

# Sleeve Gastrectomy

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The sleeve gastrectomy (SG), also called greater-curvature, vertical or longitudinal gastrectomy, is a new tool in the surgical treatment of the morbidly obese and the super-obese patient (BMI > 50 kg/m<sup>2</sup>). SG was conceived as the restrictive part of a more complex procedure that combines malabsorptive and restrictive concepts: the biliopancreatic diversion with duodenal switch (BPD-DS), first described by Hess and Hess,<sup>1</sup> and simultaneously by Marceau,<sup>2</sup> in 1988. The SG, as part of the BPD-DS, consists of creating a maximal gastric reservoir or tube of 150 to 200 mL but, as an isolated procedure, the gastric pouch size usually varies from 60 to 120 mL, depending on the size of the bougie we introduce into the stomach to perform the SG.

The concept for SG also came as a modification of the restrictive Magenstrasse and Mill procedure (M & M). A group in Leeds, England first described the M & M procedure in 1995. The Magenstrasse or “Street of Stomach” is the name given to the narrow tube of lesser curvature created after division of the proximal greater curvature. It is based on the principle that gastric restrictive procedures needed to be divided and not simply stapled.<sup>3</sup> The M & M procedure is performed using a similar technique to that used for vertical banded gastroplasty in which, the circular end-to-end stapler (CEEA) is fired approximately 6 cm from the gastroesophageal junction at about the middle of the lesser curvature. In the M & M procedure, a CEEA stapler is fired along the junction of the antrum and body of the stomach just distal to the *incisura angularis*. After placement of a 32- to 36-Fr bougie, sequential firings of linear staplers up to the angle of His complete the creation of the Magenstrasse. The remaining antrum is known as the Mill because of the normal grinding that the food bolus undergoes before its expulsion into the duodenum.<sup>3,4</sup> Major benefits of the M & M procedure are the preservation of gastric emptying as opposed to other bariatric procedures and avoidance of foreign materials. However, gastrointestinal problems such as diarrhea, dumping, and vomiting are also reduced when compared with gastric bypass.<sup>5</sup> SG is essentially completion of the Magenstrasse distally by completely separating the greater curvature of the stomach from the lesser curvature and antrum (Fig 1).

The physiologic and clinical benefits of the minimally invasive approach described as shorter hospital stay, lower rate of incisional hernias, lower rate of wound infections and pulmonary complications, as compared with the open approach, complement the efficacy of this procedure in the treatment of morbid obesity.

SG was first performed by laparoscopy, as part of BPD-DS, in early July 1999 by Michel Gagner at Mount Sinai Hospital (New York, NY) after obtaining good results in a feasibility study in a porcine model.<sup>6,7</sup>

This operation became an independent procedure when it was found that supersuper-obesity (BMI > 60 kg/m<sup>2</sup>) and male gender were associated with elevated morbidity and mortality when those patients underwent BPD-DS.<sup>8-10</sup> In 2000, Gagner first proposed the SG as the first step of a two-stage laparoscopic duodenal switch as an alternative to this high-risk group of patients to decrease morbidity and mortality. In 2003, SG was proposed as the first step of a two-stage laparoscopic Roux-en-Y gastric bypass (LRYGB).<sup>11</sup> Since then, many surgical teams have already adopted this procedure with good results.<sup>12</sup> SG produces weight loss by two mechanisms: Firstly, it produces early satiety as a purely restrictive procedure; secondly, it reduces plasma ghrelin levels.<sup>13</sup>

Anticipated weight loss, relief of comorbidities, improved quality of life, patient preference, technical considerations and risks, patient behavior, and body composition changes<sup>14</sup> are main factors that should be taken into account when selecting a bariatric procedure.

Accepted indications for this laparoscopic procedure are:

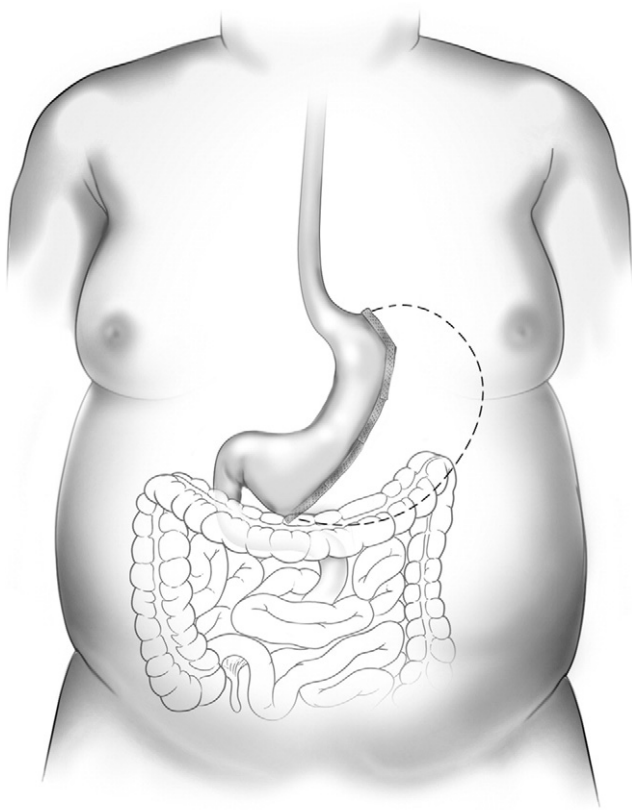
- Supersuper-obese patients (BMI > 60 kg/m<sup>2</sup>) as a first stage for laparoscopic RYGB or BPD-DS
- Patients with BMI > 40 kg/m<sup>2</sup> with severe medical disease (cirrhosis, AIDS, Crohn's)
- Patients with low BMI (35-40) with a major comorbidity
- The morbidly obese adolescent<sup>15</sup>

Benefits of SG include low rate of complication; the avoidance of foreign material to create a restrictive band or placement of a subcutaneous reservoir; the maintenance of normal gastrointestinal continuity with preservation of the antrum and nerve supply permitting adequate gastric emptying; the absence of malabsorption and the ability to convert this procedure into multiple other operations.

Patients elected for SG undergo a complete clinical and multidisciplinary evaluation including laboratory tests. In this preoperative screening, surgeons, gastroenterologists,

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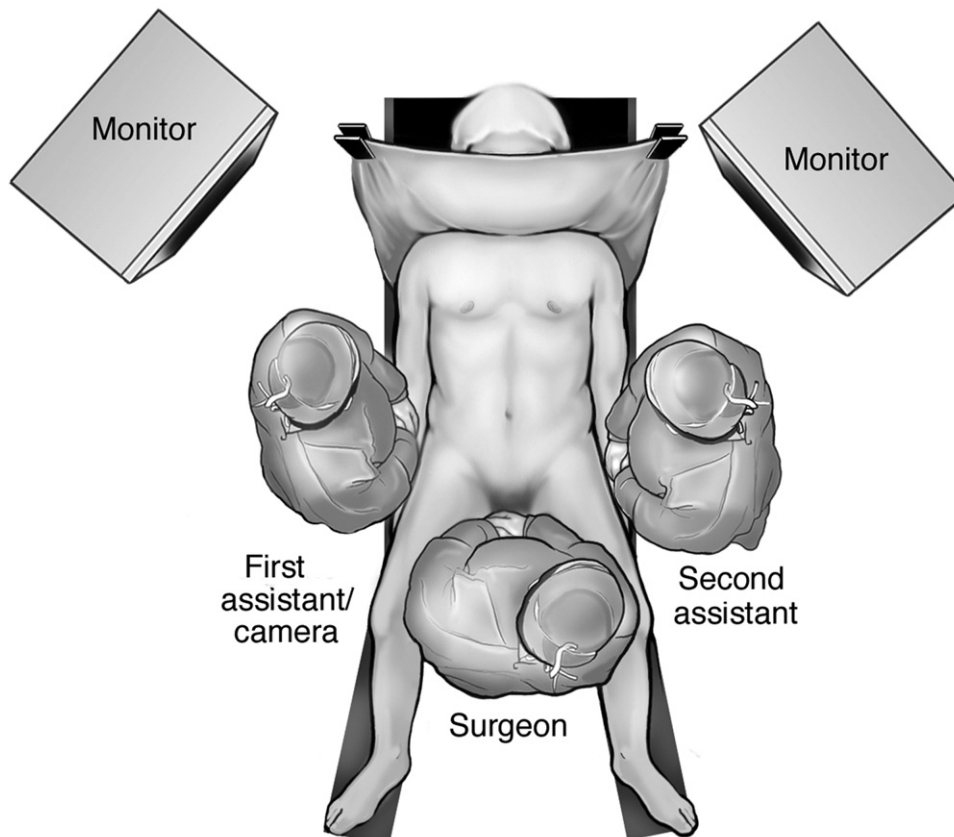
**Figure 1** SG, also called greater-curvature, vertical, or longitudinal gastrectomy.

psychiatrists, nutritionists should participate actively. We routinely perform esophagogastroduodenoscopy preoperatively to exclude gastric or duodenal pathology, including *Helicobacter pylori* infection, which must be treated before surgery. All patients above age 50 undergo screening colonoscopy. Sleep apnea studies are selectively performed in patients with clinical suspicion.

## Technique of Sleeve Gastrectomy

### Positioning of the patient

- After prophylactic antibiotics and general anesthesia are administered with orotracheal intubation, the patient is placed in the supine split-leg position, also called French position.
- Sequential compression boots are placed for DVT prophylaxis.
- A Foley catheter is inserted to monitor the urine output and an 18-Fr orogastric tube is also inserted to decompress the stomach to have an adequate working space.
- Footplate supports are placed in the operating table with the patient's limbs properly secured to prevent falls during surgery. We prefer the Alphastar table (Maquet; Ra-statt, Germany) with footplate attachments.
- In the French position, the surgeon stands in-between the legs and the assistants stand on either side of the patient. The first-assistant (liver retractor and camera holder) stands on the patient's right, and the second-assistant stands on the patient's left (Fig 2).



**Figure 2** Supine split-leg position, also called French position.

## Port placement

- This procedure is performed through seven abdominal trocars.
- An open technique on top of the umbilicus is performed to access the abdominal cavity. A 10-mm blunt trocar is introduced and the CO<sub>2</sub> is insufflated up to 15 mm Hg of pressure. A 30-degree laparoscope is next introduced allowing for a rapid diagnostic laparoscopy.
- After the patient is positioned in reverse trendelenburg and slight rotation toward the right, trocars are placed under direct vision in the following fashion: a 10-mm trocar in the epigastric left paramedian position in-between the subxiphoid space and umbilicus; 10-mm trocar in the right sub costal position at the midclavicular line; 5-mm trocar in the subxiphoid position at the level of the liver edge; 15-mm Versaport (Tyco Health care, Norwalk, CT), with a 5- to 15-mm adapter, in the left sub costal position at the midclavicular line approximately four fingerbreadths below the costal margin; 5-mm trocar in the left lateral position at the anterior axillary line; and finally, 15-mm Versaport, with a 5- to 15-mm adapter, in the right midabdomen above the level of the umbilicus medial to the midclavicular line (Fig 3).

## Sleeve Gastrectomy

With the patient in steep reverse trendelenburg position, a 10-mm liver retractor is placed through the right sub costal port to expose the entire length of the stomach. We start by dividing the greater omentum with the ultrasonic shears at a midpoint along the greater curvature (Fig 4). The branches of the gastroepiploic artery are divided near the gastric wall (Fig 5). We then proceed with the division of the short gastric vessels that is performed up to the fundus using the ultrasonic shears (SonoSurg, Olympus Corporation, Tokyo, Japan) (Fig 6). These maneuvers are facilitated by the medial and anterior retraction of the stomach.

The angle of His is identified and dissected free from the left crus. The surgeon must remove all fat over the left gastroesophageal junction to clearly identify it. Careful attention on dissection over the gastroesophageal junction and the posterior aspect of the fundus must be taken because of the risk of splenic injury.

The greater curvature dissection continues from the midpoint distally to approximately 2 cm proximal to the pylorus. After the greater curvature dissection is complete, we proceed to lysis of all adhesions in the lesser sac (gastro-pancreatic attachments) leaving the posterior aspect of the antrum free.

The entire greater curvature devascularization can also be performed using two other techniques: the first one starts at the level of the left crus of the diaphragm going distally to 2 cm proximal to the pylorus, and the second technique starts distally 2 cm proximal to the pylorus going cephalad up to the fundus.

At the level of the crow's foot just distal to the *incisura angularis*, approximately 5 to 6 cm proximal to the pylorus (Fig 7), the SG is begun with sequential firings of linear staplers through the 15-mm Versaport with the stomach retracted flat and laterally (Fig 8). Staple-line reinforcement materials should be used to reduce the risk of intraoperative bleeding and leakage. We use the bioabsorbable glycolide

copolymer reinforcements (Seamguard; W.L. Gore & Associates, Inc, Flagstaff, AZ) as it has shown to be safe and effective to prevent these complications.<sup>16-21</sup>

The first stapler is directed so that a narrow 1.5 cm of anterior stomach serosa is visible between the stapler and the lesser curvature. A second stapler is aligned with the first and then fired, leaving enough width not to occlude the gastric lumen. After the second firing, a bougie is inserted transorally by the anesthesiologist and carefully positioned in the antrum under laparoscopic vision (Fig 9). For all LSG as part of a BPD-DS, we used the 60-Fr bougie to ensure adequate protein intake. For primary LSG, we use a 40-Fr bougie but it could be smaller or greater (28-54 Fr).

Usually three additional 60-mm or 4.8-mm stapler firings are needed to complete the gastrectomy. At the uppermost portion of the stomach, the transection line is allowed to deviate away from the bougie to avoid severe stenosis at the gastroesophageal junction but going further from the bougie may lead to fundus dilation and weight regain (Fig 10).

The gastric pouch size usually varies from 60 to 120 mL but by changing the size of the bougie, we can create different volumes of the SG. After completion of the SG, the anesthesiologist removes the bougie. Hemostatic clips are rarely needed if buttressing of the staple line has been applied appropriately. Figure-of-eight/of 3-0 Maxon sutures (it has to be absorbable suture to prevent a definite stricture) are placed at the intersections of the staple lines and at the most distal end of the staple line. The excised stomach is then retrieved through the umbilicus using a large specimen bag to prevent wound contamination. Finally, methylene blue-tinted sterile saline is instilled under pressure, through an orogastric tube, with the proximal duodenum clamped to test the staple line for leaks. Oversewing is used if leaks are identified.

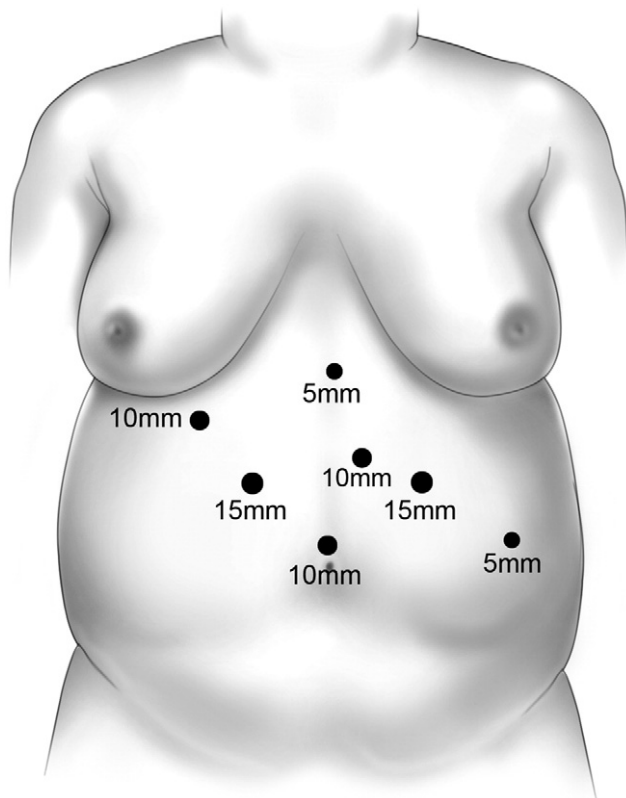
## Inspection and closure

Before removal of the trocars, the gastric staple line is inspected for hemostasis and extravasation of methylene blue. All fascial defects larger than 5 mm are closed using a suture-passer (Karl Storz, Tuttlingen, Germany) with 0 Vicryl sutures. Routine drainage is not used. The skin is closed with interrupted subcuticular monofilament suture. All specimens are sent for surgical pathology evaluation.

## Postoperative follow-up

Careful attention is needed for any general (ie, pulmonary embolism or myocardial infarction) or procedure-related complication after surgery. Special attention must be taken to staple-line hemorrhage, leaks, wound infection, and stricture mainly at the gastroesophageal junction.

A water-soluble (Gastrografin) upper gastrointestinal contrast study is performed selectively, that is, for patients with any technical difficulties intraoperatively, including a leak on a methylene-blue test, and for patients who show clinical signs and symptoms of possible leakage (fever greater than 38.0°C, tachycardia, tachypnea, severe somnolence, severe leukocytosis). Otherwise, patients receive a clear liquid diet on the first postoperative day followed by a puree diet on the second day. Inpatient nutrition counseling is performed. The

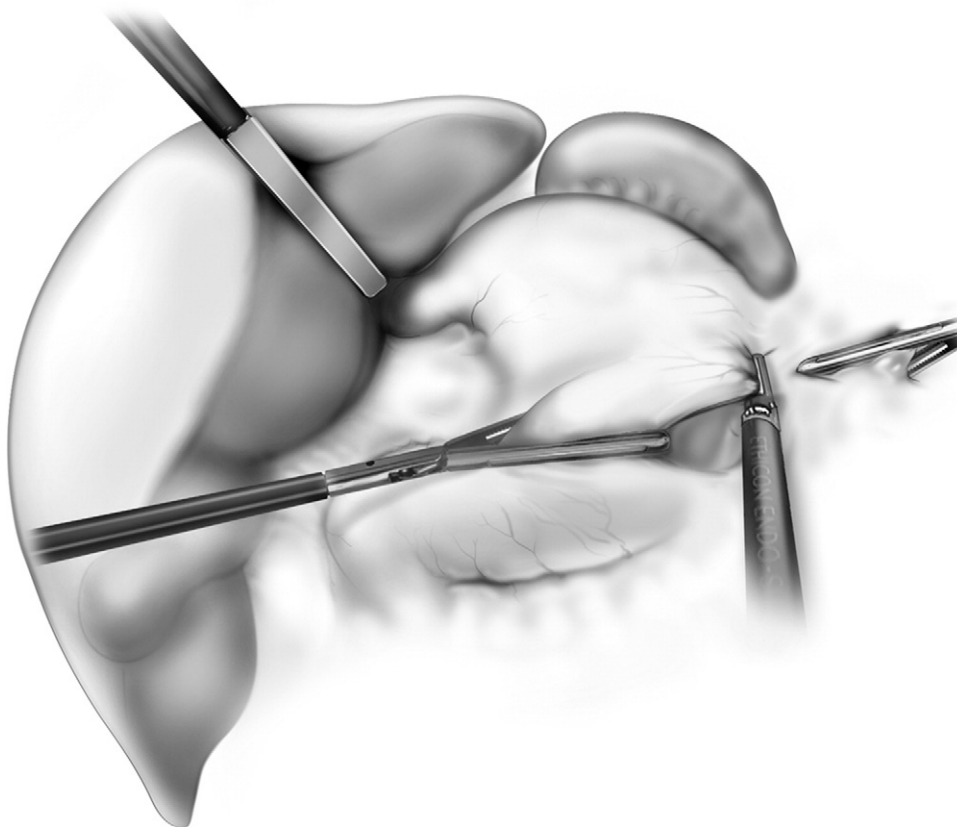


**Figure 3** Trocar placement.

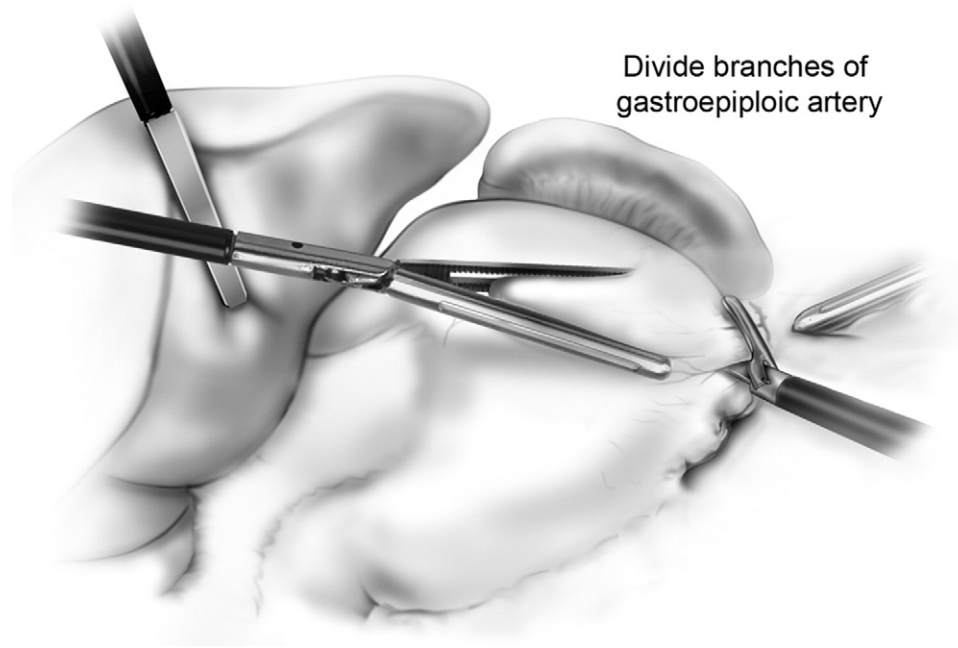
patients are usually discharged on the third postoperative day, on oral analgesics and all medications crushed. Proton-pump inhibitors are useful for several weeks in patients with dysphagia or reflux symptoms. Antihypertensive and oral hypoglycemic agents are continued and adjusted by primary care physician. Patients are examined 4 weeks, 3 and 6 months postoperatively, and then annually. At 4 weeks postoperative visit, patients receive follow-up nutritional counseling for a protein-enriched diet and are given twice-daily multivitamins, oral iron, and calcium supplements. Patients with intact gallbladder are prescribed ursodiol 250 mg twice daily (Actigall, Ciba-Geigy, Summit, NJ) for 6 months during the time of maximal weight loss for gallstone prophylaxis. Laboratory testing for protein, vitamin, and mineral deficiencies is performed at these visits. Patients are encouraged to attend a monthly support group.

## Results

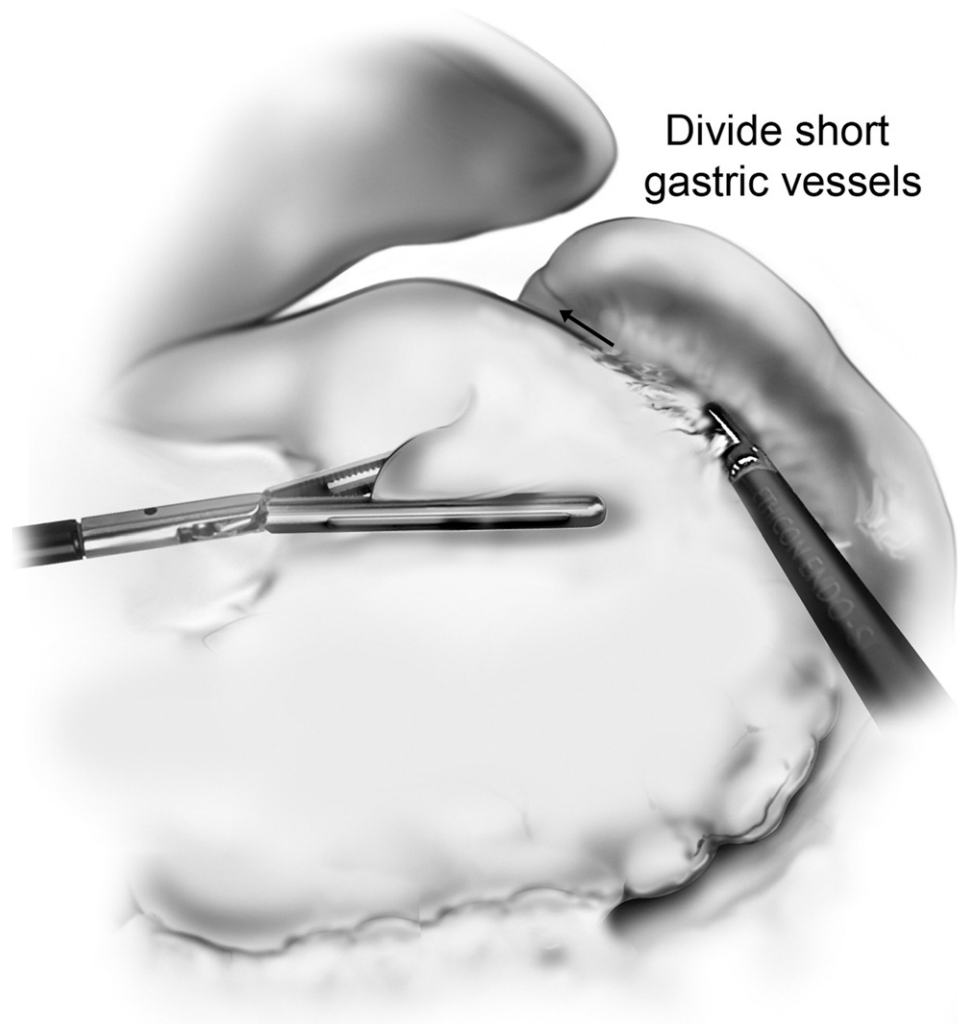
Surgical management of the supersuper-obese patient (BMI > 60 kg/m<sup>2</sup>) is associated with higher morbidity and mortality, and long-term weight loss failure. To overcome these problems, in 2000, Gagner and co-workers first proposed the laparoscopic sleeve gastrectomy (LSG), and in 2003 as the first step of a two-stage LRYGB, as an alternative for this high-risk group of morbidly obese patients to decrease morbidity and mortality.<sup>11</sup> In this study, 7 patients (3 females and 4 males; mean age 43 years) with BMI between 58 to 71



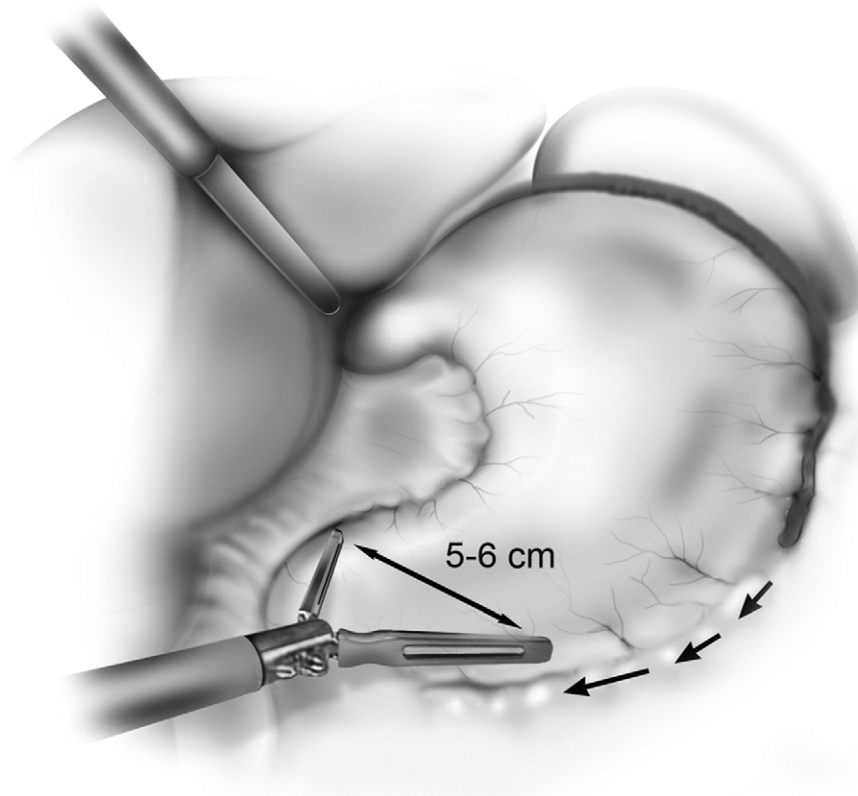
**Figure 4** A good exposure of the entire stomach is crucial to start dissection of the greater curvature. The left hand of the surgeon retracts the stomach anteriorly and medially with a soft flat 5-mm forceps (Dorsey, Karl Storz, Tuttingen, Germany), the second assistant retracts the greater omentum laterally with a second soft forceps, therefore the surgeon can start dissection at a midpoint along the greater curvature using the ultrasonic shears with his/her right hand, through the left 15-mm port.



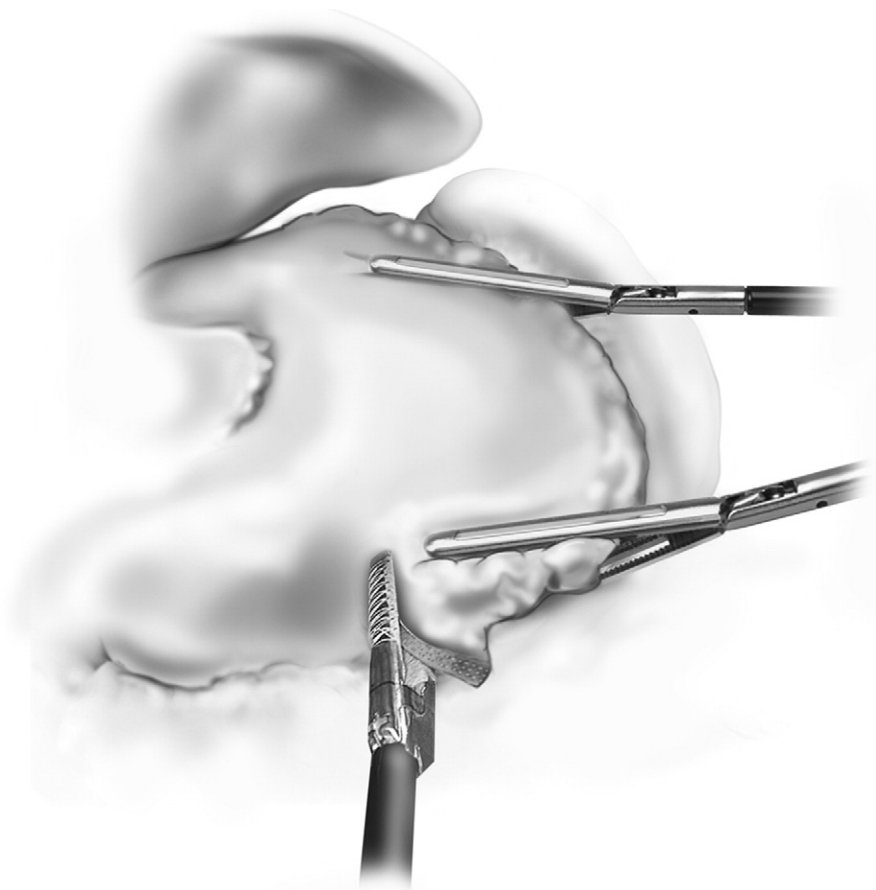
**Figure 5** The greater curvature dissection continues cephalad to the angle of His. The branches of the gastroepiploic artery (perpendicular to the gastric wall) are identified and divided near the stomach.



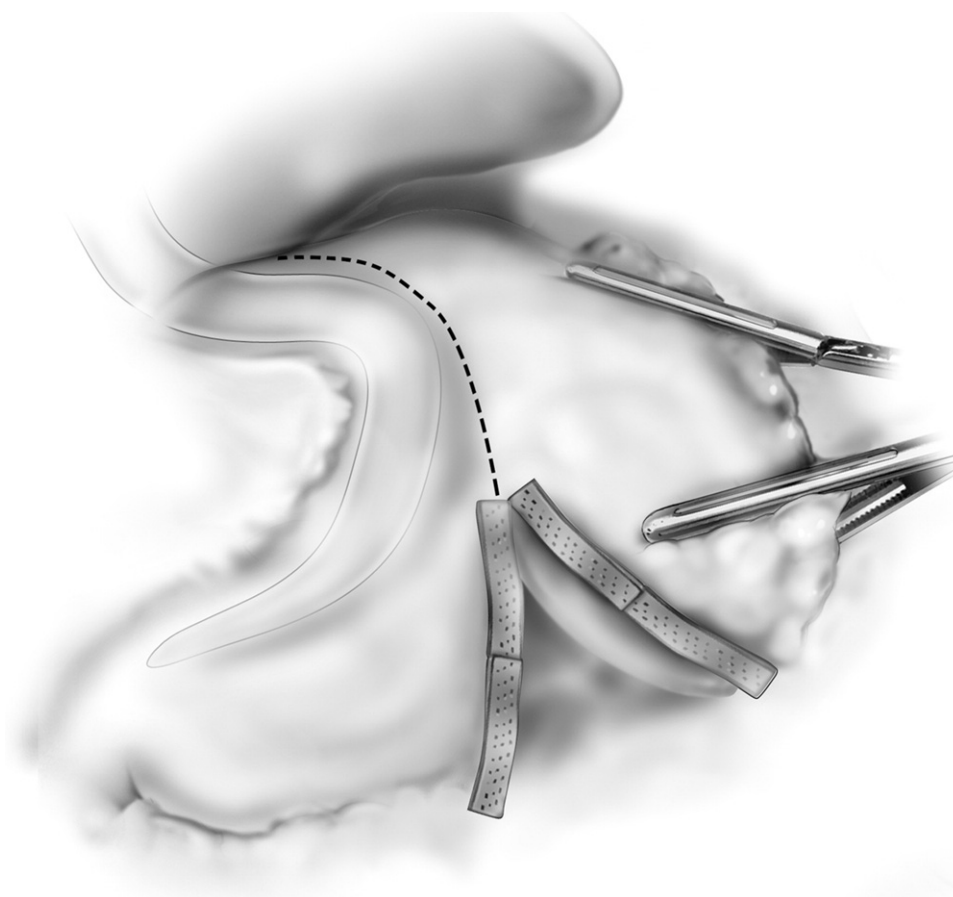
**Figure 6** Division of the short gastric vessels is performed up to the fundus using the ultrasonic shears. The stomach is retracted downward with the right hand of the surgeon and the second assistant retracts laterally and downward the greater omentum using soft forceps or bowel graspers. Then, the surgeon proceeds with transection of the short gastric vessels with ultrasonic shears, through the left 15-mm port.



**Figure 7** The greater curvature dissection continues from the midpoint distally to approximately 2 cm proximal to the pylorus. Instrument palpation is used to confirm the position of the pylorus. Then, using a soft forceps we estimate a distance of 5 to 6 cm proximal to the pylorus to select the point in the antrum where the firing will start.



**Figure 8** The SG is begun with sequential firings of 60-mm/4.8-mm linear staplers reinforced with buttress bioabsorbable material (Seamguard; W.L. Gore & Associates, Inc, Flagstaff, AZ) through the 15-mm Versaport with the stomach retracted flat and laterally starting 5 to 6 cm proximal to the pylorus.



**Figure 9** The first stapler was positioned so that a narrow 1.5 cm of anterior stomach serosa is visible between the stapler and the lesser curvature. A second 60-mm/4.8-mm linear stapler is aligned with the first and then fired, leaving enough width not to occlude the gastric lumen. The 40-Fr bougie is inserted into the stomach and aligned medially along the lesser curvature into the duodenum to proceed with the SG. Inserting the bougie after the first two stapler firings is a technical tip to facilitate aligning of the bougie along the lesser curvature

kg/m<sup>2</sup> underwent a two-stage LRYGB at the Mount Sinai Medical Center. Before the LSG, the mean BMI was 63 kg/m<sup>2</sup> and before the second-stage procedure, BMI was 50 kg/m<sup>2</sup> with 33% EWL. Mean time between procedures was 11 months. Since that initial study, many reports have been published.<sup>12,13,15,22-28</sup> In total, 547 patients were reported with a mean EWL of 51% and 56% at 6 and 12 months, respectively.

Complications occurred in approximately 10% of patients with reoperations as the most common complication; however, the indications for reoperation were not reported. Postoperative complications were mainly associated with leaks, prolonged ventilator requirements (>24 hour ventilator requirement) and strictures, but also renal insufficiency, hemorrhage, atelectasis, and delayed gastric emptying.

The mortality associated with LSG is <1% (three reported deaths in the literature). Deaths were caused by traumatic trocar insertion, primary peritonitis 3 weeks after surgery, even though no leak or bowel ischemia was identified on autopsy, and pulmonary embolism occurred 3 months after surgery.

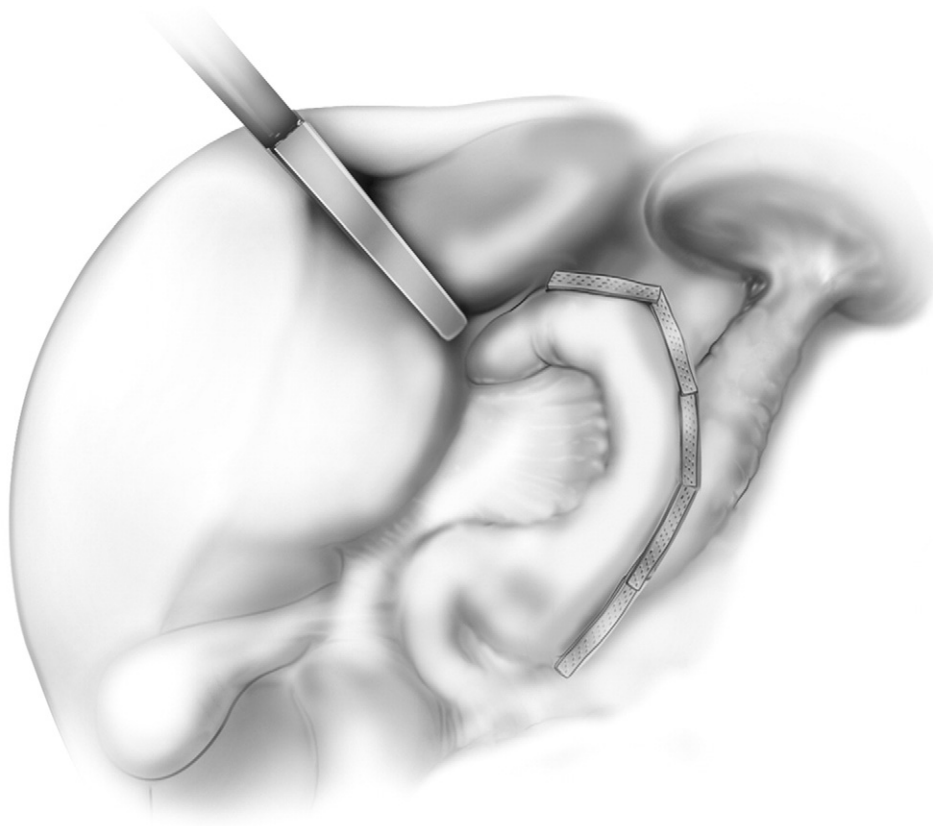
A recent prospective randomized trial comparing LSG with laparoscopic gastric banding (LGB) reported better results in terms of weight loss for LSG as compared with LGB.<sup>28</sup> Forty patients were randomly assigned each group. Median age was 36 for the LGB group and 40 for the LSG group.

No statistical differences were reported in gender and age distribution. Preoperative median BMI was 37 for LGB and 39 for LSG. One year after surgery, median EWL was 41.4% after LGB and 57.7% after LSG ( $P = 0.0004$ ). Three years after surgery, median EWL was 48% versus 66% ( $P = 0.0025$ ), respectively. Loss of feeling of hunger after 1 year was registered in 42.5% for the LGB group and 75% for the LSG group ( $P = 0.003$ ). These results proved that LSG is more effective than LGB as it has shown for other restrictive procedures.

## Discussion

LSG has proved to be more effective than gastric balloon in the superobese patients<sup>27</sup> and also more effective than LGB.<sup>28</sup> Decrease of large parts of the ghrelin-producing stomach mass may account for its superiority to other gastric restrictive procedures in terms of weight loss and loss of sensation of hunger. Ghrelin is an orexigenic hormone whose plasma concentration regulates hunger and food intake.<sup>13</sup> However, the gastric emptying function of the antrum, preserved in the LSG, and its relationship with the appetite also explains weight loss and differences in loss of hunger sensation.<sup>29</sup>

Even though short-term results are satisfactory, there are no long-term results with the LSG. Although, the Longitudinal As-



**Figure 10** Usually three additional 60-mm or 4.8-mm stapler firings reinforced with buttressing material, parallel to the bougie, are needed to complete the gastrectomy. At the uppermost portion of the stomach, the transection line is allowed to deviate away from the bougie to avoid severe stenosis at the gastroesophageal junction but going further from the bougie may lead to fundus dilation and weight regain.

assessment of Bariatric Surgery (LABS) study, a multicenter collaborative study currently with the National Institutes of Health funding, should be able to provide an even more comprehensive evaluation for the current procedures with greater numbers of patients in follow-up for a longer period.

The main concern of the LSG is the possibility of dilation of the gastric reservoir with consequent weight regain. However, laparoscopic re-SG can be performed in the setting of gastric tube dilation or inadequate original gastric volume reduction.<sup>30,31</sup>

## Conclusions

LSG is an effective primary bariatric procedure in the short-term. The overall EWL at 6 and 12 months ranges from 35% to 71% (mean 51%) and 33% to 81% (mean 56%), respectively. Although, long-term follow-up is required to establish differences over time.

LSG is a relatively safe and simple procedure with low rate of complications and mortality and is ideally suitable in high-risk patients (BMI > 60 kg/m<sup>2</sup>) who may benefit from a two-stage RYGB or BPD-DS operation.

## References

- Hess DS, Hess DW: Biliopancreatic diversion with a duodenal switch. *Obes Surg* 8:267-282, 1998
- Marceau P, Hould FS, Simard S, et al: Biliopancreatic diversion with duodenal switch. *World J Surg* 22:947-954, 1998
- Johnston D, Dachtler J, Sue-Ling HM, et al: The Magenstrasse and Mill operation for morbid obesity. *Obes Surg* 13:10-16, 2003
- Carmichael AR, Johnston D, Barker MC, et al: Gastric emptying after a new, more physiological anti-obesity operation: The Magenstrasse and Mill procedure. *Eur J Nucl Med* 28:1379-1383, 2001
- Carmichael AR, Sue-Ling HM, Johnston D: Quality of life after the Magenstrasse and Mill procedure for morbid obesity. *Obes Surg* 11:708-715, 2001
- de Csepe J, Burpee S, Jossart G, et al: Laparoscopic biliopancreatic diversion with a duodenal switch for morbid obesity: A feasibility study in pigs. *J Laparoendosc Adv Surg Tech A* 11:79-83, 2001
- Gagner M, Patterson E: Laparoscopic biliopancreatic diversion with duodenal switch. *Dig Surg* 17:547-566, 2000
- Ren CJ, Patterson E, Gagner M: Early results of laparoscopic biliopancreatic diversion with duodenal switch: A case series of 40 consecutive patients. *Obes Surg* 10:514-524, 2000
- Almogy G, Crookes PF, Anthonie GJ: Longitudinal gastrectomy as a treatment for the high-risk super-obese patient. *Obes Surg* 14:492-497, 2004
- Fazylov RM, Savel RH, Horovitz JH, et al: Association of super-super-obesity and male gender with elevated mortality in patients undergoing the duodenal switch procedure. *Obes Surg* 15:618-623, 2005
- Regan JP, Inabnet WB, Gagner M, et al: Early experience with two-stage laparoscopic Roux-en-Y gastric bypass as an alternative in the super-super obese patient. *Obes Surg* 13:861-864, 2003
- Mognol P, Chosidow D, Marmuse JP: Laparoscopic sleeve gastrectomy as an initial bariatric operation for high-risk patients: Initial results in 10 patients. *Obes Surg* 15:1030-1033, 2005
- Langer FB, Reza Hoda MA, Bohdjalian A, et al: Sleeve gastrectomy and gastric banding: Effects on plasma ghrelin levels. *Obes Surg* 15:1024-1029, 2005

14. Strain GW, Gagner M, Inabnet WB, et al: Comparison of effects of gastric bypass and biliopancreatic diversion with duodenal switch on weight loss and body composition 1-2 years after surgery. *Surg Obes Relat Dis* 3:31-36, 2007
15. Baltasar A, Serra C, Pérez N, et al: Laparoscopic sleeve gastrectomy: A multi-purpose bariatric operation. *Obes Surg* 15:1124-1128, 2005
16. Consten EC, Gagner M: Staple-line reinforcement techniques with different buttressing materials used for laparoscopic gastrointestinal surgery: A new strategy to diminish perioperative complications. *Surg Technol Int* 13:59-63, 2004
17. Yo LS, Consten EC, Quarles van Ufford HM, et al: Buttressing of the staple line in gastrointestinal anastomoses: Overview of new technology designed to reduce perioperative complications. *Dig Surg* 23:283-291, 2006
18. Nguyen NT, Longoria M, Chalifoux S, et al: Bioabsorbable staple line reinforcement for laparoscopic gastrointestinal surgery. *Surg Technol Int* 14:107-111, 2005
19. Nguyen NT, Longoria M, Welbourne S, et al: Glycolide copolymer staple-line reinforcement reduces staple site bleeding during laparoscopic gastric bypass: A prospective randomized trial. *Arch Surg* 140:773-778, 2005
20. Consten EC, Gagner M, Pomp A, et al: Decreased bleeding after laparoscopic sleeve gastrectomy with or without duodenal switch for morbid obesity using a stapled buttressed absorbable polymer membrane. *Obes Surg* 14:1360-1366, 2004
21. Consten EC, Dakin GF, Gagner M: Intraluminal migration of bovine pericardial strips used to reinforced the gastric staple-line in laparoscopic bariatric surgery. *Obes Surg* 14:549-554, 2004
22. Moon Han S, Kim WW, Oh JH: Results of laparoscopic sleeve gastrectomy (LSG) at 1 year in morbidly obese Korean patients. *Obes Surg* 15:1469-1475, 2005
23. Catheline JM, Cohen R, Khochtali I, et al: [Treatment of super super morbid obesity by sleeve gastrectomy]. *Presse Med* 35(Pt 1):383-387, 2006
24. Langer FB, Bohdjalian A, Felberbauer FX, et al: Does gastric dilatation limit the success of sleeve gastrectomy as a sole operation for morbid obesity? *Obes Surg* 16:166-171, 2006
25. Cottam D, Qureshi FG, Mattar SG, et al: Laparoscopic sleeve gastrectomy as an initial weight-loss procedure for high-risk patients with morbid obesity. *Surg Endosc* 20:859-863, 2006
26. Lee CM FJ, Cirangle PT, Jossart GH: Laparoscopic vertical sleeve gastrectomy for morbid obesity in 216 patients: Report of two-year results. *Surg Endosc* 21:1810-1816, 2007
27. Milone L, Strong V, Gagner M: Laparoscopic sleeve gastrectomy is superior to endoscopic intragastric balloon as a first stage procedure for super-obese patients (BMI > or = 50). *Obes Surg* 15:612-617, 2005
28. Himpens J, Dapri G, Cadiere GB, et al: A prospective randomized study between laparoscopic gastric banding and laparoscopic isolated sleeve gastrectomy: Results after 1 and years. *Obes Surg* 16:1450-1456, 2006
29. Bergmann JF, Chassany O, Petit A, et al: Correlation between echographic gastric emptying and appetite: Influence of psyllium. *Gut* 33:1042-1043, 1992
30. Gagner M, Rogula T: Laparoscopic reoperative sleeve gastrectomy for poor weight loss after biliopancreatic diversion with duodenal switch. *Obes Surg* 13:649-654, 2003
31. Baltasar A, Serra C, Pérez N, et al: Re-sleeve gastrectomy. *Obes Surg* 16:1535-1538, 2006