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Preliminary Report: Search for a Transgastric Approach for Managing Gastrogastric Fistulas

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Abstract
Background Revision surgery to eliminate a gastrogastric fistula (GGF) is often associated with high morbidity.
Methods This report describes a percutaneous transgastric approach for revision surgery in three patients with GGF using a transgastric, totally extraperitoneal approach.
Results The access was performed successfully in all the patients. There were no intraoperative complications, and the patients had an uneventful recovery. One patient had a recurrence 8 months after the procedure but had achieved satisfactory weight loss during the period. We were able to perform a second percutaneous transgastric repair. The second patient showed an asymptomatic recurrence of the fistula, which was later completely repaired. The third patient has had moderate weight loss.
Conclusions Although current results are not optimal, we believe that this approach could represent an alternative for patients with a hostile abdomen or in whom co-morbidities comprise a prohibitive factor. Further experience, technical improvements, and longer follow-up are needed to evaluate and optimize this approach and evaluate its potential use in other surgical areas.

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Introduction

An increasing number of patients who undergo bariatric surgery will require surgical revision in the long term because of complications or unsatisfactory weight loss [1]. For Roux-en-Y gastric bypass (RYGBP), the incidence of revision procedures is 3–13% [2, 3]. The main indications for reoperation are failure of weight loss or weight regain, a marginal ulcer, and/or undesirable side effects.

Gastrogastric fistula (GGF) is a known complication following RYGBP. Historically, the incidence of GGF in the literature is wide, ranging from 0 to 50% depending on the case of a divided or a nondivided gastric bypass [4]. When GGFs are large, conservative treatment usually fails [5]. Revisional surgery to eliminate GGF can be difficult to perform and is often associated with a long postoperative hospital stay and a high incidence of recurrence [5, 6].

Transgastric laparoscopy has been used for a variety of esophageal, gastric [7, 8], duodenal, and pancreatic indications. We previously reported a case of percutaneous transgastric closure of a GGF after RYGBP [9]. We present here three patients in whom revision surgery was required because of GGF after RYGBP. The repair was made using laparoscopic instruments via an intragastric, percutaneous approach. This less invasive approach was performed in these patients with a hostile abdomen because of either previous surgery or severe co-morbidities that increased the surgical risk.

Cases

Patient 1

A 44-year-old woman had rheumatoid arthritis, gastroesophageal reflux disease (GERD), asthma, and urinary

stress incontinence. Her surgical history included multiple abdominal operations and an open RYGBP in 1988. She was diagnosed with GGF several years later and underwent open revision and GGF repair. Her postoperative course was complicated by abdominal sepsis from gastric leak and required reoperation and a prolonged intensive care unit (ICU) stay. She regained all of her preoperative weight and failed numerous medical weight loss attempts.

When referred to our service, she had a body mass index (BMI) of 54.5 kg/m^2. An upper gastrointestinal (UGI) series demonstrated a large (3 cm) GGF and a relatively small gastric pouch. Endoscopy and abdominal computed tomography (CT) confirmed the diagnosis, and a transgastric revision was undertaken to correct the fistula. At a 2-week follow-up, her weight loss was 7 kg, and the gastrostomy tubes were removed. At the 1-, 4-, and 7-month follow-up visits, the weight losses were 13.5, 17.2, and 23.2 kg, respectively, she had no interval complications.

At the 8-month follow-up she had developed epigastric pain and heartburn. A UGI study identified recurrence of a small GGF (Fig. 1). She underwent a second transgastric revision in which the diameter of the fistula was significantly smaller (8 mm), and some traces of suture from the first trangastric revision were identified. Closure was performed with the same technique. Her symptoms resolved after the second procedure, and at the 14-month follow-up her weight loss was 4 kg.

Patient 2

A 66-year-old woman had coronary artery disease, hypertension, hypercholesterolemia, GERD, hypothyroidism, and osteoarthritis. Her surgical history included "stomach stapling" in 1979, but her operative records were unavailable for review. She lost 45 kg after the initial bariatric surgery. She underwent revision bariatric surgery shortly after the initial procedure. Her surgical history included total abdominal hysterectomy, appendectomy, open cholecystectomy, and cesarean section. Her BMI was 40.9 kg/m^2. A UGI series and endoscopy showed a moderately sized (2 cm) GGF with a large gastric pouch. She underwent percutaneous transgastric GGF closure.

Fig. 1 Preoperative barium study. *Arrow* shows a gastrogastric fistula (GGF) between the gastric pouch and the gastric remnant. Contrast is passing freely through the gastrojejunostomy into the Roux limb

At the 1-month follow-up she had lost a total of 6 kg. Imaging showed incomplete closure of the fistula, and revision surgery was performed 2 months afterward. During the procedure the large gastric pouch and GGF were repaired.

Patient 3

A 51-year-old woman with alcoholic liver cirrhosis had previously undergone a transjugular intrahepatic portosystemic shunt (TIPS) procedure with several revisions. Her medical history included GERD, stress incontinence, depression, chronic pleural effusion, gastric ulcer, pulmonary hypertension, and fibromyalgia. Her surgical history included RYGBP 7 years before and several minor gynecologic procedures. She initially lost 56 kg after her RYGB but then regained 43 kg. She was referred to our service by the liver transplant service for consideration of revisional bariatric surgery.

Her BMI was 44 kg/m^2. A UGI series and CT showed a 3-cm GGF. The patient underwent percutaneous transgastric GGF closure. She had lost 12 kg at the 1-month follow-up but then regained 7 kg at her 4-month follow-up. At the 24-month follow-up her weight loss was 10 kg.

Operative technique

For the surgery, the patients were placed in a supine position and underwent general anesthesia. Ultrasonography (US) was used to localize the edge of the liver. Intravenous glucagon (1 mg) was administered to assist with gastric insufflation by inducing pyloric spasm. The gastroscope was advanced through the GGF into the distal stomach, which was insufflated. Fluoroscopy confirmed that the stomach was positioned below the liver margin and the transverse colon was inferior to the stomach.

With the stomach fully insufflated, and under direct vision with the endoscope, a site in the mid-body of the stomach and another site in the distal body of the stomach were chosen for port placement. Under fluoroscopic (Fig. 2) and endoscopic guidance, two T-tacks (Boston Scientific, Natick, MA, USA) were placed for gastropexy near the greater curvature, and the stomach was affixed to the anterior abdominal wall. A 19-gauge thin-walled needle was used to puncture percutaneously the mid-body of the stomach, and a floppy 0.035 in. diameter Benson wire was introduced into

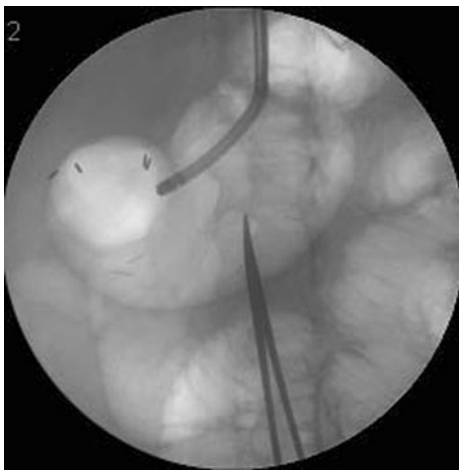

Fig. 2 Fluoroscopic view. Stomach is fully insufflated and the endoscope is in the distal stomach. This confirms that the liver margin and the transverse colon are away from the access point

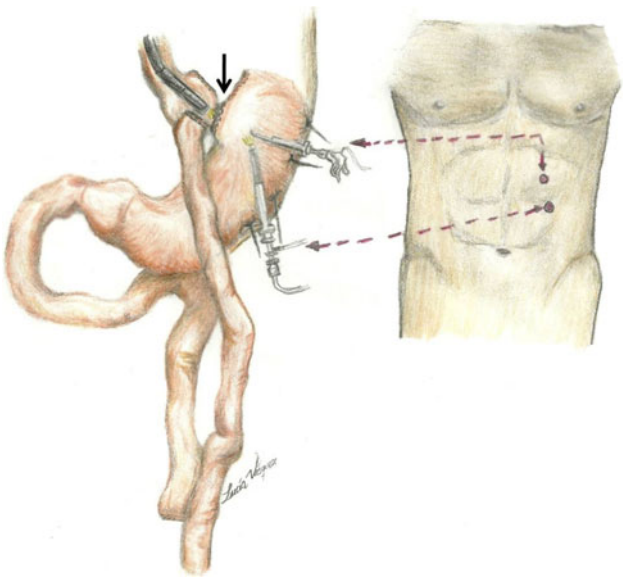

Fig. 3 Port placement at the mid-body of the stomach and another site in the distal body. *Arrow*: GGF

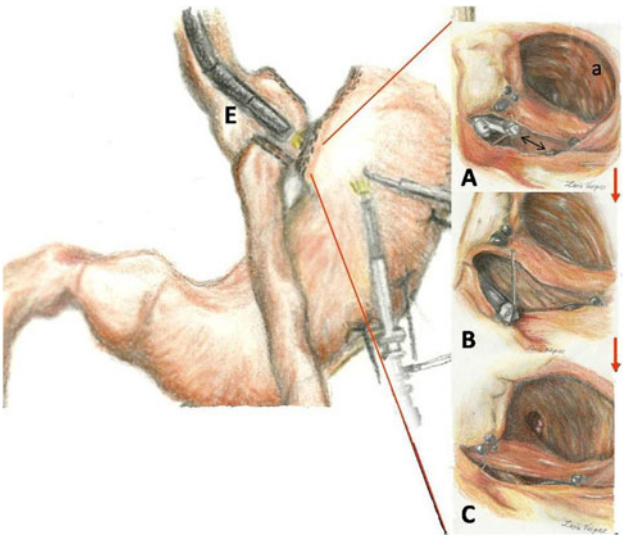

Fig. 4 EndoStitch was used to place several figure-of-eight sutures to close the fistula. *E*: endsocope; *A*: endoscopic view of the Endostitch; *a*: anastomosis; *arrow*: large GGF; *B*, *C*: endoscopic view of the Endostitch placing the suture to close the GGF

the stomach through the needle. The tract was dilated with a 12 cm long, 10 mm diameter Trackmaster balloon (Boston Scientific) at 10 atmospheres of pressure. A 30F peel-away sheath (Cook, Bloomington, IL, USA) was advanced over the balloon into the stomach. The balloon and sheath were then exchanged over a guidewire for a Step trocar device (Autosuture, Norwalk, CT, USA). Positioning of the 12 mm trocar for the Step device was guided under direct vision with the gastroscope. A second Step port with a 5 mm trocar was placed in the distal stomach, directly between two T-tacks under direct visualization (Fig. 3). With the 5-mm laparoscopic camera and the gastroscope for visualization, an EndoStitch (Autosuture) was used to place several figure-of-eight Surgidec sutures to close the fistula; each suture was tied externally and placed using a knot-pushing device (Fig. 4). The GGF was completely obliterated. Visualization with the endoscope showed no compromise of the gastrojejunostomy.

A saline immersion leak test was performed by first desufflating the stomach remnant and then insufflating air into the gastric pouch with the gastroscope, which demonstrated no air leak. The 12-mm and 5-mm ports were exchanged over a wire for 26F and 16F Foley catheters, respectively; and the Foley balloons were inflated with diluted contrast. Each catheter was anchored to the skin with 3-0 nylon sutures and placed for gravity drainage. Final fluoroscopic inspection was performed to confirm appropriate balloon positions.

In all three patients the estimated blood loss was minimal. A Gastrografin contrast study on postoperative day (POD) 1 demonstrated no evidence of GGF between the gastric pouch and remnant (Fig. 5). Patient 1 was discharged 24 h after surgery for both procedures. Patients 2 and 3 were discharged 48 and 72 h, respectively, after surgery because of urinary tract infections. The patients left the hospital tolerating a regular diet and resumed their normal activities. In all three cases, the Foley catheters were removed 3 weeks after surgery, with no persistent drainage.

Discussion

One of the most challenging complications of RYGBP is the development of a GGF. The management of GGF

Fig. 5 Postoperative Gastrografin contrast study on day 1. *Arrow* indicates no evidence of the GGF. Contrast flows freely through the gastrojejunal anastomosis

should be dictated by patient presentation. Many patients can be treated conservatively, and some are asymptomatic or achieve adequate weight loss despite the presence of a GGF [10, 11]. Small GGF tracts may be successfully treated with proton pump inhibitor (PPI) therapy and avoidance of nonsteroidal antiinflammatory drugs. In symptomatic patients with small GGF tracts who fail medical management, endoscopic injection of fibrin sealant combined with PPI therapy may be an alternative [5].

In patients with large GGF tracts whose symptoms persist, who demonstrate poor weight loss or weight regain, or in whom long-term acid suppression therapy is undesirable, revision surgery should be considered [5]. Open and laparoscopic revision bariatric surgery has classically been associated with increased technical difficulty, length of hospital stay, and early and long-term complication rates [1, 12], with a morbidity rate of 10–30% and a mortality rate of <1% [13].

We believe that in the modern era patients need and want to be treated in the most minimally invasive manner. Progress in minimally invasive and endoscopic techniques have led to the emergence of a new branch called endoluminal surgery. Direct access to the lumen of the stomach allows a magnified high-resolution image for precise repair using laparoscopic and endoscopic instruments. The stomach is perhaps the most acceptable organ in which to perform intraluminal surgery. This large-volume elastic organ is easily accessible during inflation because its anterior boundaries reach the abdominal wall, facilitating placement of endoluminal trocars.

This article describes four transgastric repairs for GGF in three patients. We selected these three patients for percutaneous transgastric repair of their GGF because they had either a history of several abdominal or revision procedures, severe co-morbidities, or both. Traditional revision surgery in these patients would have imposed a high risk for them. Although the transgastric approach seems like a promising alternative, we also found some unexpected clinical results. Although the fistula recurred in patient 1, she was still able to achieve good weight loss during the interim period, and we were able to perform a second percutaneous transgastric repair. In the second patient revision surgery was performed to reduce the large gastric pouch and completely close the GGF. In the third patient moderate weight loss was achieved.

Because of these results, we believe that the technique to close the GGF needs to be improved to achieve better long-term results. One of the potential reasons of failure could be that apposition of two mucosal surfaces may interfere with healing of the GGF. Therefore, resecting the mucosa of the GGF area before suturing might be useful. Also, endoscopic procedures such as mucosal ablation or endoscopic mucosal resection can be adopted as each has been used successfully in minimally invasive treatment of vascular and neoplastic disease of the stomach [14–16].

None of the three patients in this report had an active ulcer at the time of intervention. Still, we believe that because PPIs and sucralfate have been shown to be effective for ulcer disease after RYGBP [17], the procedure could be performed along with medical therapy.

Conclusions

Although results were not ideal, we showed that an otherwise highly complex revision procedure can be performed with low operative risk, minimal blood loss, short hospital stay, and minor discomfort. An improved suturing technique is needed to optimize the results. Further evaluation of this application may make it useful for other bariatric revision procedures, such as staple-line disruption in vertical banded gastroplasty (VBG), which accounts for most surgical failures in VBG patients [18]. Also, further development of the technique could involve the use of endoscopic suturing systems, which have shown to be safe, efficient, and accurate in tissue transposition [19, 20] and have already been used in endoluminal antireflux and bariatric-related procedures [21, 22].

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