

Sleeve Gastrectomy Associated with Antral Lesion Resection and Roux-en-Y Antrojejunal Reconstruction

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Abstract

Obesity has been growing worldwide, reaching epidemic proportions. Bariatric surgery is the most effective and durable treatment for severe obesity and related diseases. Roux-en-Y Gastric Bypass (RYGB) and Sleeve Gastrectomy (SG) are the most frequently performed bariatric operations, with long-term good results, in terms of weight loss and comorbidities control. Gastroesophageal Reflux Disease (GERD) is commonly associated with obesity. In general, it precludes the indication of sleeve gastrectomy, since this technique has a refluxogenic potential, as shown in many studies. In such cases, RYGB is considered the best surgery, reaching good weight loss and gastroesophageal reflux disease control. The drawback of this technique is that it leaves the remnant stomach, the duodenum, and the proximal part of the jejunum inaccessible. Besides, RYGB makes transoral endoscopic access to the biliary tree impossible. For all these reasons, this bariatric technique is not indicated in cases of gastric polyposis, gastric dysplasia, or strong family history of cancer, among others. We report a case of a morbidly obese patient with intense GERD, for whom a RYGB was precluded due to her strong family history of cancer, even knowing that it would be the best choice for reflux disease control. Instead, SG was chosen, even knowing it could worsen the gastroesophageal reflux disease. The patient signed an informed consent, after being fully enlightened about the risks. During the surgery, a small subserosal whitish le-

sion was detected, near the pylorus, on the anterior wall of the antrum. Thinking in a Gastrointestinal Stromal Tumor (GIST), it was resected, with a 2 cm safety margin, leaving a 4 to 5 cm hole on the gastric wall. The decision to maintain the proposed sleeve gastrectomy was made, to avoid leaving a remnant stomach, in a patient with such a strong family history of cancer. In the area of the resected lesion, an intraoperative decision was made not to just close the big gastric hole, being afraid of causing some anatomic or functional disturbance in gastric emptying. Instead, we decided to use the gastric opening to construct a Roux-en-Y antrojejunal anastomosis, with a 50 cm alimentary limb and a 200 cm biliopancreatic limb. Accordingly, it was performed a sleeve gastrectomy, associated with an antrojejunostomy in a Roux-en-Y fashion. The patient had an uneventful postoperative course. In the second year, she achieved normal weight and good nutritional status, without gastroesophageal reflux symptoms complaints. Seriography study shows that most of the contrast material passes through the antrojejunal anastomosis, instead of the pylorus, while the duodenum is endoscopically patent. This case report shows an unexpected surgical finding that led to a tactic of adding a Roux-en-Y gastric bypass in the antrum, associated with a sleeve gastrectomy, a strategy that may be adopted in cases of morbidly obese patients with important GERD, for whom gastrointestinal exclusions are contraindicated. To confirm this hypothesis, controlled studies are needed.

Keywords

Roux-en-Y Gastric Bypass, Sleeve Gastrectomy, Jejunum Gastric Bypass, Bariatric Surgery

1. Introduction

Obesity has been growing all over the world, reaching epidemic proportions, and bariatric surgery is the most effective and durable treatment for patients with this disease [1]. There are many surgical techniques, with its inherent mechanisms of action [2] [3]. Among bariatric procedures, the most frequently adopted worldwide are Roux-en-Y Gastric Bypass (RYGB) and Sleeve Gastrectomy (SG) [4] [5].

Sleeve gastrectomy is alluded to be a refluxogenic surgery thanks to its increased intragastric pressure, alteration in esophagogastric junction anatomy and lack of gastric wall complacency, after removing gastric corpus and fundus, thus promoting a high incidence of de novo Gastroesophageal Reflux Disease (GERD) or exacerbating preexisting reflux [6] [7] [8]. On the other hand, it keeps intact the entire gastrointestinal tract, diminishing nutritional problems and preserving total endoscopic and radiological access to it [9]. Its metabolic effects and weight loss are very acceptable in the long term, mainly in non-super obese patients, but inferior, compared to RYGB [10].

RYGB used to be the most practiced bariatric surgery worldwide, being sur-

passed by SG in 2013, in the USA [11]. Nevertheless, it continues to be largely indicated, with good results, concerning weight loss and metabolic effects [12]. It is considered the most efficient bariatric operation to treat obese patients with GERD [13]. In this technique, the remnant stomach, the duodenum, and the proximal jejunum are excluded from food contact and from endoscopic evaluation, which can lead to some concerns and nutritional problems [14]-[19]. Routine resection of the remnant is described, considering the risk of cancer, in populations where it is more prevalent [20].

This is a case report of an obese patient, who had moderate gastroesophageal reflux symptoms and strong family history of gastric and pancreatic cancer. The surgical team planned to do hiatal hernia correction, cruroplasty and sleeve gastrectomy, avoiding exclusions, which agreed with the patient's wishes. During the surgery, a subserosal lesion was found in the anterior wall of the antrum, which leads us to decide in the sense of resecting the lesion and adding a Roux-en-Y antrojejunostomy in the resection area. To our knowledge, this is the first report of adding a Roux-en-Y antrojejunal anastomosis over a sleeve gastrectomy.

2. Patient Consent

The patient signed a Free and Informed Consent Form (FICF) and was informed about the procedure she would be submitted to, which would be a sleeve gastrectomy, having all her doubts about the procedure answered, in the presence of a companion. It was explained about possible intra and postoperative complications, as well as the possibility of changes in surgical planning, in case of intraoperative unexpected findings. An informed consent signed by the patient was obtained for the use of this case details and images of surgery by the surgeon for scientific purposes. All the human data was carried out in accordance with the Declaration of Helsinki.

3. Case Presentation

Table 1 shows the overall characteristics of the clinical case.

Table 1. Patient's characteristics.

Demographics:
<ul style="list-style-type: none">● Patient CMSF;● Female;● 39 years old;● Weight: 116 Kg;● Height: 1.66 m;● BMI: 42.1 Kg/m²;● History of progressive obesity for the last 15 years.
Patient's habits:
<ul style="list-style-type: none">● No alcoholism or smoking;● No physical activity;● Food habits: Preference for pasta and sweets;● Several previous attempts to lose weight, with nutritional counseling and use of medications (Sibutramine, Liraglutide, Orlistat).

Continued

Comorbidities:

- Hypertension in the last 3 years: Losartan 50 mg BID;
- Diabetes in the last 5 years Vildagliptin 50 mg + Metformin 1000 mg;
- Mild sleep apnea;
- Steatosis grade II;
- Hypercholesterolemia: Rosuvastatin 20 mg;
- GERD: Weekly symptoms (pyrosis and regurgitation): Validated questionnaire;
- Left knee arthropathy;
- Laparoscopic appendectomy 8 years before;
- Two cesarean sections.

Family history:

- Morbidly obesity: Maternal uncle;
- Obesity: Mother and sister;
- Hypertension: Father;
- Diabetes: Mother;
- Family history of cancer: Gastric cancer (mother), pancreatic cancer (maternal uncle).

Preoperative workup:

- Preoperative UPPER DIGESTIVE ENDOSCOPY:
 - Hiatal hernia grade I (20 mm);
 - Erosive esophagitis grade B (LA classification) ;
 - Mild pangastritis;
 - Histopathology: Chronic active gastritis/H.pylori-negative.
- Preoperative SERIOGRAPHY:
 - Short hiatal hernia with documented gastroesophageal reflux.
- Preoperative MANOMETRY:
 - Inferior esophageal sphincter hypotony;
 - Normal esophageal motility;
 - Good esophageal functional reserve.
- Preoperative IMPEDANCE pHmetry:
 - Pathological orthostatic and supine acidic reflux;
 - DeMeester Score: 79.4.
- Preoperative ULTRASOUND:
 - Steatosis grade II.
- Preoperative POLYSOMNOGRAPHY:
 - Mild sleep apnea.
- Preoperative LABORATORY TESTS:
 - Blood glucose: 165 mg/dl HbA1C: 7.8%/GADA and ICA negatives;
 - Iron and Vitamin D deficiencies (supplemented);
 - Total cholesterol: 250 mg/dl LDL: 135 mg/dl/HDL: 37 mg/dl;
 - AST: 65 UI/L ALT: 89 UI/L;
 - Other laboratory tests were normal.

Other information:

- Pre op workup ok, with due care;
 - Pre op multidisciplinary team counseling;
 - Proposed surgery: Sleeve gastrectomy;
 - Surgery performed on 01/15/20. Surgical planning modification occurred, due to unexpected intraoperative finding (subserosal, 0.5 cm diameter, pre-pyloric nodule, on the anterior wall). No frozen biopsy available. Sleeve gastrectomy and lesion resection, with 2 cm safety margin, was performed. A Roux-en-Y gastrojejunostomy was added in the site of the resected lesion. There were no interurrences during the procedure;
 - Surgical time: 95 min;
 - Length of hospital stay: 24 hours;
-

Continued

- Uneventful postoperative recovery;
- Histopathology: Schwannoma.

Second postoperative year:

- Weight loss: 51 Kg;
 - %TWL: 43.96%;
 - No diabetes medications, since hospital discharge;
 - No antihypertensive medications, since the fourth postoperative month;
 - Sleep apnea resolution;
 - Free of GERD symptoms;
 - No steatosis;
 - Good nutritional status;
 - Endoscopy: No hiatal hernia/no esophagitis/well-formed wide antrojejunal anastomosis, 1 cm proximal to the pylorus (**Figure 1**);
 - Seriography: No hiatal hernia/no gastroesophageal reflux/very preferential flow to the jejunum (**Figure 2**).
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Figure 1. Gastrojejunal anastomosis.



Figure 2. Seriography image.

4. Surgical Technical Description

Table 2 describes trocars, patient, and surgical team positions, which are shown in **Figures 3-5**.

Table 3 describes the surgical technique and steps.



Figure 3. Trocars position.



Figure 4. Patient position.



Figure 5. Team position.

Table 2. Surgical team, patient, and trocars positions.

- Patient in horizontal dorsal decubitus, in lithotomy position;
- Surgical table in 30° anti-trendelenburg during all the surgery;
- Surgeon between the patient's legs, first assistant on the patient's left, camera holder on the patient's right, scrub nurse on the patient's left, anesthesiologist at the head of the bed and video set at the level of the patient's right shoulder;
- Pneumoperitoneum is performed with a Veress needle, at Palmer's point;
- First 10 mm trocar is inserted 25 cm below the xiphoid process, 2 cm to the left of the midline;
- First 12 mm trocar is inserted 15 cm below the left costal margin, at the anterior axillar line;
- Second 12 mm trocar is inserted 15 cm below the right costal margin, at the anterior axillar line;
- First 5 mm trocar is inserted 5 cm below the left costal margin, at the midclavicular line;
- Second 5 mm trocar is inserted 5 cm below the xiphoid process.

Table 3. Surgical steps.

- The surgery starts with a pneumoperitoneum confection, using a Veress needle introduced below the left costal margin (Palmer point);
- The patient is positioned in a 30° reverse trendelenburg position, without lateralization;
- The abdominal cavity is checked, with the surgeon positioning between the patient's legs, the first assistant, on the patient's left and the camera assistant, on the patient's right;
- A 0.5 cm whitish, round, subserosal lesion is identified on the anterior wall of the antrum, in between the greater and lesser curvature, 3 cm proximal to the pylorus (**Figure 6**);
- The left hepatic lobe is withdrawal using a straight cylindrical retractor, inserted through the 5 mm trocar, 5 cm below the xiphoid process;
- A 32Fr Fouchet tube is introduced down to the stomach;
- The dissection of the vessels of the greater curvature of the antrum starts 7 cm proximal to the pylorus, opening a small retrogastric window;
- Longitudinal gastric stapling begins at this level, shaped by a 32Fr Fouchet tube, stapling with 60 mm J&J Echelon GST (7 shots), up to the Angle of His, sectioning the stomach longitudinally; for this, 1 green, 1 gold and 5 blue cartridges are used, from distal to proximal stomach;
- The gastric vessels from the right and left gastroepiploic arcade and the short gastric vessels are sealed, near the stomach wall, with ultrasonic scalpel, from the level of the distal gastric septation until the Angle of His, releasing the entire septated stomach, which is then positioned over the right hepatic lobe;
- The posterior wall of the gastric tube is fixed to the base of the transverse mesocolon, at the level of the incisura angularis, up to the distal edge of the gastric staple line, with 3-0 Polypropylene thread;
- The lesion in the antrum is resected circumferentially, addressing all the layers of the gastric wall, with a 2 cm safety margin, starting approximately 1cm proximally to the pylorus. A 4 to 5 cm hole is created in the anterior wall of the antrum (**Figure 7**);
- A 300 cm of common channel is warranted, counting it from the Ileocecal Valve (ICV);
- The Treitz angle is identified;
- A 200 cm jejunal segment (Biliopancreatic Limb, BPL) is counted and brought up to be anastomosed at this level with the antrum opening;
- A 4cm longitudinal opening is made in the antimesenteric side of the jejunum, using harmonic scalpel (**Figure 8**);
- An antrojejunal anastomosis is done, starting with a running posterior full-layer 3-0 PDS thread suture (**Figure 8** and **Figure 9**);
- An antrojejunal anterior full-layer 3-0 PDS thread running suture is done, tying it up with the posterior layer thread suture (**Figure 10**);
- A little hole is made in the mesentery of the afferent jejunum, just coincident to the distal end of the gastric staple line;
- A 60 mm staple is inserted open in the mesenteric hole, using a white cartridge to transect the jejunum;
- The jejunum is transected at this level, separating the alimentary limb from the biliopancreatic one (**Figure 11** and **Figure 12**);
- A 50 cm alimentary limb is measured and a 3 cm longitudinal linear opening is made at this level, in it is antimesenteric border, using harmonic scalpel;
- A 3cm longitudinal linear opening is made in the antimesenteric border of the biliopancreatic limb, starting 1 cm proximal to the staple line, running proximally, using harmonic scalpel;
- A side-to-side enteroenteric, 3 cm manual, extramucosal running suture, is done between these two jejunum openings, creating a Roux-en-Y configuration (**Figure 13**);

Continued

- The mesenteric space between the alimentary and the biliopancreatic limbs is closed with a 3-0 polypropylene running suture;
- The mesenteric space between the mesentery of the alimentary limb and the transverse mesocolon (Petersen space) is closed with a 3-0 polypropylene running suture;
- The integrity of both anastomosis is tested with methylene blue, infused through the Fouchet tube, removing it afterwards;
- The resected stomach segment is placed in an endobag and extracted through the 12 mm incision in the left abdomen;
- The hepatic retractor and the trocars are removed, with closure of the aponeurosis at the sites of the 12 mm trocars with 2-0 Vicryl, transparietal sutures;
- Cavity drainage is not performed;
- The wounds are closed with intradermic sutures, using 3-0 Monocryl thread.



Figure 6. Antral lesion.

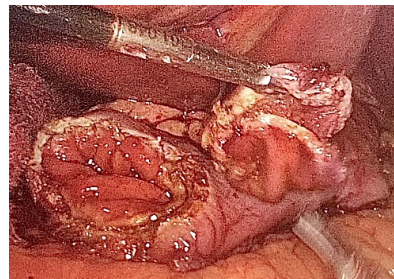


Figure 7. Antral lesion resection.

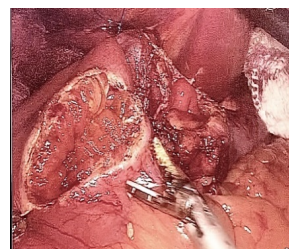


Figure 8. Antrojejunal opening.

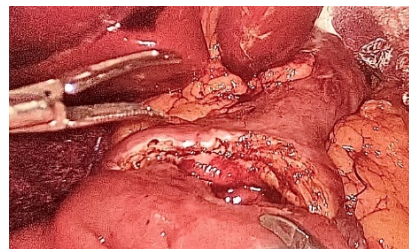


Figure 9. Posterior layer anastomosis.



Figure 10. Loop gastrojejunal anastomosis.

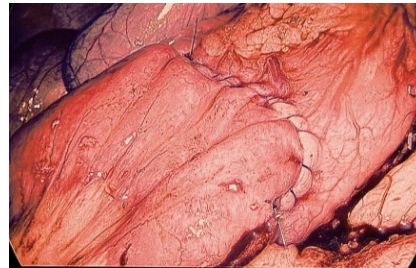


Figure 11. Roux-en-Y gastrojejunal anastomosis.

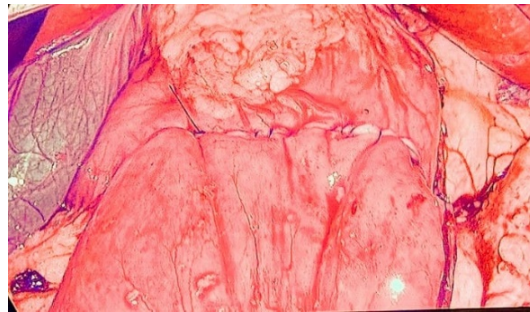


Figure 12. Roux-en-Y gastrojejunal anastomosis.



Figure 13. Jejunojejunal anastomosis.

5. Discussion

Currently, sleeve gastrectomy is one of the most practiced bariatric surgeries worldwide [4]. It has good and durable metabolic and weight loss results, depending on the initial Body Mass Index (BMI) and comorbidities severity [21]. It is supposed technical simplicity is one of the possible reasons for its frequent indication. However, many studies have demonstrated a refluxogenic potential of SG [22] [23] [24] [25] [26]. Many factors can be involved in its pathophysiol-

ogy, such as: increased intragastric pressure, loss of gastric complacency, proximal gastric tube migration, sling fibers rupture, and gastric tube tortuosity, among others [6] [27] [28] [29]. These factors can develop gastroesophageal reflux disease, known as de novo reflux, or worsen preexisting GERD.

One advantage of SG is its preservation of gastrointestinal anatomic integrity, keeping all segments of gastrointestinal tract accessible, including biliary tree [30]. This corroborates with a good nutritional status after this operation, if supplementation is properly done [31] [32]. Resecting the gastric corpus and fundus longitudinally implies reducing gastric reservoir and complacency. Moreover, it diminishes ghrelin production, which contributes with hormonal effects of sleeve gastrectomy, adding independent positive metabolic influence on weight loss [33].

With the intention to add metabolic and hormonal mechanisms to the sleeve gastrectomy, a Roux-en-Y gastroileal anastomosis was proposed, in association with it, promoting a prompt contact of the food with the ileum mucosa, stimulating the production of incretins, while keeping the duodenum accessible [34] [35]. This configuration, known as transit bipartition, leaves no exclusions in the gastrointestinal tract and preserves free access to the digestive system [36]. In transit bipartition, a 260 cm long ileal limb is measured from the Ileocecal Valve (ICV) and transected at this level. The distal stump of the ileum is brought to the greater curvature of the antrum, where a 3 cm long gastroileal anastomosis is done, 3 to 4 cm proximal to the pylorus [37]. This anastomosis has been shown to be safe, with low incidence of complications [35]. Then, an ileo-ileal anastomosis is done, 100 to 200 cm distant from the ICV point, forming the common channel and giving a “Y” configuration.

A Single Anastomosis Sleeve Ileal (SASI) bipartition was done more recently, with similar good results in terms of weight loss and metabolic effects [38] [39]. This technique makes the procedure easier, with a longer common channel, incurring in less risk of diarrhea and malnutrition, but a little less weight loss, and it is inherent biliary reflux to the antrum [40]. As in transit bipartition, the larger the anastomosis and the closer it is to the pylorus, the bigger the chances of diarrhea and malnutrition [40]. Some authors have used the jejunum, instead of ileum, in an omega fashion, to do this antrum anastomosis, mainly in non-super obese patients, to avoid malnutrition problems. This anastomosis is done at a distance that varies between 200 to 250 cm from Treitz angle [41] [42].

Using both segments, jejunum or ileum, the anastomosis with the antrum, in omega or Roux-en-Y fashion, is mainly done with linear staples, 3 cm longer and at a distance of 3 to 5 cm from the pylorus. There have been few complications related with this type of anastomosis, with few leaks, bleedings, or ulcerations [42].

The older current bariatric procedure is RYGB, and it is still considered a gold standard technique in some countries, having long-lasting good results in terms of weight loss and metabolic control [43]. It has more potent metabolic effects than SG, showing better resolution or control rates in diabetes, hypertension,

and hyperlipidemia [44]. Some studies demonstrate that elongating biliopancreatic limb brings better metabolic results, in the long term [45] [46] [47].

Although some recent studies have shown a frequent incidence of gastroesophageal reflux after RYGB [48] [49] [50], it is still considered the best procedure for obese patients who have gastroesophageal reflux disease [51]. Some of the reasons related to the improvement of GERD after gastric bypass are the low acidity of a small gastric pouch, the expedited gastric emptying, and the absence of bile, due to the Roux-en-Y configuration [52] [53].

The exclusion of gastric remnants, the duodenum and part of the jejunum are important drawbacks of RYGB. This precludes future endoscopic evaluations of these segments and makes it difficult to access biliary tree [54]. These exclusions can make RYGB inappropriate for patients with gastroduodenal ulcers, gastric polyps, gastric dysplasia, strong family history of cancer, and intractable *H. pylori*, among others [55]. There are inferences of a cancer environment in the gastric remnant chamber [19]. Another issue related to exclusions concerns micronutrient and vitamin deficiencies, which can manifest after surgery, requiring more vigorous nutritional supplementation [14].

In this case report, it is demonstrated a situation of a morbidly obese patient, with metabolic issues and documented GERD, for whom a RYGB could be the best bariatric surgery option to offer. The fear of exclusions, based on her family history of cancer, prompted the surgical team to offer SG, even being aware of the possibility of gastroesophageal reflux worsening and lower metabolic effect. An extra care about hiatal hernia repair and crural closure was taken into account and explained to the patient, as an attempt to reduce the chances of gastroesophageal reflux. After agreement and informed consent signing, the patient was prepared and the procedure scheduled. In the intraoperative period, an unexpected, subserosal, whitish, 1cm lesion was found on the anterior wall of the antrum, near the pylorus. Frozen biopsy was not available. GIST was a possibility, and one option would have been proceeding with RYGB and remnant resection, which is prophylactically done by some authors, in places where gastric cancer is prevalent [20]. Bariatric surgery could also have been aborted, in order to better evaluate the strategy, but the option of not leaving excluded areas prevailed. The decision was to proceed with SG, starting stapling 7 cm apart from the pylorus. The lesion was distal to the stapled stomach and was resected with a 2 cm safety margin, as GIST was a possibility [56] [57]. A large circular opening (about 4 to 5 cm in diameter) was created in the anterior wall of the distal antrum, which would make it inappropriate to just close it, as it would probably create anatomical and functional alterations to the gastric tube emptying. The gastric orifice was used to make a Roux-en-Y gastrojejunal anastomosis configuration, using metabolic measurements (Biliopancreatic limb-200 cm/Alimentary limb-50 cm), after warranting 300 cm of common channel, counting it from the Ileocecal Valve (ICV). Accordingly, SG was preserved, adding RYGB in the antrum, without exclusions.

The patient had uneventful postoperative recovery, being discharged from the hospital on the day after the operation. The histopathology of the specimen demonstrated a schwannoma, which is a rare gastric tumor [58].

The patient has already had a 2-year follow-up and her BMI has dropped from 39 to 23 kg/m², without complaints of reflux, according to a validated questionnaire. All her comorbidities were resolved without requesting medications. She keeps multidisciplinary follow-up and takes multivitamins, as prescribed.

Endoscopically, there are no signs of esophagitis, the sleeve is well configured and the gastrojejunal anastomosis is 4 cm large, without ulcers. She does not use proton pumps inhibitors. The pylorus is about 1.5 cm distant from the distal margin of the anastomosis and preserves its motility.

Regarding the serigraphy, it is demonstrated a very preferential flow to the Roux limb, instead of the pylorus, which points out to a prevalence of RYGB effects.

To our knowledge, this is the first report of adding a Roux-en-Y jejunal configuration over a sleeve gastrectomy, thus constructing an antrojejunal anastomosis. The wide anastomosis, done manually over a resected gastric wall, near the pylorus, may have contributed to the preferential route through the anastomosis, instead of the pylorus, clearly demonstrated by the serigraphy. This could represent a functional deviation of food from the duodenum, towards the jejunum, while keeping the pylorus, duodenum and biliary tract accessible. This would make the Roux-en-Y metabolic effects prevail. The absence of gastric body and fundus, with decreased production of ghrelin [59], could add some metabolic benefit to this procedure. To evaluate this hypothesis, clinical trials are necessary.

6. Conclusion

This case report demonstrates a surgical strategy of maintaining a sleeve gastrectomy in a patient with severe reflux, due to her strong family history of cancer and the need to avoid gastrointestinal exclusions. An unexpected nodular lesion near the pylorus, found during the surgery, led to a partial resection of the anterior antral wall, thus creating a huge hole in this place. The use of this hole for a Roux-en-Y gastric bypass reconstruction, with metabolic measurements, has warranted that there are no digestive exclusions and will allow full endoscopic access to the duodenum and biliary tree. This strategy, combining SG with RYGB, demonstrates a tactic that can be employed in obese patients suffering from severe gastroesophageal reflux disease and must not have digestive segments excluded. In light of the foregoing, controlled trials are necessary to properly evaluate this hypothesis.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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