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This is the author's manuscript

Original Citation:

Availability:

This version is available http://hdl.handle.net/2318/99422 since

Published version:

DOI:10.1007/s11695-009-9871-1

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13 September 2026

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***This is an author version of the contribution published on**:*
Questa è la versione dell'autore dell'opera:
[Obesity Surgery, 19,8, 2009, DOI: 10.1007/s11695-009-9871-1 *]*

The definitive version is available at:
La versione definitiva è disponibile alla URL:
http://link.springer.com/article/10.1007%2Fs11695-009-9871-1

Laparoscopic Adjustable Silicone Gastric Banding vs Laparoscopic Vertical Banded Gastroplasty in Morbidly Obese Patients: Long-Term Results of a Prospective Randomized Controlled Clinical Trial

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Abstract
Background
Aim of the study is to present long-term results of a prospective randomized single-institution clinical trial comparing laparoscopic adjustable silicone gastric banding (LASGB) with laparoscopic vertical banded gastroplasty (LVBG) in morbid obesity.
Methods
A total of 100 morbidly obese patients (body mass index 40 to 50 kg/m^2) were randomized to LASGB (n = 49) or LVBG (n = 51) and followed up for a minimum of 7 years.
Results
Mean operative time was 65.4 min in LASGBs and 94.2 min in LVBGs ($p<0.05$); mean hospital stay was 3.7 and 6.6 days, respectively ($p<0.05$). Late complication rates were 36.7% in LASGBs vs 15.7% in LVBGs at 3 years ($p <0.05$), 46.9% vs 43.1% at 5 years (NS), and 55.1% vs 47.1% at 7 years (NS). Late reoperation rates were 28.6% in LASGBs and 2.0% in LVBGs at 3 years ($p<0.001$), 38.8% and 2.0% at 5 years ($p < 0.001$), and 46.9% and 7.8% at 7 years ($p <0.001$). Excess weight loss in LASGBs was 41.8% at 3 years, 33.2% at 5 years, and 29.9% at 7 years; excess weight loss in LVBGs was 60.9%, 57%, and 53.1%, respectively ($p < 0.05$).
Conclusions
This study demonstrates that in a carefully selected group of patients, LVBG is significantly more effective than LASGB in terms of late complications, late reoperations, and long-term results on weight loss.
Keywords
Adjustable silicone gastric banding Vertical banded gastroplasty Laparoscopy Bariatric surgery Obesity surgery Long-term results

Introduction

The introduction of laparoscopic surgery has created a revolution in the field of bariatric surgery [*1*, *2*]. Laparoscopic procedures have progressively replaced traditional open bariatric procedures in both Europe and North America. Gastric bypass, duodenal switch, and gastric banding are the most commonly performed laparoscopic procedure in USA and Canada [*1*, *3*, *4*] while in Europe, laparoscopic gastric restrictive procedures still represent the majority of bariatric procedures [*5*]. Two reasons explain this disparity. First, different diet habits lead to a better response in European patients following gastric restrictive procedures. Second, most European patients present for bariatric surgery with a body mass index (BMI) between 35 and 50 kg/m^2, and superobese patients (BMI > 50 kg/m^2) remain a rare entity. Gastric restrictive procedures frequently fail in the superobese patient population [*6*, *7*].
Laparoscopic adjustable silicone gastric banding (LASGB) was first reported by us in 1994 [*8*]. Introduction of LASGB into clinical practice was an immediate success. It caused the rapid growth of bariatric programs in surgical departments throughout European countries, where these procedures were limited to a few centers in the past. Vertical banded gastroplasty (VBG) was the most popular gastric restrictive procedure during the prelaparoscopic era. In our experience,

laparoscopic vertical banded gastroplasty (LVBG) continues to provide satisfactory outcomes when performed with a minimal invasive approach [*9*].
The aim of this study is to present long-term results of a randomized clinical trial comparing LASGB with LVBG. The 3-year follow-up results of the present randomized clinical trial have already been published [*10*] showing a shorter operative time and hospital length of stay for LASGB, a fewer rate of complications, and a greater weight loss for LVBG.
In the treatment of a benign condition such as morbid obesity, long-term results are crucial; unfortunately, long-term results of bariatric surgery are infrequently reported. Therefore, we believe it is important to evaluate the results of our trial after all included patients accomplished a follow-up of more than 7 years.

Materials and Methods

A prospective randomized controlled trial was created and approved by the hospital ethics committee. Patient inclusion criteria included history of obesity ≥5 years, documented weight-loss attempts in the past, BMI from 40 to 50 kg/m^2, and age between 18 and 60 years. Exclusion criteria included contraindications to creation of pneumoperitoneum (e.g., glaucoma), large esophageal hiatal hernias (>3 cm), symptomatic gastroesophageal reflux disease (GERD), pregnancy, drug or alcohol abuse, psychological disorders (e.g., bulimia, depression), hormonal or genetic obesity-related disease, and previous gastric surgery.
Patients were evaluated by a dietician and by a psychiatrist in order to exclude sweet eating and binge eating disorders. These two groups of patients represent a well-known contraindication to restrictive bariatric procedures [*11*]. Patients were considered eligible after evaluation of clinical history, a thorough physical examination, blood chemistry, hormonal status, esophagogastroduodenoscopy, barium meal, esophageal manometry, 24 h pH-metry, spirometry, and abdominal ultrasound (if cholelithiasis was present, a cholecystectomy was routinely performed at the time of bariatric surgery).
Multiple preoperative interviews were conducted with the patients with the goal of creating a clear understanding of expected benefits, risks, and long-term consequences of gastric restrictive procedures. This included establishing a clear representation of the anticipated postoperative changes in eating habits, necessary behavior modifications, and requisite prolonged follow-up with nutritional counseling and testing. A special consent form signed by the patient was also required for trial inclusion.

Surgical Techniques

LASGB consisted of the application of the Lap-Band (BioEnterics, Inamed, CA, USA). LVBG consisted of a Mason's technique [*12*] modified according to MacLean et al. [*13*]. Both surgical techniques have been previously described [*10*].

Outcome Assessment

All patients underwent an upper gastrointestinal evaluation with hydrosoluble contrast medium on the first (LASGB) or on the second (LVBG) postoperative day. The follow-up visits regimen was conducted at 1, 3, 6, and 12 months postoperatively and then annually. Patients who missed the follow-up schedule were invited again by personal telephone interview to participate in the follow-up evaluations.
Unsatisfactory weight loss was defined as weight loss at 3 months less than 20% of excess body weight loss (EWL%), at 6 months <30% EWL, or at 1 year and after <40% EWL. In cases of unsatisfactory weight loss following LASGB, a band recalibration was performed by inflating the

band with 1–1.5 cc. saline under fluoroscopic control; a clinical examination was scheduled 20 days after each band recalibration.
The following data were recorded: surgical time (time between skin incision and closure of the wound), anesthesiology time (global time in the operative room), conversion rate, intraoperative and postoperative morbidity, 60 days mortality, and length of hospital stay. Long-term complications, additional procedures, readmissions, and hospital stay were also evaluated. Percentage of excess weight loss, Reinhold's classification [*14*], and residual BMI were used to describe the postoperative results. Ideal weight was determined by the use of Metropolitan Life Insurance Company tables [*15*]. The results were expressed as excellent when the patient had 0% to 25% excess weight, a good result was 26% to 50%, a fair result was 51% to 75%, a poor result was 76% to 100%, and a failure was >100% excess weight at the time of evaluation.

Statistical Analysis

The primary endpoint of the study was reoperation rate at 3 years follow-up. Secondary endpoints were early and late complications rates and percent EWL at 3, 5, and 7 years.
Appropriate sample size was calculated based on assumption of a difference of 5% in the reoperation rate between LASGB and LVBG, a difference of 5% in early and late complications, and a difference of 10% in percent EWL. These differences were considered clinically significant, and a sample size of 100 patients was needed to prove these differences. Randomization was performed 1 day before surgery by means of sealed opaque envelopes containing computer-generated random numbers. Categorical variables were compared by χ^2 test, with Yates correction and the Fisher exact test (two-tail) when necessary. Continuous variables were compared by the Student's t test or the Mann–Whitney test, depending on distribution. All p values were two-sided. A p value of less than 0.05 indicates a statistically significant difference. All calculations were done with SPSS (version 10.0). Data were analyzed according to the "intention to treat" principle.

Results

Between February 1999 and December 2000, 175 patients underwent bariatric surgery at the Center for Minimally Invasive Surgery of the University of Turin, Italy. Seventy-five (42.8%) were excluded from the study because of BMI>50 kg/m^2 (35 patients), BMI<40 kg/m^2 with comorbidities (five patients), specific contraindication to pneumoperitoneum (four patients), previous gastric surgery (six patients), severe GERD (14 patients), and refusal to enter the protocol (11 patients). The remaining 100 patients were randomized into two treatment groups: 49 underwent LASGB and 51 LVBG (Fig. 1).

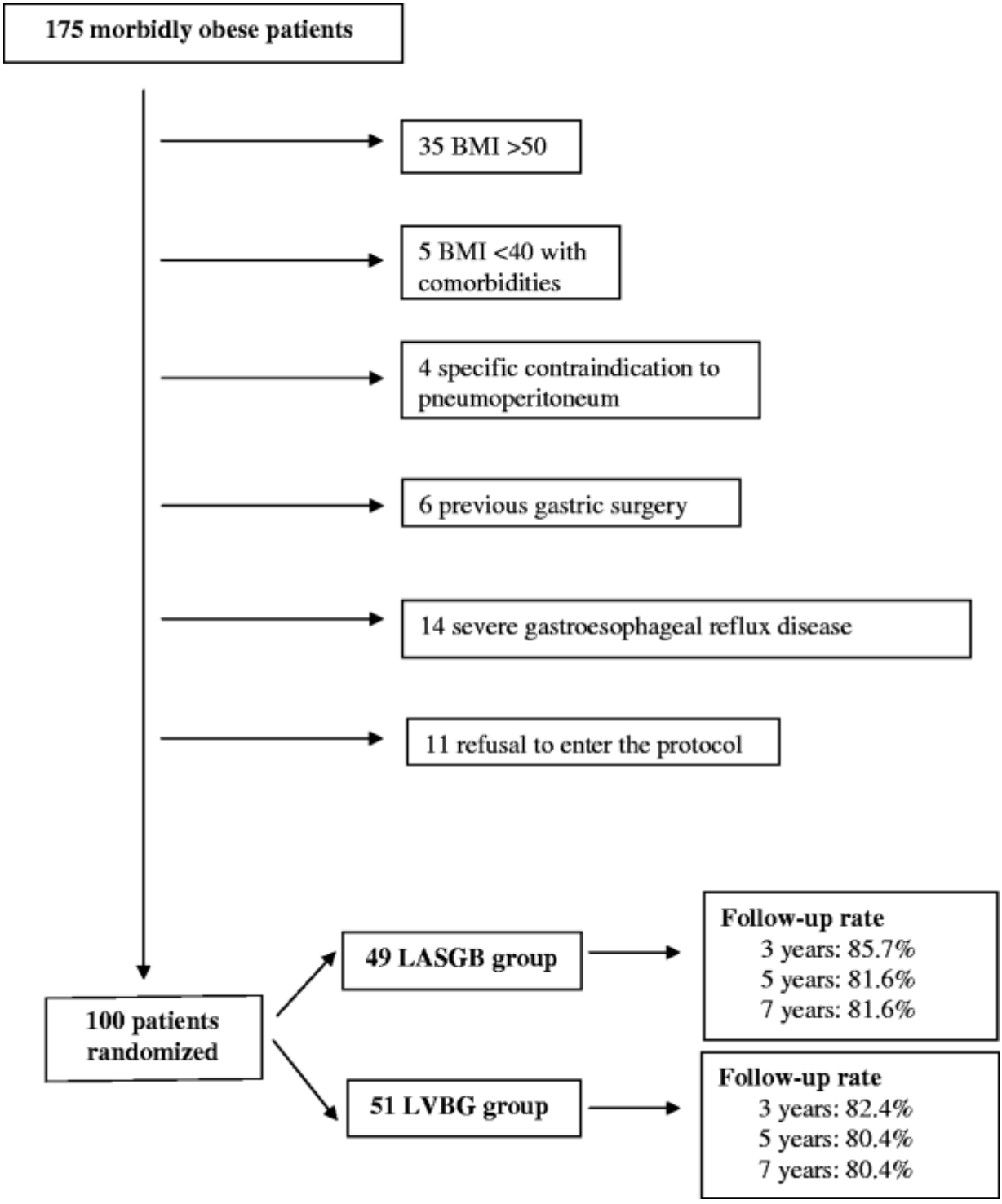

Fig. 1
Study design

There were no significant differences between the groups in terms of sex, age, mean weight, BMI, percent EW, and laboratory test results (Table 1). An associated procedure was performed in 10% of both groups. Four cholecystectomies and one lymph node biopsy were performed in LASGB group. Five cholecystectomies were performed in LVBG group. All procedures were completed by laparoscopy with no need for conversion. The mean operative time and mean length of hospital stay have been previously reported [*10*] and are summarized in Table 1.

Table 1
Patients demographic data and operative results

Group	N	Sex	Age (years)	Weight (kg)	BMI (kg/m^2)	% EW	Operative time, minutes	Laparotomic conversion, %	Hospital stay, days
LASGB	49	F 38, M 11	37.2 (20–55)	121.5 (90–175)	44.7 (40.1–50.0)	106.5 (79.3–142.6)	65.4 (35–120)	0	3.7 (2–6)
LVBG	51	F 43, M 8	38.2 (21–58)	118.7 (90–160)	44.2 (40.0–50.0)	104.8 (79.4–136.0)	94.2 (40–270)	0	6.6 (3–58)
p value	NS	NS	NS	NS	NS	NS	<0.05	–	<0.05

LASGB laparoscopic adjustable silicone gastric banding, LVBG laparoscopic vertical banded gastroplasty, BMI body mass index, %EW excess weight percentage, NS not statistically significant

In the present study, we present the long-term results in the same group of patient. Mean follow-up for the study population was 93.1 months, range 84–106.

Few patients were lost to follow-up. In the LASGB group, the follow-up rate was 85.7% (42/49) at 3 years, 81.6% (40/49) at 5 years, and 81.6% (40/49) at 7 years. In the LVBG group, the follow-up rate was 82.4% (42/51) at 3 years, 80.4% (41/51) at 5 years, and 80.4% (41/51) at 7 years (Fig. 1).

Mortality related to bariatric surgery was nil in either groups. One patient in the LVBG group died for causes not related to surgery nor obesity (street accident).

Late complication rates were 36.7% (18/49) in LASGB vs 15.7% (8/51) in LVBG at 3 years ($p < 0.05$), 46.9% (23/49) vs 43.1% (22/51) at 5 years (NS), and 55.1% (27/49) vs 47.1% (24/51) at 7 years (NS; Table 2). In the LASGB series, the 7-year late complications were 22.4% (11/49) pouch dilation with or without band slippage, 12.2% (6/49) GERD, 6.1% (3/49) complete food intolerance, 6.1% (3/49) poor weight loss or weight increase, 2.0% (1/49) no patient compliance, 2.0% (1/49) band erosion, and 4.1% (2/49) complication of the port.

Table 2

Long-term complication and reoperation rates

Long-term complications	3 years			5 years			7 years		
	LASGB	LVBG	p value	LASGB	LVBG	p value	LASGB	LVBG	p value
Rate %	**36.7%**	**15.7%**	**<0.05**	**46.9%**	**43.1%**	**NS**	**55.1%**	**47.1%**	**NS**
Gastroesophageal reflux (GERD)	4	4	NS	6	10	NS	6	11	NS
Pouch-to-fundus fistula	–	1	NS	–	1	NS	–	1	NS
Staple line leak	–	1	NS	–	1	NS	–	1	NS
Bolus obstruction	–	1	NS	–	4	NS	–	4	NS
Pouch dilation with/without band slippage	9	1	<0.05	9	3	NS	11	3	<0.05
Outlet stenosis	–	–	NS	–	1	NS	–	2	NS
Band erosion	–	–	NS	1	–	NS	1	–	NS
Port infection	1	–	NS	1	–	NS	1	–	NS
Port twisting	1	–	NS	1	–	NS	1	–	NS
Food intolerance	1	–	NS	2	2	NS	3	2	NS

Long-term complications	3 years			5 years			7 years		
	LASGB	LVBG	p value	LASGB	LVBG	p value	LASGB	LVBG	p value
Rate %	**36.7%**	**15.7%**	**<0.05**	**46.9%**	**43.1%**	**NS**	**55.1%**	**47.1%**	**NS**
Poor compliance	1	–	NS	1	–	NS	1	–	NS
Poor weight loss	1	–	NS	2	–	NS	2	–	NS
Weight regain	–	–	NS	–	–	NS	1	–	NS
Reoperations rate (%)	28.6%	2.0%	<0.001	38.8%	2.0%	<0.001	46.9%	7.8%	<0.001

LASGB laparoscopic adjustable silicone gastric banding, LVBG laparoscopic vertical banded gastroplasty, NS not statistically significant

In our experience, the pouch dilation associated to the band slippage was always quite severe, requiring a reoperation in most of cases. In one patient, we replaced the band; in six cases, we removed the band; and in two cases, we performed a LVBG after the band removal; in the other 2, cases we achieved a clinical improvement by a complete band desufflation.

In the LASGB group, the postoperative GERD was treated with medical therapy with protonic pump inhibitors (PPI), although a band desufflation was required in some cases; in three patients, the GERD was not improved by medical therapy and band desufflation, and we performed a reoperation with band removal in two of them and band removal followed by a Roux-en-Y gastric bypass in one of them.

The case of band erosion required a reoperation with band removal. The patients who presented no compliance or severe food intolerance, as those who suffered a poor weight loss or weight regain, underwent reoperation with band removal and conversion to another bariatric procedure in all cases (a VBG in three cases and a gastric by-pass in five cases).

At 7 years, the late postoperative complications in the LVBG group were 21.6% (11/51) GERD, 7.8% (4/51) bolus obstruction, 5.9% (3/51) pouch dilation, 3.9% (2/51) stenosis at the gastric pouch outlet, 3.9% (2/51) complete food intolerance, 2.0% (1/51) pouch-to-fundus fistula, and 2.0% (1/51) staple line leak.

Concerning GERD management in patients who underwent LVBG, the medical therapy with PPI was effective in most cases; in three patients (3/11, 27.3%), due to persistent symptoms despite medical therapy, we performed a reoperation with conversion to Roux-en-Y gastric bypass. All the cases of bolus obstruction and stenosis of the gastric pouch outlet were successfully treated by endoscopic removal of the bolus or endoscopic dilation.

Late reoperations rates at 3 years follow-up were 28.6% (14/49) in the LASGB group and 2.0% (1/51) in the LVBG group ($p<0.001$); at 5 years follow-up, the rates were 38.8% (19/49) in the LASGB group and 2.0% (1/51) in the LVBG group ($p<0.001$); at 7 years follow-up, the rates were 46.9% (23/49) in the LASGB group and 7.8% (4/51) in the LVBG group ($p <0.001$). In the LASGB group at 7 years, reoperation rate concerning the band was 42.9% (21/49), while the reoperation rate concerning the port was 4.1% (2/49). In one case, the twisted port was repositioned and in one case, the infected port was replaced. Twenty patients (40.8%) underwent band removal; among these, in three cases a VBG and in five cases a gastric bypass were performed after the band removal.

There were four reoperations performed in the LVBG at 7 years: One patient underwent gastric bypass for an early staple line leak, and three patients underwent late conversion to gastric bypass for severe GERD. Regarding weight loss results, LVBG showed better outcomes than LASGB throughout all the follow-up period. The weight loss results are showed in Table 3.

Table 3

Results on weight loss

	BMI			%EW			% EWL		
	LASGB	**LVBG**	**p value**	**LASGB**	**LVBG**	**p value**	**LASGB**	**LVBG**	**p value**
3 years	34.9 (22.9–43.4)	30.2 (22.2–39.0)	<0.05	60.7 (7.1–100)	39.8 (2.8–84.2)	<0.05	41.8 (−5.3–92.2)	60.9 (18.7–96.9)	<0.05
5 years	36.5 (26.8–44.1)	31.0 (22.2–42.8)	<0.05	68.1 (19.7–105.4)	43.3 (2.8–101.8)	<0.05	33.2 (−1.8–82.3)	57.0 (3.2–96.9)	<0.05
7 years	37.3 (26.2–44.4)	31.7 (22.9–44.8)	<0.05	70.5 (16.9–105.4)	46.9 (6.4–100)	<0.05	29.9 (−3.5–84.8)	53.1 (16–92.8)	<0.05

LASGB laparoscopic adjustable silicone gastric banding, LVBG laparoscopic vertical banded gastroplasty, BMI body mass index, %EW excess weight percentage, % EWL excess weight loss percentage, NS not statistically significant

If we consider long-term results according to Reinhold classification [*14*], an excellent or good result (residual excess weight <50%) was achieved at 3 years in 20.4% of LASGB and in 54.9% of LVBG (p<0.001), at 5 years in 6.1% of LASGB and in 51.0% of LVBG (p<0.001), and at 7 years in 6.1% of LASGB and in 45.1% of LVBG (p <0.001). Procedural failure resulting from insufficient weight loss (residual excess weight >100%) was present in 2.0% at 3 years, in 8.2% at 5 years, and in 6.1% at 7 years in the LASGB patients, while it was present in 2.0% at 5 and 7 years in the LVBG group (Table 4).

Table 4

Weight results according to Reinhold's classification

	Residual excess weight <50%		p value	Residual excess weight >100%		p value
	LASGB (%)	**LVBG (%)**		**LASGB (%)**	**LVBG (%)**	
3 years	20.4	54.9	<0.001	2.0	0	NS
5 years	6.1	51.0	<0.001	8.2	2.0	NS
7 years	6.1	45.1	<0.001	6.1	2.0	NS

LASGB laparoscopic adjustable silicone gastric banding, LVBG laparoscopic vertical banded gastroplasty, NS not statistically significant

Discussion

To date, bariatric surgery is the only long-term effective therapy available for the morbid obese population. It markedly lowers body weight, reverses or ameliorates comorbidities, improves quality of life, and ultimately results in a decrease in overall mortality [*16*, *17*].

Prospective randomized trials comparing different bariatric procedures are essential for the progress of this field of surgery. Unfortunately, limited literature data are available on restrictive procedures and only few trials have compared AGB and VBG. Ashy and Merdad [*18*] and van Dielen et al. [*19*] published two trials in which laparoscopic AGB and open VBG were compared; in both studies, the authors found greater EWL after open VBG at 6 or 24 months, but failed to report long-term data. LAGB showed shorter hospital stay and less complications in both studies, but the laparoscopic approach performed in LAGB patients could explain these differences. In the study by Nilsell et al. [*20*], AGB and VBG were compared in open access surgery. Weight reduction tended

to be larger and quicker after VBG, but after 5 years, gastric banding patients reached the same level of weight loss. Reoperations were performed more often in the VBG group, but the high complication rates after VBG might have been due to not dividing the stomach between the staple lines as already demonstrated by MacLean et al. [*13*].

Our study was designed to compare two restrictive laparoscopic procedures: LASGB vs LVBG. The technique of LASGB underwent several modifications [*21*] and different devices have been developed. At the time when we began our trial, two models of adjustable bands were available: the LapBand and the Swedish Band. In our study, we used the LapBand that was the only band approved by the Food and Drug Administration for clinical use [*22*]. Postoperative results of our trial [*10*] demonstrated that LASGB required shorter operative time, had lower early morbidity and shorter mean length of hospitalization, while LVBG was significantly superior to LASGB in terms of weight loss and complications at 3 years follow-up.

In the present study, we report the long-term results of the trial. It is important to note that less than 20% of patients were lost to follow-up at 7 years.

Concerning long-term complication rate, the difference between LASGB and LVBG at 7 years follow-up was statistically not significant. On the contrary, the difference in the reoperation rate between the two groups remained significant throughout all the follow-up period—38.8% vs 2.0% ($p < 0.001$) at 5 years and 46.9% vs 7.8% ($p<0.001$) at 7 years.

This is due to the fact that, in our experience, late complications after LVBG are often of mild clinical impact, and most of these do not require surgical therapies. In this group of patients, the most frequent postoperative complication was the onset of GERD (21.6% at 7 years). This complication was usually controlled medically by PPI therapy, and after 7 years, only three patients needed a revision surgery with conversion to Roux-en-Y gastric bypass. It is important to note that patients preoperatively affected by GERD were excluded from the study.

GERD onset is a well-known long-term complication after vertical banded gastroplasty, with rate up to 38% in literature [*23*]. Furthermore, GERD is the most frequent cause for reversal surgery: In a recent analysis on patients who underwent a reversal of a VBG [*24*], the rate of reflux as presenting symptom was 67%. The conversion into Roux-en-Y gastric bypass is an effective technique for VBG patients who suffered from GERD: In a study on 25 patients with severe GERD after VBG who subsequently underwent a conversion to a gastric bypass, 96% of the patients were symptom free after the surgical conversion at a mean follow-up of 37 months [*25*].

On the other hand, late complications after LASGB required reoperation for most of cases. In this group of patients, the most frequent complication was the pouch dilation with band slippage that occurred in 22.4% of patients and required surgical reintervention in all cases. High long-term band slippage rates are reported by several authors. Mognol et al. in a series of 179 patients reported a late slippage rate of 20.1%, with reoperation in all cases [*26*]; Weber et al. in a series of 103 LASGB reported at 3 years follow-up band slippage rate of 35.9% [*27*]. Furthermore, other complications of the LASGB group such as gastric wall erosion and food intolerance have been treated surgically. Globally, the reoperation rate at 7 years was 46.9%, and 20 patients (40.8%) had their bands removed. These data are in line with those reported by Wölnerhanssen et al. [*28*] with a 33.7% rate of band removal at 5 years and by Silecchia et al. [*29*] with a reoperation rate of 13% at 3 years and 24% at 5 years.

Concerning weight loss, LVBG was superior to LASGB in terms of mean excess weight loss, and the difference remained significant ($p < 0.05$) throughout the seven postoperative years: The mean EWL% for LASGB was 33.2% at 5 years and 29.9% at 7 years; for the LVBG group, the mean EWL% was 57.0% at 5 years and 53.1% at 7 years.

Different weight loss outcomes following LASGB are reported in the literature. Suter et al. [*30*] reported his 10-year experience on 317 patients submitted to LAGB: The mean EWL% at 5 years was 58.5%, and the insufficient weight loss (EWL <25%) rate was 10.5%. Tolonen et al. [*31*] recently reported similar results, with a mean EWL% at 7 years of 56% in patients with the band in place, but 46% in all patients. The failure rates (EWL <25%) increased to nearly 40% during years

8 and 9, and the success rate (EWL >50%) declined from nearly 60% at 3 years to 35% at 8 and 9 years. At 7 years follow-up, the mean EWL% was 55.7%, but analysis according to the intention-to-treat principle gave a mean result of 45.7%. This result is supported by other authors [*28*, *32*] reporting mean values of 5 years EWL% of 40–50%.

Laparoscopic VBG achieves 60–70% of excess weight loss at 3 years [*9*, *33–35*], but at 5 years, results are worse [*36–38*], with a high rate of weight regain [*39*]. Weight regain over time is a commonly cited complication of LVBG, but long-term studies are lacking. Furthermore, the long-term studies that have been published concern Mason's procedure [*36*, *39*, *40*], which does not involve total transection of the gastric stapler line. The consequence of this approach is the appearance of fistulae on the gastric stapler line, commonly occurring after 5 years of follow-up [*33*], with consequent restrictive effect loss. Unfortunately, the long-term EWL% in MacLean technique is reported in very few papers. Pérez et al. [*41*] reported a 5-year follow-up EWL% of 56.4%, on a series of 85 patients: Nine of them were submitted to Mason technique and the rest to MacLean technique.

In our experience, LASGB achieved poor results on weight loss, with a tendency toward weight gain over time. On the contrary, LVBG was associated with better and more durable weight loss effects. Furthermore, none of our LVBG patients needed to be converted to another bariatric procedure for weight regain. As other authors [*39*], we noted in our series a maximum effect of weight loss achieved at 3 year after surgery, with a subsequent trend of weight regain after that period, in both groups. Nevertheless, weight regain is in our experience higher after LASGB than after LVBG: At 7 years follow-up, the LVBG EWL% was 53.1% vs 29.9% in the LASGB group. Moreover, the mean BMI at 7 years for the LVBG patients was 31.7, considerably inferior to the preoperative data of 44.2, with statistically significant difference ($p<0.001$). On the contrary, the mean BMI at 7 years for LASGB group was 37.3 vs a preoperative data of 44.7.

Satisfactory results of restrictive surgery are probably related to a careful selection of patients and strict exclusion criteria: In our opinion, it is very important to submit to restrictive gastric surgery only patients with a preoperative BMI<50, with no binge- or sweet-eating disorders. Also, according to MacLean et al. [*42*], we strongly believe that the gastric pouch needs to be separated at the vertical staple line in order to avoid staple line disruption and late weight regain. This study demonstrates that in a carefully selected group of patients, LVBG is significantly more effective than LASGB in terms of late complications, late reoperations, and long-term results on weight loss.

References

1.
Buchwald H, Williams SE. Bariatric surgery worldwide 2003. Obes Surg. 2004;14(9):1157–64.
2.
Rosenthal RJ, Szomstein S, Kennedy CI, et al. Laparoscopic surgery for morbid obesity: 1, 001 consecutive bariatric operations performed at The Bariatric Institute, Cleveland Clinic, Florida. Obes Surg. 2006;16(2):119–24.
3.
Santry HP, Gillen DL, Lauderdale DS. Trends in bariatric surgical procedures. JAMA. 2005;294:1909–17.
4.
Pratt GM, Learn CA, Hughes GD, et al. Demographics and outcomes at American Society for Metabolic and Bariatric Surgery Centers of Excellence. Surg Endosc. 2009;23:795–9.
5.
Rivas H, Martínez JL, Delgado S, et al. Current attitudes to the laparoscopic bariatric operations among European surgeons. Obes Surg. 2004;14(9):1247–51.
6.
Capella JF, Capella RF. The weight reduction operation of choice: vertical banded gastroplasty or gastric bypass? Am J Surg. 1996;171(1):74–9.
7.

Fox SR, Oh KH, Fox K. Vertical banded gastroplasty and distal gastric bypass as primary procedures: a comparison. Obes Surg. 1996;6(5):421–5.
8.
Morino M, Toppino M, Garrone C, et al. Laparoscopic adjustable silicone gastric banding for the treatment of morbid obesity. Br J Surg. 1994;81(8):1169–70.
9.
Morino M, Toppino M, Bonnet G, et al. Laparoscopic vertical banded gastroplasty for morbid obesity. Assessment of efficacy. Surg Endosc. 2002;16(11):1566–72.
10.
Morino M, Toppino M, Bonnet G, et al. Laparoscopic adjustable silicone gastric banding versus vertical banded gastroplasty in morbidly obese patients: a prospective randomized controlled clinical trial. Ann Surg. 2003;238(6):835–41.
11.
Sugerman HJ, Starkey JV, Birkenhauer R. A randomized prospective trial of gastric bypass versus vertical banded gastroplasty for morbid obesity and their effects on sweet versus non-sweet eaters. Ann Surg. 1987;205(6):613–24.
12.
Mason EE. Gastric surgery for morbid obesity. Surg Clin North Am. 1992;72(2):501–13.
13.
MacLean LD, Rhode BM, Forse RA. A gastroplasty that avoids stapling in continuity. Surgery. 1993;113(4):380–8.
14.
Reinhold RB. Critical analysis of long-term weight loss following gastric by-pass. Surg Gynecol Obstet. 1982;155(3):385–94.
15.
Metropolitan Life Foundation. Height and weight tables. New York: Metropolitan Life Insurance; 1983. p. 1–3.
16.
Sjöström L, Lindroos AK, Peltonen M, et al. Lifestyle, diabetes, and cardiovascular risk factors 10 years after bariatric surgery. N Engl J Med. 2004;351(26):2683–93.
17.
Fisher BL, Schauer P. Medical and surgical options in the treatment of severe obesity. Am J Surg. 2002;184(6B):9S–16.
18.
Ashy AR, Merdad AA. A prospective study comparing vertical banded gastroplasty versus laparoscopic adjustable gastric banding in the treatment of morbid and super-obesity. Int Surg. 1998;83(2):108–10.
19.
van Dielen FM, Soeters PB, de Brauw LM, et al. Laparoscopic adjustable gastric banding versus open vertical banded gastroplasty: a prospective randomized trial. Obes Surg. 2005;15(9):1292–8.
20.
Nilsell K, Thörne A, Sjöstedt S, et al. Prospective randomised comparison of adjustable gastric banding and vertical banded gastroplasty for morbid obesity. Eur J Surg. 2001;167(7):504–9.
21.
Favretti F, Cadiere GB, Segato G, et al. Laparoscopic adjustable silicone gastric banding (Lap-Band): how to avoid complications. Obes Surg. 1997;7(4):352–8.
22.
Buchwald H, Ikramuddin S. Laparoscopic adjustable gastric banding in bariatric surgery: an overview of the LAP-BAND. Introduction. Am J Surg. 2002;184(6B):1S–3.

23.
Balsiger BM, Poggio JL, Mai J, et al. Ten and more years after vertical banded gastroplasty as primary operation for morbid obesity. J Gastrointest Surg. 2000;4(6):598–605.
24.
Thoreson R, Cullen JJ. Indications and results of reversal of vertical banded gastroplasty (VBG). J Gastrointest Surg. 2008;12(11):2032–6.
25.
Balsiger BM, Murr MM, Mai J, et al. Gastroesophageal reflux after intact vertical banded gastroplasty: correction by conversion to Roux-en-Y gastric bypass. J Gastrointest Surg. 2000;4(3):276–81.
26.
Mognol P, Chosidow D, Marmuse JP. Laparoscopic gastric bypass versus laparoscopic adjustable gastric banding in the super-obese: a comparative study of 290 patients. Obes Surg. 2005;15(1):76–81.
27.
Weber M, Müller MK, Bucher T, et al. Laparoscopic gastric bypass is superior to laparoscopic gastric banding for treatment of morbid obesity. Ann Surg. 2004;240(6):975–82.
28.
Wölnerhanssen BK, Peters T, Kern B, et al. Predictors of outcome in treatment of morbid obesity by laparoscopic adjustable gastric banding: results of a prospective study of 380 patients. Surg Obes Relat Dis. 2008;4(4):500–6.
29.
Silecchia G, Bacci V, Bacci S, et al. Reoperation after laparoscopic adjustable gastric banding: analysis of a cohort of 500 patients with long-term follow-up. Surg Obes Relat Dis. 2008;4(3):430–6.
30.
Suter M, Calmes JM, Paroz A, et al. A 10-year experience with laparoscopic gastric banding for morbid obesity: high long-term complication and failure rates. Obes Surg. 2006;16(7):829–35.
31.
Tolonen P, Victorzon M, Mäkelä J. 11-year experience with laparoscopic adjustable gastric banding for morbid obesity—what happened to the first 123 patients? Obes Surg. 2008;18(3):251–5.
32.
Jan JC, Hong D, Bardaro SJ, et al. Comparative study between laparoscopic adjustable gastric banding and laparoscopic gastric bypass: single-institution, 5-year experience in bariatric surgery. Surg Obes Relat Dis. 2007;3(1):42–50.
33.
Nocca D, Aggarwal R, Blanc P, et al. Laparoscopic vertical banded gastroplasty. A multicenter prospective study of 200 procedures. Surg Endosc. 2007;21(6):870–4.
34.
Magnusson M, Freedman J, Jonas E, et al. Five-year results of laparoscopic vertical banded gastroplasty in the treatment of massive obesity. Obes Surg. 2002;12(6):826–30.
35.
Näslund E, Freedman J, Lagergren J, et al. Three-year results of laparoscopic vertical banded gastroplasty. Obes Surg. 1999;9(4):369–73.
36.
Kalfarentzos F, Kechagias I, Soulikia K, et al. Weight loss following vertical banded gastroplasty: intermediate results of a prospective study. Obes Surg. 2001;11(3):265–70.
37.
Balsiger BM, Murr MM, Poggio JL, et al. Bariatric surgery. Surgery for weight control in patients with morbid obesity. Med Clin North Am. 2000;84(2):477–89.

38.
Howard L, Malone M, Michalek A, et al. Gastric bypass and vertical banded gastroplasty—a prospective randomized comparison and 5-year follow-up. Obes Surg. 1995;5(1):55–60.
39.
Wang W, Yu PJ, Lee YC, et al. Laparoscopic vertical banded gastroplasty: 5-years results. Obes Surg. 2005;15(9):1299–303.
40.
del Amo DA, Díez MM, Guedea ME, et al. Vertical banded gastroplasty: is it a durable operation for morbid obesity? Obes Surg. 2004;14(4):536–8.
41.
Pérez N, Baltasar A, Serra C, et al. Comparative analysis of vertical banded gastroplasty and duodenal switch at five years follow-up. Obes Surg. 2005;15(7):1061–5.
42.
MacLean LD, Rhode BM, Forse RA. Late results of vertical banded gastroplasty for morbid and super obesity. Surgery. 1990;107(1):20–7.