The Surgical Management of Complex Fistulas After Sleeve Gastrectomy

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Abstract

Background Laparoscopic sleeve gastrectomy (LSG) is gaining acceptance as the preferred option for treating obesity. Risks of leak and subsequent fistula after sleeve gastrectomy still present significant concerns in clinical practice. This current series presents unusual fistulas post-LSG and their surgical management.

Methods The series presents chronic leaks that have progressed into fistulas. Three patients with fistulas are presented: gastrocolic, gastropleural, and gastrosplenic. Surgical intervention was warranted in all cases with en-bloc resection of the fistula with subtotal gastrectomy and Roux-en-Y esophagojejunostomy reconstruction. A subtotal colectomy with ileo-descending colon anastomosis was additionally necessary in the gastrocolic patient.

Results The patients with the gastropleural and gastrosplenic fistulas were discharged home on postoperative Day 6 and Day 7, respectively. The patient with the gastrocolic fistula had an extended postoperative hospital course and was discharged home on postoperative Day 35. All cases were negative for staple line leaks. To date, the fistulas healed with no recurrence.

Conclusions En-bloc resection of the fistula with proximal gastrectomy and Roux-en-Y esophagojejunostomy (PGRYEJ) is a surgical option to treat chronic staple line leakage when non-operative therapy is rendered ineffective. Adequate preoperative planning with optimization of nutritional status and control of local and systemic sepsis is paramount for ultimate success. A symptomatic leak requires immediate operation regardless of the time interval between the primary sleeve operation and appearance of the leak.

Keywords Fistula · Gastrocolic · Gastropleural · Gastrosplenic · Surgery · Sleeve gastrectomy

Introduction

Laparoscopic sleeve gastrectomy (LSG) has demonstrated to be effective for achieving weight loss and comorbidity resolutions in obese patients [1, 2]. However, the morbidity and mortality associated with postoperative leaks remain a concern. This has resulted in poor outcomes for patients, increasing hospital stay, litigations, and costs [3].

A leak results from disruption of the staple line in the postoperative period. Persistent leaks could become chronic, subsequently leading to abscess formation. The abscess can then form a fistula with adjacent epithelial lined structures or form sinuses with non-epithelial-lined structures.

Critical decision-making is essential to treating fistulas in complex cases. Non-healing leaks may result in fistulas, gastrointestinal bleeding, or deep vein thrombosis from systemic...
sepsis. Uncommon fistulas involving multiple organs present challenges in treatment. The current case series will evaluate and investigate three unusual postoperative fistulas and their surgical management.

Case Series

Clinical Case 1

A 21-year-old male, with a history of LSG 6 months prior for generalized obesity and a body mass index (BMI) of 43, developed a sudden episode of syncope and hypotension. After the diagnosis of a subdiaphragmatic abscess, a laparoscopic drainage was performed. He was transferred to our institution on mechanical ventilation and remained on antibiotics with a nasogastric tube in place. A repeat computed tomography (CT) scan with intravenous (IV) contrast and esophagogastroduodenoscopy (EGD) revealed a late proximal staple line disruption with abscess formation in the left upper abdomen. Upper GI (UGI) series with Gastrografin demonstrated a network of fistulas in the region of the gastric fundus and greater curvature of the stomach in communication with the transverse colon (Fig. 1). Multiple dilated loops of small bowel were also involved in the chronic abscess cavity, resulting in a small bowel obstruction. An oral duodenal tube was placed for decompression of the small bowel. The patient received blood transfusions and was stabilized in the intensive care unit. The patient had a chronic leak that caused acute clinical deterioration due to erosion of the abscess, resulting in intraabdominal bleeding, bowel obstruction, and fistula formations within the colon. The worsening bowel obstruction and increasing white count were the determining factors in the decision to take the patient to the operating room. Since he was able to tolerate a liquid protein diet intermittently, his nutritional parameters were acceptable. His young age and the fact that he had no previous comorbidities were considered.

Surgical Technique

After positioning and port placement, blunt dissection was used to access the left upper quadrant abdomen. The upper abdomen was inaccessible due to a distended colon, which was adhered to the liver and diaphragm. The decision was made to proceed with conversion to an open procedure. A supraumbilical midline laparotomy was performed. No purulent material was found in the subdiaphragmatic abscess cavity. The stomach was transected just proximal to the gastroesophageal (GE) junction. The area of the colonic gastric fistula was identified. Subtotal colectomy with an ileo-descending colon anastomosis was executed. The ligament of Treitz was then identified, and 40 cm distal to the ligament of Treitz, the small bowel was transected. The distal limb was brought to the upper abdomen, and a side-to-side esophageojunostomy was performed on the posterior wall using the linear stapler. The anterior wall was closed with a two-layer running suture. Subsequently, 100 cm distal to the esophageojunostomy, a side-to-side jejunostomy between the biliopancreatic alimentary limbs was achieved and then closed. A nasogastric tube was left into the proximal jejunum. Total operative time was 311 min. The patient was extubated shortly after surgery. The UGI with Gastrografin demonstrated no leaks or obstruction. He remained tachycardiac, and a 2D echocardiogram revealed marked congestive heart failure. A CT scan demonstrated fluid collection in the left upper quadrant that required draining. A soft diet was tolerated 10 days after surgery. On postoperative Day 23, a deep vein thrombosis was detected in the left subclavian vein, and anticoagulation was started. The patient’s condition gradually improved, and he was discharged on postoperative Day 35. At 7 months postoperative, the patient was doing well.

Clinical Case 2

A 41-year-old male presented to our institution for revisional surgery. He had LSG 9 months previously for central obesity (BMI 47) where an early proximal staple line leak was discovered 5 days postoperative. Laparoscopic suturing was performed and failed to correct the leak. Despite drainage, he became septic with acute renal failure. The sepsis had since resolved. He arrived at our institution 8 months later with two drains in place. UGI with Gastrografin highlighted a fistulous tract from the fundus to left pleural space. Chest X-ray demonstrated a left pleural effusion, and CT with contrast revealed a drain crossing the tract of a gastropleural fistula in the left epigastrium. Moderate loculated pleural effusion with

![Fig. 1 UGI with Gastrografin. Network of fistulas identified at the gastric fundus and greater curvature of the stomach with communication to the transverse colon](image-url)
atelectasis in the left lower lung was additionally detected on the CT scan (Fig. 2). The persistence of the leak with communication with the pleura was the indication for surgical intervention. The patient was on chronic total parenteral nutrition (TPN), so his nutritional status was already optimized.

**Surgical Technique**

Intraoperatively, a large fistulous tract from the staple line in the proximal aspect of the stomach was viewed laparoscopically. The esophagus was dissected and the diaphragmatic crus opened. The distal stomach was mobilized and transected just distal to the chronic cavity, leaving a remnant of the body and antrum and allowing for access to the less hostile lesser sac. Further cranial dissection leads to the isolation of the fistulous tract and the en-bloc resection into the normal distal esophagus. The small bowel was transected 50 cm from the ligament of Treitz. The distal limb of the small bowel was brought to the upper abdomen in an antecolic, antegastric fashion without tension. A side-to-side esophagojejunostomy was performed on the posterior wall using a linear stapler, and a two-layer closure of the anterior wall was performed. A nasogastric tube was placed into the proximal jejunum, 100 cm on the esophagojejunostomy. A side-to-side jejunoojejunostomy between the biliopancreatic and alimentary limbs was performed. A gastrostomy tube was placed into the distal stomach for decompression. Operating room time was 169 min. Postoperative UGI with Gastrografin showed no leak or obstruction. After tolerating a liquid diet with supplementary tube feeds, the patient was discharged home on postoperative Day 6. Three weeks later, the patient was advanced to a pureed diet, and the gastrostomy tube was clamped. Five months later, the patient continued to do well.

**Clinical Case 3**

A 22-year-old male, 8 months status post-LSG at an outside institution from generalized obesity (BMI 40), presented with left upper quadrant abdominal pain and a 103 °F fever. The primary operation was complicated by an early proximal staple line disruption and splenic abscess formation, which required multiple percutaneous drainages and non-operative management of nothing by mouth (NPO) and TPN. On EGD, a suture at the proximal staple line disruption site and fistula were identified at the GE junction. The fistulous tract had a spontaneous closure with TPN after 6 weeks. Four months later, CT scan of the abdomen and UGI showed a recurrent gastroesplenic fistula. After several attempts to treat with NPO/TPN, CT scan of the abdomen showed a left pleural effusion with contrast extravasation into the left upper quadrant abdomen (Fig. 3).

**Surgical Technique**

The procedure began with adhesion takedown in the left upper quadrant abdomen laparoscopically. The area of the fistula was identified, which was located at the GE junction and proximal esophagus. At the time the patient came to us, the abscess was drained percutaneously. The chronic abscess cavity was resected en-bloc, but the spleen was spared. The esophagus was transected, and the stomach was also divided just distal to the chronic cavity. A Roux limb was brought to the upper abdomen, and a side-to-side esophagojejunostomy between the esophagus and the alimentary limb was performed on the posterior wall with a technique similar to the one previously described. A side-to-side jejunoojejunostomy between the biliopancreatic and alimentary limbs was performed 100 cm from the esophagojejunostomy with a totally stapled technique. A gastrostomy tube was placed into the distal stomach. Drains were placed near the esophagojejunostomy. Operating room time was 252 min total. The patient was discharged home on postoperative Day 7 tolerating a pureed diet, and the gastrostomy tube clamped. Two days after discharge, the drains were removed. The gastrostomy tube was removed 2 weeks later. Eight months postoperatively, the recovery was uneventful.
Discussion

Non-operative management of leaks after LSG is the preferred approach in the hemodynamically stable patient. However, due to the unique physiologic features of LSG—increased intraluminal pressure, and intact pylorus distally, with or without distal stricture from narrowing of the incisura—leaks are inclined to become persistent and progress to chronic fistulas despite non-operative management [5, 7]. Few publications exist describing surgical interventions of fistulas after primary LSG. This report details surgical management of unusual fistulas resulting from preceding sleeve gastrectomies. For the purpose of defining key terms, leaks are classified as acute (<7 days), early (1–6 weeks), late (>6 weeks), and chronic (>12 weeks) after the primary procedure [8]. A leak may progress to a fistula after 12 weeks [8]. The series of cases presented in this report are chronic leaks that have developed into fistulas, warranting surgical intervention.

As LSG gains acceptance as the preferred bariatric procedure, greater emphasis in leak prevention is vital. Gastric staple line leaks occur in up to 5.1 % of primary cases and 20 % of revisional cases [3, 9]. The majority of the leaks after LSG occur in the proximal third of the stomach or at the angle of His (85.7 %), as opposed to in the distal third of the stomach (14.3 %) [10]. The anatomic location and timing of the leak result in different disease processes [8]. All three cases presented involved proximal staple line disruptions. The chronicity of the leaks resulted in fistulas.

Tachycardia is the most common sign of leaks, presenting in 72 % to 92 % of patients [11, 12]. As in the gastrocolic and gastropleural fistula patients, presentation is often without fever or pain; thus, high clinical suspicion is essential as early recognition provides optimal management. Diagnostic studies consist mainly of UGI with water-soluble contrast and CT scan. Sensitivity is low due to the fact that majority of leaks and fistulas are formed after imaging in the early postoperative period. The sensitivity of a CT scan is higher in that, besides the appearance of the leak. Morbidity and mortality of surgical management or reoperation for leaks are up to 50 % and 2 to 10 %, respectively, with a 48 % conversion rate to open surgery [11, 18, 19]. Consequently, the initial managements for control of local sepsis remain as non-operative and endoscopic approaches. A study by Thodiyil et al. [20] demonstrated leak resolution by supportive management in 33 of 40 patients who underwent Roux-en-Y gastric bypass (RYGB). However, leaks are inclined to become persistent and progress to chronic fistulas despite non-operative management, especially when a functional (pylorus) or mechanical (angulation or twist at the incisura) obstruction exists, as in the case of LSG. Current recommendations state reoperation is optimal after 12 weeks of non-operative treatment to avoid dense adhesions and allow optimization of the nutritional status [8]. Hemodynamic instability due to sepsis generally requires urgent return to the operation room. Early leaks may be treated with drainage of collections and control of the fistula. For late leaks, the treatment of choice is surgical. In our experience, a chronic leak (>12 weeks from the primary procedure) is unlikely to close without surgical intervention. The preoperative strategy should consist of extensive counseling of the patient about the

Non-surgical approaches consist of endoscopic clips, sealants, and self-expanding stents. Self-expandable stents produce occlusions to stop leaks or can bypass leaks. A multicenter study involving 15 patients, with prior gastric bypasses and LSG, reported a 93 % success rate in gastrobronchial fistula closures. These endoscopic methods comprised stricturotomies, dilations, gastric septoplasties, and stents. Although an average of 4.5 endoscopic sessions were required per patient, the mean healing time was 4.4 months [14]. Stenting is a viable option for acute proximal leaks after failed non-operative therapy; however, this has limited utility for late and chronic leaks [8]. Contrarily, a systematic analysis by Aurora et al. [15] suggested that 79 % of leaks will manifest in the late postoperative stage and should be managed by endoscopic techniques. Surgical management is not likely to close a leak due to inflammation and poor tissue perfusion [16]. From the aforementioned, endoscopic stenting or sealant combined with percutaneous drainage and parenteral nutrition are the preferred options. A meta-analysis involving seven studies for the treatment of leaks after bariatric surgery showed that re-stenting was required in 4 of 7 studies, with 9 % of patients needing revision surgery. This analysis also reported stent migration in 16.9 % of the studies [17]. However, early placement could result in reduced hospital stay as patients are able to be fed through the gut, decreasing morbidity. Thus, endoscopic stenting is an effective modality, especially early on. When endoscopic stenting does not improve the fistula, reoperation would be indicated.

While the timing of surgical treatment is debatable, the decision to proceed surgically depends on the patient’s status and the time between the primary operation and appearance of the leak. Morbidity and mortality of surgical management or reoperation for leaks are up to 50 % and 2 to 10 %, respectively, with a 48 % conversion rate to open surgery [11, 18, 19]. Consequently, the initial managements for control of local sepsis remain as non-operative and endoscopic approaches. A study by Thodiyil et al. [20] demonstrated leak resolution by supportive management in 33 of 40 patients who underwent Roux-en-Y gastric bypass (RYGB). However, leaks are inclined to become persistent and progress to chronic fistulas despite non-operative management, especially when a functional (pylorus) or mechanical (angulation or twist at the incisura) obstruction exists, as in the case of LSG. Current recommendations state reoperation is optimal after 12 weeks of non-operative treatment to avoid dense adhesions and allow optimization of the nutritional status [8]. Hemodynamic instability due to sepsis generally requires urgent return to the operation room. Early leaks may be treated with drainage of collections and control of the fistula. For late leaks, the treatment of choice is surgical. In our experience, a chronic leak (>12 weeks from the primary procedure) is unlikely to close without surgical intervention. The preoperative strategy should consist of extensive counseling of the patient about the
planned operation (including risks and long-term implications), preoperative imaging studies, optimization of the nutritional status, and, ideally, full control of the local sepsis. The surgeon should explain options to the patient, including construction of a Roux limb to the fistulous tract and more radical resection of the fistula complex with esophagojejunal reconstruction. Most of these patients initially opted for LSG based on the “safer” risk profile compared to RYGB, so now they have to live with an RYGB physiology. Preoperative imaging studies are fundamental to assess the resolution and adequate drainage of the local sepsis, as well as assessing the anatomy. Usually, chronic leak patients had already undergone extensive workup and follow-up with CT scans and upper GI studies. Optimization of nutritional status should be achieved by enteral nutrition when enteric access is available or in alternative with TPN. The optimal duration of the nutritional period depends on the usual nutritional parameters (albumin and pre-albumin).

Gastric bypass should be the next option after exhausting medical management. The gastrosplenic and gastropleural cases involved immediate detection of leaks after the primary LSGs. The gastrosplenic patient returned to the operating room for suture repair, which failed and required drain placement. The leaks persistently continued in both cases, necessitating surgical management. The surgeries performed were both PGRYEJ as demonstrated by Thompson et al. [21] to be effective for chronic staple line disruptions after sleeve gastrectomy. The decision to use a gastrostomy tube was made by the surgeon at the time of the operation. Usually, a gastrostomy tube is left in place if the patient is expected to require enteral nutrition short-term based on the individual nutritional status. In all cases, the fistulas healed with no recurrence. To date, between 5 and 8 months, no secondary effects developed from the fistula surgeries. No major nutritional support was required after the definitive surgical intervention.

Other surgical management options described in the literature include Roux-en-Y over the fistula, esophagojejunal anastomosis, and total gastrectomy [22, 23]. Total gastrectomy has been demonstrated by Serra et al. [24] to be an aggressive technique as the mean hospital stay of patients was 4.5 months (1–10 months) with several re-do surgeries. With total gastrectomy, leaks may potentially occur at the anastomosis and duodenal stump. Cases of gastrocolic fistulas were traditionally treated in a two-stage approach by performing a diverting loop colostomy and then resection [25, 26]. In cases of peritonitis, an initial diverting colostomy and delayed resection is still the preferred route. In today’s practice for benign gastrocolic fistulas, the single stage approach is preferred with preoperative nutritional support and en-bloc resection of the fistula with primary anastomosis [27, 28].

Conclusion

Roux-en-Y esophagojejunostomy is an effective and safe technique to treat staple line leakage. All fistulas described are the result of cases that were either asymptomatic or treated non-operatively for long periods of time. It is the authors’ experience and recommendation that once the patient’s nutritional status has been optimized, and after 12 weeks from the last operation, a definitive surgical intervention such as a PGRYEJ be performed. This procedure can be adopted when non-operative therapy or reinterventions have failed.

Compliance with Ethics Guidelines

Conflict of Interest The authors declare that they have no competing interests.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study. Regarding the informed consent being obtained from all individual participants for whom identifying information is included in this article, this does not apply.