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Comparative Study Between the Outcomes of Laparoscopic Sleeve Gastrectomy and Mini Gastric Bypass for Morbidly Obese Patients

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ABSTRACT

Background: Obesity has become a global epidemic, and bariatric surgery has emerged as an effective treatment for morbidly obese individuals. Laparoscopic sleeve gastrectomy [LSG] and mini gastric bypass [MGB] are two commonly performed procedures with distinct mechanisms of action and outcomes.

Aim of the work: This comparative study aims to evaluate and compare the outcomes of LSG and MGB in morbidly obese patients, focusing on weight loss, depression improvement, early complications and blood glucose.

Patients and Methods: A prospective interventional study included 40 consecutive morbid obese patients who underwent bariatric surgery [LSG or MGB]. The effects of both procedures on weight loss outcomes, the severity of depression, blood glucose and laboratory parameters were evaluated over six-months duration.

Results: Both procedures demonstrated similar effectiveness in reducing weight and lowering random blood sugar levels during the planned follow-up appointments. In the case of LSG, the percentage of excess weight loss [%EWL] had average figures of 13.64%, 34.2%, and 59.52%, while for LMGB, it was 13.42%, 42.96%, and 58.91% at the 1-month, 3-month, and 6-month follow-up visits, respectively. There was a notable decrease in reported depression scores after six months, with no significant variance observed between the two procedures.

Conclusion: Both procedures were associated with a similar reduction in body weight and percentage of excess weight loss, improvement in blood glucose levels, and depression scores.

Keywords: Bariatric Surgery; Morbid Obesity; Gastrectomy; Gastric Bypass.

INTRODUCTION

Obesity has become a significant global health issue, with its prevalence steadily increasing in many communities [1]. Morbid obesity, in particular, represents a severe form of the condition, often associated with a higher risk of comorbidities such as depression and diabetes [2]. The impact of obesity on mental health, including the heightened risk of depression, and its profound influence on the development and management of diabetes cannot be understated [3].

Bariatric surgery plays a pivotal role in the treatment of morbid obesity by offering effective and long-lasting weight loss solutions for patients who have struggled with traditional weight loss methods [4]. Many procedures have been shown to significantly reduce excess body weight and improve overall health outcomes in morbidly obese individuals. These bariatric surgeries not only lead to substantial weight loss but also result in significant improvements in obesity-related comorbidities such as type 2 diabetes, hypertension, and sleep apnea [5].

Around the world, the Laparoscopic sleeve gastrectomy [LSG] is becoming more and more popular as a stand-alone treatment for morbid obesity [6]. LSG is a primarily restrictive operation that maintains the natural continuity of the gastrointestinal tract without the use of anastomoses [7].

Laparoscopic sleeve gastrectomy has become more popular recently due to its positive results [8]. Nevertheless, this procedure can lead to various complications such as staple line leakage, bleeding, ongoing vomiting, gastroesophageal reflux disease [GERD] and deficiencies in nutrients [8,9]. Additionally, although LSG is effective in promoting weight loss in individuals with a BMI below 50 kg/m2, those with super obesity may experience less successful weight reduction following this surgery [10].

Mini gastric bypass [MGB], on the other hand, is a different bariatric surgery that has piqued the interest of a sizable number of gastrointestinal surgeons [11]. It is also a different safe, practical, and successful bariatric procedure [12]. Several studies since the seminal Rutledge research [13] have shown great results in obese patients treated with MGB [14, 15].

This study aims to compare the effectiveness of laparoscopic sleeve gastrectomy and mini gastric bypass surgery in treating morbid obesity by evaluating short-term weight loss and resolution of comorbidities between the two procedures.

PATIENTS AND METHODS

Study Design: This is an interventional, prospective study conducted at the General Surgery Department of Al-Azhar University Hospitals in New Damietta, Egypt. The study was carried out between January 2020 and December 2021.

Participants: The study included 40 consecutive morbidly obese individuals who underwent bariatric surgery [LSG or MGB] during the previous study timeframe. The patients were randomly divided into two equal groups using a sealed envelope technique. The 20 patients who received laparoscopic sleeve gastrectomy were placed in the LSG group. The 20 patients who underwent laparoscopic mini gastric bypass were placed in the MGB group.

Inclusion criteria were: patients between 18-55 years of age with a body mass index [BMI] greater than 35 kg/m2.

Exclusion criteria were: a contraindication to general anesthesia or laparoscopy, active cancers or infections, obesity due to endocrine causes, patients using an internal defibrillator or pacemaker, pregnancy, or serious mental illness.

Ethics Approval: The regional ethics committee of Al-Azhar University Faculty of Medicine approved the study. All patients provided written informed consent after thorough explanation of risks and benefits of each intervention and were free to withdraw from the study at any time.

Data Collection

Collected data included patient demographics, comorbidities such as hypertension, difficulty breathing with routine tasks, nocturnal symptoms, snoring, and clinical assessment including general, abdominal, and lower limb examination. Anthropometric measures were obtained preoperatively after fasting. Laboratory investigations included complete blood count, renal and liver function tests, random blood sugar, INR, endocrine profile, and serum electrolytes. Abdominal ultrasound and lung function, echocardiography, and upper GI endoscopy were also performed.

Radiological Examinations: An abdominal ultrasound was performed to rule out any abdominal pathology such as gallstones that could be treated during bariatric surgery. Tests for lung function and echocardiography were also conducted.

Endoscopy: Upper GI endoscopies were carried out in each case to identify gastroesophageal reflux disease and any other stomach pathologies.

Anesthesia Consultation: Echocardiography and pulmonary function testing were mandated to evaluate the cardiopulmonary condition prior to surgery. A member of the anesthetic team clinically evaluated the patient to determine anesthetic risk. The anesthetic team also reviewed the patient investigations.

Depression Evaluation: The Depression, Anxiety and Stress Scale-21 [DASS-21] Arabic validation was used to measure depression. The final score was compared to the typical DASS by multiplying each component score by two. Components were graded as normal, mild, moderate, severe or extremely severe based on the net result. Only the depression component was used. Depression was determined if the score was 10 or higher, and classified as mild, moderate, severe or extremely severe [16].

Preparation for surgery: Patients received a low carbohydrate, high protein diet for two weeks preoperatively. They were hospitalized one day prior to surgery. Low molecular weight heparin was administered 12 hours before surgery to prevent thrombosis. Ceftriaxone 1 gm was given as antibiotic prophylaxis 30 minutes before surgery.

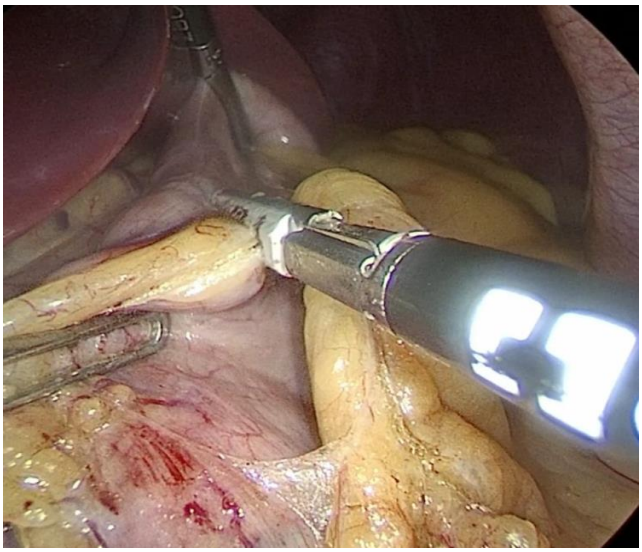
The surgical procedure

Both surgeries were carried out while the patients were in the anti-trendenberg position and under general anesthesia. The cameraman was on the patient's right, the assistant on the left, and the primary surgeon was situated between the patient's knees. The camera port was inserted in the midline above the umbilicus after abdominal insufflation with a Veress needle, and two working ports—one at the right midclavicular line and the other at the left—were then inserted. One assistant port was inserted at the left midaxillary line, and the other port was inserted in the epigastrium for liver retraction.

Laparoscopic sleeve gastrectomy procedure

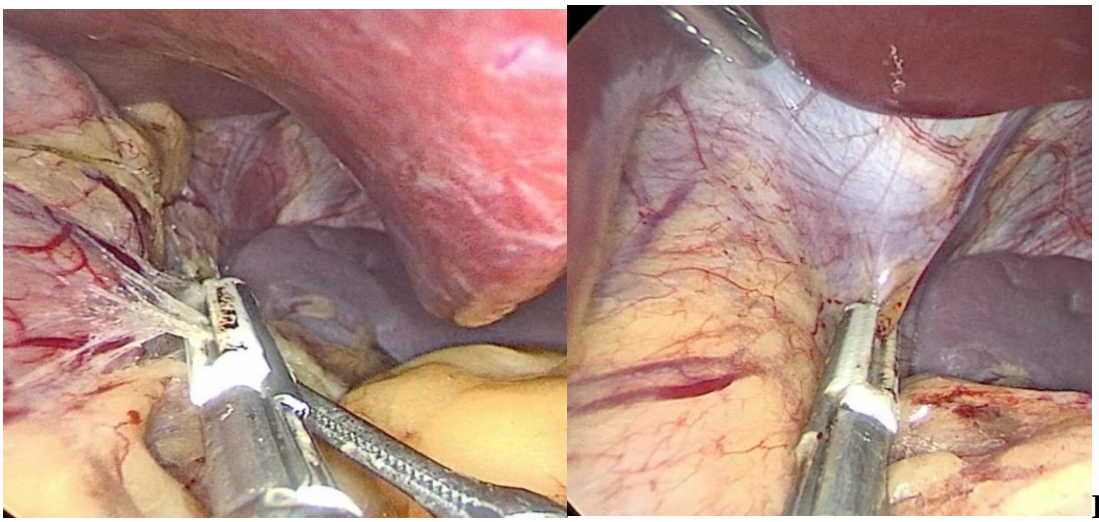
The larger stomach curve's devascularization process began 4 to 6 cm from the pylorus. A vessel sealing device was used to devascularize [Figure 1-A]. After fully releasing the stomach fundus, the short gastric arteries were divided, and the left gastric crus was identified [Figure 1-B]. The pylorus was reached by inserting a 38-Fr bougie into the stomach. Over the bougie, a surgical endostapler [Johnson] was used to produce the sleeve. The stomach was divided using approximately 4–6 cartridges [Figure 1-C]. At the fundus, we often started with the green one, then moved on to the gold one, and ultimately the blue one.

The methylene blue test was performed to rule out leakage after the stomach had been completely divided. The bougie was then withdrawn to the heart. Clipping was used to stop any bleeding spots that were above the staple line. The staple line was covered with a drain. The ports were then closed with non-absorbable sutures after the stomach was removed through the right functional port.



A

Figure [1]: Laparoscopic sleeve gastrectomy; **[A]** Devascularization of the greater gastric curve, **[B]** Division of short gastric vessels| and angel of His, **[C]** Division of the stomach over the bougie



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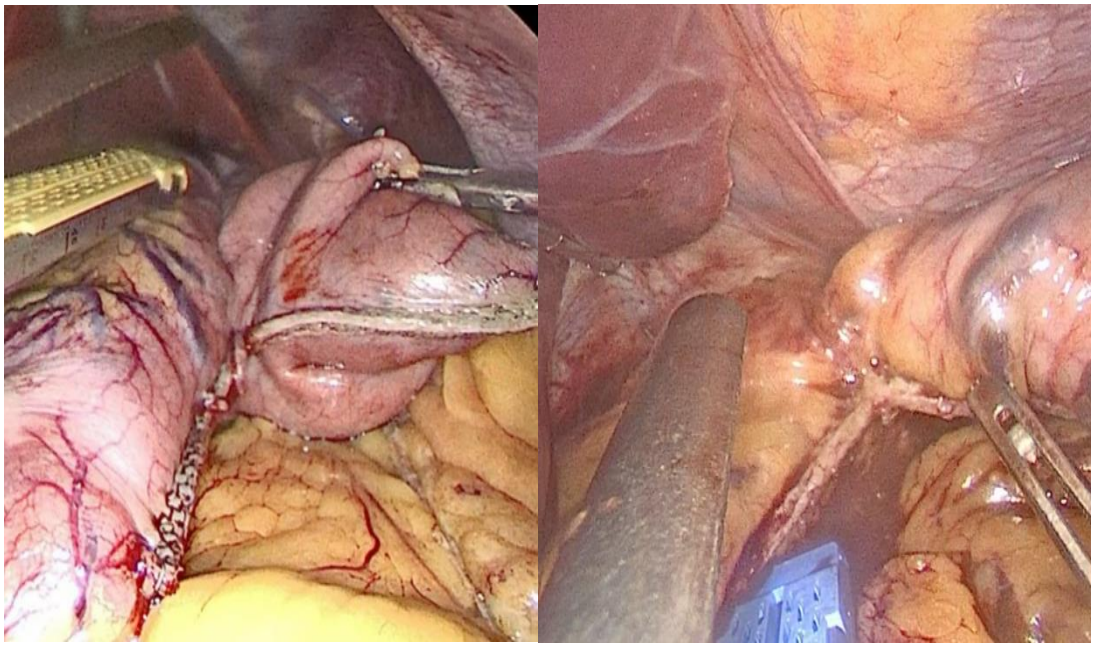


C

Laparoscopic mini gastric bypass procedure

The lesser gastric curve at the level of the Crow's foot was the starting point for the dissection, which continued into the lesser omentum and into the lesser sac [Figure 2-A]. After cutting the stomach in half using an endostapler that passed through the earlier hole, the lower horizontal edge of the gastric pouch was produced [Figure 2-B]. Another two or three cartridges, which were placed vertically to construct the vertical edge of the pouch, were used to complete the creation of the gastric pouch after a 38-Fr bougie had been inserted up to the transection line [Figure 2-C]. The last transsection cartridge's stapler was able to pass through a window created by the dissection that was done just laterally to the angle of his till. By that we secured compete separation of the pouch from the excluded stomach to limit the danger of gastro-gastric fistula [Figure 2-D]. To locate the duodenojejunal flexure, the transverse colon with its mesocolon was retracted cranially. From then, we began counting until we were 180 to 200 centimeters away [Figure 2-E]. At that moment, a gastrojejunostomy was made after a hole was made in the gastric pouch and another one in the jeujunal loop [Figure 2-F]. An endostapler [blue cartridge] was used to make the anastomosis, and continuous vicryl sutures [2/0] were used to seal the remaining defect [Figure 2-G].

To rule for leakage, an intraoperative methylene blue test was performed. A drain was introduced through the anastomosis and along the vertical staple line of the gastric pouch. After that, non-absorbable threads were used to close the abdominal ports.

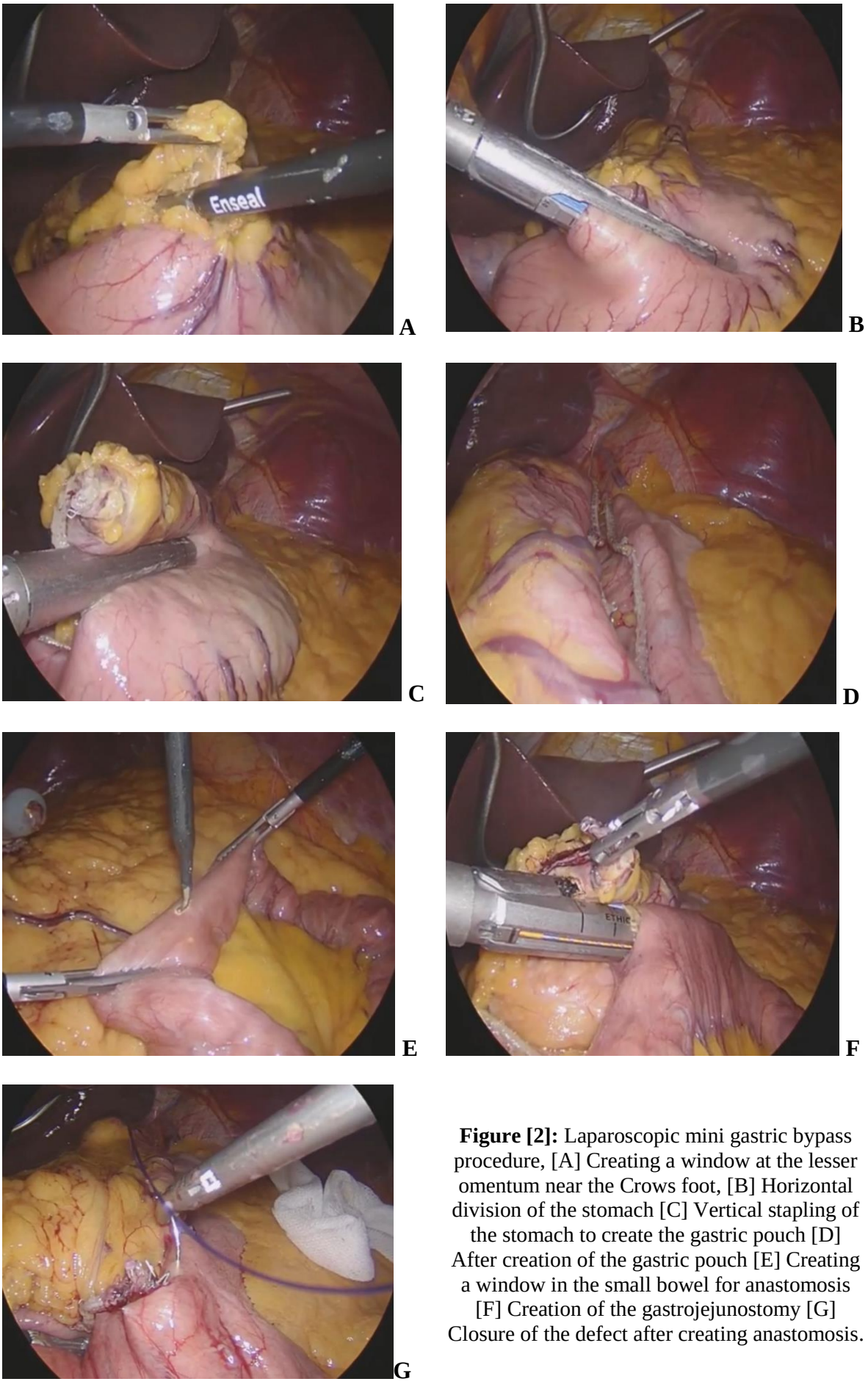


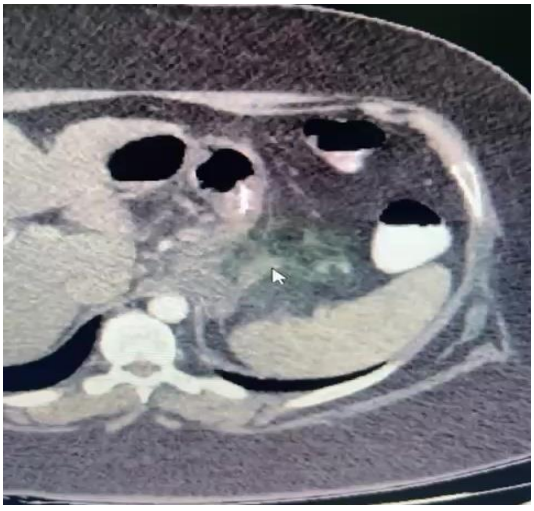
Figure [2]: Laparoscopic mini gastric bypass procedure, [A] Creating a window at the lesser omentum near the Crows foot, [B] Horizontal division of the stomach [C] Vertical stapling of the stomach to create the gastric pouch [D] After creation of the gastric pouch [E] Creating a window in the small bowel for anastomosis [F] Creation of the gastrojejunostomy [G] Closure of the defect after creating anastomosis.

Post-operative care: Patients were taken from the operating room to the recovery area and then to the inpatient area, where they were continuously observed and frequently examined. Patients who required breathing support were admitted to the intensive care unit [ICU] and typically left the next morning. Ketorolac 30 mg/12 hr. and IV paracetamol [1 gm/6 hr.] were used to maintain analgesia. A mild opioid was started if the patient reported experiencing a breakthrough pain. 2000 ml of ringer lactate and 1000 ml of 10% glucose were administered intra-venously each day. IV antiemetics [Primperan] and PPIs [Controloc 40 mg twice daily] were started for the patients. All patients received SC anticoagulation after 12 hours, daily for 10 days following surgery, after ensuring satisfactory hemostasis and stable hemoglobin levels. Patients were permitted to begin oral fluid after performing an oral gastrograffin study to rule out leakage after 24 hours. The majority of stable patients were released on the second or third POD.

Nutritional modification: Following surgery, a low-calorie, protein-rich liquid diet was initiated for one month. Then, other food components were added under the guidance of a qualified dietician. A daily oral supplementation of 18 mg of iron, 400 mcg of folic acid, 800 IUs of vitamin D, and 500 mcg of vitamin B12, in addition to calcium, selenium, copper, and zinc, was recommended for all patients in the two groups.

Follow up: Visits were set at intervals of 1 week, 1 month, 3 months, and 6 months following the surgeries. At these appointments, various parameters were evaluated, including the calculation of the percentage of excess weight loss [EWL%], which is derived by subtracting the follow-up weight from the initial operative weight, dividing it by the difference between the operative weight and the ideal weight determined by a body mass index [BMI] of 25 kg/m2, and then multiplying it by 100. Additionally, the same preoperative laboratory parameters were assessed, and the depression component of the Depression Anxiety Stress Scales [DASS] was measured once again during these follow-up assessments.

A



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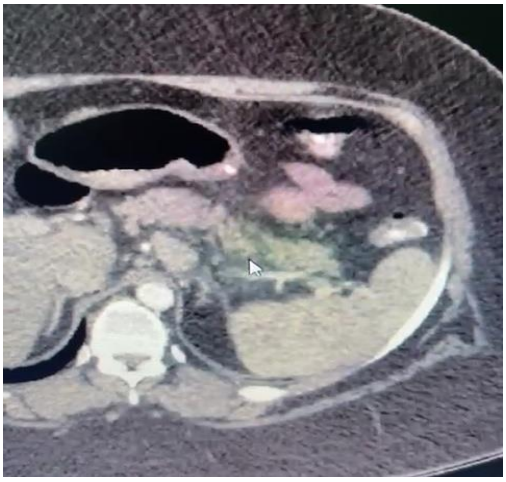


C

Figure [3]: Follow-up post sleeve gastrostomy by abdominal CT with IV contrast and opacification of bowel by oral contrast in a male patient aged 42y to ensure absence of leakage; the images showed sequential axial abdominal cut [A] below gastro-esophageal junction, the staples are intact with no contrast leakage into the reaction seen lateral to greater curvature, [B] in the body & [C] just before pyloric region, both images showed free flow of contrast luminal opacification till distal small bowel loops with no intra-peritoneal leakage

The primary outcomes of the study focus on evaluating the results of weight loss post both surgeries and assessing how both surgical methods impact the frequency and intensity of depression experienced by the participants.

The secondary outcomes of the study include monitoring complications post-surgery, assessing hospitalization rates, evaluating glycemic management, and observing signs and symptoms of malnutrition such as changes in albumin and hemoglobin levels.

Statistical analysis: The data collected were coded, processed, and analyzed using SPSS [Statistical Package for Social Sciences] version 27 for Windows® by IBM SPSS Inc. in Armonk, IL, USA. The data were assessed for normal distribution using the Shapiro-Wilk test. Parametric quantitative data were presented as mean ± standard deviation [SD], while non-parametric data were presented as median [range]. Qualitative data were shown as frequencies and relative percentages. The Chi-Square test was employed for qualitative data analysis, and for quantitative data analysis, the Student's t-test or Mann-Whitney [U] test was used. To compare two related groups, paired samples t-test or Wilcoxon signed-rank test was used. The significance level was set at a probability value [p-value], and the outcomes were interpreted as follows: non-significant if $p > 0.05$ and significant if $p \leq 0.05$.

RESULTS

Demographic data: In the LSG and MGB groups, the mean ages of the included cases were 39.95 and 37.05 years, respectively. Since women made up 80% and 75% of the study cases in the same two groups, respectively, the majority of study participants were female. Men made up the remaining patients. In the two study groups, the initial BMI of the included cases was 46.77 kg/m^2 and 45.95 kg/m^2, respectively. There was no discernible difference between the two groups for any of the aforementioned factors [$p > 0.05$] [Table 1].

Comorbidities: Across the two study groups, there was statistical equality in the prevalence of several obesity-related comorbidities [$p > 0.05$]. The most frequent comorbidity was diabetes, which affected 25% and 30% of people in the LSG and MGB groups, respectively. Hypertension came in second with 20% and 15% of instances in those same two groups. In both study groups, OSA was also present in 5% of cases. Six patients in each group, or 30% of cases, had depression according to the DASS diagnosis prior to surgery. Four and five cases in each of the two study groups, respectively, revealed mild depression in the majority of these cases. The other cases were mildly depressed. There was no discernible difference between the two groups [$p = 0.495$], with it ranging from 1 to 20 in the LSG group and from 2 to 20 in the MGB group [Table 1].

Preoperative laboratory investigations: In the LSG and MGB groups, serum ionized calcium had mean values of 4.77 and 4.83 mg/dl, whereas random blood glucose had mean values of 159.65 and 157.1 mg/dl. In the same two groups, serum hemoglobin had mean values of 13.3 and 12.97 gm/dl, but serum albumin had mean values of 4.49 and 4.34 gm/dl. In the examined groups, serum sodium had mean concentrations of 140.55 and 139.65 mEq/l, respectively, and potassium had mean concentrations of 4.36 and 4.53 mEq/l. No significant difference between the two groups was seen in any of the preoperative laboratory tests previously [$p > 0.05$] [Table 1].

Early postoperative data: In the current investigation, leakage cases were not observed. In comparison to none in the MGB group, three cases [15%] of GERD were recorded after LSG. In the MGB group [5%], there was just one instance of port site infection. Across the two study groups, all of the prior complications were statistically equivalent. In the LSG and MGB groups, post-operative vomiting occurred 20% of the time and 0% of the time, respectively. LSG was much more likely to cause this event. The duration of hospitalization had median values of 2 and 3 days in the same two groups respectively. In the two groups, it varies between one and three days, with no statistically significant difference between them [$p = 0.098$] [Table 2].

Follow up at 1 week: All of the evaluated laboratory measurements at one-week revealed no significant differences between the two research groups. Ionized calcium had mean values of 4.9 and 4.88 mg/dl in the LSG and MGB groups, respectively, while random blood sugar had mean values of 153.15 and 149.3 mg/dl. In the same two groups, serum albumin had mean levels of 4.39 and 4.43 gm/dl, whereas hemoglobin had mean values of 12.05 and 11.1 gm/dl. Also, the serum sodium values were the same in both groups at 140.3 and 139.45 mEq/L, and the serum K values were 4.39 and 4.44 mEq/L, respectively [Table 2].

One-month follow up

The %EWL had mean values in the LSG and MGB groups of 13.64 and 14.42%, respectively, at the one-month follow-up visit. Just five patients [25%] in each of the study groups developed depression. In the two study groups, moderate depression was found in three and four cases, respectively, whereas mild depression was prevalent in the other patients. The LSG group's depression score ranged from 1 to 18 [median = 6], whereas the MGB group's ranged from 0 to 18 [median = 6]. In the two groups, there was no discernible difference in the prevalence of depression or its assessed score [Table 3].

At a one-month follow-up, no laboratory measure revealed a discernible difference between the two groups. In the LSG and MGB groups, respectively, RBG had mean values of 141.6 and 135.7 mg/dl, whereas ionized calcium had mean values of 4.77 and 4.76 mg/dl. In the same two groups, hemoglobin had mean levels of 13.02 and 13.03 gm/dl while serum albumin had mean values of 4.38 and 4.46 gm/dl. Moreover, potassium had a mean value of 4.34 mEq/L in both study groups, whereas serum sodium had mean values of 139.1 and 140.85 mEq/L in the same groups, correspondingly [Table 3].

Three-months follow up

In the LSG and MGB, the%EWL had mean values of 42.96 and 43.2%, respectively, with no discernible difference between the two study groups. The median DASS score in the two groups was 6 as well [p = 0.586]. In the LSG group, it ranged from 1 to 14, while in the MGB group, it varied from 0 to 16. At that visit, just three cases [15%] in each of the two groups reported depression. One case had mild depression, while the other two had depression [Table 4].

At the three-month follow-up visit, the two surgeries revealed statistically comparable laboratory data [p > 0.05]. Ionized calcium had mean values of 4.75 and 4.74 mg/dl in the LSG and MGB groups, respectively, whereas RBG had mean values of 114.4 and 108.6 mg/dl. Also, in the two groups under study, serum albumin had an average value of 4.39 gm/dl. In the same two groups, hemoglobin had mean values of 12.97 and 12.57 gm/dl, respectively. The sodium readings were the same at 138.55 and 140.15 mEq/L, while the potassium values were 4.22 and 4.34 mEq/L in the two research groups, respectively [Table 4].

Six-months follow up

According to statistical analysis, the %EWL had mean values in the LSG and MGB groups of 58.91 and 59.52%, respectively, with no discernible difference [p = 0.610]. The same two groups' respective median scores for the DASS were 4 and 5, respectively, with no discernible difference between them [p = 0.346]. Only two people in each group [10%] reported depression, and all of these people had the mild kind [Table 5].

With the exception of ionized calcium, which exhibited a significant drop in the MGB group [p = 0.039], other six-month laboratory data did not significantly differ between the two research groups [p > 0.05]. In the LSG and MGB groups, it had mean values of 4.74 and 4.42 mg/dl, respectively. RBG had mean values of 113.85 and 110.65 mg/dl for the remaining laboratory parameters in the same two groups, respectively. Moreover, in the same groups, hemoglobin had mean values of 13.2 and 12.59 gm/dl while serum albumin had mean values of 4.3 and 4.05 gm/dl. The same two groups had sodium values of 141.1 and 131.25 mEq/L and potassium values of 4.27 and 4.21 mEq/L, respectively [Table 5].

The degree of weight loss, expressed in the %EWL, did not show any significant difference between the two study groups. Both procedures showed a comparable efficacy in weight reduction throughout the scheduled follow up visits. In the LSG, %EWL had mean values of 13.64, 34.2, and 59.52%, while it was 13.42, 42.96, 58.91% for LMGB in the 1, 3, and 6-month follow up visits respectively [Figure 4].

Both procedures were equally effective in reducing random blood sugar levels throughout the follow up visits, which showed a significant decrease in RBG levels compared to the baseline value [p < 0.05] [Figure 5].

Both surgical procedures were comparable in decreasing the depression scores throughout the follow up visits. Although the median value was the same in the initial two visits, there was a significant decline in the reported range [Figure 6].

Table [1]: Preoperative data of the two studied groups

Items		Laparoscopic Sleeve Gastrectomy [A] n=20	Laparoscopic Mini Gastric Bypass [B] n=20	p value
Age [years]		39.95 ± 10.21	37.05 ± 10.53	0.382
Sex	Female	16 [80%]	15 [75%]	1
	Male	4 [20%]	5 [25%]	
BMI [Kg/m^2]		46.77 ± 5.35	45.95 ± 5.65	0.641
Comorbidities	Diabetes	5 [25%]	6 [30%]	0.723
	HTN	4 [20%]	3 [15%]	0.677
	OSA	1 [5%]	1 [5%]	1
Depression	No depression	14 [70%]	14 [70%]	0.801
	Mild depression	2 [10%]	1 [5%]	
	Moderate depression	4 [20%]	5 [25%]	
DASS score		6 [1-20]	6 [2-20]	0.495
RBG [mg/dl]		159.65 ± 36.49	157.10 ± 38.19	0.830
Ionized Calcium [mg/dl]		4.77 ± 0.19	4.83 ± 0.22	0.321
Albumin [gm/dl]		4.49 ± 0.35	4.34 ± 0.40	0.216
Serum Na [mEq/L]		140.55 ± 3.36	139.65 ± 3.20	0.391
Serum K [mEq/L]		4.36 ± 0.33	4.53 ± 0.40	0.149
Serum hemoglobin [gm/dl]		13.30 ± 1.06	12.97 ± 0.87	0.281

Table [2]: Early postoperative data in the two studied groups

	Items	Laparoscopic Sleeve Gastrectomy n=20	Laparoscopic Mini Gastric Bypass n=20	P value
Early postoperative	Leakage	0 [0%]	0 [0%]	1
	GERD	3 [15%]	0 [0%]	0.072
	Port infection	0 [0%]	1 [05]	0.311
	Vomiting	4 [20%]	0 [0%]	0.035*
	Hospital stay	2 [1-3]	3 [1-3]	0.098
One-week follow up	RBG [mg/dl]	153.15 ± 32.34	149.30 ± 29.85	0.698
	Ionized Calcium [mg/dl]	4.90 ± 0.25	4.88 ± 0.27	0.811
	Albumin [gm/dl]	4.39 ± 0.31	4.43 ± 0.35	0.671
	Serum Na [mEq/L]	140.30 ± 2.72	139.45 ± 2.84	0.339
	Serum K [mEq/L]	4.39 ± 0.36	4.44 ± 0.36	0.664
	Serum hemoglobin [gm/dl]	12.05 ± 1.05	11.1 ± 1.07	0.790

Table [3]: Outcomes of the two studied groups at one month postoperative

Items	Laparoscopic Sleeve Gastrectomy [A] n=20	Laparoscopic Mini Gastric Bypass [B] n=20	P value
EWL [%]	13.64 ± 3.89	14.42 ± 3.03	0.843
Depression			
No depression	15 [75%]	15 [75%]	0.788
Mild depression	2 [10%]	1 [5%]	
Moderate depression	3 [15%]	4 [20%]	
DASS score	6 [1-18]	6 [0-18]	0.615
RBG [mg/dl]	141.60 ± 20.68	135.70 ± 19.03	0.883
Ionized Calcium [mg/dl]	4.77 ± 0.26	4.76 ± 0.26	0.952
Albumin [gm/dl]	4.38 ± 0.37	4.46 ± 0.33	0.501
Serum Na [mEq/L]	139.10 ± 2.69	140.85 ± 2.43	0.137
Serum K [mEq/L]	4.34 ± 0.36	4.34 ± 0.26	0.894
Serum hemoglobin [gm/dl]	13.02 ± 1	13.03 ± 1.13	0.846

Table [4]: Outcomes of the two studied groups at three months postoperative

Items	Laparoscopic Sleeve Gastrectomy [A] n=20	Laparoscopic Mini Gastric Bypass [B] n=20	p value
EWL [%]	42.96 ± 4.02	43.2 ± 4.48	0.860
Depression			
No depression	17 [85%]	17 [85%]	1
Mild depression	1 [5%]	1 [5%]	
Moderate depression	2 [10%]	2 [10%]	
DASS score	6 [1-14]	6 [0-16]	0.586
RBG [mg/dl]	114.40 ± 16.90	108.60 ± 23.94	0.219
Ionized Calcium [mg/dl]	4.75 ± 0.24	4.74 ± 0.25	0.847
Albumin [gm/dl]	4.39 ± 0.42	4.39 ± 0.30	0.868
Serum Na [mEq/L]	138.55 ± 2.70	140.15 ± 3.01	0.185
Serum K [mEq/L]	4.22 ± 0.34	4.34 ± 0.28	0.250
Serum hemoglobin [gm/dl]	12.97 ± 1	12.57 ± 0.85	0.176

Table [5]: Outcomes of the two studied groups at six months postoperative

Items	Laparoscopic Sleeve Gastrectomy n=20	Laparoscopic Mini Gastric Bypass n=20	p value
EWL [%]	58.91 ± 3.12	59.52 ± 4.29	0.610
Depression			
No depression	18 [90%]	18 [90%]	1
Mild depression	2 [10%]	2 [10%]	
DASS score	4 [1-10]	5 [0-12]	0.346
RBG [mg/dl]	113.85 ± 14.82	110.65 ± 12.13	0.228
Ionized Calcium [mg/dl]	4.74 ± 0.21	4.42 ± 0.24	**0.039***
Albumin [gm/dl]	4.30 ± 0.35	4.05 ± 0.29	0.066
Serum Na [mEq/L]	141.10 ± 3.01	131.25 ± 2.46	0.074
Serum K [mEq/L]	4.27 ± 0.31	4.21 ± 0.24	0.291
Serum hemoglobin [gm/dl]	13.20 ± 0.82	12.59 ± 1.20	0.068

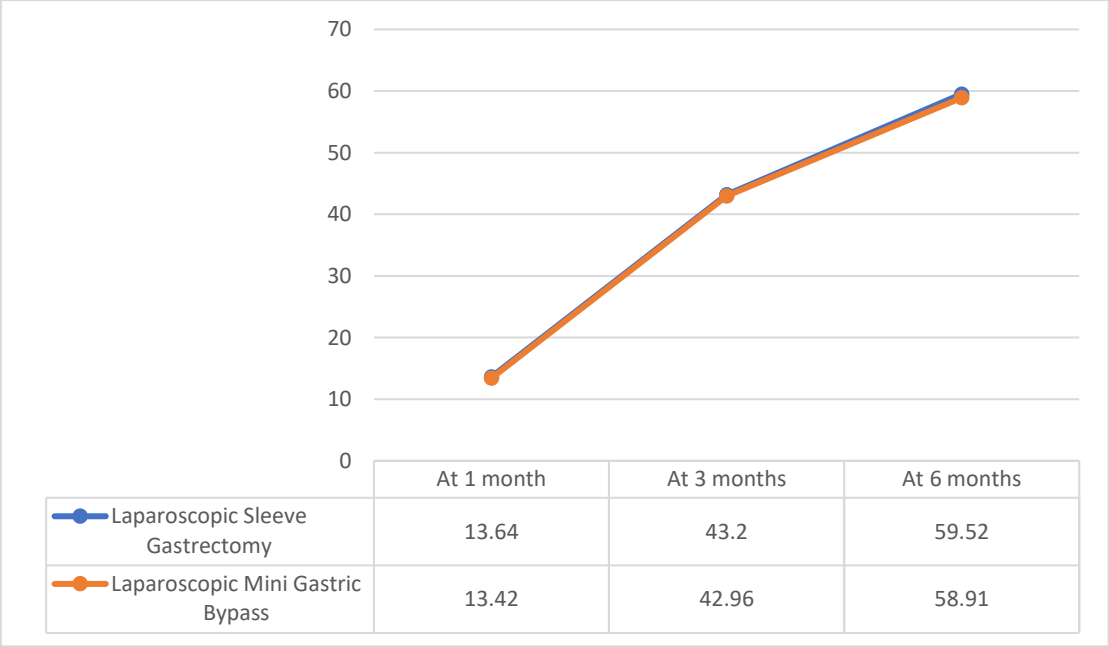
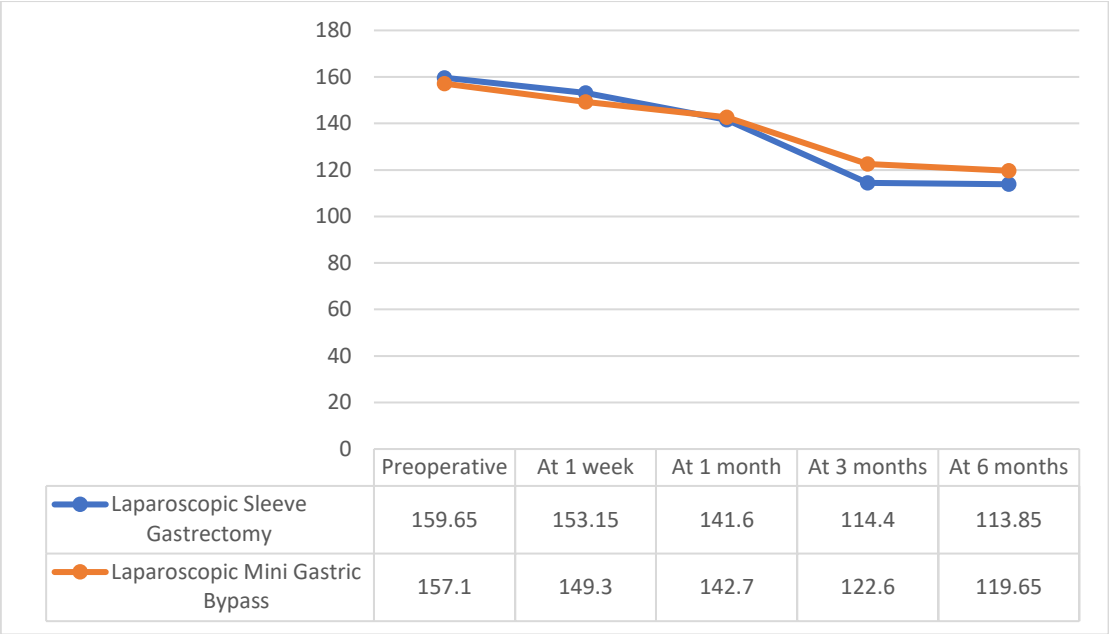
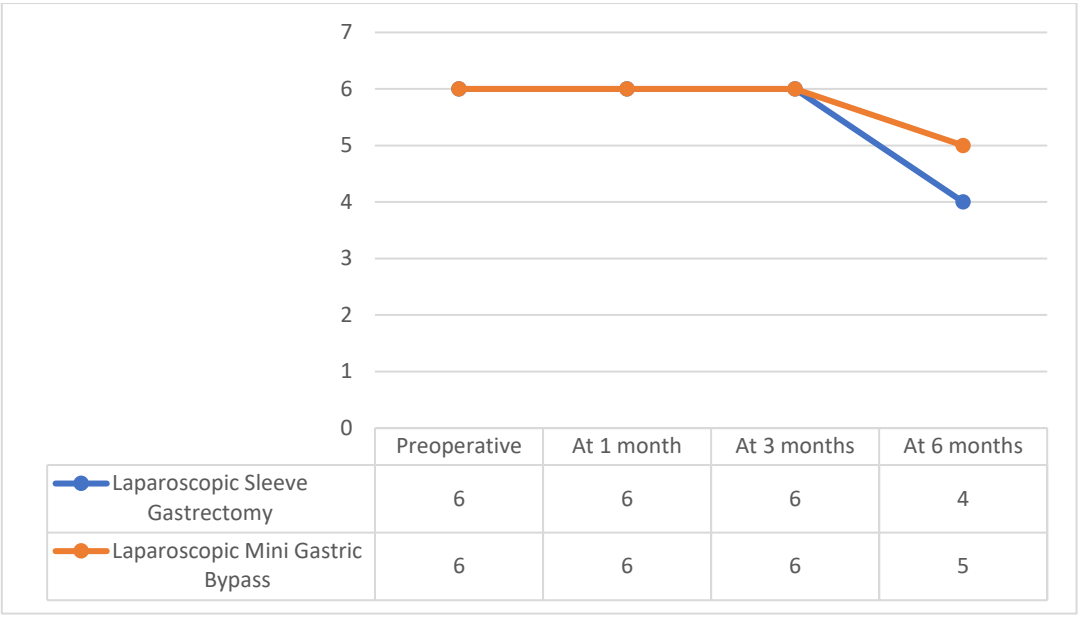


Figure [4]: Follow up of the estimated weight loss in the two study groups along the duration of follow up



	Preoperative	At 1 week	At 1 month	At 3 months	At 6 months
Laparoscopic Sleeve Gastrectomy	159.65	153.15	141.6	114.4	113.85
Laparoscopic Mini Gastric Bypass	157.1	149.3	142.7	122.6	119.65

Figure [5]: Follow up of the RBG in the two study groups along the duration of follow up



	Preoperative	At 1 month	At 3 months	At 6 months
Laparoscopic Sleeve Gastrectomy	6	6	6	4
Laparoscopic Mini Gastric Bypass	6	6	6	5

Figure [6]: Follow up of DASS score in the two study groups along the duration of follow up

DISCUSSION

This research, which compared the effects of LSG and MGB operations on weight loss, glycemic control, and depression, was carried out at the Al-Azhar University Hospitals in New Damietta. A total of 40 patients were included; they were split into two groups; group A had 20 patients who received LSG, and group B contained the remaining 20 cases who underwent MGB. While they made up 80% and 75% of the study cases in the same two groups, correspondingly, the majority of the study subjects of this research were women.

Another study conducted in the same context supported the strong female predominance in the two groups. In the LSG and MGB subgroups, females made up 91.9% and 93.4% of cases, correspondingly, with no discernible difference between the two groups [p = 0.064] [17]. According to some authors, women are more likely than men to be obese [18]. On the other hand, others claimed that men were more prevalent in the two categories, accounting for 72.7% and 60.4% of cases in the LSG and MGB groups, respectively [19]. Different epidemiological traits of the obese population in various geographic locations may account for this.

In our investigation, neither of the two groups had any instances of post-operative leaking. **Fikry *et al.*** [20] reported no instances of leakage in their study, which included 20 LSG patients in addition to 20 MGB patients, which is similar to our study in that. The scientists ascribed leakage following LSG to the sleeve's elevated luminal pressure [21]. Additionally, according to **Musella *et al.*** [19], statistically speaking, leakage incidence was comparable between LSG and MGB [p = 1], occurring in 0.7% and 0% of cases in the two groups, correspondingly.

The incidence of post-operative vomiting in the current study was 20% and 0% in the LSG and MGB groups, correspondingly, with a significantly higher incidence of that complication associated with LSG.

LSG carries a higher risk for that complication because of the drastic reduction in dry matter intake, because although nausea can happen after any procedure under general anaesthesia due to anesthetic drugs used, improper protocols for prophylaxis of nausea and vomiting, or even several surgical details [22, 23]. According to **Celio *et al.*** [24]'s report on a prospective cohort analysis of 65 bariatric surgery patients, 20.7% of LSG patients were unable to fulfil their clinical route aim of hospital discharge day because of post-operative nausea and vomiting. These data are consistent with our own.

In our study, the MGB group experienced only one port site infection [5%]. There was no observable difference between the two groups for this metric. In contrast to none in the MGB group, our study identified three cases [15%] of GERD following LSG. However, no statistically significant difference between the two groups could be identified.

In contrast, MGB is thought to work better than LSG at treating all types of reflux. The surgical reconstruction aspect of the MGB surgery, which makes it easier for stomach content to move into the jejunum, is what the authors identify as the cause of their findings. They added that weight loss had no connection to GERD improvement [25].

Some authors even claim that GERD has improved after LSG, and they attribute this to the acceleration of gastric emptying at 6 months and 2 years following sleeve gastrectomy, the reduction of intra-abdominal pressure, which in turn reduces intragastric pressure, and the reduction of acid secretion by reducing the volume of the gastric mucosa [26].

Both operations had great effects on diabetes in the current investigation, which were demonstrated by considerable drops in RBG levels post-operatively compared to preoperative values. Throughout the follow-up visits, both methods were equally helpful in lowering erratic blood sugar levels. In comparison to the LSG group, the MGB group is thought to experience greater fat malabsorption, considerable fast transit, and maximum resolution of diabetes [27]. Weight loss is unquestionably a determining factor for diabetes remission following metabolic surgery, while the underlying mechanism of diabetes remission after MGB and LSG is yet unknown [28].

ElAtrash *et al.* [29] also found no significant difference in post-operative RBG levels between LSG and MGB procedures [p = 0.758], which is consistent with our findings. In the same groups, the six-month RBG had mean levels of 124.2 and 125.07 mg/dl, respectively. In the same setting, **Mahdy *et al.*** [30] observed that in the LSG and MGB groups, respectively, diabetic improvement was seen in 71.4% and 85.7% of diabetic cases, demonstrating success of both treatments in the repair of metabolic abnormalities accompanying diabetes.

Moreover, LSG and MGB resulted in clearance rates of 59.57% and 75.51%, accordingly, after six-month follow-up, with no significant difference between the two groups [p = 0.09], according to **Seetharamaiah *et al.*** [28]. The earlier findings were validated by **Madhok *et al.*** [31]. However, **Musella *et al.*** [19] found that MGB was more effective than LSG at treating diabetic patients. RBG had mean values of 122.2 and 104 inside the LSG and MGB subgroups, respectively, on the short-term follow-up, with a significant distinction between the two groups [p 0.001]. Moreover, MGB had a greater rate of diabetes remission [85.4% vs. 60.9% in LSG - p 0.001].

In terms of post-operative albumin levels, our investigation found no significant differences between the two techniques. The risk of malnutrition should theoretically increase with MGB because it is a malabsorptive treatment compared to LSG [restrictive], but this was not seen in our study. This may be explained by abstaining from over-extending the afferent limb [keeping it at 200 cm], providing adequate protein supplements,

offering suitable food advice, motivating patients to stick with therapy, and keeping tight follow-up.

It was evident that both methods had a significant negative impact on the depression component of the DASS [p 0.05] when it came to their effects on depression. The clinical manifestation of this was a decrease in the prevalence and intensity of depression.

It has been demonstrated that depression and obesity frequently co-occur, and a reciprocal relationship between the two has been discovered. Both obesity and depression are caused by factors such inflammation and disruption of the HPA axis [32]. Obesity is usually accompanied by a number of psychopathologies, including stigma, body dissatisfaction, unhealthy eating habits, and low self-esteem, all of which can have an impact on depression [33].

Similar to our findings, a number of long-term studies have investigated the connection between bariatric surgery and depression, showing that post-surgical depression and depressed symptoms are significantly reduced [34-36].

The connection between weight loss surgery and the chronicity of mental health disorders, such as depression, was one of many outcomes after bariatric surgery that **Dawes *et al.*** [37] looked into in a systematic review. In 11 out of 12 investigations, they discovered lower rates and fewer symptoms of depression following surgery compared to pre-surgery.

Lengthy mood advancement is hypothesized to deteriorate due to unrealized surgical expectations and the resulting disappointment [38], weight gain and/or recurrence of comorbidity [39, 40], different nutritional inadequacies that may potentially manifest as depressive symptoms [41], or relative malabsorption of antidepressants [42].

Our research has some drawbacks. First of all, it is a single center study that comprised a tiny sample size. Long-term and medium follow-up are also lacking in our investigation. Thus, more research including more people from various bariatric clinics should be carried very soon. Furthermore, included in these outcomes should be short- and long-term follow-up intervals.

Conclusion: Both the procedures [LSG and MGB] resulted in comparable decreases in body weight and excess weight loss percentage, as well as enhancements in blood glucose levels and depression scores.

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