



ELSEVIER

Surgery for Obesity and Related Diseases ■ (2015) 00–00

SURGERY FOR OBESITY
AND RELATED DISEASES

Original article

Revisional single-anastomosis gastric bypass for a failed restrictive procedure: 5-year results

Matthieu Bruzzi, M.D.* , Thibault Voron, M.D., Franck Zinzindohoue, M.D., Ph.D., Anne Berger, M.D., Ph.D., Richard Douard, M.D., Ph.D., Jean-Marc Chevallier, M.D., Ph.D.

Department of Digestive Surgery, Hôpital Européen Georges Pompidou, Paris, France

Received April 27, 2015; accepted August 29, 2015

Abstract

Background: Long-term outcomes of revisional laparoscopic single anastomosis-gastric bypass for a failed restrictive procedure (rSAGB) have not been analyzed.

Objectives: To assess 5-year outcomes of rSAGB compared with 5-year outcomes of primary SAGB (pSAGB).

Setting: University public hospital, France.

Methods: One hundred twenty-six patients who underwent SAGB between October 2006 and October 2008 were included in this retrospective study. rSAGB was defined as SAGB performed after failure of a first restrictive procedure. Five-year outcomes of each procedure regarding mortality, morbidity (i.e., Clavien-Dindo score), weight loss (change in body mass index [BMI] and percentage of excess BMI loss [%EBMIL]), co-morbidities remission, and Gastrointestinal Quality of Life Index (GIQLI) score, were assessed.

Results: Thirty patients (24%) who had prior restrictive bariatric surgery (including 22 laparoscopic adjustable gastric bandings, 4 vertical banded gastroplasties, and 4 sleeve gastrectomies) underwent conversion to rSAGB. Ninety-six patients (76%) underwent primary SAGB (pSAGB group). Both groups were comparable in age, gender, BMI, and preoperative co-morbidities. Pre-operative mean BMI of the rSAGB group was 45.5 ± 7 kg/m². There were no deaths and the major complications rate was 10%. No increase in morbidity was found between the 2 groups. Two patients required conversion to RYGB after rSAGB because of intractable biliary reflux. At 5 years, mean BMI was 32 kg/m² and mean %EBMIL was 66% after rSAGB; no significant differences were found compared with pSAGB (BMI = 31 kg/m², %EBMIL = 73%). Co-morbidities and remission rates were statically similar. Overall, GIQLI score was significantly lower in the rSAGB group (104.1 ± 17.6 versus 112.5 ± 16.8 , $P = .025$). Significant differences were found in “upper gastrointestinal symptoms” and “psychological” scores.

Conclusion: At 5 years, rSAGB for a failed restrictive procedure was safe and effective, but quality of life and upper gastrointestinal function were lower compared with pSAGB. (Surg Obes Relat Dis 2015;■:00–00.) © 2015 American Society for Metabolic and Bariatric Surgery. All rights reserved.

Keywords:

Mini-gastric bypass; Single-anastomosis gastric bypass; Revision; Failed restrictive procedure; Weight loss; Morbid obesity

As a consequence of the growing numbers of primary bariatric surgeries [1], surgeons now manage more patients who have had a previous failed and/or complicated bariatric restrictive procedure (laparoscopic adjustable gastric banding [LAGB] [2], vertical banded gastroplasty [VBG] [3], or sleeve gastrectomy [SG] [4,5]).

*Correspondence: Matthieu Bruzzi, Department of Digestive Surgery, Hôpital Européen Georges Pompidou, 20 rue Leblanc, 75015 Paris cedex, France.

E-mail: matthieu_bruzz@yahoo.fr

Indications for revision surgery include insufficient weight loss, weight regain, and/or surgery-related complications, especially after LAGB [2]. Revision from a restrictive procedure to a sleeve gastrectomy, although sometimes considered [5–9], does not usually provide adequate weight loss [5–9]. Conversion to a biliopancreatic diversion with a duodenal switch also has been described [6], but a revisional laparoscopic Roux-en-Y gastric bypass (rLRYGB) appears to be the procedure of choice for revision because of its efficacy and safety profile [3,6,10,11]. Nevertheless, the literature remains heterogeneous; some authors report lower weight loss [12–14] and/or a higher morbidity rate [15] after an rLRYGB, whereas others have found no difference between an rLRYGB and a primary LRYGB (pLRYGB) [6,16].

Short- and long-term results from our first laparoscopic single-anastomosis gastric bypasses (SAGB) have been previously reported [17,18], and SAGB appears to be a simple, well tolerated, and effective alternative to LRYGB [19]. However, long-term outcomes for revisional SAGB for a failed restrictive procedure (rSAGB) have not yet been analyzed. Therefore, the aim of this study was to present the 5-year results of rSAGB and to compare these results with primary SAGB (pSAGB).

Materials and Methods

Between October 2006 and October 2008, 175 patients underwent an SAGB (either a pSAGB or an rSAGB) for morbid obesity in the Department of Digestive Surgery at the Hôpital Européen Georges Pompidou, Paris, France. The present investigation analyzes and compares mortality, morbidity, weight loss, evolution of obesity-related comorbidities, and quality of life at 5 years after pSAGB and rSAGB. Data were collected from a prospectively maintained database.

Preoperative evaluation

An extensive preoperative evaluation was performed [18]. All patients underwent preoperative abdominal ultrasonography and upper endoscopy with systematic gastric biopsies. *Helicobacter pylori* infection was treated if diagnosed. Obesity-related comorbidities were recorded.

Indications to perform a SAGB relied on guidelines published by the National Institutes of Health [20]. Indications for an rSAGB were mostly insufficient weight loss and/or weight regain despite dietary counseling. The objective criteria for reoperation was a percentage of excess BMI loss (%EBMIL) of <50%. In some cases, a revisional procedure was performed for complications after an LAGB (slippage, pouch dilation, stenosis).

Surgery

Surgical procedures were carried out by 6 senior members of the surgical staff using the same standardized

technique [21]. Briefly, a long, narrow gastric tube was constructed. Vertical bivalving of the greater omentum was performed. The jejunum was ascended in a precolic position and an end-to-side mechanical anastomosis was performed with the gastric tube at 200 cm from the Treitz's ligament.

Revisional procedures after LAGB were performed concomitantly with lap-band removal, when possible (1-stage procedure), or after a delay (2-stage procedure). The band was always deflated a few weeks before the surgical procedure. When a 1-stage procedure could be performed, the port was initially removed. Then the identified band was dissected from its attachments to the liver; the gastrogastic sutures were carefully separated, and the fibrous capsule at the level of the His angle was dissected to see and liberate the left crus of the diaphragm. The rest of the scar tissue was not removed. After band removal, an SAGB was performed, as described previously [21]. Concerning revisional SAGB after VBG, all patients had a silastic ring VBG procedures. Silastic ring removal and rSAGB were performed in a 1-stage procedure.

Patients were placed on routine antisecretory medicine after surgery for 6 months and were also discharged under multivitamins and preventive anticoagulation.

Postoperative evaluation

Patient follow-ups were conducted at months 1, 3, 6, and 12 after surgery, and annually thereafter. Morbidity at 90 days (early morbidity) and thereafter (late morbidity) were recorded and classified according to the Clavien-Dindo classification for surgical complications [22]. For early morbidity, major complications were defined as adverse \geq grade IIIb events; complications that required surgical treatment were classified as a major complication in late morbidity.

Weight loss was expressed as evolution in body mass index (BMI) and %EBMIL. Severe malnutrition was defined as %EBMIL >100% associated with a serum albumin level <30 g/L, and weight loss failure was defined as %EBMIL \leq 25%.

Resolution of co-morbidities was considered as normalization of preoperative co-morbidities at the end of the complete follow-up. Type 2 diabetes mellitus (T2DM) remission required glycated hemoglobin (HbA_{1c}) to be \leq 6.5% with an absence of any specific treatment.

Quality of life was assessed using the Gastrointestinal Quality of Life Index (GIQLI) [18,19,23]. All patients included in the study completed postoperative GIQLI questionnaires after 5 years, and the results were compared between the rSAGB and pSAGB groups.

Lost to follow-up

Patients lost to follow-up were not included in the study because of incomplete 5-year follow-up. Preoperative

clinical characteristics of these patients were compared with the study group. Median follow-up, mortality, and morbidity of these patients were assessed.

Statistical analyses

Categorical data were compared between independent groups using the χ^2 test or Fisher's exact test. For continuous data, the independent-samples *t* test was used, after using Levene's test to assess the equality of variance. All statistical analyses were performed using SPSS version 22.0 software (IBM Corp., Armonk, NY, USA). A *P* value $\leq .05$ was considered statistically significant.

Results

Patient characteristics

Among the 175 patients who underwent a SAGB procedure, 126 patients who had a 5-year complete follow-up were included (72%). Thirty patients (24%) had undergone prior restrictive bariatric surgery (including 22 LAGBs, 4 vertical banded gastroplasties, and 4 sleeve gastrectomies) and underwent conversion to a SAGB (rSAGB group). Indications for a revisional procedure are summarized in Table 1. Ninety-six patients (76%) underwent a pSAGB. The clinical characteristics are shown in Table 2. The median follow-up period was 66 months (range 60–83 mo).

Operative characteristics and postoperative course

One conversion to a laparotomy was required in the pSAGB group because of severe adhesions. In the rSAGB group, all procedures were performed laparoscopically and 15 gastric bands (15/22, 68%) were removed simultaneously (1-stage procedure). The median time between initial restrictive surgery and rSAGB was 34 months (range 24–43 mo). The mean operative time was 140 ± 45 minutes in the rSAGB group and 100 ± 38 minutes in the pSAGB group. No patient died during the postoperative period.

In the rSAGB group, 2 patients (6.6%) experienced major early complications (Table 3): 1 surgical perianastomotic

Table 1
Indications for a revisional SAGB

Factor	n (%)	Prior surgery (n)
Inadequate weight loss	20 (66%)	LAGB = 16 Sleeve = 3 Mason = 1
GERD	4 (13%)	Mason = 3 Sleeve = 1
Dysphagia	3 (10%)	LAGB = 3
Gastric prolapse	3 (10%)	LAGB = 3

SAGB = laparoscopic single-anastomosis gastric bypass; LAGB = laparoscopic adjustable gastric bypass; GERD = gastrointestinal reflux disease.

Table 2

Clinical characteristics of morbidly obese patients before a revisional or a primary laparoscopic single-anastomosis gastric bypass

Variable	Primary SAGB (n = 96)	Revisional SAGB (n = 30)	<i>P</i>
Age (yr): mean \pm SD	49.5 \pm 16	53 \pm 9	NS
Gender			
Female	76 (79%)	26 (87%)	NS
Male	20 (21%)	4 (13%)	NS
BMI (kg/m ²): mean \pm SD	48 \pm 8	45.5 \pm 7	NS
Before surgery			
LAGB		22 (74%)	
VBGLAGB		4 (13%)	
Sleeve gastrectomy		4 (13%)	
Hypertension	36 (39%)	13 (43%)	NS
Hyperlipidemia	22 (24%)	9 (30%)	NS
Joint pain	42 (46%)	10 (33%)	NS
T2DM	20 (21.5%)	9 (30%)	NS
Sleep apnea	18 (19%)	6 (20%)	NS
OHS	1 (1%)	0 (0%)	NS

SAGB = laparoscopic single anastomosis-gastric bypass; SD = standard deviation; NS = not significant; BMI = body mass index; LAGB = laparoscopic adjustable gastric banding; VBG = vertical banded gastroplasty; T2DM = type 2 diabetes mellitus; OHS = obesity hypoventilation syndrome.

abscess drainage on postoperative day (POD) 14 and 1 port-site incarceration of the small bowel on POD 4. Major late

Table 3

Early and late complications from revisional and primary laparoscopic single-anastomosis gastric bypass

SAGB	Primary SAGB (n = 96)	Revisional SAGB (n = 30)	<i>P</i>
Early mortality (<3 mo)	0	0	
Early complications (<3 mo)	7 (7.3%)	3 (10%)	NS
Major (Clavien-Dindo \geq IIIb)	5 (5.3%)	2 (6.6%)	NS
Anastomotic leak	0	0	
Perianastomotic abscess	0	1 (3.3%)	
Biliary peritonitis (traumatic injury)	1 (1%)	0	
Intraabdominal bleeding	1 (1%)	0	
Port-site herniation	2 (2%)	1 (3.3%)	
Anastomotic stricture	1 (1%)	0	
Minor (Clavien-Dindo \leq IIIa)	2 (2.1%)	1 (3.3%)	NS
Marginal ulcer	1 (1%)	0	
Deep vein thrombosis	0	1 (3.3%)	
Minor wound infection	1 (1%)	0	
Late mortality (>3 mo)	0	0	
Late complications (>3 mo)	7 (7.3%)	3 (10%)	NS
Major	4 (4.2%)	2 (6.7%)	NS
Peritonitis caused by ulcer perforation	2 (2%)	0	
Intractable biliary reflux	0	2 (6.7%)	
Bowel obstruction	1 (1%)	0	
Incisional hernia	1 (1%)	0	
Minor	3 (3.1%)	1 (3.3%)	NS
Marginal ulcer	1 (1%)	1 (3.3%)	
Excessive weight loss	2 (2.1%)	0	

SAGB = laparoscopic single-anastomosis gastric bypass; NS = not significant.

Table 4
Body mass index (BMI) and percentage of excess BMI loss (%EBMIL)

	Month 0	Month 12	Month 24	Month 60
BMI (kg/m ²): mean ± SD				
pSAGB (n = 96)	48 ± 8	32 ± 6	30 ± 6	31 ± 6
rSAGB (n = 30)	45.5 ± 7	33 ± 4.5	30.5 ± 4	32 ± 5
<i>P</i>	NS	NS	NS	NS
%EBMIL (%): mean ± SD				
pSAGB (n = 96)		74 ± 27	79 ± 25	73 ± 27
rSAGB (n = 30)		61 ± 15	75 ± 17	66 ± 22
<i>P</i>		0.031	NS	NS

pSAGB = primary laparoscopic single anastomosis-gastric bypass; rSAGB = revisional laparoscopic single-anastomosis gastric bypass.

morbidity was recorded in 2 patients (6.6%), who required conversion to a RYGB for intractable biliary reflux at 2 and 3 years after an rSAGB.

In the pSAGB group, major early morbidity occurred in 5 patients (5%), 4 of whom required surgical treatment (Table 3). One patient with biliary peritonitis, caused by a traumatic injury to the afferent loop, had resurgery on POD 1. Intraoperative splenic injury required laparoscopic splenectomy on POD 1 in a super-obese patient. Bowel obstruction caused by port-site incarceration of the small bowel occurred in 2 patients before POD 7. One patient underwent endoscopic balloon dilation for an anastomotic stricture on POD 60. Major late morbidity occurred in 4 patients (4%): 2 late marginal ulcer perforations occurred at 3 and 4 years after SAGB (successfully managed by an emergency laparotomy). One patient presented with a bowel obstruction caused by postoperative adhesions without an internal hernia and was treated laparoscopically at 3 years after a pSAGB. One incisional hernia required surgical treatment at 4 years after a pSAGB.

There were no significant differences between early and late major morbidity rates between the rSAGB and pSAGB groups (Table 3). Concerning rSAGB after band removal, no significant differences in major morbidity rates were found between the 1- and 2-stage procedures.

Weight loss

Changes in BMI and %EBMIL are shown in Table 4. After rSAGB, mean BMI was 32 ± 6 kg/m² and mean %EBMIL was 66% ± 22% at 5 years. No significant differences in BMI and %EBMIL between the rSAGB and pSAGB groups were found by the end of the follow-up (Table 4). Weight loss failure occurred in 1 patient (3.3%) in the rSAGB group and in 3 (3%) patients within the pSAGB group.

Nutritional status and co-morbidities

At 5 years, 2 patients (2%) developed severe malnutrition after pSAGB; no cases occurred after rSAGB. Mean albumin level was 38 ± 4 g/L in the overall series and no significant differences were found between the 2 groups.

Significant decrease in the rates of hypertension, T2DM, hyperlipidemia, sleep apnea syndrome, and joint pain were observed at the end of the follow-up period compared with the preoperative period in each group (Table 5). At 5 years, no significant differences were found in the remission rates of any obesity-related co-morbidities that occurred in the rSAGB and pSAGB groups (Table 5).

Quality of life

At 5 years, pSAGB patients had a significantly higher GIQLI score than rSAGB patients (112.5 ± 16.8 versus 104.1 ± 17.6, *P* = .025) (Table 6). Significant differences were found in the “upper symptoms” and “psychological” scores between the 2 groups. rSAGB patients had significantly more symptoms, such as “regurgitation” (*P* = .011), “belching” (*P* = .030), “epigastric fullness” (*P* = .018), and “restricted eating” (*P* = .047), compared with pSAGB patients at 5 years (Table 6).

Lost to follow-up

Forty-nine patients were lost to follow-up and were not included in the study because of incomplete 5-year follow-up. These missing patients were comparable to the 126 patients’ study group (Table 7). No mortality and no morbidity occurred in these missing patients during a median follow-up of 12 months (range 1–36 mo).

Table 5
Remission rates for obesity-related co-morbidities at 5 years

	Revisional SAGB (n = 30)	Primary SAGB (n = 96)	<i>P</i>
Hypertension	58% (7/12)	50% (18/36)	NS
Hyperlipidemia	75% (6/8)	82% (19/23)	NS
Joint pain	33% (3/10)	38% (16/42)	NS
T2DM	85% (6/7)	81% (17/21)	NS
Sleep apnea	50% (3/6)	50% (9/18)	NS

SAGB = laparoscopic single anastomosis-gastric bypass; T2DM = type 2 diabetes mellitus.

Table 6
Comparison between 5-year Gastrointestinal Quality of Life Index scores:
rSAGB group versus pSAGB group

GIQLI	pSAGB group (n = 96)	rSAGB group (n = 30)	P
OVERALL (0–144)	112.5 ± 16.8	104.1 ± 17.6	.025
SYMPTOMS	59.1 ± 10	54.1 ± 10.9	.027
Upper symptoms	37.2 ± 7.3	33.6 ± 7.8	.026
Regurgitation	3.2 ± .9	2.5 ± 1.3	.011
Heartburn	3.2 ± 1.1	2.7 ± 1.3	NS
Nausea	3.5 ± .9	3.1 ± 1	NS
Belching	3.2 ± 1	2.7 ± 1.2	.03
Epigastric fullness	2.9 ± 1.1	2.3 ± 1.3	.018
Bloating	2.2 ± 1.4	1.9 ± 1.3	NS
Abdominal noises	3 ± 1.1	3.2 ± 1.1	NS
Nonenjoyed eating	3.4 ± 1.2	3 ± 1.5	NS
Restricted eating	3 ± 1.1	2.4 ± 1.4	.047
Eating speed	2.9 ± 1.3	3.2 ± 1.2	NS
Dysphagia	3.8 ± .6	3.7 ± .7	NS
Pain	3 ± 1.1	2.9 ± 1.1	NS
Lower symptoms	21.9 ± 4.6	20.5 ± 5.5	NS
Diarrhea	2.8 ± 1.2	2.8 ± 1.4	NS
Bowel urgency	2.9 ± 1.2	2.6 ± 1.3	NS
Bowel frequency	2.9 ± 1.2	2.8 ± 1.3	NS
Constipation	3.4 ± 1	3.4 ± 1	NS
Blood in stool	3.8 ± .5	3.6 ± 1	NS
Flatus	2.4 ± 1.5	2 ± 1.5	NS
Incontinence	3.7 ± .7	3.4 ± 1.2	NS
Physical	21.2 ± 5	19.7 ± 7.1	NS
Strength	3.7 ± .6	3.4 ± 1	NS
Feeling unwell	3.3 ± 1.2	3.1 ± 1.3	NS
Feeling unfit	2.7 ± 1.4	2.7 ± 1.7	NS
Endurance	3 ± 1.3	3 ± 1.4	NS
Waking up at night	2.7 ± 1.3	2.4 ± 1.5	NS
Appearance	3.3 ± 1.2	2.9 ± 1.6	NS
Fatigue	2.6 ± 1.4	2.2 ± 1.5	NS
Psychological	17.3 ± 3	15.8 ± 3.4	.031
Sadness	3.4 ± 1	3.1 ± 1.3	NS
Nervousness	3.7 ± .7	3.6 ± .8	NS
Frustration	3.5 ± .9	3.2 ± 1.3	NS
Happiness	3.4 ± 1	2.8 ± 1.4	.019
Stress	3.3 ± 1	3 ± 1.1	NS
Social	14.9 ± 3.8	14.5 ± 5.2	NS
Bothered by treatment	3.4 ± 1.1	3.1 ± 1.1	NS
Daily activities	3.7 ± .7	3.4 ± 1	NS
Leisure activities	3.4 ± 1.1	2.9 ± 1.6	NS
Personal relationships	2.4 ± 1.6	2.7 ± 1.6	NS
Sex life	2 ± 1.7	2.4 ± 1.9	NS

GIQLI = Gastrointestinal Quality of Life Index; pSAGB = primary laparoscopic single-anastomosis gastric bypass; rSAGB = revisional laparoscopic single-anastomosis gastric bypass; NS = not significant.

Discussion

The present study compared the 5-year outcomes of 30 morbidly obese patients who underwent revisional SAGB for a failed restrictive procedure with the outcomes of 96 patients who underwent a primary SAGB. The main findings were regarding the safety profile and the long-term efficacy of rSAGB.

No increase in morbidity was observed after revisional SAGB during the 5-year follow-up and our major morbidity

rate was within the range reported in the literature for revisional LRYGB after a failed restrictive procedure [6,12–15]. The 6.6% early major-complication rate we found in the rSAGB group appears to be acceptable; in addition, it represents the initial experience of the department (learning curve). Concerning major late morbidities, 2 cases of intractable biliary reflux were successfully converted to a RYGB without any morbidity in rSAGB patients after a failed LAGB (in both cases).

Weight loss was statistically similar between the 2 groups, and our mean %EBMIL of 66% at 5 years in the rSAGB group compares favorably with results reported in the literature after an rLRYGB [6,13,14]. This supports the hypothesis that rSAGB produces successful weight loss after a failed restrictive procedure. The long-term efficacy of SAGB is also reflected in the good management of obesity-related co-morbidities, such as T2DM [18,24]. In the present study, remission rates from all co-morbidities were improved and were similar between the 2 groups: 85% of our T2DM patients experienced T2DM remission in the rSAGB group versus 81% in the pSAGB group. These promising results for weight loss and co-morbidity remission, which are in accordance with those reported in the literature for rLRYGB [6,13,14], support the use of rSAGB to treat morbid obesity after a failed restrictive procedure.

The other important finding from this study was the worse 5-year functional results after an rSAGB. Patients in the rSAGB group had significantly a lower overall GIQLI score than patients in the pSAGB group (104.1 ± 17.6 versus 112.5 ± 16.8, $P = .025$). Interestingly, more symptoms (such as “regurgitation,” “belching,” “epigastric fullness,” and “restricted eating”) were found after rSAGB compared with pSAGB. According to these results, restrictive surgery before SAGB seemed to worsen the upper gastrointestinal symptoms and probably created the gastrointestinal reflux disease [25–27] or pseudo-achalasia symptoms [28–30]. The mechanism for this is unknown, but some authors propose that high-outflow resistance with chronic high pressure is caused by the band (LAGB or VBG), or that the pylorus (sleeve gastrectomy) can lead to progressive weakening of the esophageal musculature

Table 7
Preoperative clinical characteristics of the 49 missing patients (MP) compared with the study group

Variable	Study group (n = 126)	MP (n = 49)	P
Age (yr): mean ± SD	50 ± 10	51 ± 9	NS
Gender			
Female	100 (79%)	37 (75%)	NS
Male	26 (21%)	12 (35%)	NS
BMI (kg/m ²): mean ± SD	47 ± 8	47 ± 9	NS
Procedures before SAGB:	30 (24%)	13 (26.5%)	NS
LAGB	22 (17.5%)	10 (20%)	NS
VBG	4 (3%)	2 (4%)	NS
Sleeve gastrectomy	4 (3%)	1 (2%)	NS

SD = standard deviation; NS = not significant; BMI = body mass index; SAGB = single-anastomosis gastric bypass; LAGB = laparoscopic adjustable gastric banding; VBG = vertical banded gastroplasty.

and the lower esophageal sphincter [31]. These nonspecific upper symptoms appear to be reversible in most cases [30,32], but our worse 5-year functional results suggest some irreversible damage. Additionally, the only 2 successful conversions to a RYGB for intractable biliary reflux were performed in the rSAGB group. Although the study's design does not allow any firm conclusions, these observations suggest that poorer functional results could be related to prior restrictive surgery and stress, but also the need for standardized and exhaustive preoperative evaluation to diagnose esophageal peristalsis and/or low esophageal sphincter anomalies before performing an rSAGB (careful clinical evaluation, manometry, pH, upper endoscopy, upper gastrointestinal series). Further high-level studies are required to confirm these observations and to compare the long-term functional results between rSAGB and rLRYGB.

Conclusion

A rSAGB after a failed restrictive procedure was well tolerated and effective in the long-term. However, quality of life and upper gastrointestinal function were lower after revisional surgery compared with primary surgery. Further studies are required.

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