ORIGINAL ARTICLE

Laparoscopic Gastric Bypass Is Superior to Adjustable Gastric Band in Super Morbidly Obese Patients

A Prospective, Comparative Analysis

Wilbur B. Bowne, MD; Kell Julliard, MS; Armando E. Castro, MD; Palak Shah, MD; Craig B. Morgenthal, MD; George S. Ferzli, MD

Hypothesis: Outcome following laparoscopic adjustable gastric banding (LAGB) in super morbidly obese patients is significantly worse compared with the standard laparoscopic Roux-en-Y gastric bypass (LRYGB).

Design: Prospective case series.

Setting: Community teaching hospital (490 beds).

Patients: A prospectively maintained database identified patients who underwent operative treatment for morbid obesity between February 2001 and June 2004. The study group included super morbidly obese patients (body mass index >50 [calculated as weight in kilograms divided by the square of height in meters]) following LAGB and LRYGB.

Interventions: Among 106 patients with super morbid obesity, 60 (57%) and 46 (43%) underwent LAGB and LRYGB, respectively.

Main Outcome Measures: Patient demographics, weight loss, percentage of excess weight loss, change in body mass index, early (<30 days) and late (≥30 days) complications, reoperations, medical comorbidity, and patient satisfaction were studied. Analysis was performed using the *t* test and Pearson χ^2 analysis.

Results: Overall median follow-up was 16.2 months (range, 1-40 months). Preoperative factors of patient age, sex, weight, body mass index, and medical comorbidity were similar between the 2 groups. Compared with LRYGB, patients who underwent LAGB experienced a greater incidence of late complications ($P<.05$), reoperations ($P<.04$), less weight loss ($P<.001$), and decreased overall satisfaction ($P<.006$). Likewise, patients who underwent LRYGB had a greater resolution of concomitant diabetes mellitus ($P<.05$) and sleep apnea ($P<.01$) compared with the LAGB group. Furthermore, postoperative adjustments to achieve consistent weight loss for LAGB recipients ranged from 1 to 15 manipulations. Our single mortality was in the LAGB group.

Conclusions: In super morbidly obese patients, LAGB is significantly associated with more late complications, reoperations, less weight loss, less reduction of medical comorbidity, and patient dissatisfaction compared with LRYGB. Further evaluation of LAGB in this patient population appears warranted.

Arch Surg. 2006;141:683-689

Author Affiliations: Departments of Surgery (Drs Bowne, Castro, Shah, Morgenthal, and Ferzli) and Clinical Research (Ms Julliard), The State University of New York, Health Science Center of Brooklyn, and Lutheran Medical Center, Brooklyn.

THE PREVALENCE OF OBESITY in the United States has markedly increased over the past 2 decades, with a proportion occurring in the super morbidly obese population (body mass index [BMI] >50 [calculated as weight in kilograms divided by the square of height in meters]).[1] As described by Mason et al[2] in 1987, these patients have a weight equal to or greater than 225% higher than their ideal body weight. Indeed, super morbidly obese patients have a higher incidence of medical comorbidity including hypertension, diabetes mellitus, pulmonary dysfunction, sleep apnea, and degenerative arthritis, thus predisposing these patients to greater risk following bariatric surgery.[3,4] Further complicating this issue is the lack of evidence-based outcome data comparing commonly performed bariatric procedures, laparoscopic adjustable gastric band (LAGB) and laparoscopic Roux-en-Y gastric bypass (LRYGB), in this high-risk patient population.

Historically, LAGB has been the most commonly performed operation for the treatment of morbid obesity in Australia and

Europe since 1993.[5,6] Following approval by the Food and Drug Administration in 2001, LAGB has provided surgeons and patients with an alternative treatment strategy beside LRYGB. The advantages of LAGB are well known.[7-18] However, controversial, increasing experience with LAGB (BMI>35) reports a higher incidence of failure and complications.[19-29] As LAGB and LRYGB have become routine at our institution, concerns over safety, feasibility, and effectiveness of LAGB in our super obese patients remain unclear.

Therefore, this investigation was undertaken with the following aims: (1) to compare the demographic and comorbidity profile of super morbidly obese patients undergoing LAGB and LRYGB procedures, (2) to determine and compare weight loss, change in BMI, early and late complications, and patient satisfaction after LAGB and LRYGB, and (3) to establish the influence of LAGB and LRYGB on concomitant medical comorbidity.

METHODS

PATIENTS

More than 315 bariatric procedures for morbid obesity were performed at our institution by a single surgeon (G.S.F.) between February 2001 and June 2004. Operations were performed in the setting of a comprehensive multidisciplinary program with an established laparoscopic surgery fellowship. A prospectively maintained database identified a consecutive series of 106 super morbidly obese patients (BMI>50) who underwent either LAGB (60 patients) or LRYGB (46 patients) during this 3-year period. Patient information and follow-up were obtained from the database, medical record review, operative reports, and patient interviews. The collection of clinical data, and its organization into a computerized bariatric database, was approved by the Human Studies Committee in accordance with the Health Insurance Portability and Accountability Act of 1996.

All patients undergoing LAGB had the LAP-BAND System (INAMED Health, Santa Barbara, Calif) placed. The surgeon completed mandatory training in a LAP-BAND System workshop. The indications for obesity surgery were the same for both groups and established by the National Institutes of Health Consensus Development Panel[30]: BMI of 40 or higher or 35 or higher in the presence of obesity-related comorbidities. All patients had failed to maintain weight loss with a supervised dietary and exercise program (8-12 months). Patients were allowed to choose from either LAGB or LRYGB after extensive multidisciplinary counseling (nutritionist, endocrinologist, psychologist, and surgeon) regarding treatment options for super morbid obesity. Standard education programs of at least 3 mandatory nutrition-psychological support group meetings were required before surgery.

PREOPERATIVE ASSESSMENT AND PREPARATION

Patients attended comprehensive informational and support group meetings. Additional specialty consultation was obtained if indicated. All patients were required to undergo cardiac, pulmonary, and upper gastrointestinal evaluation before surgery. At the discretion of the pulmonologist, most patients were required to undergo overnight polysomnography. If patients were diagnosed with obstructive sleep apnea, institution of nocturnal continuous positive airway pressure therapy was required before surgery. Patients undergoing LRYGB had preoperative bowel cleansing. Prophylaxis against venous thromboembolism consisted of perioperative lower extremity sequential pneumatic compression devices. Prophylactic intravenous antibiotic administration was routine for all patients.

OPERATIVE CONDUCT

Laparoscopic Adjustable Gastric Banding

The surgical technique used for LAGB has been previously described.[8,31] Briefly, blunt dissection and electrocautery were used to identify and separate the angle of His from the gastrophrenic membrane and left crus. Dissection was carried out by the pars flaccida technique, in which the clear area of the gastrohepatic ligament was divided, identifying the right crus. The peritoneum just anterior to the right and left crus was gently incised. Subsequently, a blunt atraumatic grasper was inserted with easy passage in a flat trajectory toward the angle of His. Antibiotic-soaked tubing of the band device was grasped and brought through the retrogastric tunnel. The tubing was placed through the buckle of the LAP-BAND System and locked. Three to 4 gastro-gastric sutures were placed, creating an anterior fundoplication over the band, leaving the band at an 8- to 10-o' clock position. The band tubing was brought out through a left upper quadrant trocar connected to the reservoir, which was secured to the abdominal wall fascia. The band reservoir was left empty at the completion of surgery.

Laparoscopic Roux-en-Y Gastric Bypass

As previously described,[32] the dissection begins by placing the omentum superiorly and identifying the ligament of Treitz. The extended Roux limb measures 150 cm, with the distance from the ligament of Treitz to the jejunojejunostomy spanning 60 to 80 cm.[33] This side-to-side enteroenterostomy was created with a single application of a 2.5-mm linear cutting stapler (Endo GIA; US Surgical, Norwalk, Conn) to restore intestinal continuity. The common enterotomy at the jejunojejunostomy was closed with intracorporeal suturing. The jejunal mesenteric defect was closed with interrupted sutures. Using a 15-mL balloon-tipped calibrated orogastric tube (INAMED Health) to size the gastric pouch, multiple loads of a 3.5-mm linear cutting stapler (Endo GIA) were applied, starting at the lesser curvature just caudal to the orogastric tube and proceeding to the angle of His. This creates a 30-cm^3, divided gastric pouch. An intracorporeal-sutured gastrojejunostomy with an antecolic, antegastric Roux limb was created using a similar technique as described by Himpens.[34]

POSTOPERATIVE MANAGEMENT

During the postoperative course, both patients who underwent LAGB and LRYGB recovered in a monitored surgical unit experienced in the postsurgical care of bariatric patients. A water-soluble contrast study was obtained the next day. If no leak or obstruction was demonstrated, a liquid diet was initiated. Patients who underwent LAGB were routinely discharged on the first postoperative day. Patients who underwent LRYGB were usually discharged on the first or second postoperative day. Subsequent diets were similar for both groups: 3 small meals per day (2-4 oz) incorporating high protein (64 g/d) with minimal carbohydrates and fat.

Postoperatively, all patients were seen after 1 week following surgery. For the patients who underwent LAGB, saline was not added to the band reservoir until 4 to 6 weeks had elapsed after surgery. Band adjustments were routinely performed in the clinic. However, fluoroscopic guidance was necessary when

reservoir access was difficult to obtain. Criteria for band reservoir adjustment was determined by various factors including amount of gastric restriction during meals, level of satiety and hunger after meals, and amount of recent weight loss or gain. The first adjustment typically involved addition of 1 mL of sterile saline. Subsequent adjustments usually required 0.5 or 1 mL of saline.

Patients who underwent LRYGB were seen every 3 months during the first year, every 6 months during the second year, and yearly thereafter. During each visit, all patients were weighed on the same digital bariatric scale (Health-O-Meter, Bridgeview, Ill). All patients started taking a daily multivitamin 1 week after surgery. In addition, patients started taking lifelong daily vitamin B_{12}, iron, and calcium supplements.

DATA AND STATISTICAL ANALYSIS

Data were prospectively collected into a computerized database and reviewed retrospectively. Patient demographics, obesity-related comorbid conditions, operating time, hospital stay, early (<30 days) and late (≥30 days) complications, reoperations, change in BMI, weight loss, and patient satisfaction were recorded for all patients. Weight loss was expressed as percentage of excess weight loss (%EWL). The %EWL was defined as the difference between start weight and end weight, divided by baseline excess weight. Excess weight was determined from the ideal body weight, based on sex and height-adjusted weight for a medium frame according to the 1983 Metropolitan Life Insurance Company tables.[35] Weight loss analysis for patients who had their bands removed was included only to the time of band removal. Comorbidities were preoperatively assessed and recorded before surgery and postoperatively through the last follow-up. Hypertension was defined as patients taking antihypertensive medications or a systolic pressure higher than 140 mm Hg and diastolic pressure higher than 90 mm Hg. Patients were considered as having diabetes if receiving oral antidiabetic medication or having an elevated glycosylated hemoglobin level. Dyslipidemia was diagnosed on the basis of the use of statin or elevated total cholesterol or triglyceride levels. Reactive respiratory disease (asthma) was determined by pulmonary evaluation and dependence on bronchodilators. Degenerative arthritis was assessed by the use of antiarthritic medications, patient history, and physical examination. A rating scale (1, very satisfied; 2, satisfied; 3, not satisfied; and 4, regret) was used to assess overall patient satisfaction. A 2-tailed *t* test was used for continuous variables and a Pearson χ^2 or Fisher exact test was used for categorical variables. Continuous variables are expressed as mean ± SD. Statistical analysis was performed with SPSS version 10.1 software (SPSS Inc, Chicago, Ill). In all statistical analyses, a *P* value <.05 was considered significant.

RESULTS

PATIENT, TREATMENT, AND COMORBIDITY CHARACTERISTICS

Data on 106 super morbidly obese patients were retrieved from our prospective database. The overall median follow-up was 16.2 months (range, 1-40 months). Among this group, all patients underwent primary bariatric procedures. Patient and preoperative characteristics for the LAGB (n=60 [57%]) and LRYGB (n=46 [43%]) study groups are presented in **Table 1**. Both groups were comparable regarding age, sex, and BMI. The mean age and BMI were 41.9 vs 42.8 years and 55.4 vs 56.7, respectively. Similarly, preoperative weight (150.1 vs 157 kg) and excessive weight (86.2 vs 92.0 kg) were equivalent. Likewise, the number of patients with a BMI of 60 or higher (LAGB , 17% [10/60]; LRYGB, 33% [15/46]; *P*=.07) were similar comparing groups. There was no statistical difference between groups with respect to concomitant medical comorbidity except for dyslipidemia, which was more common in the LRYGB group. The median follow-up was 17.7 months for patients who underwent LAGB and 13.0 months for patients who underwent LRYGB.

Table 1. Preoperative Characteristics of Patients*

Characteristics	LRYGB (n = 46)	LAGB (n = 60)	*P* Value
Age, y	42.8 ± 9.7 (21-65)	41.9 ± 10.9 (18-63)	.45
Sex (F/M)	35/11	50/10	.35
BMI	56.7 ± 5.5 (50-70)	55.4 ± 4.5 (50-68.1)	.18
Weight, kg	157 ± 18.8 (120.2-195)	150.1 ± 18.6 (124-209)	.07
Excess weight, kg	92.0 ± 16.1 (61.8-123.6)	86.2 ± 15.4 (65.5-130)	.08
Hypertension	26 (56.5)	24 (40)	.07
Diabetes mellitus type 2	8 (17.4)	11 (18.3)	.55
Dyslipidemia	17 (37.0)	17 (18.3)	.03
Coronary artery disease	2 (4.3)	3 (5.0)	.63
Respiratory (asthma)	15 (33.0)	17 (28.3)	.75
Sleep apnea	25 (54.3)	28 (47.0)	.27
Degenerative arthritis	21 (46.0)	14 (23.3)	.13

Abbreviations: BMI, body mass index (calculated as weight in kilograms divided by the square of height in meters); LAGB, laparoscopic adjustable gastric banding; LRYGB, laparoscopic Roux-en-Y gastric bypass.
*Values are expressed as mean ± SD (range) or number (percentage) of patients.

Table 2. Perioperative Data*

	LRYGB (n = 46)	LAGB (n = 60)	*P* Value
Operation time, min	121 ± 45 (70-210)	75 ± 22 (50-180)	<.001
Hospital stay, d	3.5 ± 3.4 (1-18)	1.8 ± 1.9 (1-11)	<.002
Conversion to open surgery	0	1	

Abbreviations: LAGB, laparoscopic adjustable gastric banding; LRYGB, laparoscopic Roux-en-Y gastric bypass.
*Values are expressed as mean ± SD (range) or number of patients.

PERIOPERATIVE DATA

One hundred five procedures (99%) were completed with the laparoscopic approach, as outlined in **Table 2**. One patient in the LAGB group required open conversion because of inadequate exposure due to an enlarged liver and insufficient pnuemoperitoneum, whereas in the LRYGB group, no conversion was necessary. Patients undergoing LRYGB had significantly longer mean operative times (121 vs 75 minutes; *P*<.001) and hospital stay (3.5 vs 1.8 days; *P*<.002) compared with LAGB. Two patients who underwent LRYGB (4.3%) and 1 patient who un-

Table 3. Complications

Complication	No. (%)
LAGB	
Early complications (n = 60)	
Emesis/dehydration	7 (12)
Food impaction	1 (1.6)
Port displacement	1 (1.6)
Trocar site infection	1 (1.6)
Myocardial infarction	1 (1.6)
Late complications (n = 55)*	
Emesis/dehydration	24 (44)
Port displacement	11 (20)
Food impaction	2 (4)
Reflux	2 (4)
Band slippage	1 (2)
Abdominal abscess	1 (2)
Trocar site infection	1 (2)
Aspiration pneumonia	1 (2)
LRYGB	
Early complications (n = 46)	
Emesis/dehydration	4 (9)
Abscess	1 (2)
Anastomotic bleed	1 (2)
Anastomotic leak	1 (2)
Pneumonia	1 (2)
Late complications (n = 39)†	
Emesis/dehydration	5 (13)
Bowel obstruction	3 (8)
Anastomotic stenosis	2 (5)
Gastritis	1 (2.5)
P value, early complications, LAGB vs LRYGB	.33
P value, late complications, LAGB vs LRYGB	<.05

Abbreviations: See Table 2.
*Late complication follow-up data not obtained in 5 patients who underwent LAGB.
†Late complication follow-up data not obtained in 7 patients who underwent LRYGB.

Table 4. Reoperations and Interventions/Studies*

	LAGB (n = 60)	LRYGB (n = 46)	*P* Value
Reoperations	15	3	<.04
Port revision	12	0	
Band removal	2	0	
Internal hernia reduction	0	1	
Anastomotic repair†	0	1	
Abscess drainage	1	1	
Interventions/studies			
Band adjustment, mean (range)	2.1 (1-15)	0	
Endoscopy/dilatation	5	4	
Upper gastrointestinal series	27	10	

Abbreviations: See Table 2.
*Values are expressed as absolute number of reoperations, reinterventions, and studies unless otherwise indicated. Interventions means band adjustments and endoscopy/dilatations.
†Performed laparoscopically.

derwent LAGB (1.6%) had concomitant procedures (adhesiolysis) at the time of surgery.

COMPLICATIONS, REOPERATIONS, AND INTERVENTIONS

Early (<30 days) and late (≥30 days) complications are listed in **Table 3**. Reoperations and interventions are shown in **Table 4**. Early complications accounted for 11 cases (18%) in the LAGB and 8 cases (17%) in the LRYGB group ($P = .33$). Common early complications included emesis/dehydration in 7 patients (12%) who underwent LAGB and 4 patients (9%) who underwent LRYGB. In either group, we routinely evaluated patients with contrast radiography and endoscopy along with intravenous fluid administration and close observation. Neither group required further intervention. Additional early complications and treatment in the LAGB group included food impaction (endoscopic removal), reservoir/port displacement (operative revision), trocar site infection (incision and drainage), and myocardial infarction (medical management). Among LRYGB early complications, intra-abdominal abscess (exploratory laparoscopy and drainage), anastomotic bleed (transfusion and endoscopic coagulation), anastomotic disruption (exploratory laparoscopy and repair), and pneumonia (medical management) were reported. There were no early deaths in either group.

Late complications occurred in 11 patients (28%) in the LRYGB group and 43 patients (78%) in the LAGB group ($P<.05$), consequently accounting for the majority of reoperations for patients who underwent LAGB (14 of 15) compared with 3 reoperations (2 early and 1 late) in the LRYGB group ($P<.04$). Similarly, late complications in the LAGB and LRYGB groups were mainly emesis/dehydration, of which 14 patients (25%) who underwent LAGB required saline removal from their band reservoirs. Indeed, a variable frequency of band adjustments was necessary: up to 15 adjustments occurred in a single patient. Among 3 patients who underwent LRYGB who developed bowel obstruction, a single patient required urgent laparotomy to reduce an internal hernia, whereas no further intervention was needed for the remaining 2 patients. Likewise, anastomotic stenosis was successfully managed with only endoscopic balloon dilatation in 2 patients. There were no late deaths in the LRYGB group.

Eleven patients who underwent LAGB experienced reservoir displacement, otherwise precluding percutaneous access and further adjustment, each patient undergoing operative revision. Subsequently, 2 patients decided on elective band removal. Additional late complications and treatment in the LAGB group included food impaction (endoscopic removal, 2 patients), reflux esophagitis (endoscopy and medical management, 2 patients), abdominal abscess formation (laparoscopic drainage and band removal), band slippage (laparotomy and band removal), and delayed trocar site infection (incision and drainage). A band-related mortality resulting from aspiration pneumonia occurred following elective band removal. No patients in the LAGB group underwent conversion to gastric bypass.

WEIGHT LOSS

Weight loss was significantly different between the 2 groups, markedly in favor of patients who underwent

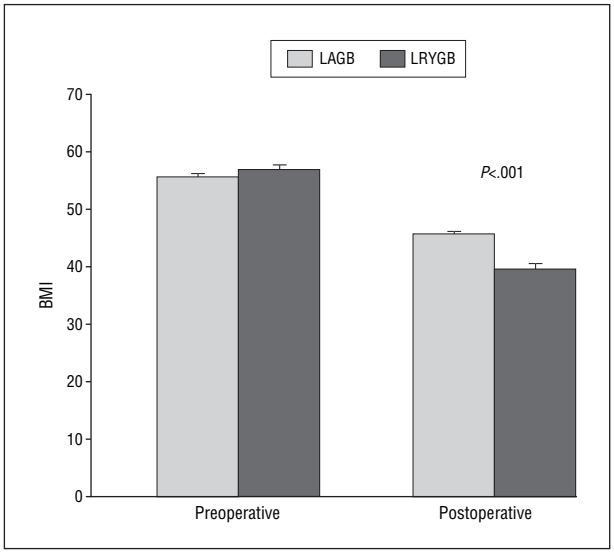

Figure 1. Comparison of mean change from preoperative body mass index (BMI) (calculated as weight in kilograms divided by the square of height in meters) to postoperative BMI at last follow-up for the laparoscopic adjustable gastric banding (LAGB) (n=60) and laparoscopic Roux-en-Y gastric bypass (LRYGB) (n=46) groups. The median follow-up was 17.7 months for the LAGB group and 13.0 months for the LRYGB group.

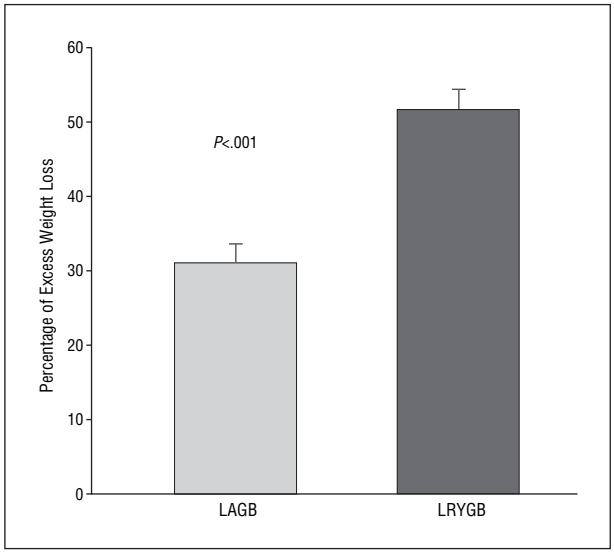

Figure 2. Comparison of the mean percentage of excess weight loss for the laparoscopic adjustable gastric banding (LAGB) (n=60) and laparoscopic Roux-en-Y gastric bypass (LRYGB) (n=46) groups. The median follow-up was 17.7 months for the LAGB group and 13.0 months for the LRYGB group.

LRYGB. **Figure 1** demonstrates the mean change in BMI comparing preoperative and postoperative BMI at last follow-up among patients who underwent LAGB (9.8 [range, 0.7- 24.1]) and LRYGB (26.5 [range, 1.8-70]) ($P<.001$). Likewise, total weight loss and %EWL were significantly less in patients who underwent LAGB (31% EWL [range, 0.02-0.88]) compared with LRYGB (52% EWL [range, 0.10-0.95]) (**Figure 2**) ($P<.001$). Furthermore, reanalysis excluding patients with a BMI of 60 or higher did not significantly change the statistical modeling or its interpretation.

COMORBIDITIES

The prevalence of preoperative comorbidities, such as hypertension, diabetes mellitus type 2, respiratory (asthma), sleep apnea, and degenerative arthritis, was similar between the 2 groups (**Table 5**). The frequency of all comorbidities decreased in the follow-up period, however, most notably in the patients who underwent LRYGB. The prevalence of hypertension dropped from 56.5% to 21% in the LRYGB group and from 40% to 29% in the LAGB group. Diabetes mellitus declined from 17.4% to 0% and 18.3% to 11%, respectively, leading to a significantly lower frequency in the patients who underwent LRYGB ($P=.05$). Sleep apnea was also significantly lower in the LRYGB group after follow-up compared with the LAGB group ($P=.01$). Similarly, more favorable trends were measured for dyslipidemia, respiratory/asthma, and degenerative arthritis in the LRYGB group after follow-up.

PATIENT SATISFACTION

As shown in **Figure 3**, LRYGB strongly correlated with overall patient satisfaction ($P=.006$). Nearly 80% of patients who underwent LRYGB said they were very satisfied. The remaining patients who underwent LRYGB rated their experience as satisfactory, whereas no patients were dissatisfied or regretted having undergone the procedure. Indeed, despite reoperative procedures in 3 patients who underwent LRYGB, all continued to highly rate their respective experience. The distribution of patient response following LAGB was less favorable. Forty-six percent and 35% of respondents were either very satisfied or satisfied, respectively. Among 10 patients, dissatisfaction or regret was reported.

COMMENT

Literature regarding both LAGB and LRYGB in super morbidly obese patients is sparse. Many studies combine data for all patients who meet criteria for bariatric surgery, despite differences in comorbidity, technical considerations, and outcome associated with more advanced stages of obesity.[26,36,37] Our study represents the first focused attempt to address the effectiveness of LAGB compared with LRYGB in super morbidly obese patients, in hopes of better defining potential benefits that may guide future treatment planning.

In our series of 106 patients, we found that LRYGB is a more effective weight loss procedure compared with LAGB. In either case, both procedures were performed safely with the laparoscopic approach. However, late complications requiring operative management were more frequent after the LAGB procedure. In contrast, emesis and dehydration were responsible for most early and late complications after LRYGB, neither requiring reoperation. Most importantly, LRYGB resulted in greater improvement in obesity-related comorbidity, significantly associated with diabetes mellitus and sleep apnea cessation. Not surprisingly, concordant patient approval was reported most commonly in the LRYGB group.

The similarity in patient demographics and medical comorbidity between our study groups was an important factor when comparing these different surgical ap-

Table 5. Comorbidities*

Comorbidity	No. (%) LRYGB Preoperative (n = 46)	LRYGB Follow-up (n = 39)	LAGB Preoperative (n = 60)	LAGB Follow-up (n = 55)	*P* Value Preoperative	*P* Value Follow-up
Hypertension	26 (56.5)	8 (21)	24 (40)	16 (29)	.07	.35
Diabetes mellitus type 2	8 (17.4)	0	11 (18.3)	6 (11)	.55	.05
Dyslipidemia	17 (37)	8 (21)	11 (18.3)	6 (11)	.03	.24
Respiratory (asthma)	15 (33)	4 (10.2)	17 (28.3)	14 (25)	.75	.10
Sleep apnea	25 (54.3)	3 (8)	28 (47)	17 (31)	.27	.01
Degenerative arthritis	21 (46)	15 (38)	14 (23.3)	11 (20)	.13	.07

Abbreviations: See Table 2.
**P* values indicate the differences between the groups (LRYGB vs LAGB). Comorbidity follow-up data were not obtained in 5 patients who underwent LAGB and 7 patients who underwent LRYGB.

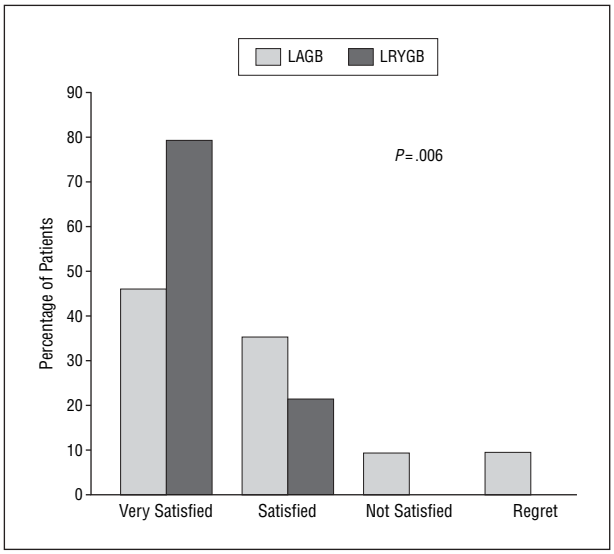

Figure 3. Overall patient satisfaction based on a patient satisfaction rating scale (1, very satisfied; 2, satisfied; 3, not satisfied; and 4, regret). No responses to the survey were obtained from 6 patients who underwent laparoscopic adjustable gastric banding (LAGB) and 3 patients who underwent laparoscopic Roux-en-Y gastric bypass (LRYGB).

proaches. At our institution, patients were allowed to choose between the 2 procedures. Indeed, patient preference was usually predetermined or based on physician referral bias, Internet communications, news and commercial reports, and various peer and support groups. Furthermore, patients considered at higher risk (BMI ≥ 60) were similarly distributed between the 2 groups. Although not a randomized study, we established a homogenous patient cohort between the 2 groups with minimal selection bias.

Not surprisingly, LRYGB was associated with longer operative time and hospital stay compared with LAGB. Clearly, both LAGB and LRYGB are associated with low rates of conversion to open procedures. Reported operative times in the literature vary secondary to technical considerations and surgeon experience.[37] Accordingly, LRYGB requires multiple steps, including division of the stomach and creation of 2 anastomosis. Conversely, LAGB, with the pars flaccida technique, creates a narrow tunnel behind the stomach prior to retrogastric band deployment. In both cases, a well-standardized protocol was performed in these technically challenging patients.

In general, the type and severity of both early and late complications were different between the 2 groups. Complications requiring reoperations occurred early in the LRYGB group, whereas they occurred later in the LAGB group. We found no significant difference in the number of early complications between patients undergoing LRYGB and LAGB in our study population. Early complications in patients who underwent LAGB were typically device related.[19,22,23,29] Obstructive symptoms associated with LAGB typically occurred within the immediate postoperative period, usually a consequence of gastric edema or esophageal dysmotility. On the other hand, similar obstructive complaints (early or late) were commonly the result of dietary noncompliance in patients who underwent LAGB. Conversely, early complications resulting in reoperation among the patients who underwent LRYGB were likely related to technical flaws during the initial operation.[38-40] In contrast to previous studies,[26,36] this report did show a statistical correlation between LAGB and occurrence of late complications (78%), possibly pointing toward long-term limitations and safety concerns for this purely restrictive procedure. Furthermore, 15 reoperations (83%) were from the LAGB group, the majority (93%) resulting from late complications. Indeed, our only mortality occurred following a late complication (aspiration pneumonia) in the LAGB group.

The modest weight loss after both LRYGB and LAGB in this prospective analysis supports the utility of each approach. However, LRYGB appears to be more effective in super morbidly obese patients when compared with LAGB (52% vs 31% EWL). These observations are consistent with previous reports.[26,36] Likewise, other investigators have described similar findings in morbidly obese patients but report equal weight loss following longer periods of surveillance (≥3 years). O'Brien and Dixon[41] report a 56% and 59% EWL at 5 years for LAGB and LRYGB, respectively. Certainly, a longer duration of follow-up is necessary in our study group to further assess the durability of continued weight loss exclusively in super morbidly obese patients.

The reduction of medical comorbidities is considered an important outcome variable for measuring success of a bariatric procedure.[5] Therefore, we analyzed our comorbidity data to compare the effectiveness of these 2 procedures. We found that weight loss in the LRYGB group paralleled the significant reduction of comorbidities such as type 2 diabetes mellitus and sleep apnea, whereas appreciable trends for hypertension (56.5%-21%), dyslipidemia (37%-21%), and degenerative arthritis (46%-38%) were recorded. These data are concordant with previous studies.[18,36] The LAGB procedure, however, was less effective in controlling all comorbidities. Longer follow-up with larger study groups is necessary to confirm these observations.

Quality of life was a measurable outcome in our study. Patient satisfaction was significantly in favor of the LRYGB group. Not surprisingly, increased weight loss and reduction in medical comorbidity were primary considerations most important to our patient population. Suboptimal weight loss and aggravating late comorbidity were factors responsible for the discontent of many patients who underwent LAGB. Most importantly, whether these observed early patterns of weight loss or comorbidity reduction translate to prolongation of life in super morbidly obese patients deserves our continued study.[42]

In summary, our data show that LRYGB and LAGB produce satisfactory weight loss in super morbidly obese patients. However, weight loss in the LRYGB group was more pronounced. Patients undergoing LAGB had shorter operative times and hospital stays but experienced a significantly greater incidence of late complications resulting in more reoperations. Moreover, LRYGB offered a significant advantage regarding reduction of comorbidities after surgery. Not surprisingly, patient approval was in favor of LRYGB. Therefore, in our experience, LRYGB appears superior to LAGB in super morbidly obese patients.

Accepted for Publication: June 23, 2005.
Correspondence: George S. Ferzli, MD, Division of Minimally Invasive/Laparoscopic Surgery, SUNY–Health Science Center of Brooklyn, 65 Cromwell Ave, Staten Island, NY 10304 (gferzli@aol.com).
Acknowledgment: We are most appreciative of the excellent data management of Karen Biondo, Laura Giannone, MS, RD, CDN, and Kyaw Zaw, MD. We also gratefully acknowledge our colleagues in the Department of Surgery, who have helped care for these patients.

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