ABSTRACT

Objectives: We present 2 patients with free perforation of the anterior wall of the Roux limb due to marginal ulceration after an antecolic laparoscopic gastric bypass and describe the surgical management and laparoscopic repair technique.

Methods: A 15 mm Hg pneumoperitoneum was established with a Veress needle via the left subcostal approach in both patients. Entrance into the abdomen was achieved with the 5 mm Optiview blunt trocar. The Genzyme liver retractor was used to lift the left lobe of the liver and expose the gastrojejunal anastomosis. A 30° 5 mm telescope was used for visualization. In both cases, free fluid and purulent material were noted in the subdiaphragmatic region and along the right paracolic gutter, but the gastrojejunal anastomosis was intact. A 1 cm perforation with surrounding inflammatory exudate was identified on the anterior surface of the Roux limb distal to the gastrojejunostomy. The edges were debrided and intracorporeal 1-layer repair of the ulcer was performed with simple interrupted 2–0 Vicryl sutures. Fibrin glue was applied to the suture line and covered with an omental onlay patch. The anastomosis was tested with air insufflation and methylene blue dye with no evidence of a leak. A Jackson-Pratt drain was placed in the left upper quadrant.

Results: Both patients underwent an unremarkable hospital course, and follow-up EGD examination after 3 months revealed no evidence of ulceration.

Conclusion: Laparoscopic exploration and the repair of the gastrointestinal perforations in patients with a recent history of laparoscopic RYGBP is safe, if patients are hemodynamically stable and present within the first 24 hours of the onset of symptoms.

Key Words: RYGBP, EGD, Gastrointestinal perforations, Gastrojejunostomy.

INTRODUCTION

Bariatric surgery has become an important adjunct in battling obesity. The prevalence of obesity currently exceeds 60% among United States adults.1 Surgical therapy is not only effective in producing long-term weight loss but ameliorates and even cures some of the significant complications of obesity, including diabetes, hypertension, dyslipidemia, sleep apnea, and many others.2 This lifesaving surgery has many proven health benefits, but there are also potential risks and complications. Marginal ulcer formation after gastric bypass surgery is a complication that can arise in the early postoperative period or many months after the operation.3

Marginal ulceration is the most common abnormality found among symptomatic patients after gastric bypass surgery on flexible upper endoscopy examination.4 The incidence of free perforation of marginal ulcers after laparoscopic antecolic gastric bypass is 1.6%.5 Although the precise cause of this complication needs further elucidation, multiple factors may contribute to its occurrence, such as a foreign body, ischemia, smoking, Helicobacter pylori (H. pylori), staple line dehiscence, large gastric pouch, pouch orientation, gastro-gastric fistula, and non-steroidal anti-inflammatory drugs (NSAIDs).3,6–9

Laparoscopic repair of a perforated marginal ulcer after laparoscopic gastric bypass is a feasible, safe alternative to open exploration in hemodynamically stable patients who present within 24 to 48 hours of onset of symptoms. A minimally invasive approach to such a complex surgical problem has not been well described in the surgical literature. This article discusses the surgical management and the operative technique used in 2 patients who had the laparoscopic antecolic Roux-en-Y gastric bypass operation and presented more than a year later with free perforation of the jejunal Roux limb.

CASE REPORT 1

History of Presentation

A 50-year-old female presented with severe epigastric pain and nausea that began 10 hours before emergency room admission. She had undergone laparoscopic Roux-
en-Y gastric bypass 16 months earlier (BMI = 50 kg/m²) and had lost 140 pounds since her surgery. She was diagnosed with a 1 cm ischemic ulcer at the gastrojejunal anastomosis 2 weeks after the operation, which was managed successfully with Protonix and Carafate. Repeat upper endoscopy (EGD) 8 weeks later showed complete resolution of the ulcer. The patient remained asymptomatic until the morning of her presentation. Before the gastric bypass procedure, her past medical history was significant for GERD, and she was a heavy cigarette smoker.

On physical examination she was afebrile with a heart rate of 93 and blood pressure of 156/77. Her abdomen was diffusely tender with guarding and rebound. Bowel sounds were present. Her white blood cell count was elevated to 14.6 k/mm³ (range, 4.5 to 11.0) with 14% band cells (range, 0 to 6).

**Radiology**

CT scan of the abdomen and pelvis with oral and intravenous contrast demonstrated free intraperitoneal air in the upper abdomen, perihepatic and perisplenic ascites, and fluid collection in the cul-de-sac. The gastrojejunal and jejunojejunal anastomoses appeared intact. There was no extravasation of water-soluble contrast (Figure 1).

**CASE REPORT 2**

**History of Presentation**

A 46-year-old male who had the laparoscopic gastric bypass procedure 17 months earlier presented to the emergency department with the sudden onset of abdominal pain and nausea that had begun earlier that morning. Since surgery, he had been doing well and lost 192 pounds of his initial weight (BMI = 52 kg/m²). His past medical history was significant for hypertension, hypercholesterolemia, obstructive sleep apnea, chronic obstructive pulmonary disease (COPD), asthma, and muscle and joint pain.

On physical examination he was afebrile, with a heart rate of 77 and blood pressure of 178/135. The abdomen was soft on palpation, but diffusely tender with rebound and generalized guarding. Bowel sounds were absent. His white blood cell count was 6.1 k/mm³ (range, 4.5 to 11.0).

**Radiology**

A CT scan of the abdomen and pelvis showed contrast extravasation in the region of gastrojejunal anastomosis and intraabdominal free air (Figure 2).

**Operative Findings and Hospital Course**

A 15 mm Hg pneumoperitoneum was established by using a Veress needle via the left subcostal approach in both patients. Entrance into the abdomen was achieved with the 5 mm Optiview blunt trocar. The Genzyme liver retractor was used to lift the left lobe of the liver and expose the gastrojejunal anastomosis. A 30° 5 mm telescope was used for visualization.

In both cases, free fluid and purulent material were noted in the subdiaphragmatic region and along the right paracolic gutter, but the gastrojejunal anastomoses appeared intact.
to be completely intact. Upon closer examination, an approximately 1 cm perforation with surrounding inflammatory exudate was identified on the anterior surface of the Roux limb distal to the gastrojejunostomy (Figure 3). The edges were debrided and intracorporeal 1-layer repair of the ulcer was performed with simple interrupted 2–0 Vicryl sutures (Figures 4 and 5). Fibrin glue was then applied to the suture line and covered with an omental onlay patch. At the completion of the operation, the anastomosis was tested with air insufflation and methylene blue dye with no evidence of a leak. A Jackson-Pratt drain was placed in the left upper quadrant.

Both patients underwent an unremarkable hospital course, and a follow-up EGD examination after 3 months revealed no evidence of ulceration.

DISCUSSION

Marginal ulcers without free intraperitoneal perforation have been described by many authors in the surgical
Recently, free intraperitoneal perforation of a marginal ulcer after laparoscopic Roux-en-Y gastric bypass was reported by Lublin et al.\(^5\) After a retrospective chart review of the 902 laparoscopic gastric bypass procedures (retrocolic, 403; antecolic, 499), 8 patients were found who had free perforations from marginal ulcers. Free marginal ulcer perforations occurred only in those patients who had an antecolic laparoscopic gastric bypass. Macgregor et al\(^{13}\) reviewed the complication of perforated peptic ulcer in the excluded stomach in 11 patients after Roux-en-Y gastric bypass (RYGBP). MacLean et al\(^{14}\) reported on their experience with stomal ulceration as a complication of gastrogastric fistula following RYGBP. Finally, Goitein et al\(^{15}\) reported on 3 cases of perforation at the jejunojejunal anastomosis 8 weeks after RYGBP. These articles describe similar complications of ulcer disease after RYGBP, but the report by Lublin et al\(^5\) and this article are the only ones known to us that document the existence of free perforation of a marginal ulcer after laparoscopic RYGBP. Postoperative complications in those who have had RYGBP surgery represent a unique set of clinical problems that require a new approach to their solution. In this article, we describe the surgical management and the operative technique in 2 patients after laparoscopic antecolic Roux-en-Y gastric bypass who presented more than a year later with free perforation of the jejunal Roux limb.

Bariatric surgery patients may not exhibit typical symptoms of abdominal pain as do normal-sized patients. They have lower physiologic reserve; therefore, the lack of fever, a normal white blood cell count, absence of peritoneal signs on physical examination, or abdominal pain are not sufficient to rule out intraabdominal catastrophe.\(^{16}\) Garza et al\(^{17}\) discovered that postprandial abdominal pain, nausea, and emesis were among the most common complaints in patients with internal herniation. He reported that while 47% of patients with an internal hernia presented with diffuse abdominal pain, 20% had a benign abdominal examination. Fortunately, our 2 patients complained of sudden onset of severe epigastric pain and had peritoneal signs. The appropriate requests for surgical consultation resulted in an expedient workup and successful treatment. This sequence of events, however, is not always the case. Therefore, abdominal complaints in patients with a prior history of gastric bypass surgery should be regarded with a high index of suspicion.

Given the multifactorial causes of symptoms after RYGBP, upper endoscopy is a useful tool for the management of postoperative symptoms.\(^{18}\) Preoperative upper endoscopy provides not only information about the presence of GERD, \(H. pylori\) infection, Barrett’s esophagitis, esophageal dysplasia, or hiatal hernia, but also may alter surgical and medical management of patients undergoing gastric bypass.\(^{19}\) We routinely perform upper endoscopy as part of the preoperative workup for all patients planning to undergo gastric bypass surgery. It is important to evaluate the future site of the gastric remnant and the rest of the stomach for the presence of ulcers or masses. Both patients in our case study had been evaluated with upper endoscopy before having their operation. A marginal ulcer should be suspected in any patient with abdominal discomfort after RYGBP. The most common symptom of a marginal ulcer is abdominal pain.\(^ {10,12,21}\) Mucosal edema at the gastrojejunal anastomosis causes nausea and vomiting, but these are less frequent symptoms.\(^{20}\) Although marginal ulcers are the most common finding on upper endoscopy after Roux-en-Y gastric bypass, symptoms are a poor predictor of endoscopic pathology according to Marano et al.\(^{22}\) Huang et al\(^4\) reported on 49 patients who underwent 69 upper endoscopy procedures after RYGBP. Twenty-eight patients (57%) in that study had at least one major abnormality identified on upper endoscopy within the first 6 months after surgery, and only 21 (43%) patients had normal postsurgical anatomy. Although abdominal pain was the most frequent presenting symptom, it did not correlate with any specific endoscopic finding. The positive predictive value of any of the symptoms was only 40%.\(^4\)

Our first patient had preoperative gastroesophageal reflux disease (GERD) and had been taking NSAIDs for joint pain. She also was a long-standing cigarette smoker and continued to smoke after the surgery. Marshall\(^8\) clearly demonstrates that anastomotic ulcers result from the effect of acid on the jejunal mucosa and that smoking adversely affects proton pump inhibitor (PPI)-associated ulcer healing in gastric bypass patients. In their review, PPI therapy resulted in complete ulcer healing in only 23% of smokers. The second patient, in addition to taking NSAIDs for muscle and joint pain, had preoperatively been on steroids for treatment of asthma. A significant number of patients who present for gastric bypass surgery suffer from degenerative joint disease and many take large quantities of nonsteroidal anti-inflammatory medications. Concurrent presence of gastroesophageal reflux disease, \(H. pylori\) infection, and hiatal hernia complicates the strategy. Patients with asthma or chronic obstructive pulmonary disease, on steroids, further impair wound healing and disrupt the protective effect of the gastric mucosal barrier. Patients with these preoperative comorbidities are at increased risk of developing postoperative mucosal ulceration. Preoperative screening for \(H. pylori\) infection and...
prophylactic treatment with proton pump inhibitors lowers the postoperative incidence of marginal ulcers. Postoperative upper endoscopy can be safely performed 2 weeks or more after surgery. Whether a benefit exists for routine postoperative endoscopy in asymptomatic patients at high risk of developing marginal ulcers remains to be determined. However, it should be performed in all patients with GI symptoms after gastric bypass, even in the absence of abdominal pain.23

Marginal ulcers may present years after surgery and as early as 7 days. The incidence of marginal ulcers after RYGB surgery varies from 1% and 16%. Marginal ulceration of the jejunal Roux limb may result from anastomotic ischemia due to tension on the staple line or as a result of exposure to high acid load from either retained parietal cell mass in a large pouch, or because of staple-line dehiscence with formation of gastrogastric fistula. A well-documented association exists between marginal ulcers and gastrogastric fistulas. Marginal ulcers were seen in 53.3% of patients diagnosed with gastrogastric fistulas in a study by Carrodeguas et al. The presence of gastrogastric fistula will not allow marginal ulcers to heal. An upper GI series with gastrograffin and upper endoscopy (EGD) are very helpful studies for diagnosing gastrogastric fistula, which may also be the result of an incomplete staple line transection or a sealed anastomotic leak. Therefore, all patients who had gastric bypass surgery and present with symptoms of nausea, vomiting, abdominal pain, failure of weight loss, and those who regain weight or have episodes of upper gastrointestinal bleeding should be evaluated with an upper GI series, endoscopy, or CT scan. Staple-line dehiscence and large pouch size are the most common causes of late marginal ulceration, occurring months to years after a gastric bypass according to Sapala et al. It has been our practice to create a very small gastric pouch including only the cardia of the stomach to avoid acid production from the body or fundus. The role of CT scanning in the diagnosis of major postoperative complications after laparoscopic Roux-en-Y gastric bypass surgery was examined by Esmailzadeh et al. Both of our patients had a preoperative abdominal CT scan that helped identify the exact location of the problem. This is an integral part of preoperative evaluation, especially if exploratory laparoscopy is planned. Postoperatively, a CT scan can correctly pinpoint the location of the leaking anastomosis, which facilitates laparoscopic exploration and offers clues to the presence of other intraabdominal pathologies. CT scan findings may include extraluminal collection of contrast, free intraabdominal air, fluid collection/abscess, and other inflammatory changes. If clinically feasible, all patients with a history of a gastric bypass operation, who present with abdominal pain, should have a contrast CT scan evaluation of the abdomen. The surgical management of the 2 patients we describe herein depended on exploratory laparoscopy first. If laparoscopic repair cannot be performed safely, the procedure should be converted to an open operation. In the absence of overwhelming sepsis with hemodynamic instability, exploratory laparoscopy helps identify the problem and spare the patient the morbidity of an open abdominal operation. Early diagnosis and surgical intervention limits extensive intraperitoneal soilage that may make the laparoscopic repair technically more challenging. Therefore, the first 24 hours are probably the best window of opportunity for laparoscopic intervention that would allow adequate visualization. Goitein et al confirmed the safety of the laparoscopic approach. They described successful laparoscopic repair of a perforation at the jejunojejunal anastomosis 30 days after laparoscopic RYGBP. We propose the following steps in evaluation of patients with nonspecific abdominal symptoms and use of the laparoscopic approach to the repair of gastrointestinal perforations in the setting of recent laparoscopic bariatric surgery:

- evaluate all symptomatic patients with a GI series, upper endoscopy, or CT scan;
- patients without peritoneal signs should undergo diagnostic laparoscopy if radiological and endoscopic studies fail to delineate the diagnosis;
- patients with peritoneal signs must have a diagnostic laparoscopy;
- when free perforation of the ulcer is diagnosed intraoperatively (usually on the jejunal limb), debride necrotic ulcer edges before repair;
- close the perforation site with an absorbable suture material;
- test for a leak with either, air insufflation, methylene blue dye, or intraoperative endoscopy;
- cover the repair site with an omental onlay patch if possible;
- leave closed-suction drains before closure.
CONCLUSION

Laparoscopic exploration and repair of gastrointestinal perforations in patients with a recent history of laparoscopic RYGBP is safe, if patients are hemodynamically stable and present within the first 24 hours of the onset of symptoms. Free air from an intraperitoneal perforation of a marginal ulcer can be managed without having to perform an open exploratory laparotomy. A successful outcome depends on prompt evaluation by a surgeon who is familiar with bariatric surgery and has experience in performing advanced laparoscopic procedures.

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