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Original Article

Surgery Section

Comparison of Outcomes Regarding Weight Loss in Laparoscopic Sleeve Gastrectomy vs Laparoscopic Mini Gastric Bypass in Morbidly Obese Patients- A Cohort Study

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ABSTRACT

Introduction: Obesity is defined as abnormal or excessive fat accumulation that may impair health. Body Mass Index (BMI) is a simple index of weight for height (kg/m^2) that is commonly used to classify overweight and obesity in adults. Mini Gastric Bypass (MGB) leads to improved quality of life, reduction in episodes of Gastroesophageal Reflux Disease (GERD), high patient acceptance, early safety, and efficacy. Laparoscopic Sleeve Gastrectomy (LSG) is a restrictive, irreversible procedure in which stomach capacity is markedly reduced by creating a lesser curvature tube. MGB is mildly restrictive but importantly, a malabsorptive operation. Many observational studies have concluded that better weight loss and diabetes remission are the advantages of MGB. However, comparative studies of outcomes and complications between Laparoscopic Sleeve Gastrectomy (LSG) and MGB are still scarce.

Aim: To compare the effectiveness and outcomes regarding weight loss after LSG and MGB in morbidly obese patients.

Materials and Methods: This prospective cohort study was carried out in the Department of Surgery of SPS Hospital, Ludhiana, Punjab, India from 1st June 2018 to 31st May 2019. Adults between 20-70 years of age and with BMI >37.5 without co-morbidities, and BMI >32.5 with co-morbidities Type II Diabetes Mellitus (T2DM) were included. The authors included 59 patients; 34 patients underwent MGB (22 were female and 12 were male) and 25 patients underwent LSG (18 were female and 7 were male). A comparison of continuous variables between the study groups was done using the Student's t-test. For comparing categorical data, a Chi-square (χ^2) test was performed.

Results: The overall % Excess Weight Loss (EWL) after MGB ranged from 27.74 to 62.32% with a mean of 44.88±17.44%. The overall % EWL after LSG ranged from 26.62 to 45.8% with a mean of 36.21±9.59%. ($p<0.05$) in % EWL at nine months in both procedures as MGB resulted in more % EWL than LSG. Perioperative results regarding the mean operative time for MGB was 3.24 hours and for LSG, 2.43 hours ($p<0.05$). A total of 50% (5/10) of patients who underwent MGB had remission, and 25% (1/4) of patients who underwent LSG had remission of T2DM after nine months ($p>0.05$). None of the patients required readmission post LSG, while 3% (1/34) required readmission post MGB. None of the patients had postoperative leakage in both groups.

Conclusion: The better outcome was associated with MGB in terms of the percentage of Excess Weight Loss (EWL).

Keywords: Body mass index, Excess weight loss, Glycosylated haemoglobin, Morbid obesity

INTRODUCTION

Obesity is defined as abnormal or excessive fat accumulation that may impair health. BMI is a simple index of weight for height (kg/m^2) that is commonly used to classify overweight and obesity in adults. According to the World Health Organisation (WHO) report, in February 2018, there were more than 1.9 billion overweight adults worldwide in 2016. Of these, 650 million were obese [1]. Overweight is characterised as BMI of 25.0 to 29.9 kg/m^2, obesity as BMI >30.0 kg/m^2, and morbid obesity as BMI >37.5 kg/m^2 without co-morbidities and BMI >32.5 kg/m^2 with co-morbidities [1]. In Asia, overweight is defined as a BMI of 24.0-27.9/m^2, and obesity as a BMI >28.0 kg/m^2 [2].

Obesity is strongly associated with severe medical problems, including an increased risk of cardiovascular morbidity and mortality, orthopaedic dysfunction, depression, breast, colon and uterine cancer, and cholelithiasis [2,3]. Weight reduction reduces the incidence of most obesity-related complications and improves quality of life [4]. Criteria for adults are being evaluated, and patients with BMI >37.5 kg/m^2 without co-morbidities and BMI 32.5 kg/m^2 with co-morbidities can be considered for surgery [5].

The most effective therapy to treat obesity and related co-morbidities is bariatric surgery, with LSG being the most popular procedure. It is a technically less complex procedure with a short learning curve and effective weight loss, but it has a high risk of weight gain and GERD [6]. MGB leads to improved quality of life, reduction in episodes of GERD, high patient acceptance, early safety, and efficacy. For newer surgeons, MGB is easier to learn because of one anastomosis and longer pouch [7]. Perioperative complications can be classified as cardiorespiratory problems, which include Myocardial Infarction (MI), Pulmonary Embolism (PE), and/or Deep Venous Thrombosis (DVT), leakage (most common and feared early complication) and directly related to surgical technique. Other late complications include obstruction stricture, ulcer GERD, malabsorption, revision, and weight regain [8].

The primary aim was to compare the effectiveness and outcomes regarding weight loss after LSG and MGB in morbidly obese patients, and secondary objectives were to compare the remission of co-morbidities T2DM and to compare the complications after LSG and MGB.

MATERIALS AND METHODS

This prospective cohort study was conducted in the Department of Surgery of SPS Hospital, Ludhiana, Punjab, India from June 1, 2018 to May 31, 2019. Institutional Ethics Committee (IEC) approval was obtained.

Inclusion criteria:

- Adults between 20-70 years of age group.
- Patients with BMI >37.5 without co-morbidities and BMI >32.5 with co-morbidities (T2DM).

Exclusion criteria:

- Age <20 years or >70 years.
- Re-do surgeries
- Open LSG and open One Anastomosis/MGB (OAGB-MGB) surgeries

Sample size calculation: All 59 patients within the age range of 20-70 years and with BMI >37.5 without co-morbidities and BMI >32.5 with co-morbidities T2DM who underwent the procedure during the specified study period constituted the sample population. In the initial study, patients were randomly assigned to MGB or LSG using a computer-generated randomisation list. A total of 34 patients underwent MGB (22 were female and 12 were male), and 25 patients underwent LSG (18 were female and 7 were male).

Study Procedure

All patients meeting the inclusion criteria were interviewed using a questionnaire covering personal information and co-morbidities, including Diabetes Mellitus (DM). Routine blood investigations, glycated haemoglobin, chest X-ray, electrocardiogram, abdominal ultrasound, upper gastrointestinal endoscopy, and Doppler bilateral lower limb examinations were performed. Informed written consent was obtained for surgery and anaesthesia.

The LSG is a restrictive, irreversible procedure in which stomach capacity is markedly reduced by creating a lesser curvature tube. The procedure involved dissection across the antrum, 4 cm proximal to the pylorus, over a 36 French bougie using a bipolar vessel sealing device, creating the lesser curvature conduit to the angle of His by three-row endo stapler sequential firing. MGB is mildly restrictive but importantly, a malabsorptive operation. A five-trocar technique was used. A three-row endo stapler was fired perpendicular to the lesser curvature, distal to the crow's foot. This was followed by vertical gastric division continuing proximally to the left of the angle of His, thus creating a long gastric tube over a 36 French bougie. The excluded part of the stomach remained in-situ. The jejunal loop 200 cm distal to the ligament of Treitz was brought up by the antecolic method. Gastrojejunostomy and enterostomy were performed, and gastrostomy was closed with 2-0 V-Lock Barb suture. The operative time (from incision to the last stitch), hospital stay, bleeding, leakage, readmission, wound infection, GERD, and bowel obstruction were noted.

Postoperatively, patients were kept nil per oral for one day. On Postoperative Day (POD) one, a clear liquid diet was started orally, with 15-20 mL every hour, and after 5-6 hours, it was increased to 50 mL/hourly. Antibiotics were stopped, and the dressing was changed on POD second. The Jackson-Pratt drain was removed, and patients were discharged with iron and folate, calcium supplements, Proton Pump Inhibitors (PPI) (twice a day), multivitamins, injection Low Molecular Weight Heparin (LMWH) subcutaneous, a liquid diet, and were followed-up in the surgical Outpatient Department (OPD) on the 7th to 10th day of the operation for suture removal.

At the first follow-up (POD-7), sutures were removed, patients were inquired about any fresh complaints, and were advised to continue supplements and light exercises. At the second follow-up, one month after surgery, LMWH was stopped, a semisolid diet was started, and then patients were switched to a normal diet after 2-3 weeks. Patients were advised strict dietary monitoring, smaller bites, thorough chewing, meal duration ≥15 minutes, adequate hydration, frequent meals (intervals of ≥2-4 hours) and small diet portions, continued supplements, and PPIs. At the third and fourth follow-ups, 3 and 6 months after surgery, respectively, BMI and % were reinstated. At the last follow-up, nine months after surgery, BMI and % EWL were calculated, dietary compliance and supplements were reinstated, and T2DM remission was checked by assessing glycosylated haemoglobin preoperatively and at the 9th month of follow-up.

STATISTICAL ANALYSIS

All statistical calculations were performed using the Statistical Package for the Social Sciences (SPSS) 21.0 version statistical program for Microsoft Windows. Data were described in terms of range, mean±Standard Deviation (SD), median, frequencies (number of cases), and relative frequencies (percentage) as appropriate. A comparison of continuous variables between the study groups was conducted using the Student's t-test. For comparing categorical data, the Chi-square (χ^2) test was performed. A probability value (p-value) less than 0.05 was considered statistically significant.

RESULTS

The age group in the MGB was from 31 to 57 years, with a mean age of 44.03±13.10 years, and the overall range for LSG was from 28 to 50 years, with a mean age of 38.64±10.84 years. There was no statistical significance in age distribution, sex distribution, BMI distribution, and T2DM, as p>0.05 [Table/Fig-1].

Variables	MGB	LSG	p-value (Chi-square (χ^2)
Age (Mean±SD) (years)	44.03±13.10	38.64±10.84	0.099¥
Sex (M:F)	12/22	7/18	0.554#
BMI (Mean±SD) (kg/m^2)	47.79±8.94	46.95±5.92	0.686¥
Diabetes	10 (29%)	4 (16%)	0.232#

[Table/Fig-1]: Baseline characteristics of the patients.
¥: Student's t-test was used; #: Chi-square test was used

The mean operative time for MGB was 3.24 hours and for LSG was 2.43 hours (p<0.05). None of the patients required readmission post LSG, while 1/34 (3%) required readmission post MGB. In the present study, none of the patients had postoperative leakage in both groups. None of the patients had wound infection post LSG. 1/34 (3%) of patients had wound infection post MGB. The patient in the MGB group had meshplasty for an umbilical hernia simultaneously, which got infected, for which he was readmitted, and the mesh was removed [Table/Fig-2].

Variables	MGB (n=34)	LSG (n=25)	p-value
Operative time (hours) (Mean±SD)	3.24±0.64	2.43±0.69	0.001¥
Hospital stay (Days)	3.44±0.99	3.04±0.89	0.551¥
GERD	0	1 (4%)	0.240#
Bleeding	0	0	-
Nausea/vomiting	4 (12%)	3 (12%)	0.978#
Wound infection	1 (3%)	0	0.424#
Bowel obstruction	0	0	-

[Table/Fig-2]: Comparison of operative time and postoperative complications.
¥: Student's t-test was used; #: Chi-square test was used

The preoperative HbA1c in the MGB group was in the range of 7.29 to 9.51%, with a mean of 8.40±1.11%, and the preoperative HbA1c in the LSG group was in the range of 7.28 to 8.58%, with a mean of 7.93±0.65%. HbA1c at nine months in the MGB group was in the range of 5.99 to 7.51%, with a mean of 6.75±0.76%, and HbA1c at nine months in the LSG group was in the range of 6.54 to 7.16%, with a mean of 6.85±0.31%. In 5/10 (50%) of patients who underwent MGB, there was remission, and 1/4 (25%) of patients who underwent LSG had T2DM after nine months. There was no significant difference (p>0.05) in preoperative HbA1c, HbA1c at nine months, remission of T2DM after nine months, and BMI

reduction between MGB and LSG groups at 3, 6, and 9 months. There was a significant difference in % EWL (p<0.05) between LSG and MGB at 3, 6, and 9 months, with MGB having a greater %EWL [Table/Fig-3].

Variables		MGB	LSG	p-value (Student's t-test)
HbA1c (preoperative)		8.40±1.11	7.93±0.65	0.444
HbA1c (9 months) (%)		6.75±0.76	6.85±0.31	0.806
BMI (Mean±SD) (kg/m^2)	3 months	44.16±8.97	43.54±5.78	0.762
	6 months	40.89±8.67	40.59±5.70	0.878
	9 months	38.53±8.84	38.36±5.63	0.935
% EWL	3 months	17.20±6.95	13.90±4.57	0.044
	6 months	30.93±11.13	25.44±8.09	0.041
	9 months	44.88±17.44	36.21±9.59	0.029

[Table/Fig-3]: Comparison of preoperative HbA1c, HbA1c at 9 months, BMI reduction and % EWL.

DISCUSSION

Obesity is a major public health burden of pandemic proportions. MGB, with its low complication rate and better long-term results, has become a good alternative to LSG [9]. Many observational studies have concluded that better weight loss and diabetes remission are advantages of MGB. However, comparative studies of outcomes and complications between LSG and MGB are still scarce [8-10].

The female predominance was due to the prevalence of obesity in females, leading to more female candidates undergoing bariatric procedures [11]. In the MGB group, 29% of patients had T2DM, while in the LSG group, 16% of patients had T2DM. Mostafa EA et al., found that MGB is a promising antidiabetic procedure [12]. Madhok B et al., found a statistically significant difference in the time taken during MGB due to the creation of GJ, closure of enterotomy, and the learning curve [13]. Lee WJ et al., revealed similar postoperative hospital stays for both groups due to similar postoperative management, i.e., early ambulation, early initiation of oral therapy, and physiotherapy [14]. The present study found no postoperative leakage, possibly due to careful tissue handling, consideration of tissue thickness, avoiding tension, twisting or kinking of the mesentery, usage of a 36 French bougie, reinforced suture line, and on-table leakage test [15]. In the postoperative period, none of the patients in the MGB group had GERD, while 4% had GERD in the LSG group. Jammu GS and Sharma R revealed that GERD was maximally seen after LSG, possibly because of lower intragastric pressure in MGB patients [8]. In LSG, the long narrow sleeve gastric tube might increase the intragastric pressure, triggering GERD and slowing the exit of food through the pylorus. In the present study, post-LSG patients had mild GERD, which was managed conservatively by lifestyle modification, PPI, and antiemetics. No postoperative bleeding was noted in both groups. Trastulli S et al., found no postoperative bleeding [16].

In the present technique, authors waited for a few seconds after closing with a tri-stapler to avoid bleeding. Before the end of the procedure, the staple line was inspected, and systolic blood pressure was increased to >140 mm of Hg to check for any suture line bleed, and any bleeding was controlled with stitches and endoclips, administration of LMWH was started six hours postoperatively. Seetharamaiah S et al., revealed that nausea/vomiting was found in 4% of patients in the LSG group and 2.9% of patients in the MGB group [17].

The authors observed that nausea/vomiting was frequently seen during the first month postoperatively, possibly due to inappropriate eating habits. All were managed conservatively with antiemetics and PPIs. None of the patients had postoperative bowel obstruction after MGB and LSG. Bruzzi M et al., found that 0.8% of patients undergoing MGB had bowel obstruction requiring surgical intervention [18]. None of the patients had wound infection post-LSG. Three percent of patients had wound infection post-MGB. The patient in the MGB group who had meshplasty for umbilical hernia simultaneously developed an infection due to enterotomy, and the mesh had to be removed later. Similarly, a study by Kular KS et al., showed that 0.3% of patients had wound infection post-MGB, which was managed conservatively [19]. In the present study, none of the patients had readmission post-LSG. Three percent of patients had readmission post-MGB. No readmission was needed, possibly due to no bleeding and no leakage after MGB/LSG [20].

The overall % Excess Weight Loss (EWL) after MGB ranged from 10.25 to 24.15% with a mean of 17.20±6.95%. The overall % EWL after LSG ranged from 9.33 to 18.47% with a mean of 13.90±4.57%. Abouelela MS et al., in their study, found that BMI and % EWL after three months were statistically non significant after both procedures [21]. Weight loss in the bariatric procedure is due to a reduction in the volume of the stomach, calorie restriction, and frequent meals. There was a significant difference (p<0.05) in % EWL at six months in both procedures, as MGB resulted in a higher % EWL than LSG.

Mostafa MM et al., in their study, found that the %EWL at six months in the MGB group was 68.61±7.06% and in the LSG group was 61.06±6.22% with p<0.05 [22]. Early and better weight loss in a shorter follow-up in MGB may be due to the usage of a constant biliopancreatic limb length of 200cm, faster gastric emptying, early satiety, and surgery-induced change in gut microbiome. There was a significant difference (p<0.05) in % EWL at nine months in both procedures, with the MGB group achieving a higher % EWL than LSG. There was a significant decrease in BMI in both groups, but the difference in BMI decrease in the two groups was statistically insignificant, probably because of the short duration of follow-up, as mentioned previously. Early and higher weight loss in MGB is proposed to be due to the usage of a constant biliopancreatic limb length of 200 cm, early satiety, better glycaemic control, effect on central gustatory pathways through gut hormones, changes in palatability, and changes in the gut microbiome. Weight loss was better in patients who underwent MGB, possibly due to weight-independent factors such as an increase in Glucagon-like Peptide 1 (GLP1) [4].

There was no significant difference (p>0.05) in the remission of T2DM after nine months between both groups. This may be because of better glucose homeostasis, achieved by the effects of reduced Ghrelin levels, GLP1 hormone, Peptide YY hormone, which increases insulin sensitivity and inhibits glucagon release [4].

Limitation(s)

The relatively small sample size and the fact that subjects are from a single centre mean that the findings cannot be generalised, especially given the short duration of the follow-up period.

CONCLUSION(S)

A better outcome was associated with MGB in terms of percentage excess weight. Prospective studies with a large number of subjects and long-term follow-up can help define the efficacy of MGB and LSG on morbid obesity and diabetic remission.

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