

## Comparative Study Between The Effect Of Sleeve Gastrectomy And Mini Gastric Bypass On Type II Diabetic Morbid Obese Patient

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**Abstract: Aim:** The aim of this study was to compare between the effect of sleeve gastrectomy and mini gastric bypass on type II diabetic morbid obese patient as regard, the mean operative time, conversion rate, hospital stay, rate of complications, Diabetic remission, and weight loss within 6 months. **Patients and methods:** In randomized prospective comparative study, 30 patients morbid obese with type II diabetes were enrolled in this study, 15 patients underwent GS (Group I) and 15 patients underwent MGB (Group II). For all patients, full history taking, general and local examination, routine laboratory investigations. Cardiopulmonary evaluation, abdominal ultrasound Upper GIT endoscopy, DVT prophylaxis and Informed consent were done. During operations, Operative details were recorded: Mean operative time, Intraoperative mishap, Cause of conversion if occurred and any associated procedures. Postoperative: Clinical evaluation and Gastrograffine X-ray (On second day). If no leaks, Patients started fluids immediately. Patients discharged when the condition permitted and the drain was removed. Diet progression from soft to solid at weeks 7. Daily walking for 30 minutes. Patients received multivitamins and calcium supplements. **Results:** No statistical significant difference was detected between the two groups as regard( history and clinical characteristics); age and sex distribution, occupation, life style, onset of obesity, surgical history, dietary habits, anthropometric measures (weight, height and BMI), excess weight, waist circumference, hip circumference and W/H. There is no statistical significant difference between the two groups, as regard, diabetic remission, conversion rate, mean overall cost, early and late complication. Significant difference of shorter operative time and hospital stay were detected with GS. Statistically difference between the two groups, as regard; postoperative patients' weight reduction, BMI reduction, decreased W/H, increased (%EWL) and (%BMIL) in favor of MGB. **Conclusion:** There was a significant reduction of mean BMI in both LSG and LMGB, while %EWL and %BMIL more prominent in LMGB, but SG have significant shorter operative time and less postoperative hospital stay. There was obvious amelioration of obesity related DM in LSG and MGB but LMGB have higher rate of resolution. [Mohammed Ibrahim El-Anany, Hamdy Abd El-Aleem Mohammed, Abed Mohammed Abd El-Badei Kendil. **Comparative Study Between The Effect Of Sleeve Gastrectomy And Mini Gastric Bypass On Type II Diabetic Morbid Obese Patient.** *N Y Sci J* 2016;9(12):140-149]. ISSN 1554-0200 (print); ISSN 2375-723X (online). <http://www.sciencepub.net/newyork>. 24. doi:[10.7537/marsnys091216.24](https://doi.org/10.7537/marsnys091216.24).

**Keywords:** Laproscopic Sleeve Gastrectomy (LSG), Laproscopic Mini Gastric Bypass (LMGB)

### Introduction

Severe obesity is one of the major problems in Western Countries and is associated with several comorbidities and disabling diseases (e.g., cardiovascular disease, metabolic syndrome, type 2 diabetes, fertility, certain tumor types and increased mortality) (Toghaw et al., 2004).

One of the major comorbidities of obesity is type 2 diabetes mellitus (T2DM). In fact, the term "diabesity" (Bose et al., 2009) has been introduced to refer to obesity accompanied by T2DM.

With the exception of nutritional and some pharmacological treatments, bariatric surgery is performed more and more frequently as the treatment of choice in patients with severe obesity.

The recent widespread use of bariatric surgery has been attributed to the high success rate of weight loss and improvement of comorbidities. This success was only dampened by a number of complications and technical difficulties that is innate to each procedure.

These challenges have inspired the search for an ideal surgery and explain the dynamic nature and evolution of the field of bariatric surgery (Melissas, 2008).

The efficacy of these surgical procedures in weight control has been widely described in several studies.

Additionally, one of the most relevant corollary effects reported following bariatric surgery is T2DM remission.

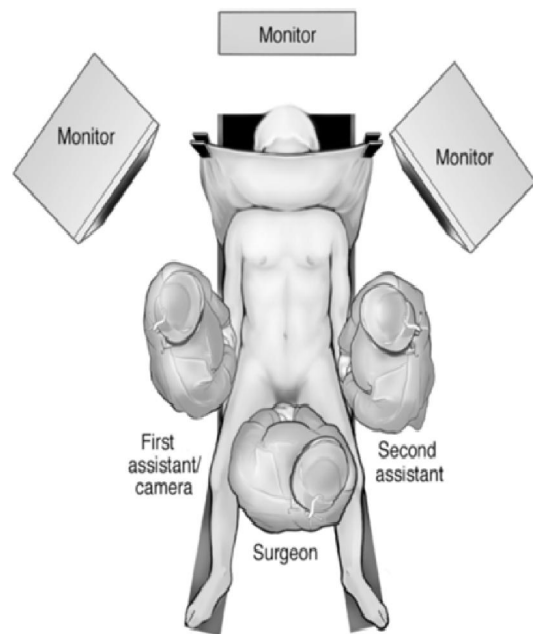
A variety of surgical procedures are available and, currently, it is difficult to identify the most effective option based on patient characteristics and comorbidities. Furthermore, little is known regarding the effect of the various surgical procedures on glycemic control and on T2DM remission (Cutolo et al., 2012).

The aim of this study is to compare the clinical efficacy of laparoscopic sleeve gastrectomy (SG) and laparoscopic mini-gastric bypass (MGB) on type II diabetic morbid obese patients.

### Patients and methods:-

This randomized prospective comparative study was conducted on 30 Morbid obese patients with type 2 diabetes; 15 patients underwent to SG (Group I) and others underwent to MGB (Group II) at AL-Azhar University Hospitals during the period from January 2016 to July 2016. They were divided randomly using sealed envelope technique into 2 groups (361).

Apart from previous major abdominal surgery, body mass index (BMI) >60 kg/m<sup>2</sup>, patient's refusal of entry into clinical trial, patients with eating disorders (Bulimia), patients not suitable to undergo general anesthesia, treatable endocrinopathy, active peptic ulcer disease and Reflux oesophagitis and psychological disturbances were excluded from this study.



**Figure 1. Operating room layout**

5 Trocars were placed as follows: A 10-12 mm trocar 20 cm below the xiphoid process for the 30° optical system. A 5 mm trocar on the left anterior axillary line for grasper. A 12 mm trocar on the left mid-clavicular line just between the 1st and the 2nd trocars for stapler introduction. A 12 mm trocar on the right mid-clavicular line for stapler. A 5 mm trocar below the xiphoid process for liver retraction.

After identification of the crow's foot (5-6 cm from the pylorus), the gastrocolic ligament was opened adjacent to the stomach using Ligasure® or Fourth-Triad® (products of Covidien Autosuture®, formerly Tyco Healthcare, Mansfield, Massachusetts, USA) or harmonic scalpel at a midpoint along the greater curvature. The branches of the gastroepiploic artery are divided near the gastric wall. We continue

Clear written consent was taken from patients according to Al-Azhar university committee.

### Technique of Laparoscopic Sleeve Gastrectomy (LSG) (362-364):

Operating room layout is shown in (Figure 1). General anaesthesia with cuffed endotracheal intubation. Calf compression was done during the procedure to avoid DVT. The patient is placed in the supine split-leg position and reverse Trendelenburg with assurance of proper support for the extremities to prevent falls during position changes of the operating table (Figure 2). The surgeon standing between patient's legs. Pneumo-peritoneum was induced with CO<sub>2</sub> with a Veres needle and maintained at a pressure of 14 mmHg.



**Figure 2. Patient positioning during surgery**

cephalad and then proceed with division of the short gastric vessels that is carried out up to the fundus. Division of the posterior fundic vessels is also performed. The angle of His is then dissected free from the left crus of the diaphragm. Careful attention on dissection must be taken due to the risk of splenic or esophageal injury and colon. The greater curvature dissection continues from the midpoint distally to approximately 2 cm proximal to the pylorus. After the greater curvature dissection is complete, we proceed to lyse all adhesions in the lesser sac leaving the posterior aspect of the antrum free. A 36-Fr orogastric tube was then inserted by the anaesthesiologist into the stomach, and was directed towards the pylorus using EndoGIA® Universal 12 mm stapler with 3.5mm (blue) & 4.8mm (green) single use straight or

roticulator® 60 mm loading unit (product of Covidien Autosuture®, formerly Tyco Healthcare, Mansfield, Massachusetts, USA), the stomach was divided parallel to the orogastric tube along the lesser curvature, till the angle of His was reached and the stomach became completely separated. Complete removal of the fundus was ensured and this was aided by identification of retro-fundic pad of fat. Before each fire, the orogastric tube was moved to and fro to ensure not to be incorporated into the jaws of the stapler. A diluted methylene blue leakage test was then carried out. An 18-Fr drain was placed at the left subdiaphragmatic space. The resected stomach was then removed from any of the 12-mm trocar, then wounds closed.

**Technique of Laparoscopic Mini Gastric Bypass (LMG)** (Error! Reference source not found. Error! Reference source not found.): As (LSG) but: 5 Trocars were placed as follows: 12-mm camera port in the midline, 2 handbreadths below the xiphisternum. 12-mm retractor port in the right midclavicular line, 2–3 fingerbreadths below the costal margin. 12-mm midline working port, 2–3 fingerbreadths below the xiphisternum. 12-mm left working port, 2–3 fingerbreadths below the left costal margin in the midclavicular line. 5-mm assistant port in the left anterior axillary line, 2 fingerbreadths below the costal margin.

The mesentery at crow's foot on the lesser curvature is dissected for a distance of 2–5 cm, making a window into the lesser sac. Gastric tube was created by applying one horizontal 45-mm endo-GIA (Covidien) at the level of the crow's foot perpendicular to the lesser curvature. Four to five vertical 60-mm endo-GIA cartridges were fired upward to the angle of His. A 36 french bougie is advanced and retracted under direct vision by anesthesiologist before each firing. Move the omentum upward into the lesser sac between the gastric tube and remnant stomach. The jejunum is then identified at the ligament of Treitz and measured to 200 cm distally and anastomosed with a mini-gastric tube in side-to-side, antecolic, isoperistaltic fashion with an endo-stapler (Endo GIA Universal Stapler, Covidien Autosuture, Mansfield, MA). The anastomosis is created with a size of more than 3 cm because the restriction is provided by the narrow-sleeved tube rather than the small anastomosis. The gastric and jejunal-hole used for introducing the endo-stapler was closed with continuous suture using vicryl 2/0 or V-LOCK. An intraoperative leak test was blue dye to confirm negative leak at anastomosis. An 18-Fr drain was placed at the left subdiaphragmatic space. The wounds were closed.

#### Statistical measures

Some statistical measures as mean, standard deviation (SD), t student test, correlation coefficient

(r) of two variables, Chi-square test (X<sup>2</sup>) and Probability (P) were used.

#### Results

This study was carried out on thirty morbidly obese patients at Alazhar University Hospitals. All patients had a preoperative BMI  $\geq 35$  and  $\leq 60$  kg/m<sup>2</sup>. All patients were followed up for 6 months. They were divided by simple randomization using sealed envelope technique method into two groups: Group (A); managed by Laparoscopic Sleeve Gastrectomy (LSG) and Group (B); managed by Laparoscopic Mini-Gastric Bypass. The choice of procedure was allocated to patients prior to the operation.

#### I- Preoperative analysis:

##### 1. Demographic profile of patients (Table 1):

There was no statistically significant difference between both groups in mean age and sex (P value > 0.05).

##### 2. Occupation and lifestyle of patients (Table 2):

There was no statistically significant difference between both groups in Occupation and lifestyle (P value > 0.05).

##### 3. History of obesity (Table 3):

There was no statistically significant difference between both groups regarding onset and duration of obesity (P value > 0.05).

##### 4. Past surgical history (Table 4):

There was no statistically significant difference in both groups regarding patients' surgical history (P value > 0.05).

##### 5. Pre-operative Patients' dietary habits (Table 5):

There was no statistically significant difference in both groups regarding patients' eating patterns (P value > 0.05).

##### 6. Preoperative anthropometric measures (Tables 6,7):

There was no statistically significant difference in both groups regarding preoperative anthropometric measures (P value > 0.05).

Waist circumference, hip circumference and Waist/Hip ratios were statistically comparable in the two studied groups

#### II- Operative analysis:

All patients were investigated thoroughly including respiratory function tests, electrocardiogram, echocardiogram and chest X-ray to assess cardiopulmonary status and their fitness to anesthesia. All patients were received venous and antibiotic prophylaxis and signed the consent. The patients were placed in a split leg position with the knees slightly flexed and hip externally rotated. Surgery was performed in a steep reverse Trendelenburg position.

##### 1. Operative time (Table 8):

There was statistically significant difference between both groups regarding mean operative time in favour for Group A (P value < 0.05).

**2. Conversion rate and Intra-operative mishaps (Table 9)**

Intra operative mishaps, the associated procedures, stapler related problem, intraoperative bleeding and conversion from laparoscopy to open procedure were not statistically significant (P value>0.05).

**3. Early postoperative morbidity (Table 10):**

Early (<30 days) postoperative surgical complications are summarized in Table (XXII). There was no statistically significance in incidence of major postoperative complications in both groups (P value >0.05). There was no statistically significance in incidence of minor postoperative complications in both groups (P value >0.05). There was no statistically significance in incidence of medical complications in both groups (P value >0.05).

**4. Hospital stay (Table 11)**

There was statistically significance in hospital stay between both groups (P value <0.05) which is shorter in group A.

**5. Mean overall cost:**

As there was statistically difference in both groups regarding mean operative time and hospital stay, we roughly consider the cost of both operations by calculation of stapler and cartilages reload prices. In all cases of LSG and LMGB we used five to seven cartiradges reloads (Table 12) plus stapler Therefore, we can consider that the cost of LSG was less than cost of LMGBG.

**III- Follow up:**

Patients were scheduled for follow up at 3 month and 6 month postoperative. This was done for all patients through regular visits at outpatient clinic.

**1. Weight loss and anthropometric data (Tables 13-17):**

Table (13) summarized the patients’ weight throughout the follow-up period. Starting from 3 months postoperative, there was a statistically significant decrease of weight than initial weight in both groups and this significance increased in both groups with time during the follow-up period (P value of both groups ≤0.05). After 6 month postoperatively,

there was also statistically significance difference in weight reduction between both groups (P value<0.05).

Table (14) summarized the patients’ BMI throughout the follow-up period. Starting from 3 months postoperative, there was a statistically significant decrease of BMI than initial BMI in both groups and this significance increased in both groups with time during the follow-up period (P value of both groups ≤0.05). After 6 month postoperatively, there was statistically significance difference in BMI reduction in Group B (LMGB) than Group A (LSG) (P value =0.010, 0.045 respectively).

Tables (15) summarize the patients’ percentage of excess weight loss (%EWL) throughout the follow-up period. There was a statistically difference in favor of Group B throughout the whole follow-up period (P value ≤0.05).

Tables (16) summarize the patients’ percentage of excess body mass index loss (%EBMIL). There was a statistically difference in favor of Group B throughout the whole follow-up period (P value ≤0.05).

Tables (17) summarize the patients’ changes of W/H ratio. There was a statistically difference in favor of Group B throughout the whole follow-up period (P value ≤0.05).

**2. Diabetic follow up (Tables 17-19):**

All patients were diagnosed with type 2 diabetes. The mean glycemia value was 169.87 ± 35.76, and the mean HbA1c level was 8.5 ± 1.0. At 3 mo post-surgical intervention, diabetes remission was reported by 18 subjects (53.3% in SG vs 66.67% in MGB, P = 0.710). At the 6-mo follow-up diabetes remission was reported by 23 (66.67% for SG vs 86.67% for MGB, P =0.389). MGB showed a clear trend toward higher diabetes remission rates relative to SG

There was no statistically significant difference in both groups regarding Glycemia values, HbA1c and Diabetic remission (P value > 0.05).

**3. Long-term complications (Table 20):**

Long-term medical and surgical complications in both groups are summarized in Table (20). There were no statistically significant difference in both groups regarding anaemia, symptoms of bile reflux, incisional hernia, conversion to open surgery and gall bladder stones (P value >0.05).

**Table 1. Demographic profile of the studied patients**

	Age						T-test	
	Group I			Group II			T	P-value
Range	21.000	-	59.000	20.000	-	60.000	0.198	0.845
Mean±SD	39.500	±	9.050	40.250	±	11.580		
Sex	Group I		Group II		Total		Chi-square	
	N	%	N	%	N	%	X <sup>2</sup>	P-value
Male	4	26.67	3	20.00	7	23.33	0.00	1.00
Female	11	73.33	12	80.00	23	76.67		



Total	15	100	15	100	30	100.00		
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**Table 2. Occupation and lifestyle of the studies obese patients.**

Occupation	Group I		Group II		Total		Chi-square	
	N	%	N	%	N	%	X <sup>2</sup>	P-value
Sedentary life	5	33.33	6	40.00	11	36.67	5.891	0.659
Housewife	1	6.67	4	26.67	5	16.67		
Officer	2	13.33	2	13.33	4	13.33		
Nurse	1	6.67	1	6.67	2	6.67		
Student	1	6.67	1	6.67	2	6.67		
Physician	1	6.67	0	0.00	1	3.33		
Teacher	1	6.67	0	0.00	1	3.33		
Manual work	2	13.33	0	0.00	2	6.67		
Engineer	1	6.67	1	6.67	2	6.67		
Total	15	100	15	100	30	100.00		

**Table 3. Onset of obesity in the two studied groups**

Onset of obesity	Group I		Group II		Total		Chi-square	
	N	%	N	%	N	%	X <sup>2</sup>	P-value
Childhood	2	13.33	1	6.67	3	10.00	0.00	1.00
Adulthood	13	86.67	14	93.33	27	90.00		
Total	15	100	15	100	30	100.00		

**Table 4 Surgical history in the two studied groups**

Surgical history	Group I		Group II		Total		Fisher exact test	
	N	%	N	%	N	%	P-value	
PUH repair	1	6.67	0	0.00	1	3.33	1.000	
Cholecystectomy	2	13.33	0	0.00	2	6.67	0.258	
Appendectomy	2	13.33	2	13.33	4	13.33	0.650	
C.S	2	13.33	4	26.67	6	20.00	0.392	
Left V.V stripping	1	6.67	0	0.00	1	3.33	0.560	
Hysterectomy	0	0.00	1	6.67	1	3.33	0.533	
Abdominoplasty	0	0.00	1	6.67	1	3.33	0.500	
Amputation/ Hip Replacement	0	0.00	1	6.67	1	3.33	0.500	
Inguinal Hernia	0	0.00	1	6.67	1	3.33	0.500	

**Table 5. Dietary habits in the studied obese groups**

Dietary Habits	Group I		Group II		Total		Chi-square	
	N	%	N	%	N	%	X <sup>2</sup>	P-value
Overeaters	10	66.67	8	53.33	18	60.00	2.622	0.454
Nighteaters	3	20.00	2	13.33	5	16.67		
Binge eaters	2	13.33	3	20.00	5	16.67		
Snackers	0	0.00	2	13.33	2	6.67		
Total	15	100	15	100	30	100		

**Table 6. Preoperative anthropometric measures in the two studied groups**

		Preoperative anthropometric measures						T-test	
		Group I			Group II			t	P-value
Weight	Range	94.000	-	172.000	112.500	-	182.540	0.407	0.687
	Mean±SD	138.540	±	22.540	135.540	±	17.540		
Height	Range	152.000	-	178.000	155.870	-	180.540	0.340	0.736
	Mean±SD	166.870	±	8.215	167.870	±	7.870		
BMI	Range	36.420	-	58.210	38.870	-	60.540	0.606	0.549
	Mean±SD	40.540	±	11.224	43.540	±	15.540		
Excess W	Range	37.525	-	112.000	40.540	-	113.800	0.481	0.635
	Mean±SD	79.450	±	22.870	75.870	±	17.540		

**Table 7. Preoperative W/H ratio in the two studied obese groups**

		Group I						T-test	
		Group I			Group II			t	P-value
Waist (Cm)	Range	112.000	-	175.000	140.000	-	170.000	1.610	0.118
	Mean±SD	145.800	±	16.870	153.540	±	7.870		
Hip(Cm)	Range	142.000	-	185.000	159.000	-	173.000	1.007	0.323
	Mean±SD	160.700	±	15.540	165.000	±	5.654		
W/H ratio	Range	0.880	-	0.980	0.920	-	0.970	1.341	0.190
	Mean±SD	0.930	±	0.053	0.950	±	0.023		

**Table 8. Operative time in the two studied obese groups**

	Time of OR(min.)						T-test	
	Group I			Group II			T	P-value
Range	63.000	-	122.000	85.000	-	185.000	4.462	0.000
Mean±SD	90.450	±	15.456	125.750	±	26.454		

**Table 9. Intra-operative mishaps in the two studied obese groups**

Intra-operative complications	Group I		Group II		Total		Fisher exact test
	N	%	N	%	N	%	P-value
Conversion	0	0.00	2	13.33	2	6.67	0.258
Intra operative bleeding	1	6.67	0	0.00	1	3.33	0.552
Stapler related	0	0.00	1	6.67	1	3.33	0.533
Associated operation (Cholecystectomy)	2	13.33	1	6.67	3	10.00	0.548

**Table10. Early postoperative complications in the two studied obese groups**

Early postoperative complications	Group I		Group II		Total		Fisher exact test
	N	%	N	%	N	%	P-value
<b>Major</b>							
Leak	0	0.00	2	13.33	2	6.67	0.296
Wound dehiscence	1	6.67	0	0.00	1	3.33	0.552
DVT	0	0.00	1	6.67	1	3.33	0.533
<b>Minor</b>							
Seroma	2	13.33	3	20.00	5	16.67	0.500
Trocar site infection	4	26.67	2	13.33	6	20.00	0.429
Presetting vomiting	1	6.67	0	0.00	1	3.33	0.480
<b>Medical</b>							
Lung atelectasis	0	0.00	1	6.67	1	3.33	0.533
Anemia	1	6.67	0	0.00	1	3.33	0.533
Mortality	0	0.00	0	0.00	0	0.00	1.000

**Table 11. Hospital stay in the two studied obese groups**

	Stay in Hospital						T-test	
	Group I			Group II			T	P-value
Range	3.000	-	7.000	4.000	-	12.000	2.351	0.026
Mean±SD	4.500	±	0.750	5.540	±	1.540		

**Table 12. Number of Cartiradges used in the two studied obese groups**

	Cartiradges						T-test	
	Group I			Group II			T	P-value
Range	5.000	-	7.000	5.000	-	7.000	1.125	0.267
Mean±SD	5.95	±	0.39	6.10	±	0.45		

**Table 13. Pre- and postoperative patients' weight in the two studied obese groups**

		Weight						T-test	
		Group I			Group II			t	P-value
Before	Range	95.000	-	172.000	112.000	-	181.000	0.494	0.625
	Mean±SD	139.700	±	22.540	135.870	±	19.870		
After 3 months	Range	79.000	-	135.000	82.000	-	140.000	3.039	0.005
	Mean±SD	116.540	±	19.540	95.454	±	18.454		
After 6 months	Range	72.000	-	115.000	72.000	-	105.000	2.076	0.047
	Mean±SD	89.450	±	15.450	80.154	±	7.870		
Paired T-test (P-value)	Before-A fter3ms	<0.001*			<0.001*				
	Before-A fter6ms	<0.001*			<0.001*				
	A fter3ms-A fter6m	0.034*			0.047*				

**Table 14. Pre- and postoperative patients' BMI in the two studied obese groups**

		BMI						T-test	
		Group I			Group II			t	P-value
Before	Range	35.870	-	60.150	38.990	-	58.458	0.685	0.499
	Mean±SD	51.450	±	8.540	49.450	±	7.415		
After 3 months	Range	31.450	-	48.500	27.000	-	44.154	2.670	0.012
	Mean±SD	40.215	±	5.870	35.100	±	4.540		
After 6 months	Range	27.450	-	41.450	25.540	-	34.548	2.351	0.026
	Mean±SD	33.215	±	4.215	30.120	±	2.870		
Paired T-test (P-value)	Before-A fter3ms	<0.001*			<0.001*				
	Before-A fter6ms	<0.001*			<0.001*				
	A fter3ms-A fter6m	<0.001*			0.033*				

**Table 15 Percentage of excess weight loss (%EWL) in the two studied groups**

		% EWL						T-test	
		Group I			Group II			t	P-value
After 3 months	Range	32.100	-	63.450	41.870	-	67.870	4.490	0.000
	Mean±SD	39.540	±	9.215	52.870	±	6.875		
After 6 months	Range	55.215	-	78.454	63.870	-	84.540	2.587	0.015
	Mean±SD	66.245	±	6.870	72.140	±	5.540		
Paired T-test (P-value)	A fter3ms-A fter6m	<0.001*			<0.001*				

**Table 16 Percentage of BMI loss (%BMIL) in the two studied obese groups**

		% EBMIL						T-test	
		Group I			Group II			t	P-value
After 3 months	Range	34.450	-	73.215	44.800	-	88.450	6.755	0.000
	Mean±SD	46.780	±	9.215	60.454	±	11.248		
After 6 months	Range	59.215	-	91.540	70.450	-	99.245	2.322	0.028
	Mean±SD	74.540	±	9.154	81.540	±	7.245		
Paired T-test (P-value)	A fter3ms-A fter6m	<0.001*			<0.001*				

**Table 17. Changes of W/H ratio in the two studied obese groups**

		W/H ratio						T-test	
		Group I			Group II			t	P-value
Before	Range	0.870	-	0.970	0.910	-	0.970	1.030	0.312
	Mean±SD	0.930	±	0.018	0.940	±	0.033		
After 3 months	Range	0.780	-	0.920	0.770	-	0.887	2.876	0.008*
	Mean±SD	0.860	±	0.030	0.831	±	0.025		
After 6 months	Range	0.770	-	0.880	0.760	-	0.887	2.803	0.009*
	Mean±SD	0.830	±	0.029	0.785	±	0.055		
Paired T-test (P-value)	Before-A fter3ms	<0.001*			<0.001*				
	Before-A fter6ms	<0.001*			<0.001*				

	A fter3ms-A fter6m	0.042*	0.033*
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**Table 17. Glycemia values in the two studied obese groups**

		Glycemia values						T-test	
		Group A			Group B			t	P-value
Before	Range	162.89	-	201.43	143.56	-	183.32	2.352	0.025
	Mean±SD	180.547	±	20.540	161.874	±	22.874		
After 3 months	Range	129.67	-	170.34	122.98	-	159.43	0.976	0.337
	Mean±SD	150.775	±	19.540	143.570	±	20.870		
After 6 months	Range	127.48	-	163.28	118.112	-	154.76	1.023	0.315
	Mean±SD	145.410	±	17.540	138.540	±	19.218		
Paired T-test (P-value)	Before-A fter3ms	<0.001*			<0.001*				
	Before-A fter6ms	<0.001*			<0.001*				
	A fter3ms-A fter6m	0.0778			0.156				

**Table 18 HbA1c in the two studied obese groups**

		HbA1c						T-test	
		Group A			Group B			t	P-value
Before	Range	6.744	-	10.22	6.91	-	10.76	0.280	0.782
	Mean±SD	8.750	±	2.080	8.542	±	1.990		
After 3 months	Range	5.65	-	8.11	5.594	-	7.991	0.257	0.799
	Mean±SD	6.875	±	1.550	6.708	±	1.984		
After 6 months	Range	5.144	-	7.980	5.044	-	7.101	0.456	0.652
	Mean±SD	6.775	±	1.680	6.522	±	1.338		
Paired T-test (P-value)	Before-A fter3ms	<0.001*			<0.001*				
	Before-A fter6ms	<0.001*			<0.001*				
	A fter3ms-A fter6m	0.215			0.147				

**Table 19 Diabetic remission in the two studied obese groups**

Diabetic remission	Group A		Group B		Total		Fisher exact test
	N	%	N	%	N	%	P-value
3ms	8	53.33	10	66.67	18	60.00	0.710
6ms	10	66.67	13	86.67	23	76.67	0.389

**Table 20 Long-term complications in the two studied obese groups**

	Group I		Group II		Total		Fisher exact test
	N	%	N	%	N	%	P-value
Anemia	1	6.67	0	0.00	1	3.33	0.533
Bile reflux	0	0.00	1	6.67	1	3.33	0.533
Inscional hernia	0	0.00	1	6.67	1	3.33	0.533
Cholethiasis	2	13.33	1	6.67	3	10.00	0.548

**Discussion**

We aimed from this prospective study to compare between the effect of sleeve gastrectomy and mini gastric bypass on type II diabetic morbid obese patient as regard, the mean operative time, conversion rate, hospital stay, rate of complications, Diabetic remission, and weight loss within 6 months.

We found that, the operative time of Group A (LSG) range from 63.0 – 122.0min with mean duration 90.45 ± 15.456 min. In group B (LMGB) the operative time range from 85.0 – 185.0 min. with mean duration 125.75 ± 26.454. There was statistically

significant difference in both groups regarding mean operative time in favored for group A.

In Group A, mean operative time was comparable to results in the literature, where the mean operative time for LSG ranged from 49 to 143 minutes (Arias et al., 2009)

In Group B (LMGB); the mean operative time was longer than that of reported by others at the beginning of the study and then operative time was significantly decreased with experience and improvement of the learning curve. Our operating times have gradually decreased with experience and approach those in other centers (Musella et al., 2008).



We found that, conversion occurred in two patients in group B (13.33 %) and 0% in group A which was statistically non-significant (P value >0.05). Intraoperative mishaps occurred in one patient of group A (Bleeding) and in one patient of group B (stapler related), which was not statistically significant (P value >0.05). As regard intraoperative mishaps and conversion to open surgery, almost within range of other studies (**Pech et al., 2012**).

In our study, postoperative complications divided into early (within 30 days from operation) and late complications. Early (<30 days) postoperative surgical complications was divided to major and minor complications.

We found that, major early complications, postoperative gastric leakage occurred in two patients of group B (13.33 %), one of those patients had (6.67%) leakage from gastrojejunostomy (low output about 200 cc/day).

The 2nd leakage was diagnosed as a leak from the excluded stomach which appeared on the 3rd day postoperatively. No leak was reported in group A (LSG).

Wound dehiscence was occurred in one patient in group A at the trocar site of specimen extraction.

Regarding minor complications; five patients (16.67 %) had wound seroma ( two patients of group A and 3 patients in group B), six patients (20%) had trocar site infection (4 in group A and two patients in group B) one patient (6.67%) in group A Suffered from frequent vomiting after resuming soft diet and finally Patient who had intraoperative bleeding from short gastric during operation was suffered from anemia (6.67%). There was no mortality in both Groups.

As regard late postoperative complications in both groups Anaemia occurred in one patient 6.67% in Group A (LSG). Symptoms of bile reflux occurred in one patient 6.67% in Group B (LMGB) while not occurred in Group A (LSG), One patient 5% in Group B (LMGB) had got incisional hernia, Gall bladder stones discovered in two patient 13.33% of Group A (LSG) and in one patient 6.67% of Group B (LMGB) which was statistically not significant (P value >0.05).

In both groups, there was a significant reduction of mean weight and BMI during follow up period. The mean weight after 3 months and 6 months postoperative in group A (LSG) were  $116.54 \pm 19.54$  and  $89.45 \pm 15.45$  respectively. While in group B was  $95.454 \pm 18.450$  and  $80.154 \pm 7.87$  respectively. As regard reduction of BMI in group A at 3 and 6 months of follow up was  $40.215 \pm 5.87$  and  $33.215 \pm 4.215$  respectively, while in group B was  $35.1 \pm 4.54$  and  $30.12 \pm 2.87$  respectively. There was statistically significant difference between both groups regarding weight reduction and BMI reduction in favor of group

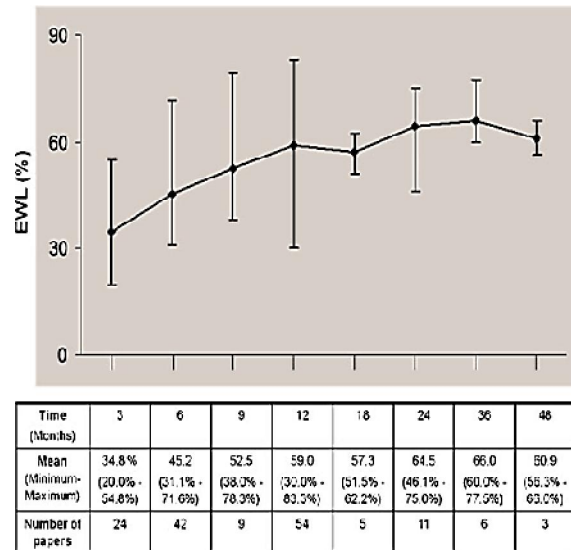
B. Also there was a statistically difference in favor of Group B (LMGB) regarding %EWL and EBMIL throughout the whole follow-up period. The patients' percentage of excess weight loss (%EWL) throughout the follow-up period. In group A (LSG) the mean %EWL after 3 months were  $39.540 \pm 9.215\%$  and  $66.245 \pm 6.870\%$  after 6 months. In Group B the mean %EWL after 3 months were  $52.870 \pm 6.875\%$  and  $72.140 \pm 5.540\%$  after 6 months.

Our results of weight loss in LSG group were similar to that of Fischer L. et al (**Fischer et al., 2012**) of University of Heidelberg, Germany who reported a systematic literature search on LSG from the period January 2003 to December 2010. The final study included 123 papers describing 12,129 patients. A majority of the papers describe PEWL at 12 months (43.9% of all papers, 50.0% of papers with  $\geq 100$  patients). Follow-up periods of more than 36 months were described in less than 10% of papers. The maximum PEWL occurred 24 and 36 months postoperatively with a mean PEWL of 64.3% (minimum 46.1%, maximum 75.0%) and 66.0% (minimum 60.0%, maximum 77.5%), respectively. After that, a slide but not a significant decrease of EWL was evident. After 48 months, patients with LSG have a mean PEWL of 60.9% (minimum 56.3%, maximum 66.0%). At 12 months, the mean EWL in patients receiving LSG was significantly lower when compared to patients who underwent gastric bypass (LSG 56.1%, gastric bypass 68.3%). Although patients with gastric bypass still had higher PEWL rates at 24 months compared to patients after LSG, these differences were not significant (LSG 61.3%, gastric bypass 69.6). A statistical analysis regarding PEWL between LSG and gastric bypass was performed. There were 17 papers dealing with LSG and 12 papers dealing with gastric bypass available at the time point of 12 months; at 24 months, 7 LSG papers and 10 gastric bypass papers were accessible. At 12 months, the PEWL in patients receiving gastric bypass was significantly higher when compared to patients who underwent LSG (mean EWL—gastric bypass 68.3%, LSG 56.1%). Even though patients with gastric bypass still had higher PEWL rates at 24 months compared to patients after LSG, these differences were not significant anymore (mean EWL—gastric bypass 69.6%, LSG 61.3%). Figure (3).

In the current study, Type 2 diabetes mellitus Clinically presented in all patients. 23 patients became euglycemic after surgery with no need of drugs. Oral hypoglycemic drugs were used and controlled 7 patients (23.33%) who were on insulin therapy (5 patients in group A and 2 in group B). At the end of follow up period the percentage of complete resolution of T2DM in group A and B was 66.67% and 76.67% respectively with no significance between both groups.

These data are correlated with a comparably steep increase in the prevalence of obesity (Mokdad et al., 2001).

There is increasing evidence indicating that SG causes early and significant improvements in glucose homeostasis in most morbidly obese subjects with T2DM (Reis et al., 2012).



**Figure 3. Percentage of excessive weight loss (PEWL) of patients receiving LSG at various time points postoperatively. Further the number of papers that present EWL of the given time points are mentioned. (Fischer et al., 2012).**

Similarly, laparoscopic mini-gastric bypass is reported to be a safe alternative to LRYGB, showing comparable efficacy in weight reduction and resolution of metabolic complications, including diabetes (Chakhtoura et al., 2008).

Both short-term (Lee et al., 2005) and long-term (Lee et al., 2011) follow-up confirmed the durable effect of this simplified procedure for obese or morbidly obese patients with T2DM.

Recently, Lee et al (Lee et al., 2008) published the first comparative study between sleeve gastrectomy and mini-gastric bypass to determine the efficacy of these treatments on diabetic control. Their results strongly support the hypothesis that duodenal exclusion may play a role in diabetes mellitus resolution following bariatric surgery in overweight patients.

Our findings extend the observations of Lee to severely obese patients. Unlike the study conducted by (Lee et al., 2008) we only enrolled patients diagnosed with severe obesity and a clear indication to bariatric

surgery. Despite this difference in the recruited patient population, our results also confirm that MGB is associated with better glycemic control and a higher rate of diabetes remission.

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