Minigastric bypass compared with Roux-en-Y gastric bypass after failed vertical banding gastroplasty: a retrospective cohort of 100 patients

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Introduction
Bariatric surgeries are currently the only effective treatment for morbid obesity and its associated comorbidities, including type 2 diabetes mellitus, hypertension, and dyslipidemia. Restrictive procedures have an estimated failure rate up to 20%. Roux-en-Y gastric bypass (RYGB) is commonly performed as a revision surgery for failed restrictive procedures. Few studies have compared RYGB with minigastric bypass (MGB) after failed restrictive procedure, especially vertical banding gastroplasty (VBG).

Patients and methods
A total of 100 patients underwent revisional bariatric surgery, either MGB or RYGB, after failed VBG at a bariatric surgery unit. Ain Shams University Hospitals was done. Patients with morbid obesity after failed VBG were included in the study, and patient with any contraindication to surgery or surgeries converted to open were excluded from the study. Patients were followed up for 1 year after the surgery.

Results
A total of 100 patients (50 MGB and 50 RYGB) were included in our study. The mean age was 36.7±4.1 years in MGB and 28±4.8 years in RYGB. Although preoperative BMI was significantly lower in MGB group (43.±2.4, P=0.001), 1-year postoperative BMI was significantly lower in RYGB group (27.7±2.06, P=0.001). MGB took significantly less operative time (125±2.4) compared with RYGB (145.6 ±2.6 min). No significant difference in hospital stay between two groups was detected.

Conclusion
Our study showed that both procedures significantly reduced BMI, with greater efficacy in RYGB. MGB is simpler and has less operative time.

Keywords:
failed VBG, redo surgeries, RYGB, vertical band gastroplasty

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Introduction

The WHO reported a threefold increase in the prevalence of obesity globally between 1975 and 2016. More than 1.9 billion adults aged 18 years and older were obese [1].

Bariatric surgeries are currently the only effective treatment for morbid obesity and its associated comorbidities, including type 2 diabetes mellitus, hypertension, and dyslipidemia. However, 20% of patients fail to lose weight or they regain weight after surgery [2]. It is estimated that 60% of restrictive [vertical banded gastroplasty (VBG) and adjustable gastric band] bariatric procedures require revision surgery [3].

Roux-en-Y gastric bypass (RYGB) is commonly performed as a revision surgery for failed restrictive procedures, but RYGB is associated with high rate of complications and long operative duration. Recently, a few studies have demonstrated excellent results for minigastric bypass (MGB) for revision surgery with short operative duration and low rate of complications postoperatively [4,5].

Few studies have compared RYGB with MGB after failed restrictive procedure. Laparscopic gastric banding (LAGB) or laparoscopic sleeve gastrectomy was the most common performed restrictive procedures in the past 10 years [6,7]. Fewer studies talk about open VGB as a primary failed restrictive procedure [8,9].

Currently, there is no consensus regarding best revision surgery after failed restrictive procedures. Our study aims to compare RYGB and MGB as revision bariatric procedures for failed VBG regarding BMI loss,

operative time, hospital stay, and postoperative complications.

Patients and methods

This study included 100 patients who needed to undergo revisional bariatric surgery after failed VBG in the Bariatric Unit, Department of General Surgery, Ain Shams University hospitals, from January 2017 to January 2020 after approval from the ethical committee. Overall, 50% of our patients underwent MGB [patients who had dilated gastric pouch (long gastric pouch) above the mesh or patients who were able to remove the mesh to pass the bougie easily through the gastric outlet] and 50% underwent LRYGB (patients with short gastric pouch above the mesh and are unable to remove the mesh or pass the bougie).

Patients with BMI more than 40 kg/m^2 were included in this study if they were complaining of failed previous VBG, that is, unsatisfactory weight loss (<50% of the excess body weight in 2 years after the operation) and/or suffering from one of VBG common complication, that is, GG fistula, pouch dilation or staple-line disruption with weight regain, mesh migration with stomal stenosis with persistence vomiting, stomal ulcers, intractable bleeding, severe reflux esophagitis, or poor control of obesity-associated comorbidities.

Patients were excluded from this study if there were any contraindications to laparoscopic surgery or general anesthesia or the patients refused bypass surgery. Moreover, surgeries that were converted from laparoscopic to open or cases with intraoperative complications were excluded from the study.

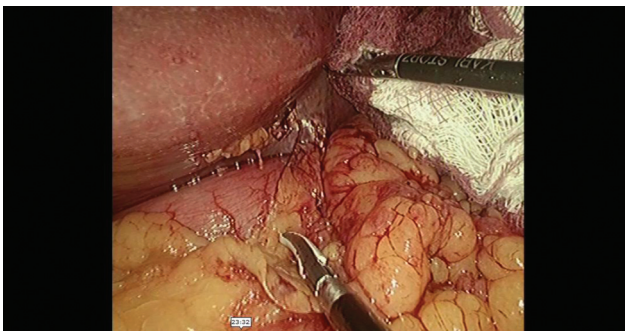
Preoperatively, a multidisciplinary team evaluated the participants regarding medical, endocrinological, nutritional, and psychiatric status. Preoperative assessment included blood examinations, cardiology evaluation, and chest radiography. Psychiatric counseling was conducted to evaluate any mental health contraindications to surgery. Moreover, all our patients underwent pelviabdominal ultrasonography, barium meal, and upper endoscopy preoperatively.

Clear informed consent was taken from all patients after reviewing with them all of the benefits, risks, and long-term consequences of the conversion to bypass surgery. High-protein diet was recommended 7 days before the operation, whereas liquids only were allowed during the day before operation.

All surgeries were done laparoscopically, and adhesiolysis for all of the adhesions between anterior wall of the stomach wall and surrounding stricter, liver and omentum, until visualization of the mesh was a common step in all surgeries followed by removal of the mesh carefully without injuring the stomach wall, followed by passage of bougie size 36 Fr into the stomach (Figs 1–3).

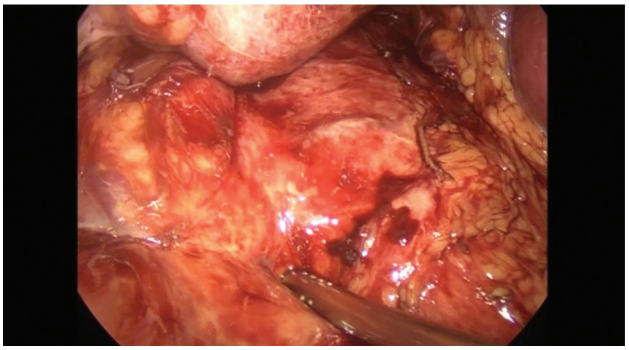
For patients with short gastric pouch above the mesh or unable to pass the bougie freely or failure to remove the

Figure 1



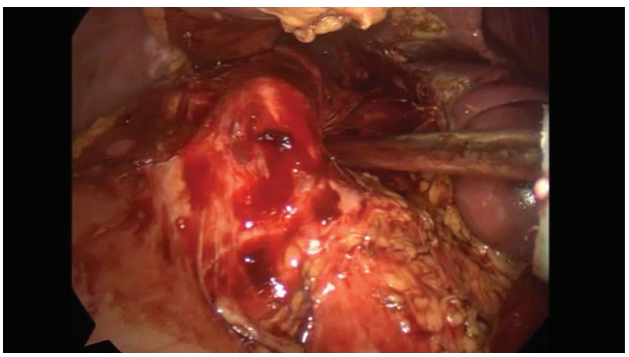
Dissection of the liver from anterior surface of the stomach.

Figure 2



Trial for exposure of the mesh.

Figure 3



Failure of passage of bougie due to presence of mesh.

mesh, LRYGB was done. A small gastric pouch was done by stapling the stomach using a linear stapler. At 100 cm from DJ, biliopancreatic limb was created, and the alimentary limb was measured 150 cm (after counting biliopancreatic limb). End-to-side gastrojejunostomy (between gastric pouch and alimentary limp) and side-to-side jejunojejunostomy (between biliopancreatic limp and alimentary limp) were done using a linear stapler. Both enterotomies and mesenteric defects were closed by nonabsorbable sutures.

For patients with long dilated gastric pouch above mesh or we succeeded to remove the mesh or freely passage of the bougie through gastric outlet, MGB was done. A long and narrow gastric tube calibrated with a 36-Fr bougie was performed using a linear stapler designed for redo surgeries, which began at the angle of the lesser curvature until the angle of His. A unique anastomosis was made between the distal end of the gastric tube and a long jejunal omega loop of 200 cm. It was an end-to-side gastrojejunal anastomosis with a linear stapler and closed on its anterior part with a running suture.

According to our department protocol, nothing per month for 2 days after the operation followed by clear fluid for 1 week and semisolid food for 2–4 weeks was performed by all our patients postoperatively. Normal healthy diet was subsequently introduced. A gastrografin study was performed in the third week after the operation, and if normal, the patient was discharged. Patients were planned for follow-up visit every week for 1 month and then visited every month for 1 year to monitor their postoperative outcome, that is, BMI, general health condition, and any possible complications.

Statistical analysis

Statistical analysis was done using IBM SPSS statistics for windows, Version 23.0. Armonk, NY: IBM Corp. To ensure our data had normal distribution, we performed Kolmogorov–Smirnov test and Shapiro–Wilk test. We used Student's *t* test for comparison of mean between the two groups (MGB vs. RYGB). Paired sample *t* test was used to compare BMI before surgery and 1 year postoperatively in each group. *P* value less than 0.05 was considered statistically significant.

Results

A total of 100 patients undergone revision bariatric surgery, either MGB or RYGB, after failed previous VBG were included. Overall, 75% of our patients were complaining of unsatisfactory weight loss or weight regain after open VBG, whereas 25% were complaining of other VBG complications, such as persistent vomiting, reflux esophagitis, or attacks of bleeding.

There was no significant difference between the two groups regarding preoperative BMI and mean age of the patients. No significant difference was found regarding sex, morbidities, and causes of revision surgery, as shown in Table 1.

Irrespective to the type of surgery we performed, three cases had liver injury, two cases had intestinal injury, which was repaired intraoperatively, and one case had bleeding from gastroesophageal area, but it was stopped with compression.

MGB was successfully performed in 50 cases. The mean duration of procedure was 125 min (range, 93–225 min), and the mean length of hospital stay was 3 days (range, 2–7 days). The mean BMI decreased to 32.51 kg/m^2 (range, 26.8–43.5 kg/m^2) after 1 year of the operation. One case had hematemesis and decrease hemoglobin owing to bleeding from the anastomotic site 1 day after the operation. Upon re-exploration, a second suture was taken over the anastomotic line, and bleeding was stopped. One case had port-site infection, which is treated medically. Three cases had unsatisfactory weight loss 1 year after the operation (Table 2).

RYGB was performed in 50 cases, with a mean duration of operation of 145.6 min (range,

Table 1 Patients demographic data

	MGB	RYGB	*P* value
Number of patients [*n* (%)]	50 (50)	50 (50)	
Age (mean±SD)	37.6±4.1	28±4.8	0.001
Sex			1.00
Male	12	12	
Female	38	38	
Mortality	0	0	NA
Preoperative BMI (mean±SD)	43.3±2.4	47.6±2.6	0.001
Postoperative complications			0.3
Wound infection	1	1	
Anastomotic site bleed	1	0	
Unsatisfactory weight loss	3	0	
Postoperative IO	0	2	
Causes of revision			0.6
Weight regains	30	19	
Unsatisfactory weight loss	11	15	
Reflux esophagitis	9	16	

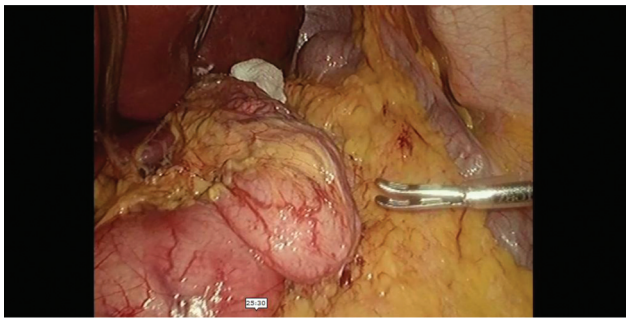
MGB, minigastric bypass; RYGB, Roux-en-Y gastric bypass.

Table 2 Comparison between minigastric bypass and Roux-en-Y gastric bypass regarding operative time

	MGB	RYGB	*P* value
Operative time (min) (mean±SD)	125±2.4	145.6±2.6	0.001

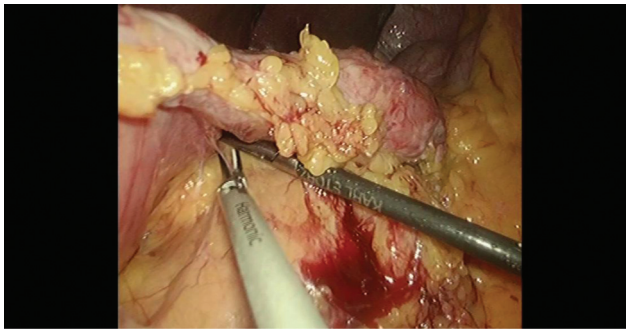
MGB, minigastric bypass; RYGB, Roux-en-Y gastric bypass.

Figure 4



Passage of bougie after mesh removal.

Figure 5



Trial for mesh removal posteriorly.

110–212 min) and a mean length of hospital stay of 4.2 days (range, 5–10 days). The mean BMI decreased to 27.7 kg/m^2 (range, 25.3–44.3 kg/m^2) after 1 year of the operation. Two cases had intestinal obstruction; one occurred 2 weeks after the operation upon re-exploration, and hernia through the mesenteric defect was found. The herniated intestine was viable, and reduction with closure of the defect was performed. The other case occurred 3 months after the operation, and on re-exploration, twisted loops were found, which were viable. Untwisting and fixation were done. One case had port-site infection, which was treated medically. Finally, no mortalities occurred in this study (Figs 4–6 and Tables 3–5).

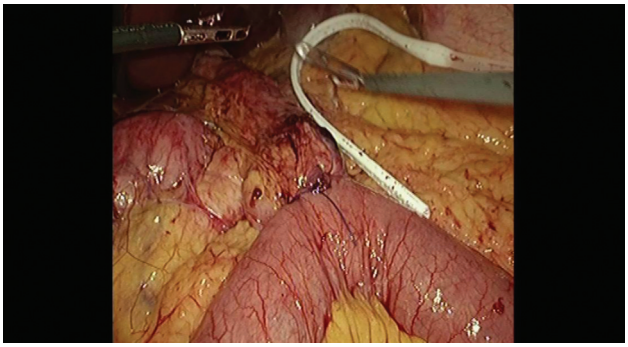
Discussion

VBG was one of the most famous bariatric surgeries at the end of the last decade [10]. However, 20% of patients experience weight regain, with unsatisfactory results after surgery. This can be explained by staple-line disruption, pouch dilation, and the switch in patients eating habits to become 'sweet eaters' [11].

Van Gemert *et al.* [12] stated that revisional bariatric surgery is required in 56% of patients who underwent VBG.

In our study, the results showed that both surgeries had sufficiently decreased BMI after 1 year of follow-up, with greater efficacy in RYGB. However, RYGB had longer duration of operation. The was no difference between the two groups in postoperative hospital stay, and no significant difference between both groups in postoperative complications and mortality.

Figure 6



MGB in a case with long pouches after mesh removal. MGB, minigastric bypass.

Table 3 Comparison between minigastric bypass and Roux-en-Y gastric bypass regarding BMI loss after 1 year of follow-up

	MGB	RYGB	*P* value
Postoperative BMI (mean±SD)			
1 year	32.5±2.1	27.7±2.06	0.001

MGB, minigastric bypass; RYGB, Roux-en-Y gastric bypass.

Table 4 Comparison between preoperative BMI and postoperative BMI regarding minigastric bypass and Roux-en-Y gastric bypass

	Preoperative BMI	BMI 1 year	*P* value
MGB	43.3±2.4	32.5±2.11	0.001
RYGB	47.6±2.6	27.7±2.06	0.001

MGB, minigastric bypass; RYGB, Roux-en-Y gastric bypass.

Table 5 Comparison between minigastric bypass and Roux-en-Y gastric bypass regarding Hospital stay

	MGB	RYGB	*P* value
Hospital stay (mean number of days ±SD)	3 ±0.5	4.2 ±0.6	0.59

MGB, minigastric bypass; RYGB, Roux-en-Y gastric bypass.

Several studies have shown that primary MGB is effective but simpler and safer compared with RYGB [13]. Robert *et al.* [14] reported that primary MGB is noninferior to RYGB in weight loss and remission of diabetes mellitus. Lee *et al.* [15] showed in their RCT of 80 patients that there was no significant difference between RYGB and MGB in treatment of obesity except excess weight reduction in RYGB group at 1 year of follow-up. They also concluded that RYGB group had more operation time, early postoperative complication, and more hospital stay.In this meta-analysis of 11 studies, Wang *et al.* [16] compared MGB with RYGB regarding estimated weight loss (EWL), remission of comorbidities, operation time, hospital stay, and mortality. They reported that MGB group had higher EWL in 1- and 2-year follow-up and shorter operative time but no difference regarding mortality, gastrointestinal reflux disease (GERD), and hospital stay.

Few studies had compared MGB with RYGB following failed restrictive procedures. For instance, Velotti *et al.* [2] in their meta-analysis of only five studies showed that only one study compared MGB and RYGB after failed VBG. Velotti *et al.* [2] reported that both operations results in comparable EWL and BMI loss at 1 year of follow-up. Moreover, they stated that MGB had less postoperative complications and shorter operative time.

Salama and Sabry [10] compared MGB with RYGB after failed VBG. In their study of 60 patients, MGB group had lower operative time and lower hospital stay compared with RYGB. Their results showed no significant difference between both surgeries regarding BMI 1 year postoperatively, indicating that both procedures had similar effect in weight reduction.

Our study is limited to short follow-up period of only 1 year postoperatively, thereby missing long postoperative complications and BMI loss of both procedures, which is why further studies showing long-term results with a greater number of cases are recommended.

Conclusion

Our study showed that both procedures significantly reduced BMI, with greater efficacy in RYGB. MGB is simpler and has less operative time. Future large RCTs comparing MGB with RYGB after failed VBG are needed to discover remission of comorbidities after each procedure.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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