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ORIGINAL ARTICLE

Comparative Study Between Laparoscopic Sleeve Gastrectomy and Laparoscopic Mini Gastric Bypass in Control of Type 2 Diabetes Mellitus in Obese Patients

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Abstract

Background: **Recent diabetes mellitus (DM) treatment recommendations state that weight reduction should be the rational and most practical method of treating Type 2 diabetes mellitus (T2DM) given the significance of obesity in the genesis of the disease. Bariatric surgery is increasingly used as the preferred therapy for people with extreme obesity, except certain pharmacological and nutritional therapies.**

Aim and objectives: **To examine the effectiveness of controlling T2DM in obese individuals with laparoscopic sleeve gastrectomy and laparoscopic mini-gastric bypass (LMGB).**

Patients and methods: **The Al-Azhar University hospitals hosted a randomized controlled trial that took place between May 2022 and August 2023. Using the closed envelopment approach, 60 obese individuals with T2DM were randomly allocated into two groups.**

Results: **Concerning personal factors, biochemical features, medical characteristics, and operation time, the two groups did not differ statistically. Hospital stay, (fetal bovine serum (FBS) at baseline, at follow-up, and overall FBS change), and (BMI at baseline, at follow-up, and overall BMI reduction).**

Conclusion: **In addition to helping patients lose weight, bariatric surgery [Sleeve Gastrectomy (SG) and mini-gastric bypass (MGB)] is a metabolic procedure that can treat the majority of metabolic syndrome symptoms. It is also thought to be the gold standard for the maintenance management of T2DM in obese persons, and our research suggests that mini-gastric bypass has faster and more effective results with diabetes mellitus remission than those shown with Sleeve Gastrectomy.**

Keywords: Laparoscopic mini gastric bypass, Laparoscopic sleeve gastrectomy, Obese patients, type2 diabetes mellitus

1. Introduction

Morbid obesity causes a high proportion of metabolic syndrome consequences, involving diabetes mellitus type 2 (T2DM), which is a major public health problem on a global scale. Strong evidence supports the fact that The only treatment that has been shown to effectively treat morbid obesity is bariatric surgery which can effectively treat the majority of people with the condition.[1]

T2DM is one of the main comorbidities of obesity. The word 'diabesity' has been coined to describe obesity and T2DM.[2]

The majority of DM patients who are severely obese show a significant increase in their T2DM, and this population gains the most from bariatric surgery. Due to this, people who are obese and have DM who are not getting enough control of their present medical care may benefit from a newly developed treatment option that involves bariatric surgery.[3]

The sleeve gastroplasty has limitations. A strong restrictive weight loss occurs when the stomach is shrunk to a capacity of roughly 60 cc. As a consequence, patients eat less since they feel satisfied with just a tiny quantity of food. The weight

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reduction achieved with the Sleeve Gastrectomy (SG) is better than what would be seen with only a tiny stomach pouch because there are also important impacts on the processes that control appetite. The ability to generate Ghrelin, a hormone that affects how you feel and quells hunger that is released by the stomach and proximal small intestine, is lowered, which has a positive impact on appetite. This hormone is most active before meals.[4]

Rutledge developed the laparoscopic minigastric bypass (LMGB) in an effort to execute a weight reduction procedure that was efficient, simple, and secure. The technique entails performing a side-to-side gastrojejunostomy 180–220 cm distal to the Treitz ligament and inserting a long lesser-curvature stomach tube.[5]

Based on intestinal shortcuts, faster nutrition absorption, and increased glucagon-like peptide-1 (GLP-1) production, in controlling blood sugar levels, MGP is crucial.[6]

This study compared the effectiveness of LMGB versus laparoscopic sleeve gastrectomy (LSG) in controlling T2DM in obese people.

2. Patients and methods

The Al-Azhar university hospitals hosted the randomized controlled trial, which took place between May 2022 and August 2023.

Using the closed envelopment approach, the study's 60 obese individuals with T2DM were randomized into two groups at random: group (1): Sleeve gastrectomy performed laparoscopically on 30 individuals and group (2): 30 people had LMGB. The same surgical team operated on each patient at Ain Shams University Hospitals.

2.1. Inclusion criteria

They were able to fulfill the following requirements: body mass index (BMI) less than or equal to 30, and an age greater than 18, and T2DM. They were ready to provide permission and cooperate with the examination and treatment program.

2.2. Exclusion criteria

Patients who were not included in the research include: Abnormalities of the endocrine system, such as hypothyroidism, cushing syndrome, and previous weight loss procedures under 18 years of age, T2DM, major upper abdominal surgery ladies who are expecting or nursing, patients who should not have insufflation include individuals with severe cardiovascular disease, severe restrictive lung disease, a substantial abdominal ventral hernia, and severe mental illness.

2.3. Methods

Complete history taking (including patient's personal information, feeding history, length of obesity, history of prior attempts at weight reduction, whether surgical or nonsurgical, medical history for comorbidities, and prior surgical history) was performed on all patients, comprehensive physical exam, as well as laboratory, and other tests.

2.4. Operative techniques

In the first group, the procedure known as the sleeve gastrectomy was performed using a laparoscopic approach. Laparoscopy was used to perform the MGB procedure on the second group.

2.5. Data management and statistical analysis

The data that was obtained was brought into a computer, updated, coded, and tabulated with the help of the Statistical program for Social Science that was developed by IBM Corporation (2011). IBM Corporation. (2013). IBM SPSS Statistics for Windows, Version 20.0. Armonk, New York. The data were provided, and the proper evaluation was made of the type of data gathered for each parameter.

Age, sex, family history of diabetes, BMI loss, type of medication, duration of DM, distribution of obesity, C-peptide (<3 ng/ml and >3 ng/ml, while typical range in our study was 1.13 ng/ml), and preoperative DM status better control if glycated hemoglobin test (HBA1c) is less than 8.5 % and there is no history of hyperglycemic problems; worse control if HBA1c is greater than 8.5 % and there are several visits to the emergency room due to complications.

3. Results

Table 1.

This table showed that no statistically significant differences could be found between the groups when taking into account age, sex, and family history (Table 2).

This table showed that the biochemical features did not significantly differ between the two groups statistically (C-peptide, BMI baseline, fetal bovine serum (FBS) baseline, and HbA1c baseline) (Table 3).

This table showed that no substantial health disparities were detected between the two groups. (Distribution of obesity, Duration of DM (yrs.),

Table 1. Comparison of the personal features of groups 1 and 2.

	Group		*P* value	Significance
	Sleeve gastrectomy Mean ± SD	Minigastric bypass Mean ± SD		
Age	37.73 ± 9.35	37.47 ± 9.05	0.911[a]	NS
	No. (%)	No. (%)		
Sex				
Male	12 (40.0 %)	10 (33.3 %)	0.592[b]	NS
Female	18 (60.0 %)	20 (66.7 %)		
Family history				
Negative	11 (36.6 %)	9 (30 %)	0.273[b]	NS
Positive	19 (63.3 %)	21 (70 %)		

[a] Student t tests.
[b] χ^2 Chi-Square Tests.

Table 2. Comparison of the biochemical features of groups 1 and 2.

	Group		*P* value	Sig.
	Sleeve gastrectomy Mean ± SD	Mini gastric bypass Mean ± SD		
C-peptide	3.97 ± 1.13	4.63 ± 1.47	0.549[a]	NS
BMI baseline	53.43 ± 8.78	51.33 ± 8.41	0.421[a]	NS
FBS baseline	148.27 ± 11.78	151.67 ± 12.27	0.514[a]	NS
HbA1c baseline	8.61 ± 0.78	8.10 ± 0.92	0.326[a]	NS

FBS, fetal bovine serum; HbA1c, glycated hemoglobin test.
[a] Student t tests.

Table 3. Comparison of the medical features of groups 1 and 2.

	Group		*P* value	Significance
	Sleeve gastrectomy No. (%)	Mini gastric bypass No. (%)		
Distribution of obesity				
Peripheral	5 (15.6 %)	8 (26.7 %)	0.235[a]	NS
Central	11 (36.6 %)	13 (43.3 %)		
Both	14 (46.6 %)	9 (30 %)		
Duration of DM (yrs.)				
<5 years	18 (60 %)	16 (53.3 %)	0.593[a]	NS
>5 years	12 (40 %)	14 (46.7 %)		
Preoperative medication				
OHG	20 (66.7 %)	21 (30 %)	0.573[a]	NS
Insulin	10 (33.3 %)	9 (30 %)		
Status of DM (according to baseline HbA1c)				
Less Control	9 (30 %)	10 (33.3 %)	1.0[a]	NS
Better Control <8.5 %	21 (70 %)	20 (66.7 %)		
C-peptide				
<3 ng/ml	6 (20.0 %)	8 (26.7 %)	0.542[a]	NS
>3 ng/ml	24 (80.0 %)	22 (73.3 %)		

HbA1c, glycated hemoglobin test.
[a] χ^2Chi-Square Tests.

Table 4. Comparison of the operating times between groups 1 and 2.

	Group				*P* value	Significance
	Sleeve gastrectomy		Mini gastric bypass			
	Range	Mean	Range	Mean		
Operative time	50–120 min.	85	90–160 min.	130	0.61[a]	NS

[a] Student t tests.

Table 5. Baseline, follow-up, and total changes in body mass index compared between groups 1 and 2.

	Group		*P* value	Significance
	Sleeve gastrectomy Mean ± SD	Mini gastric bypass Mean ± SD		
BMI baseline	53.33 ± 8.78	51.33 ± 9.41	0.872	NS
BMI 3 months	44.00 ± 8.49	43.93 ± 7.94	0.975	NS
BMI 6 months	37.73 ± 6.92	36.73 ± 4.83	0.519	NS
BMI12 months	33.47 ± 5.69	31.87 ± 3.66	0.200	NS
Total BMI loss	18.47 ± 5.14	19.67 ± 7.17	0.459	NS

*Student *t*-test.

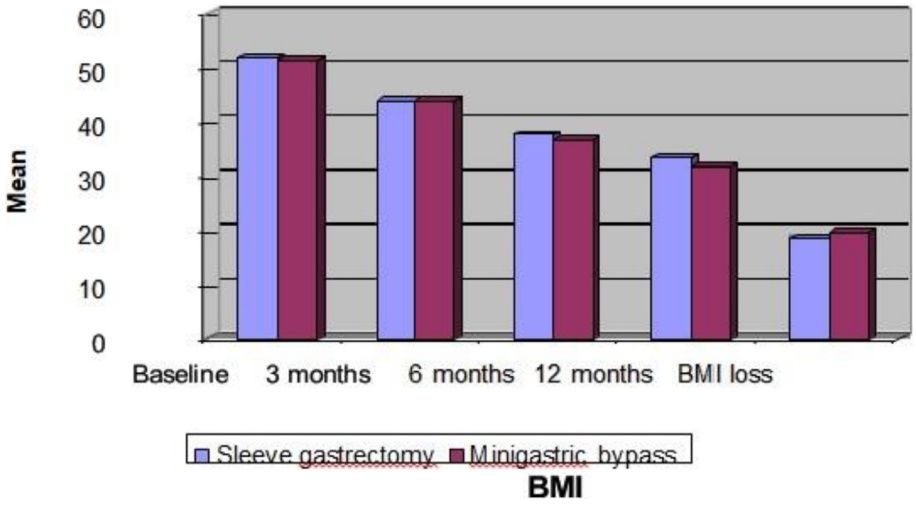

Fig. 1. Comparison of group 1 and group 2's baseline, follow-up, and total changes in BMI.

Preoperative medication, Status of DM (according to baseline HbA1c) and C-peptide (Table 4).

This table showed that there was no significance between the studied groups regarding operative time (Table 5).

Table 6. Comparison of hospital stays between groups 1 and 2.

	Group				*P* value	Significance
	Sleeve gastrectomy		Mini gastric bypass			
	Range	Mean	Range	Mean		
Hospital stay	1–3 days	2	1–5 days	3	0.75[a]	NS

[a] Student *t* tests.

This table showed that there was no significance between the studied groups regarding BMI (Fig. 1, Table 6).

The table above illustrated the fact that Regarding hospital stay, there was no statistically substantial variation between the two groups (Table 7).

This table showed that regarding FBS at baseline, at follow-up, and overall FBS change (FBS baseline, FBS 3 months, FBS 6 months, FBS 12 months, and Total FBS change), there was significant difference between the studied groups regarding total FBS Change (Fig. 2).

Table 7. Comparison of baseline, follow-up, and total FBS changes between groups 1 and 2.

	Group		*P* value	Significance
	Sleeve gastrectomy Mean ± SD	Mini gastric bypass Mean ± SD		
FBS baseline	148.27 ± 12.78	151.67 ± 12.27	0.179	NS
FBS 3 months	132.47 ± 11.31	135.47 ± 9.99	0.281	NS
FBS 6 months	124.20 ± 10.99	125.07 ± 10.66	0.758	NS
FBS 12 months	115.33 ± 13.79	111.87 ± 12.05	0.304	NS
Total FBSchange	29.93 ± 12.84	37.80 ± 6.41	0.004	HS

*Student *t* tests.
FBS, fetal bovine serum.

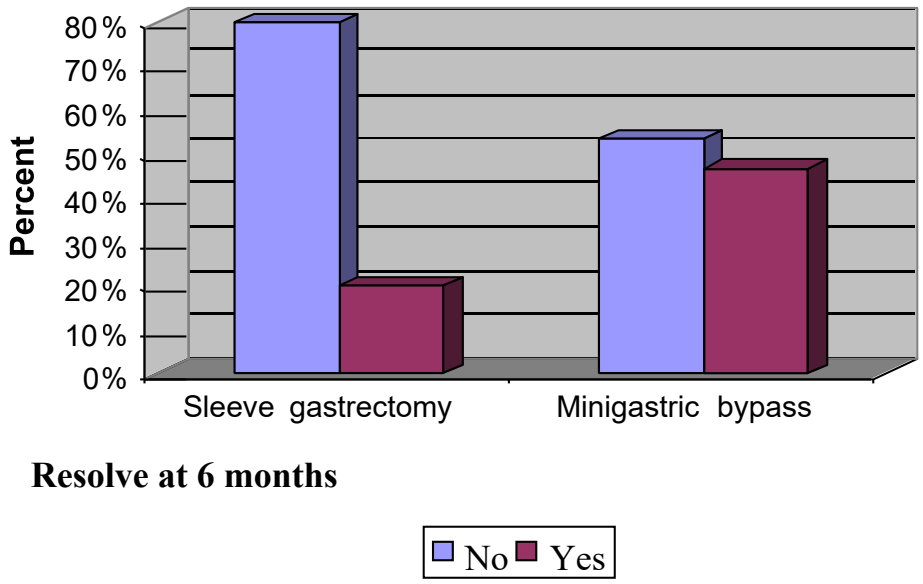

Fig. 2. A comparison of group 1 and group 2's results for controlling their diabetes after 6 months.

4. Discussion

The worldwide incidence of T2DM and obesity has sharply grown, becoming a severe global health issue. Both illnesses promote a rise in both the rates of morbidity and death, as well as an increased likelihood of cardiovascular disorders. Currently, It is generally agreed that bariatric surgery is the most effective method of dealing with obesity, and people with diabetes who have this procedure report considerable improvements in their glycemic control.[7]

The average procedure for group 1 (sleeve gastrectomy) took 85 min on average, with variations between 50 and 120 min. The average surgery duration for group 2 (MGB) was 130 min, with individual cases varying from 90 to 160 min. All procedures were laparoscopic except for one, which required an open procedure owing to increasing airway pressure during abdominal insufflation. Operative time differences between the two groups were statistically insignificant.

In the research by[8] (to contrast the LMGB, LSG, LAGB, and gastric balloon), the average operational time with LSG was 75 ± 15.3 min compared with 115 ± 15.6 min with LMGB, according to the data that had been published.

Additionally, the mean operating duration with LMGB was 115.3 min in Lee and his colleague's research comparing LMGB with LRYGB.[9]

Hospital stays varied from 1 to 3 days in the SG group, with an average of 2 days, whereas they varied from 1 to 5 days in the MGB group, with a mean of 3 days.

The average postoperative hospitalization after LSG in the research conducted by Gentileschi and colleagues was 3.2 days.[10] While length of stay in the hospital after surgery, on average in a different trial conducted by Dapri and colleagues was 3.6 days.[11]

The median BMI drop in MGB was greater than that in SG after a year, although this variation was statistically insignificant. When compared with the study that was conducted by Milone and his colleagues (to compare SG and MGB in the treatment of diabetes after a year), Changes in body mass index (BMI) were found to be linked with both SG and MGB (20.33 4.48 % vs. 19.19 ± 4.42 %), with no statistically significant difference between the two (P value = 0.931).[6]

In particular, 18 participants (3 months post-surgical procedure) had DM remission (53.3 % in SG vs. 62.5 % in MGB, $P = 0.722$). At the 6-month follow-up, the same findings were verified (53.3 % for SG vs. 68.8 % for MGB, $P = 0.473$).[6]

The research also found a positive link between BMI reduction and DM remission, although this correlation was statistically insignificant, suggesting that other, more significant processes than weight loss may be at play in postoperative diabetes resolution.

These findings concur with several global investigations. In their study of the impact that The effects that laparoscopic Roux-en-Y gastric bypass surgery has on people with T2DM, Schauer and his colleagues discovered that people whose DM has been under control for a shorter period, less than five years (which indicates mild disease with more preserved functional pancreaticβ cells), low HBA1c, and non-insulin usage respond better to the

procedure and experience remission of their diabetes. Therefore, early surgical intervention is advised for DM. patients. They also came to the conclusion indicates the degree of reduction in BMI has a favorable correlation with the absence of diabetic symptoms.[12]

In the research that Lee and his colleagues conducted in hindsight to examine the differences between three different types of gastrointestinal surgery (LGB, LMGB, and LSG), they found that Major predictors of T2DM remission in overweight individuals included waist circumference and C-peptide levels.[13]

4.1. Conclusion

In addition to being a method for losing weight, bariatric surgery (both SG and MGB) is also a metabolic operation that may treat the majority of the symptoms associated with metabolic syndrome. This makes it the most effective long-term therapy option for T2DM in obese individuals. When SG and MGB are compared, the results of our research reveal that MGB has a greater and more rapid impact on diabetes remission than SG.

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Conflicts of interest

No conflict of interest.

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