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Laparoscopic Sleeve Gastrectomy versus Minbypass: Incidende of Leak and How to Manage

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Abstract: Background: A variety of surgical procedures are available but, the question is which procedure is the ideal choice, unfortunately it is difficult to identify the most effective option based on patient characteristics and co-morbidities. Furthermore, little is known regarding the effect of various surgical procedures on glycemic control and on type 2 D.M remission. Bariatric surgery techniques include restrictive procedures, malabsorptive procedures and combined procedures which depends on both malabsorption and decrease size of stomach such roux-en-y and mini-gastric bypass surgeries. **Objective:** To make a comparison between incidence of Leak after Mini Bypass or Sleeve Gastrectomy. Also to highlight the best way for its management. **Patients and Methods:** Our study included the initial experience for 40 morbidly obese patients who fulfilled the selection criteria and formed the study population. The patient population was divided into two groups, group I & II which included 20 morbidly obese patients who had done LSG and LMGB respectively. Patients were followed up as regard occurrence of leakage by doing C.T with contrast and upper GI endoscopy for suspected cases. 6 months comparative data was recorded as regard post-operative leakage in both procedures. **Results:** The study showed that LMGB is superior to LSG as regard incidence of post operative leakage. Although our study results support LMGB as a less incidence of post operative leakage, further studies with larger sample size and long follow up periods are needed to verify results of this thesis. **Conclusion:** Leakage in this study occurs in four patients (out of 40, with rate of 10%). Three of them occur in patients underwent laparoscopic sleeve gastrectomy and only one patient with laparoscopic mini gastric bypass with non-significant difference between both approaches.

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Keywords: Gastroesophageal reflux disease, laparoscopic adjustable gastric band, gastro-jejunal anastomosis

1. Introduction

Obesity is defined as a medical condition in which excess body fat has accumulated to the extent that it may have a negative effect on health and it's significant health concern due to its high prevalence and associated health risks.

Obesity increases the risk of many physical and mental conditions. This co -morbidities are most commonly shown in metabolic syndrome, a combination of medical disorders which includes: diabetes mellitus type 2, high blood pressure, high blood cholesterol, and high triglyceride levels [(1)].

Obesity can be treated by so many ways but, the most effective treatment is bariatric surgery. Surgery for severe obesity is associated with long-term weight loss, improvement in obesity related conditions, and decreased overall mortality [(2)].

Today, the most commonly used bariatric techniques is sleeve gastrectomy that represents restrictive method that causes weight loss by restricting the amount of food that can be consumed by reducing the size of the stomach, and mini bypass that represents a combined technique mainly malabsorptive method that intended to cause weight loss by limiting the amount of food that is absorbed from the intestines into the body [(3)].

While in the past bariatric surgery was performed through long open incision approaches, most bariatric operations are now performed using laparoscopic techniques that employ smaller incisions to reduce tissue damage, lessen postoperative pain, and shorten the length of hospitalization [(4)].

Although all procedures can be beneficial to patients, the operations have varying degrees of success and complication profiles that are unique to each procedure.

Rare complications occur in the early postoperative period after bariatric surgery; however, serious complications include difficult-to-remedy proximal leaks and bleeding from the long gastric staple line. The majority of complications associated with bariatric surgery occur in the late postoperative period. These include gastroesophageal reflux, vomiting, gastric tube stricture, stenosis, leak,

incisional hernia, gastrocutaneous fistula, and weight regain [5].

In mini bypass Early postoperative serious complications are the minority and include leak, ileus, obstruction, and GI tract hemorrhage.

Despite the apparent decreased incidence over time, Gastric Leak remains an important cause of overall morbidity and mortality after primary stapled bariatric procedures [6].

Leak may be acute occurs within 3 days postoperatively or late complication occurs 8 days after surgery. It can be discovered accidentally during doing routine follow up investigations [6].

Or can be suspected via certain symptoms and signs.

Clinical picture of patients with gastric leak varies from the completely asymptomatic patient to sepsis, multi-organ failure and death. The most common signs and symptoms were fever, epigastric pain, tachycardia & leukocytosis [3].

The treatment of leaks after bariatric surgery should be tailored to the clinical state of the patient. Those presenting with hemodynamic instability or with signs of sepsis require prompt surgical intervention. The time of appearance and diagnosis of leaks is also crucial. Early leaks usually need a prompt surgical approach; on the contrary late leaks are managed as majority of cases through medical treatment [7].

Medical management includes but is not limited to placing a drain if necessary, parenteral or enteral nutrition, high- dose proton pump inhibitors, broad spectrum antibiotics, use of biological glues (such as Seamguard, Tissucol and fibrin sealant), use of flexible coated stents [8].

Aim of the Work

The aim of the study is to make a comparison between incidence of Leak after Mini Bypass or Sleeve Gastrectomy. Also to highlight the best way for its management.

Patients and Methods

This is randomized controlled trials which include 40 patients, who have been admitted to Ain Shams university hospitals, Cairo, Egypt from April 2018 to November 2018 with a diagnosis of morbid obesity. All the patients involved in our results completed 6 months follow up and the patients who did not complete 6 months follow up period were excluded.

An informed consent was taken from all patients who accept to participate in our study.

Group I: This group composed of 20 morbidly obese patients who had done laparoscopic sleeve gastrectomy.

Group II: This group composed of 20 morbidly obese patients who had done Laparoscopic Mini Gastric Bypass.

All patients in this study were subjected to:

Pre-operative:

History taking: Personal history: including age, sex, residence, occupation and history of smoking or alcohol intake and menstrual history in females. Present history: including present condition, eating habits, if the patient is sweet eater or not, previous diet control trials and effect of obesity on daily activities and life style. Past history: of any coexisting medical disease e.g: DM, HTN, hyperlipidemia, osteoarthritis, obstructive sleep apnea, polycystic ovary, ISHDs. History of GERD. History of any endocrine disorders. History of previous operations (type, time, place and complications). Other systems review (cardio-vascular system, respiratory, liver diseases and joints for arthritis). Medications.

Examination: Complete physical examination with measurement of **weight** per Kg, **height** per meter, calculation of **BMI** = (weight Kg/height m^2), **Ideal weight** at BMI 25 kg/ m^2 = (25 * height^2) and **excess weight** = (The gross weight in kg – the ideal weight in kg) was done.

A- General: full general examination was done, focusing on: Vital data. Complexions (Jaundice & Pallor). Cardio-vascular fitness. Respiratory fitness.

B. Local: full abdominal examination focused on: Scars of previous operations (mainly in the upper abdomen). Abdominal wall hernias.

Investigations:

a) Laboratory: General pre-operative investigations for all the patients include: Full blood count, coagulation profile, liver function tests, renal function tests, lipid profile, serum electrolytes, thyroid function tests, serum cortisol level, arterial blood gases and random blood sugar (in diabetics we added fasting 2 hours postprandial blood sugar and HbA1c).

b) Cardio-respiratory investigations: All patients had electrocardiography (ECG), pulmonary function tests (PFT) while some had echocardiography (ECHO) who had cardiac troubles.

c) Radiological: All patients had done preoperative Chest X-Ray and Pelvi-abdominal ultrasound: for associated gallstones, liver size (hepatomegaly).

Inclusion criteria: Candidates for this study were those morbidly obese patients who fulfilled the following criteria: **BMI:** 35-40 with or without co-morbidites. **Age:** 18-60. **Gender:** both genders. Never underwent any previous abdominal operations except C.S.

Exclusion criteria: It is vital that we needed to go for proper evaluation of patients comorbidities

before operation procedure. Thus the risk/benefit ratio was considered when assessing bariatric operation surgery. Accordingly, patients > 60 yrs old and <18 yrs old and patients with BMI >40 and <35 Also psychological unstable patients and those who were unable to follow up in outpatient clinic were excluded. Contraindications to laparoscopy. Conversion fromlaparoscopic to open surgery.

Operative Management:

Operative Setup: The patient was required to have nothing by mouth eight hours before the operation. Patients were counseled about the risks and benefits of this procedure, including the potential for conversion to an open procedure, potential complications and other treatment options. Informed consent was signed by all patients. Arrangement for availability critical care bed if needed postoperatively. A prophylactic dose of anticoagulation (Clexane 40 mg) S.C was given 12 hours before operation. 2 hours before the operation a single dose of 3rd generation cephalosporin (Cefatriaxone 1 gm) was given to the patient. After completion of the preoperative check, the patient was transferred to the operating room. Compression stockings were applied to the patient's legs. The operation was done under general endotracheal anesthesia. After induction of anesthesia a nasogastric tube and a Foley's catheter were inserted.

Patient position: The patient was put in a supine decubitus, and with both upper limbs put on an arm rest. The table is then elevated, and put in reverse Trendelenburg position then opening of the patient legs and put them at leg rest with fixation of the legs at this position by straps (French position). The patient was secured well to the operating table in order not to fall during changing of position. After that, sterilization and draping of the area between nipple line and upper thigh was done. The surgeon stood between the patient legs and the assistant to left of the patient, and the camera man to the right of the patient.

Instrumental set: Laparoscopy system with the light source, camera control unit, insufflator and irrigation system integrated in one unit. Laparoscope: a 10 mm 0-degree lens and a 10 mm 30 degrees lens were used and interchanged when needed. Ports: one Visiport, two 12 mm disposable ports (one may be 15mm for green covidien cartridge), two 5 mm reusable ports. Basic instrument set: 5 and 10 mm atraumatic graspers, 5 mm scissors, 5 and 10 mm dissecting instrument, 5 mm hook, 10 mm Babcock forceps, suction irrigation device with 5 mm tip and 10mm needle holder. A reusable liver retractor. 10 mm reusable clip applier and 10 mm disposable automatic clip applier. LigaSure generator unit with 10 mm (Atlas) and 5 mm (V) instruments (Valleylab, Covidien). Calibration tube 36 F. Covidien Endo-GIA Straight Staplers (60mm). Laparotomy instrument set.

Ports Placement: 12-mm optical trocar camera port in the midline approximately two handbreadths below the xyphi-sternum (ignoring the location of the umbilicus). 12-mm port in between the right midclavicular and anterior axillary line, 2–3 fingerbreadths below the right costal margin the surgeon's left hand working port). 12-mm port in the left midclavicular line two to three fingerbreadths below the patient's left costal margin is the surgeon's right hand working port. 5-mm assistant port in the left anterior axillary line, 2–3 fingerbreadths below the left costal margin and 5-mm midline port 2–3 fingerbreadths below the xyphi-sternum for liver retraction.

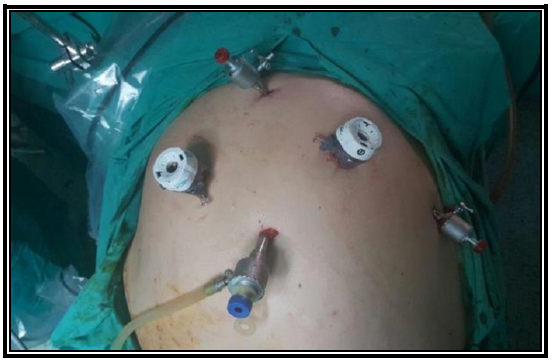

Figure (1): Ports placement.

Operative Technique:

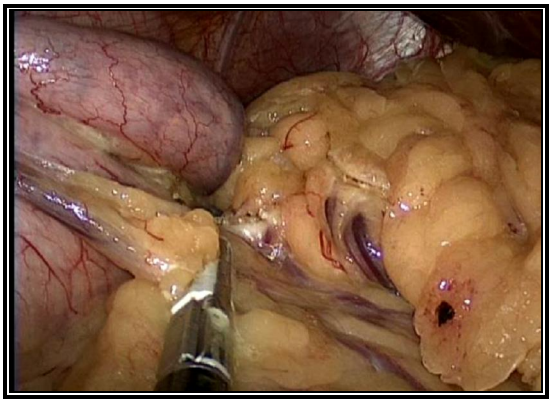

Figure (2): Dissection of greater curvature of stomach in LSG.

Laparoscopic sleeve gastrectomy: The first step consisted of exploration of the entire intrabdominal cavity then we opened the gastrocolic ligament attached to the stomach, usually starting 10-12 cm from the pylorus toward the lower pole of the spleen. Then the gastric greater curvature was freed up to the cardio-oesophageal junction close to

stomach sparing the gastro-epiploic vessels. Meticulous dissection was performed at the angle of His with full mobilization of the gastric fundus. The mobilization of the stomach continues dissecting the greater gastric curve toward the antrum up to 3-5 cm from the pylorus.

At this time a 36-Fr orogastric tube is inserted under vision directed toward the pylorus, proximal to the lesser curvature of the stomach then, the stomach is resected with linear staplers parallel to orogastric tube along the lesser curve starting 3-5 cm far from pylorus.

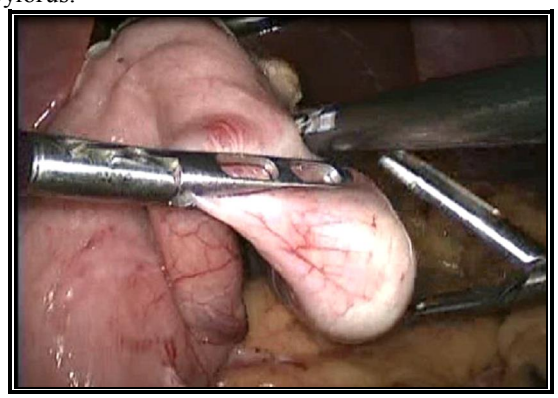

Figure (3): Introduction of the bougie under vision.

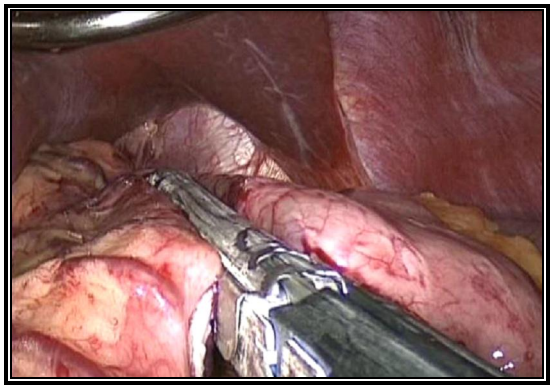

Figure (4): Resection of stomach using stapler

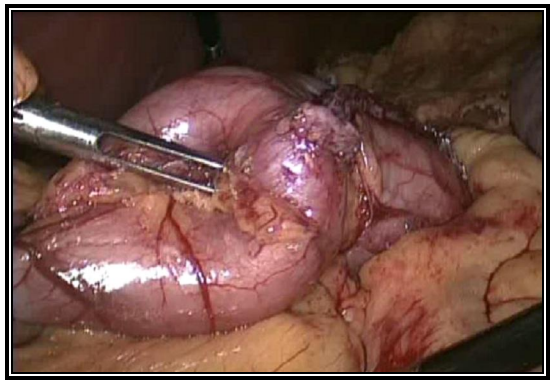

Figure (5): Methylene blue test after completed LSG.

The orogastric bougie is replaced by a naso-gastric tube that is positioned in the distal stomach to perform a methylene blue test. The staple line was inspected to search blue positivity. In case of negative test, the resected stomach was removed by left mid-abdominal trocar usually without prolonging incision. The gastric residual volume ranged from 80 to 100 ml.

We routinely put a drain in one of the trocar site after the procedure beside stomach to monitor for leakage or bleeding and then we remove the drain after 48 hours.

Laparoscopic mini gastric bypass: A window is created to enter the lesser sac at the level of crows' foot just proximal to the antrum. Through the window created, a 60 mm Endo-GIA is passed horizontally and then vertically to the axis of stomach, and fired, creating a gastric tube, upward to the angle of His (under 36 Fr nasogastric tube guidance).

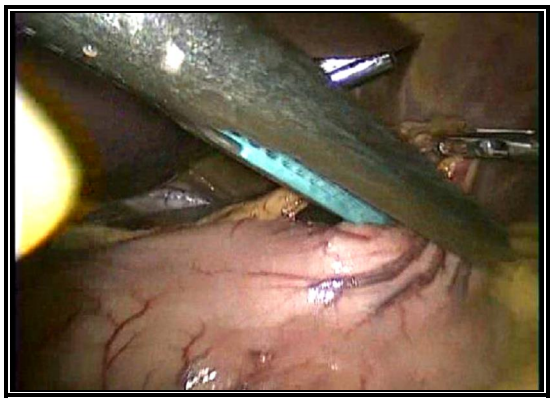

Figure (6): Window created and stapler applied in MGB.

No short gastric vessels are divided. Anterior gastrostomy is done in the new pouch. Measurement of 200 cm of jejunum from the ligament of Treitz, then an antecolic antigastric terminolateral gastrojejunostomy is performed using 30 mm blue endostapler.

Figure (7): Side to side gastro-jejunostomy using the stapler.

The residual orifice is closed with continuous manual suture with V-Loc or vicryl or PDS 2/0. A normal nasogastric tube is placed in the ‘‘new stomach’’ and its continence is tested with injection of 50–100 cc of methylene blue. A drain is placed near the anastomosis.

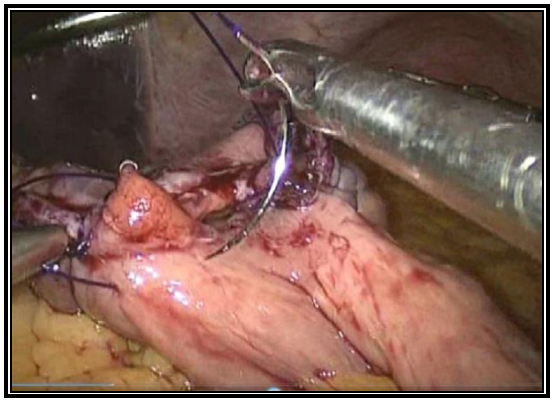

Figure (8): Closure of the stoma using sutures

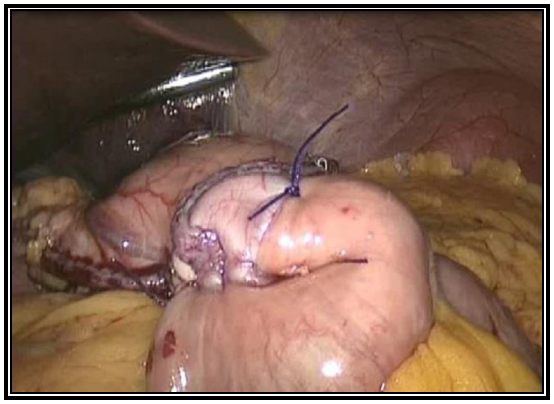

Figure (9): Methylene blue test after completed MGB.

The abdomen was deflated and port sites were closed.

Postoperative Management: Post-operatively, the patient was monitored for any surgical or anesthetic complications. To prevent vomiting in the immediate postoperative period, all patients received IV antiemetic before the end of anesthesia; all patients were ambulated early postoperatively. The catheter was removed in the next morning, while nasogastric tube remained until postoperative ileus is resolved. The patient is permitted to drink clear fluids as soon as bowel movements had resumed (audible bowel sounds) and continued on oral fluids for two weeks then soft diet started for another week. Then, they gradually introduce solid foods. Patients were discharged when they were tolerating oral fluid; have their drain removed usually after 48 hours. Patients were advised to take an oral multivitamin supplement daily. A follow up visit was done one week after discharge, with the patient's wounds inspected, with follow up investigations in suspected patients were done to exclude presence of any leak either from stable line in LSG or from anastomotic sites in LMGB like: CBC. Abdominal U/S. Abdominal C.T. Upper G.I Endoscopy (Most Accurate).

Data Collection: Data was collected from patient records, medical files and interviews. The documented pre-operative, operative and post operative follow up data for all patients was collected and reviewed. The outcome of both surgeries was evaluated.

Operation surgery will include: All patients were subjected to follow up program with regular visits to surgeon scheduled as follows: Weakly during the first month. One month interval during the next six months.

Outcome Measures: The comparison between Sleeve Gastrectomy and Mini Gastric Bypass as regards the following: Incidence of post-operative leakage.

Statistical Analysis

Data analysis was performed using the software SPSS (Statistical Package for the Social Sciences) version 20. Quantitative variables were described using their means and standard deviations. Categorical variables were described using their absolute frequencies and to compare the proportion of categorical data, chi square test was used. Kolmogor-ov-Smirnov (distribution-type) and Levene (homogeneity of variances) tests were used to verify assumptions for use in parametric tests. To compare means of two groups, independent sample t test was used when data is normally distributed. Nonparametric test (Mann Whitney) was used to compare means when data was not normally distributed and to compare medians in categorical data. The level statistical significance was set at 5% (P<0.05). Highly significant difference was present if p≤0.001.

3. Results

Table (1): Distribution of the studied groups according to demographic characteristics.

	Laparoscopic sleeve gastrectomy	Laparoscopic min-gastric bypass	X2	p
	N (%)	N (%)		
Gender:				
Male Female	6 (30) 14 (70)	4 (20) 16 (80)	Fisher	0.716
Age:				
Mean ± SD Range	34.1 ± 12.32 18 - 55	35.35 ± 7.65 25 - 46	Z (-0.325)	0.754

Z mann whitney test

Table (2): Distribution of the studied groups according to demographic characteristics.

	Laparoscopic sleeve gastrectomy	Laparoscopic min-gastric bypass	t	p
BMI:				
Mean ± SD Range	37.8 ± 1.82 35 - 40	38.2 ± 1.44 35 - 40	-0.771	0.446

Table (3): Distribution of the studied groups according to associated comorbidities.

	Laparoscopic sleeve gastrectomy	Laparoscopic min-gastric bypass	X2	p
	N (%)	N (%)		
Diabetes:				
No Yes	15 (75) 5 (25)	17 (85) 3 (15)	Fisher	0.695
Hypertension:				
No Yes	17 (85) 3 (15)	16 (80) 4 (20)	Fisher	1
OSA:				
No Yes	17 (85) 3 (15)	16 (80) 4 (20)	Fisher	1
GERD:				
No Yes	16 (80) 4 (20)	18 (90) 2 (10)	Fisher	0.661
Hyperlipidemia:				
No Yes	15 (75) 5 (25)	17 (85) 3 (15)	Fisher	0.695

Table (4): Distribution of the studied groups according to incidence of leakage.

	Laparoscopic sleeve gastrectomy	Laparoscopic min-gastric bypass	X2	p
	N (%)	N (%)		
Within 3 days:				
No Yes	18 (90) 2 (10)	19 (95) 1 (5)	Fisher	1
After 3 days:				
No Yes	19 (95) 1 (5)	20 (100) 0 (0)	Fisher	1

Table (5): Relation between incidence of leakage in the first 3 days and demographic characteristics, BMI and associated comorbidities.

	Leakage withiin the first 3 days			
	No	**Yes**	**t**	**p**
	Mean ± SD	**Mean ± SD**		
Age	28 ± 8.72	35.27±1.15	-1.201	0.237
BMI	38.67±2.31	37.95±1.6	0.731	0.469
	N (%)	**N (%)**	**X2**	**p**
Gender:				
Male Female	10 (27) 27 (73)	0 (0) 3 (100)	Fisher	0.560
Diabetes:				
No Yes	30 (81.1) 7 (18.9)	2 (66.7) 1 (33.3)	Fisher	0.498
Hypertension:				
No Yes	31 (86.8) 6 (16.2)	2 (66.7) 1 (33.3)	Fisher	0.448
OSA:				
No Yes	30 (81.1) 7 (18.9)	3 (100) 0 (0)	Fisher	1
GERD:				
No Yes	31 (83.8) 6 (16.2)	3 (100) 0 (0)	Fisher	1
Hyperlipidemia:				
No Yes	29 (78.4) 8 (21.6)	3 (100) 0 (0)	Fisher	1

Table (6): Relation between incidence of leakage in the first 3 days and demographic characteristics, BMI and associated comorbidities.

	Leakage after the first 3 days			
	No	**Yes**	**t**	**p**
	Mean ± SD	**Mean ± SD**		
Age	50	34.33± 9.96	1.553	0.129
BMI	39	37.97±1.65	0.615	0.542
	N (%)	**N (%)**	**X2**	**p**
Gender:				
Male Female	9 (23.1) 30 (76.9)	1 (100) 0 (0)	Fisher	0.250
Diabetes:				
No Yes	9 (23.1) 30 (76.9)	1 (100) 0 (0)	Fisher	0.250
Hypertension:				
No Yes	32 (82.1) 7 (17.9)	1 (100) 0 (0)	Fisher	1
OSA:				
No Yes	32 (82.1) 7 (17.9)	1 (100) 0 (0)	Fisher	1
GERD:				
No Yes	33 (84.6) 6 (15.4)	0 (0) 1 (100)	Fisher	1
Hyperlipidemia:				
No Yes	32 (82.1) 7 (17.9)	0 (0) 1 (100)	Fisher	0.2

4. Discussion

The prevalence of people who are overweight or obese has increased dramatically in high-income countries during the past 20 years. The World Health Organization estimates that 54.3% of women and 51.7% of men in the United States will be obese (BMI 30 kg/m2) in 2015. Obesity are notoriously difficult to manage [9].

Severe obesity is one of the major problems in and is associated with several co-morbidities and disabling diseases (e.g., cardiovascular disease, metabolic syndrome, type 2 diabetes, fertility, certain tumor types and increased mortality) [9].

This highlights the significance of bariatric surgery [10].

A variety of surgical procedures are available and currently, it is difficult to identify the most effective option based on patient characteristics and co-morbidities. Furthermore, little is known regarding the effect of the various surgical procedures on glycemic control and on T2DM remission [11].

SG is a technically less complex procedure with short learning curve and effective weight loss but it suffers from two outstanding disadvantages including high risk of weight regain and gastroesophageal reflux disease (GERD) [12].

Both the laparoscopic sleeve gastrectomy (LSG) and mini gastric bypass (MGB) (omega gastric bypass (OGB)/OAB) are newer bariatric procedures. The LSG is becoming more popular and is being used as a primary procedure for morbid obesity [13].

LSG was initially described as vertical gastrectomy as a part of a biliopancreatic diversion with duodenal switch by Marceau et al. in 1993. LSG was being used as a stage I procedure to bring down super obese high-risk patients [14].

Once the patient loses some weight and comorbidities improve, then the stage II definitive procedure, such as biliopancreatic diversion with duodenal switch or laparoscopic Roux-en-Y gastric bypass (LRYGB) is done [15].

Mini-gastric bypass (MGB), is also known as single anastomosis gastric bypass or omega gastric bypass [16].

Due to safe and simple process as well as effective outcomes, MGB has quickly become one of the most popular procedures in many countries [17].

MGB has become one of the most popular surgical procedures for morbid obesity in many countries because of its high safety and effectiveness. Today, thousands of MGB cases have been reported and most of these cases showed MGB had similar or superior safety and effectiveness than SG or RYGB [18, 19].

Since the first mini-gastric bypass (MGB) in 1997, the operation is becoming more and more popular, due to increasing reports supporting the operation as a short, straight forward procedure with low complication rates and excellent outcomes [14].

MGB has been reported to be a very safe, simple, and effective bariatric procedure. All the reports published to date have been very encouraging [20].

The power of the MGB comes from the fact that it has restrictive and malabsorptive components; additionally it produces hormonal changes and also lowers the patient's bile acid pool. Studies show that a bariatric operation which includes a gastric and intestinal component outperforms purely gastric restrictive procedures like the band and sleeve gastrectomy [21].

Various studies of the MGB and the LSG have reported excellent results with the additional benefits of both procedures being relatively simple to perform and associated with low complication rates [14].

In the last few years, several encouraging reports have been published considering LSG as a primary or stand-alone procedure [22], with better results than laparoscopic adjustable gastric banding or an intragastric balloon [23].

Reports with short-term follow-up have shown results similar to laparoscopic Roux-en-Y (LRNY). There are few reports comparing LSG and LRNY [24] but fewer reports were found on comparison of LSG and MGB (OGB) [14].

The purpose of this study was to compare the two surgical approaches regarding occurrence of early or late onset leakage.

Our study included the initial experience for 40 morbidly obese patients who fulfilled the selection criteria and formed the study population. The patient population was divided into two groups, group I & II which included 20 morbidly obese patients who had done LSG and LMGB respectively. The patients were followed up for one week as regard occurrence of leakage.

The sample size of our study was quite small and the follow up period was shorter as compared to other similar published studies and this attribute to the insignificant statistical difference between the 2 groups. Thus, the present work could be considered a preliminary study; providing the rationale for a randomized prospective trial.

As regard demographic data in the study group, gender distribution in the study group showed that 30 morbidly obese patients were females and 10 morbidly obese patients were males. This indicated a higher frequency of morbidly obese patients in females as compared to males putting in mind that patients were selected in a random fashion. This is in concordance with the WHO study, which pointed out that unlike Europe and North America, obesity is

more prevalent among women and in urban areas in eastern countries [25].

Mean age for patients who had LSG was 34.1 ± 12.32 SD with a range from 18 to 55years. Mean age for patients who had LMGB was 35.35 ± 7.65with a range from 25 to 46 years old. As regard age of both groups of patients no statistical significant difference between both groups regarding age or gender, also it is not clinically significant as patients were selected in a randomized fashion to had either LSG or LMGB.

In the current study, the mean BMI for patients who had LSG was 37.8 kg/m² ± 1.82 SD. with a range from 35 to 40 Kg/m². Mean BMI for patients who had LMGB was 38.25 Kg/m² ± 1.44 SD. with the same range. There was no statistically significant difference between both groups as regard BMI but this was clinically insignificant as both groups fulfilling criteria of morbid obesity and all of them had BMI of more than 40 Kg/m² and patients were allocated randomly in each group.

According to pre-operative associated co morbidity of the study group, the percentage of diabetes and hyperlipidemia was 25% in LSG group and 15% in LMGB group, hypertension and obstructive sleep apnea (OSA) were 15% and 20% in LSG and LMGB groups respectively. Hyperlipidemia was present in 25% and 15% in patients underwent LSG and LMGB respectively.

Twenty percent and 10% of patients with LSG and LMGB groups respectively complained of GERD. Also, no significant difference was present between them which pointed to effective random allocation of patients within both groups and eliminate any potential confounder on outcome in both approaches.

Preoperative preparation of patients in this study included routinely antibiotic prophylaxis and thrombo-prophylaxis in the form of low molecular weight heparin 12 hours before operations and sequential compression boots during operation and then early mobilization of the patients after surgery, and this was implicated in that no cases of infection or DVT and pulmonary embolism occurred in this study.

The operative technique used was the laparoscopic technique for either of LSG or LMGB, the mean operative time was 52.95±15.33 min for LSG group and 72± 14.89 min for LMGB group.

This may be attributed to that various initial experience and technical aspects in different surgical centers in both approaches.

In our technique, for the sleeve gastrectomy procedure, 75%-80% of the greater curvature was excised, leaving a narrow stomach tube of 36 F. Single-loop gastric bypass was performed, which consisted of constructing a 40-70 mL gastric pouch with a jejunal exclusion of 200 cm. All procedures were performed using a laparoscopic approach. This is similar to the technique in several studies [9].

Leakage in this study occurs in four patients (out of 40, with rate of 10%). Three of them occur in patients underwent laparoscopic sleeve gastrectomy and only one patients with Laparoscopic min-gastric bypass. Yet with non-significant difference between both approaches.

Two out of the three patients who developed leak in the first approach occur in the first three days. The patient who developed leakage after Laparoscopic min-gastric bypass had it in the first 3 days.

Regarding Laparoscopic min-gastric bypass, leakage rate was 5%. This result is in agreement with where leak rate was 4.3%. Also this result was in harmony with [26].

Regarding sleeve gastrectomy, it's believed that leaks are not a consequence of staple-line failure or dehiscence; rather, maybe due to the presence of gastric-wall heat ischemia near the staple line, which may be caused by dissection of the greater curvature using electro cautery or the LigaSure device, may be a major cause of leak.

In contrast with ours, 7 out of 214 patients developed leak, 2 in the first 3 days and the rest develop late leakage.

Also, leakage in our results was much higher than other studies by ***Cottam et al.*** [22]; ***Weiner et al.*** [13]; ***Tucker et al.*** [27].

On studying relation between early or late leakage with study parameters including demographic data, BMI, operative time or associated comorbidities, no significant difference was present between patients who developed early or late leakage making only surgical techniques the only incriminated factor.

According to the results of our meta-analysis by ***Wang et al.*** [28], the overall rate of leakage of MGB was 0.76% versus 2.3% of SG.

Rutledge and Walsh [29] performed a retrospective and observational study on 2410 patients having MGB, results showed that the rate of early complications was 5.9% and rate of leakage was 1.08%. ***Noun et al.*** [30] performed a similar study in 1000 consecutive patients, and results showed that the rate of leakage was 0.43%. Most recently, ***Taha and Abdelaal*** [31] reported 1520 cases receiving MGB for consecutive 6 years, and results showed that leakage rate was 0.1%. All the 3 large sample size observational studies presented the favorable rate early complications, which seemed superior than our results. Our results indicated MGB group had lower leakage rate compared with SG group. The lower leakage rate in MGB group may be explained by the decreased intragastric pressures caused by pylorus exclusion [32].

On studying relation between occurrence of early or late onset leakage and all of the following parameters (gender, age, BMI, operative time and associated comorbidities), statistically non-significant difference was present.

By the end of this study, we recommend that some preventive measures should be taken to prevent leak: careful patient selection, adequate surgical procedure, gentle handling of tissues, careful suturing, avoidance of distal strictures, and careful management of electrocautery and the LigaSure device, especially the latter because we are convinced that the most important factor for leak pathogenesis is thermal damage.

Also, it is recommended that large scale prospective multicenter studies with long follow up period should be done to verify results of this thesis.

This study can be explained in context of certain limitations including small sample size and short follow-up time may influence the stability of result.

5. Conclusion

Both Laparoscopic Sleeve gastrectomy and mini gastric bypass are safe, simple and effective bariatric surgeries.

Leakage in this study occurs in four patients (out of 40, with rate of 10%). Three of them occur in patients underwent laparoscopic sleeve gastrectomy and only one patient with laparoscopic mini gastric bypass with non-significant difference between both approaches.

Regarding sleeve gastrectomy, it is believed that leaks are not a consequence of staple line failure or dehiscence; rather, may be due to presence of gastric wall heat ischemia near the staple line, which may be caused by dissection of the greater curvature using electro-cautery or the ligasure device, may be a major cause of leak.

References

1. Baker RS, Foote J, Kemmeter P, et al. (2004): The science of stapling and leaks. Obesity surgery, 14(10), 1290-1298.
2. American Society for Metabolic and Bariatric Surgery (ASMBS). Bariatric surgery procedures. 2014.
3. Hutter MM. Schimmer BD and Jones DB. (2011): A first report from The American College Of Surgeries. Bariatric Surgeries Centre Network laparoscopic sleeve gastrectomy has morbidity and effectiveness posmoned between the band and the bypass. Ann Surg:254(3)410-20 discussion 420-2.
4. Heneghan HM, Meron-Eldar S, Yenumula P et al. (2012): Incidence and management of bleeding complications after gastric bypass surgery in the morbidly obese. Surg Obes Relat Dis.; 8(6):729-735.
5. Aurora AR. Khaitan L, Saber AA (2012): Sleeve gastrectomy and the risk of leak a systematic analysis of 4888 patients. Surg Endoscope; 26(6):1509-15.
6. Podnos YD, Jimenez JC, Wilson SE, et al. (2003): Complications after laparoscopic gastric bypass a review of 3464 cases. Arch Surg Chic III 1960;138 (9):957-61.
7. Csendes A, Braghetto I, Leon P, et al. (2010): '' Management of leaks after laparoscopic sleeve gastrectomy in patients with obesity '' Journal of Gastrointestinal Surgery, 14(9): 1343-1348.
8. Nguyen NT, Nguyen XMT, Dholakia C (2010): The use of endoscopic stent in management of leaks after sleeve gastrectomy '' Obesity Surgery, 20(9): 1289-1292.
9. Milone M, Di Minno MN, Leongito M, et al. (2013): Bariatric surgery and diabetes remission: sleeve gastrectomy or mini-gastric bypass? World J Gastroentero. 19(39): 6590 7.
10. Abegunde DO, Mathers CD, Adam T, et al. (2007): The burden and costs of chronic diseases in low-income and middle-income countries. Lancet; 370:1929–38.
11. Li JV, Ashrafi an H, Bueter M, et al. (2011): Metabolic surgery profoundly infl uences gut microbial-host metabolic crosstalk. Gut. 60(9):1214–23.
12. Jammu GS and Sharma R. (2016): A 7-year clinical audit of 1107 cases comparing sleeve gastrectomy, Roux-En-Y gastric bypass, and mini-gastric bypass, to determine an effective and safe bariatric and metabolic procedure. Obes Surg; 26:926–32.
13. Weiner RA, El-Sayes IA, Theodoridou S, et al. (2013): Early postoperative complications: incidence, management, and impact on length of hospital stay. A retrospective comparison between laparoscopic gastric bypass and sleeve gastrectomy. Obes Surg.; 23(12):2004–12.
14. Kular KS, Manchanda N and Rutledge R (2014): A 6-year experience with 1,054 mini-gastric bypasses-first study from Indian subcontinent. Obes Surg; 24:1430–5.
15. Kim WW, Gagner M, Kini S, et al. (2003): Laparoscopic vs. open biliopancreatic diversion with duodenal switch: a comparative study. J Gastrointest Surg.; 7:552–7.
16. Rutledge R (2001): The mini-gastric bypass: experience with the first 1,274 cases. Obesity surgery, 11(3): 276-280.
17. Musella M, Apers J, Rheinwalt K, et al. (2016): Efficacy of bariatric surgery in type 2 diabetes mellitus remission: the role of mini gastric

bypass/one anastomosis gastric bypass and sleeve gastrectomy at 1 year of follow-up. A European survey. Obes Surg; 26:933–40.
18. Chevallier JM, Arman GA, Guenzi M, et al. (2015): One thousand single anastomosis (omega loop) gastric bypasses to treat morbid obesity in a 7-year period: outcomes show few complications and good efficacy. Obesity surgery, 25(6): 951-958.
19. Carbajo MA, Luque-de-Leon E, Jimenez JM, et al. (2017): Laparoscopic oneanastomosis gastric bypass: technique, results, and long-term follow-up in 1200 patients. Obes Surg; 27:1153–67.
20. Mahawar KK, Carr WR, Balupuri S, et al. (2014): Controversy surrounding 'mini' gastric bypass. Obes Surg; 24:324–33.
21. Disse E, Pasquer A, Espalieu P, et al. (2014): Greater weight loss with the omega loop bypass compared to Roux-en-Y gastric bypass: a comparative study. Obes Surg. bc24 (6):841–6.
22. Cottam D, Qureshi FG, Mattar SG, et al. (2006): Laparoscopic sleeve gastrectomy as an initial weight-loss procedure for high-risk patients with morbid obesity. Surg Endosc.; 20(6):859–63.
23. Van Rutte PW, Smulders JF, de Zoete JP, et al. (2012): Indications and short term out comes of revisional surgery after failed or complicated sleeve gastrectomy. Obes Surg.; 22(12):1903–8. volume. Obes Surg. 17:1297–305.
24. Boza C, Gamboa C, Salinas J, et al. (2012): Laparoscopic Roux–en–Y gastric bypass vs laparoscopic sleeve gastrectomy and: a case control study and 3 years of follow up. Surg Obes Relat Dis.; 8:243–9.
25. Musaiger AO, Al-Awadi AHA, Al-Mannai MA (2000): Lifestyle and social factors associated with obesity among the Bahraini adult population. Ecol. Food and Nutr,; 39: 121-133.
26. Greenway FL (1996): Surgery for obesity. Endocrinol Metab Clin.
27. Tucker ON, Szomstein S and Rosenthal RJ (2008): Indications for sleeve gastrectomy as a primary procedure for weight loss in the morbidly obese. J Gastrointest Surg; 12: 662-667.
28. Wang FG, Zhao-Peng Y, Wen-Mao Y, et al. (2017): Comparison of safety and effectiveness between laparoscopic mini-gastric bypass and laparoscopic sleeve gastrectomy A meta-analysis and systematic review. Medicine: 96 (50): 1 -9.
29. Rutledge R and Walsh TR (2005): Continued excellent results with the mini-gastric bypass: six-year study in 2,410 patients. Obes Surg; 15:1304–8.
30. Noun R, Skaff J, Riachi E, et al. (2012): One thousand consecutive mini-gastric bypass: short- and long-term outcome. Obes Surg; 22:697–703.
31. Taha O and Abdelaal M (2017): Outcomes of omega loop gastric bypass, 6-years experience of 1520 cases. Obes Surg; 27:1952–60.
32. Li J, Lai D and Wu D. (2016): Laparoscopic Roux-en-Y gastric bypass versus laparoscopic sleeve gastrectomy to treat morbid obesity-related comorbidities: a systematic review and meta-analysis. Obes Surg; 26:429–42.

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