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Mini gastric bypass versus R-En-Y gastric bypass in meddle aged super obese Egyptian patients

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Abstract
Conflict of interest: A multidisciplinary coordinated team work involving laparoscopic bariatric surgeon, internal medicine and radiologist of paramount importance to accomplish accurate and early complication management if it arises.
Aim of the study: Comparative study between outcomes efficacy and safety of Laparoscopic Mini Gastric Bypass (LMGB) versus Laparoscopic R-En-Y Gastric Bypass (LRGB) for the treatment of middle aged super-obese Egyptian patients.
Introduction: Advantages of the Mini Gastric Bypass. The single anastomosis that confers a degree of technical simplicity and the benefit of potentially fewer sites for anastomotic leaks to occur and fewer sites for internal hernias, with MGB because the potential sites for internal hernias are reduced to one (Petersen's defect). Reduced Technical Complexity is evident with a shorter learning curve and a shorter operative time. Furthermore, ease of reversal and revision has been described in published reports on this procedure. Demonstrated safety and efficacy .There is now published experience with this procedure by a number of surgeons from different parts of the world. Their results, to date, suggest non-inferiority of MGB compared to the gold standard Roux en-Y Gastric Bypass in terms of mortality, weight loss, comorbidity resolution, and quality of life.
Patients & Methods: two hundred and forty patients divided into two groups.120 patients underwent LMGB and 120 underwent LRGB at the AL-Azhar university hospitals and other certified hospitals and private centers, from Jun. 2013 to Nov.2015 were done.
Results: Mean operative time of the procedure was significantly lower in the LMGB group (50±5 minutes vs. 120±15 minutes). Intraoperative complications are more frequent in LRGB group, bleeding 2 cases controlled by sutures and clips and electrocautery. 3 cases of injuries to the liver, LMGB group, 2 cases (1.6%) of leaks required readmission and insertion of endoscopic stent. gastro-esophageal reflux confirmed by Endoscopy that responded well to proton pump inhibitors, abstinence of smoking, diet instructions. Abdominal pain, vomiting, pain (7 patient =5.8%) due to cholecystitis 2 cases laparoscopic cholecystectomy done easily. Compared with LRGB 4 cases (3.3%) of leaks need readdmision and insertion of endoscopic stent, one case of hematoma aspirated under CT guidance, 2 cases suffered from severe vomiting due to stomal oedema treated by conservative IV fluid. 2 cases of marginal ulcer and abdominal pain, vomiting (13 patient=10.83%) 6 cases were founded to have stricture treated by endoscopic dilatation after an initial upper gastrointestinal endoscopy and contrast study, 4 cases of calcular cholecystitis underwent laparoscopic cholecystectomy, 2 cases of marginal ulcer conservatively managed and 2 cases of internal hernia diagnosed laparoscopically then converted to open due to gangrenous loops. No mortality in both group.
Discussion: Mini Gastric Bypass considered the 3rd most frequently performed procedure for weight control worldwide nowadays. MGB has a high patient acceptance and most patients report a significant improvement in the quality of life, Mini Gastric Bypass, a quick to perform and low risk procedure with minimal postoperative complications experienced by the patients. Because of the minimum trauma associated with this procedure, the postoperative recovery period is in the region of 24 hours. The patients recover quickly and can resume their activities within two to three days. The weight loss that occurs subsequently, is not accompanied by nutritional or metabolic disturbances.
Conclusion: The efficacy and safety of Mini Gastric Bypass is evident as it is a simple procedure, its outcomes were found to be favorable with a low complication rate, no mortalities and favorable weight loss compared with Roux-En-Y Gastric Bypass. It is less time consuming and requires shorter hospital stay.

Keywords: laparoscopic mini-gastric bypass, laparoscopic R-En-Y gastric bypass, bleeding, leaks, marginal ulcer, stricture, elemental deficiency

1. Introduction

Obesity is now a pandemic affecting people of all ages. Overweight and obesity affects all age group, are now dramatically on the rise in low- and middle-income countries, particularly in urban settings [1]. Determinants of Obesity Health and Financial Impact Egyptian Context Estimated by WHO to be the 14th fattest country in the world in 2010 [2-3] Obesity in Egyptian Women Fattest African country, 70% of adults are overweight or obese [3] Obesity is more prevalent in women in Egypt, and it is becoming an increasing problem Obesity Diabetes Hypertension Cardiovascular Disease, Obesity is the biggest indicator for hypertension [4] Obesity is a risk factor for MI and stroke. 30.3. Lost every day due to obesity in Egypt [5].

Edward Mason was the first surgeon performung the gastric bypass operation in 1967 as a treatment for morbid obesity. The Roux-en-Y gastric bypass (RYGB) is the "gold standard" bariatric surgical procedure. The RYGB has evolved significantly over the previous decades [6].

Rutledge is the inventor of Mini Gastric Bypass since 1997 he published his study in 2001 with promising results of 1,274 patients of Mini Gastric Bypass, he concluded that the MGB is

safe, results in major weight loss, has a short operating-time, and has a short hospital stay. The MGB appears to meet many of the criteria of an "ideal" weight loss operation [7]. Mini Gastric Bypass is considered the 3rd performed procedure for weight control worldwide nowadays. MGB has a high patient acceptance and most patients report a significant improvement in the quality of life [8].

Advantages of the Mini Gastric Bypass. The single anastomosis that confers a degree of technical simplicity and the benefit of potentially fewer sites for anastomotic leaks to occur and Fewer sites for Internal Hernias, with MGB because the potential sites for internal hernias are reduced to one (Petersen's defect). Reduced Technical Complexity is evident with a shorter learning curve and a shorter operative time. Furthermore, ease of reversal and revision has been described in published reports on this procedure. Demonstrated safety and efficacy. There is now published experience with this procedure by a number of surgeons from different parts of the world. Their results, to date, suggest non-inferiority of MGB compared to the gold standard Roux en-y Gastric Bypass in terms of mortality, weight loss, comorbidity resolution, and quality of life [9].

R-En-y Gastric Bypass has several reported documented in literatures complications which can occur with varying degrees of morbidity and mortality risk. These complications includes: early (staple line leaks, gastrointestinal bleeding, intestinal obstruction) and late complications (anastomotic strictures, marginal ulceration-gastro-gastric fistula and Roux limb reconstruction problems) [10].

Petersen's space hernia is more common with RYGB. An internal hernia leads to clinically significant complications, such as a closed loop bowel obstruction with or without strangulation. It is considered to be the most common cause of Small Bowel Obstruction (SBO) after laparoscopic RYGB. Internal hernias typically occur at three potential locations: the jejunojejunostomy mesenteric defect, Petersen's space, and transverse mesocolic defect in the retrocolic approach [11, 12].

Study Design

Our study was a comparative study, carried out on two hundred and forty patients divided into two groups. LMGB group of 120 patients, LRGB group of 120 patients.

Statistical Analysis

Prospective interventional study. It was a descriptive study using means of proportions by ration or present age.

Patients & Methods

Two hundred and forty patients divided into two groups, 120 patients underwent LMGB and 120 underwent LRGB at the AL-Azhar University Hospitals and other Certified Hospitals and Private Centers, from Jun. 2013 to Nov.2015 were done; all operations were performed by the same operative team. Complete medical and surgical history taken, blood tests (CBC, T3, T4, TSH, S. Cortisol level, Fasting and post prandial blood sugar, HBA1c, S. cholesterol, S. triglycerides, SGOT, SGPT, Bilirubin (direct and indirect), S. albumen, coagulation profiles , S. Urea, S. Creatinine, Na+, k+, Uric acid, Helicobacter pylori (breath test), Vitamin profiles (B12, Folic acid, Fe. (Iron), Vit. D, Zinc, Mg.Ca++) and X-ray (Barium meal, Trendlenburg position), abdominopelvic Ultrasound, duplex of both lower limb venous system, chest x-ray (AP and L), Abdominopelvic CT with contrast, ECG, spirometry, operative and post operative data are collected), informed consent, the study approved from all relevant committee.

Inclusion Criteria

Patients with body mass index (BMI) = 50 -60kg/m², Age 20-40 years old.

Exclusion criteria

Patients aged below 20 years or above 40 years, BMI below 50 kg/m² or above 60 kg/m², patients with hiatus hernia, reflux esophagitis, unfit for general anesthesia.

Operative Technique

All patients received subcutaneous low molecular weight heparin, Antibiotics (IV). And sequential compression devices are applied as prophylaxis against deep venous thrombosis.

Laparoscopic R-En-Y Gastric bypass

The patients were placed in steep reverse Trendlenburge position. The surgeon stands between the patient's legs. pneumoperitoneum by Veress needle in the left upper quadrant. Five trocars technique is used. To create the gastric pouch, first divide the lesser omentum with a Harmonic scalpel. Thin transect by endostapler transversely 2–3 cm distal to the gastroesophageal junction and just distal to the left gastric artery then transect longitudinally up to the angle of His, to create a 20–30 ml gastric pouch.Then we perform Jejunojejunostomy. A side-to-side functional anastomosis is formed between the two enterotomies with an endostapler enterotomies in the Roux limb and biliopancreatic limb with a Harmonic instrument, A 150 cm Roux limb is standard. Perform the gastrojejunostomy. Measure out 100 cm of jejunum from the ligament of Treitz, gastrojejunostomy anastomosis, Retrocolic, antegastric anastomosis. Create a gastrotomy and create an enterotomy at a corresponding point on the Roux limb. Insert a blue staple and load it into the pouch and Roux limb to no more than 2.0 cm and fire it to create the gastrojejunostomy, use saline air methods to test the anastomosis for leaks. Close Peterson's defect with suture.

Laparoscopic Mini Gastric bypass

A pneumoperitoneum through the left subcostal space. Four trocar techniques is used .A trocar for the camera (10 mm) between the xiphoid and umbilicus 2cm to the left side, the lesser curvature and identify a point at the "crow's foot" level. Transect the stomach horizontally. Then the vertical stomach transection progresses until the esophageal-gastric junction has been reached. We proceed identifying the angle of Treitz. Then, we measure aproximately 2 m jejunum distally from this point. We anastomose the gastric pouch to the jejunal loop the gastric and jejunal holes are closed using sutures. Anti-reflux suture are applied. Saline air test is used to check the anastomotic leaks, No attempt was made to close Petersen's defect. No drains were used.

Postoperative Care

Oral Gastrograffin test is used to check that the pouch and anastomosis are not leaking. If the result is normal the patients

were allowed sips of water on day 0 and 1.0 liter of water to drink on day 1, discharged to home on day 2 on fluid diet. Then pureed diet then semi -soled then normal small meal. We recommend routine supplementation with iron, calcium, vitamin D, vitamin B12 and multivitamins. Patients were advised to take Lansoprazole 30 mg daily for 6 months. Follow up appointments at 7days, one months, 3m, 6m, 9m, 12m.

Dietitian care and Exercise Program
Were offered to all patients.

2. Results

120 patients were operated upon and underwent LMGB (80 cases were female (66.66%), 40 cases were male (33.33%), while 120 patients underwent LRYGB 78 cases were female (65%), 42 cases were male (35%). Both groups were Middle age (20 -40) years, all patients were super obese (BMI=50-60) Mean BMI was 55±5. The two groups were also comparable for obesity-associated co-morbidities such as hypertension, diabetes, sleep apnea, hyperlipedemia, osteoarthritis. Previous weight loss procedure and abdominal surgery. Table (1)

Table 1: Patients demographics

	LMGB(120)	LRGB(120)
Age (years)	20-40	20-40
Sex	F = 80 (66.66%)	F=78(65%)
	M = 40(33.33%)	M=42(35%)
BMI(KG/M²)	50-60 55±5	50-60 55±5
Associated Comorbiedities		
Hypertension	61 (50.8 %)	66 (55%)
Diabetes	46 (38%)	40 (33.3%)
Hyperlipedaemia	37 (30.8 %)	32 (26.6 %)
Sleep Apnea	19 (15.8%)	18 (15%)
Oestioarthritis	72 (60%)	80 (66.66%)
Previous Weight loss procedure		
LSG	3(2.5%)	2 (1.6 %)
VBG	5(7.6%)	3 (2.5%)
LAGB	2(1.6 %)	3 (2.5%)
Balloon	7(5.8%)	4(3.2%)
Previous abdominal surgery		
Cholicystictomy	3(2.5%)	2(1.6%)
CS	5(4.1%)	9 (7.5%)
appendectomy	2(1.6 %)	1(0.8%)

LSG= Laparoscopic Sleeve Gastrectomy, VBG=Vertical Banded Gastroplasty, LAGB=Laparoscopic Adjastable Gastric Band CS= Cesarean Section, F=Female, M=Male.

Elemental laboratory profiles preoperative. LMGB group and LRGB group show high percentage of Vit. D deficiency and low iron 96 Patients (80%) 14 (11.66%), and 92 (76.66%), 12 (10%) Table (2).

Table 2: Preoperative E lemental Laboratory Profile

	LMGB	LRGB
Vit. D	96 (80%)	92 (76.66%)
Ca++	8 (6.6%)	12 (10%)
Mg++	0 (0%)	0 (0%)
Zinc	0 (0%)	0 (0%)
Vit. B12	0 (0%)	0 (0%)
Iron	14 (11.66%)	12 (10%)

Vit. = vitamin

Mean operative time of the procedure was significantly lower in the LMGB group (50±5minutes vs. 120±15 minutes). Intraoperative complications more happen in LRGB, bleeding 2 cases controlled by sutures and clips and electrocautery. 3 cases of injuries to the liver. and 3 cases converted to open technique due to extensive adhesion. Table (3)

Table 3: Operative Data.

	LMGB	LRGB
Operative time(minuets)	50±5	120±15
Intraoperative		
Bleeding	0 (0%)	2(1.6 %)
Injuries	0 (0%)	3(2.5%)
leaks	0 (0%)	0 (0%)
Conversion	0 (0%)	3(2,5%)

Early Postoperative complications show less complication rate in LMGB group, 2cases (1.6%) of leaks need readmission and insertion of endoscopic stent. Compared with LRGB 4 cases (3.3%) of leaks need readdmision and insertion of endoscopic stent, one case of hematoma aspirated under CT guided, 2 cases for severe vomiting due to stomal oedema treated by conservative IV fluid. No mortality in both group. Table (4):

Table 4: Early Post-Operative complication.

	LMGB	LRGB
Leaks	2(1.6%)	4 (3.3%)
haematoma	0	1(0.8%)
Hospital Stay(day)	2-5 3.5± 1.5	5-9 7± 2
Readmission	2(1.6%)	7(5.8)
Mortality	0	0

Post-operative weight loss data show marked weight loss and lowering Body Mass Index BMI=30kg/m² in both group and Percentage Excess Weight Loss (PEWL= 84%, That means the efficacy of both procedure in controlling obesity Table (5):

Table 5: Postoperative Weight Loss:

BMI/PEWL Months		LMGB 55±5	LRGB 55±5
1st month	BMI /kg/m²	48	48
	PEWL%	40 %	40%
3ed months	BMI/kg/m²	43	43
	EBWL%	52%	53%
6th months	BMI/kg/m²	38	38
	PEWL%	61%	61%
9months	BMI/kg/m²	34	34
	PEWL%	76%	76%
12TH months	BMI/kg/m²	30	30
	PEWL%	84%	84%

PEWL=percentage of excess weight loss

Post-operative reduction of Comorbediteis in both groups are Evident, remission of the associated comorbedities are similar in both group. As regard post-operative complications LMGB reported symptoms of gastro-esophageal reflux confirmed by Endoscopy that respond well to proton pump inhibitors, abstinence of smoking, diet instructions. Abdominal pain, vomiting pain (7 patient =5.8%) due to cholecystitis 2 cases laparoscopic cholecystectomy done easily, 5cases of colitis medically treated,17 cases of hair loss. compared to LRGB 2 cases of marginal ulcer and abdominal pain, vomiting (13 patient=10.83%) 6 cases due stricture treated by endoscopic dilatation after an initial upper gastrointestinal endoscopy and contrast study, 4 cases of calcular cholecystitis subjected to laparoscopic cholecystectomy, 2 cases of marginal ulcer conservatively managed and 2 cases of internal hernia diagnosed laparoscopically thin converted to open due to gangrenous loops. Table (6).

Table 6: Comorbedities and complication

	LMGB **Cure Reduced dose**	**LRGB** **Cure Reduced dose**
Associated Comorbiedities		
Hypertension	57 (93.4 % - 4(6.5%)	61 (92,4%) - 5(7.6%)
Diabetes	40 (86.9%) - 6(13.1%)	34(85 %) - 6(15%)
Hyperlipedaemia	34 (91.8 %) - 3(8.2%)	30 (93.75 %) - 2(6.25%)
Sleep Apnea	19 (1OO%) - 0	18 (100%) - 0(0%)
Oestioarthritis	67 (93 %) - 5(7%)	76 (95%) - 4(5%)
Complications		
Reflux	3(2.5%)	3(2.5%)
Marginal ulcer	0(0%)	2(1.6%)
Internal hernia	0(0%)	2(1.6%)
Abdominal pain. Vomiting	7(5.8%)	13(10.83%)
Hair loss	17(14.1%)	18(15%)

3. Discussion

Bariatric surgery can successfully treat most patients with morbid obesity as well as associated comorbidities (13) and it is the only recommended effective treatment for morbid obesity .Gastric bypass reduces DM-related deaths with evident efficacy on type 2 diabetes (14-15) So ,gastric bypass surgery has been proposed as a new treatment modality for type 2 DM (16-17). Laparoscopic Roux-en-Y gastric bypass (LRYGB) is a safe and effective standard bariatric surgical procedure and has been performed recently to control DM [16, 18]. Laparoscopic Mini-Gastric Bypass is a growingly accepted procedure among bariatric surgeon as a safe alternative to LRYGB because of its simple surgical technique, comparable or lower complication rate, and similar efficacy, including weight reduction and control of DM and other comorbiditis [19, 20].

Series done by (García-Caballero, Carbajo) Mini Gastric Bypass, easily quick to perform and low risk procedure with minimal postoperative complications experienced by the patients. The minimum trauma associated with this procedure, the postoperative recovery period is short .The patients recover quickly and can resume their activities within two to three days. The weight loss that occurs subsequently, is not accompanied by nutritional or metabolic disturbances [21].

Mean operative time of the procedure was significantly lower in the LMGB group (50±5minutes vs. 120±15 minutes). Intraoperative complications more happened more frequent in LRGB, bleeding 2 cases controlled by sutures and clips and electrocuatery. 3 cases sustained of injuries liver and 3 cases converted to open technique due to extensive adhesions. Our study was able to show that LMGB is a safe procedure especially in the super-obese patient regarding early postoperative results and is thus in accordance with the findings of other studies.

(Yingjun, Huang *et al.*) Study Compared with LAGB, LSG, and LRYGB, LMGB that prove its efficacy was at the least not inferior in weight loss and T2DM remission and, at the same time, it had few complications. There still remain some issues to be further clarified, that is, the long-term (>5 years) effects on weight loss and T2DM remission, late complications, and their treatment [22].

Elemental laboratory profiles preoperative. LMGB group and LRGB group show high percentage of Vit. D deficiency and low iron 96 Patients (80%) 14 (11.66%), and 92 (76.66%), 12 (10%), so we routinely prescribed postoperatively without recorded deficiency within 12 months follow up.

No Mini-Gastric-Bypass patient of this study had to be converted to open procedure comparable to LRGB 3 cases converted to open due to extensive adhesion. Furthermore, there is growing evidence in the literature that LMGB is comparable as the same or even superior to LRYGB in terms of weight loss and improvement of associated morbidities.

Early safety and efficacy It is now widely acknowledged that MGB is at least as effective as Roux-en-Y gastric bypass (RYGB), if not more effective [23, 24] when it comes to weight loss and comorbidity resolution. It takes less time to perform, has a shorter learning curve, and is associated with fewer major complications [23].

Our present study could demonstrate similar results regarding early postoperative complications comparing LMGB to standard LRYGB, while revealing shorter duration of the operation time with equivalent mean hospital stay.

Percentage Excess weight loss (PEWL) in Mini Gastric Bypass after one year in our study are the same in both group (84%) this attributed to the post operative dietetic and exercise program. Was similar to other published studies [24]. In another study in 2008 on 16 patients under Mini Gastric Bypass surgery results showed that patients had 78-minute surgery and postoperative hospital stay 1.2 days. There were no long-term complications and mortality after surgery and weight loss at two years after surgery was 72 kg [26]. Excessive weight loss in Mini-Gastric Bypass surgery was reported as much as 70

percent in various studies over one [24, 27]. Another study published in 2012 evaluated 1000 patients who had undergone Mini Gastric Bypass surgery between 2005 and 2011 were studied. According to the study, Mini Gastric Bypass was low-risk and effective method that can be performed easily and with little associated side effects [28]. Various studies have shown that Mini Gastric Bypass surgery over the short-term, was safe and successful in excessive weight loss [29, 30] this point was confirmed in our study.

In Our study post-operative complication in LMGB group Reflux, Marginal ulcer, Internal hernia, Abdominal pain, Vomiting, Hair loss are less in comparable with LRGB. **LMGB** reported symptoms of gastro-esophageal reflux confirmed by Endoscopy that respond well to proton pump inhibitors, abstinence of smoking, diet instructions. abdominal pain, vomiting pain (7 patient =5.8%) due to cholecystitis 2 cases laparoscopic cholecystectomy done easily, 5cases of colitis medically treated, 17 cases of hair loss. compared to **LRGB** 2 cases of marginal ulcer and abdominal pain, vomiting (13 patient=10.83%) 6 cases due stricture treated by endoscopic dilatation after an initial upper gastrointestinal endoscopy and contrast study, 4 cases of calcular cholecystitis subjected to laparoscopic cholecystectomy, 2 cases of marginal ulcer conservatively managed and 2 cases of internal hernia diagnosed laparoscopically thin converted to open due to gangrenous loops. Management of small bowel obstruction in a patient with history of gastric bypass differs from the typical management of adhesive small bowel obstruction. Because internal hernias and closed loop obstructions occur more commonly after RYGB compared to the general surgery patient and post-RYGB have a biliopancreatic limb and gastric remnant that cannot be decompressed with a nasogastric tube, nonoperative management can lead to bowel ischemia, perforation, and poor clinical outcomes. A low threshold to operate must be maintained in a post-RYGB with severe abdominal pain [30]

In a study published by Adams *et al.* with a mean follow-up of 7.1 years, the mortality rate for patients who underwent RYGB was 2.7% versus 4.1% in BMI-matched controls. Disease specific mortality was reduced by 56%, 92%, and 60% for coronary artery disease, diabetes, and cancer, respectively [31].

Marginal ulcers, occur 1.0–16% of the time after RYGB [32- 34] Early causes include ischemia or tension at the anastomosis. Other associated factors include smoking, NSAID, and steroid use, Helicobacter pylori infection, large pouch or a gastrogastric fistula [33] Symptoms include epigastric pain, nausea, and vomiting. Patients who develop these symptoms or gastrointestinal bleeding after RYGB should have an upper endoscopy performed to evaluate for marginal ulcer. Although rare, ulcers can also occur in other segments of the gastrointestinal tract. Initial treatment is with medical therapy including acid suppression, sucralfate, and elimination of modifiable risk factors such as use of NSAIDs, steroids, tobacco, and caffeine products. Ulcers that are causing severe chronic pain, malnutrition, or bleeding may require surgical resection and revision of the GJ or closure of a gastrogastric fistula if present. Perforation of a marginal ulcer requires urgent surgical treatment [34].

4. Conclusion

Mini gastric bypass efficacy and safety is evident. It' is a simple procedure; it is less time consuming and is associated with shorter hospital stay. It has more favorable outcome a lower complication rate, no mortalities and is considered a suitable weight loss procedure compared with Roux-En-Y Gastric Bypass.

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