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Comparison between Laparoscopic Sleeve Gastrectomy (LSG) and Mini Gastric Bypass (MGB) for Remission of Type II Diabetes Mellitus in Morbidly Obese Patients

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Abstract: ***Bariatric surgery is preferred treatment for remission of Type II DM in severe obese patients. The ideal procedure to achieve remission which is both safe and effective is still unknown. This study compared LSG and MGB procedures for remission of Type II diabetes and possible mechanisms to achieve it. MGB stand out to be better for lowering BMI and achieving remission of diabetes and it could become a standard procedure for control of diabetes in morbidly obese patients.***

Keywords: LSG, MGB, Type II DM, Morbid Obesity

1. Introduction

India has maximum number of diabetics in the World affecting approximately 62 million individuals which is more than 7.1% of India's adult population [1-2]. The high incidence is because of genetic susceptibility along with consumption of high calorie, low activity lifestyle ultimately leading to obesity with several co-morbidities.

In the past diet, exercise and medications were the only prescribed treatments for diabetes but now bariatric surgery has gained acceptance and is preferred treatment in severe obese patients. Various surgical procedures are used for diabetes control in obese patients but their efficacy in Type II diabetes remission is still debatable. The purpose of this study is comparison of LSG and MGB in remission of Type II diabetes in morbidly obese patients.

2. Material and Methods

A prospective analysis of 50 morbid obese patients with diabetes hospitalised in our Department of Advanced Laparoscopic and Bariatric Surgery from May 2014 to April 2015 who underwent either LSG or MGB are included in the study. Only patients who underwent a regular follow up for 1 year were included.

The indications for surgery took into account guidelines issued by International Federation for The Surgery of Obesity and Metabolic Disorder (IFSO) i.e. individuals with BMI>40 kg/m^2 or BMI>35 kg/m^2 with co-morbidities. The exclusion criteria included patients with existing heart disease, hyperlipidemia, disorders of renal function.

During this period 30 patients underwent LSG. These were matched in age, gender, BMI and HBA1C levels to 20 patients who underwent laparoscopic MGB in the same time period.

Diagnosis of Type II diabetes was made according to American Diabetes Association Guidelines:
HBA1C > 6.5%
Fasting Blood Glucose (FBG) > 126 mg/dl (7mmol/ L)
2 hour PP > 200mg/dl (11.1mmol/L) during an OGTT
Remission of type II diabetes was defined as FBG below 126 mg/dl or HBA1C < 6.5% without use of oral hypoglycaemic drugs.

All procedures were performed by a single expert surgeon (>1000 laparoscopic surgeries).

For LSG procedure 80-85 % greater curvature of stomach was removed leaving stomach to a size of 34F bougie. Single loop bypass was done constructing a 40-80 ml sleeve gastric pouch with jejunal exclusion of 180-220 cm.

The average time taken for surgery in LSG was 90 min and MGB was 105 min. All patients underwent a regular follow up for 1 year; every month for first 3 months and then every 3 months. At each visit, weight loss and FBG along with HBAIC were evaluated. Remission of diabetes was defined as HBA1C levels < 6.5 without use of OHA or Insulin supplementation. Dietician opinion was taken at every visit.

Statistical analysis was done using SPSS 17 system. Continuous data was expressed as mean $\pm$ SD. To compare continuous variables, an independent and/or paired sample t test was performed. Changes in values of BMI, FBG and HBA1C was expressed as percentage changes vs pre operative values. A logistic regression model was applied with type II diabetes remission at 12 months as dependent variable and gender, age, pre op BMI, glycaemia and HBA1C values as independent variables. Statistical significance was defined as p value < 0.05.

3. Observation and Results

Out of 50 subjects who underwent either LSG or MGB for obesity and Type II diabetes 2 were excluded because of inadequate follow up. Thus total 48 patients were recruited for study (25 females and 23 males) out of which 28 underwent LSG (58.4%) and 20 (41.6%) underwent MGB.

The mean age of the patients included in our study was 39.95 ± 10.06 years. The mean weight of patients was 123.90 ± 24.53 kg and mean BMI was 45.81 ± 5.44 kg/m^2.

All patients were diagnosed with type II diabetes (21[44%] on metformin, 18[38%] on metformin + insulin and 9[18%] were not on any treatment. The average FBG was 129.9 ± 34.78 and average HBA1C was 7.87 ± 1.36.

The pre operative data of the study population as per type of surgery LSG or MGB are as follows:

Table 1: Pre op data of study population

	LSG(28)	MGB(20)	P value
Age (yr)	41.21 ± 10.12	37.95 ± 9.44	0.2597
Weight (kg)	122.75 ± 21.24	125.65 ± 24.6	0.6645
BMI	44.82 ± 5.16	47.23 ± 6.38	0.1552
FBG (mg/dl)	131.32 ± 27.61	140.2 ± 30.13	0.2957
HBA1C	7.83 ± 1.32	8.11 ± 1.56	0.5052

In LSG group M : F ratio = 1:1 (14,14)
In MGB group M : F ratio = 0.82 : 1(9,11)
Out of 28 subjects in LSG group 14(50%) were on metformin alone, 9(31%) were on metformin + insulin and 5(19%) were not on any treatment.
Out of 20 subjects in MGB group 7(35%) were on metformin alone, 9(45%) were on metformin + insulin and 4(20%) were not on any treatment.

Table 2 Changes in body weight, BMI, glycaemia and HBA1C 3months, 6 months and 12 months after surgery:

LSG

	3 months	6 months	12 months
Body Wt.	106.61 ± 14.3	97.43 ± 11.1	90.85 ± 9.70
BMI	38.51 ± 4.8	35.18 ± 4.2	33.26 ± 3.8
FBG	121.46 ± 21.2	115.81 ± 18.4	107.32 ± 16.6
HBA1C	7.14 ± 0.7	6.56 ± 0.5	6.14 ± 0.4

MGB

	3 months	6 months	12 months
Body Wt.	103.37 ± 16.2	90.18 ± 12.4	80.66 ± 11.3
BMI	39.13 ± 5.2	35.32 ± 4.3	32.63 ± 3.7
FBG	128.6 ± 24.3	121.27 ± 20.6	110.46 ± 17.8
HBA1C	7.36 ± 0.8	6.62 ± 0.6	6.28 ± 0.3

After surgical procedure, a significant reduction in body weight, BMI, glycaemia and HBA1C values were observed as compared to pre operative values (Table 2).

Table 3: Percentage changes in BMI and HBA1C 12 months following surgery

	LSG	MGB	P value
BMI	26.8 ± 3.4	32.7 ± 5.6	**<0.001** (Significant)
HBA1C	23.3 ± 4.2	25.2 ± 4.6	0.1443

12 months post surgery MGB was associated with more percentage weight loss and decrease in BMI which was statistically significant. Similarly MGB was associated with more percentage decrease in glycaemia and HBA1C at 12 months (Not statistically significant).

Table 4: Diabetes remission post surgery

	LSG (28)	MGB (20)
3 months	12 (42.85%)	9 (45%)
12 months	21 (75%)	18 (90%)

MGB showed a slightly higher diabetes remission rate than LSG at 3 months but significantly higher remission at long follow up i.e. 12 months post surgery (Table 4).

4. Discussion

Diabetes is fast gaining status of potential epidemic in India affecting more than 62 million individuals currently. It is predicted that by 2030 diabetes may affect upto 79.4 million individuals in India [6]. Obesity is one of the major risk factors for diabetes yet there is very little research focussing on this risk across India.

According to WHO Obesity is one of most common yet most neglected public health problem in the World. Globally 1 in 6 adult is obese and nearly 2.8 million individuals die each year due to overweight/obesity. [7]

India is 2nd most populous country in the World. It is experiencing rapid transition from under nutrition due to poverty in the past to obesity associated with affluence at present. Obesity in India affects around 30 million people, 3rd highest in the World after US and China. [5], [8-11]

Diabetes is a major complication of obesity which is caused by a progressive defect in insulin secretion along with progressive rise in insulin resistance. An increase in overall fatness, preferentially of visceral as well as ectopic fat depots is associated with insulin resistance. [23]

Obesity along with its complications is very difficult to manage. Diet control, exercise and pharmacological management have previously being used but results were not very promising and weight regain was a big issue. So in cases of failed conservative measures bariatric surgery should be considered as treatment of choice for severe obesity. Bariatric surgery in addition has got a great effect in resolution of other co-morbidities associated with obesity such as diabetes, hypertension and hyperlipidemia. Bypass procedures such as Roux-en-y gastric bypass (RYGBP) and Bilio-Pancreatic Diversion (BPD) are more effective treatment for remission of type II DM than other procedures. Mechanisms involved in these procedures are decrease in food intake, partial mal-absorption of nutrients, anatomic alteration in GI tract which incites change in incretin system affecting glucose balance. However due to complications associated with bypass procedures safer alternatives like MGB and LSG which are associated with good remission rate of diabetes as well are used currently. [4]

Our study aims to compare the efficacy of these two procedures in remission of type II diabetes as well as weight reduction.

The underlying weight independent mechanisms hypothesised to be resulting in resolution of diabetes after these procedures are summarised below:

1) Increased secretion of GLP 1 from enhanced distal intestinal nutrient delivery (Hindgut Theory).
2) Exclusion of small intestine from nutrient flow down regulating anti incretin factors (Foregut theory)
3) Impaired ghrelin secretion
4) Changes in intestinal nutrient sensing mechanisms affecting insulin sensitivity
5) Alteration in gut factors (unknown) especially in duodenum
6) Bile acid perturbations. [13-16]

Milone et al recently published comparative study between LSG and MGB for remission of type II diabetes and concluded that MGB is superior to LSG in obtaining diabetes remission. [3]

Similar results were observed in our study but statistical significance was not achieved between LSG and MGB in remission of type II diabetes. However we observed a greater decline in body weight and BMI in MGB group which was statistically significant. Similar results were observed in study published by Kular et al. They observed a greater %EWL (excess weight loss) with MGB than LSG.

5. Conclusion

Overall MGB has got potential superiority than LSG in diabetes remission as well as weight reduction but further studies are required to accept MGB as an ideal procedure for diabetes remission in severe obese patients.

6. Limitations of Study

- Low sample size
- Short follow up

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