the field of bariatric surgery continues to grow.

Key Points

- ▶ Bariatric surgery carries a significant endoscopic burden in investigating for complications and dealing with complications themselves.
- ▶ Balloon dilatation of bariatric anastomotic strictures is safe and effective.
- ▶ Most bariatric anastomotic strictures present for dilatation within 5 months of surgery.

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Contributors HS and SM planned the study. HS and HG were involved in data collection, supervised by SM, and all three authors were involved in writing and revising the manuscript. HS is responsible for the overall content.

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