

Original Research Article

Laparoscopic sleeve gastrectomy versus laparoscopic mini-gastric bypass and early metabolic outcome in super-obese patients

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ABSTRACT

Background: Bariatric surgery became the most popular choice in the management of obesity. Laparoscopic sleeve gastrectomy (LSG) and laparoscopic mini-gastric bypass (LMGB) has taken place in weight-loss and improvement in comorbidities.

Methods: This was a retrospective cohort study with equal allocation included 112 super-obese patients with body mass index ≥ 50 kg/m², which carried out in General Surgery department of Al-Azhar University Hospitals, between January 2016 and December 2018. 56 patients underwent LSG (Group A), and 56 patients underwent LMGB (Group B). Metabolic effect and weight loss outcomes were evaluated over one year.

Results: Operative time was shorter in LSG than LMGB (64.3±33.32 min versus 70±37.24 min). There was a highly significant more weight loss in LSG than in LMGB at 6 and 12 months following the surgery. Also, improvement of type 2 diabetes mellitus, hypertension, hyperlipidemia, and quality of life occurred after 1 year in both surgeries.

Conclusions: LSG and LMGB were better optimal procedures for super-obese patients with a comparable percent excess weight loss and improvement of associated comorbidities.

Keywords: Bariatric surgery, Dyslipidemia, Mini-gastric bypass, Sleeve gastrectomy, Type 2 diabetes mellitus

INTRODUCTION

The definition of morbid obesity is a body mass index (BMI) >40 or >35 kg/m² associated with co-morbidities.¹

Bariatric surgeries appear to be effective in weight reduction, decreasing co-morbidities and mortality, with subsequent improved quality of life in obese patients.^{2,3}

The increase in BMI associated with decrease in health performance.⁴

Hypertension, diabetes mellitus, pulmonary dysfunction sleep apnea, and degenerative arthritis, are the most common problem that occur in obese patients.⁵

World Health Organization (WHO), report that 2 billion people worldwide suffering from overweight.^{6,7}

All bariatric operations have advantages and disadvantages. The laparoscopic mini gastric bypass (LMGB) operation is less invasive than laparoscopic Roux en-Y gastric bypass (LRYGB). The aim of LMGB is to reduce the weight and treatment of co-morbidities.

Besides that, it is associated with a rapid learning curve and low incidence of post-operative complication.^{8,9}

Surgery for super-obesity is more difficult and usually associated with less better outcomes than surgery for morbid obesity.¹⁰

Several bariatric surgeries as sleeve gastrectomy (SG), duodenal switch, gastric banding, and Roux en-Y gastric bypass offer safe outcomes for super-obese patients.^{11,12}

Metabolic effects of bariatric surgery include changes in insulin resistance, insulin release, diabetes, dyslipidemia, and inflammatory status.¹³

Several studies that compare the bariatric surgeries and medical therapy demonstrate that the bariatric surgeries were superior to the medical treatment as it affects the level of glycated hemoglobin.¹⁴

Buchwald et al showed that LSG and LMGB decrease the level of C-reactive protein (CRP) with no significant difference between both operations.¹⁵

Also, Schauer et al demonstrate that bariatric surgery associated with decreased mortality (40%), decreased coronary disease (56%), improvement of diabetes (92%), and reduction of malignant neoplasia (60%).¹⁶

The aim of our study to demonstrate the early metabolic outcome after LSG versus LMGB in super-obese patients.

METHODS

This was a retrospective cohort study with equal allocation which carried out on 112 patients with BMI ≥ 50 kg/m² with or without co-morbidities.

Exclusion criteria: Patients with chronic diseases proved to be unfit for surgery, unstable mental health, and drug or alcohol addiction.

Ethical approval was granted for the study by Al-Azhar University-Faculty of Medicine's ethics committee according to the Declaration of Helsinki.

All patients underwent LSG or LMGB by the same surgical team according to our suggestion and patient's preference in general surgery department of Al-Azhar University Hospitals, between January 2016 and December 2018.

Patients were divided into two groups based on the procedure, Group A included 56 patients underwent LSG and Group B included 56 patients underwent LMGB.

Age and gender together with the co-morbidity data as diabetes mellitus, hypertension and hyperlipidemia were recorded.

Also, the type of surgery, operative time, and hospital stay were collected.

Surgical technique

Positioning (patient and surgical team)

The patient lies in the supine position with head inclined 45 degrees and with legs open position. The patient supported to the operating table using plaster tape or belt applied to the lower abdomen and both thighs.

Elastic stocking was used in both lower limbs as anti DVT measure along with perioperative low molecular weight heparin.

A urinary catheter was then inserted under complete aseptic condition.

The surgeon stands between the legs, with the 1st assistant on the left side of the patient while the 2nd assistant (camera man) on the right side of the patient.

Pneumo-peritoneum and trocars placement

The pneumo-peritoneum was performed by veress needle in the left upper quadrant, near the costal margin at the level of the mid-clavicular line. The pressure applied range from 12-15 mmHg.

A 10 mm port was inserted 15 cm from xiphoid process and 3-5 cm to the left of midline. The second 12 mm trocar was inserted 3-5 cm to the right of midline. Another 12 mm trocar was inserted near left costal margin in midclavicular line while 5 mm trocar in left anterior axillary line.

Liver retractor was applied though 5mm port inserted below xiphoid process or below right costal margin in anterior axillary line.

Sleeve gastrectomy techniques

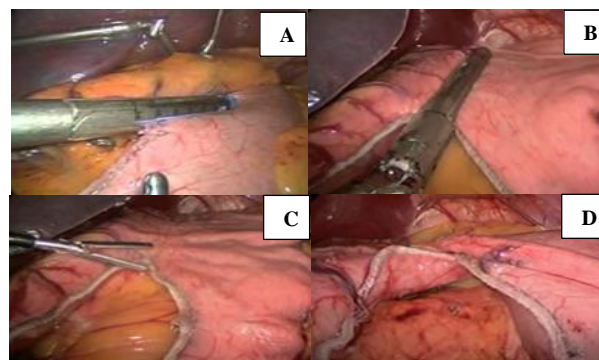


Figure 1 (A-D): Steps of LSG.

The aim was to reduce gastric volume by applying 6 to 7 cartridges. We started with one green cartridge then 4 to

6 gold or blue cartridges placed through the gastric wall, extending from 6 cm above the antrum till the esophago-gastric junction.

Intra-operative leak testing with methylene blue was performed.

Mini-gastric bypass

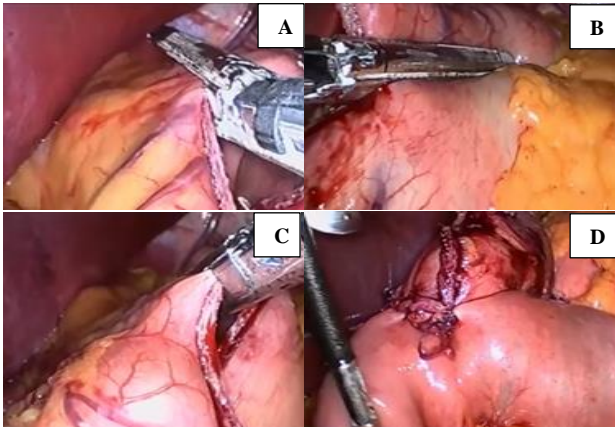


Figure 2 (A-D): Steps of LMGB.

The aim was to create a gastric pouch about 15-18 cm (50-150 ml) with a gastro-enteric anastomosis 200 cm from the duodeno-jejunal junction (bilio-pancreatic loop).¹⁷

Rutledge et al was the 1st one who describes MGB as a simplification of RYGB by performing a single anastomosis, with a significant reduction of technical complexity, shorter operative time and a potential reduction in morbidity and mortality.¹⁸

The gastric pouch was created using one 45 mm gold or blue cartridges to perform the horizontal section and 3 to 4 cartridges to perform the vertical section then the pouch anastomosed to jejunum (side to side) using 45 mm blue cartridge. Later the orifice through which the cartridge applied was closed continuously with 3-0 polydioxanone.^{18,19}

Intra-operative leak testing with methylene blue was performed.

Post-operative protocol

All patients remain fasting for about 24 hours.

A gastrografen study was performed; once there is no evidence of leak oral fluid diet started then the patient discharged 2-6 days post-operative.

All patients were followed up at 1, 3, 6, and 12 months following the surgery at which the BMI and percent excess weight loss (%EWL) was calculated and the remission of associated comorbidities was noted.

Statistical analysis

The collected data were organized, tabulated and statistically analyzed using SPSS software (Statistical Package for the Social Sciences, version 21, SPSS Inc. USA). Data were described using mean and standard deviation (SD) and frequencies according to the type of the data (quantitative or categorical respectively). Chi-square and fisher exact test were used for comparison of qualitative variables. We used one-way ANOVA test to compare between means of categorical and numerical data. Significance level (p value) was adopted, i.e. p < 0.05 for interpretation of results of tests of significance.

RESULTS

A total 112 super-obese patients between January 2016 and December 2018 were included in the retrospective study. The mean age was 34.5 years (22-49 years).

There were 47 males and 65 female patients. LSG was performed in 56 patients and MGB in 56 patients (Table 1).

There were no significant differences in operative time (64.3±33.32 versus 70±37.24 min), or hospital stay (3.1±2.27 versus 3.75±2.84) (Table 1).

Intraoperatively, 2 patients (3.5%) in Group 2 suffered from anastomotic or gastric pouch leak during leak testing with methylene blue, while another 2 patients (3.5%) suffered from bowel perforations due to iatrogenic injury. However, all intra-operative complications were managed without further sequel. No intra-operative complications occurred in Group 1, with a significant difference between both groups regarding the overall intraoperative complications (p=0.05) (Table 1).

Table 1: Characters of the study groups and there early post-operative outcomes (n=112).

Point of difference	Group A (LSG)	Group B (LMGB)
Number	56	56
Gender	M: 28 (50%); F: 28 (50%)	M: 19 (34%); F: 37 (66%)
Operative time (minutes)	64.3±33.32 (45-120) m.	70±37.24 (60-120) m.
Intra-operative anastomotic leak	0	2 (3.5%)
Intra-operative bowel injury	0	2 (3.5%)
Hospital stay (day)	3.1±2.27(2-5)	3.75±2.84(3-6)

The mean WL, and mean %EWL at 6 and 12 months were summarized in (Table 2).

The percentage of associated type 2 diabetes pre-operatively was significantly higher in LMGB patients as

compared to LSG patients [25 (44.6%) versus 12 (21.4%) p=0.008]. However, there was no significant difference in

pre-operative FBS (190.46 versus 210 mg/dL; p=0.416) (Table 2).

Table 2: The mean WL, and mean %EWL at 6 and 12 months and associated co-morbidities.

Parameters	LSG group		LMGB group		X ² -Test/ ANOVA test	P-value
	Number	Frequency %	Number	Frequency %		
Weight loss at 6 months	40.71±11.5		21.46±9.17		492	0.001 HS
Weight loss at 12 months	60.48±20.7		43.52±15.51		368	0.002 HS
BMI at 6 months	42.57±2.66		45.06±3.37		138	0.01 S
BMI at 12 months	34.96±5.28		41.75±2.58		251	0.02 S
%EWL at 6 months	43.75±10.75		25.2±11.31		354	0.001HS
%EWL at 12 months	63.6±17.21		46.7±18.82		432	0.001 HS
Type 2 Diabetes	12	21.40	25	44.60	10.5	0.008 HS
Hypertension	11	19.60	6	10.70	0.91	0.14 NS
Hyperlipidemia	13	23.20	8	14.20	0.45	0.792 NS

Values are expressed as mean±standard deviation (SD). NS: Non significant (p>0.05), S: significant (p<0.05). HS: highly significant (p<0.001).

Table 3: Comparison of weight loss and the co-morbidities outcome in two groups.

Parameters	LSG group		LMGB group		X ² -Test/ ANOVA test	P-value
	Number	Frequency %	Number	Frequency %		
Total diabetic patients	12	21.40	25	44.60	10.5	0.008 HS
Remission group	8	66.60	16	64	9.3	0.015 S
Non- remission group	4	33.30	9	36	8.9	0.004 HS
Total hypertensive patients	11	19.60	6	10.70	0.91	0.14 NS
Remission group	8	72.80	4	66.60	0.43	0.23 NS
Non- remission group	3	27.20	2	33.30	0.82	0.58 NS
Total hyperlipidemic patients	13	23.20	8	14.20	0.45	0.792 NS
Remission group	10	76.90	6	75	0.21	0.83 NS
Non- remission group	3	23.10	2	25	0.35	0.62 NS

Values are expressed as mean±standard deviation (SD). NS: Non significant (p>0.05), S: significant (p<0.05). HS: highly significant (p<0.001).

The percentage of associated hypertension and hyperlipidemia were non-significant between both groups (Table 2).

The remission of type 2 DM occurred in 8 in group1 and 16 patients in Group 2 with a significant difference between both groups, p=0.015 (Table 3).

There was no statistical difference in percentage of resolution of hypertension (72.8% versus 66.6%; P=0.23), hyperlipidemia (76.9% versus 75%; p=0.83) in both groups respectively (Table 3).

DISCUSSION

Laparoscopic sleeve gastrectomy had shorter operative times (64.3±33.32 min versus 70±37.24 min), this was explained by relatively less technical difficulty in LSG compared to MGB. This agreed with Mostafa et al while disagreed with Plamper et al who stated that the operative time was shorter in MGB than SG.^{20,21}

LSG also associated with a fewer complications than LMGB as anastomotic leak or bowel injury intraoperatively; this was explained by there was no anastomosis in LSG and less manipulation of bowels during LSG. Also, to demonstrate the post-operative complications in both surgeries we recommend a prospective study over long time follow up (3 to 5 years follow up) to record the data without any missing part and including a large number of patients.

In our study the mean WL, and the mean %EWL at 6 and 12 months were significantly higher after LSG than after LMGB. These results were agreed with Mostafa et al at 6 months while disagreed at 12 months.²⁰

Several studies showed that LMGB was more effective in WL over long term than LSG.²²⁻²⁵

In our study we have used the absolute weight loss and %EWL to demonstrate the weight loss after both surgeries, while the weight loss was reported by Sczepaniak et al. in many different methods as absolute

weight loss, percentage of total weight loss, %EWL, percentage of excess BMI loss, and percentage of patients with successful weight loss.²⁵

Improvement in obesity-related co-morbidities

In our study, there were 37 patients suffering from type 2 DM, 12 in LSG group and 25 in LMGB group while hypertension were found in 17 patients, 11 in LSG group and 6 in LMGB group. Also 21 patients have hyperlipidemia, 13 of them in LSG group and 8 in LMGB group.

Regarding type 2 DM, remission occurred in 8 patients in LSG group while occurred in 16 patients in LMGB with significant difference between both groups as the total number of the patients associated with type 2 DM were bigger in Group 2. Also, the remission was significantly higher than non-remission indicating that LSG and LMGB were effective in management of type 2 DM. this is agreed with several studies.^{20,26-29}

Also, Schauer et al demonstrated that LMGB was superior to LSG in remission of type 2 DM at 3 years follow up.¹⁶

Also, our data explained by that the primary risk factor for type 2 DM is the obesity, and 90% of all patients with type 2 DM are either overweight or obese.³⁰

In our study, remission of hypertension occurred in 8 and 4 patients respectively in both groups without significant difference while the remission is significantly higher than non-remission. This agreed with several studies.^{20,29}

Regarding the hyperlipidemia, the remission occurs in 10 and 6 patients in both groups respectively without significant difference while the remission rate was significantly higher than non-remission rate. This is agreed with Ramos et al, who noted that mini- gastric bypass significantly improve hyperlipidemia compared to medical therapy alone, while LSG significantly increase HDL and reduce the triglycerides level compared to medical therapy alone.^{20,26}

There is a relationship between weight loss and improvement of associated comorbidities by bariatric surgery, as the bariatric surgery decrease weight through several metabolic changes involving glycated hemoglobin, cholesterol and triglycerides.³¹

In our study, the small number of patients included in the study together with short follow-up postoperatively considered a limitation factors to evaluate the long-term risk-benefit ratio and late outcomes of the procedure.

CONCLUSION

LSG and LMGB were better optimal procedures for super obese patients. LSG gives better result in weight loss and

%EWL in the 1st year than LMGB, with a comparable improvement of associated comorbidities in both surgeries.

Recommendations

We recommend further prospective researches on a large number of patients and long term follow up (3-5 years).

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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