Banded versus nonbanded laparoscopic mini-gastric bypass: a cohort study of a single center with 3 years of follow-up

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Introduction
Bariatric surgeries are currently the only effective treatment for morbid obesity and its associated comorbidities. However, 20% of patients fail to lose weight or regain weight after surgery. Banding of sleeve gastrectomy and Roux-en-Y gastric bypass had better results than their nonbanded counterparts. In this study, we aimed to study the effectiveness of banded mini-gastric bypass (BMGB) in BMI loss, resolution of comorbidities, and postoperative complications compared with mini-gastric bypass (MGB).
Patients and methods
From June 2018 to June 2021, we reviewed all medical records of patients of the Bariatric Surgery Department at Ain Shams University Hospital undergoing either MGB) or BMGB. We included all patients older than 18 years, and we excluded those who were younger than 18 years or older than 60, had previous bariatric or gastrointestinal surgery, had psychiatric contraindications, pregnancy, and had other medical reasons denying laparoscopy. Patients were followed up at 12, 24, and 36 months at clinics.
Results
A total of 60 patients were included: 30 underwent laparoscopic MGB and 30 underwent BMGB. Most of the participants were females (70%). During 36 months of follow-up, no patient was lost. After 3 years of follow-up, patients had no significant difference in BMI loss for MGB and BMGB at 12 months (MGB: 29.4 ± 2.4 vs. BMGB: 28.4 ± 2.6, *P*=0.14) and 36 months (MGB: 24.7 ± 2.2 vs. BMGB: 24.2 ± 2.1, *P*=0.34), respectively. Yet, a significant lower BMI is detected in the MGB group at 24 months of follow-up (MGB: 24.8 ± 1.3 vs. BMGB: 26 ± 2.2, *P*=0.01). No significant difference is detected between both operations in resolution of preoperative comorbidities or postoperative complications.
Conclusion
BMGB is a safe and effective procedure for morbidly obese patients. Our study showed no difference between BMGB and MGB in BMI loss owing to short-term follow-up. Studies are needed to compare BMGB with other banded procedures.

Keywords:
band, banded mini-gastric bypass, mini-gastric bypass, weight loss

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Introduction

WHO reported a triple increase in the prevalence of obesity globally between 1975 and 2016. More than 1.9 billion adults aged 18 years and older were overweight, of whom 650 million adults were obese [1]. The prevalence of obesity has increased significantly around the world, affecting 42.4% of US adults. The Center for Diseases Control and Prevention estimated that 30% of the American adult population is considered morbidly obese, with BMI of more than 30, leading to several comorbidities including dyslipidemia, hypertension (HTN), diabetes mellitus (DM) type 2, obstructive sleep apnea, and even psychiatric problems [2].

Bariatric surgeries are currently the only effective treatment for morbid obesity and its associated comorbidities. However, 20% of patients fail to lose weight or regain weight after surgery [3]. Attempts have been made to overcome this drawback. For example, single anastomosis sleeve ileal (SASI) bypass is currently under study. Others have attempted to study banded sleeve gastrectomy (BSG) and banded Roux-en-Y gastric bypass [4,5].

A study done by Bhandari *et al.* [6] concluded that BSG is safe and effective in weight loss after 2–5 years of follow-up. Fink *et al.* [7] also reported that BSG sustainably reduces weight compared with nonbanded sleeve gastrectomy, thus overcoming weight regain

dilemma [8]. Mahdy *et al.* [9] reported that SASI is an effective procedure in reducing BMI and in improving obesity-related comorbidities during 12 months of follow-up. A systematic review done by Hany *et al.* [10] concluded that SASI effectively reduced weight and improved comorbidities.

In this study, we aimed to study the effectiveness of banded mini-gastric bypass (BMGB) in BMI loss, resolution of comorbidies, and postoperative complications compared with mini-gastric bypass (MGB).

Patients and methods

We conducted a prospective cohort for patients undergoing either MGB or BMGB. We reviewed all medical records of patients in the Bariatric Surgery Department at Ain Shams University Hospital from June 2018 to June 2021. We included all patients older than 18 years, and we excluded those who were younger than 18 years or older than 60 years, had previous bariatric or gastrointestinal surgery, had psychiatric contraindications, had pregnancy, and had other medical reasons denying laparoscopy. Patients were followed up at, 12, 24, and 36 months at clinics. Missing patients were phone called and asked to attend the next day for follow-up. BMI, comorbidities (DM and HTN), and postoperative morbidities were assessed at each follow-up visit. This research was performed at the Department of General Surgery, Ain Shams University Hospitals. Ethical Committee approval and written, informed consent were obtained from all participants.

Preoperatively, a multidisciplinary team evaluated the participants regarding medical, endocrinological, nutritional, and psychiatric workup. Preoperative assessment included blood examinations, cardiology evaluation, and chest radiography. Psychiatric counseling was conducted to evaluate mental health contraindications to surgery. Patients were also assessed for comorbidities and BMI.

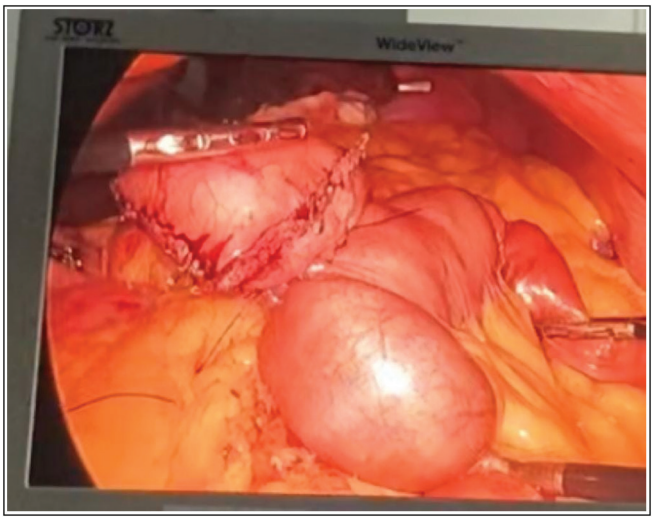
Surgical procedure

Laparoscopically, a long and narrow gastric tube calibrated with a 36-Fr bougie was introduced using a linear stapler and begun at the incisura angularis until the angle of His. A unique anastomosis was made between the bottom of the gastric tube and a long jejunal omega loop of 200 cm. It was an end-to-side gastrojejunal anastomosis done with a linear stapler (45 mm, blue cartridge, Ethicon; Johnson & Johnson, New York, NY, USA) and closed on its anterior part with a running suture. Then, a Minimizer ring, 7 cm, was placed around the middle part of the gastric pouch. Figures 1 and 2 show BMGB and MGB, respectively.

Figure 1

Banded mini-gastric bypass (BMGB).

Figure 2



MGB. MGB, mini-gastric bypass.

Statistical analysis was done using IBM SPSS statistics for windows, Version 23.0 (IBM Corp., Armonk, NY, USA). To ensure our data had normal distribution, we performed Kolmogorov–Smirnov test and Shapiro–Wilk test. Categorical variables were analyzed using χ^2 test. We used Student's *t* test for comparison of mean between two groups (MGB vs BMGB). *P* value less than 0.05 was considered statistically significant.

Results

Of 60 patients, 30 underwent laparoscopic MGB and 30 underwent BMGB. Most of the participants were females (70%). There was no significant difference between two groups regarding age (*P*=0.16), sex (*P*=0.57), preoperative BMI (*P*=0.30), and comorbidities (*P*=0.36), as shown in Table 1. No mortality happened in either of the two groups. During 36 months of follow-up, no patient was lost.

The overall mean operative time is significantly higher in the BMGB group compared with MGB, as shown

in Table 2 (MGB: mean 68.8 ± 9.3 min vs. BMGB: mean 79.4 ± 11.1).

After 3 years of follow-up, patients had no significant difference in BMI loss for MGB and BMGB at 12 months (MGB: 29.4 ± 2.4 vs. BMGB: 28.4 ± 2.6, *P*=0.14) and 36 months (MGB: 24.7 ± 2.2 vs. BMGB: 24.2 ± 2.1, *P*=0.34). Yet, a significant lower BMI is detected in MGB group at 24 months of follow-up (MGB: 24.8 ± 1.3 vs. BMGB: 26 ± 2.2, *P*=0.01) (Table 3).

Table 4 shows that both surgeries significantly reduced BMI after 36 months of follow-up (*P*=0.0001).

Regarding resolution of preoperative comorbidities including DM, HTN, and sleep apnea, no significant difference was detected between both operations (*P*=0.23). Tables 5 and 6 show postoperative complications in each surgery type. No significant difference was detected between both procedures.

Table 1 Patient characteristics regarding type of operation: mini-gastric bypass versus banded mini-gastric bypass

	MGB	BMGB	*P* value
Number of patients [*n* (%)]	30 (50)	30 (50)	
Age (mean±SD)	37.3 ± 7.3	40.1 ± 8	0.16
Sex			
Male	10	8	0.57
Female	20	22	
Preoperative BMI (mean±SD)	49.5 ± 3.4	50.7 ± 5	0.30
Comorbidities*			
DM	7	11	0.36
HTN	6	8	
HTN and DM	4	2	
Sleep apnea	2	0	
No comorbidities	11	8	
Mortality			
Yes	0	0	NA
No	30	30	

BMGB, banded mini-gastric bypass; DM, diabetes mellitus; HTN, hypertension; MGB, mini-gastric bypass. *Some data are missing.

Table 2 Mean difference in operative time between mini-gastric bypass versus banded mini-gastric bypass

	MGB	BMGB	*P* value
Operative time (mean±SD)	68.8 ± 9.3	79.4 ± 11.1	0.00

BMGB, banded mini-gastric bypass; MGB, mini-gastric bypass.

Table 3 Comparison between mini-gastric bypass versus banded mini-gastric bypass regarding BMI loss during 36 months of follow-up

	MGB	BMGB	*P* value
Postoperative BMI (mean±SD) (months)			
12	29.4 ± 2.4	28.4 ± 2.6	0.14
24	24.8 ± 1.3	26 ± 2.2	0.01
36	24.7 ± 2.2	24.2 ± 2.1	0.34

BMGB, banded mini-gastric bypass; MGB, mini-gastric bypass.

Discussion

The role of bariatric surgery is to treat obesity and its related morbidity and mortality, including cardiovascular, endocrinal, musculoskeletal, and psychological problems. There is no ideal bariatric surgery. The field is evolving rapidly with many operations each with its risk and benefit. We hypothesized that BMGB could overcome postoperative weight regain of MGB. Our results showed that both MGB and BMGB effectively reduced BMI after 36 months of follow-up, yet no difference was found between both surgeries in BMI loss (except at 24 months), resolution of comorbidities, and postoperative complications. In BMGB, only one patient experienced persistent vomiting more than 2 weeks that required band removal after 6 months owing to failure of conservative measures.

In a study conducted by Sheikh *et al.* [11], patients were followed for 11 years. In their cohort, 139 patients

Table 4 Comparison between preoperative and postoperative BMI in mini-gastric bypass versus banded mini-gastric bypass groups after 36 months of follow-up.

	Preoperative BMI	Postoperative BMI (36 m)	*P* value
MGB	49.5 ± 3.4	24.7 ± 2.2	0.0001
BMGB	50.7 ± 5	24.2 ± 2.1	0.0001

BMGB, banded mini-gastric bypass; MGB, mini-gastric bypass.

Table 5 Comparison between banded sleeve gastrectomy and nonbanded sleeve gastrectomy regarding resolution of comorbidities of patients

	MGB	BMGB	*P* value
Resolution of comorbidities			
Yes	10	11	0.23
No	4	1	
Partial resolution	5	9	

BMGB, banded mini-gastric bypass; MGB, mini-gastric bypass.

Table 6 Postoperative complications according to operation type

	MGB	BMGB	*P* value
Postoperative complications*			
No	24	25	0.43
Iron-deficiency anemia	1	1	
Unsatisfactory weight loss	2	0	
Respiratory distress	1	0	
Marginal ulcer	1	0	
Wound infection	1	0	
Esophagitis	0	1	
Vomiting	0	2	

BMGB, banded mini-gastric bypass; MGB, mini-gastric bypass. *Some data are missing.

underwent BMGB, with only 92 patients responding to follow-up. The authors concluded that BMGB is safe and effective with excess weight loss (EWL) of 84.3% at 11 years of follow-up. Five patients had band-related problems in first 6 years postoperatively, which required surgical management. Another study done by Awad *et al.* [12] with a follow-up period of 10 years. In their study, 260 had BMGB, whereas 218 had MGB. The authors concluded that a significant difference in EWL appeared from third year of follow-up, with 82% in BMGB versus 63% in MGB. Concerning band-related problems, band migration arose in PTFE ring compared with polyurethane vascular patch strip. These two studies showed that persistent weight reduction of BMGB appeared with long-term follow-up in contrast to our study, where we followed our patients for only 36 months.

Concerning medium and short-term follow-up, Lemmens [13] followed 432 patients – 254 with MGB and 178 with BMGB. The author reported no significant difference between both operations in weight loss or EWL in early postoperative years. However, at 5 years of follow-up, BMGB had significantly more weight loss and lesser weight regain compared with MGB. As for band-related problems, five patients had functional stenosis at ring level in the early postoperative period. Six patients had their GaBP ring broken. In another study by Lemmens *et al.* [14] using the GaBP ring system, the authors concluded that BMGB effectively reduced weight with no weight regain during 4 years of follow-up. Few complications were reported, but none were band related. Lastly, Clarke *et al.* [15] followed 156 patients with BMGB up to 5 years. The authors concluded that BMGB had effective EWL but food intolerance and vomiting in 29 patients. This study is limited in the sample size and its observation of study design. We followed our patients for a short period of 3 years; therefore, a significant difference between BMGB and MGB in BMI loss was not detected, as was presented before with longer follow-up period where differences between both operations appeared.

Conclusion

Our study showed no difference between BMGB and MGB in BMI loss owing to short-term follow-up. However, our results showed few complication rates in BMGB than MGB, which could be managed conservatively. Thus, BMGB is safe and effective procedure for morbidly obese patients.

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Conflicts of interest

No conflict of interest.

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