

The First International Consensus Summit for Sleeve Gastrectomy (SG), New York City, October 25–27, 2007

Mervyn Deitel · Ross D. Crosby · Michel Gagner

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Abstract Sleeve gastrectomy is a rapid and less traumatic operation, which thus far is showing good resolution of comorbidities and good weight loss if a narrower channel is constructed than for the duodenal switch. There are potential intraoperative complications, which must be recognized and treated promptly. Like other bariatric operations, there are variations in the technique used. The laparoscopic sleeve gastrectomy (LSG) is being performed for super-obese and high-risk patients, but its indications have been increasing. A second-stage bariatric operation may be performed if necessary, with increased safety. Long-term results of LSG and further networking are anxiously awaited.

Keywords Consensus conference · Morbid obesity · Bariatric surgery · Laparoscopic sleeve gastrectomy · Outcome

Introduction

The most frequently performed bariatric operations are the laparoscopic adjustable gastric banding (LAGB: Europe, South America and Australia mainly), the Roux-en-Y gastric bypass (RYGBP: America), and biliopancreatic

diversion with duodenal switch (DS: North America, Brazil, Europe). The sleeve gastrectomy (SG) is the first part of the DS operation, and leaves a lesser curvature tube after excising the fundus and greater curvature portion of the stomach.

About 7 years ago, some surgeons who were performing the DS operation began to do the first part (the lesser curvature gastric tube) as a first-stage for poor-risk patients, intending to do the second stage (DS or RYGBP) later [1–8]. It was noted that patients occasionally lost significant weight so that they did not require the second stage. Also, the SG was performed in some patients whose weight was not severe enough to warrant the usual bariatric operations [9–16]. Eventually, some surgeons performed the SG as their sole bariatric operation, going on to a second stage only where the weight loss was inadequate [17]. These surgeons, in future SGs, constructed a narrower gastric tube, which increased the weight loss [9].

SG can be performed by an open laparotomy procedure but is usually done as a laparoscopic operation [laparoscopic sleeve gastrectomy (LSG)], which is particularly appropriate for the SG.

There are variations in the techniques for all bariatric operations. As an example, the laparoscopic RYGBP may have the gastrojejunostomy performed antecolic or retrocolic, with a circular stapler transorally or transabdominally or with a linear stapler transabdominally; the resulting peritoneal defects are closed but some workers leave them open; the intestinal length used varies with the surgeon.

Similarly, there are multiple technical variations currently for the LSG. There is variation in the size of bougie beside which the linear cutting staplers are placed to divide the stomach. There is variation in the level at which the surgeons start the division in the antral area. Many surgeons leave in most of the antrum for its pumping, emptying

M. Deitel (✉)
Obesity Surgery, 39 Bassano Rd.,
Toronto, ON M2N 2J9, Canada
e-mail: journal@obesitysurgery.com

R. D. Crosby
Biomedical Statistics Neuropsychiatric Research Institute,
120 8th St. S., POB 1415, Fargo, ND 58107-1415, USA

M. Gagner
Department of Surgery, Mount Sinai Medical Center,
4300 Alton Rd., Miami Beach, FL 33140, USA

action [5, 6, 18–20]. If the dissection is begun close to the pylorus, this thick area can crack and predispose to leaks. However, a site of rare leaks has been the region of the gastric cardia. High gastric leaks are difficult to treat. It is important that surgeons do not include a portion of the esophagus in the resection. In dividing the stomach, most surgeons have been oversewing the staple-line by continuous or interrupted absorbable sutures to prevent bleeding and leaks [2, 3, 5, 9, 16, 18], but many surgeons instead use a buttress of a collagen-like material (Seamguard®, Gore, Flagstaff, AZ, USA) along the staple-line when applying the stapler [21–23].

There can be a problem with the sleeve when a hiatus hernia is present, and some surgeons have advised in this instance putting a few nonabsorbable sutures through the crura of the diaphragm posteriorly to prevent slippage of a reduced stomach. Also, there has been an occasional postoperative problem of gastroesophageal (GE) reflux, which may resolve after a period of time. Most bariatric operations have required postoperative vitamin and mineral supplements, but this may not be as necessary after the SG except for vitamin B₁₂. Many surgeons give a proton pump inhibitor (PPI) to inhibit acid secretion [5].

The long gastric sleeve could develop a stenosis, especially if there was tightness in the construction at the angularis [24]. It is important not to staple the bougie, and most surgeons prefer a rigid tube because of this. The general complications of surgery in the morbidly obese, such as deep vein thrombosis, pulmonary embolism, etc. [25–27], may still occur but may be less likely after this briefer procedure. Another variation in performing SG is that some surgeons will start by entering the gastrocolic omentum to the lesser sac and construct the sleeve first [28], whereas most surgeons mobilize the greater curvature up to the cardia and left crus and then perform the vertical division [5].

The percent of excess weight loss (EWL) after SG at 3 years has been reported to be similar to that after RYGBP [5, 9, 21]. Because the SG has rapidly become a widely performed operation, this timely meeting was organized by Michel Gagner, assisted expertly by Ciné-med®, Woodbury, CT. Bariatric surgeons invited from various parts of the world, experienced in the SG, communicated their techniques and results.

The Meeting

The first day consisted of live surgery by experts performing SG (about 250 attendees). The second full day consisted of presentations and video case reviews by world experts (about 275 attendees). The third (final) day consisted of the International Summit Consensus of experts

to determine the efficacy and current state of the art of LSG as a primary operation. Total registration for the meeting was 325, with a strong international participation.

Presentations

Professor Michel Gagner gave a brief preliminary overview. There are 10 centers in the USA that have now achieved a 5-year follow-up. Of the patients, 22% have been male, and these tend to be superobese. Only one death was reported in the first 260 patients. SG currently represents ~2% of the bariatric operations in the USA, although there is no specific insurance code. The laparoscopic DS began to be performed in the late 1990s, and the SG started in Europe shortly thereafter. The Magenstrasse–Mill (M&M) procedure has been performed for a number of years in the UK, with long-term EWL of 60% [29, 30]. The vertical banded gastroplasty (VBG) operation showed frequent weight regain by 5 years, and the question is whether this will also occur with the SG.

For SG, five or six trocars are used, with the surgeon standing between the patient's legs. Gagner uses an open technique for the first trocar, establishing a pneumoperitoneum of 15 mm Hg. Then, two right trocars, a left trocar, and a midline trocar are inserted, for vision to the upper right (Fig. 1). The right subcostal trocar is used to insert the fan retractor for the liver. The camera is placed between the umbilicus and xiphoid and has to be high in position. An orogastric tube may be passed to initially decompress the stomach, and it is then removed. Some surgeons commence with an opening through the gastrocolic ligament to lesser sac, and initially cut–staple the vertical channel. Gagner first mobilizes the greater curvature outside the epipoic arcade, close to the gastric wall, which will be removed. With light traction between two atraumatic forceps, and starting below the midpoint of the greater curvature, using LigaSure® (Valleylab, Boulder, CO, USA), SonoSurg® (Olympus Surgical, Orangeburg, NY, USA), Harmonic Scalpel® (Ethicon, Cincinnati, OH, USA), or coagulating hook, and the patient in slight reverse Trendelenberg, the posterior stomach is visualized. Fine adhesions to the pancreas are divided and the lesser sac totally freed. Fat must be cleared off the left side of the GE junction, so that later stapling would not be compromised. Exposure must be high, defining the complete left crus.

Most surgeons commence the dissection 5–10 cm proximal to the pylorus, but some European surgeons start the resection closer to the pylorus. If the dissection commences too close to the pylorus, the antral pumping mechanism will be defective, the antrum will not empty properly, and the patient may have some nausea. The linear stapling division is generally from a right trocar towards the

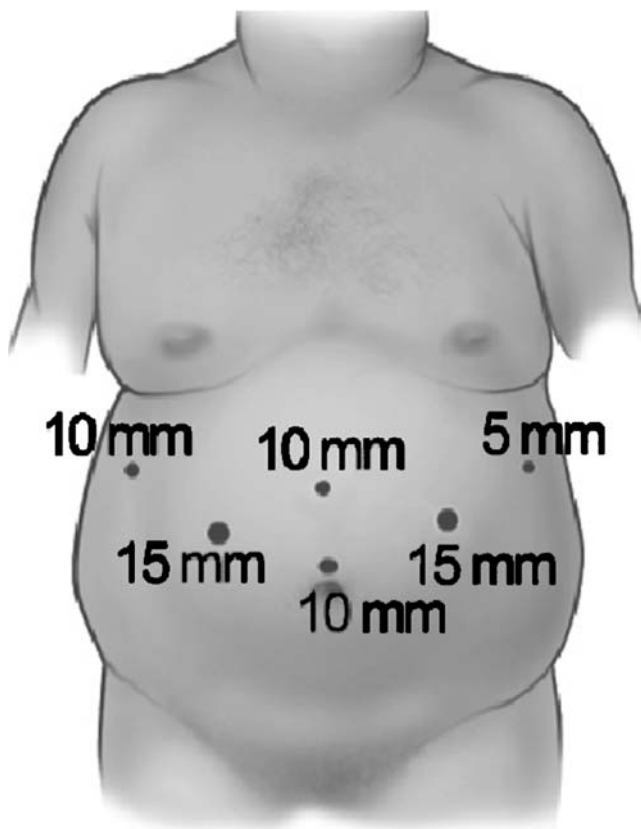


Fig. 1 Trocar placement for LSG. Five trocars are frequently used, with a single one in the right abdomen

left shoulder, with or without buttressing material, and leaves about 1 cm of fat pad along the lesser curvature (~3 cm width). This assures adequate blood supply on the lesser curvature for the sleeve.

Dr. Gagner starts transecting the stomach 6 cm proximal to the pylorus (Fig. 2), and then the anesthesiologist inserts a 36–40-Fr bougie down to pylorus, if the SG is intended as the sole operation (for a DS, a 60-Fr bougie is used). The sleeve is started at the lower end of the crow's foot. The procedure requires five to six firings of the linear cutting stapler (60 cm long, 4.8-mm staple-height, green cartridge) to divide the entire stomach. It is important to remove all fundus to avoid regain of weight (Fig. 3). The vagus nerves anteriorly and posteriorly are preserved for normal gastric emptying.

The greater curvature portion may be extracted in a bag (Endobag®, Covidien, Mansfield, MA, USA) via a right paramedian or epigastric trocar-site enlarged to two-fingers diameter. The specimen has the shape of a comma with the fundus at the top (Fig. 4). The staple-line is variously oversewn, and many workers do intraoperative testing via an 18-Fr Argyle tube with diluted methylene blue or air under saline using a gastroscope, with the prepyloric area compressed. With the bougie removed, Gagner reinforces

each crossing-overlapping site from the stapler with an absorbable monofilament figure-of-eight suture.

A Gastrografin® swallow is ordered by many surgeons 1 day after surgery, or others perform this study only if there is a problem. A liquid diet may be commenced on the first postoperative day.

Ahmad Assalia of Haifa discussed the hormonal changes after SG. Ghrelin is a hormone that increases in the bloodstream before meals, increasing appetite. In the SG, resection of the fundus removes the major site of ghrelin release [31–33]. This 29-amino-acid peptide also stimulates gastric emptying. Langer found that, after SG, there is dramatic decrease in ghrelin, studied to 6 months, whereas there is an increase in ghrelin levels after LAGB [34]. Kotidis has found that, with dieting or after RYGBP, ghrelin levels increase, whereas after DS, ghrelin levels decrease, with the complete fundal resection considered to be the main cause [35, 36].

However, after the BPD of Scopinaro, fasting plasma ghrelin levels increase [31, 36, 37], despite reported good weight loss by Scopinaro. Himpens found that, after 3 years following SG, patients have regained their appetite, but their EWL still increased.

John Melissas of Crete presented studies in gastric emptying after SG. In Melissas' series, the 23 patients had mean preoperative BMI of 47.2 ± 4.8 and 1-year BMI of 31.1 ± 4.5 . Using a T-99m-labeled solid meal for scintigraphy, he found a statistically significant increased rate of gastric emptying to the duodenum after LSG [38]. Intestinal distension and satiety signals via gut hormones are possible mechanisms for reduction of food intake and weight loss following this “food limiting operation.” Thus, SG appears to be more than just a gastric restrictive operation.

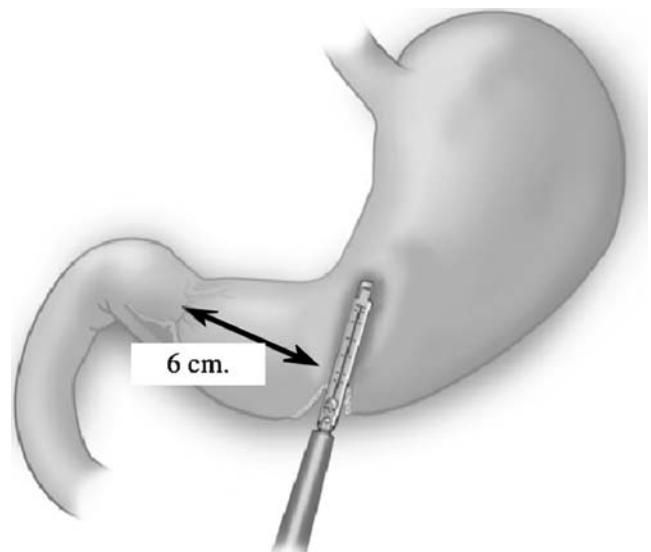


Fig. 2 Laparoscopic placement of endoscopic stapler, 6 cm proximal to the pyloric valve (method of Gagner) at approximately the incisura angularis [5]



Fig. 3 The greater curvature is removed from the proximal antrum to the angle of His [6]

Nicola Basso of Italy [19] presented the SICOB survey of 193 patients who had SG, of which 34 were revised from a prior LAGB or VBG. The mean preoperative BMI was 55, with multiple comorbidities. A second-stage procedure was performed in 26.8% (36 to a DS, 4 to a RYGBP). A 32–48-Fr bougie (average 42 Fr) was used, and the sleeve was started 8 cm proximal to the pylorus, so that the antrum was left in. The staple-line was reinforced along the greater curvature side in 61%, usually by an over-and-over absorbable suture. Type 2 diabetes had been present in 73% of patients, of whom 66% were cured and 20% improved. Hypertension resolved in 88% and obstructive



Fig. 4 The resected gastric segment, distended with saline, shows the shape of a comma [16]

sleep apnea in 87%. Preoperatively, anesthetic risk ASA III was present in 57.1% and ASA IV in 42.9% (there were no ASA II patients preop). Postoperatively, only 17.1% were now ASA IV, and one-third were ASA II (measured by the anesthesiologist). LSG mortality was 0.3%, and 12% of Italian bariatric centers have adopted this operation, being the first stage in 77%.

Antonio Lacy of Barcelona [39] discussed the reversal of type 2 diabetes following LSG. GLP-1 and PYY-36 were elevated after SG, which could account for Melissas' findings above. Lacy compared LSG to LRYGBP in matched type 2 diabetics, except that those in the LSG group had a higher BMI and enlarged liver. At 8 months, resolution of diabetes was similar in both groups, as were changes in fasting plasma glucose and HbA1c. Treatment of diabetes when still required at 8 months was similar in both groups. Percent excess BMI loss (%EBL) and improvement in other comorbidities were similar.

Philippe Mognol of Paris [40] presented the early results in France. At 1 year, SG gave the same good results as RYGBP and better weight loss than after gastric banding. Those with BMI > 60 preoperatively required a second-stage procedure because, at 3 years after SG, this group had weight regain. One-third of patients had a preoperative BMI > 70 kg/m².

Dr. Greg Jossart of San Francisco discussed patients with very high BMI and high-risk patients [21]. Using the Ligasure device in LSG, he began dividing the stomach 6 cm proximal to the pylorus using a 40-Fr bougie, but later began closer to the pylorus, using a 32-Fr bougie, leaving a bit more room at the pylorus to avoid closing the pylorus. The resulting gastric tube measures only 40 ml, and the 32-Fr has yielded better weight loss. (For the DS, he constructs a larger sleeve.) He uses Seamguard® staple-line reinforcement. He orders a PPI for the first 2–3 months and a liquid protein diet for 2 weeks. The weight loss has been the same as after DS and RYGBP and better than after gastric banding. With preoperative BMI ≤ 50, a second stage has not been necessary. The weight loss has been rapid, and many patients have BMI 25 at 3 years with the 32-Fr bougie. With a BMI > 60, he does not know the final result. With BMI < 55, the SG actually had better weight loss than the RYGBP. Operating time is decreased, morbidity over time is the lowest, mortality is rare, and there is high patient satisfaction. The major problem has been a leak rate of 0.8%, treated with fibrin glue, a stent, and/or possibly a clip.

Hazam Elariny of Virginia presented an east-coast experience with LSG. He believes that SG is the next wave of bariatric surgery. He noted that with the 60-Fr bougie, as used in laparoscopic DS, there will be weight regain. SG needs more reduction of capacity of the gastric sleeve for adequate weight loss. His measurements of the resected

specimen have found a 1,200–3,000 cm³ capacity when the specimens were distended with saline. He starts his dissection 2 cm proximal to the pylorus, leaving a small antrum. In his most recent 480 patients, he added a Marlex collar 1 cm in width, 7 cm distal to the angle of His, stapled to itself over a 60-Fr bougie. He uses a 40-Fr bougie, but inserts the 60-Fr when applying the collar and to avoid entering the esophagus [41]. He leaves one branch of the gastroepiploic but starts near the pylorus.

Phil Schauer of the Cleveland Clinic presented his experience. He announced the recent position paper by the American Society for Metabolic and Bariatric Surgery, based on the early results of LSG [42]. The document will be updated as new data are received. SG is currently being used for high-risk patients as a first stage, with the second stage being the RYGBP. Complications and weight loss will be compared over time.

Aniceto Baltasar presented his experience in Spain. In review, Marceau in 1993 [43] and Hess in 1998 [44] started the DS, and the SG followed. The M&M operation maintained the fundus [30], so that the ghrelin area was not removed. Baltasar was influenced in doing the LSG by Regan's article from Gagner's group [7]. Frühbeck had found ghrelin to be in the fundus after RYGBP [31], and Langer confirmed that ghrelin is much lower after SG [34]. Baltasar uses the same ports as for DS. The patient is placed in reverse Trendelenberg, and a Nathanson liver hook (Automated Medical Products, POB 2508, Edison, NJ, USA 08818) is used to retract the liver to the right, aided by a suture through the round ligament. He originally left in the antrum, but now commences the dissection close to the pylorus. Baltasar uses a 32-Fr tube, although the bougie used at the beginning of his experience was larger. He tests for leaks with methylene blue and uses a drain for 24 h. His indications for LSG are [9]: (1) super-superobese; (2) low BMI (35–43, instead of lap-band); (3) severe medical conditions; (4) gastric band failure; (5) children aged 8–12, with very good results thus far; and (6) the elderly. With DS, EBL was >70% at 5 and 10 years. With SG, EBL has been 70% at 5 years. Severe medical conditions have had a good result.

His complications consisted of a leak at the staple-line in 2%, with the worst treated with fibrin glue, a stent [45, 46], or Roux loop [47]. One case of gastric atony was treated by total gastrectomy [48]. There were two cases of trocar-site bleeding out of 146 patients, controlled by suture. For later weight regain or inadequate weight loss, it is possible to resleeve or perform a LDS [49, 50]. However, Langer et al. [51] found that, with a 46-Fr bougie, dilatation had occurred in only one of 28 patients at 2 years after SG.

Peter Crookes of Los Angeles [1, 2] presented his 5-year results with mainly open SG. Using an open method with the Gomez retractor, the sleeve was marked out. DS was

aborted in 31 high-risk patients who underwent the SG instead, and the patients did well, so that the operation was able to stand alone in the elderly or as a first stage. SG alone was performed for cirrhosis, longer operating time to avoid rhabdomyolysis, cardiac event, ventilation problem, or common bile duct stones. The SG was also used for HIV-positive patients and for vast central obesity, with more males and twice as many diabetics in this group. There was one death from gangrenous bowel in a cocaine addict. For the past year, the SG has been performed with the laparoscopic technique, with one patient developing a gastric leak at the angle of His. The %EBL at 48 months is quite good. In 49 diabetics, 23 were cured, 11 reduced medications, and 13 were unchanged. There has been no malnutrition. As far as late results, only eight patients have reached 5 years, with %EBL 35 and moderate resolution of comorbidities. GE reflux disease (GERD) has been found in 15 out of his 118 SG patients (13%), requiring daily PPI. GERD symptoms have been difficult to control, and some patients may have to be converted to a RYGBP in the future.

Rudolf Weiner from Frankfurt presented his results from Germany [52]. From 2001 to 2006, 120 patients underwent LSG. He started with a 44-Fr bougie, but now uses a 32-Fr, which has produced greater weight loss. However, when performing an LSG for a gastric band migration, he uses a larger bougie or prefers the BPD of Scopinaro because the tighter sleeve in this situation resulted in a 5.2% leak rate (whereas leaks were otherwise rare). The effect on diabetes has been the same as after RYGBP.

Won Woo Kim of Seoul presented the results from Korea [53], where a lower BMI than 35 may be an indication for bariatric surgery. The SG is now being performed in the Philippines, Taiwan, Singapore, Japan, and Hong Kong. The bulky Korean diet consists of low fat and high carbohydrate (sticky rice, high in complex carbohydrates, in kimchi soup). Most comorbidities were markedly improved by 1 year. He uses a 48-Fr bougie, which creates a tube of 50–60 ml. At 1 year, there has been ~90% EWL, which has been maintained at about 85% at 3 years. At 6 months, diabetes resolved in 100% of their patients. Arthritis, amenorrhea, and reflux esophagitis also resolved in 100% at 1 year.

Jacques Himpens of Belgium presented his 5-year results. He started the LSG in September 2001 following the Crete International Federation for Surgery of Obesity meeting, and excluded September and October 2001 from his results because of the learning curve. Of 60 patients, 47 have been available for follow-up (78%). In his 46 patients who are beyond 5 years, 19 (40%) have been successful (EWL 60%), 11 (23%) needed a second procedure, and 16 (37%) had inadequate weight loss. Patients must be informed that they may require an added operation in the

future. He believes that DS is the best second-stage operation. In the LSG, if 2 cm proximal to the pylorus is too thick (with danger of serosa cracking), he moves an additional 1 cm proximally. For the DS, he started 6 cm proximal to the pylorus; for the LSG, he uses a 34-Fr bougie and resects more antrum [54].

Himpens reported that, at 5 years after 2,000 gastric banding operations, his reoperation rate was 50%. Comparing GERD after LSG and LAGB, he found increased use of PPIs to 1 year after LSG, following which their use decreased; after LAGB, however, GERD was more frequent after 3 years with increased use of PPIs. Weight loss and loss of hunger sensation were better after SG than LAGB at 1 and 3 years. He found significantly less vomiting after LSG compared to LAGB [54]. Bernante, Gagner, and Peterli's groups [55–57] found that LSG was a favorable revision operation after a failed gastric banding. Nocca of France also found that LSG has fewer complications than gastric banding [58] and is better than the intragastric balloon as a first-stage procedure [6], but the problem of GERD has to be considered further after longer follow-up.

Camilo Boza of Chile compared LSG with LRYGBP, with 140 patients in each group, from November 2005 to May 2006. He mobilizes the greater curvature first, commences 6 cm proximal to pylorus, resects snugly on a 60-Fr bougie, exposes the left crus completely, resects all fundus, and oversews the staple-line. His LSG weight-loss results have been the same as after LRYGBP, with the same resolution of diabetes and comorbidities. The rise in GLP-1 at 30 days after LSG was less than after LRYGBP.

Greg Dakin of Cornell, NY, discussed nutritional deficiencies and supplementation after SG [5]. There is one reported case of Wernicke's syndrome due to thiamine deficiency from vomiting after SG [59]. Deficiencies after SG are extremely rare. If vitamin D is deficient preoperatively (85% of patients), this should be replaced with calcium postoperatively. He recommends sips of clear fluids on postoperative day 1, purees in small amounts on day 2, a soft diet at 4 weeks, and introduces solids at 1–2 months, progressing. He advises chewable multivitamins.

Dr. Jossart discussed GERD and strictures. In his experience, 30% of patients have some vomiting early postoperatively. It is important to use a firm bougie and avoid narrowing at the angularis. He starts the dissection 4 cm proximal to the pylorus [21]. If a hiatal hernia is present, he approximates the crura posteriorly with a few Ethibond sutures because a wrap is impossible. He completes all gastric dissection before repairing the hiatal hernia. One must avoid stapling the esophagus. He orders a PPI for at least 2 months postoperatively.

Alfons Pomp of New York [5] uses green stapler loads for a thick stomach but notes that the gastric wall is thinner at the angle of His (although slightly thicker in males). He uses BioAbsorbable Seamguard® to buttress the staple-line, which decreases intraoperative bleeding and probably decreases leaks. In his opinion, oversewing the staple-line may not be optimal.

Professor M.J. McMahon, in a live video presentation from Leeds, UK, presented the M&M operation [30]. For the M&M, initially, a 40-Fr bougie was used, and later, a 32-Fr bougie. His group found 63% EWL at 4 years. There were a few leaks at the fundus from an ischemic staple-line. Therefore, he removed the redundant stomach, performing an SG, but found only 40% EWL at 3 years (with a few patients then being converted to RYGBP). His group noted four leaks from the upper end, of which one needed a total gastrectomy and three healed spontaneously; however, they had no leaks after using the Seamguard® buttress. EWL was similar to RYGBP (~70% EWL at 6 years). He suspects that the 10-year results will be the same as RYGBP.

Drs. Rosenthal [20] and Mattar of USA discussed SG followed by a second-stage operation, and Dr. Krawczykowski of France discussed SG after gastric banding [57, 58]. Manish Parikh of New York discussed conversion of failed RYGBP to a DS laparoscopically, in two stages if necessary [60]. In the first stage, the RYGBP was converted into a SG, and mean EWL was 34% at 1 year; the longest follow-up was 24 months with 50% EWL. After conversion to a DS, mean EWL was 62.7% after 1 year, with complete resolution of comorbidities.

Aureo De Paula of Brazil discussed a new operation—LSG with ileal transposition, which has been effective for diabetes [61, 62]. Other operations involving LSG with intestinal and enterohormonal modifications to treat obesity and associated diseases are being studied [63, 64].

The Consensus Summit

The Consensus Panel assembled in Florence Gould Hall on October 27, 2007, with a series of questions voted upon, using Meridia® Audience Response, by experts representing SG and the spectrum of bariatric operations. The panels consisted of: (1) Pomp, Inabnet, Basso, Mattar, and Kurian; (2) Jossart, Elariny, Kini, Melissas, and Bouillot; (3) Baltasar, Mognol, Zundel, Herron, and Frering; (4) Lacy, Boza, De Paula, Kim, and Bertrand; (5) Himpens, Dakin, Nocca, Miller, and Fiennes; (6) Fabre, Weiner, Assalia, Alvarez-Cordero, and Arvidsson;

(7) Higa, Deitel, Rosenthal, Ferzli, and Naim; and (8) Christou, Crookes, Rubino, Segan, and Gagner.

There were ~40 votes per question:

1. *Is sleeve gastrectomy indicated for high-risk patients?* Sixty-two percent completely agreed, 33% somewhat agreed, 0% had no opinion, 4% somewhat disagreed, and 0% completely disagreed.
The same pattern was used for all questions. One hundred percent agreed that SG is indicated for a patient with BMI>60, also for the patient with BMI>50 with little cardiac reserve (EF<15%) and for the patient with BMI>40 and cirrhosis.
2. *Is sleeve gastrectomy indicated as a primary procedure with BMI>40 or >35 with comorbidities?* Fifty-eight percent completely agreed, 19% somewhat agreed, 8% had no opinion, 14% somewhat disagreed, and 0% completely disagreed. The majority agreed that SG is indicated as a primary procedure in a patient with BMI 37 with type 2 diabetes and also for a patient with BMI 38 and obstructive sleep apnea on continuous positive airway pressure. Seventy percent completely agreed and 19% agreed somewhat that SG would be an excellent primary procedure in patients with BMI>40 or >35 with comorbidities if the %EWL at 5 years would be similar to RYGBP.
3. *Can SG be a reasonable option in special groups?* Forty-three percent completely agreed and 31% somewhat agreed. A similar result was provided in the case of a 16-year-old female with BMI 45 (adolescent) without comorbidities. In the situation of a 67-year-old male (elderly) with BMI 47 with prostate cancer who needs a prostatectomy but the urologist wants major weight loss before intervention, all but 9% completely agreed or somewhat agreed that SG was a reasonable option here. Eighty percent also agreed that SG is a reasonable option for a 72-year-old female with BMI 41 with osteoarthritis who needs hip replacement whose orthopedic surgeon wants weight loss before joint replacement and who cannot exercise.
4. *Is SG indicated as a primary procedure for BMI 30–35?* Thirty-one percent completely agreed, 19% somewhat agreed, 11% had no opinion, 17% somewhat disagreed, and 22% completely disagreed. With regard to patients with BMI 30–35 with comorbidities, 8% believe bariatric surgery is never indicated, 22% believe gastric banding is the best procedure, 8% RYGBP, 41% SG, and “other” 22%.
5. *Are SG data equivalent to or better than LAGB data when the FDA approved LAGB (3 years)?* Fifty percent agreed completely, 14% somewhat agreed, and 27%

had no opinion. A large majority believed that SG results in more weight loss than gastric banding. A majority believes, on the basis of experience (including level 1 evidence-based), that SG has fewer postoperative complications than gastric banding, but 11% feel that severe complications are more prevalent after SG. A majority voted that SG has more perioperative complications than gastric banding. Also, a majority has found that SG is less expensive than gastric banding.

6. *Are weight loss failures from SG easier to manage surgically than after other approved procedures?* Eighty percent agreed or somewhat agreed. In the situation where, after 3 years following a SG, a patient significantly regains weight, 21% would do a laparoscopic resleeve, 38% a LRYGBP, and 41% a LDS.
7. *Are complications following SG less frequent and lesser in magnitude than after RYGBP?* Thirty-two percent completely agreed and 41% somewhat agreed. It was generally agreed that the incidence of leaks after SG occurred at about the same frequency as after RYGBP. The Consensus found that strictures after SG are less frequent than after RYGBP. However, GERD after SG is significantly more frequent than after RYGBP. Regarding refractory GERD after SG, 39% would use medical treatment, 12% would use laparoscopic hiatal hernia repair (possibly with resleeve), and 44% would convert to a RYGBP.
8. *Is SG not new (similar to a long VBG or first part of a DS), and therefore, does it not require a special Institutional Review Board (IRB) consent?* Thirty-two percent agreed completely, 32% agreed somewhat, 11% had no opinion, 5% disagreed somewhat, and 21% completely disagreed. Eighty-four percent acknowledged that SG does not require an IRB protocol at their hospital. Furthermore, with respect to using the CPT code of a VBG for SG, 24% agreed, 59% disagreed, and 18% voted “unknown.” *Is there enough data to obtain a new CPT code for SG?* Seventy-one percent voted “yes,” 11% “no,” and 17% “unknown.”

Results of the Laparoscopic Sleeve Gastrectomy Questionnaire

A questionnaire had been developed regarding the LSG to provide a consensus of information at this time point. The questionnaires were filled in by the attendees and participants who had been performing the SG, and the data were

Table 1 Complications reported following sleeve gastrectomy (87 questionnaires)

Complication	Percent of patients		
	Mean±SD (%)	Median (%)	Range (%)
High leaks (EGJ)	1.6±2.8	0	0–10
Lower leaks	0.8±2.5	0	0–16
Suture-line hemorrhage	1.4±2.6	0	0–10
Splenic injury	0.1±0.7	0	0–5
Liver injury	0.1±0.8	0	0–5
Post-op GER	4.7±8.9	0	0–36
Other	1.0±2.3	0	0–10

EGJ=esophagogastric junction,
GER=gastroesophageal reflux

analyzed by Ross D. Crosby, Ph.D., and his biomedical statistics associates. The study was based on 87 completed questionnaires that had been filled out during the meeting, and are reported as mean ± SD, as median and range, or as percent where indicated.

The mean number of years performing the LSG by the respondents was 2.47 ± 1.60 (median 2, range 0.42–7.0)—a wide range. The number of LSG patients per surgeon was 73.8 ± 133.0 (median 27, range 2–850)—suggesting that a few surgeons had a large experience. In 93.8% of the surgeons, LSG was intended as their sole procedure; of these, 50.9% required a second procedure for inadequate weight loss. A total of 79.5% of the surgeons reported no conversions from a laparoscopic to an open SG.

Weight loss in kilograms were as follows:

- 1 year, 47.5 ± 19.5 (median 41.5, range 20–100, $n=34$)
- 2 years, 54.2 ± 22.4 (median 50, range 20–110, $n=17$)
- 3 years, 46.4 ± 31.3 (median 60, range 0–78, $n=5$)
- >3 years, 35.3 ± 38.3 (median 30, range 0–76, $n=3$)

%EBL was as follows:

- 1 year, 49.8 ± 19.6 (median 50, range 10–85, $n=3$)
- 2 years, 58.4 ± 19.6 (median 60.5, range 12–90, $n=28$)
- 3 years, 56.3 ± 21.6 (median 62, range 0–78, $n=13$)
- >3 years, 53.3 ± 22.6 (median 60, range 0–72, $n=8$)

Size of bougie (French units) used for the LSG was 37.3 ± 6.6 (median 36, range 28–60, $n=86$). Of 86 responses, 81 (94.2%) first mobilize the greater curvature of the stomach before constructing the sleeve, and 5 (5.8%) enter lesser sac and construct the sleeve before mobilizing the greater curvature. Of these surgeons, the resection commences 5.6 ± 1.5 cm (median 6, range 1–10) proximal to the pylorus; estimated percent of antrum removed was $40.1 \pm 28.2\%$ (median 50, range 0–100). Percent of fundus removed was $95.2 \pm 8.3\%$ (median 100, range 70–100). Regarding drainage, 65.1% leave a drain and 33.8% do not. The most common drainage was closed suction (Jackson–Pratt), but a Blake or penrose drain was used by

a number of surgeons. Of the surgeons, 97.5% believe that a silastic ring should not be placed around the sleeve.

The complications with SG that had been experienced by the surgeons are compiled in Table 1. Treatment of leaks included four early oversewing, seven drainage (CT or open, two with NJ feeding and six with TPN), and three endoscopic clipping. For persisting fistulas, three were treated with fibrin glue, five with stents, one with Roux loop, and one with total gastrectomy. For persisting fistulas, the study did not permit a comparison of the effectiveness of techniques used; however, surgeons preferred fibrin glue in 47.6% and a stent in 59.1%. Postoperative supplements were ordered by 64.1% of the surgeons and PPIs by 83.1%. A total of 67.7% of the surgeons have been following their patients with endoscopy and/or GI series, sometimes on an “as necessary” basis.

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