Endoscopic Treatment of Complications After Bariatric Surgery

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Contents

Supplementary Information: The online version of this chapter (https://doi.org/10.1007/978-3-030-54064-7_53-1) contains supplementary material, which is available to authorized users.

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S. Agrawal (ed.), *Obesity, Bariatric and Metabolic Surgery*,
https://doi.org/10.1007/978-3-030-54064-7_53-1

Abstract

With increasing prevalence of obesity and its related comorbidities, there has been a steep rise in the number of bariatric procedures throughout the world. Clearly, this has resulted in a growth in the number of complications unique to bariatric surgery. There is a need to treat these complications in a minimally invasive way. Thus, technically advanced endoscopic procedures have come into practice, known as "bariatric endoscopy," an interface between bariatric surgery and advanced therapeutic endoscopy.

Surgical treatment of complications may lead to increased morbidity. Therefore, it is being replaced by minimally invasive endoluminal endoscopic procedures, especially to control conditions such as infection, fistula, stenosis, food impaction, ring and band erosion, bleeding, and choledocholithiasis. Endoscopic approach has shown a progressive increasing role in treating these complications.

Keywords

Bariatric surgery · Sleeve gastrectomy · Gastric bypass · Adjustable gastric band · Stenosis · Gastric fistula · Bariatric endoscopy

Introduction

In parallel with the worldwide increasing numbers of bariatric procedures, complications of bariatric surgery have been increasing in a progressive scale. The surgical management of these complications can be technically demanding, involving prolonged hospitalization time and greater risk for the patient and resulting in higher postoperative morbidity. Thus, less invasive approach using technically advanced endoscopic procedures have come into practice known as "bariatric endoscopy," defined as an interface between advanced therapeutic endoscopy and bariatric surgery which involves the treatment of complications in a minimally invasive manner [1–3].

The timely and proper treatment of bariatric surgery complications depends on the early recognition of their signs and symptoms, and endoscopy will allow the diagnosis of the problem and also treatment leading to the improvement of the patient.

This chapter aims to briefly present the role of endoscopy in the treatment of complications that may arise after the procedures such as adjustable gastric band, Roux-en-Y gastric bypass (RYGB), and sleeve gastrectomy (SG). Also, postoperative weight regain management is discussed.

Laparoscopic Adjustable Gastric Band (LAGB) Complications

LAGB Erosion and Slippage

Intragastric band erosion is a late complication that can occur in about 1.5% of patients that underwent adjustable gastric band procedure considering a variation from 0.23% to 32.65% [4]. The patient may present with epigastric pain radiating to the scapula, shoulder, or retrosternal pain, subcutaneous port infection, or weight regain. Upper gastrointestinal (GI) endoscopy can confirm the diagnosis. Retroflexion endoscopic maneuver can show the eroding prosthesis inside the gastric lumen at the level of gastric cardia.

Endoscopic removal of a gastric band is less invasive and is, therefore, increasingly preferred to surgical laparoscopic removal [5, 6]. Division of the LAGB can be performed with a gastric band cutter (GBC – Agency for Medical Innovations, A.M.I.GmbH, Götzis, Switzerland) or a lithotriptor, followed by surgical removal of the subcutaneous port (Figs. 1 and 2) [6].

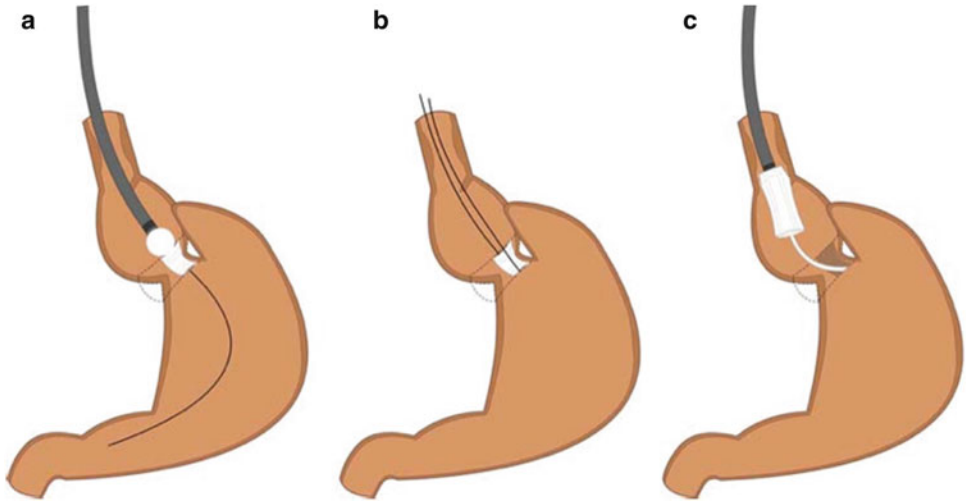

Fig. 1 Schematic images describing band removal with gastric band cutter. (**a**) Passage of metallic thread in between eroded band and gastric wall; (**b**) recovery of thread by endoscope; (**c**) oral removal of band after cutting it

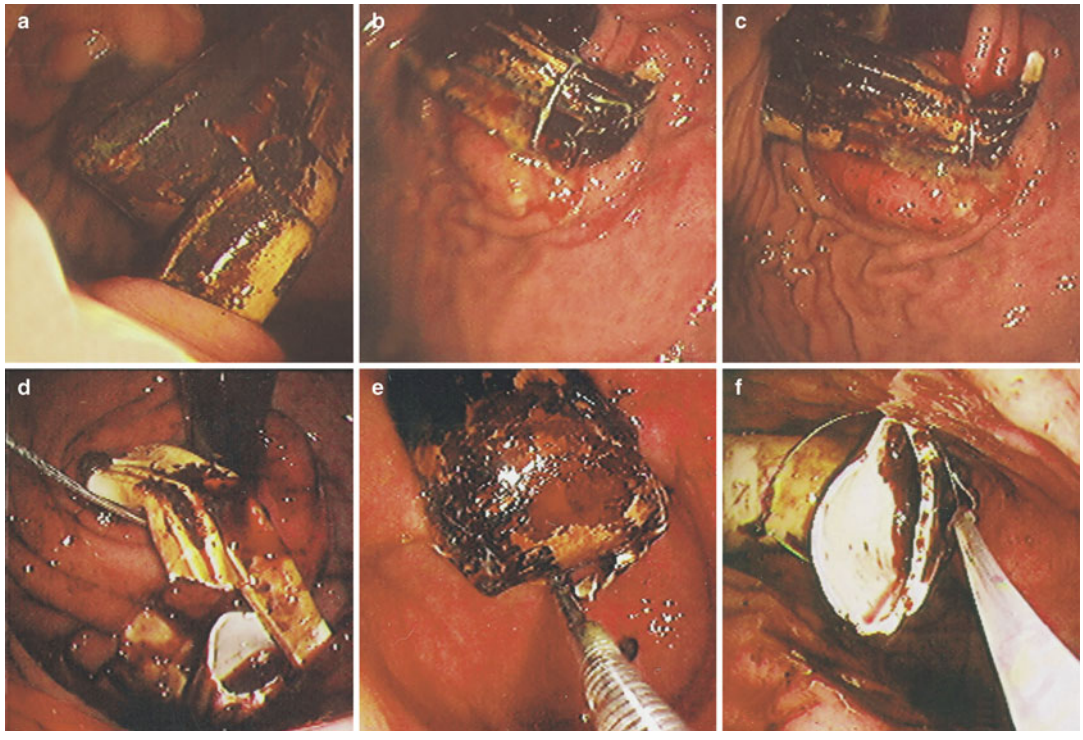

Fig. 2 Endoscopic images of band removal. (**a**) Eroded band; (**b**) metallic thread over band; (**c**) metallic thread "hanging" band; (**d**) transected band pulled into antrum by polypectomy snare; (**e**) band grabbing with polypectomy snare; and (**f**) band removal with polypectomy snare

When the prosthesis gets displaced distally (slipped), there is subsequent dilation of the proximal gastric pouch, thereby hindering the passage of food. This is diagnosed as band

slippage. Such patients present with epigastric pain, vomiting, dysphagia, heartburn, and halitosis. Endoscopy and/or contrast swallow imaging is required to confirm the diagnosis [6]. It is important that the band could be immediately deflated in all the patients with suspected slippage in order to alleviate the passage of de food. This allows the stomach to return to its normal anatomical position and decreases the need for an emergent surgery [7].

If this fails to resolve the symptoms, an upper GI endoscopy should be performed. If the prosthesis happens to remain slipped, then hyperinflation of the stomach helps in forcing the proximal displacement of the band, thus repositioning it to its usual site. Forced endoscopic balloon dilation can also be used looking for similar result. These maneuvers also allow for temporary relief of obstructive symptoms. In cases where this maneuver fails, the band needs to be surgically removed [8].

Laparoscopic Roux-En-Y Gastric Bypass Complications

Food Impaction

Food impaction after RYGB may be associated with dietary noncompliance, the use of a restrictive ring, or stenosis of the gastric pouch or gastrojejunostomy. Clinical presentation is consistent with upper GI obstruction involving nausea, retrosternal pain, epigastric discomfort, or postprandial vomiting. Endoscopy allows both diagnosis and immediate treatment (see Fig. 3).

Retained fragments can be removed with a retrieval basket or sometimes can be gently pushed into the distal jejunal loop. It is strongly advised that after the resolution of symptoms, the etiology of the stenosis should be investigated and treated [9–11].

Marginal Ulcers

Marginal ulcers may occur as an early or late complication of surgery with an incidence rate of up to 16%, and there is no established treatment protocol [12, 13]. The pathophysiology is associated with hyperacidity and mechanic and ischemic factors. This often has a multifactorial etiology and is associated with tobacco and alcohol consumption, nonsteroidal anti-inflammatory drug (NSAID) usage, *Helicobacter pylori* infection, leaks, and foreign bodies [13]. Ulcers are more common at the jejunal side of the gastrojejunal anastomosis and may vary in size and depth [10–14]. When marginal ulcers appear as early postoperative complications, it is thought to be associated with the surgical healing itself [7].

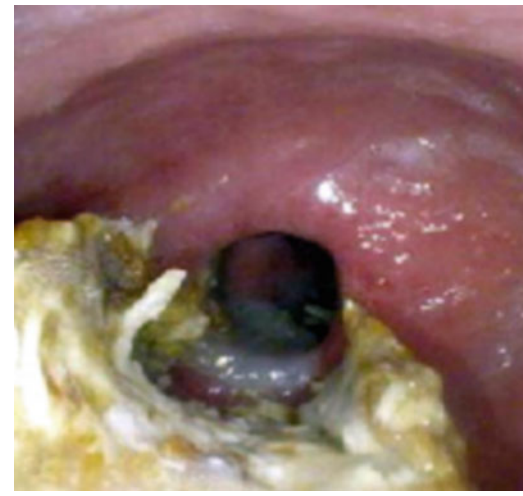

Fig. 3 Endoscopic image of food impaction in gastrojejunal anastomosis

Their presentation is commonly asymptomatic but they may present with epigastric pain, obstructive symptoms caused by the inflammatory edema, or even GI bleeding [10–14]. Upper GI endoscopy is the investigation of choice. Treatment should include high-dose proton-pump inhibitors for at least 2 months and sucralfate for 10 days [12, 13].

Upper GI endoscopy should be repeated to ensure healing [14]. Ulcers can cause strictures due to fibrotic scar formation, and these can be treated through stenotomy and balloon dilation [6].

Anastomotic Stricture

A stricture is diagnosed when the lumen of the anastomosis is <10 mm in diameter, making it difficult for a standard endoscope (9.8 mm in diameter) to pass through (Fig. 4). The patients' main presenting symptom is usually food stuck and dysphagia [14]. This complication is believed to be caused by ischemia, gastric hypersecretion, excessive vomiting, foreign body reaction to staples, and anastomotic surgical technique [14].

Initial treatment with "through-the-scope balloon dilation" is preferable, up to a maximum diameter of 15 mm when inflated (Fig. 5). Subsequent balloon dilations of up to 20 mm may be used, as needed. Studies indicate that a small number of dilations, between one and two, are often enough to resolve the stricture [14, 15]. Persistent stenosis after two dilations or presence of gastrojejunostomy fibrosis is managed by the division of fibrous stenosis, which may be performed using a needle-knife. Complication rates of the dilation procedure can be as high as 2.5%, perforation being the most common. It occurs in up to 1.86% of patients; however, this can be treated conservatively [14].

If initial administration of corticosteroids to reduce the anastomosis edema fails to improve the symptoms, upper GI endoscopy is the diagnostic and therapeutic method of choice for early stenosis occurring within the first weeks after surgery. In such cases, balloon dilation should be used cautiously with low inflation pressures because the risk of perforation is higher [15].

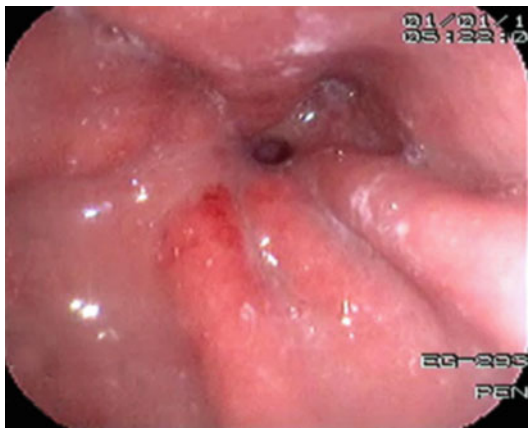

Fig. 4 Endoscopic image of the stenosis of gastrojejunal anastomosis, not allowing free passage of the endoscope

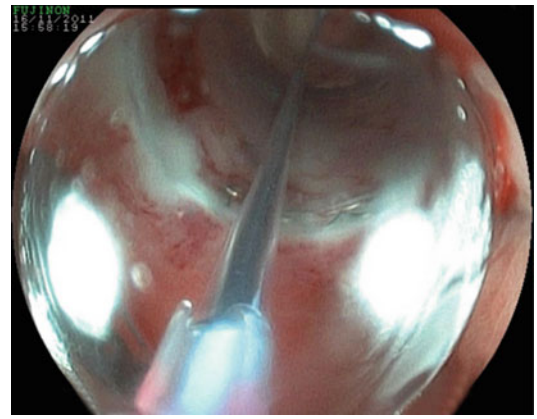

Fig. 5 Endoscopic image showing balloon dilation of anastomotic stricture

Choledocholithiasis

There is an increased incidence of gallstone disease after bariatric surgery. In cases with gastric bypass, treatment can be more challenging due to the lack of endoscopic access to the duodenum, papilla, and the common bile duct (CBD) as a result of surgically altered anatomy due to Roux-en-Y [4]. A combination of laparoscopy and endoscopy can be used, wherein a transgastric endoscopic retrograde cholangiopancreatography (ERCP) (Fig. 6) is performed along with laparoscopic cholecystectomy. It is accessed via a 1 cm incision in the anterior wall of the remnant stomach through which a duodenoscope (introduced laparoscopically) is passed. The rest of the procedure follows conventional ERCP [16].

In those cases where this is technically challenging, an alternate technique wherein access to CBD via jejunum is facilitated using a double balloon enteroscope. This technique has a successful biliary cannulation rate of up to 60% [17].

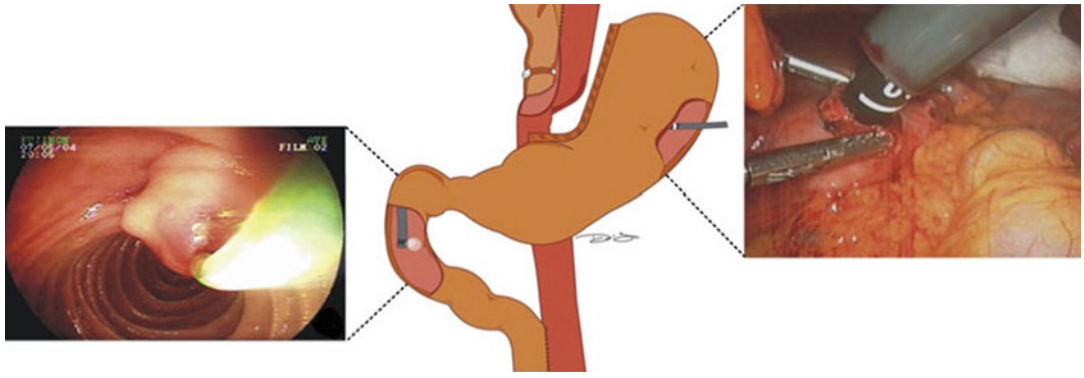

Fig. 6 Endoscopic retrograde cholangiopancreatography procedure. Insertion of the duodenoscope in the gastrotomy; schematic drawing of access to the duodenum through the remnant stomach; endoscopic view via cannulation of the papilla

Banded Laparoscopic Roux-En-Y Gastric Bypass Complications

Ring Erosion

The intragastric ring erosion related to the banded gastric bypass occurs slowly and the incidence varies from 0.9% to 7.0% [18]. It leads to the formation of an inflammatory capsule around the ring just close to the gastric pouch serosa. This prevents leakage of gastric contents into the abdomen. The clinical presentation is nonspecific and up to 15% of the patients are asymptomatic, but when symptoms do occur, they include weight regain, epigastric pain, obstructive symptoms, and upper GI bleeding [18].

The eroding prosthesis is often seen directly in the lumen of the gastric pouch through diagnostic endoscopy (Fig. 7). An early endoscopic finding may be just an ulcer at the site of the ring. The migrated ring can be removed with a standard single-channel endoscope utilizing an endoscopic scissor [19]. If this fails due to the rigidity of the ring, an endoscopic lithotriptor (or gastric band cutter) may be used.

A dual-channel device can also be used if the ring has only a small area of intragastric erosion and is adherent to the gastric pouch wall. The double-channel allows the introduction of foreign body grasping forceps, for traction, allowing better ring exposure. The other channel can then be utilized to pass the endoscopic scissor.

Ring Slippage/Intolerance/Stenosis

Postprandial vomiting, dysphagia, and other obstructive symptoms should always be investigated. Ring slippage is a rare complication leading to progressive obstructive symptoms including vomiting, eructation, weight loss, malnutrition, and dehydration [20]. If there has been a complete slippage, there can be signs of esophagitis from excessive vomiting, gastric pouch dilatation, or formation of gastric "neofundus" [20]. Diagnosis can be elucidated with either contrast X-ray which

Fig. 7 Endoscopic image of intragastric (pouch) ring erosion in Roux-en-Y gastric bypass

shows an area of contrast retention or endoscopy which may show food stasis and convergence of mucosal folds caused by the jejunal obstruction just beneath the anastomosis.

Some patients may have frequent episodes of vomiting with no evidence of stenosis, a condition quoted by the authors as "food intolerance secondary to the presence of the ring" (Fig. 8) [21].

Dilation with a 30 mm balloon (Rigiflex® – Boston Scientific, Natick, MA) promotes stretching or rupture of the internal fibrotic band that is caused by the presence of the ring; this can relieve the symptoms (Fig. 9); however, weight regain may be an important complication [20]. Stent placement can also be used, especially if symptoms persist, to induce an inflammatory/ischemic reaction around the ring which leads to intragastric erosion. The stent and ring may be removed after approximately 2 weeks. A fibrotic scar tissue forms in the area of ring erosion restricting the pouch diameter, which helps in better weight control when compared to dilation [22–24].

Gastric Fistula After RYGB and Sleeve Gastrectomy

Gastric fistula is one of the most feared complications after bariatric surgery and may present with variable symptoms [25, 26]. The incidence has decreased in recent years due to the recognition of its etiology and improved surgical technique. However, it is still associated with high morbidity [27].

Some risk factors for gastric leaks are male gender, increasing age, body mass index >50 kg/m^2, presence of comorbidities, revisional surgery, and beginning of the surgeon's learning curve [27]. In some cases, the pathogenesis can be explained by ischemia of the angle of His, increased intraluminal pressure, and staple line or suture failure [28].

Leaks are classified according to the time of onset (acute, <7 days; early, <6 weeks; late, 6–12 weeks; chronic, >3 months) [29]. In acute/early leaks, the clinical presentation includes tachycardia, abdominal pain, fever, leukocytosis, and sepsis [30].

SG leaks may be more difficult to treat, compared to RYGB, due to the absence of an excluded stomach which could possibly promote a blockage in the area of leak. The gastric intraluminal pressure is increased by the increase in occurrence of stenosis. The most common site of involvement is the angle of His, especially when stapling is performed too close to the esophagogastric junction.

The fistula may be difficult to control and, in some cases, does not heal after conventional treatment (reoperation, intra-abdominal drainage, and feeding distal to the fistula) [31]. A chronic internal fistula (gastrocutaneous, gastrogastric, gastrojejunal, gastrocolic, and gastrobronchial) may develop if the external drainage is not adequate [32]. The chronic inflammatory response leads to the development of distal stenosis and a fibrotic septum between the perigastric fluid collection and intraluminal cavity, which are the factors associated with perpetuation of leaks. In selected cases, surgery is recommended for abscess drainage and should always be performed in case of peritonitis, preferably by laparoscopy [33]. Clinical approach includes broad-spectrum antibiotic therapy and fluid resuscitation; thereafter, specific measures to treat the leak should be taken including revisional surgery open or laparoscopic or endoscopic approach. The decision should be taken based in the experience of the team. Revisional surgery is usually associated with elevated morbidity and mortality. The endoscopic management should be considered as the first-line therapeutic option in hemodynamically stable patients due to decreased invasiveness [25, 29, 34–39].

Upper GI endoscopy simultaneously facilitates both diagnosis and minimal invasive therapy. For both SG and RYGB, stenosis is usually identified distal to the fistula, and the resulting increased pressure leads to its delayed healing. Stenotomy and balloon dilation can relieve distal stenosis (Figs. 10 and 11) which helps in gastric emptying, reducing intraluminal pressure, and decreasing fistula output [33]. Also, occlusion of the internal

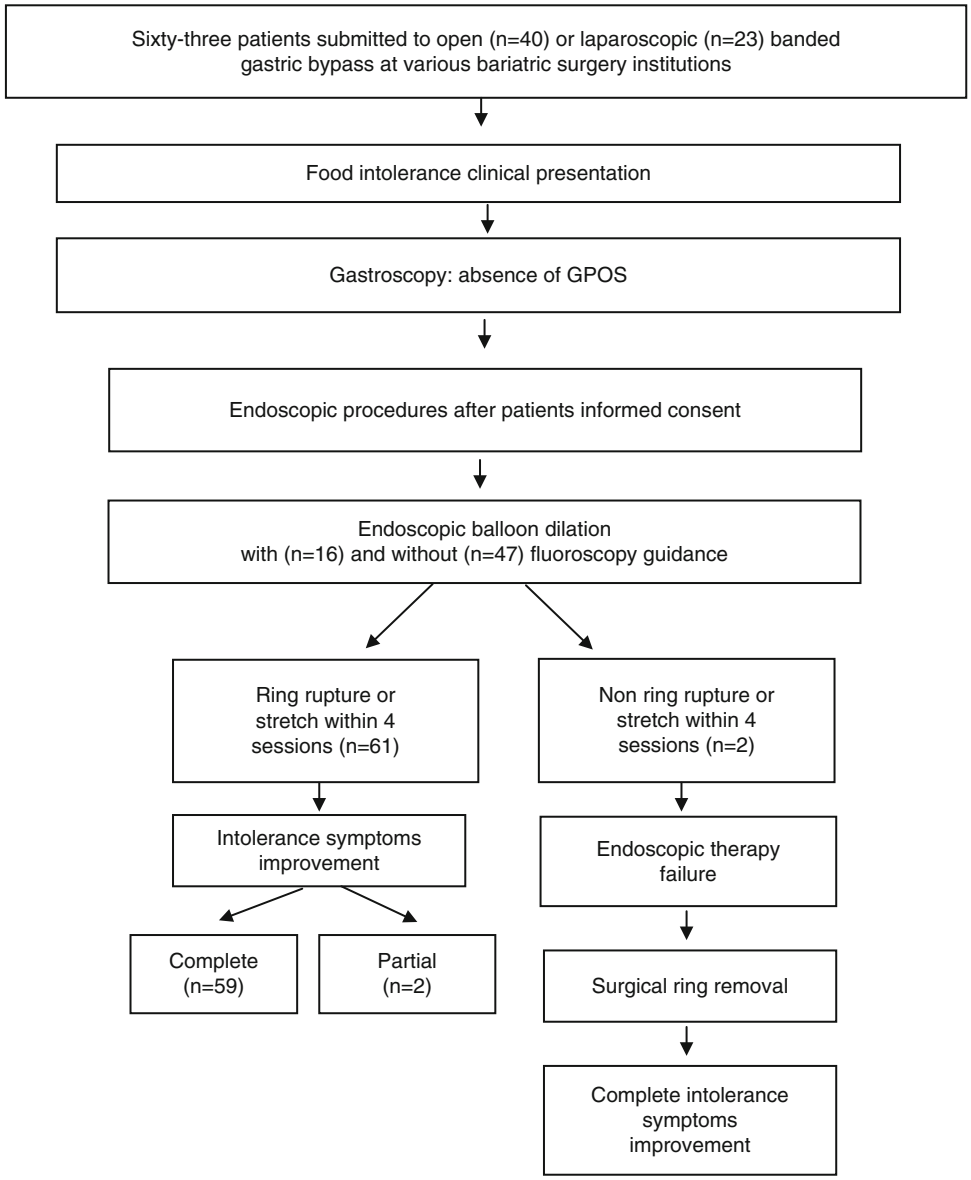

Fig. 8 Flowchart for the treatment of food intolerance by endoscopy

opening of the fistula is possible with implantation of a removable stent.

The aim of endoscopic therapy is to solve the three main issues perpetuating the leak: distal gastric stricture, increased intragastric pressure, and fistulous tract persistence [24]. Several procedures have been reported including closure (stenting, clips, glues, and endoluminal suture) and endoscopic internal drainage (EID) methods (septotomy with balloon dilation, endoscopic vacuum therapy (EVT), and pigtail drain) [34–37, 39, 40].

In acute or early leaks, self-expandable metallic stents (SEMS) promote the occlusion of leak orifice along with correction of axis deviation and distal strictures. It decreases the intraluminal pressure and helps in closing the leak [25]. Stents should be removed in up to 4 weeks, which is

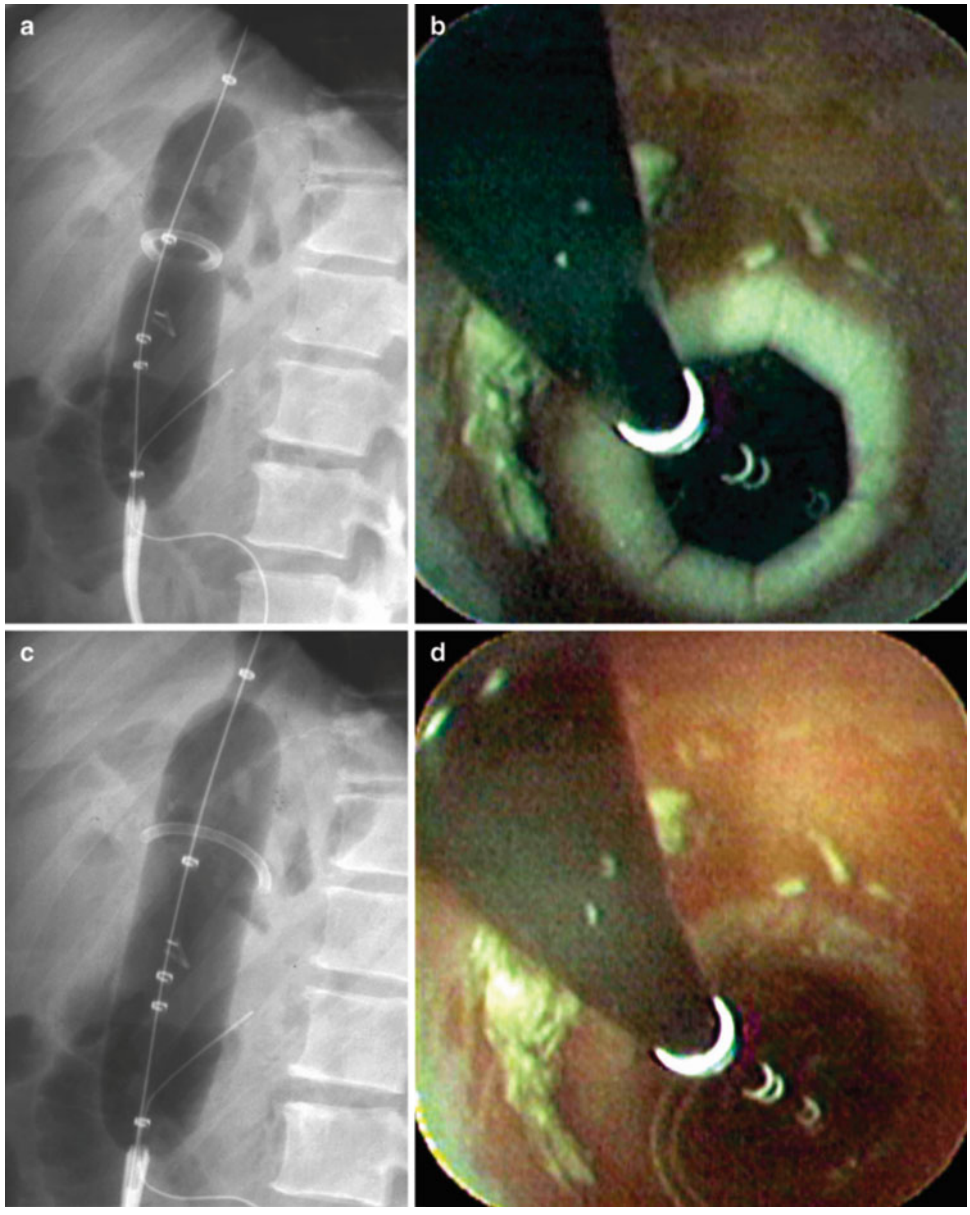

Fig. 9 (**a**) X-ray; (**b**) endoscopic image of gastric pouch evidencing the inflated Rigiflex® balloon revealing the ring compression; (**c**) X-ray; (**d**) endoscopic image evidencing ring rupture after few minutes of dilation

usually enough to correct strictures and deviations. It also ensures lower migration and easier removal. After initial leak control, the stent is removed even if complete orifice closure is not achieved. When needed, endoscopic treatment is continued through septotomy, stenotomy, balloon dilations, internal drainage with double-pigtail stent, and vacuum therapy.

A multicenter study showed that migration is the most common complication of stents, with rates going up to 19.5%, requiring repositioning of the stent [41]. Approximately 3.4% of patients were unable to complete the treatment due to device intolerance. Stenosis occurred in 13.8% of patients, which required endoscopic dilatation after stent removal. Overall, 80.5% of cases

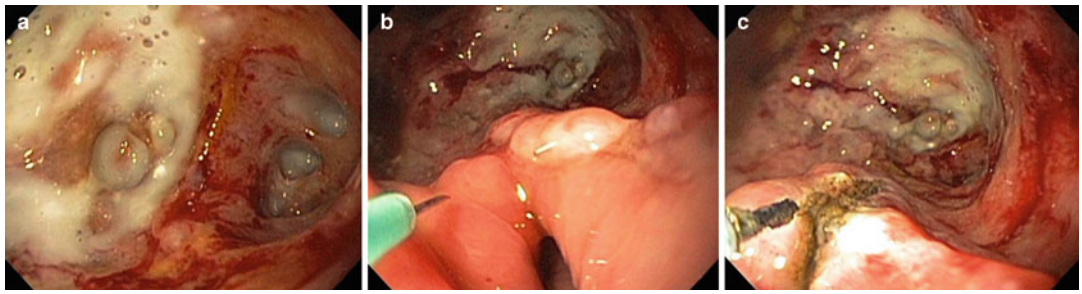

Fig. 10 Endoscopic septotomy. (**a**) Perigastric cavity partially clean; (**b**) beginning of septotomy using needle-knife catheter; (**c**) sectioned septum

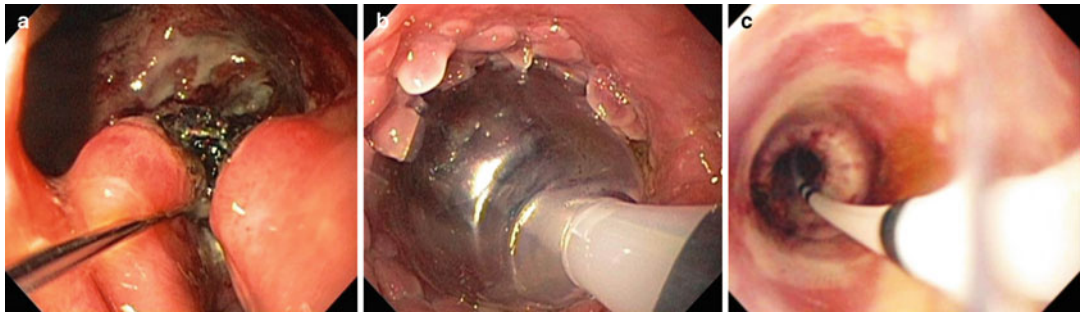

Fig. 11 Balloon dilation procedure (**a**) Savary-Gilliard wire-guide passage in stenosis area; (**b**) inflated balloon – Rigiflex (Boston)®; (**c**) sectioned septum and removed edges after dilation

resolved without any other additional procedures. Only 5.7% required a reoperation after stent due to endoscopic treatment failure [41]. Newer stents made specifically for SG (longer and with a larger diameter) showed superior results, compared to esophageal stents, in the management of SG leaks [42].

Till now, there is no standard of care for chronic leaks. Often, revisional surgery tends to be complex and therapeutic endoscopy proves valuable [43]. When there is a septum adjacent to the fistulous orifice, endoscopic septotomy is performed which decreases the flow of gastric contents through the fistula [39, 40]. Septotomy is performed with needle-knife or argon plasma coagulation, followed by balloon dilation, thereby reducing the intraluminal pressure and facilitating the internal drainage. This therapy has been associated with high success rate in the cases with late and chronic fistulas [34, 39, 44]. In addition to the stenotomy of fibrotic band, pneumatic balloon dilation of up to 30 mm is performed to correct the anatomical and functional changes. These procedures may be repeated on a weekly basis until the digestive secretion flow and pouch axis are corrected, encouraging permanent healing of fistula [4, 45]. The correction in the flow of digestive contents will eventually lead to leak closure. Stents can be used in selected cases, especially when there are anatomical defects or gastric content leakage. Internal drainage with double-pigtail stent can be performed on late fistulas associated with long fistulous tract and perigastric abscess [46].

The placement of a double-pigtail drain through the fistulous tract, communicating the perigastric collection and intraluminal cavity, creates an internal drainage system. The foreign body reaction also induces tissue reepithelization. This therapy has been described with high success and low complication rates, especially in cases of smaller leaks (<10 mm) [36, 39, 47]. This has also been reported as a bridge to other endoscopic methods and also as a salvage treatment when

other techniques have failed [48, 49]. In the largest series reported on EID, double-pigtails were delivered as a first-line approach [50]. At each session, stent exchange must be performed until the fistula is healed to avoid stent obstruction and to stimulate tissue granulation. Internal pigtail drainage achieved 78.8% clinical success [47]. According to Souto-Rodríguez et al. [51], this approach allows for early oral re-feeding in the first 24–48 h following pigtail insertion, without any negative impact on the final results. No standardized protocol was observed to remove the pigtails, and the decision was left to the discretion of the endoscopist and decided on an individual basis, although the stent retrieval was planned for up to 4 months after complete clinical resolution [48]. In addition to the high efficacy, EID has a low complication rate [47, 48].

Endoscopic vacuum therapy has also been described with a high success rate [40, 52–54]. EVT is a technique that allows internal drainage and thus, controls the infection and promotes tissue healing. EVT is frequently used in case of gastroesophageal leaks with clinical success rates higher than 80% [53–55]. However, EVT negatively is associated with an elevated number of procedures to exchange the vacuum system replacing for a new one. EVT avoids complicated, time-consuming, and cost-consuming open surgical reoperations. Moreover, the total cost of treatment can be reduced with lower use of total parenteral nutrition, systemic antibiotics, and intensive care [55]. Other endoscopic approaches include usage of endoscopic clips, biologic glue, and tissue sealants, however, with controversial results [56, 57].

Twisted Gastric Tube After SG

Twisted gastric tube after SG is a possible complication, rarely described in the literature [58]. It may cause leak or food intolerance. Its diagnostic investigations of choice are plain or contrast X-ray, computerized tomography (CT) scanning, and/or endoscopy. Upper GI X-ray images are very important for the correct management of the case, considering sometimes it is not easy to identify evidence of a stenosis or stricture on endoscopic examination even in patients with clinical symptomatology (Fig. 12).

With endoscopy, twisted gastric folds with an axis deviation show a twisted gastric tube. Endoscopic treatment can be attempted by balloon dilation with a 30 mm balloon. If it persists, open incision of the greater curvature including the first muscle layer followed by balloon dilatation is indicated. This procedure can be performed with argon plasma or electrocautery that appears to be safe, effective, and relatively less invasive but comparable to gastric seromyotomy [59]. Recently, peroral endoscopic myotomy has also been described to treat SG stenosis and axis deviation [60].

Secondary Treatment for Obesity

Some patients undergoing RYGB may regain approximately 30% of their excess weight loss, but around 20–30% of these patients regain a large proportion of their lost weight [61]. It negatively impacts the quality of life by negating the expected long-term benefits of obesity surgery [61]. Poor eating habit is one of the main factors

Fig. 12 X-ray image showing gastric twists

associated with this complication. Increased caloric intake can be related to esophageal, gastric, or anastomotic dilation with subsequent weight regain. It is important that dietary habits (volume and quality of the meal) and behavioral habits (anxiety disorders) are always evaluated when there is inadequate weight loss. A combination of genetic, anatomic, behavioral, and psychological components is thought to contribute to weight regain.

Weight regain in the late postoperative period after RYGB should be evaluated by a multidisciplinary team as well as endoscopic or radiologic study of the surgical anatomy. When there is dilation of the anastomosis after RYGB, endoscopic diameter reduction methods (as described below) may be tried. Reoperation has been the most traditional option, but it is a high-risk procedure with high morbidity and mortality [61]. In this context, bariatric endoscopy has been demonstrated as a viable approach for weight regain with fewer complications [62].

The most relevant aspects of weight regain, after RYGB that are treated by endoscopy, are gastrojejunostomy and gastric pouch [62, 63]. However, other complications, such as gastrogastric fistula, ring slippage or stricture, and stenosis, may be inducing weight gain. Chronic stenosis causes food intolerance, thereby making the patient to select the most appealing foods such as carbohydrates, sweets, and caloric liquids which pass easily through the stricture.

Application of argon plasma may induce the formation of fibrotic scar and consequent anastomotic diameter reduction (Fig. 13). Argon plasma coagulation (APC) is a noncontact electrocoagulation method that results in superficial thermal coagulation and induces an inflammatory and fibrotic response. This fibrotic response can reduce the diameter of anastomosis when argon plasma is applied at dilated gastrojejunostomy [64, 65].

Significant dietary restrictions should be observed post procedure due to the anticipated anastomotic edema and local inflammatory response [65]. The initial edema and inflammatory response cause immediate gastric restriction. However, this effect decreases over the time and the fibrosis replaces the edema. More than one session is usually necessary to achieve long-lasting effects [65]. The procedure duration is approximately 5–10 min and the length of hospital stay is about 30–60 min [65]. The diameter reduction delays gastric emptying and may cause early satiety, thereby improving weight reduction.

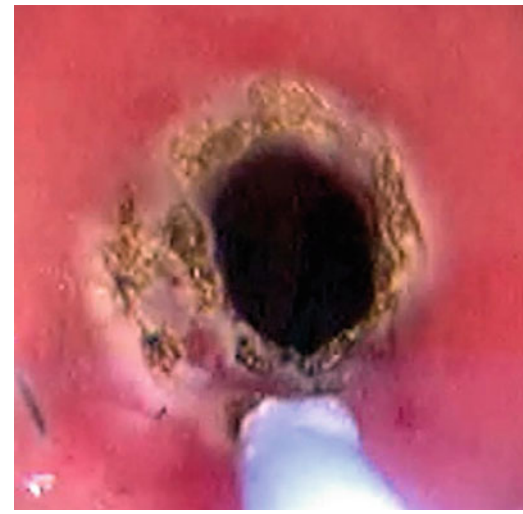

Fig. 13 Endoscopic argon plasma application at gastrojejunal anastomosis

A multicenter study reported that when patients with weight regain after RYGB received APC therapy, they showed 6–10% of total weight loss at 12 months with significant decrease in gastrojejunostomy diameter [65]. However, complications can occur after APC therapy. One of the possible complications is anastomotic stricture that can reduce by itself or should be treated with endoscopic balloon dilation. Gastrojejunal ulcer, melena, and vomiting have also been reported [65, 66].

de Quadros et al. [66], in a randomized controlled study comparing APC to exclusive multidisciplinary management after weight regain, showed the safety and efficiency of APC along with superiority of APC on weight loss compared to the control group. They also reported that multidisciplinary treatment was important to stop weight regain [66].

Endoscopic suturing devices are minimally invasive alternatives that may be used alone or in association with argon plasma. The procedure

involves suturing the internal mucosa and muscular layer, thereby restricting the gastric lumen [67]. The sutures are performed under direct vision with the aid of a curved needle. The important advantage of endoscopic suturing is the possibility to be performed in patients who have had different kinds of surgical techniques such as SG and RYGB. It helps not only in treating the weight regain but also in controlling the metabolic diseases, especially in patients without clinical conditions to surgical revision. APC, when associated to the suturing procedure, leads to better weight loss outcomes and can achieve an excess weight loss of 24.9% after 1 year but with a low complication rate [62, 68].

Summary

Endoscopic treatment of bariatric surgery complications is a relatively new field of interface between bariatric surgery and endoscopic diagnostic procedures. Over time, with progressive confidence of the bariatric teams offering a less invasive and effective modality treatment, a new member has been added to the multidisciplinary bariatric groups, the endoscopist.

Key Learning Points

- Abdominal epigastric pain is the main complaint of patients with marginal ulcer, and the healing process usually will occur with prolonged use of proton-pump inhibitors and sucralfate.
- Upper digestive endoscopy is the best diagnostic and therapeutic method to manage stenosis of gastrojejunal anastomosis. Endoscopic balloon dilation is a safe and effective approach with a low morbidity rate.
- Combined management (laparoscopic and endoluminal procedures) can be performed by transgastric ERCP to treat choledocholithiasis after gastric bypass. Recently, enteroscopy has been performed as a minimally invasive approach.
- Minimally invasive treatment of bariatric surgery leaks is evolving with several options such as internal drainage (septotomy, pigtail drains, and vacuum therapy), longer stents made specifically for SG, and chronic treatment with continuous dilations.
- Weight regain may occur after RYGB; however, argon plasma coagulation and endoscopic suturing are showing promising results.

Cross-References

- ▶ Laparoscopic Adjustable Gastric Banding: Complications – Diagnosis and Management
- ▶ Laparoscopic OAGB/MGB: Early (</= 30 days) Complications – Diagnosis and Management
- ▶ Laparoscopic OAGB/MGB: Late (>30-days) Complications – Diagnosis and Management
- ▶ Laparoscopic Roux-en-Y Gastric Bypass: Complications – Diagnosis and Management
- ▶ Laparoscopic Sleeve Gastrectomy: Early (</= 30 days) Complications – Diagnosis and Management
- ▶ Laparoscopic Sleeve Gastrectomy: Late (>30-days) Complications – Diagnosis and Management

Acknowledgement The authors are grateful to Patrícia Souza de Paula for their work in producing this chapter in the first edition of the book.

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