Bariatric endoscopy: treatment of obesity and bariatric surgery complications

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Introduction

The fast increase in the number of patients undergoing bariatric surgery has led to the emergence of bariatric endoscopy as a therapeutic interface for minimally invasive treatment of complications. These techniques have the potential to be safer, reversible and cost-effective, with decreased morbidity, because of their less invasive nature.

The field of bariatric endoscopy can be subdivided into three areas: primary treatment of obesity; treatment of complications after bariatric surgery; and treatment of secondary obesity. When used as a primary treatment for obesity, endoscopic therapies have better results compared to clinical treatment, but are still not as durable or as effective as surgical treatment. Bariatric endoscopy is currently evolving, using more sophisticated and more durable devices and expanding its reach as a treatment for type 2 diabetes[1].

The literature on devices such as dilation balloons, clips, scissors and stents for bariatric surgery complications is growing but still scarce[1-2]. Bariatric endoscopy is considered as a new and unfamiliar field by most endoscopists, even those who are experts in advanced techniques.
Primary Treatment of Obesity

Intragastric Balloon (IGB)

The IGB is a space-occupying device that reduces stomach capacity and induces early satiety. Currently, several types of balloons are available on the market, with different filling methods, treatment lengths and volumes.

The Orbera® (Apollo Endosurgery, Austin, TX) (FDA approved) is a cylindrical-shaped balloon filled with 450–700 ml of saline and methylene blue, which shows early signs of deflation by a change in urine color. The device is placed and removed endoscopically, under direct view. After six months, the balloon needs to be removed, due to the risk of spontaneous deflation and resultant bowel obstruction.

In a systematic review encompassing 3,608 patients, weight loss on balloon removal was 14.7 kg, with a %EWL of 32.1%. The majority of complications were mild and the early removal rate was 4.2%. This weight loss exceeds the 10% considered to be sufficient to obtain health benefits and improve morbid conditions associated with obesity, such as hypertension, diabetes and hyperlipidemia[3]. Another review of randomized control trials comparing the effectiveness of intragastric balloon versus sham/diet, balloons proved to be more effective in terms of body mass index (BMI) loss, weight loss and %EWL[4].

Endoscopic Sleeve Gastroplasty (ESG)

The OverStitch® (Apollo Endosurgery, Inc., Austin, TX) (FDA approved) is an endoscopic suturing device that can be used for revisional and primary bariatric endoscopic procedures. The ESG is a procedure that reduces stomach size through approximation of tissues, mimicking a laparoscopic gastric plication. Overstitch® performs full-thickness suturing, allowing for a serosa to serosa approximation with lasting plication durability.

In a study involving 25 patients with one-year follow-up, there was an 18.7 percentage of total body weight loss (%TBWL) and the procedure was not found to be associated with serious complications, and endoscopic and radiologic evaluation showed preservation of the tubular aspect of the stomach one year after operation[5]. ESG is a procedure that can be repeated when necessary, thereby increasing weight loss.

Primary Obesity Surgery Endolumenal (POSE™)

POSE™ (under FDA evaluation) involves the use of the Incisionless Operating platform (IOP) (USGI Medical, San Clemente, CA). Transmural tissue anchor plications are placed, reducing accommodation of the gastric fundus, with additional plications in the distal body near the proximal antrum in order to delay gastric emptying[6-7]. The POSE™ procedure reduces and modifies the stomach, leading to earlier and prolonged satiety.

In a series of 147 patients, there was a mean %EWL of 42% after six months and 44% one year after the procedure, without serious long-term adverse events. In two-year follow-up endoscopies, visible anchors and tissue folds were observed[8].

Aspiration Therapy

Aspiration therapy is a novel procedure that involves the endoscopic placement of the Aspire Assist Device® (Aspire Bariatrics, King of Prussia, Pennsylvania, USA) (FDA approved). The device is made of silicone and is inserted in a manner similar to a standard percutaneous endoscopic gastrostomy tube. An attached water reservoir flushes water into the stomach to facilitate subsequent aspiration cycles[6-7].

In a randomized pilot trial, there was a %TBWL of 18.6%, compared to 5.9% in the control group. When comparing %EWL, the aspiration therapy group showed a 49% reduction and the lifestyle group 14.9%. There were no adverse effects on eating behavior and no increased food intake, or binge eating episodes. The most common adverse events included peristomal pain, peristomal irritation and constipation[9].
Duodenojejunal Bypass Sleeve

The Endobarrier Gastrointestinal Liner™ (GI Dynamics, Inc., Lexington, MA) consists of a nitinol anchor that fixes the device to the duodenum and a fluoropolymer sleeve extending 60 cm into the small bowel, creating a duodenal-jejunal bypass. It creates a barrier to absorption and delays mixing of food with digestive enzymes, which flow outside of the sleeve, with an effect similar to surgical gastric bypass. The Endobarrier™ is mainly indicated for diabetic obese patients, especially difficult-to-control grade I moderate obesity[10].

A 52-week evaluation showed significant reductions in waist circumference, systolic and diastolic pressure, cholesterol, triglycerides and fasting glucose. The prevalence of metabolic syndrome was reduced from 83.3% to 41.6% and %EWL was 47.0%. Subjects regained a mean of 4.4 kg during the six months following device removal without any kind of maintenance program[11].

An FDA multicenter pivotal trial was placed on hold, after reports of four cases of hepatic abscess among the 325 patients enrolled. Recently, GI Dynamics issued the final results of the U.S. ENDO Trial, showing meaningful improvements in hemoglobin A1c levels and weight reduction compared to the control group. There was a 3.5% hepatic abscess rate, and a 10.9% rate of device-related serious adverse events requiring early removal, with no mortality[12].

Duodenal Mucosal Resurfacing®

Duodenal Mucosal Resurfacing® (Fractyl Laboratories, Cambridge, Massachusetts, USA) (initial clinical studies) aims to ablate the superficial duodenal mucosa, using radiofrequency ablation technology. Mucosal remodeling may hypothetically reset duodenal enteroendocrine cells that have become diseased, with an incretin effect, thus restoring signaling that can improve diabetes control. It may be useful in the management of type 2 diabetes in normal weight and obese individuals.

In the first-in-human trial, 39 diabetic patients were submitted to the procedure. The procedure was well tolerated, with minimal gastrointestinal symptoms. Three patients presented with duodenal stenosis, successfully treated by balloon dilation. HbA1c was reduced by 1.2% after 6 months, with more important effects when a long duodenal segment was ablated[13].

Endoscopic Treatment of Bariatric Surgery Complications

Roux-en-Y Gastric Bypass (RYGB)

Anastomotic Stricture

Gastrojejunal anastomotic stricture is defined by a diameter of <10 mm or inability to pass through a common endoscope (9.8 mm). It usually presents when the patient starts a solid diet, with complaints of food intolerance, vomiting and epigastric pain. Treatment can be carried out by hydrostatic balloon dilation, using TTS (through the scope) balloons, with diameters up to 15 mm. The endoscopic approach is successful in 98% of cases, with a complication rate of 2.5%, mostly perforations and controlled bleeding[14-15]. In cases of failure, endoscopic stenotomy can be performed, using endoscopic electrocautery to make incisions in the stricture, followed by dilation.

Marginal Ulcers

This complication has a multifactorial etiology, including tobacco and alcohol consumption, nonsteroidal anti-inflammatory drug usage, gastrogastric fistulas and foreign bodies. Ulcers can have varying size and depth and are usually located on the jejunal side of the anastomosis. The main symptoms are epigastric pain, dysphagia, nausea and vomiting. All foreign bodies, such as visible sutures and staples, should be removed to improve ulcer healing and a proton pump inhibitor and sucralfate should be prescribed[16].

Ring Complications: Intragastric Erosion, Slippage
and Food Intolerance

The most common symptoms of intragastric ring erosion are weight regain, nausea, vomiting, and bleeding, and endoscopy may show the ring inside the gastric pouch\footnote{17}. In the early stages, an ulcer at the erosion site may be the only sign, and PPIs should be prescribed until complete ring erosion has occurred. When \(>30\%\) of the ring circumference is visible inside the gastric pouch, endoscopic removal, using endoscopic scissors or a gastric band cutter to cut the ring, and a foreign body grasper, is indicated. Treatment should be scheduled as early as possible, owing to the risk of gastric wall bleeding or food impaction\footnote{18}.

Distal ring slippage may lead to obstructive symptoms and can be managed endoscopically by 30 mm achalasia balloon dilation, which has a low complication rate. The aim is to dilate or rupture the thread running inside the ring, thus relieving symptoms. In such cases, some weight gain may occur after the restriction provided by the ring is lost\footnote{19}. Ring removal can also be achieved by stent placement, which will cause an inflammatory/ischemic reaction around the ring, promoting intragastric erosion, with stent and ring removal possible after 10-15 days. A fibrotic scar tissue forms in the erosion area, restricting the pouch diameter, leading to less weight gain\footnote{20}.

In some cases, episodes of vomiting may occur even when there are no signs of ring complications and this may be defined as ring-related food intolerance. These patients can also be treated by dilation or stenting, with improvement of symptoms in more than 90\% of cases\footnote{21}.

Sleeve Gastrectomy (SG)

Gastric Stricture

In post-sleeve gastric strictures, endoscopy may reveal a reduction in the gastric lumen, usually near the incisura, associated with difficult progression of the endoscope. Typical symptoms include dysphagia, vomiting and excessive weight loss. Treatment can be carried out using pneumatic 30 mm balloon dilation, in combination with stenotomy when necessary\footnote{22-23}.

Leaks after Bariatric Surgery

In spite of the advantages associated with bariatric surgery, gastric leaks are one of the most feared complications after RYGB and SG. Initial measures include surgical or percutaneous drainage, antibiotics and nutritional support\footnote{24-25}. Fistula treatment involves clinical, surgical and endoscopic management, chosen according to patient status and local fistula conditions.

Endoscopic Treatment

After initial control of the leak, specific surgical or endoscopic measures are taken. Early diagnostic endoscopy allows evaluation of the internal orifice of the leak, identifies any strictures, helps to position abdominal drains and to improve internal abscess drainage, and is a therapeutic method. The endoscopic approach involves internal drainage, septotomy, dilations, suturing, clips, and in most cases, stent placement, and aims to resolve the three main issues perpetuating the leak: distal gastric stricture, increased intragastric pressure and fistulous tract persistence\footnote{26-30}.

In SG, there may also be an axis deviation with associated increased intragastric pressure, which will benefit from an early and minimally invasive approach\footnote{23}.

The type of management is chosen according to time of onset, divided into four phases: (a) acute (<7 days): self-expandable metallic stents (SEMS); (b) early (1-6 wk): SEMS + balloon dilation + septotomy; (c) late (6-12 wk): septotomy + balloon dilation + SEMS; (d) chronic (>12 wk)\footnote{31}: septotomy + balloon dilation.

For late and chronic leaks, endoscopic treatment is usually performed across multiple sessions employing several techniques (multimodality). Septotomy can be performed when there is a septum adjacent to the fistulous orifice, in the gastric wall, allowing stomach
contents to continue to flow through the fistula. It can be performed using a needle-knife or argon plasma coagulation, followed by gastric dilation, directing the flow of stomach contents to the gastric pouch instead of the leak orifice. Combined stenotomy and balloon dilation can be performed when stenosis and fibrotic tissue are present. This treatment can be performed on an outpatient basis, with low morbidity and mortality, and greater comfort for the patient, thereby decreasing the need for hospitalization. The correction of the flow of stomach contents will eventually lead to leak closure. Stents can be used in selected cases of late and chronic leaks, mainly when there are anatomical defects.

Secondary Treatment of Obesity

Some patients undergoing RYGB may regain approximately 30% of excess weight loss and 20 to 30% of these patients regain a large proportion of the lost weight. Several factors may be related to regain, including poor nutrition, fistula, surgical technique and ring complications. It is important to evaluate dietary habits and behavior in cases of inadequate weight loss, including the size and quality of meals and anxiety disorders.

Weight regain following RYGB should be reviewed by a multidisciplinary team as well as endoscopic or radiologic evaluation to study the surgical anatomy. Dilation of the gastrojejunal anastomosis and gastric pouch enlargement are possible causes of RYGB failure. An increase of 10 mm in stoma diameter is associated with an 8% increase in the maximal percentage of weight lost after RYGB that was regained. The ideal anastomosis should have an approximate diameter of 10 mm and not exceed 14 mm. In the presence of a dilated stoma, reoperation is still complex and associated with significant morbidity and questionable efficacy. Endoluminal therapies for pouch and stoma revision are a less invasive approach for failure or weight regain after bariatric surgery.

Application of argon plasma has been reported as a way of inducing the formation of a fibrotic scar and consequent anastomotic diameter reduction. To produce the desired effect, the anastomosis should be coagulated in a circumferential way. There is an initial edema and inflammatory response, causing immediate restriction. This effect decreases over time, and the edema is replaced by fibrosis. More than one session is needed to achieve long-lasting effects. This leads to delayed gastric emptying, early satiety and weight loss.

Endoscopic suturing devices, such as the OverStitch® (Apollo Endosurgery Inc., Austin, TX) have been proposed as minimally invasive alternatives and may be used in isolation or in association with argon plasma. The procedure involves suturing the internal mucosa using a flexible endoscope, thereby restricting the gastric lumen. The sutures are performed under direct view with the aid of curved needle.

Conclusion

Bariatric Endoscopy is a powerful tool for obesity treatment and management of bariatric surgery complications. This field is growing and evolving every day, with new devices and procedures being developed. Endoscopists, bariatric surgeons and clinicians should be familiar with this topic, leading to better and minimally invasive patient care.

References


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