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DYNAMIC MANUSCRIPT

Laparoscopic remnant gastrectomy as a novel approach for treatment of gastrogastric fistula

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Abstract
Background Gastrogastric fistula (GGF) is a rare complication after divided Roux-en-Y gastric bypass (RYGBP). The incidence can be as high as 49% in patients who undergo nondivided or partially divided RYGBP. We have previously reported a GGF rate of 1.5% after divided RYGBP. Remnant gastrectomy has been advocated by our group as a treatment option for this complication. We report our initial experience using the laparoscopic approach.
Methods After IRB approval and following HIPAA guidelines, we conducted a retrospective review of prospectively collected database of 1,796 patients who underwent RYGB from 2001 and to 2008 at the Bariatric and Metabolic Institute. Data included mean time to laparoscopic remnant gastrectomy (LRG), mean length of hospital stay, follow-up period after laparoscopic remnant gastrectomy, rate of conversion, type of procedure performed, and early and late postoperative complications.
Results Twenty-one (1.1%) patients have been diagnosed with GGF; 11 more patients were admitted with GGF after undergoing initial RYGB at another institution. All patients ($n = 32$) were initially treated with sucralfate and proton pump inhibitors, and 22 of 32 patients eventually underwent LRG: 1 underwent fistulectomy, 1 underwent conversion of vertical banded gastroplasty to RYGB, and the remaining 8 patients have undergone only medical treatment. The mean time to LRG was 9 months from the time of diagnosis of GGF. Two of the 22 patients had conversion to an open approach: one because of a loss of poor visual surgical field resulting from excessive intraluminal air from intraoperative endoscopy and the other as a result of the inability to understand the anatomy laparoscopically. Three of the 22 patients (13%) underwent LRG and redo gastrojejunostomy because of a stenosed gastrojejunostomy. The mean hospital stay after LRG was 4.7 (range, 3–8) days. Early postoperative complications included intra-abdominal bleeding, pneumonia, wound infections, and fever of unknown origin. Late complications included intra-abdominal abscess, wound infections, fever, and food impactation. The follow-up period after LRG was an average of 4 (range, 1–11) months. During the follow-up period, there was no evidence of marginal ulceration, bleeding, abdominal pain, or recurrence of the GGF in any patient.
Conclusions Laparoscopic remnant gastrectomy seems to be a safe and effective treatment option for patients with GGF after RYGBP.

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Gastrogastric fistula (GGF) is one of the complications that can occur after Roux-en-Y gastric bypass (RYBG) surgery for weight loss (Fig. 1). The exact incidence is unknown, because the majority of patients are not studied for the presence of a fistula unless they are asymptomatic. The incidence is as high as 49% in patients who undergo nondivided or partially divided gastric pouch [1]. Complete

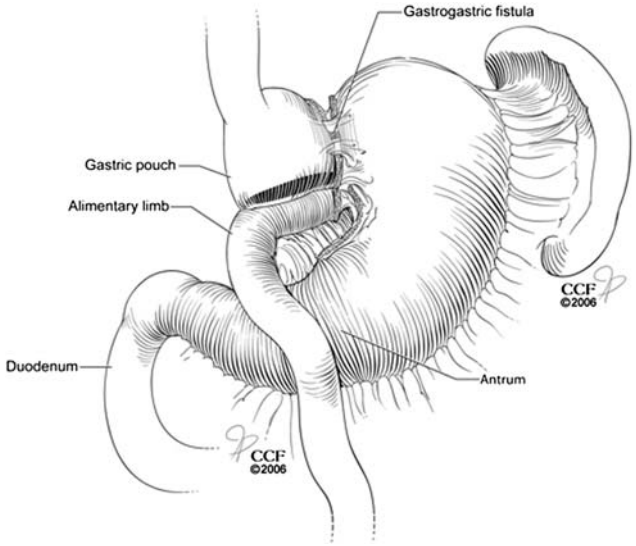

Fig. 1 Gastrogastric fistula

transection of the gastric segment has reduced the incidence of GGF, but reports of incidences of 3–6% exist in the literature [4, 6, 7]. In previous studies, we have reported a GGF rate of 1.5% after RYBG surgery with a completely divided gastric pouch [2, 3]. Buttressing of the staple line, construction of an 8- to 10-mm anastomosis, avoidance of obstruction of the efferent limb, and intraoperative tests for leaks of the pouch and the anastomosis are possible ways to decrease the rates of leaks and GGF [2, 4, 6]. This article focuses on the surgical technique for treating the GGF.

The exact etiology of GGF is unknown; various causes have been postulated, such as operative technique (nondivided gastric pouch), inadvertent failure to divide the stomach, anastomotic leak, gastric wall tissue migration, marginal ulceration, perforation of pouch or remnant, and erosions from a foreign body.

The most common symptom of GGF is epigastric abdominal pain. Other symptoms include nausea, vomiting, hematemesis, hematochezia, and weight regain. Objective findings include the presence of a marginal ulcer and GGF on endoscopy.

Gastrografin upper GI study shows the flow of contrast into the remnant stomach. This is the most optimal study to evaluate not only GGF but also the presence of leaks and also helps in understanding the anatomy. Computer axial tomography (CAT) often is used to evaluate leaks and other intra-abdominal processes. CAT scan usually shows the presence of contrast or air in the remnant stomach. Endoscopy is a valuable tool in visualizing the location of the fistula and helps to plan for surgery.

The majority of patients with GGF can be conservatively managed [5]. Medical treatment often includes the use of proton pump inhibitors (PPI) to reduce acid production. Sucralfate is used to provide protective coating to the pouch and ulcer to relieve pain and decrease exposure to stomach acids. This regimen is usually prescribed for 6 to 8 weeks [2, 5]. When the patient presents with acute bleeding from ulceration, endoscopy is useful for both the diagnosis and treatment.

Surgery is indicated when conservative measures fail and the patient is regaining weight. Surgical options include fistulectomy and remnant gastrectomy. We discuss the technique of laparoscopic remnant gastrectomy (LRG).

Laparoscopic remnant gastrectomy technique

The abdominal cavity is accessed using an open technique through a 1-cm supraumbilical incision using a Hasson cannula. The abdomen is insufflated with carbon dioxide to a pressure of 15 mmHg. The accessory trocars are inserted under direct vision in the subxiphoid area, right, mid, and left upper abdomen as shown in Fig. 2. The liver retractor is placed to expose the gastroesophageal junction after lysis of any adhesions between the liver and the stomach. The anatomy is defined by lysing any adhesions between the gastric pouch, liver, remnant stomach, and alimentary limb. The gastric remnant is mobilized from the short gastric vessels to the level of the gastroesophageal junction (Fig. 3), and a window is dissected between the pouch and the gastric remnant (Fig. 4). The dissection should be performed on both the anterior and posterior wall of the stomach, and take down of the short gastric vessels along the greater curvature facilitates this maneuver. Intraoperative endoscopy is useful in identifying the location of the fistulous tract between the pouch and the gastric remnant. With the use of a 45-mm linear stapler, the stomach is transected at the level of antrum (Fig. 5), followed by a transverse remnant gastrectomy, which completely mobilizes the stomach. An Ewald tube is placed to mark the gastroesophageal junction and the anastomosis. The pouch is then trimmed by trisecting the fistulous tract with several applications of the green cartridge, 45-mm linear stapler (Fig. 6A and B). When the pouch is not enlarged or too small, the gastric remnant is excised, leaving a margin of remnant tissue attached to the GGF side (Fig. 7A and B). All the staple lines are oversewn using 2-0 Vicryl sutures (Ethicon). A repeat endoscopy is performed to confirm the exclusion and closure of the fistulous tract. A leak test using both air and/or methylene blue dye also is performed. Drains are placed at both the pouch and antrum. The gastric remnant is removed by placing a specimen back and extracting it through the umbilical incision.

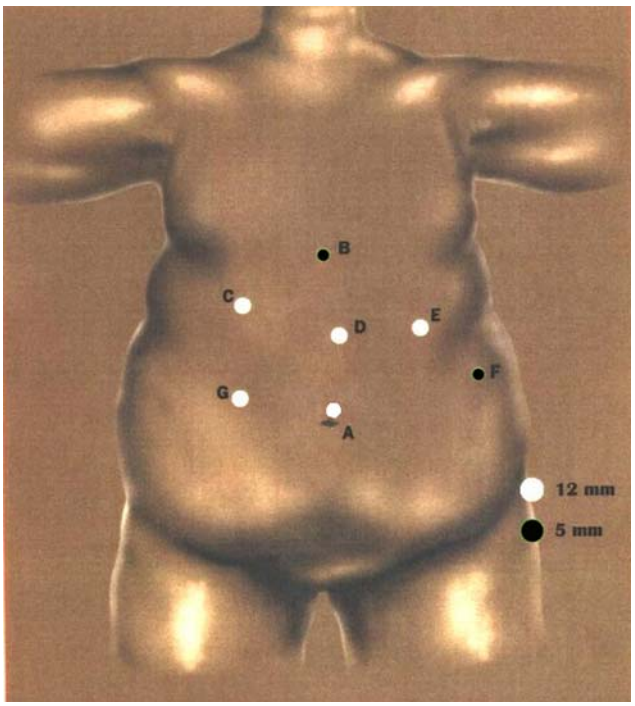

Fig. 2 The accessory trocars are inserted under direct vision in the subxiphoid area, right, mid, and left upper abdomen

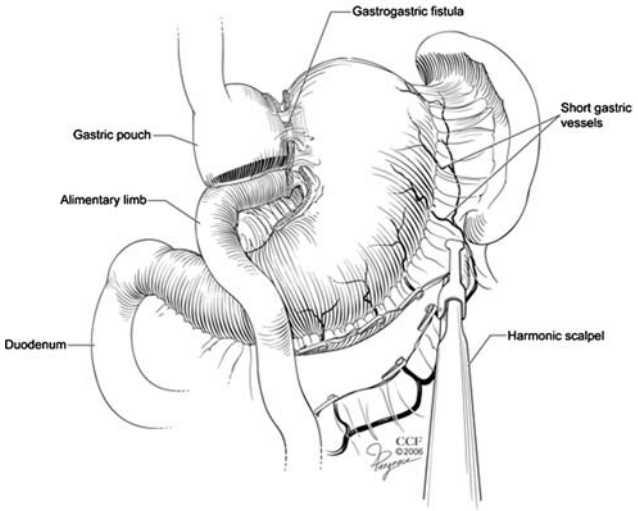

Fig. 3 The gastric remnant is mobilized from the short gastric vessels to the level of the gastroesophageal junction

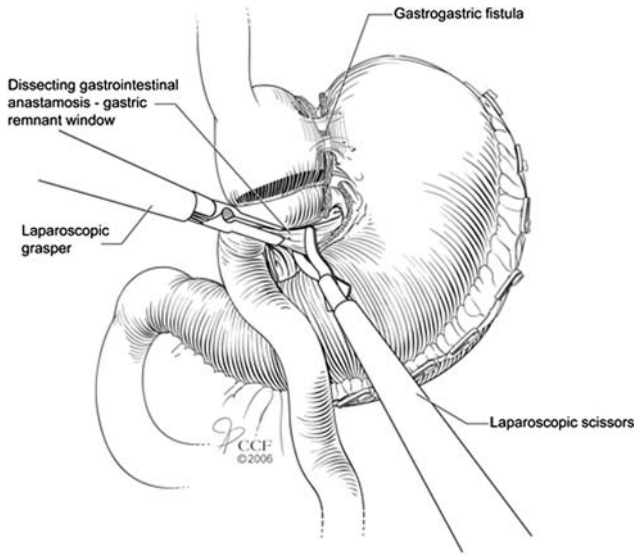

Fig. 4 A window is dissected between the pouch and the gastric remnant

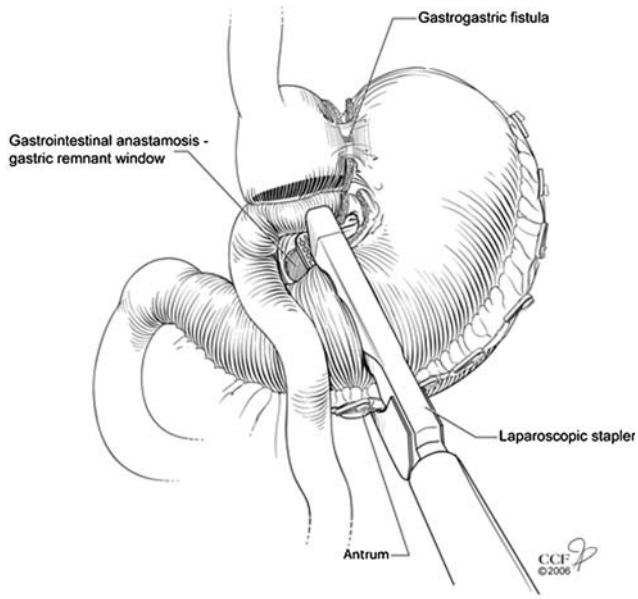

Fig. 5 With the use of a 45-mm linear stapler, the stomach is transected at the level of antrum

Our experience

To date, we have treated 32 patients with GGF. Of the 1,796 patients who underwent RYBG surgery at our institution from 2001 until now, 21 (1.1%) have been diagnosed with GGF; 11 more patients were admitted with GGF after RYGB undergoing the initial RYGB at another institution. All patients ($n = 32$) were initially treated with sucralfate and PPI, and 22 of 32 patients eventually underwent laparoscopic remnant gastrectomy (LRG): 1 underwent fistulectomy, 1 underwent conversion of vertical banded gastroplasty to RYGB, and the remaining 8 patients underwent only medical treatment. The mean time to LRG was 9 months from the time of diagnosis of GGF. Two of the 22 patients had conversion to an open approach: one because of a loss of poor visual surgical field resulting from excessive intraluminal air from intraoperative endoscopy and the other as a result of the inability to understand the anatomy laparoscopically. Three of the 22 patients (13%)

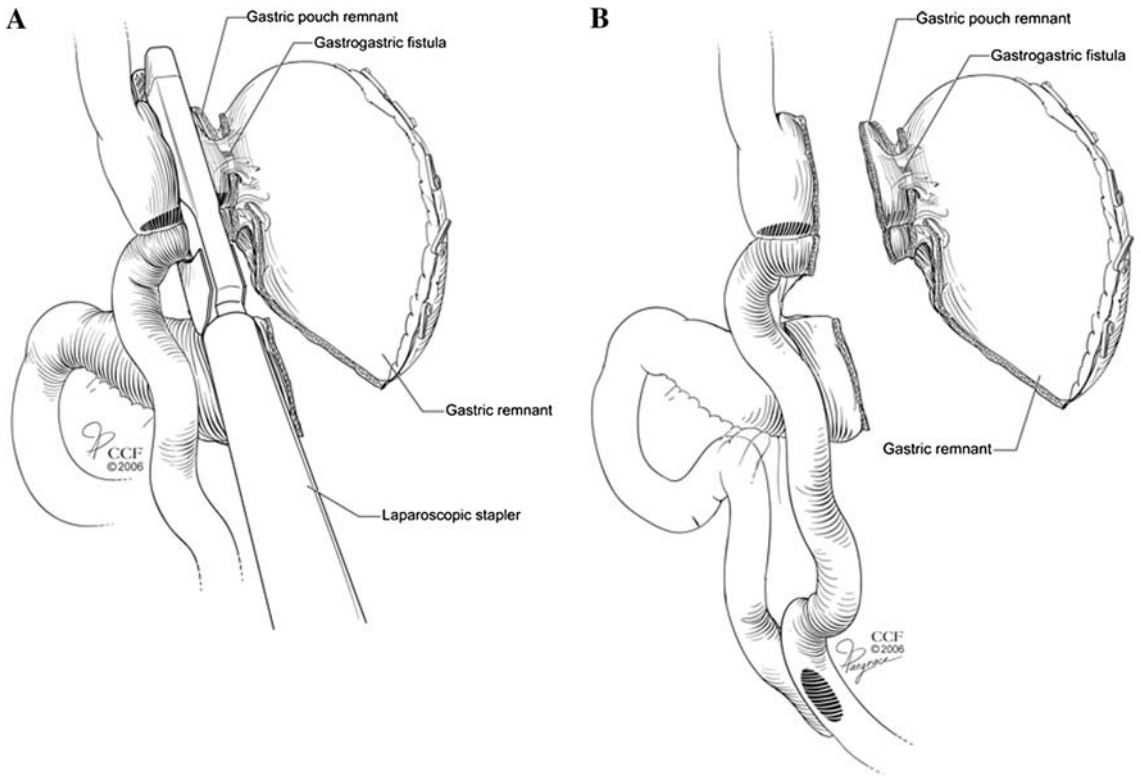

Fig. 6 **A** and **B**: The pouch is trimmed by trisecting the fistulous tract with several applications of the green cartridge, 45-mm linear stapler

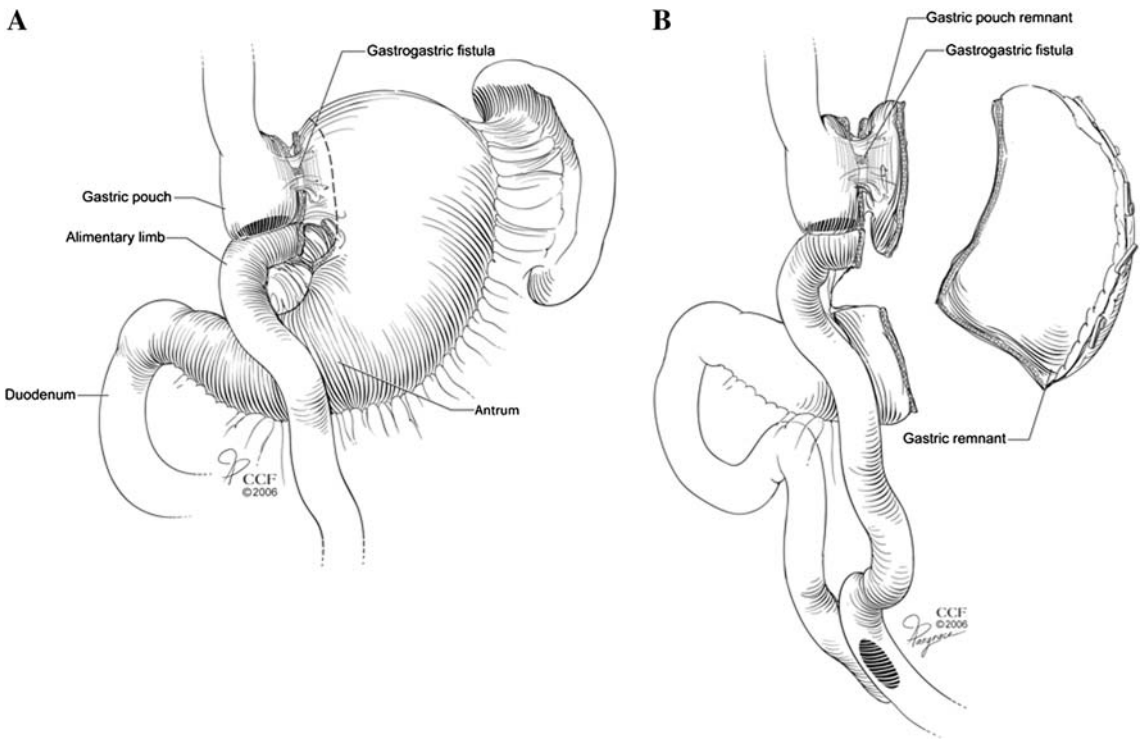

Fig. 7 **A** and **B**: The gastric remnant is excised, leaving a margin of remnant tissue attached to the GGF side

underwent LRG and redo gastrojejunostomy because of a stenosed gastrojejunostomy. The mean length of hospital stay after LRG was 4.7 (range, 3–8) days. Early postoperative complications included intra-abdominal bleeding, pneumonia, wound infection, and fever of unknown origin. Late complications included intra-abdominal abscess, wound infection fever, and food impaction. The follow-up period after LRG was an average of 4 (range, 1–11) months. During the follow-up period, there was no evidence of marginal ulceration, bleeding, abdominal pain, or recurrence of the GGF in any patient.

Conclusions

In experienced hands, remnant gastrectomy can be performed safely and effectively via laparoscopy as a treatment option for GGF in patients who undergo bariatric surgery.

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