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Original article

Quality of life after sleeve gastrectomy and adjustable gastric banding

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Abstract

Background: With the addition of laparoscopic vertical sleeve gastrectomy (SG) to the bariatric surgery procedural toolkit, patients desiring a restrictive bariatric procedure often choose between adjustable gastric banding (LAGB) and SG. One study compared quality of life after these 2 procedures and found no difference. The purpose of our study was to re-evaluate the postoperative quality of life in LAGB and SG patients at a military teaching hospital in the United States.

Methods: A retrospective review of 108 consecutive laparoscopic restrictive bariatric procedures performed within 15 months at a Department of Defense hospital was conducted. Of these 108 patients, 69 had undergone laparoscopic vertical SG and 39 LAGB. A validated quality of life questionnaire (Bariatric Quality of Life) was conducted a mean of 9.3 ± 3.2 months (range 5–16) postoperatively. The weight loss and standard laboratory parameters were measured at 0, 1, 3, 6, and 12 months.

Results: The quality of life assessment revealed significantly better scores after SG than after LAGB (66.5 versus 57.9, $P = .0002$). The excess weight loss and excess body mass index loss at 3, 6, and 12 months postoperatively were significantly greater in the laparoscopic SG group. The patients demonstrated a clear preference over time for SG once it was offered.

Conclusion: Early postoperative quality of life was superior after SG than after LAGB. SG also resulted in superior early excess weight loss. In a practice not constrained by reimbursement, these findings were associated with increased patient choice of SG after it began to be offered. (Surg Obes Relat Dis 2012;8:31–40.) Published by Elsevier Inc. on behalf of American Society for Metabolic and Bariatric Surgery.

Keywords: Bariatric surgery; Gastrectomy; Gastroplasty; Quality of life

Laparoscopic adjustable gastric banding (LAGB) has been a commonly accepted bariatric procedure in the United States since the first adjustable gastric band received approval from the Food and Drug Administration in 2001. Laparoscopic vertical sleeve gastrectomy (SG) has emerged more recently as an intriguing alternative to the traditional classifications of "restrictive" or "malabsorptive" bariatric operations. Much of its mechanism could be restrictive in nature, but some evidence exists to suggest that hormonal mechanisms of hunger modulation could play a role in the mechanism of action of SG [1–3]. The origins of SG include both the Magenstrasse and Mill procedure [4] and the gastric restrictive portion of the duodenal switch operation. Although the SG is not a truly "new" procedure, several published series of SG [5–8] as a primary, isolated weight

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loss procedure have generated significant interest in the bariatric community.

Most previously published studies have confirmed the improved quality of life after weight loss surgery. Muller et al. [9] compared the quality of life of adjustable gastric banding patients compared with gastric bypass patients using the Moorehead-Ardelt Quality of Life Questionnaire II and found no significant differences between the 2 groups, although the excess weight loss differed significantly. Sabbagh et al. [10] compared the postoperative quality of life in patients who had undergone isolated primary SG, SG after LAGB, and LAGB and found no significant differences in the quality of life at >2 years, although the exact period between the surgery and survey in each group was not specified.

In October 2008, we introduced SG to our joint Army/Air Force bariatric program, based at an Air Force military treatment facility. Bariatric surgery is offered to spouses, dependents, and retirees from military service as a part of their full spectrum of care benefits. Active duty military members are prohibited from undergoing bariatric surgery by Surgeon General mandate. The care rendered within our military treatment facility is not subject to insurance constraints, and the surgeons are salaried, active duty, military providers. In this program, LAGB and laparoscopic Roux-en-Y gastric bypass were offered until October 2008, when SG was introduced. Patients soon began choosing SG much more frequently than LAGB. Although this curious anomaly in a cost-neutral system could have simply been a result of surgeon and patient enthusiasm for a novel procedure, we undertook a study of postoperative quality of life as a possible alternate explanation.

Patients can choose their bariatric procedure according to the real or perceived weight loss outcomes, safety, and quality of life communicated by other patients within the program or other programs. Other factors cited in 1 heavily LAGB-oriented study included referring physician experience and loosely defined "invasiveness" [11].

Our program requires that patients attend ≥1 bariatric support group meeting before undergoing bariatric surgery. This allows preoperative patients the chance to interact with postoperative gastric bypass, LAGB, and SG patients. The Internet might also play a key role in allowing patients across the United States to form a large "support network," communicating about procedures, insurers, surgeons, and hospitals.

The present study evaluated the postoperative quality of life of patients, comparing LAGB and SG.

Methods

The study design was a retrospective cohort analysis. The patients in our bariatric program choose to undergo laparoscopic Roux-en-Y gastric bypass, LAGB, or SG according to their preference and physician guidance. Each patient is presented with their surgical options, and an informed consent discussion is performed, summarizing the best available evidence for each procedure. The laparoscopic Roux-en-Y gastric bypass patient numbers remained stable throughout the study period, and the present study was not designed to focus on that operation, but rather on the restrictive procedures. The indications for bariatric surgery conformed to the 1991 National Institutes of Health consensus statement, using a body mass index (BMI) of >40 kg/m^2 or 35–39.9 kg/m^2 with significant obesity-related co-morbidities. Wilford Hall Medical Center institutional review board approval was requested and granted to review patient procedural choice and the short-term outcomes of the restrictive bariatric procedures and to perform a validated quality of life telephone survey (Bariatric Quality of Life [BQL], as described by Weiner et al. [12]). The BQL survey contains 30 questions, and the possible scores range from 14 to 78, with greater scores representing better quality of life. The survey includes 15 questions focusing on postoperative symptoms, 1 question regarding cessation of medications, and 14 items using a 5-point Likert scale focusing on quality of life. The BQL instrument has been prospectively validated, although the form published in English does contain typographical errors (greater numbers should denote better quality of life for survey items 7, 8, 9, and 11), which we corrected before using the instrument (Table 1). Verbal informed consent by telephone was documented by the investigators before survey administration.

Surgical pathway

All patients undertook a 2-week preoperative, liquid, high-protein, low-carbohydrate fast, similar to that described by Fris [13]. All procedures were performed with the patient supine on the operating table, without separating the legs. Deep vein thrombosis prophylaxis consisted of perioperative sequential compression devices on the legs and enoxaparin 40 mg administered subcutaneously at induction. Foley catheters were not used; instead, the patients voided immediately before the operation. Intravenous cefazolin 2 g was given to all patients, and 500 mg intravenous metronidazole was also administered to the SG patients. For patients with penicillin or cephalosporin allergy, ciprofloxacin 400 mg was substituted for cefazolin. The abdomen was entered with a 12 mm Ethicon XCEL trocar (Ethicon EndoSurgery, Cincinnati, OH) under optical guidance. Preinsufflation with a Veress needle was used in cases of a reoperative abdomen.

For all patients, a postoperative liquid diet was continued for 2 weeks before allowing the patients to advance to pureed food and then to solid foods at 3 weeks postoperatively. Scheduled follow-up visits at 3, 6, and 12 months, and yearly thereafter, were arranged, with additional visits for LAGB patients every 4–6 weeks, with band adjustments as the patient's weight loss and satiety dictated.

Table 1
Bariatric quality of life survey

Question	Answer and score				
Do you suffer from					
Vomiting	Yes ☐ 0		No ☐ 0.5		
Sour belching	Yes ☐ 0		No ☐ 0.5		
Heartburn	Yes ☐ 0		No ☐ 0.5		
Nausea	Yes ☐ 0		No ☐ 0.5		
Diarrhea	Yes ☐ 0		No ☐ 0.5		
Flatulence (gas)	Yes ☐ 0		No ☐ 0.5		
Foul-odor feces	Yes ☐ 0		No ☐ 0.5		
Bladder problems/urinary incontinence	Yes ☐ 0		No ☐ 0.5		
Hair loss	Yes ☐ 0		No ☐ 0.5		
Gallstones (or gallbladder removed)	Yes ☐ 0		No ☐ 0.5		
Diabetes	Yes ☐ 0		No ☐ 0.5		
High blood pressure/hypertension (even if treated)	Yes ☐ 0		No ☐ 0.5		
Asthma/sleep apnea	Yes ☐ 0		No ☐ 0.5		
Arthritis/joint pain	Yes ☐ 0		No ☐ 0.5		
Gout	Yes ☐ 0		No ☐ 0.5		
Other:					
Do you take any medication regularly?	Yes ☐ 0		No ☐ 0.5		
If yes, what kind of medication do you take?					
Antidiabetics	Yes ☐		No ☐		
Insulin	Yes ☐		No ☐		
Antihypertensives	Yes ☐		No ☐		
Antidepressants	Yes ☐		No ☐		
Appetite suppressants	Yes ☐		No ☐		
Diuretics	Yes ☐		No ☐		
Pain killers	Yes ☐		No ☐		
1. I like my weight.					
	☐ 5 Absolutely true	☐ 4 True	☐ 3 Half/half	☐ 2 Wrong	☐ 1 Absolutely wrong
2. I can accept my weight.					
	☐ 5 Absolutely true	☐ 4 True	☐ 3 Half/half	☐ 2 Wrong	☐ 1 Absolutely wrong
3. How is your actual quality of life?					
	☐ 5 Very good	☐ 4 Good	☐ 3 OK	☐ 2 Bad	☐ 1 Very bad
4. I exercise regularly.					
	☐ 5 Absolutely true	☐ 4 True	☐ 3 Half/half	☐ 2 Wrong	☐ 1 Absolutely wrong
5. I am participating in social activities (theater, etc.).					
	☐ 5 Absolutely true	☐ 4 True	☐ 3 Half/half	☐ 2 Wrong	☐ 1 Absolutely wrong
6. I often meet friends or family.					
	☐ 5 Absolutely true	☐ 4 True	☐ 3 Half/half	☐ 2 Wrong	☐ 1 Absolutely wrong
7. I feel excluded from social life.					
	☐ 1 Absolutely true	☐ 2 True	☐ 3 Half/half	☐ 4 Wrong	☐ 5 Absolutely wrong
8. I feel under pressure because of my weight.					
	☐ 1 Absolutely true	☐ 2 True	☐ 3 Half/half	☐ 4 Wrong	☐ 5 Absolutely wrong
9. Sometimes, I feel depressed.					
	☐ 1 Absolutely true	☐ 2 True	☐ 3 Half/half	☐ 4 Wrong	☐ 5 Absolutely wrong
10. All in all, I feel satisfied in my life.					
	☐ 5 Absolutely true	☐ 4 True	☐ 3 Half/half	☐ 2 Wrong	☐ 1 Absolutely wrong
11. I feel restricted because of my weight.					
11a. At home					
	☐ 1 Absolutely true	☐ 2 True	☐ 3 Half/half	☐ 4 Wrong	☐ 5 Absolutely wrong

Table 1
Continued.

Question	Answer and score				
11b. At work					
	☐ 1 Absolutely true	☐ 2 True	☐ 3 Half/half	☐ 4 Wrong	☐ 5 Absolutelywrong
11c. Privately					
	☐ 1 Absolutely true	☐ 2 True	☐ 3 Half/half	☐ 4 Wrong	☐ 5 Absolutelywrong
12. I feel self-confident.					
	☐ 5 Absolutely true	☐ 4 True	☐ 3 Half/half	☐ 2 Wrong	☐ 1 Absolutelywrong

Adapted from Weiner et al. [12], with typographical corrections.

Laparoscopic vertical SG technique

For laparoscopic vertical SG, the greater curvature vessels were divided using either the EnSeal or Harmonic scalpel device (Ethicon EndoSurgery). A sizing bougie, 32–40F according to surgeon preference, was inserted transorally and positioned adjacent to the lesser curvature of the stomach. Initially, stapling began 5–6 cm from the pylorus, but we later modified our technique to begin only 2–3 cm from the pylorus. The antral staple line was initiated with 2 firings of the 4.8-mm stapler, followed by 3.5-mm staples on the cephalad remainder of the stomach. SEAMGUARD Bioabsorbable Staple Line Reinforcement (W.L. Gore, Flagstaff, AZ) was initially used as tissue reinforcement; however, in April 2009, we began using the Autosuture Duet TRS single-use loading unit stapler (Covidien Autosuture, Mansfield, MA) with integrated bioabsorbable reinforcement strips. Selective oversewing of problem areas on the staple line, such as acutely angled staple line junctions or areas of oozing, was performed. All patients underwent an endoscopic air-leak test at the conclusion of the procedure, with the gastric tube submerged in saline irrigant and the endoscope inflating and examining the inner lumen. A closed-suction drain was left in place adjacent to the gastric staple line for 48 hours postoperatively. Postoperative contrast swallow studies were performed, beginning with water-soluble contrast and proceeding to thin barium if no large extravasation was shown. Later in our practice, swallow studies were obtained only infrequently, according to the findings in the operating room, or for postoperative fever or tachycardia. The patients were discharged home on postoperative day 1 or 2. The SG patients were instructed to take daily oral proton-pump inhibitors for 1 year postoperatively.

LAGB technique

The pars flaccida approach was used to insert the Lap-Band device (Allergan, Irvine, CA). When a hiatal hernia was encountered in dissecting the angle of His, it was repaired by performing cruroplasty using permanent braided suture in the anterior position. The band was buckled around the top portion of the stomach to create a 20-mL "pouch." A gastrogastric imbrication was performed to prevent anterior slippage. The tubing was brought out through a 15-mm left upper quadrant trocar site and connected to the port, which was secured to the anterior rectus fascia using 2-0 polypropylene sutures. No saline was instilled at surgery other than what was needed to displace air in the system. Postoperatively, either a barium swallow test or plain radiograph was performed before allowing the patient to drink a protein-rich, low-calorie liquid diet. The patients were discharged on postoperative day 1. The patients were first evaluated for a band adjustment at 4–6 weeks and were scheduled to return to the clinic for adjustment every 6 weeks thereafter, until adequate satiety and weight loss were achieved.

Definitions

Standard BMI definitions were used. The percentage of excess weight loss was defined as follows: (weight lost)/(preoperative weight − ideal body weight), with the ideal body weight defined using the standard Devine formula, equivalent to that found in the Metropolitan Life Insurance tables. For men, the ideal body weight equals 50 kg plus 2.3 kg/1 in. >5 ft., and for women, the ideal body weight equals 45.5 kg + 2.3 kg/1 in. >5 ft. The percentage of excess BMI loss was defined as follows: (BMI points lost)/(preoperative BMI − 25).

Statistical analysis

All variables were tested for normality. For the variables that did not pass the test, the Mann-Whitney nonparametric test comparing 2 independent samples was used instead of the *t* test. Fisher's exact test was used to compare SG versus LAGB involving contingency tables. Multivariate comparisons over time were done using the *t* test. All hypotheses tested were 2 sided with an overall level of significance set at $\alpha = .05$. The analysis tools were SAS, version 9.1.3 (SAS Institute, Cary, NC) and Microsoft Excel 2007 (Redmond, WA).

Table 2
Preoperative baseline characteristics

Characteristic	LAGB group	SG group	*P* value
Age (yr)	47.0 ± 9.5	49.6 ± 10.7	.1081
Men (n)	7/39 (17.9)	15/69 (21.7)	.8045
Weight (kg)	115.9 ± 19.6	118.6 ± 20.9	.6383
Preoperative BMI (kg/m^2)	41.9 ± 5.2	42.7 ± 5.0	.3246
Total cholesterol (mg/dL)	196.3 ± 34.2	172.8 ± 37.6	.0008
Systolic blood pressure (mm Hg)	137.6 ± 15.1	136.2 ± 12.7	.8790
Diabetic subgroup	17/39 (43.6)	31/69 (44.9)	1.0000
Fasting glucose (mg/dL)	104.1 ± 15.6	125.4 ± 41.7	.0788
Hemoglobin A1c (%)	6.6 ± 1.2	6.9 ± 1.0	.1450

LAGB = laparoscopic adjustable gastric banding; SG = sleeve gastrectomy; BMI = body mass index.

Data presented in mean ± standard deviation or numbers, with percentages in parentheses.

Results

From July 2008 to September 2009, 108 patients underwent restrictive bariatric procedures. Of these 108 patients, 39 (36.4%) had undergone LAGB and 69 (63.6%) SG. Clinic follow-up data were available for 107 (99%) of 108 patients at 1 month, 94 (87%) of 108 at 3 months, 92 (85.2%) of 108 at 6 months, and 42 (70%) of 60 at 12 months. Of the LAGB patients, the mean number ± standard deviation of band adjustments during the first 12 months was 4.1 ± 2.1 (range 0–10). One patient moved out of the area with her military spouse after the first postoperative visit and thus underwent no adjustments in our clinic. However, she was provided with information on local bariatric surgeons in the location to which she moved. Overall, 48 patients (44%) had type 2 diabetes mellitus preoperatively. The baseline characteristics for the 2 cohorts are listed in Table 2. Only the baseline total cholesterol level differed significantly between the 2 groups. The trend of procedure selection is evident in Figure 1, with SG rapidly assuming dominance as the restrictive procedure of choice.

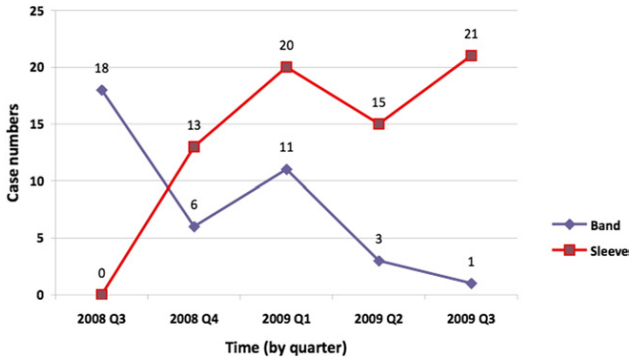

Fig. 1. Patient choice of procedure over time.

Table 3
Operative morbidity (90-d)

Variable	LAGB	SG
Any complication*	6 (15.4)	11 (15.9)
Grade 1		
Urinary retention		3
Readmission for dehydration	1	1
Wound seroma	1	
Emergency room visit for noncardiac chest pain		1
Reflux symptoms		1
Grade 2		
Wound cellulitis	1	1
Urinary tract infection		1
Transfusion for postoperative anemia		1
Grade 3		
Reoperation under general anesthesia	3	2

LAGB = laparoscopic adjustable gastric banding; SG = sleeve gastrectomy.

Data in parentheses are percentages.

* p = NS.

Operative morbidity and mortality

No mortalities occurred in either group. The postoperative 90-day morbidity, categorized by the Clavien grade [14], is compared in Table 3. No staple line leaks or intra-abdominal infections developed in the SG group. No clinically apparent venous thromboembolism was diagnosed in either group. No conversions from the laparoscopic technique were made. The major 90-day morbidity in the LAGB group included 2 reoperations for flipped and inaccessible ports and 1 reoperation for acute cholecystitis 1 month after LAGB. The major morbidity in the SG group included reoperation for gastric staple line bleeding in 2 patients and 1 transfusion of packed red blood cells in 1. All 3 bleeding complications occurred early in the series and did not recur in the present series after the change in tissue reinforcement material. No significant difference was found in the 90-day postoperative complication rate between the LAGB and SG groups (15.4% in the LAGB group and 15.9% in the SG group, P = 1.00). Not included in 90-day morbidity rates were 4 late reoperations in the LAGB group: 2 for band removal owing to patient intolerance at 6 and 27 months after LAGB, and 2 at 17 and 19 months after LAGB for weight loss failure, with removal of the band and revision to SG.

BQL survey outcomes

The BQL surveys were conducted by telephone a mean of 9.3 ± 3.2 months (range 5–16) postoperatively. Because the surveys were conducted at a single point, and because of the chronologic shift in patient preference toward SG, the surveys for the LAGB patients were performed, on average, longer from the date of surgery (11.4 ± 3.2 mo postoperatively for the LAGB group versus 7.9 ± 2.2 mo postoperatively for the SG group).

Table 4
BQL survey results, part 1, LAGB versus SG

Results	LAGB group	SG group	*P* value
BQL composite score	57.9 ± 12.3	66.5 ± 9.1	.0002
Symptom scores			
Vomiting	16 (43)	1 (2)	<.0001
Sour belching	5 (14)	4 (7)	.4763
Heartburn	12 (32)	8 (15)	.0694
Nausea	7 (19)	3 (5)	.0831
Diarrhea	1 (3)	5 (9)	.3956
Flatulence	20 (54)	21 (38)	.1423
Foul-odor feces	5 (14)	4 (7)	.4763
Bladder/urinary problems	5 (14)	7 (13)	1.0000
Hair loss	14 (38)	27 (49)	.3924
Gallstones	2 (5)	1 (2)	.5625
Diabetes	6 (16)	9 (16)	1.0000
Hypertension	16 (43)	18 (33)	.3796
Asthma	22 (59)	19 (35)	.0208
Arthritis	21 (57)	27 (49)	.0527
Gout	2 (5)	1 (2)	.5625
Any medication use	32 (86)	44 (80)	.5767

BQL = Bariatric Quality of Life index; LAGB = laparoscopic adjustable gastric banding; SG = sleeve gastrectomy.
Data in parentheses are percentages.

BQL survey data were obtainable for 37 (94.9%) of 39 patients after LAGB and 55 (79.7%) of 69 patients after SG. The BQL scores are listed in Tables 4 and 5. The SG patients demonstrated a significantly greater BQL composite score than the LAGB patients (66.5 versus 57.9, respectively, $P = .0002$), indicating greater quality of life. With respect to specific symptoms, the SG patients reported significantly less vomiting than the LAGB patients (2% versus 43%, respectively, $P < .0001$). Asthma was also reported less frequently postoperatively in the SG group. A nonsignificant trend was seen toward a lower frequency of heartburn and nausea in the SG group. Part 2 of the BQL survey (Table 4) showed a consistent pattern of greater socially related quality of life in the SG group. The only exceptions were in the participation in social activities (question 5), meeting with friends or family (question 6), and the frequency of exercise (question 4), in which the scores for both groups were similar.

Weight loss outcomes

The weight loss among the 2 patient groups, defined by the percentage of excess weight loss and percentage of excess BMI loss, is compared in Table 6. Both LAGB and SG experienced significant excess weight loss and excess BMI loss compared with the baseline values ($P < .0001$ at 1, 3, 6, and 12 mo). At 1, 3, 6, and 12 months of follow-up, the SG group demonstrated a significantly greater percentage of excess weight loss and percentage of excess BMI loss than the LAGB group.

Discussion

Laparoscopic vertical SG, although not a truly new operation, nevertheless has assumed a trajectory of increasing popularity as a primary weight loss procedure, a trend we anticipate will only continue if more insurers offer coverage in the future. We were impressed by the rapidity with which the patients shifted to choose SG instead of LAGB in a program that offers both options, in addition to gastric bypass, and can do so without any financial motivation. The BQL survey results and weight loss comparisons offer a glimpse into why patients might choose 1 procedure over another.

The postoperative quality of life after bariatric surgery is thought to depend on the quantity of weight loss, resolution of co-morbid medical conditions, improved function in daily activities, and the absence of postoperative complications. No reference standard yet exists for the assessment of bariatric postoperative quality of life. A number of instruments for the assessment of quality of life exist, both general and bariatric specific in nature. The general instruments used to assess quality of life in previous bariatric surgery studies included the Short-Form 36-item Health Survey [9,15,16] or the shorter 12-item questionnaire [12,17,18], the Nottingham Health Profile [19], the Gastrointestinal Quality of Life Index [12], the EQ-5D [20], various institution-specific visual analog scales, and the Linear Analogue Self-Assessment Questionnaire [18]. Additionally, a number of studies have been published using bariatric surgery-specific quality of life instruments, including the Swedish Obese Subjects Quality of Life Survey [21], the Bariatric Analysis and Reporting Outcome System (BAROS) [12,22,23], which incorporates the Moorehead-Ardelt Quality of Life Questionnaire II [9,10,24], and the BQL [12].

When comparing the BQL scores between the 2 groups, the significantly greater rates of vomiting in the LAGB patients, along with the strong trend toward greater rates of heartburn and nausea symptoms, were surprising findings. Some published reports have suggested that postoperative regurgitation and reflux are found in a significant proportion of postoperative SG patients [25,26]. Our survey, however, suggests that LAGB patients might, in fact, experience greater rates of vomiting and reflux symptoms. A part of this effect could be attributable to our practice of instructing SG patients to take daily oral proton-pump inhibitors for the first postoperative year. We would still recommend caution, however, in performing SG in patients with pre-existing complicated reflux disease. Our group favors laparoscopic Roux-en-Y gastric bypass for that patient subset.

In general, the remarkable finding in our study was the greater BQL scores after SG compared with those after LAGB. The social dimension examined in the second part of the BQL survey (Table 5) revealed a consistently greater quality of life after SG in a number of spheres, leading us to believe the statistical significance of these findings was not

Table 5
Bariatric quality of life survey results, part 2, LAGB versus SG

Question	Absolutely true or very good (%)	True or good (%)	Half/half or okay (%)	Wrong or bad (%)	Absolutely wrong or very bad (%)	*P* value
1. I like my weight.						.0246
LAGB	8	8	46	16	22	
SG	22	25	36	9	7	
2. I can accept my weight.						.0001
LAGB	8	19	32	30	11	
SG	47	24	15	7	7	
3. How is your actual quality of life?						.0406
LAGB	32	43	24	0	0	
SG	56	35	9	0	0	
4. I exercise regularly.						.0604
LAGB	22	30	38	11	0	
SG	49	18	24	7	2	
5. I am participating in social activities (theater, etc.).						.2767
LAGB	43	30	14	11	3	
SG	64	20	9	7	0	
6. I often meet friends or family.						.5372
LAGB	51	24	16	5	3	
SG	65	20	11	4	0	
7. I feel excluded from social life.						.0465
LAGB	5	0	16	16	62	
SG	0	4	4	15	78	
8. I feel under pressure because of my weight.						.0004
LAGB	5	19	8	24	43	
SG	4	0	11	9	76	
9. Sometimes, I feel depressed.						.0343
LAGB	16	19	22	16	27	
SG	11	4	15	16	55	
10. All in all, I feel satisfied in my life.						.0031
LAGB	24	35	38	3	0	
SG	58	27	13	2	0	
11. I feel restricted because of my weight						
11a. At home						.0332
LAGB	3	14	11	19	54	
SG	2	2	4	13	80	
11b. At work						.00009
LAGB	5	8	11	24	51	
SG	0	0	2	7	91	
11c. Privately						.0006
LAGB	5	14	24	22	35	
SG	2	4	7	9	78	
12. I feel self-confident.						.0478
LAGB	30	46	16	3	5	
SG	56	29	13	2	0	

LAGB = laparoscopic adjustable gastric banding; SG = sleeve gastrectomy.

a mathematical aberration. To our knowledge, the BQL survey has not been used to compare the outcomes from 2 different procedures as we have done.

We chose the BQL survey instrument because it is a bariatric-specific quality of life instrument and goes beyond merely reporting whether medical co-morbidities have improved to record specifics about symptom sets and particular facets of social interaction. Although other scoring systems, such as the BAROS quality of life survey (incorporating the Moorehead-Ardelt quality of life questionnaire) are simpler and more widely used, we believe the BAROS survey might oversimplify quality of life. Another of our reasons for choosing the BQL survey relates to the proprietary, fee-based nature of the BAROS survey. We are grateful to Weiner et al. [12] for offering the BQL instrument without a request for payment, as a service to the bariatric community and a contribution to medical science.

The morbidity in both LAGB and SG groups was low. Although both SG and LAGB groups demonstrated significant excess weight loss and excess BMI loss compared

Table 6
Weight loss over time, determined by mean %EWL and mean %EBL

Variable	Follow-up point (mo)			
	1	3	6	12
%EWL				
LAGB	15.2 ± 5.5	21.6 ± 9.5	28.1 ± 14.7	29.5 ± 16.7
SG	20.3 ± 6.1	34.1 ± 8.8	43.3 ± 11.4	47.2 ± 11.9
P value (LAGB versus SG)	.0001	.0001	.0001	.0003
%EBL				
LAGB	19.1 ± 7.2	27.2 ± 11.8	35.5 ± 18.8	36.9 ± 20.7
SG	25.0 ± 7.5	42.4 ± 11.6	53.5 ± 15.3	58.1 ± 17.6
P value (LAGB versus SG)	.0003	.0001	.0001	.0009

%EWL = percentage of excess weight loss; %EBL = percentage of excess body mass index loss (>25 kg/m^2); other abbreviations as in Table 2. Data presented as mean ±standard deviation.

with the same group at baseline, the SG group experienced significantly better excess weight loss and BMI loss than the LAGB group. This parallels other published weight loss data for both LAGB and SG. One potential criticism of this comparison is that it is well known that LAGB patients typically do not reach a weight loss nadir until close to 2 years postoperatively. Many of the studies describing the remission of diabetes and other co-morbidities in LAGB patients have used a 2year endpoint [27,28]. However, the relatively flat weight loss curve after 6 months in the LAGB population is consistent with our experience with this technique, and our band adjustment regimen is consistent with that espoused in published studies and recommended by the manufacturer [29]. The quality of life measures, such as regurgitation and vomiting that the LAGB patients scored poorly on in the present survey have been elsewhere reported to consistently increase the longer the band has been in place [26].

The late reoperation rate after LAGB is significant and escapes the usual 30- or 90-day morbidity reporting. This has been well-described previously [30] and should be acknowledged in the preoperative informed consent discussions between the patient and surgeon.

One limitation of our study was the postoperative follow-up point at which the BQL survey was performed. The LAGB patients were surveyed an average of 3.5 months later postoperatively than the SG patient cohort. However, we believe the comparison at least approaches validity, because it is often argued that LAGB patients achieve weight loss slower than do SG or gastric bypass patients. Thus, a comparison in which the SG patients were closer to their surgery than the LAGB patients could indeed be worthwhile. Perhaps the most valid comparison could be made when both groups are 3–5 years from surgery.

Another significant limitation of the present study was the lack of a preoperative comparison of BQL scores. Although the LAGB and SG groups appeared very similar with regard to the baseline demographics, co-morbidities, and obesity, it would be helpful to compare a pre- and postoperative BQL survey in these 2 groups. Although the difference in BQL scores between the LAGB and SG groups was highly significant, we do not know that such a difference in the quality of life did not already exist preoperatively.

Six of the questions in the BQL survey focus on weight and weight loss (items 1, 2, 8, 11a, 11b, and 11c). It could be argued that such an emphasis on weight loss in the bariatric postoperative quality of life assessments unfairly portrays LAGB patients as having a poorer quality of life. This could be one reason Sabbagh et al. [10] found no difference in postoperative quality of life between LSG and LAGB using the Moorehead-Ardelt Quality of Life Questionnaire II, which does not incorporate any directly weight-related questions. We would argue that bariatric postoperative quality of life does depend significantly on the patient's weight loss. Weight loss is the primary expectation of the bariatric patient, and bariatric surgeons know how frustrated patients can be who struggle with inadequate weight loss after any procedure. Generic health-related quality of life surveys, such as the Short Form 36-item Health Survey, might pay less attention to weight but could also fail to adequately describe significant postbariatric quality of life issues. We believe that the BAROS and BQL surveys do attempt to assess each of the spheres of weight loss: postoperative symptoms and complications, social functioning, and self-esteem. Of the 9 possible points in the BAROS survey, 3 (33%) relate to weight loss, and 30 (38.5%) of 78 possible points in the BQL survey relate to weight.

A potential confounder in the present study relates to the intensity of postoperative follow-up after LAGB. It could be argued that the frequent postoperative visits for LAGB adjustment adversely affects patients' quality of life, accounting for the lower BQL scores. We would argue that, as shown in the study by Shen et al. [29], more frequent postoperative follow-up visits actually improve weight loss after LAGB, which should, in turn, improve BQL scores. It is also possible that the frequency of postoperative follow-up after LAGB drove some patients (or their surgeons) to choose SG for its relative convenience. However, no financial incentive was provided to the patients or surgeons

to choose one or the other, because there was no cost for the procedure or clinic visits.

Finally, we regard with interest the observed decline in popularity of LAGB in our patient cohort and the concurrent increase in popularity of SG. Although we would like to believe that we surgeons are always objective, we are susceptible to many of the same biases and misperceptions as our patients. Each patient brings their own fears, hopes, experiences, and education to the informed consent discussion. Each surgeon is informed not just by the published medical data, but also by their collected experience with other patients. The surgeon's enthusiasm in offering a novel procedure is likely to influence some patients toward that procedure, despite our best efforts to provide impartial and evidence-based information. Any nonrandomized review of procedural choice, such as we have presented, will inevitably have a different outcome, depending on the center and the observer. However, the present study illuminates one potential outcome when a program, first, offers a full spectrum of well-accepted restrictive and malabsorptive procedures, and, second, is not influenced by concerns of cost or reimbursement. This description of our patients' choices represents as close to a pure clinical decision-making process as we can imagine, given our lack of financial constraints or reimbursement concerns in what amounts to a socialized system of healthcare.

Laparoscopic vertical SG is unlikely to entirely displace LAGB; however, as the data of its safety and efficacy increase, it is possible that the growth in the numbers of patients undergoing SG will occur within the population who otherwise would only have considered LAGB. We believe that this shift happens for a number of reasons. First, patients typically have already decided for or against Roux-en-Y gastric bypass, a combination restrictive and malabsorptive procedure, before coming to the clinic. The patients unwilling to undergo a malabsorptive procedure are thus faced with 2 "restrictive" procedures: LAGB and SG. Although it might be argued that SG is not a purely "restrictive" operation, given its effects on the plasma ghrelin levels, it tends to be grouped with the restrictive weight loss procedures by both the public and bariatric surgeons. It is the outcomes from these 2 operations that patients are likely to compare and, given the significantly better excess weight loss and quality of life seen after SG, the patient who is allowed to choose might select SG instead of LAGB. This presumes that the surgeon offers, and is competent to perform, any of the available weight loss procedures.

Conclusion

Both laparoscopic vertical SG and LAGB yield significant excess weight loss and excess BMI loss in short-term follow-up. The perioperative morbidity in our series was identical after vertical SG and LAGB. Laparoscopic SG resulted in better early postoperative weight loss and quality of life compared with LAGB. The difference in excess weight loss and the more intangible quality of life benefits could explain some of the shift in patient preference toward SG in our practice.

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