

## The Role of Laparoscopic Mini-Gastric Bypass in Management of Metabolic Syndrome

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**Abstract: objective:** the study was performed to evaluate the technique of laproscopic minigastric bypass for metabolic syndrome patients. **Study design:** The patients were enrolled in a combined prospective study and had a retrospectively gathered outcome analysis. **Patient and methods:** The study includes thirty patients; 24 females and 6 males suffering from metabolic syndrome with a mean age of  $33.15 \pm 10.17$  years (range, 20-59), who fulfilled the criteria for bariatric surgery with BMI >35 with associated co-morbidities, all patients underwent laparoscopic mini-gastric bypass. **Results:** BMI and WC were significantly reduced post-operatively; also co-morbidities as DM, hypertension and dyslipidemia were resolved or controlled. The mean operative time was  $90 \pm 12.6$  min (range, 80–120). No mortality was reported within 30 days of surgery. **Conclusion:** laparoscopic mini gastric bypass is an effective procedure for the treatment of obesity, HTN, type 2 DM and dyslipidemia, technically feasible, safe operation with a low rate of major postoperative complications.

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**Keywords:** metabolic syndrome, mimigastric bypass, DM.

### 1. Introduction

The metabolic syndrome (MetS) is known as an inter-connected physiological, biochemical, clinical, and metabolic factors that increases the risk of atherosclerotic cardiovascular disease, type II DM, and all cause mortality<sup>(1)</sup>. (MetS) represents a 2-fold the risk of developing cardiovascular disease and 5-fold increase in the risk of type II diabetes mellitus over the next 5 to 10 years<sup>(2)</sup>.

The prevalence of MetS all over the world ranges from <10% to as much as 84%, depending on the region, rural or urban countries, composition (age, sex, race, and ethnicity) of the population studied, and the definition of the syndrome used<sup>(3)</sup>.

Bariatric surgery was allowed to induce significant long-term remission of type II DM<sup>(4,5)</sup> and improvement of cardiovascular/metabolic risk factors in obese patients<sup>(6)</sup>. The short-term and long-term results of bariatric surgery complementarily lead to improvement in insulin resistance, glucose metabolism, change in adipocytokines release<sup>(7)</sup> and quality of life<sup>(8)</sup>. Nowadays, bariatric surgery is well approved as a feasible therapeutic option for type II DM in patients who are inadequately controlled by healthy lifestyle and medical treatment<sup>(9)</sup>.

Laparoscopic mini-gastric bypass, first reported by Rutledge, was proposed as a simple and effective treatment of morbid obesity<sup>(10)</sup>.

This procedure has its own advantages. It is an attractive bariatric procedure compared to the gold

standard Roux-en-Y gastric bypass (RYGB) with one less anastomosis. Many thousands of this procedure has now been performed by different surgeons who believe it is a better alternative to RYGB due to shorter operative time, fewer sites for anastomotic leaks and internal herniation, shorter learning curve, ease of reversibility and revision with the same results in terms of weight loss and co-morbidity improvement<sup>(11)</sup>.

Objective: this study was performed to evaluate the technique of laproscopic minigastric bypass for metabolic syndrome patients.

### 2. Patients and Methods

#### Study design and population

This study includes thirty (30) patients 24 females and 6 males suffering from metabolic syndrome with a mean age of  $33.15 \pm 10.17$  years (range, 20-59), who fulfilled the criteria for bariatric surgery with BMI >35 with associated co-morbidities with failure of other methods of weight loss and medical treatment, all patients underwent laparoscopic mini-gastric bypass (LMGB). These patients were enrolled in a combined prospective study and had a retrospectively gathered outcome analysis at the department of surgery, Al-Azhar University Hospitals from May 2015 to October 2017.

**Inclusion criteria:** 1) Age between 16 and 65 years, 2) BMI was more than 40 kg/m<sup>2</sup>; they had co-morbid conditions such as cardio-pulmonary problems

(e.g., severe sleep apnea and obesity related cardiomyopathy), diabetes type II, HTN or Dyslipidemia. 3) History of obesity for more than five years. 4) History of failure of conservative treatment for more than two years.

**Exclusion criteria:** 1) Patients unfit for general anesthesia. 2) Absence of periods of identifiable medical management. 3) Patients unable to participate in prolonged medical follow up. 4) Non stabilized psychotic disorders, severe depression and personality disorders unless specifically advised by a psychiatrist experienced in obesity. 5) Alcohol abuse and/or drug dependency.

**Study protocol**

Ethical approval was taken from Al-Azhar University ethical committee and written consent was taken from every patient after explanation of all details of the operation, advantages, disadvantages, diet habits after surgery, realistic expectations and with the possibility of conversion to open surgery and all the possible intra-operative, early and late post-operative complications. A comprehensive assessment program was carefully structured so that a disciplined routine is followed in each patient. All patients were pre-operatively and post-operatively evaluated. Full clinical assessment for associated co-morbidities (central obesity, hypertension, diabetes, dyslipidemia, infertility, arthritic pain), complete physical examination (including weight, height, BMI), complete laboratory tests, ECG, abdomino-pelvic ultrasound and pulmonary function tests were carried out for all patients.

**Operative Technique:** an intravenous antibiotic (1g of third-generation cephalosporin) is administered. The operation is done under general endotracheal anesthesia. We performed Laproscopic minigastric Bypass (LMGBP) using five ports with the following steps:

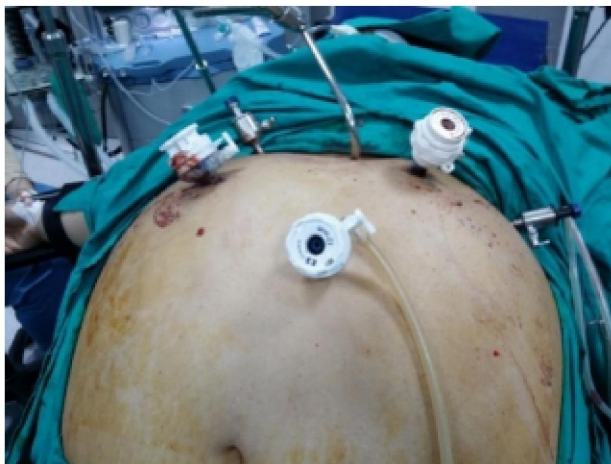
1. Creation of pneumo-peritoneum using verrus needle, the needle was inserted in the Palmers point, beneath the left rib arc, in the mid-clavicular line, just beside the arc itself.

2. Ports placement and liver retraction by self-retaining liver retractor (Figure 1).

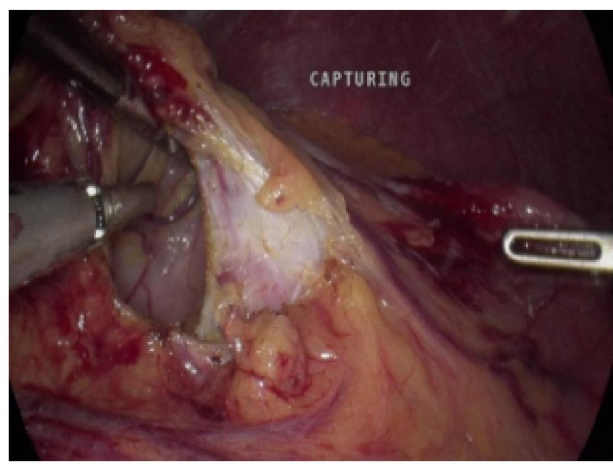
3. Creation of the gastric pouch using linear staplers; a tunnel behind the posterior gastric wall is created by the harmonic scalpel to incise the hepato-gastric ligament then introduce a 60mm Endo GIAR 3.5mm blue cartridge and transected the stomach horizontally. Then, we continued the vertical stomach transection till the gastro-esophageal junction, using a French calibrating 39 Fr bougie (Figure 2,3,4).

4. Exposure of the duodeno-jejunal junction; the ligament of Trietz was identified. We started to measure approximately 200-250cm of jejunum distally from this point, then a stitch was taken at the anti-mesenteric border of the intestinal loop to facilitate bowel delivery to the gastric pouch.

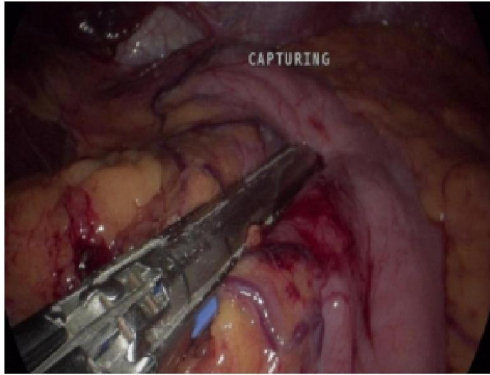
5. The gastro-jejunal anastomosis; we approximated the bowel loop to the gastric pouch; the Harmonic scalpel was used to make an opening in the small bowel and another in the gastric pouch. Then, anchoring suture was taken through the two openings. Anastomosis was done side to side by 45mm ETS 3.5mm blue cartidge. The anastomosis was done in a vertical manner to minimize reflux and with a wide stoma to facilitate drainage. Then the stoma opening was closed with two layers continuous sutures using 2/0 absorbable V-lock over a Ryle tube. Leak test was performed through injection of about 50cc of Methylene blue dye while both afferent and efferent loops were closed by intestinal clamps. Finally, anti-obstruction stitch was taken to anchor the efferent intestinal loop to the distal stomach to avoid its kink or rotation. 28 fr tube drain was put in the lesser sac (Figure 5,6).



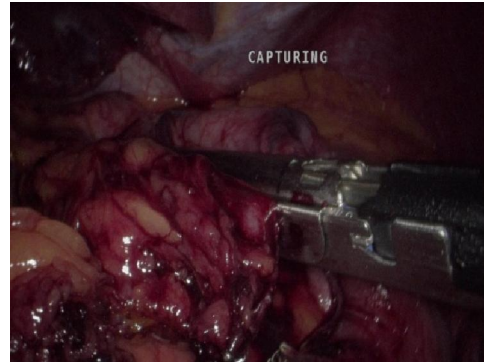
**Fig (1): position of ports**



**Fig (2): Creation of tunnel.**



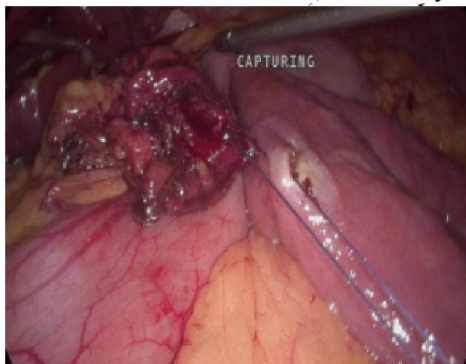
**Fig (3): Transection of the stomach.**



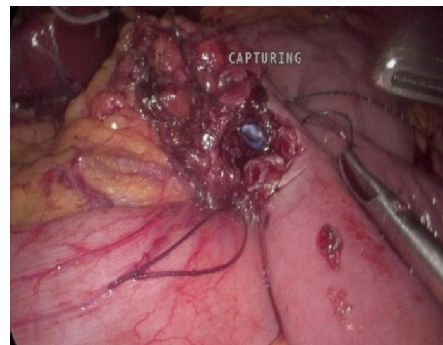
**Fig (4): Vertical division of the stomach.**

**Post-operative follow up:** the follow up period of two years was carried out on an outpatient basis: weekly visit for one month after discharge, monthly visit till the end of the third month, visit every three

months till the end of the follow up period. In each visit patient assessed for weight loss, complications and co-morbidities (diabetes, hypertension, dyslipidemia, OSA,.....)



**Fig (5): Anchoring suture.**



**Fig (6): Gastro-jejunal anastomosis.**

**3. Results**

This study includes thirty (30) patients; 24 females and 6 males of metabolic syndrome patients with a mean age of  $33.15 \pm 10.17$  years (range, 20-59) who underwent laparoscopic Mini-gastric bypass (LMGB). All patients were suffered from central obesity (100%), hypertension was present in 23 patients (76.6%), DM was present in 22 patients (73.3%), 15 patients were suffered from dyslipidemia (50%). The mean body mass index (BMI) was  $47.33 \pm 7.97$  kg/m<sup>2</sup> (range, 35 - 62.3), the mean waist circumference (WC) was  $120.8 \pm 9.41$  cm (range, 108 - 147), the mean fasting blood sugar (FBS) was  $164.3 \pm 48.47$  mg/dl (range, 88 - 250), the mean glycosylated hemoglobin (HbA1c) was  $8.47 \pm 2.45$  % (range, 4.8- 14), the mean systolic blood pressure (SBP) was  $148 \pm 23.51$  mmHg (range, 110 - 180), the mean diastolic blood pressure (DBS) was  $98 \pm 16.48$  mmHg (range, 70 - 120), the mean triglyceride (TG) was  $212.8 \pm 106.8$  mg/dl (range, 122 - 506), and the mean high density lipoprotein (HDL) was  $39.97 \pm 10.73$  mg/dl (range, 20 - 50). Arthritis (16.6%), sleep apnea (13.3%) and back pain (16.6%) (Table 1).

The mean operative time was  $90 \pm 12.6$  min (range, 80-120). No mortality was reported within 30 days of surgery. Mean hospital stay was  $4.49 \pm 1.93$  days (range, 3-20).

**Table (1): Demographic and preoperative data.**

Parameter	Value
<b>Number of patients</b>	30
<b>Sex: female</b>	24 (80%)
<b>male</b>	6 (20%)
<b>Age (years)</b>	$33.15 \pm 10.17$ years (20-59)
<b>BMI (kg/m<sup>2</sup>)</b>	$47.33 \pm 7.97$ (35-62)
<b>WC (cm)</b>	$120.8 \pm 9.4$ (108-147)
<b>FBS (mg/dl)</b>	$164.3 \pm 48.47$ (88 - 250)
<b>HbA1c (%)</b>	$8.74 \pm 2.45$ (4.8 - 14)
<b>TG (mg/dl)</b>	$212.8 \pm 106.8$ (122-506)
<b>HDL (mg/dl)</b>	$39.97 \pm 10.73$ (20-50)
<b>SBP (mmHg)</b>	$148 \pm 23.51$ (110-180)
<b>DBP (mmHg)</b>	$98 \pm 16.48$ (70-120)
<b>Sleep apnea</b>	4 (13.3%)

BMI and WC were significantly reduced post-operatively; also co-morbidities as DM, hypertension and dyslipidemia were resolved or controlled (Table 2 a & b).

Postoperative complication: one patient had post-operative chest infection treated conservatively

(3.3%), One patient had post-operative minor leak (3.3%) managed conservatively with intra-abdominal tube drainage till leak stopped for 16 days post-operatively. 2 cases (6.6%) presented with upper GIT reflux symptoms.

**Table (2a): Pre and postoperative changes in BMI, WC, FBS and HbA1c.**

Group	BMI (kg/m <sup>2</sup> )	WC (cm)	FBS (mg/dl)	HbA1c (%)
Preoperative	47.33 ± 7.9	120.8 ± 9.41	164.3 ± 48.47	8.47 ± 2.45
Post. 6 months	38.35* ± 4.95	108.1* ± 5.64	113.5* ± 25.10	6.43* ± 1.055
Post. 1 year	33.70* ± 1.57	99.77* ± 4.20	107.5* ± 23.87	6.11* ± 1.087
Post. 1.5year	31.3* ± 0.83	96* ± 4.2	101.4* ± 23.05	5.807* ± 1.096
Post. 2 year	29.65* ± 0.77	93.31* ± 4.67	95.13* ± 23.16	5.519* ± 1.041

**Table (2b): Pre and postoperative changes in TG, HDL, SBP and DBP.**

Group	TG (mg/dl)	HDL (mg/dl)	SBP (mmHg)	DBP (mmHg)
Preoperative	212.8 ± 106.8	39.97 ± 10.73	148 ± 23.51	98 ± 16.48
Post. 6 months	162.3* ± 78.52	48.97* ± 6.37	130* ± 12.32	89* ± 11.77
Post. 1 year	142.2* ± 52.73	51.80* ± 5.42	124.3* ± 9.97	85.83* ± 9.92
Post. 1.5year	128* ± 36.85	56.57* ± 5.77	122.8* ± 8.67	83.50* ± 8.92
Post. 2 year	115.9* ± 27.19	57.63* ± 4.93	120.3* ± 8.50	80.33* ± 8.087

\*: Significantly different from Preoperative group at p < 0.05.

#### 4. Discussion

The metabolic syndrome is a major public-health and clinical challenge worldwide in the wake of urbanization, surplus energy intake, increasing obesity, and sedentary life habits<sup>(2)</sup>.

Although medical management of morbid obesity patients made some progress, however, a persistent weight reduction can hardly be achieved in these patients. For extreme cases of obesity, only surgical intervention can produce substantial weight loss<sup>(12)</sup>.

Surgery is only one part of a long term multidisciplinary approach that should include a plan for lifelong follow up including monitoring for nutritional and metabolic complications and dietary counseling to prevent weight gain<sup>(12)</sup>.

Regarding the operative time in our study; the mean operative time was 90 minutes. In comparison to other studies; study done by **Carbajo et al., (2005)**<sup>(13)</sup>

included 209 patients with mean BMI 48 kg/m<sup>2</sup>, the mean operative time was 93 minutes. **Musella et al., (2014)**<sup>(14)</sup> in their study on 974 patients with mean BMI 48 kg/m<sup>2</sup>, mean operative time was 90 minutes.

Regarding hospital stay in our study; the mean postoperative hospital stay was 2 days. It was 1.8 days in a study done by **Noun et al., (2012)**<sup>(15)</sup> on 1000 patients, but in a study done by **Piazza et al., (2012)**<sup>(16)</sup> on 197 patients, it was 5 days.

Regarding the change in the BMI; in our study, the mean initial BMI for our patients was 47.33kg/m<sup>2</sup>. After 6 months BMI decreased to 38.35kg/m<sup>2</sup>. After 1 year BMI decreased to 33.70kg/m<sup>2</sup>. (Table 3) shows changes in BMI in other studies.

Regarding controlling of co-morbidities in our study; DM resolved in 82%, HTN resolved in 90% and dyslipidemia treated in 80% of patients after 1 year. (Table 4) shows changes in BMI in other studies.

**Table (3): BMI in our study and other studies.**

Studies	No. of cases	Duration of follow up	Initial BMI	BMI after one year
<b>Carbajo et al., 2005</b> <sup>(13)</sup>	209	One year	48	30.02
<b>Noun et al., 2012</b> <sup>(15)</sup>	1000	One year	42.5	28.3
<b>Musella et al, 2014</b>	974	One year	48	31.8
<b>Wang et al., 2005</b> <sup>(17)</sup>	423	One year	44.2	29.2
<b>Piazza et al., 2012</b> <sup>(14)</sup>	197	One year	52.9	39.4
<b>Our study</b>	100	One year	47.33	33.07

**Table (4): DM, HTN and dyslipidemia resolution in our study and other studies.**

Studies	DM (%)	HTN (%)	Dyslipidemia (%)
Rutledge et al., 2002 <sup>(18)</sup>	92	90	88
Rutledge and Walsh., 2005 <sup>(19)</sup>	83	80	80
Wang et al., 2005 <sup>(17)</sup>	100	94	85
Noun et al., 2012 <sup>(15)</sup>	85	85	82
<b>Our study</b>	82	90	80

**5. Conclusion**

Laparoscopic mini gastric bypass is an effective procedure for the treatment of obesity, HTN, type 2 DM and dyslipidemia, technically feasible, safe operation with a low rate of major postoperative complications, has a significant reduction in patient’s hospital stay, efficient in losing excess weight and in maintaining the weight loss, is a promising bariatric procedure.

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