Converting Endoscopic Bariatric Procedures to LSG: POSE, Endosleeve, and Balloon

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1 Introduction

Bariatric surgery has now provided a new option for overweight patients that have attempted conventional weight loss methods and failed. With more studies being performed covering health and the detriments that come with increasing BMI's, the different emerging methods of weight loss have caught the attention of physicians, researchers, and patients alike, trying to provide the best option catered to each person individually. A systematic review and meta-analysis conducted by Gloy et al. [1] was able to demonstrate that bariatric surgery is a more effective method than non-surgical treatments for obesity, as well as the co-morbid conditions that come along with it. Therefore, more and more patients and physicians are starting to turn to bariatric surgeries, not only for the treatment of obesity, but also for the management of these co-morbid conditions.

Currently, multiple endoscopic procedures exist that are sought after due to the fact that they can be considered as 'less invasive' bariatric procedures. These include the Primary Obesity Surgery, Endolumenal (POSE) procedure, the endosleeve, and the balloon. However, long-term success rates of these procedures, especially in patients with higher BMI's, have shown to be lower than their surgical 'invasive' counterparts.

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Sleeve gastrectomy (SG) was initially conceived and first described in 1988 by Hess and Marceau as a restrictive component of the BPD-DS procedure at times when bariatric surgery was conducted via laparotomy. Nowadays, it has become the most performed bariatric procedure in the world (according to the numbers from the ASMBS), overtaking the Roux-en-Y gastric bypass. Therefore, it is understandable why it is considered a good option for revision following a failed endoscopic bariatric procedure.

2 The POSE Procedure

The POSE procedure was recently developed for patients with a BMI of 30–40; who have less than 100 lb (45 kg) of excess weight to lose. It currently has the advantage of being an incision-less weight loss option with fast recovery time over the popular bariatric surgeries, allowing patients to leave the hospital within 24 hours, as well as allowing for earlier intervention in obese patients for weight loss management.

2.1 How the POSE is Performed

The procedure is performed using an Incisionless Operating Platform (IOP) (USGI Medical, San Clemente, CA, USA) and endoscope, which is passed through the mouth and into the stomach. Once in the stomach, the IOP tools are used to grasp, fold, and fasten together full-thickness bites of stomach tissue. The POSE procedure involves making multiple stomach folds and securing them with expandable suture anchors. 14–18 stitches are placed in the fundus and antrum.

This procedure is still in its investigational stage in the USA, with limited data available currently on the short and long-term outcomes of it; however, its use outside the US has shown great positive results with one study from Spain showing patients losing up to 62% of their excess weight within a year [2]. Another study that followed patients who underwent this procedure for 1 year was able to demonstrate promising early results, with a 45% reduction in excess weight and an average of 50% reduction in hunger after that time [3]. A prospective observational study performed by Espinós et al. in Spain covering a period of 6 months post the POSE procedure was also able to demonstrate an EWL of 49.4%, as well as less hunger and early satiety in the patients [4]. Alhassani et al.'s study showed that all the patients that underwent the procedure reported less hunger following it, which was maintained with time, with a mean total body weight loss at 4 months of 13.21%. However, given that this procedure is still new, there isn't any significant evidence to support its effectiveness.

2.2 Converting a POSE to an LSG

Conversion from the POSE procedure after failed weight loss has been proven to be effective when necessary. The LSG is performed in a standard split-leg French position using four laparoscopic ports. Endoscopy would be used to visualize the stomach from the inside and to see the exact site of the stitches from the POSE procedure so that they can be avoided, as well as aid in the sleeve gastrectomy. Devascularization of the greater curvature of the stomach would then be carried out starting from 4 cm from the pylorus and up to the angle of His. The sleeve is then performed with a linear laparoscopic stapler using green cartridges for the antrum, body, and fundus, aiming for a final gastric pouch size of 100 ml. Endoscopy and laparoscopy are both used to ensure that the metal anchors of the POSE procedure are not incorporated or encountered when dividing the stomach. Endoscopy can also be utilized to assess for leak using air and inflation with water.

3 The Endosleeve

The Endoscopic sleeve gastroplasty, otherwise known as the endosleeve, has been showing increasing popularity around the world. It's aim is to mimic a sleeve gastrectomy by reducing the size of the gastric cavity to a tubular lumen with a line of clinched plications in the greater curvature [5]. It is indicated in patients with a BMI ranging from 30 to 49 kg/m^2 and requires an endoscopic suturing system (OverStitch; Apollo Endosurgery Inc., Austin, Texas) mounted onto a specific double- or single-channel endoscope, an esophageal overtube (US Endoscopy, Mentor, Ohio), and a tissue retraction screw (Helix; Apollo Endosurgery Inc., Austin, Texas).

3.1 How the Endosleeve is Performed

The procedure is performed under general anesthesia with orotracheal intubation. Full-thickness sutures (aiming at the muscularis propria) are delivered, starting distal (prepyloric antrum) to proximal (gastroesophageal junction), with a triangular stitch pattern (anterior wall—greater curvature—posterior wall). Each suture consists of around 3–6 full-thickness stitches. After all the sutures are clinched together, a plication is formed. To reduce the gastric lumen to the desired size, 6–8 plications are generally needed. A small fundus is, therefore, left in place (like a pouch) to delay gastric emptying.

Currently, the results are limited to short-term studies, however, showing promising results. For example, a multicentre analysis with 248 patients that were followed over 24 months demonstrated a %TBWL of 18.6% (15.7–21.5%); in an intention-to-treat analysis, 53% of these patients were able to achieve >10%TBWL [6].

It is important to note that this technique is not considered as competition to surgeries like sleeve gastrectomy or gastric bypass, but an alternative for less obese patients or those not willing to accept a surgical intervention [7, 8].

3.2 Converting Endosleeve to LSG

There is no robust literature about endosleeve failure and subsequent revisional surgery, with only a limited number of cases available [9, 10]. A recent study with 1000 patients that underwent endosleeve described the need for 8 revisions to sleeve gastrectomy in that population due to poor weight loss (%TBWL <5% after a 6-month period). However, there is no information about outcomes from that cohort [9].

A preoperative endoscopy is always mandatory to be performed before considering a revisional procedure. If none of the sutures are seen to be in place during the endoscopy, a typical SG can be offered without the need of a transoperative endoscopy. In that case, a stapler load of 4.1 mm or more is recommended along the sleeve line. The posterior wall should then be carefully dissected since anatomic modifications are typically present due to sutures and adhesions related to the inflammatory process that would have occurred post the initial endosleeve. On the other hand, if it is seen on endoscopy that some sutures have remained intact, a hybrid approach could be considered. The first part of the surgery would be to attempt to liberate the sutures during endoscopy. If this is not entirely possible, the endoscope will help to guide the correct placement of the stapler to avoid sutures and metal anchors. However, if during the procedure, a safe stapler position cannot be offered at the incisura, a gastric bypass should be considered instead. At the end of the procedure, an endoscopy is recommended to help identify any foreign body within the sleeved lumen.

4 The Balloon

The idea of using a gastric space-occupying device was first described by Nieben in 1982, based on the observation that a gastric bezoar can be well tolerated for an extended period of time and cause significant weight loss [11], however, had relatively high complication rate. The development of the saline-filled balloon revived interest in the method due to the fact that the balloon is a non-invasive restrictive bariatric procedure that is completely reversible and repeatable [12–14]. It is offered to morbidly obese patients who either refuse surgery or those who do not meet the International Federation of Surgical Obesity criteria for surgery and who had previously experienced poor results with conservative treatments [12–14]. It is also recommended for super-obese patients before undertaking elective or bariatric surgery to reduce surgical risk. However, it is essential to note that in the USA, the FDA have only approved it form patients with a BMI ranging from 30 to 40 [15, 16]. The balloon is generally designed to remain in the stomach for a maximum period of 6 months, after which there is an increased number of complications,

mainly related to spontaneous deflation and intestinal obstruction [17]. It is also important to keep in mind that, given that it is a reversible short-term procedure, the maximum weight loss achieved with a balloon is significantly less than that of surgical options available.

In a published series of 19 patients with BMI 35–40 and 15 patients with BMI >40, mean %excess weight loss (%EWL) was 42.4% and 25.9% respectively on balloon extraction and 26.4% and 20.4% at 1-year post removal. In the morbidly obese patients, 7 remained with BMI >40, 4 had BMI 35–40, and only 4 patients had BMI 30–35 [18]. Although the number of patients is small, the results of this study confirm the recurrence of obesity after the removal of the balloon. The balloon, therefore, remains a good and safe method for temporary weight loss [12–14, 19–21], opening a path for other bariatric procedures afterward.

4.1 LSG Following Balloon Removal

Currently, no studies exist that examine whether there should be a delay between balloon removal and performance of a SG. While there is some debate on this subject, most authors [22–24] advocate performing a staged SG for the purpose of allowing gastric healing and hence reducing the incidence of perioperative complications; performing a staged SG a few weeks following balloon removal would ideally allow the gastric wall edema associated with the presence of an in-situ balloon to resolve. This may in turn, reduce the risk of the staple line leak and allow the fashioning of a narrower caliber sleeve.

5 Conclusion

Laparoscopic sleeve gastrectomy can be considered a safe and effective procedure to be undertaken after endoluminal procedures, given that a proper preoperative endoscopic examination is performed to ensure the viability of this surgery.

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