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# Sleeve Gastrectomy Combined with Nissen Fundoplication as a Single Surgical Procedure, Is It Really Safe? A Case Report

## Authors' Contribution:

Study Design A  
Data Collection B  
Statistical Analysis C  
Data Interpretation D  
Manuscript Preparation E  
Literature Search F  
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**Conflict of interest:** None declared

**Patient:** Male, 40-year-old  
**Final Diagnosis:** Gastric perforation  
**Symptoms:** Abdominal pain  
**Medication:** —  
**Clinical Procedure:** Sleeve gastrectomy Nissen fundoplication  
**Specialty:** Surgery

**Objective:** Unusual clinical course

**Background:** Laparoscopic sleeve gastrectomy (LSG) has become the most common surgical procedure performed in bariatric surgery. Large hiatal hernias and Barrett's esophagus are the only contraindications recognized among experts. However, some studies have suggested that LSG may exacerbated gastroesophageal reflux disease (GERD) symptoms or induce postoperative GERD *de novo*. GERD and erosive esophagitis increase the risk of Barrett's esophagus. For this reason, in obese patients suffering from GERD, Roux-en-Y gastric bypass is considered the gold standard, or in the case of hiatal hernia, a laparoscopic hiatoplasty should be performed. In order to find some alternative techniques and extend the indication of LSG to obese patient with GERD symptoms, some authors have proposed a single step LSG and Nissen's fundoplication.

**Case Report:** We report our experience with a male patient who after few months after a single step LSG and Nissen's fundoplication for morbid obesity and GERD, underwent emergency remnant gastrectomy and esophagojejunostomy because of gastric ischemic perforation.

**Conclusions:** We conclude that, despite being a well-tolerated and feasible surgical procedure, a single step LSG and gastric fundoplication could increase the risk of severe postoperative complications related to LSG, and we believe that, according to guidelines, gastric bypass or LSG with subsequent hiatoplasty should be preferred in obese patients with gastroesophageal reflux symptoms or hiatal hernia.

**MeSH Keywords:** Bariatric Surgery • Bezoars • Fundoplication • Gastrectomy • Intestinal Perforation

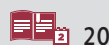
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## Background

In recent years, bariatric surgery has experienced exponential growth. Laparoscopic sleeve gastrectomy (LSG) is the most commonly performed surgical procedures worldwide. Even if in patients with asymptomatic gastroesophageal reflux syndrome, LSG is not contraindicated, confirmed Barrett's esophagus and big hiatal hernia larger than 5 cm, have to be considered absolute contraindications to this kind of bariatric surgery [1,2].

The surgical complications after LSG are widely known. There are 2 types of complications: 1) acute complications that occur early after surgery and 2) long-term complications that occur more than 30 days after surgery. Long-term complications include gastroesophageal reflux due to altered lower esophageal sphincter (LES) pressure by modifying the angle of His and dissecting of ligaments and reduction of gastric emptying, with modified gastric compliance [3,4], Barrett's esophagus, lumen stenosis of the residual stomach, dilatation of the sleeve, increased risk of intraluminal phytobezoar formation (5% to 12%) and, rarely, the necrosis of the residual stomach due to chronic vascular suffering [5–9].

According to the Society of Obesity and Metabolic Diseases (SICOB) and International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO) guidelines, Barrett's esophagus and hiatal hernia are the most common contraindications to LSG; long-term complications of sleeve gastrectomy associated with anti-reflux surgical procedures are not well known

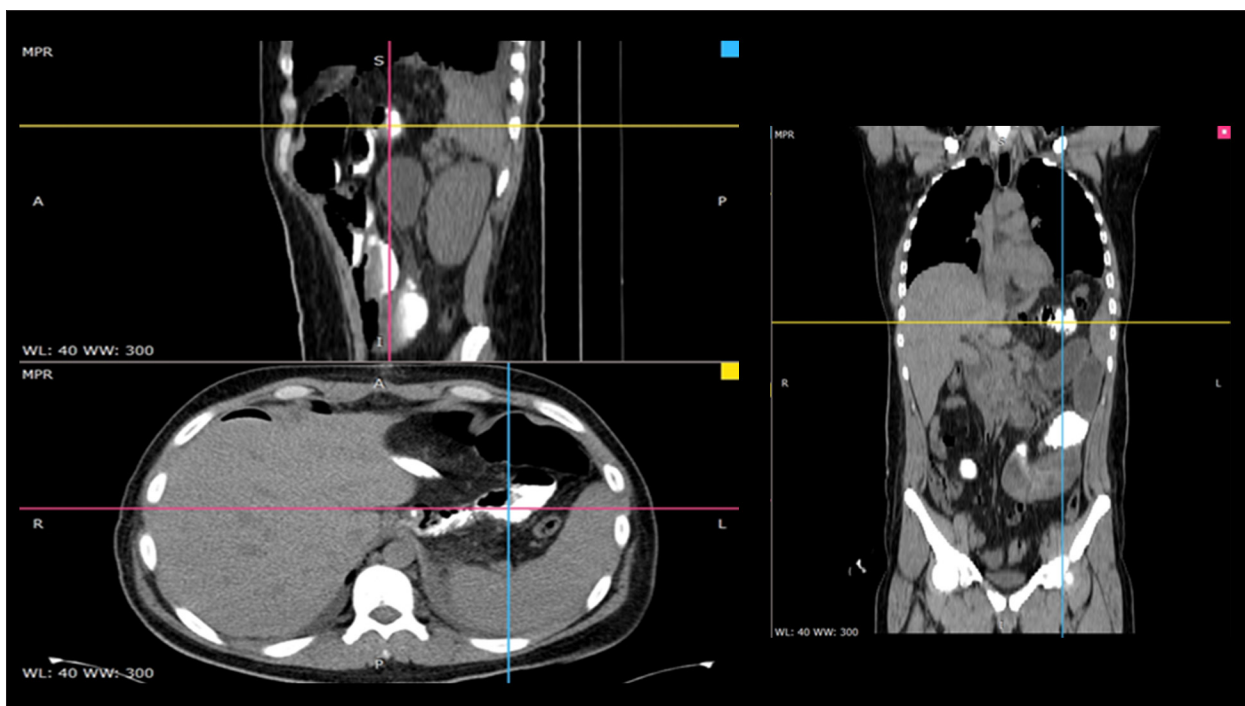
first of all because there are not a lot of cases of LSG combined with anti-reflux procedures reported in the literature [10,11].

We report an experience of a very dangerous gastric necrosis and perforation, which occurred some months after a single step LSG and Nissen's fundoplication, in order to highlight the need for shared guidelines on indications and treatments.

## Case Report

We describe the report of a male 33-year-old patient who, in November 2017, underwent at the same time laparoscopic Nissen's fundoplication and sleeve gastrectomy for pathological obesity of body mass index (BMI) of 42.45 kg/m<sup>2</sup> and symptomatic large hiatal hernia. No other disease of surgical interest was reported. The patient was not a smoker. In May 2018, the patient arrived at our university hospital unit in an emergency status with acute and severe abdominal pain, upper gastrointestinal tract obstruction, alimentary vomiting, and a serious systemic infection. At the time of admission, we found mild anemia, neutrophilic leukocytosis, high C-reactive protein (CRP) as indicated by blood tests. The computed tomography (CT) scan revealed intra-abdominal fluid collection, left sub-diaphragmatic 5 cm purulent collection and phytobezoar esophagogastric obstruction (Figure 1).

We performed total emergency gastrectomy with Roux-en-Y esophago-jejunostomy because the ischemic gangrene of the



**Figure 1.** Computed tomography scan: abdominal fluid accumulation and phytobezoar esophagogastric obstruction.



**Figure 2.** Surgical specimen: phytobezoar within the gastric plication, ischemic necrosis, and perforation.

remnant tubular stomach and the stenosis of the cardias did not allow any other treatment.

The examination of the surgical specimen showed that the gastric plication was completely occupied by a large phytobezoar and this probably caused high intraluminal pressure with consequent decreased blood flow through the sleeve, vascular necrosis, and gastric ulcer perforation at the Nissen fundoplication site (Figure 2).

Immediately after the surgery, the patient was transferred to the general surgery ward, where he was subjected to intensive monitoring of vital parameters. He had a bladder catheter inserted plus a central venous catheter, an arterial catheter for invasive blood pressure monitoring, a nasogastric tube, and an abdominal drain.

In the first days following his surgery, the patient received rehydrating intravenous therapy, broad-spectrum antibiotic therapy, and parenteral nutrition. He did not present any major problems. On the 9<sup>th</sup> postoperative day, the nasogastric tube was removed, while abdominal drainage was removed on the 14<sup>th</sup> day.

On the 15<sup>th</sup> day after the first procedure, there was an increase in bilirubinemia values. For this reason, the patient had a CT with water-soluble contrast agents taken by mouth, with no evidence of anastomotic leak or fistula. Subsequently, the patient underwent abdomen ultrasound and magnetic resonance cholangiopancreatography (MRCP) with evidence of gallbladder lithiasis, for which he was subjected to video laparoscopic cholecystectomy.

After few days, the patient was sent home in acceptable general conditions, able to feed himself, with normal blood tests.

## Discussion

Laparoscopic sleeve gastrectomy (LSG) is probably the most frequently executed bariatric operation in the world: it represented 58% of all bariatric procedures performed in the United States in 2016 [12].

LSG is performed by removing almost four-fifth of the stomach with a vertical resection of the greater curvature, creating in this way a small sleeve or tubular pouch along the lesser curvature, with weight loss through 2 principal mechanisms of action: 1) as a result of restrictive mechanism, due to a gastric volume reduction of 70% to 80%, and 2) as a result of endocrine mechanisms; the resection of gastric fundus reduces the postprandial levels of ghrelin secreted by the oxyntic glands of the stomach, induces early satiety, and promotes weight loss. In addition, LSG increases the level of GLP-1 which stimulates insulin secretion, improving glucose metabolism, and increases satiety by slowing gastric and intestinal motility.

Prospective and retrospective studies have shown many benefits that include great weight loss effects, reduction of obesity associated morbidity, relative efficiency and flexibility of technique, reduced time in surgery, and prompt caloric intake contraction [13].

LSG has the lowest procedure-related complication incidence in comparison with Roux en Y (RYGB) and laparoscopic adjustable gastric banding (LAGB) [14].

LSG, although it is recognized among experts as an uncomplicated and feasible surgical operation, has to be considered a major surgery taking into account the very important complications that this treatment might cause. The most important acute postoperative complication is the suture line leak, with a mean leak of 1.5%. Other very important complications are stricture or distension of the sleeve, reduction of spontaneous gastric motility, and increased incidence of intraluminal phytobezoar formation. Several authors described a very high incidence of erosive esophagitis and Barrett's esophagus in patients who had undergone LSG [4,15].

Various mechanisms have been suggested in order to justify the elevated incidence of GERD after LSG: lower compliance of the tubular pouch with higher intraluminal pressure, slower gastric emptying and reduced intestinal motility, alteration of the angle of His, hypotensive LES, late distension of the sleeve and development of the hiatal hernia after surgery. However, the most important cause is likely the difference between the higher intraluminal pressure of the gastric pouch, due to a gastric volume reduction of 70% to 80%, and the lower esophageal sphincter pressure.

In obese patients also suffering from large symptomatic hiatal hernia, a laparoscopic hiatoplasty should be executed after LSG to correct the symptoms; on the contrary, when there are clear clinical and instrumental signs of gastroesophageal reflux syndrome, gastric bypass is the best choice [2,3,16].

Despite the high amount of heterogeneity among studies in the literature, we can assume that SG could cause several GERD symptoms also among people who had no preoperative GERD disorders. In the fourth consensus conference on SG, post-operative symptomatic gastroesophageal syndrome was the most commonly recorded complication in a cumulative series of >46 000 LSGs performed by more than 100 surgeons of all the world, with a mean incidence of 7.9% [15].

Although Roux en Y gastric bypass is considered the best option for obese patient also suffering from GERD, this procedure is affected by high incidence of late complications not only as a result of dietary deficiency or vitamin insufficiency, but also due to anastomotic ulcers, acute bleeding, fistulas between the surgically created pouch and excluded remnant stomach, small bowel obstruction as a result of internal hernia, dumping syndrome, anastomotic stricture and other surgical complications that have to be considered and related with long-term complications after LSG. In this context, some authors have proposed the combination of anti-reflux surgery with SG in order to avoid the aforementioned complication.

Even if significant differences of opinion persist between expert surgeons (more than 1000 procedure performed) and general bariatric surgeons, Barrett's esophagus, hiatal hernia, and GERD can be considered contraindications to LSG [17].

In recent years, several prospective studies demonstrated that LSG, associated with fundoplication and/or hiatoplasty, reduces the incidence of postoperative GERD and could prevent the appearance of Barrett's esophagus [18–20].

Gastric ischemic necrosis is rarely reported among both short-term and long-term complications post sleeve gastrectomy. It could be caused either by mistakes in surgical technique such as iatrogenic devascularization of the gastric tubule or by endoluminal decubitus of phytobezoars, which have an higher incidence post LSG probably in consideration of post-gastrectomy reduction of spontaneous gastric motility and reduction of gastric acid secretion. Major risk factors for the development of phytobezoars are represented by all conditions of motility dysfunction disorders of the stomach such

as diabetes mellitus, gastric cancer, anatomic abnormalities, neurologic conditions, hypothyroidism or also previous upper gastrointestinal tract surgery or vagotomies. The incidence of the formation of specific kinds of bezoars is higher also in patients suffering from psychiatric disorders or undergoing particular dietary habits [9].

According to our experience, LSG combined with imperfect arranged Nissen fundoplication as a single surgical procedure could result in vascular suffering and consequent ischemic necrosis of the gastric tubule. In addition, endoluminal phytobezoars are a common complication after LSG; the endoscopic fragmentation or aspiration of the bezoar should always be preferred to surgical treatment, but small bowel occlusion or gastrointestinal perforation have to be considered absolute contraindications to endoscopic treatment. In this condition, the endoscopic removal of the phytobezoar is very difficult and dangerous because of the Nissen fundoplication and could result in iatrogenic gastric perforation.

## Conclusions

A single step LSG combined with fundoplication has been proposed as a single surgical procedure with the main aim to extend the indications of this bariatric procedure to obese patients suffering from symptomatic reflux syndrome. However, we believe that a standardized technique is needed; It is necessary to have precise guidelines concerning the bougie size, the possibility of concomitant hiatal hernia repair, and the angle under which to staple the fundus, when performing LSG. In addition, more prospectively designed research with standardized questionnaires and objective esophageal function tests, are necessary. In our opinion, these 2 surgical treatments, when associated, present a higher incidence of long-term complications such as gastroesophageal stricture or ischemic necrosis. Furthermore, since it is well known among experts that the LSG is a refluxogenic procedure, patients should be adequately informed about all the aspects regarding the possible development of new-onset reflux disease after LSG. We believe that, in the absence of randomized trials, in accordance with the general guidelines, gastric bypass or LSG with subsequent hiatoplasty should be preferred in obese patients with gastroesophageal reflux symptoms or hiatal hernia.

## Conflict of interest

None.

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