Banded sleeve gastrectomy versus nonbanded sleeve gastrectomy: 3-year results of a retrospective cohort study

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Introduction
Laparoscopic sleeve gastrectomy or nonbanded sleeve gastrectomy (NBSG) is nowadays the most commonly performed and known bariatric procedure for its safety and effectiveness, yet weight regain is still a long-term disadvantage. Banded sleeve gastrectomy is considered to be a restrictive operation. The authors aim to compare the results of both operations after a follow-up period of 3 years.

Methods
In this retrospective cohort, the authors reviewed all medical records of the Department of Bariatric Surgery at Ainshams University Hospital from January 2018 to December 2020. Forty patients were then divided into two groups: either laparoscopic banded sleeve gastrectomy (20 patients) or nonbanded laparoscopic sleeve gastrectomy (20 patients). The authors included all patients above 18 years old and excluded those who were below 18 years or over 60, had previous bariatric or gastrointestinal surgery, psychiatric contraindications, pregnancy, and other medical reasons for denying laparoscopy. Patients were followed postoperatively at 3, 6, 12, 24, and 36 months.

Results
During 3 years of follow-up, no patient was lost. Of 40 patients, 20 underwent laparoscopic BSG and 20 underwent NBSG. At 36 months, the BSG group had a significant BMI loss compared with the NBSG group, 20.30±2.8 and 23.9±4.2, respectively (*P* value 0.003). NBSG has less operative time (mean 41±4.2 min) compared with BSG (mean: 45.5±2.9 min). No difference is detected for postoperative reflux between BSG versus NBSG (*P*=0.67). There was no significant difference in BMI loss between two groups during 3, 6, 12, and 24 months of follow-up.

Conclusion
This study suggests that BSG is more effective than NBSG in reducing BMI at 36 months. Future large-sample randomized trials are needed to compare the two surgeries regarding long-term postoperative complications and need for secondary operation. The authors recommend testing the application of the band around the upper third of the remaining stomach in reducing the postoperative reflux after banded sleeve gastrectomy.

Keywords:
Banded sleeve gastrectomy, sleeve gastrectomy, weight loss, weight regain

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Introduction

Laparoscopic sleeve gastrectomy or nonbanded sleeve gastrectomy (NBSG) is nowadays the most commonly performed bariatric procedure worldwide. The procedure is known for its safety and effectiveness, shorter operative time, feasibility, and easiness of revision and conversion to a malabsorptive surgery [1].

Laparoscopic sleeve gastrectomy has been compared with other bariatric procedures, including laparoscopic mini-gastric bypass and laparoscopic Roux-en-Y gastric bypass (LRYGB). The most recent meta-analysis comparing laparoscopic sleeve gastrectomy with Roux-en-Y gastric bypass showed that both procedures are equally effective in weight loss and DM (type 2) resolution. Roux-en-Y gastric bypass is superior in patients with dyslipidemia, hypertension (HTN), and gastroesophageal reflux disease (GERD), but laparoscopic sleeve gastrectomy had fewer rates of complications and reoperations [2,3]. The findings of Shoar and Saber [4] suggested that LRYGB had better weight loss in long-term follow-up, but both procedures did not differ significantly in resolution of comorbidities. In a meta-analysis of 15 studies by Wang *et al.* [5], the authors concluded that mini-gastric bypass is more effective and safer than NBSG, but the authors believe that the outcome is biased due to the small sample size and the short

follow-up period. Studies have also compared robotic with laparoscopic sleeve gastrectomy [6].

However, inadequate weight loss or weight regain is still a long-term disadvantage for some patients. The recently published meta-analysis reports a weight regain rate of almost 28% and an overall revision rate of 19.9%. Weight regain is suggested to occur due to gastric dilation, thereby causing an increase in the size of the gastric reservoir. Bariatric surgeons had considered the use of sleeve gastrectomy with RYGP [7].

Recently, banded sleeve gastrectomy (BSG) is thought to be a restrictive operation. BSG will reduce food intake, affect hormonal levels, and alter gastric emptying and affecting endoluminal pressure and esophageal peristalsis. Besides weight loss and less weight regain, BSG is also thought to reduce reflux symptoms [8].

Few research papers had examined the benefits and risks of BSG, especially long-term, compared with NBSG [9]. Our study aims to compare the results of both operations after a follow-up period of 3 years.

Methods

Our study followed the reporting guidelines for observational studies according to the Strengthening the Reporting of Observational studies on Epidemiology [10].

We conducted a retrospective cohort for patients undergoing either BSG or NBSG. We reviewed all medical records of the Department of Bariatric Surgery at Ainshams University Hospital from January 2018 to December 2020. A matched-pair analysis by patients' demographics was performed with 20 patients for the BSG group and another 20 patients for the NBSG group. We included all patients above 18 years old, and we excluded those who were below 18 years or over 60, had previous bariatric or gastrointestinal surgery, psychiatric contraindications, pregnancy, and other medical reasons for denying laparoscopy. Patients were followed at 3, 6, 12, 24, and 36 months at clinics. Missing patients were phone-called and asked to attend the next day for follow-up. BMI, comorbidities [Diabetes mellitus (DM) and HTN], and the presence of reflux were assessed at each follow-up visit.

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, weight, and BMI.

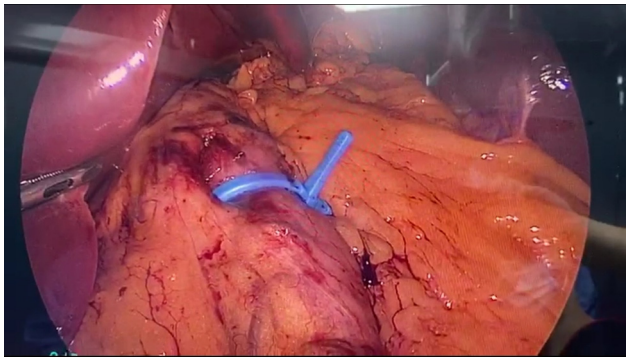
NBSG and BSG were performed laparoscopically. After dissection of the greater curvature till good visualization of the left crus of the diaphragm, resection begins 4–5 cm from the pylorus along a 36-Fr calibration tube, using violet linear tristaplers (GIA-Roticulator, Covidien, Dublin, Ireland). A gastric sleeve with a capacity, 100 ml in volume, remains. For silicone ring (MiniMizer, Bariatric Solutions) implantation, a small incision is made in the peritoneum covering the lesser curvature of the stomach ~4 cm from the gastroesophageal junction. The silicone ring is then pushed through the incision and guided along the posterior gastric wall, sparing the blood supply to the lesser curvature, as shown in Figures 1 and 2. It is closed at a circumference of 6.5 cm.The adjustable part of the ring is left to allow later modification.

Statistical analysis was done through SPSS version16.0. 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 the mean between two groups NBSG versus BSG. P value <0.05 was considered statistically significant.

Results

Of 40 patients, 20 underwent laparoscopic BSG and 20 underwent NBSG. There was no significant difference between two groups regarding age (P=0.610), sex (P=0.527), weight (P=0.290), preoperative BMI

Fig. 1



Showing the placement of silicone band in banded sleeve gastrectomy.

(*P*=0.720), and comorbidities (*P*=0.261), as shown in Table 1. During 3 years of follow-up, no patient was lost.

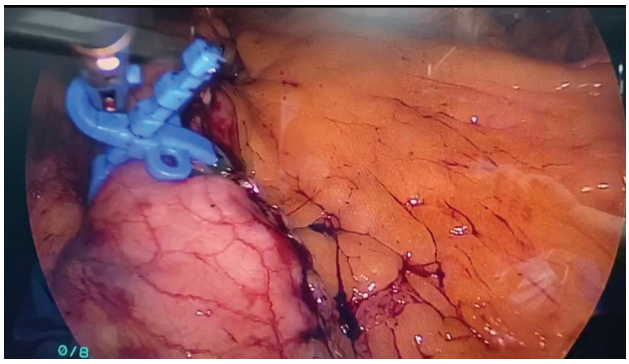
In Table 2, NBSG had significantly less operative time (mean 41±4.2 min) compared with BSG (mean: 45.5 ±2.9 min).

Comparison between BSG versus NBSG showed no difference for postoperative reflux (*P*=0.67) (Table 3).

After 3 years of follow-up, patients had a statistically significant BMI loss for the BSG group compared with the NBSG group: 20.30±2.8 and 23.9±4.2, respectively (*P*-value 0.003); however, there was no significant difference in BMI loss between two groups during 3, 6, 12, and 24 months of follow-up (Table 4).

There was no significant difference between BG and NBSG groups in preoperative comorbidities (0.261) and resolution of the comorbidities (0.450), respectively (Table 5).

Fig. 2



Intraoperative image of banded sleeve gastrectomy.

Discussion

The role of surgery in treatment of obesity is to reduce obesity-related morbidity and mortality. The magnitude of BMI loss difference between two groups increased progressively with every passing year throughout that period, ending with a marked

Table 2 Mean difference in operative time between banded sleeve gastrectomy (BSG) versus nonbanded sleeve gastrectomy (NBSG)

	BSG	NBSG	*P* value
Operative time (mean±SD)	45.50±2.94	41±4.23	0.00

Table 3 Comparison between banded sleeve gastrectomy (BSG) and nonbanded sleeve gastrectomy (NBSG) regarding postoperative reflux

	BSG	NBSG	*P* value
Reflux			0.67
Yes	3	4	
No	17	16	

Table 4 Comparison between banded sleeve gastrectomy (BSG) and nonbanded sleeve gastrectomy (NBSG) regarding BMI loss during 36 months of follow-up

	BSG	NBSG	*P* value
Postoperative BMI (mean±SD)			
3 m	34.30±4.07	34.70±4.07	0.768
6 m	28.30±4.07	29.70±4.42	0.305
12 m	22.60±3.64	24.80±4.42	0.094
24 m	21.10±3.09	22.90±4.26	0.135
36 m	20.30±2.86	23.90±4.26	0.003

Table 5 Comparison between banded sleeve gastrectomy (BSG) and nonbanded sleeve gastrectomy (NBSG) regarding resolution of comorbidities of patients

	BSG	NBSG	*P* value
Resolution of comorbidities			0.450
Yes	6	8	
No	8	6	

Table 1 Patient characteristics regarding the type of operation: banded sleeve gastrectomy (BSG) versus nonbanded sleeve gastrectomy (NBSG)

	BSG	NBSG	*P* value
Number of patients	20 (50%)	20 (50%)	
Age (mean±SD)	35.90±7.20	37.20±8.71	0.610
Sex			0.527
Male	10	8	
Female	10	12	
Weight (mean±SD)	127.50±14.73	122.50±14.73	0.290
Preoperative BMI (mean±SD)	45.20±4.25	44.70±4.49	0.720
Comorbidities			0.261
DM	8	6	
HTN	6	2	
HTN and DM	0	6	
No comorbidities	6	6	

DM, diabetes mellitus; HTN, hypertension.

BMI loss difference at 3 years of 20.30±2.86 for BSG versus only 23.90±4.26 for NBSG (P =0.003). Predictably, operative time was longer for BSG than NBSG (45.50±2.94 vs. 23.90±4.26 min, respectively, P=0.00).

The results of Gentileschi *et al*. [8] were consistent with our findings. The authors concluded that BSG is significantly better in BMI reduction than NBSG at 36 and 48 months (0.000205 and 0.00199, respectively); however, they did not compare postoperative reflux between two groups. They reported that hypertension has been decreased significantly in BSG (P=0.022), unlike DM and obstructive sleep apnea.

In their study, Fink *et al*. [11] also concluded that BSG is significantly better than NBSG in weight reduction at 3 and 5 years postoperatively. According to reflux symptom, their results were consistent with ours: no significant difference between two groups. However, BSG had less regurgitation symptoms at 3 years postoperative compared with NBSG.

In another study done by Fink *et al*. [12], from 2015 to 2019, it was suggested that BSG is significantly better in weight loss than NBSG 3 years postoperatively. Also, BSG had significant lower-reflux episodes than NBSG, but both procedures did not differ significantly in remission of DM (type 2).

Lemmens *et al*. [13] had compared not only BMI or weight loss between two groups, but also had compared weight regain. They stated that BSG had significantly less weight regain than NBSG.

Unlike our study, Bhandari *et al*. [14] studied the outcome of both surgeries on HbA1C, fasting plasma glucose, fasting C-peptide, HDL, LDL, triglycerides, hemoglobin, albumin, calcium, uric acid, vitamin B12, and vitamin D3. They found a statistically significant difference between both groups of less HbA1C and hemoglobin levels in the NBSG group. They speculate that the NBSG group had more aggressive glucose-lowering medical regimens than the BSG group.

In the pilot study of Tognoni *et al*. [15], they followed their patients for only 12 months, which showed no significant difference between two groups in BMI reduction as our study.

We believe that applying the band between the upper third and lower two-thirds of the sleeve gastrectomy causes progressive dilation of the upper third forming a high-pressure zone, contributing to the postoperative reflux. We recommend testing the application of the band around the upper third of the remaining stomach in reducing the postoperative reflux after BSG.

Our study had some limitations. First, we had a limited sample size of 20 patients in each group. Small sample size may have affected the insignificant outcome in postoperative reflux and resolution of comorbidities in the BSG group [16]. Second, we have not compared postoperative obstructive sleep apnea, HDL, LDL, or triglycerides between two groups.

Conclusion

Our findings confirm that BSG is more effective than NBSG in reducing BMI at 36 months. No significant difference was detected in the resolution of comorbidities or reflux postoperatively. Future large-sample randomized trials are needed to compare the two surgeries regarding long-term postoperative complications and BSG with other bariatric surgeries. Also, we recommend testing the application of the band around the upper third of the remaining stomach in reducing the postoperative reflux after BSG.

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Nil.

Conflicts of interest

There are no conflicts of interest.

References

1 Gentileschi P, Benavoli D, Arcudi C, Campanelli M, Valente M, Petagna L, *et al.* Laparoscopic banded sleeve gastrectomy: single-center experience with a four-year follow-up. J Laparoendosc Adv Surg Tech A 2021; 31:1269–1273.

2 Han Y, Jia Y, Wang H, Cao L, Zhao Y. Comparative analysis of weight loss and resolution of comorbidities between laparoscopic sleeve gastrectomy and Roux-en-Y gastric bypass: a systematic review and meta-analysis based on 18 studies. Int J Surg 2020; 76:101–110.

3 Hayoz C, Hermann T, Raptis DA, Brönnimann A, Peterli R, Zuber M. Comparison of metabolic outcomes in patients undergoing laparoscopic roux-en-Y gastric bypass versus sleeve gastrectomy—a systematic review and meta-analysis of randomised controlled trials. Swiss Med Wkly 2018; 148:w 14633.

4 Shoar S, Saber AA. Long-term and midterm outcomes of laparoscopic sleeve gastrectomy versus Roux-en-Y gastric bypass: a systematic review and meta-analysis of comparative studies. Surg Obes Relat Dis 2017; 13:170–180.

5 Wang FG, Yu ZP, Yan WM, Yan M, Song MM. Comparison of safety and effectiveness between laparoscopic mini-gastric bypass and laparoscopic sleeve gastrectomy: a meta-analysis and systematic review. Medicine (Baltimore) 2017; 96:50.

6 Magouliotis DE, Tasiopoulou VS, Sioka E, Zacharoulis D. Robotic versus laparoscopic sleeve gastrectomy for morbid obesity: a systematic review and meta-analysis. Obes Surg 2017; 27:245–253.

7 Clapp B, Wynn M, Martyn C, Foster C, O'Dell M, Tyroch A. Long term (7 or more years) outcomes of the sleeve gastrectomy: a meta-analysis. Surg Obes Relat Dis 2018; 14:741–747.

8 Gentileschi P, Bianciardi E, Siragusa L, Tognoni V, Benavoli D, D'Ugo S. Banded sleeve gastrectomy improves weight loss compared to nonbanded

sleeve: midterm results from a prospective randomized study. J Obes 2020; 2020:1–7.

9 Parmar CD, Efeotor O, Ali A, Sufi P, Mahawar KK. Primary banded sleeve gastrectomy: a systematic review. Obes Surg 2019; 29:698–704.

10 von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. Lancet 2007; 370:1453–1457.

11 Fink JM, von Pigenot A, Seifert G, Laessle C, Fichtner-Feigl S, Marjanovic G. Banded versus nonbanded sleeve gastrectomy: 5-year results of a matched-pair analysis. Surg Obes Relat Dis 2019; 15:1233–1238.

12 Fink JM, Hetzenecker A, Seifert G, Runkel M, Laessle C, Fichtner-Feigl S, *et al.* Banded versus nonbanded sleeve gastrectomy: a randomized controlled trial with 3 years of follow-up. Ann Surg 2020; 272:690–695.

13 Lemmens L, Van Den Bossche J, Zaveri H, Surve A. Banded sleeve gastrectomy: better long-term results? A long-term cohort study until 5 years follow-up in obese and superobese patients. Obes Surg 2018; 28:2687–2695.

14 Bhandari M, Mathur W, Kosta S, Mishra AK, Cummings DE. Banded versus nonbanded laparoscopic sleeve gastrectomy: 5-year outcomes. Surg Obes Relat Dis 2019; 15:1431–1438.

15 Tognoni V, Benavoli D, Bianciardi E, Perrone F, Ippoliti S, Gaspari A, *et al.* Laparoscopic sleeve gastrectomy versus laparoscopic banded sleeve gastrectomy: first prospective pilot randomized study. Gastroenterol Res Pract 2016; 2016:1–5.

16 Felsenreich DM, Kefurt R, Schermann M, Beckerhinn P, Kristo I, Krebs M, *et al.* Reflux, sleeve dilation, and Barrett's esophagus after laparoscopic sleeve gastrectomy: long-term follow-up. Obes Surg 2017; 27:3092–3101.