

Laparoscopic Sleeve Gastrectomy and Crural Repair as a Treatment of Morbid Obesity Associated with Gastroesophageal Reflux

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Type of article: Original

Abstract

Objective: The aim of this study was to evaluate the Laparoscopic Sleeve Gastrectomy (LSG) with simultaneous crural repair in treatment of morbid obesity associated with gastroesophageal reflux disease.

Methods: This prospective observational study was carried out from September 2012 to July 2016 in Al-Azhar University Hospital (Egypt). The study was conducted on 53 patients, 14 males (26.4%) and 39 females (73.6%) with the mean age 36.2 years (range 18-52 years), presenting with morbid obesity and reflux disease either symptomatic patients or asymptomatic (Endoscopic & Manometric), their mean Body Mass Index (BMI) was 50.1 kg/m² (range 40-62 kg/m²), who underwent LSG and antireflux procedure (crural repair).

Results: Excess weight Loss (EWL); the mean EWL at 6 months postoperatively was 46.3%, at 12 months was 54%, and at 18 months was 61%. Also, we found that, preoperative co-morbidities are resolved by 53% and improved by 23%. Reflux symptoms were absent in 30 patients (56 %), improved in 14 patients (26.4 %), but persistent in 7 patients (13.2 %).

Conclusion: Laparoscopic crural closure, during LSG, represents a valuable option for the treatment of morbid obesity and gastroesophageal reflux, and can result in favorable outcomes in terms of weight loss and gastroesophageal reflux disease (GERD) symptoms control.

Keywords: Morbid obesity, Reflux esophagitis, Sleeve gastrectomy, Hiatal repair, Weight loss

1. Introduction

Obesity worldwide is steadily increasing, and in the US, it has been estimated that if the current trend continues, 40% of Americans will be obese by 2025. One of the alarming factors of the obesity epidemic is that 15% of children and adolescents are obese (BMI > 95th percentile on the Centres for Disease Controls and Prevention standard charts) and more than 20% are at risk (BMI > 85th percentile) (1). Premature mortality and many chronic conditions, including hypertension, type II diabetes mellitus, heart disease, stroke, osteoarthritis, obstructive sleep apnea (OSA) are attributed to obesity, as well as a number of cancers and depression. Obesity associated with GERD presents a major increase in incidence worldwide. Obesity increases the intra-abdominal pressure, and so they are often associated (3, 4). Around 50%-70% of patients who undergo bariatric surgery have reflux symptoms, and symptomatic Hiatus Hernia (HH) can account for only 15% of patients with a BMI > 35 kg/m² (5). In concomitance with the rise in numbers of obesity there has been a renewed interest in the surgical treatment of morbid obesity in recent years. The reasons for the sharp increase in bariatric surgery are the unfavourable results obtained with non-surgical treatment, the significantly effective reports on durable weight loss after surgery and the consequent increase in patient demand following the widespread positive media attention on surgical treatment. Predicted weight-loss, improved quality of life, relief of co-morbidities, preference of patients, technical considerations and risks, behaviour of patient, and changes in composition of the body are the most important factors to consider when contemplating bariatric procedure. LSG is a relatively new surgical approach in the weight loss surgeon's armamentarium, but one that has seen growth in popularity, because of the perceived simplicity of the surgical technique, resolution of co-morbidities, and excellent weight loss outcomes (9). LSG was initially proposed

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Received: October 14, 2016, Accepted: December 16, 2016, Published: January 2017

iThenticate screening: December 16, 2016, English editing: January 02, 2017, Quality control: January 08, 2017

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as a first step procedure in high risk patients followed by second step Bilo-Pancreatic Diversion-Duodenal Switch (BPD-DS) or Roux-en-Y gastric bypass (RYGBP), LSG has, with minimally invasive techniques and an increase in surgical experience, become widely considered as a primary restrictive bariatric procedure (10). The indications for LSG as a primary procedure were published in 2008, with significant 3-and 5-years data and experience justifying its recommendation by the American Society for Metabolic and Bariatric Surgery as an approved bariatric procedure (11). The purpose of this research was the evaluation of LSG with simultaneous crural repair in treatment of morbid obesity associated with gastroesophageal reflux disease.

2. Material and Methods

This study was a prospective, observational study performed at the department of surgery, Al-Azhar University Hospitals. It was carried out on 53 patients, 14 males (26.4%) and 39 females (73.6%) with the mean age 36.2 years (range 18-52 years), presenting with morbid obesity and reflux disease, either symptomatic patients or asymptomatic (Endoscopic & Manometric), whose mean BMI was 50.1 kg/m² (range 40-62 kg/m²), underwent LSG and antireflux procedure (crural repair).

2.2. Selection criteria

2.2.1. Inclusion criteria

Inclusion criteria were morbidly obese patients (BMI 40 -62 kg/m²), absence of endocrinal causes, non-sweet eaters, no previous upper Gastro-intestinal tract surgery (GIT), and patients with reflux esophagitis either symptomatic or asymptomatic.

2.2.2. The Exclusion criteria

Exclusion criteria were morbidly obese patients with no reflux on preoperative studies, sweet eaters, patients with previous upper GIT surgeries, patients with psychological troubles, patients presenting esophageal motility problems (other than those related to GERD). Also, patients with Barrett's esophagus were not included. All patients were admitted to the surgical department of Al-Azhar University Hospital and referred from outpatient clinics in the period between September 2012 and July 2016. The study was approved by the local ethics committee of the surgery department. Informed consent was granted from all patients. All patients in our study underwent history taking, complete clinical examination, detailed investigations, especially upper gastrointestinal endoscopy and esophageal manometry. A number of patients were also submitted to contrasted gastroesophageal radiography using oral barium especially those whose endoscopic exams revealed the existence of hiatal hernias. The operative time and hospital stay were evaluated. All patients were followed up for 18 months. During hospital stay and follow up period, all patients were evaluated for development of morbidities (leak, stricture, vomiting, bleeding or wound complications), monitoring of EWL, evaluation of reflux symptoms, and evaluation of preoperative co-morbidities (diabetes, hypertension, OSA). Post-operatively, since most did not present symptoms, endoscopy and manometry were not routinely applied.

2.3. Surgical technique

After prophylactic antibiotic and general endo-tracheal anesthesia were administered, the patient is placed in the supine position (split-leg and reverse Trendelenburg position). Port-sites incisions and insertion of ports (5 ports) were done. Mobilization of distal esophagus and gastroesophageal junction were done by using a laparoscopic harmonic scalpel to get a 4-cm tension-free intra-abdominal esophagus. Posterior crural repair was performed with 2-3 interrupted sutures of 2-0 Ethibond. LSG was started by dividing the greater omentum with the ultrasonic shears at a point 5-6 cm from the pylorus along the greater curvature. The gastroepiploic artery branches are divided near the gastric wall. Cephalad continues, followed by the division of the gastric vessels which are carried out up to the fundus. Division of the posterior fundic vessels is also carried out. Next, the angle of His is dissected from the left crus of the diaphragm. Following greater curvature dissection, lyses to all adhesions in the lesser sac is carried out, leaving the posterior aspect of the antrum free. The LSG then commences with sequential firings of 60-100mm/4.8-mm linear staplers close to a 40-Fr bougie which follows the lesser curvature. Once the gastrectomy is completed, the excised stomach is retrieved outside through the right-side port wound. Finally, to test the staple line for leaks and measure the gastric capacity, we carry out a methylene-blue test through an orogastric tube with the proximal duodenum clamped with long intestinal forceps. If bleeding or leaks are identified, over-sewing the staple line with an absorbable running suture (vicryl) can be carried out.

2.4. Postoperative follow up

Patients are cared for on the ward, unless significant pre-existing cardiopulmonary disease, BMI > 60 kg/m², OSA and intraoperative complications warrant Intensive Care Unit (ICU) care. Anti-coagulant as a prophylaxis of DVT

was used. Patients are usually taking oral fluids and then feeding on the third postoperative day after successful leak test, and discharged on the fourth postoperative day. The follow up was scheduled weekly for one month, and then monthly, the EWL was recorded at 6t, 12, and 18t months postoperatively.

3. Results

3.1. Preoperative and general findings

Of 53 patients; 14 patients were males (26.4%), 39 were females (73.6%). 47 patients had reflux symptoms (88.6%) while 6 patients had asymptomatic reflux (11.4 %). 5 patients were super-super obese (BMI was > 60 kg/m²) (9.4%). 3 patients had history of DVT (5.6%). 5 patients had OSA (9.4%). 9 patients were diabetic (16.9%). 11 patients were hypertensive (20.7%) (Table1). All patients were of grade I or II of American Society of Anesthesiologists (ASA) grades, (ASA physical status classification system is a system for assessing the fitness of patients before surgery, the society adopted six categories; grade I – normal healthy patient, grade II – patient with mild systemic disease). The median operative time was 115 minutes (range 90-180 min). The mean postoperative hospital stay was 4.2 days (range 3-6 days).

Table 1. Patient's demographics

Parameters	Values	
Sex; n (%)	Male	14 (26.4)
	Female	39 (73.6)
Age (Year)	36.2 (range: 18-52)	
BMI (kg/m ²)	50.1 (range: 40-62)	
Reflux esophagitis; n (%)	Symptomatic	47 (88.6)
	Asymptomatic	6 (11.4)
Pathologic obesity; n (%)	5 (9.4)	
History of DVT; n (%)	3 (5.6)	
History of Diabetes; n (%)	9 (16.9)	
History of hypertension; n (%)	11 (20.7)	
History of OSA; n (%)	5 (9.4)	

3.2. Postoperative

Two patients who developed prolonged vomiting (3.7%) were treated conservatively, 1 patient developed postoperative bleeding (1.8%), exploration was done which revealed bleeding at staple line, and no patients developed leaks or stricture (0%). Mortality rate was nil (0%) (Table 2). EWL; the mean EWL at 6 months postoperatively was 46.3% (range 42.7-51.2%), at 12 months was 54% (range 45.8-60.1%), at 18 months was 61% (range 55-66.3%). Also, we found that, preoperative co-morbidities are resolved by (53%) and improved by (23%). Post-operatively; reflux symptoms were absent in 30 patients (56%), improved in 14 patients (26.4%), but persistent in 7 patients (13.2%).

Table 2. Operative and early post-operative data

Parameter	Value
Operative time (min)	115 (range 90-180)
Postoperative bleeding; n (%)	1 (1.8)
Postoperative leak; n (%)	0 (0)
Postoperative stricture; n (%)	0 (0)
Mortality rate; n (%)	0 (0)
Prolonged vomiting; n (%)	2 (3.7)
Postoperative hospital stay (day)	4.2 (range: 3-6)

4. Discussion

The general consensus that LSG is a purely restrictive procedure is going through a gradual change. Presently, it is accepted that changes in gastric emptying and the reduction of large parts of the ghrelin-producing stomach mass could account for its success in terms of loss of weight and sustained decrease of hunger, compared with other restrictive procedures. About 15% of morbid obese patients suffer from hiatus hernia, and symptomatic reflux is diagnosed in about 50–70% of patients with a BMI > 35 kg/m². Morbid obesity has been proven to be an independent risk factor for HH and gastroesophageal reflux disease (12). LSG is considered to be an effective and a

safe bariatric procedure with similar results to those of LRYGBP, in terms of weight loss it is superior to Laparoscopic Adjustable Gastric Band (LAGB), and has a low rate of postoperative morbidity (13). Patients undergoing LSG can develop symptoms of GERD, which indicates a common complication, although in a large number of patients, the incidence varies from 2.1% to 24.9%. This could be due to the anatomic disruption of the angle of His and the changes in the rate of gastric emptying (14, 15). For the first few months following LSG, symptoms of GERD can be quite common, however with Proton Pump inhibitor (PPI) treatment, they can be regulated, and appear to gradually decrease over a period of time. Furthermore, improvement of GERD through LSG can be seen in 40-85% of patients who present clinical signs of GERD before surgery. This could be accountable to loss of weight following surgery, but the increase of the gastric compliance and emptying should also be considered as a cause. Reduction of gastric intraluminal pressure is aided by preservation of the antrum and the normal gastric emptying process through the pylorus (17). The position and function of the lower esophageal sphincter can be restored and also the GERD symptoms can be improved by restoring the stretched hiatus to normal by hiatoplasty. Similar to the literature there is a female predominance, Belanger et al., (81%) (19), Jossart (78%) (20), Lakdawala et al. (63%) (21); in our study, we found that, there is also a female predominance (73.6%). Obesity is associated with many co-morbidities, including hypertension, diabetes mellitus, heart disease, reflux esophagitis, OSA and others (Walsh, 2010) (2). In the current study, patients with DM were (16.9%), with hypertension were (20.7%), with OSA (9.4%). Soliman et al. (22) reported that the mean operative time in a study on 20 patients was 95minutes (range 65-125 min); in our study, the mean operative time was 115 min. As expected, the operative time was longer in patients with high BMI. Average hospital stay was (4.2 days) in the current study. Shah et al. (23) recorded that, average hospital stay was (3.5 days) while in the study of Himpens et al. (24) was (2.2 days). In a Spanish registry, investigators reported outcomes of 17 centers for 540 patients who had undergone LSG, the overall morbidity rate was 5.2% and mortality rate was 0.36% (25). A national registry in Germany was created to collect data on 144 LSG procedures performed at 17 hospitals; the overall rate of major complications was 9.4% (26). Lee et al. (27) reported the results of 216 patients who underwent LSG, complications occurred in 7.4% and no mortality was reported. Hamoui et al. (28) performed a study on 118 patients (115 open SG and 3 LSG), the morbidity was 15.3% and mortality was 0.85%. In the current study, the overall morbidity was 5.6% (1 patient developed post-operative bleeding (1.8%), 2 patients developed prolonged vomiting (3.7%) and no mortality was reported. LSG is now being performed more frequently given the satisfactory weight loss results not only in the short-term, but also in the mid-term with shorter operating times and absence of need to create anastomosis (7). Karamanakos et al. (29), in the comparison of LSG to LRYGB, showed there was a larger percent excess weight loss at 12 months with LSG (69.7% versus 60.5%). Another prospective study comparing LSG with LAGB by Himpens et al. (30) reported better results in terms of weight loss for LSG, Median EWL at 1 year was 57.7% after LSG and 41.4% after LAGB; and at 3 years, was 66% versus 48% respectively. LSG was also effective in super-super obese and super obese according to Langer et al. (31), they reported that, mean EWL was 46% at 6 months, 56% at 12 months and 57% at 18 months. Peterli et al. (32), reported the results of 120 patients who underwent LSG, mean excess BMI loss was 62% at 1 year and 64% at 2 years in morbidly obese and super obese patients. In the current study; during the period of follow up; reflux symptoms were absent in 30 patients (56 %), improved in 14 patients (26.4 %), but persistent in 7 patients (13.2 %). Soliman et al. (22) reported that; postoperative symptomatic relieve of reflux was 65%, postoperative symptomatic improvement of reflux was 25% while persistence of GERD after LSG and crural repair was in 10% of patients. A complete assessment on all English literature on LSG comprising 1,163 patients, revealed a mean EWL percentage following LSG, ranging from 35% to 71.6% at 6 months, 45% to 83% at 1 year, 47% to 83% at 2 years and 66% at 3 years (7). The mean EWL in our study was: at 6 months 46.3%, at 12 months 54% and at 18 months 61%. Improvement of health status and resolution of co-morbidities such as diabetes, hypertension, OSA and dyslipidemia can be associated with LSG. Peterli et al. (32) and Rosenthal et al. (33) reported that, remission rates of type II diabetes after LSG were ranged between 60% and 80%, depending on the patient population and length of follow up. A study by Silecchia et al. revealed that 60% of major co-morbidities were resolved and 24% were improved in 41 super-obese patients following LSG. The study also showed a reduction in the operative risk (ASA) score, following LSG. In the current study, associated co-morbidities were resolved by 53% and improved by 23%.

5. Conclusions

Laparoscopic Sleeve Gastrectomy was initially used as the first part of a two part procedure, but now LSG may represent a safe, easy and effective primary procedure to achieve significant weight loss, as well as significant improvement or resolution of major obesity related co-morbidities, with a low mortality and morbidity. Laparoscopic crural closure, during LSG, represents a valuable option for the treatment of morbid obesity and gastresophageal reflux, and can result in good outcomes in terms of GERD symptoms control.

Acknowledgments:

The author is thankful to the Al-Azhar University Hospital (Egypt) for supporting this study.

Conflict of Interest:

There is no conflict of interest to be declared.

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