Evaluation of weight loss one and two years post-laparoscopic sleeve gastrectomy and laparoscopic adjustable gastric banding

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Background
Being a major health problem, surgical management of obesity has become a successful variant. Many laparoscopic procedures are readily available with their advantages and drawbacks. One of the major determinants of the choice of procedure is the expected weight loss. Laparoscopic sleeve gastrectomy (LSG) and laparoscopic adjustable gastric banding (LAGB) are well-known procedures with a good reputation regarding postoperative weight loss.
Aim
The aim of this study was to compare excess weight loss (EWL) percentage between both procedures after 1 and 2 years postoperatively.
Patients and methods
This study included 60 morbidly obese patients divided equally into two groups: group A patients underwent LSG and group B patients underwent LAGB. %EWL was compared between both groups after 1 and 2 years in the postoperative period.
Results
All LSG cases continued follow-up for 2 years while four cases of the LAGB group discontinued follow-up due to band removal. Both procedures achieved a satisfactory weight loss over 1 and 2 years with better results in LSG.
Conclusion
Both LSG and LAGB are the commonly performed restrictive procedures for morbid obesity with acceptable results. LSG achieved more reduction of BMI and higher % EWL after a follow-up of 12 and 24 months.

Keywords:
bariatric, morbid obese, restrictive, weight loss

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Introduction

Obesity, defined as a BMI of at least 25 kg/m^2, is a serious health problem that affects people all over the world with increasing incidence in the last few decades, which is seen more in developed countries but with increasing incidence in developing countries mostly due to lifestyle changes, lack of exercise, and rising stresses [1,2].

Laparoscopic surgical procedures represent the most effective and successful options for managing morbid obesity in the long term with 50–70% reduction of excess body weight (EBW) that is better than the results of pharmacologic or dietary regimens. Various surgical procedures are being performed with high success rates, each of them has its indications, advantages, and drawbacks [3]. The most commonly used procedures worldwide are Roux-en-Y gastric bypass, laparoscopic sleeve gastrectomy (LSG), and laparoscopic adjustable gastric band (LAGB) [4].

LAGB is a very common restrictive operation that was first described and performed in the early 1990's and gained its popularity through being one of the reversible procedures [3]. It results in a successful weight loss and relief of obesity-related comorbidities. Reversibility of the procedure, short hospital stay, and few morbidities and mortalities are common reasons for its preference by the patients [5].

LSG was introduced at its beginning as part of biliopancreatic diversion and then became the first stage of bariatric procedure for super-obese patients. Its main advantages are being a less technically demanding procedure, there is no requirement for anastomosis or bypass or artificial implants. It has also a significant resulting weight loss and low rate of complications. The mechanism of weight loss in LSG can be explained by restriction and by hormonal modulation of ghrelin hormone leading to decreased hunger sensation [6,7].

Each procedure has its advantages, indications, contraindications, and disadvantages. The choice of

the procedure depends to a great extent on the preference of the patients and surgeons. The main factor that directs this decision is mainly the ability of the procedure to achieve much and persistent EBW loss [3].

The aim of the present study was to compare LSG with LAGB regarding percentage excess weight loss (EWL) 1 and 2 years after the procedure.

Patients and methods

This comparative, prospective, randomized study was conducted in Kasr Al-Ainy Hospital, Department of General and Laparoscopic Surgery during the period from December 2012 till March 2016.

The study included 60 cases with morbid obesity who underwent bariatric procedures namely LSG and LAGB. Sleeve group includes 30 patients and band group includes the other 30 patients. Patients were randomly distributed.

Patients included in the study are those between 18 and 60 years old, men and women, with no previous bariatric procedure; BMI of at least 40 kg/m^2 without comorbidities or more than or equal to 35 with comorbidity, previous failure of diet regimens, no endocrinal cause for obesity, and psychologically stable cases. While patients with previous bariatric procedures, psychologically unstable, have no endocrinal causes of obesity, ages younger than 18 years or older than 60 years were all excluded from the study.

Prior to the procedure, full history taking, clinical examination, and investigations were done in a routine way and then the patients were consented for the procedure.

Preoperative preparation of the patients included dietary regimen under medical supervision for at least 3 weeks to reduce liver weight thus facilitating the procedure.

After performing the surgery, all patients were subjected to a close follow-up for 2 years monitoring the complications, mortalities – if any – and %EWL at 1 and 2 years postoperatively.

Surgical techniques

(1) The five ports were introduced: The first port is the camera port 1–2 cm to the left of the midline about 20 cm below the xiphoid process. The second and third ports are the working ports that were inserted to the right and left of the camera slightly above the level of camera. The assistant port was introduced in the left anterior axillary line, midway between the camera and the working ports. The liver retractor port was inserted 1–2 cm below the xiphoid process.
(2) The patient bed is tilted leg downward, anti-Trendelenburg position, and the pneumoperitoneum was created to 12–15 mmHg. Ultrasonic dissector was used in both techniques.

Laparoscopic sleeve gastrectomy

(1) We started with opening of the gastrocolic ligament 10–15 cm proximal to the pylorus and started devascularization toward the lower pole of the spleen. Short gastric vessels were divided and then meticulous dissection was performed at the angle of His with full mobilization of the gastric fundus. The mobilization of the stomach continues dissecting the greater gastric curve toward the antrum, 4–6 cm from the pylorus.
(2) The calibrating 46° bougie was introduced till passing pylorus reaching the first part of the duodenum. For each patient, 5–7 cartridges were used. After dividing the stomach, methylene blue test was done to detect any leakage. The stable line was then inspected for hemostasis and titanium metal clips were placed on the bleeding points. A routine drain is then inserted.

Laparoscopic adjustable gastric band

The pars flaccida approach was used in the dissection behind the cardia, after which the band was introduced and threaded through. A retrogastric tunnel was then created by blunt dissection. The tunnel entrance opened directly on the right crus and well above the bursa omentalis (the pars flaccida technique) keeping this tunnel as small as possible. The band was locked and the anterior stomach seromuscular oversewn to prevent slippage. The connecting tube was then threaded through the right epigastric port and connected to the injectable port which was then secured to the rectus sheath. We routinely put a drain for an average of 24 h.

Statistical analysis

Quantitative data were presented as mean and SD values. Data showed normal parametric distribution, so independent sample Student's *t*-test was used for comparisons between the two groups and significance of the weight loss after 1 year and after 2 years, by comparing BMI and %EWL after 1 and 2 years.

Qualitative data (demographic data) were presented as frequencies (*n*) and percentages.

The significance level was set at *P* value of up to 0.05. Statistical analysis was performed with IBM (IBM Corporation, New York, New York, USA) SPSS (SPSS Inc., Chicago, Illinois, USA) statistics portable version 18 for Windows.

Results

This study included 60 patients divided randomly into two groups: sleeve candidates (30 patients) and band candidates (30 patients). In the sleeve group, female patients represented 90% of the cases, the mean age was 33.97 years and the mean BMI was 48.53 kg/m^2 while in the band group, the female patients represented 70% of cases with a mean age of 33.47 years and a mean BMI of 46.13. More complications were documented in the band group (six cases, 20%) than that in sleeve group (one case, 3.3%) (Table 1).

There was no statistically significant difference in the demographic data and preoperative measurements between the two groups (i.e. adequate samples); there was a statically significant difference between the two groups with regard to of the postoperative complications, with the band method being more liable to complications.

The mean follow-up period was 24 months in 100% of sleeve cases, while in the band group, 28 out of the 30 cases continued follow-up in the first year as two cases developed complications in the first year postoperatively followed by band removal, and 26 of these 28 cases continued follow-up regularly for the second year as there was another two cases who developed complications necessitating band removal in the second year postoperatively.

After 1 year, the mean BMI and %EWL of the sleeve group showed more improvement than that of the band group. At 2 years postoperative follow-up, the overall improvement of BMI and %EWL was much more in the sleeve group than in the band group (Table 2 and Charts 1 and 2,).

Table 1 Descriptive statistics and results of χ^2 and Student's *t*-test for comparisons between demographic data in the two groups

Demographic and anthropometric data	Sleeve candidates (*n*=30)	Band candidates (*n*=30)	*P*-value
Sex [*n* (%)]			0.053
Female	27 (90)	21 (70)	
Male	3 (10)	9 (30)	
Age (mean±SD) (years)	33.97±9.41	33.47±9.20	0.691
Weight (mean±SD) (kg)	130.9±16.02	128.22±1.29	0.483
Height (mean±SD) (m^2)	164.27±6.67	165.88±12.34	0.487
BMI (mean±SD) (kg/m^2)	48.53±6.03	46.13±5.58	0.699
Complications [*n* (%)]	1 (3.3)	6 (20)	**0.044**
GERD	1 (3.3)	1 (3.3)	
Erosion	0 (0)	2 (6.7)	
Slippage	0 (0)	2 (6.7)	
Failure of weight loss	0 (0)	1 (3.3)	

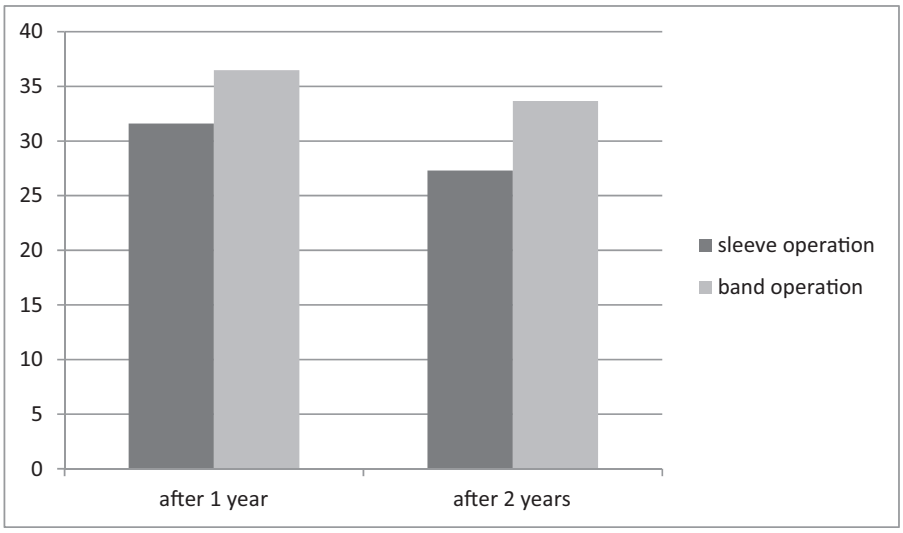
*$P\leq0.05$, significant.

Table 2 Descriptive statistics and results of independent sample *t*-test for significance and comparisons between the weight losses results of follow-up in the two groups at 1 and 2 years

	Operation type		*t*-Test for equality		
			Significance	95% confidence level	
	Sleeve	Band		Upper	Lower
BMI after 1 year					
N	30	28	0.000	–7.22	–2.54
Mean (SD)	31.60 (4.24)	36.48 (4.64)			
BMI after 2 years					
N	30	26	0.000	–8.35	–4.36
Mean (SD)	27.30 (2.38)	33.66 (4.51)			
%EWL after 1 year					
N	30	28	0.000	26.51	34.02
Mean (SD)	71.20 (18.94)	36.43 (11.17)			
%EWL after 2 years					
N	30	26	0.000	31.77	50.36
Mean (SD)	89.60 (21.75)	48.53 (12.02)			

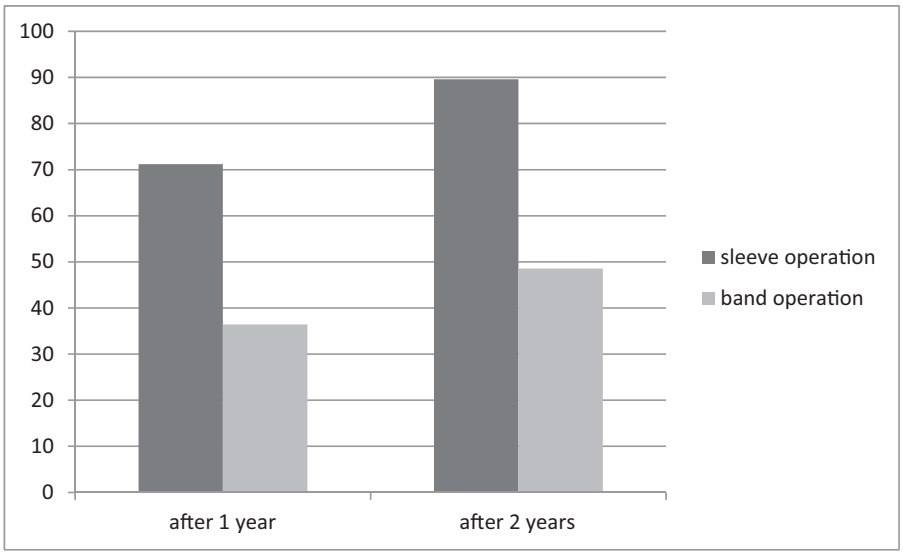
EWL, excess weight loss. *$P\leq0.05$, significant.

Chart 1



Bar chart comparison of the means of BMI values of the two groups at 1 year and 2 years.

Chart 2



Bar chart comparison of the means of % of EWL of the two groups at 1 year and 2 years.

There was statistically significant difference between follow-up results of weight loss between the two groups, measured by comparison of the means of BMI and %EWL after 1 and 2 years, with the results of the sleeve operation being superior to band operation regarding the achieved weight loss.

Discussion

In comparison with the complex, technically demanding malabsorptive laparoscopic bariatric procedures, the purely restrictive surgeries gained its popularity with higher safety profile as in LSG and LAGB. Both of them give satisfactory results regarding weight loss and resolution of comorbidities with low complications rate [7,8].

LSG and LAGB are the most commonly performed laparoscopic bariatric procedures as they are standardized and have well-established requirements. The reversibility and the possibility of readjusting the band made LAGB preferred by a lot of patients. Also, LSG has its superiority over other procedures by its ability to provide good restriction and diminishing the hunger sensation by eliminating ghrelin-secreting cells [3].

In this study, the main aim was finding which of these two procedures has an upper hand in reducing EBW

after 12 and 24 months postoperatively. Both procedures met the well-known safety criteria and the average rate of morbidities and mortalities. In LSG, one (3.3%) case only developed gastro-esophageal reflux disease (GERD) which was controlled medically while in LAGB, six (20%) cases complicated with GERD (one case), band erosion (two cases), band slippage (two cases), and failure to lose weight (one case) which in turn led to failure of continuing the follow-up of the four cases of band erosion and slippage that the bands were removed. No mortalities occurred in this study.

Comparing it with other studies, our study has had the average rate of morbidities and mortalities as found in the systematic review done by Puzziferri *et al.* [9]. In LSG, they found that the rate of complications was as follows: GERD (2%), incisional hernia (4%), failure and revision surgery (7%), and the rate of death was 5%. In LAGB, the port leak/revision was 6%, band slippage or erosion was 6%, treatment failure and need of revision was 3%, with a death rate of 0.2%.

In this study, after 1 year of follow-up, we found that BMI was reduced from 48.53±6.03 to 31.60±4.24 kg/m^2 in the sleeve group and from 46.13±5.58 to 36.48 ±4.64 kg/m^2 in the band group. Also, %EWL after 1 year postoperatively was 71.20% for LSG and 36.43 for LAGB. These results are much more in the favor of LSG over LAGB.

After 2 years of follow-up, we confirmed the superiority of LSG over LAGB. BMI was reduced to 27.30±2.38 kg/m^2 in the sleeve group and to 33.66 ±4.51 kg/m^2. %EWL values were 89.6 and 48.53% in the sleeve group and the band group, respectively.

Flint [10], performed a similar study on 228 patients comparing the results of both procedures over 24 months. It was found that %EWL was 46.1±27.8 and 72.1±20.9 for LAGB and LSG, respectively, with a statistically significant result.

Varela [8] conducted a study on 40 morbidly obese cases dividing them into two groups; 20 patients for each one. After 24 months follow-up, %EWL was 51 ±20 with LSG and 46±23 with LAGB.

Lehmann *et al.* [3] conducted a study on 202 patients and found that there was a significant reduction in % EWL in both groups in 1 and 2 years postoperative but more with LSG than LAGB. In spite of that, the results were not statistically significant except for BMI 40.0–49.9 kg/m^2 in the 6 and 12 months follow-up.

Shi and colleagues, on their study on 123 patients, found that %EWL of LSG (50.6±19) was greater than that of LAGB (40.3±11) at 12 months follow-up which was a statistically significant result [7].

Himpens *et al.* [11] performed a study on 80 patients comparing the results of %EWL between the two involved groups at 12 and 36 months postoperatively. They found that a greater reduction of %EWL was achieved with the LSG group at follow-up periods with highly significant statistical results.

Lee *et al.* [1], in their study on 188 patients, found that the LAGB group achieved a better %EWL than the LSG at 12 months follow-up (63.9 and 59.6, respectively), but these results were not statistically significant.

Wang *et al.* [2] in their meta-analysis found that % EWL was better in the LSG group (51.8%) than the LAGB group (37.8%) in a 1 year follow-up.

In another study done in 2016 by Lee *et al.* [12], it was reported that %EWL in the LSG group was 20.2 ±21.5%, which was better than the result with LAGB (12.0±11.7%) in the postoperative first year of follow-up.

In the study done by Brunault *et al.* [13], it was found that %EWL was 34.8±18.4% for LAGB and 43.8± 17.8% for LSG at 12 months postoperatively.

Thus, our study and most of the published studies agree that LSG has a better outcome after 1 and 2 years postoperatively regarding the reduction of BMI and EBW loss percentage. On the other hand, we recommend more follow-up periods to confirm the long-term effects on BMI and %EWL.

Conclusion

Restrictive procedures such as LSG and gastric band are good and safe for morbidly obese patients. The average reduction of EBW was better in sleeve gastrectomy than in gastric band during 1 and 2 years follow-up periods. Nevertheless, long-term follow-up is recommended for better evaluation of both the procedures.

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Conflicts of interest

There are no conflicts of interest.

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