

Sleeve Gastrectomy with Hiatus Hernia Repair in 25 Egyptian Morbid Obese : Short Term Results

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ABSTRACT

Background: Obesity is considered one of the risk factors for gastroesophageal reflux disease and hiatal hernia and severity of reflux symptoms in presence of obesity lead to a decrease in the quality of life. Treatment of obese patients with gastroesophageal reflux disease (GERD) and hiatal hernia (HH) has proven difficult due to poor symptom control and high failure rates in this patient population , recent studies have shown that incorporating weight loss procedures into the treatment of reflux may improve overall outcomes. Identification of HH during SG (sleeve gastrectomy) and the effect of its repair on GERD related symptoms are controversial. **Objective:** This study aimed to evaluate the effect of concomitant HHR (hiatal hernia repair) in morbidly obese patients undergoing LSG and its short term effect on resolution or persistence of GERD related symptoms, other clinical outcomes and complication rates. **Patients and methods:** A total number of 25 patients suffering from morbid obesity and hiatal hernia were operated for simultaneous laparoscopic sleeve gastrectomy with hiatal hernia repair at the department of general surgery at El Demardash Hospital at Ain Shams University in Cairo, Egypt from January 2014 to December 2016. **Results:** In our retrospective study data obtained from patients interpreted as a chart review that was conducted with a mean follow up of 7 months. The mean weight was 128kg , BMI of 44 , average weight loss of 6.4kg/month. 19/25 patients had pre-operative diagnosis of HH with 16 of them complained of GERD symptoms. 6/25 patient without symptoms showed no evidence of HH on UGI and did not have a pre-operative EGD but a HH was identified intra-operatively. Crural closure was performed in all cases with HH size ranging from 2cm to 5cm. 16/25 (64%) patients who had symptomatic reflux reported cessation of symptoms post-operative. 7 of 10 (70%) patients who was taking anti-reflux medication before surgery discontinued all medication and the other 3 patients, although reported decrease in symptoms still continued to take proton pump inhibitors. **Conclusions:** With the increase risk of reflux before weight loss surgery as well as after LSG, patients with HH identified pre-operative and intra-operative should be considered for repair, Combination LSG with HHR is safe and provides good outcomes for patients with morbid obesity and GERD.

Keywords: Sleeve Gastrectomy, Hiatal Hernia

INTRODUCTION

Obesity represents one of the risk factors for the development of gastro-esophageal reflux disease (GERD) that has multi-factorial pathophysiological mechanisms such as abnormal transient relaxations of the lower esophageal sphincter (LES) that is not triggered by swallowing, defective esophageal peristalsis, delayed gastric emptying and high fat-containing diet , in addition of the increased intra-abdominal pressure and the higher prevalence of hiatal hernia (HH) in morbid obese population.⁽¹⁾

Laparoscopic sleeve gastrectomy (LSG) is currently achieving and gaining popularity as a stand-alone bariatric procedure due to its minimal anatomic changes related to a combination of

restrictive and hormonal effects coupled with a high safety profile. However, reported studies on effect of LSG on GERD symptoms is controversial some reported improvement while others raised the potential increase in the risk of “de novo” postoperative gastroesophageal reflux disease (GERD) due to gastric fundus removal, section of the sling muscular fibers of gastroesophageal junction, reduced antral pump function, and gastric volume. these conflicting outcomes regarding offering LSG to patients with GERD or HH lead to identification of LSG as a relative contraindication by 57% of an international expert panel in 2011 and others of the same panel reached consensus on aggressive approach to identify and repair HH by closure of hiatal defects to reduce the incidence of

postoperative reflux at the time of LSG was shown to be safe, however the functional outcomes remain conflicting.^(1,2)

In the latest survey of SG surgeons, 31 % of surgeons only looked for a HH on preoperative studies or if there was a history of GERD. Even if a HH was found, 11 % of surgeons did not repair it. There is no currently available literature provided the efficacy of HH repair in obese patients undergoing SG. But this review systematically investigates published English language literature in accordance with PRISMA (preferred reporting items for systematic reviews and meta-analyses) guidelines to find out the safety, usefulness, and technical aspects of simultaneous SG and hiatal hernia repair for the treatment of obesity complicated by hiatus hernia.⁽³⁾

Even that most high volume sleeve surgeons recommend aggressively looking for and repairing HH while performing SG, others believe that SG should not be offered to obese patients with GERD and/or hiatus hernia, and they prefer performing a gastric bypass. However, gastric bypass is not suitable for all patients due to Crohn's disease, significant intra-abdominal adhesions, potential technical difficulty, patient choice, or surgeon preference. And therefore the optimal choice of bariatric procedures for obese patients with GORD and/or HH continues to be a conflicting issue in the bariatric community.⁽³⁾

Karmali et al.,⁽⁴⁾ in a recent meta-analysis a review of 15 studies found that 4 studies reported increased incidence of GERD after sleeve gastrectomy while 7 studies reported a reduced GERD prevalence after sleeve gastrectomy also manometric testing of the lower esophageal sphincter before and after LSG has lead to conflicting results. Strategies used to decrease the incidence of GERD after LSG include complete removal of the gastric fundus, avoiding creation of a narrow or corkscrew sleeve, and routine repair of identified hiatal hernias.⁽⁵⁾

Soricelli et al.^(4, 6) found a 73.3 % remission of GERD in patients who had concomitant hiatal hernia repair performed during LSG. They also found no de novo GERD symptoms in asymptomatic patients undergoing LSG with concomitant hiatal hernia (HH).

Daes et al.^(4,7) reported a decreased incidence of GERD from 49.2 to 1.5 % at 6– 12 months with concomitant hiatal hernia repair.

However, still, the role of hiatal hernia repair during sleeve gastrectomy has yet to be well defined. At the present time, there are no randomized prospective trials evaluating the role of hiatal hernia repair concomitantly with sleeve gastrectomy.⁽⁴⁾

PATIENT AND METHODS

This study was a retrospective analysis of a prospectively maintained database of patients suffering from morbid obesity and hiatus hernia whose were admitted at the department of general surgery at El Demrdash Hospital at Ain Shams University in Cairo, Egypt from January 2014 to December 2016, they were operated for simultaneous laparoscopic sleeve gastrectomy with hiatal hernia repair and this study was undertaken after obtaining institutional ethics committee approval from Ain Shams university.

Patients that was included in this study their age were between 18yrs and 65yrs, BMI more than 35 in association with any co-morbidities or more than 40 without co-morbidities they were selected on the basis of presence of hiatus hernia that was diagnosed preoperatively by endoscopy or dye study either paraesophageal (type 2), mixed (type 3), or sliding hiatal hernias of 3 cm or more with presence of esophagitis, and Barrett's metaplasia at upper endoscopy. These patients were candidates for antireflux surgery (i.e., laparoscopic Nissen–Rossetti fundoplication) or different bariatric procedure (e.g., laparoscopic gastric bypass, or Scopinaro's biliopancreatic diversion).

Preoperative assessment by full labs and anesthesia consultation and preoperative endoscopy is done only for patients with symptomatic reflux to exclude only hiatus hernia, barium swallow/meal, and oesophageal manometry/pH studies or other investigations as directed by symptoms.

Surgical Procedure

All patients were administered a prophylaxis for thromboembolism and Prophylactic Antibiotic prior to incision. All cases were performed laparoscopically using a five trocar technique, patients were in supine, reverse Trendelenburg position and legs were separated.

Insufflation of the abdomen by verrus needle was done and 5 ports were inserted.

Procedure was performed by first attacking the hiatus hernia through clarifying of the crura, fig(1) , dissection and resection of the sac and at least 5cm of oesophagus to be free in the abdomen and crural repair, fig(2a,b) by proline two zero with or without mesh after insertion of a bougie no. 36 French was done.

Then completing the usual sleeve by freeing the omentum, fig(3) till 4 cm from the pylorus by ligasure(Covidian ,USA) with dissection up to the left crus.

Bougie insertion and start stappling by green reload then blue reloads till 2 to 3 cm from angle of his to preserve the integrity of the sling fibers also keeping the stappling line straight to avoid functional narrowing and increasing reflux symptoms.

Stitches were taken from lateral side of angle of his, fig(4) to the left crus we suggest these stitches prevent slippage of the sleeved stomach to the chest again.

Methylene blue test, fig(5) was done as a test for leakage then deflation of the abdomen under vision was done then closure of the skin openings by subcuticular stitches.

2 hours postoperative we encourage the patients for good ambulation , 6 hours start oral sips then fluids the morning of the 1st day and patients were discharged one day after the operation on PPIS twice daily for one month and once daily for 3 months this is routine in our series and were instructed to continue on adequate oral fluids only with yoghurt , milk and fresh juice for 10 days then in the last 20 days of the 1st month on semisolid food. Dye study postoperative is not routine in our series. Patients were allowed to return to work after 10 days from the operation if no pain was felt.

Follow up visits were arranged after 2 weeks and after 1,3,6 and 12 months from the operation. During each visit, full physical assessment for the patients was performed and any postoperative complications such as early dysphagia ,reflux symptoms, and continuation of antireflux medications is recorded every visit .

Dye study was done on the 2nd day postoperative then 3,6,12 month late and endoscopy at 1 year.

Validated Gastroesophageal Reflux Disease Health Related Quality of Life (GERD-HRQL) questionnaire which consists of 10 questions that specifically address GERD symptoms each scored

on a 0–5 scale and an additional question which evaluates the patient's satisfaction with his or her current condition was done, the best possible aggregate score is 0 (absence of symptoms), and the worst is 50 (very severe symptoms).

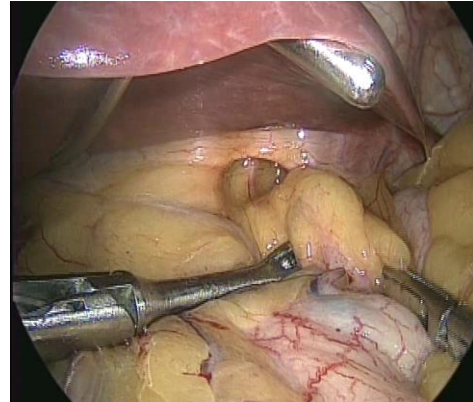


Fig. (1). Exposure of the hiatus hernia

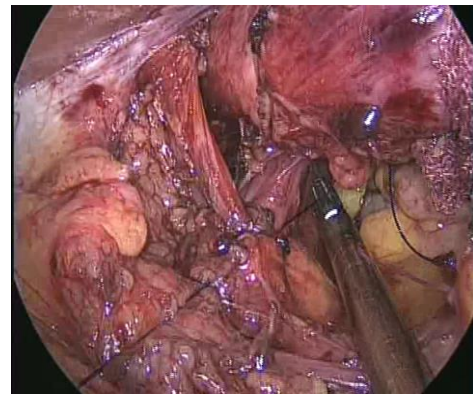


Fig. (2a). Crural repair 1st stitch

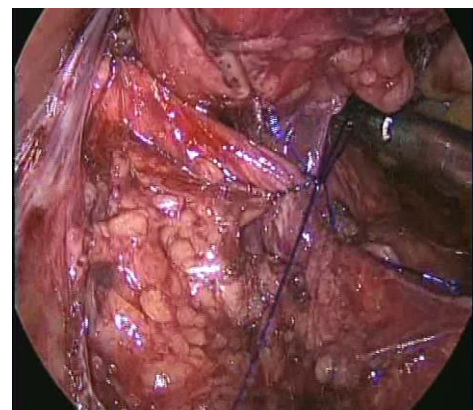


Fig. (2b). The 2nd stitch during hiatus hernia repair

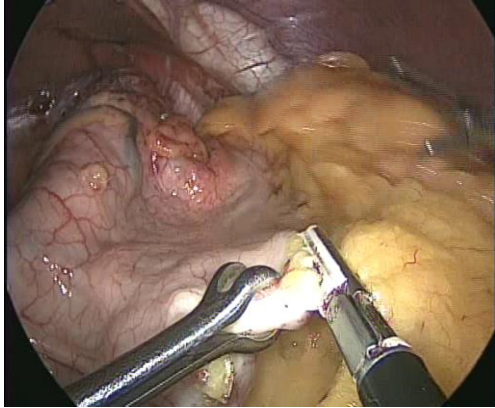


Fig.(3). Dissection of greater omentum from greater curvature.

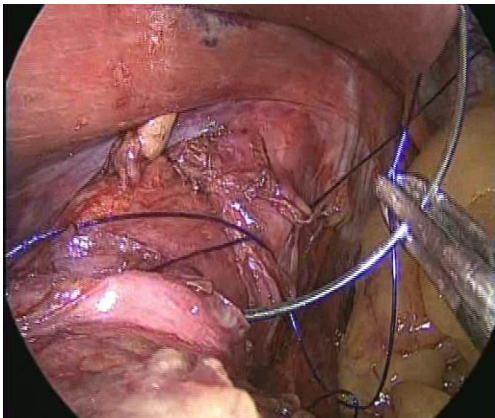


Fig. (4). The fixing stitch to augment the angle of his

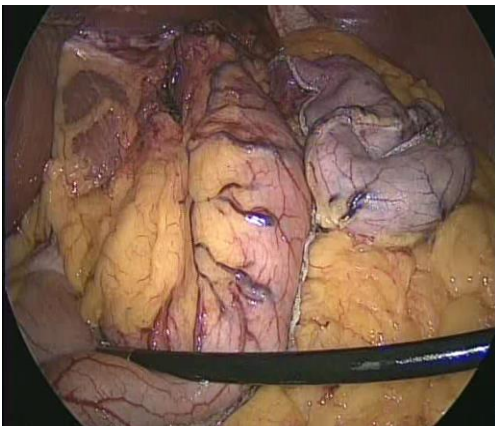


Fig. (5). Methylene blue test

RESULTS

Patients:

Data obtained from patients medical records were , 25 patients enrolled in our study 18 females and 7 males, their mean age was 47 years (ranging: 18–65years). preoperative body mass index (BMI) 51.6 kg/m² (ranging: 35–65 kg/m²). 3 patients had history of gastric band removal ,4 patients had symptomatic GB disease on top cholecystectomy was done. All patients had symptomatic GERD confirmed by dye study and/or gastroscopy, 2 with associated chronic cough and 18 took PPI on a daily basis..

19 patients diagnosed with hiatus hernia preoperatively and last 6 are diagnosed intraoperatively

Table 1: Patient demographics

Gender		
	Male	7/25(28%);
	Female	18/25 (72%)
Age (years)		Mean 41.5;range 18-65yrs
BMI (kg/m ²)		Mean 51.6; range 35-65
Follow-up (months)		Mean 8.5; range 5-12

Table 2: Preoperative UGI findings(n=)

Demonstration of hiatal hernia	19 /25 (76%)	
No evidence of hiatal hernia	6 /25 (24 %)	
Demonstration of reflux		
	Symptomatic patients	16/ 25(64 %)
	Asymptomatic patients	9/ 25(36%)

Surgical results:

All the cases (100 %) were managed laparoscopically they underwent combined sleeve gastrectomy and crural repair with fixation of the lower oesophagus and the part of the stomach lateral to the angle of his to the left crus.

With mean operative time min(ranging 60 - 100min), no conversion to open surgery was done in any case, no significant blood loss was detected, the hospital stay mean was 21 hrs (ranging 18–24 hrs).

The overall morbidity was reported as 1/25 (4%) cases had post operative bleeding that was managed by blood transfusion only, mild dysphagia postoperatively were reported in 5/25 (20%) patients started 10 days postoperative when the patient start oral soft diet relieved conservatively with returning the patient back to fluid diets again, 3/25(12%) patients were

admitted to ICU postoperative for obstructive sleep apnea.

There were no mortalities or major complications such as leak, sleeve stenosis, or stricture in our study .

Metabolic results

3/25(12%) patients were lost at a median follow-up of 8.5 months (ranging: 5–12 months). At follow-up, symptomatic GERD was reported in 3/25(12%) cases, chronic cough in 0/25 cases and daily PPI use in 3/25(12%) cases. The mean excess BMI loss (EBMIL) was 68.29 % (ranging:

25–110%) and the BMI: 37.12 kg/m² (ranging: 20–52 kg/m²). All but one patients were satisfied, and the mean GERDHRQL score was 7.5/50 (ranging: 0–15), with 4 patients presenting 0/50 and only 2 patients presenting a score over 3/50. Occasional bloatedness was reported in 2/25(8%) patients. Subgroup analysis of the 5 patients with history of GB disease at median follow-up of 11 months showed a mean EBMIL at 38.7%, with absence of daily PPI use and a mean GERD-HRQL(GERD-Health Related Quality of Life questionnaire.) score at 2,4/50 (range7).

GERD-Health Related Quality of Life Questionnaire (GERD-HRQL)	
Institution: _____	Patient ID: _____ Date ____/____/____
<input type="checkbox"/> On PPIs	<input type="checkbox"/> Off PPIs If off, for how long? _____ days / months
<i>Scale:</i>	
0 = No symptom	
1 = Symptoms noticeable but not bothersome	
2 = Symptoms noticeable and bothersome but not every day	
3 = Symptoms bothersome every day	
4 = Symptoms affect daily activity	
5 = Symptoms are incapacitating to do daily activities	
<i>Please check the box to the right of each question which best describes your experience over the past 2 weeks</i>	
1. How bad is the heartburn?	<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
2. Heartburn when lying down?	<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
3. Heartburn when standing up?	<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
4. Heartburn after meals?	<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
5. Does heartburn change your diet?	<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
6. Does heartburn wake you from sleep?	<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
7. Do you have difficulty swallowing?	<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
8. Do you have pain with swallowing?	<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
9. If you take medication, does this affect your daily life?	<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
10. How bad is the regurgitation?	<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
11. Regurgitation when lying down?	<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
12. Regurgitation when standing up?	<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
13. Regurgitation after meals?	<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
14. Does regurgitation change your diet?	<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
15. Does regurgitation wake you from sleep?	<input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
16. How satisfied are you with your present condition?	<input type="checkbox"/> Satisfied <input type="checkbox"/> Neutral <input type="checkbox"/> Dissatisfied
Administered by _____	Monitored by _____
Date (mm/dd/yy) _____	Date (mm/dd/yy) _____

DISCUSSION

Since the incidence of GERD in the bariatric population is higher than the general population, that may be in part due to the increase in incidence of HH in these patients with excess weight and increased intra-abdominal pressure. And as LSG is becoming a popular stand-alone bariatric operation but still alone has a controversial impact on GERD and although a

review of the Bariatric Outcomes Longitudinal Database in the USA reported GERD improvement ⁽¹⁾ that is explained by the decreased intra-abdominal pressure following weight loss, and other factors like accelerated gastric emptying and reduced gastric acid secretion but other authors found worsening of GERD symptoms, or development of de novo GERD which was explained by several mechanisms, such as lack of gastric compliance with high intra-gastric pressure, elimination of His angle and alteration

of the sling fibers in the distal part of the LES and a decrease in the resting pressure of the GE junction and may be also related to technical mistakes, like stenosis or twist of the gastric sleeve and incomplete fundus removal, or also related to the thoracic herniation of the proximal end of the gastric sleeve, as reported by Baumann et al.⁽⁸⁾ which explained early postoperative by the loss of abdominal fixation of the residual gastric tube, especially the lack of posterior attachments to the left crus in a high-pressure abdomen. Later, when the weight loss is achieved, the relative enlargement of the esophageal hiatus due to the shrinkage of the pericardial fat-pad becomes another contributing factor.⁽¹⁾

Therefore there is considerable debate amongst bariatric surgeons regarding the best bariatric procedure for such patients. Many surgeons believe that gastric bypass is the best option for obese patients with GERD and/or HH, but gastric bypass may not be suitable for all patients for one reason or another. These conflicting reports have raised a huge concern regarding offering SG to patients with HH or reflux symptoms.⁽¹⁾

In our study we demonstrate safety of simultaneous LSG with hiatal hernia repair, in obese subjects, with acceptable postoperative GERD rates we were based on that as HH may cause GERD and repair of HH at the time of SG can prevent the development of GERD and since HH in bariatric patients is higher than the general population, so LSG will address both of these problems if associated with HH repair. At present, there is no consensus on how to best manage HHs at the time of SG or how to repair a HH once identified.

In a recent study, Samakar et al.⁽⁹⁾ found that LSG with HHR improved GERD symptoms or the need for daily antisecretory therapy only in a third of previously symptomatic patients. Furthermore, in the same study 15.6% of asymptomatic patients developed de novo GERD despite HHR.

Santoro et al. designed a LSG with a cardioplication that embraces the left aspect of the esophagus over 180°, whereas Le Page et al. described a partial LSG with anterior fundoplication by the medial fundal remnant. Both reported good initial functional results with GERD improvement; however, we have concerns regarding the long-term outcomes of these

procedures. First, the EGJ is not fixed in the abdomen, and it may slide up to the chest. Second, the fundoplication requires an incomplete fundus removal with the potential consequence of neofundus formation with relapsing GERD and weight regain⁽¹⁰⁾ and therefore we chose to perform standard LSG with complete fundus removal associated with LHR.

We reported in our study, which included 25 patients (18 females and 7 males), their mean age was 47 years (ranging: 18–65 years). Preoperative body mass index (BMI) 44 kg/m² (ranging: 35–65 kg/m²). 19 patients diagnosed with hiatus hernia preoperatively and last 6 are diagnosed intraoperatively. All the cases (100%) were managed laparoscopically no conversion to open surgery was done in any case, no significant blood loss was detected, the hospital stay mean was 21 hrs (ranging 18–24 hrs).

With follow up ranging from 5- 12 months postoperative 3/25 (12%) patients were lost, mild dysphagia were reported in 5/25 (20%) patients started 10 days postoperative when the patient start oral soft diet relieved conservatively with returning the patient back to fluid diets again, 3/25 (12%) patients were admitted to ICU postoperative for obstructive sleep apnea. And there were no mortalities or major complications such as leak, sleeve stenosis, or stricture.

Symptomatic GERD was reported in 3/25 (12%) cases, and daily PPI use in 3/25 (12%) cases. The mean excess BMI loss (EBMIL) was 68.29 % (ranging: 25–110%) and the BMI: 37.12 kg/m² (ranging: 20–52 kg/m²). All but one patient were satisfied, and the mean GERDHRQL score was 7.5/50 (ranging: 0–15), with 4 patients presenting 0/50 and only 2 patients presenting a score over 3/50. Occasional bloatedness was reported in 2/25 (8%) patients. Subgroup analysis of the 5 patients with history of GB disease at median follow-up of 11 months showed a mean EBMIL at 38.7%, with absence of daily PPI use and a mean GERD-HRQL (GERD-Health Related Quality of Life questionnaire.) score at 3.5/50 (range: 0–7).

Daniel Gero et al.⁽¹⁾ in a consecutive cohort of 14 patients, with 100% follow-up at a median of 12.5 months postoperatively. Fourteen patients underwent LSG? sLHR [12 women and 2 men, mean (range) age 47 years (27–57), BMI 41 kg/m² (35–65)]. Five patients had previous gastric banding (GB). All had symptomatic

GERD confirmed by gastroscopy and/or upper-gastrointestinal contrast study, two with chronic cough, 10 took PPI daily. Twelve had hiatus hernia and two patulous cardia at surgical exploration. Associated interventions were three GB removals and one cholecystectomy. Postoperative complication was one surgical site infection. Follow-up of all patients at median 12.5 months (5–17) is as follows: symptomatic GERD 3/14 patients, chronic cough 0/14, daily PPI use in 1/14, mean EBMIL 68% (17–120), satisfaction 93%, mean GERD-HRQL score 3,28/50 (0–15), with 4 patients 0/50, occasional bloatedness in 2 patients and dysphagia not reported. Demonstrated a satisfactory surgical outcomes: there were no major complications and no conversions to open surgery. Functional outcomes were also very favorable and promising: patient satisfaction was 93%, and the GERDHRQL questionnaire showed the practically complete and early remission of GERD, only unsatisfied patient complained of relapsing GERD with the necessity of daily PPI use following a period of postoperative GERD remission, bloatedness was reported only occasionally in 2 patients, and dysphagia was not reported. As the long-term incidence of de novo GERD after LSG is around 20%.⁽¹⁾

Maher El Chaar et al., (11) For a total of 338 patients, 99 patients (29 %) underwent SG in combination with HH repair; 56 patients (16 %) underwent anterior repair of HH (SG + HH), and 43 patients (13%) underwent posterior repair with or without mesh placement (SG + paraesophageal hernia (PEH)). We found no significant differences in operative time or blood loss, with significantly higher %EWL at 6 months in SG + HH (n=43) and SG + PEH (n=32) compared to SG alone (n= 190). There was also a statistically significant improvement in postoperative GERD symptoms. Finally, SG + HH and SG + PEH patients reported greater satisfaction compared to SG patients (>93 versus 87 %). reported that Sixteen percent (16 %) of patients with hiatal hernias were diagnosed with type I sliding hernias or small hernias, and these patients underwent an anterior crural repair, the other 13 % of patients were found to have larger HH and were repaired posteriorly with or without an absorbable mesh depending on the quality of crural repair.

Irrespective of the type of repair, patients experienced an improvement in GERD-related

symptoms following SG compared to the preoperative period. However, they reported that this does not provide any objective evidence that HH repair in combination with SG results in resolution of GERD symptoms, especially with short-term follow-up and objective manometry, impedance, and pH studies need to be performed on patients undergoing HH repair in combination with SG, both pre- and postoperatively, in order to draw definitive conclusions regarding the development or resolution of GERD.⁽¹¹⁾

In addition, they found that patient satisfaction of both SG + HH was higher on average than the SG alone group. Patients' overall satisfaction following surgery is obviously a complicated issue that is related to such factors as length of hospital stay, amount of weight loss, resolution of comorbid conditions, and postoperative pain control, in addition to the presence of GERD-related symptoms, as addressed in there questionnaire. and also found higher weight loss at 3 and 6 months. This higher excess weight loss is likely due to better mobilization of the gastric fundus off the left crus with dissection of the hiatus during HH repair, which can result in a more adequate resection of the gastric fundus or a tighter hiatus leading to more restriction in these patients compared to patients who underwent SG alone. Thus far, their patient follow-up is limited to 6 months, with a 78 % follow-up rate.

However, one patient from the small hernia group who underwent an anterior hernia repair presented, 12 months following her surgery, with heartburn and dysphagia and was found to have a recurrent hernia, after which she underwent a formal posterior hernia repair with mesh placement.⁽¹¹⁾

A recent review of 13 studies by Laffin et al. found that 8 studies reported increased GERD after sleeve gastrectomy while 5 studies reported reduced GERD after LSG. Howard et al. (12) reported an 82 % worsening of GERD symptoms after LSG. Tai et al. (13) noted an increase in the prevalence of GERD symptoms (12.1 versus 47%) and erosive esophagitis (16.7 versus 66.7%) after LSG. Carter et al. (14) reported persistent GERD even after significant weight loss in patients with preoperative symptoms along with an increased risk of postoperative reflux symptoms in previously asymptomatic patients Cottan et al. (15) reported a series of 126 patients undergoing LSG with a 20 % incidence of GERD

at 12-month follow-up Nocca et al. (16) reported an 11.8 % incidence of GERD at 24 months following LSG Hamoui et al. (17) reported an incidence of 12.7 % GERD at 13 months after LSG in 131 patients (18).

Kamran Samakar et al. (4) Fifty-eight patients were identified meeting inclusion criteria (LSG+HHR), with a mean follow-up of 97.5 weeks (range 44–172 weeks). The mean age of the cohort was 49.5±11.2 years, with 74.1 % being female. Mean preoperative BMI was 44.2±6.6 kg/m². Preoperative upper gastrointestinal contrast series was performed in all patients and demonstrated a hiatal hernia in 34.5% of patients and reflux in 15.5% of patients. Preoperatively, 34.6 % (n=26) of patients reported subjective symptoms of reflux and/or required daily antisecretory therapy. After LSG+HHR, 34.6% of symptomatic patients had resolution of their symptoms off therapy while the rest remained symptomatic and required daily antisecretory therapy; 84.4% of patients that were asymptomatic preoperatively remained asymptomatic after surgery. New onset reflux symptoms requiring daily antisecretory therapy was seen in 15.6 % of patients who were previously asymptomatic. Post surgical weight loss did not correlate with the presence or resolution of reflux symptoms .reported that LSG with concomitant HHR had an improvement in GERD symptoms. Nonetheless, two thirds of symptomatic patients remained symptomatic after surgery, even at time points in excess of 18 months postoperatively. Even more concerning was the finding that 15.6 % of previously asymptomatic patients developed de novo reflux symptoms after LSG with concomitant HHR. Still, 65.4 % of symptomatic patients continued to have reflux after surgery despite greater than 50 % reduction in excess BMI. A hiatal hernia was identified in only 34.5 % of patients who ultimately had a hiatal hernia identified at the time of surgery.

Similarly, UGI demonstrated gastroesophageal reflux in 34.6 % of patients who were otherwise known to have symptomatic reflux. Moreover, UGI failed to identify a hiatal hernia when one was present nearly two thirds of the time. There is significant debate regarding the most useful evaluation of the hiatus (e.g., endoscopy, UGI, manometry, intraoperative assessment) future discussions of this topic should be considered.⁽⁹⁾

The small number of patients and the short length of follow-up in our study may be considered limitations in the interpretation of the results. And also the absence of preoperative GERD-HRQL questionnaire is another lack .

May be with additional data and longer follow-up of the effect of HH repair during SG on weight loss should be addressed in future research, with long-term tracking and a larger sample to reach a meaningful and definitive conclusions.

CONCLUSIONS

With the increase risk of reflux before weight loss surgery as well as after LSG, patients with HH identified pre-operative and intra-operative should be considered for repair, Combination LSG with HHR is safe and provides good outcomes for patients with morbid obesity and GERD.

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