ORIGINAL ARTICLE

Evaluation of the Outcomes of Laparoscopic Sleeve Gastrectomy with Cruroplasty Versus Roux-en-Y Gastric Bypass in Morbid Obese Patients with Gastro-Esophageal Reflux Disease

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Abstract

Background: ***Obesity is the number one health risk facing people today, according to the World Health Organisation. An enormous morbidity and death burden is being caused by the increasing incidence of obesity.***

Aim and objectives: ***To evaluate the efficacy of laparoscopic Roux-en-Y gastric bypass (LRNYGB) and laparoscopic sleeve gastrectomy (LSG) with cruroplasty and other procedures in treating obesity-related GERD symptoms and promoting weight loss in patients with the condition at one year post-operatively.***

Subjects and methods: ***From January 2022 through January 2024, fifty severely obese patients with GERD grade (A) or (B) diagnosed by endoscopy at the surgery department of Al-Azhar University Hospitals participated in a randomized controlled clinical trial with follow-up at1,3,6, and 12 months after surgery.***

Results: ***There was a statistically significant difference between the sleeve group and the Roux-en-Y group at1,3,6, and 12 months (p=0.001, 0.024, 0.031, and 0.012, respectively) compared to reflux symptoms.***

Conclusion: ***While the weight loss and GERD symptom and severity improvements achieved by LSG with cruroplasty are good, they pale in comparison to those achieved by LRYGB during the one-year post-operative follow-up period.***

Keywords: Laparoscopic sleeve gastrectomy;Roux-en-Y gastric bypass;Gastro-esophageal reflux

1. Introduction

All across the globe, people suffer from gastroesophageal reflux disease (GERD). Impaired oesophageal clearance, a temporary relaxation of the lower oesophageal sphincter, and aberrant anatomy and function of the oesophagogastric junction are important illness processes.[1]

There is a significant role for gastroenterologists to play in the fight against obesity, a disease that affects a large percentage of the global population. Preoperative examination may be necessary in certain circumstances due to the increased prevalence of certain digestive problems in obese patients. In addition, endoscopic treatment can play a significant role in weight loss, and bariatric surgery can cause both immediate and long-term gastrointestinal problems that require medicine. Obese patients undergoing or scheduled for surgical or endoscopic therapy for obesity will be managed by gastroenterologists, who will be the focus of this study.[2]

In order to aid those who are extremely obese in their weight loss efforts, gastrointestinal surgery is referred to as bariatric surgery. For most of these individuals, it's their only hope for a permanent weight loss and the amelioration or elimination of co-morbidities like GERD. Many patients with severe obesity and gastroesophageal reflux disease (GERD) reported significant symptom improvement after undergoing bariatric surgery for the former.[3]

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Sleeve gastrectomy, a type of bariatric surgery, has grown in popularity in recent years. Patients with gastroesophageal reflux disease are the focus of ongoing discussions about its potential utility. As of this writing, laparoscopic Roux-en-Y gastric bypass remains the gold standard for the treatment of these individuals; however, other approaches have been studied. Patients with reflux or minor hiatal hernias may also benefit from sleeve gastrectomy in conjunction with fundoplication or correction of the hernia.[4]

Nearly 40% of severely obese patients having bariatric surgery also have GERD, and 50% to 70% of those individuals experience symptomatic reflux before the procedure. This suggests that obesity is a significant risk factor for the development of both GERD and HH.[5]

The purpose of this study was to compare the weight loss and GERD symptom improvement rates of laparoscopic Roux-en-Y gastric bypass (LRNYGB) with those of laparoscopic sleeve gastrectomy (LSG) with cruroplasty in severely obese patients with GERD at 1-year post-operative follow-up.

2. Patients and methods

The surgical department at Al-Azhar University Hospitals served as the site of this randomized controlled clinical trial, which ran from 2022 to 2024 and included follow-up visits at1,3,6, and 12 months after surgery. Fifty severely obese patients were categorized into two groups based on endoscopic GERD grade (A) and (B): Two groups were identified: one that underwent laparoscopic sleeve gastrectomy with cruroplasty (25 patients), and another that underwent laparoscopic Roux-en-Y gastric bypass (25 patients).

Inclusion criteria:

Everyone with a body mass index (BMI) of 40 or higher, or between 35 and 40 if they also have obesity-related conditions like hypertension, dyslipidemia, type 2 diabetes, sleep apnea, obesity hypoventilation syndrome, severe arthritis, non-alcoholic fatty liver disease, or GERD grade A or B as seen through endoscopy.

Exclusion criteria:

Individuals who do not meet the criteria for general anaesthesia, such as those with untreatable coagulopathies or severe heart disease, are not eligible for insufflation. Other exclusions include patients who have severe restrictive respiratory diseases or who have undergone major upper abdominal surgeries, patients with significant abdominal ventral hernias, major psychiatric illnesses, pregnant patients, and patients with suspected intra-abdominal adhesions.

Pre-operative workup:

We took detailed medical histories from each patient and performed comprehensive physical examinations, standard laboratory tests, a chest x-ray, and an abdominal ultrasound. A waiver of liability was also acquired.

Operative:

Group-(1):

Method of intervention:

Laparoscopic five-trocar sleeve gastrectomy with cruroplasty procedures were utilized in every single patient. Our series does not include any open conversions. A first-generation cephalosporin dosage was administered prior to the procedure's commencement. Twelve hours prior to and after the operation, low molecular weight heparin was administered as a preventative measure. There was no intraoperative use of Foley catheters, and patients were instructed to vacate the area before surgery. Surgical drainage was employed; no postoperative nasogastric tubes were inserted. After the operation, patients were instructed to walk around as soon as possible and to begin clear oral feedings six hours later.

Beginning four to six centimetres from the pylorus, an energy device (Harmonic Ace®, Ethicon Endosurgery, Cincinnati, OH, USA) was used to transsect the gastro-salivary ligament. After identifying the left crus and transecting the short stomach arteries, the fundus was fully mobilized.

During the transection of the greater curvature of the stomach, the anesthesiologist implanted a 36 Fr bougie after mobilizing the fundus and removing the gastrosplenic ligament. Ethicon Endosurgery's Echelon® stapler was used to transsect the more rounded stomach. A green cartridge (staple open height 4.1 mm) or a black cartridge (4.2 mm) is always used to initiate the transection.

Whether or not the hiatus is visible on inspection, we always dissect the angle of hiatus, remove the phreno-oesophagal ligament, and mobilize the fat pad to locate and assess hiatal hernias. We utilize our atraumatic grasper to measure the hernia once we've identified the right and left crura. The grasper's open jaws length is 3 cm. The hernia sac was first divided circumferentially in order to minimise its contents.

In order to bring the gastroesophageal (GE) junction into an intra-abdominal location, the crura were dissected and skeletonized posteriorly to the confluence. Sutures that were not absorbable were then disrupted and used to resemble both crura. In order to avoid the hiatus from narrowing, a 36 Fr bougie was always used for posterior hernia repairs. To reinforce the posterior repair, a single non-absorbable stitch was

used to bind the mesh, which was cut to fit the oesophagus, to the confluence.

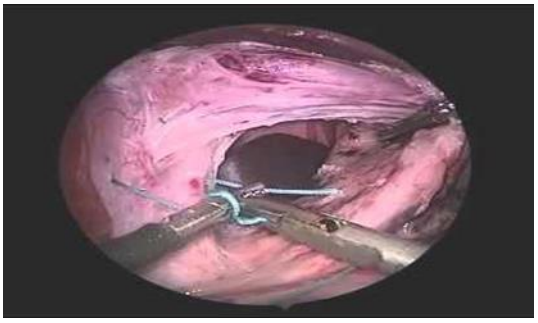

Figure 1. After repairing the diaphragm's crura, dissect the hernial sac.

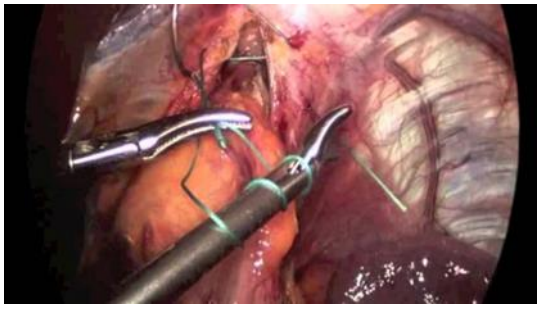

Figure 2. The use of sutures to repair the diaphragm's crura.

Figure 3. Following a hiatus hernia repair, a sleeve gastrectomy is performed.

Group-(2):

Steps of the procedure:

Creation of pneumo-peritoneum:

The patient was administered a carbon dioxide pneumo-peritoneum by means of an injection that was made using the Verrus needle technique. This was done at the Palmer's point, which is located under the left rib arc, in the midclavicular line, beside the arc. This prevents the Verrus needle from puncturing any internal organs by inserting it into the abdominal cavity at a convex angle of the rib cage.

Damage to the spleen, liver, stomach, colon, and omentum can still occur due to the fact that staplers and other surgical tools were inserted through cannulas.

Ports placement and liver retraction:

A 12-millimetre trocar was inserted above and to the left of the umbilicus, approximately 15-20 centimetres below the costal margin; the camera was then introduced through this trocar. Once inside the abdominal cavity, the Verrus needle is carefully examined for any signs of organ damage and its placement before being removed. It is feasible to see the gastro-oesophageal junction, the upper short gastric arteries, and the smaller curvature of the stomach through the epigastric port, which is used to insert the self-retaining liver retractor, which retracts the left lobe of the liver.

Two 12-millimetre ports are then implanted: one in the right mid-clavicular line, ten centimetres below the right rib arch, and one in the left mid-clavicular line, one centimetre below the left rib arch. Two 5-millimetre ports are positioned: one in the assistant's left anterior axillary line and one in the patient's right midclavicular line, immediately behind the right rib arch. Checking the location of the nasogastric tube and emptying the stomach were the first steps in the procedure, which also included exploring the abdominal cavity for possible adhesions, the omentum's mobility, and the length of the small intestine mesentery.

Creation of the gastric pouch:

After creating a tunnel beneath the postgastric wall, we begin to dissect the smaller curve of the stomach, which is located directly below the third gastric vessel from the gastro-oesophageal junction. We horizontally transected the stomach after exposing its back wall and inserting a 60-mm-long, 3.5-mm-blue cartridge.

After carefully positioning a 33 Fr bougie, which has been calibrated by the French, against the lesser curvature, we continue the vertical stomach transection to the gastro-oesophagal junction in order to avoid stenosis and create a thin gastric tube. When transectioning the stomach was complete, we would often use two or even three cartridges. The result was a gastric pouch that was approximately 15 to 30 milliliters in volume.

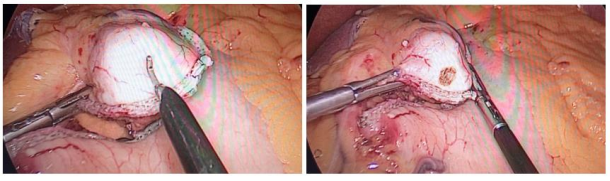

Figure 4. The gastric pouch invention.

Creation of gastrojejunostomy:

Once the transverse colon and transverse mesocolon have been elevated, the ligament of Trietz can be located. To construct the Roux limb, approximately 100 cm of small intestine must be measured from the D-J junction. To make the Roux limb more mobile, a stay suture is placed in its tendon and brought up to the gastric pouch in an antecolic fashion. Great care is used to avoid putting too much strain on the anastomosis.

In order to access the jejunum and stomach pouch, the Harmonic scalpel® or the Hook® are

utilized. A flawless alignment of the stapler can be achieved by anchoring the suture between the two apertures. In order to produce the gastro jejunostomy, a 45 mm golden cartridge is used. The remaining opening is then sealed with 2/0 absorbable V-lock®. A Ryle tube is inserted via the nasal cavity and carefully introduced to the efferent intestinal loop through the stoma opening.

Figure 5. Gastrojejunostomy Procedure Finalized

Creation of jejuno-jejunostomy:

A white cartridge is used to transect the jejunum through a linear stapler that is introduced one centimetre laterally to the gastrojejunostomy. A 75-foot mark is made 75 feet from the anastomosis, and eterotomies are made at the anterior and Roux limbs with the Harmonic® or the Hook®. A 60mm blue cartridge was used to staple the proximal jejunal limb to form a side-to-side anastomosis. Utilizing 2/0 absorbable V-lock® sutures, the enterotomy sites were meticulously closed.

Figure 6. The jejunum's staple line.

Figure 7. Developing the entero-enterostomy platform.

Postoperative work and follow-up:

Thorough monitoring of vital signs (including admission to the intensive care unit if necessary), chest physiotherapy, early mobilization encouragement, low molecular weight heparin during hospitalization, effective pain management, and evaluation of wound complications.

The patient is discharged once they have completed full ambulation and are taking their oral fluids correctly; the patient is also correctly educated about their dietary plan, and the drain is removed once no leaking has been observed. The following are the scheduled follow-up appointments following discharge: weekly, monthly (3), (6), and (12) months.

Statistical Analysis:

The data was input into the Statistical Package for the Social Sciences (IBM SPSS) version 23 after it had been edited, coded, and gathered. When the quantitative data were parametric, it was shown as a mean plus standard deviation plus range. Numbers and percentages were also used to represent qualitative characteristics. The Chi-square test was used to compare the groups using qualitative data. The independent t-test was used to compare two groups with quantitative data and a parametric distribution. We allowed a 5% margin of error and put the confidence interval at 95%. Accordingly, the following is why the p-value was deemed significant: Important, highly significant, and not significant (P>0.05, P<0.05, and P<0.01, respectively).

3. Results

Table1. Comparison of demographic information between the Roux-en-Y and sleeve groups.

		SLEEVE GROUP	ROUX-EN-Y GROUP	TEST VALUE	P-VALUE	SIG.
		No=25	No=25			
GENDER	Females	15(60.0%)	22 (88.0%)	5.094*	0.024	S
	Males	10(40.0%)	3 (12.0%)			
AGE (YEARS)	Mean±SD	42.48±9.23	44.36±8.81	-0.737•	0.465	NS
	Range	22-58	27-59			

If the P-value is less than 0.05, it is considered significant; if it is less than 0.05, it is considered highly significant.Independent t-test; chi-squared test

Gender differences between the groups under study were statistically significant (p-value = 0.024), whereas mean age differences between the groups were not statistically significant (p-value = 0.465), (table 1; figure 8).

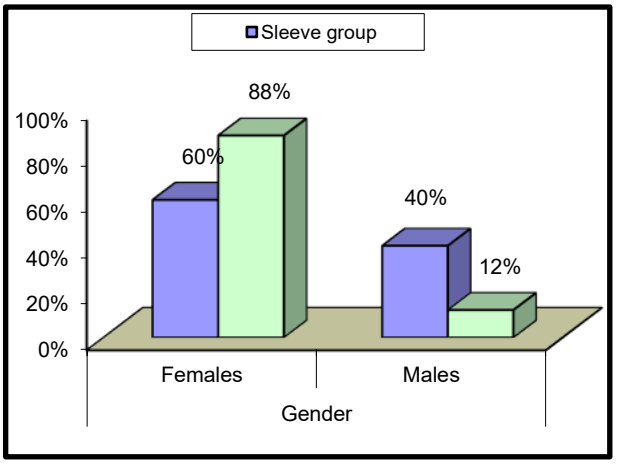

Figure 8. Comparison between sleeve group and Roux-en-Y group regarding gender.

Table 2. Comparison of excess body weight (kg) between the Roux-en-Y and sleeve groups.

		SLEEVE WITH CRUROPLASTY	ROUX-EN-Y GASTRIC BYPASS	TEST VALUE	P-VALUE	SIG.
		No=25	No=25			
EBW (KG)	Mean±SD	52.71±16.73	59.62±19.09	-1.362•	0.179	NS
	Range	29.2-94.5	31.9-99.3			

P>0.05 indicates non-significant, P<0.05 indicates significant, and P<0.01 indicates highly significant. The t-test is independent

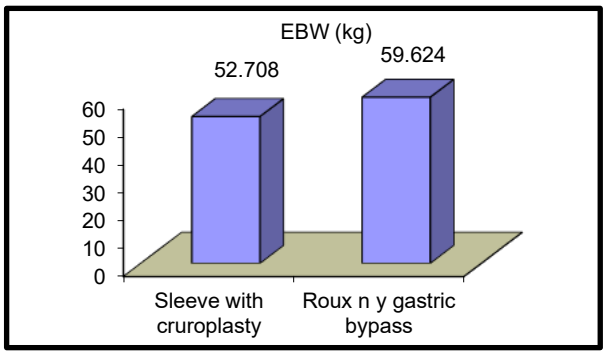

Figure 9. Comparison between sleeve group and Roux-en-Y group regarding excess body weight (kg).

Table 3. Comparison of the pre-operative endoscopic reflux grade between the sleeve group and the Roux-en-Y group

PRE-ENDOSCOPIC REFLUX GRADE	SLEEVE GROUP	ROUX-EN-Y GROUP	TEST VALUE	P-VALUE	SIG.
	No=25	No=25			
A	10(40.0%)	3(12.0%)	5.094*	0.024	S
B	15 (60.0%)	22(88.0%)			

P-value>0.05:Non-significant; P-value<0.05: Significant; P-value<0.01:Highly significant *:Chi-square test

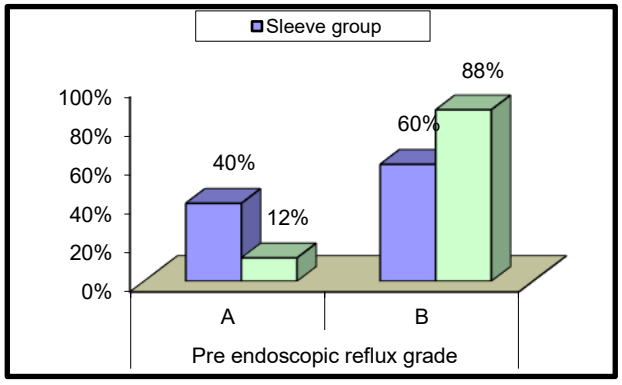

Figure 10. Comparison between sleeve group and Roux-en-Y group regarding pr- operative endoscopic reflux grade.

Table 4. Comparison between sleeve group and Roux-en-Y group regarding excess body weight loss(kg).

EBW LOSS(KG)		SLEEVE WITH CRUROPLASTY	ROUX-EN-Y GASTRIC BYPASS	TEST VALUE•	P-VALUE	SIG.
		No=25	No=25			
AT 1-MONTH(KG)	Mean±SD	7.50±2.59	8.24±2.32	-1.072	0.289	NS
	Range	3-13.76	5.01-13.56			
AT 3-MONTH(KG)	Mean±SD	13.24±4.53	16.58±5.44	-2.355	0.023	S
	Range	6.85-24.58	8.2-27.96			
AT 6-MONTHS(KG)	Mean±SD	21.18±7.25	26.90±8.82	-2.503	0.016	S
	Range	10.96-39.32	13.3-45.35			
AT 1-YEAR(KG)	Mean±SD	31.77±10.88	38.51 ± 12.63	-2.023	0.049	S
	Range	16.44-58.98	19.05 – 64.94			

P>0.05 indicates non-significant, P<0.05 indicates significant, and P<0.01 indicates highly significant. The t-test is independent

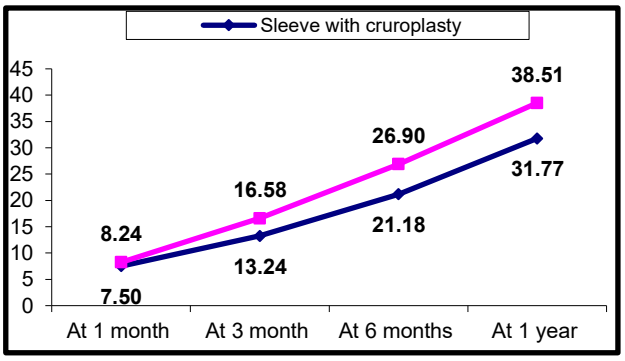

Figure 11. Comparison between sleeve group and Roux-en-Y group regarding excess body weight loss(kg).

Table 5. Comparison of the sleeve group with the Roux-en-Y group with respect to the alleviation of reflux symptoms after surgery.

IMPROVEMENT		SLEEVE GROUP		ROUX-EN-Y GROUP		TEST VALUE*	P-VALUE	SIG.
		No.	%	No.	%			
1-MONTH	Non-Improved	16	64.0%	4	16.0%	12.000	0.001	HS
	Improved	9	36.0%	21	84.0%			
3-MONTH	Non-Improved	10	40.0%	3	12.0%	5.094	0.024	S
	Improved	15	60.0%	22	88.0%			
6-MONTH	Non-Improved	11	44.0%	4	16.0%	4.667	0.031	S
	Improved	14	56.0%	21	84.0%			
1-YEAR	Non-Improved	11	44.0%	3	12.0%	6.349	0.012	S
	Improved	14	56.0%	22	88.0%			

At one month, three months, six months, and a year, the Roux-en-Y group experienced a greater improvement in reflux symptoms than the sleeve group (p-values = 0.001, 0.024, 0.031, and 0.012, respectively), (table 5; figure 12).

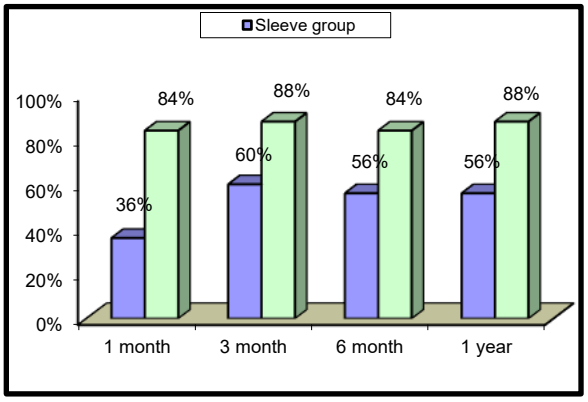

Figure 12. Comparison between sleeve group and Roux-en-Y group regarding postoperative symptomatic improvement of reflux.

4. Discussion

Gastric bypass surgery, or bariatric surgery, is an option for those who are morbidly obese. It provides the sole practical option for achieving sustainable weight loss and alleviating or improving comorbidities such as Type 2 diabetes, hypertension, and gastroesophageal reflux disease. Surgeons discovered that weight loss treatments alleviated symptoms for many

individuals with severe obesity and gastroesophageal reflux disease (GERD).[6]

The effects of LSG or RYGB on obesity and weight loss have been documented in numerous studies. Both procedures had been compared in earlier research. In a research that compared Abdel-Razik et al.,[7] during the course of 50 patients. In terms of weight loss, they found that RYGB was better than LSG, but when it came to post-operative problems like reflux, they didn't find any significant difference.

We found that three patients in the cruroplasty group experienced a worsening of GERD symptoms at LSG, which is consistent with the findings of the study by Peterli et al.,[8]. 117 patients were randomly assigned to get either LSG or RYGB. While there was no significant difference in excess body mass index (BMI) loss between the two groups, the LSG group experienced less GERD remission and more severe reflux symptoms.

Patients whose GERD symptoms worsened or persisted after surgery were requested to participate in oesophageal manometry and 24-hour pH monitoring tests. They were also instructed to continue taking their medication as usual until the studies were finished.

The results of LSG combined with cruroplasty, however, have been the subject of a few research[9] looked at just 58 individuals who had LSG with cruroplasty; 15.5% of those patients had reflux symptoms before the procedure. While 15.6% experienced the emergence of reflux symptoms after surgery, only 34.6% reported a complete disappearance of their symptoms.

Having said that, one meta-analysis conducted by Chen et al.[10] included 11 studies, including 937 patients, which were considered for inclusion. With 68% of cases experiencing GERD remission and 12% experiencing new GERD, there was a notable decrease in GERD symptoms (OR: 0.20; 95% CI: 0.10 to 0.41; P<0.00001). Findings from de novo GERD patients comparing LSG plus cruroplasty to LSG alone show no difference.

Attia[11] 53 individuals who had LSG and cruroplasty were the subjects of the study. According to his findings, LSG with cruroplasty leads to healthy weight loss and positive results in GERD symptoms, with 56 percent of patients experiencing remission and 26 percent reporting improvement.

In those who are extremely overweight, GERD is a prevalent medical condition. There are numerous possible explanations for this, including elevated intra-abdominal pressure and greater exposure to oesophageal acid. According to numerous specialists, LRYGB is the best surgical procedure for controlling GERD and achieving long-term weight loss.[7]

LSG has recently become more popular than LRYGB for a number of reasons, including the fact that it is speedier, less technically difficult, and thus linked with fewer postoperative problems. Despite the fact that research has shown no discernible difference in weight reduction compared to LRYGB. Patients with gastroesophageal reflux disease (GERD) often experience contentious outcomes when treated with LSG. One possible side effect of LSG is acid reflux, which might be worsened or start up again. If this happens, the risk of Barrett's metaplasia could rise.[8]

One of the surgical options studied to avoid de novo GERD following LSG is cruroplasty.12 The primary goal of this technique is to stop reflux by closing the oesophageal hiatus with stitches. The outcomes differ among specialists. Opinions on the effectiveness of this technique in preventing reflux vary; some find it particularly useful when combined with absorbable mesh, while others find no benefit to it at all.[11]

As far as anyone can tell, LSG and cruroplasty have conflicting results. Compared to LSG alone, the combination of LSG plus cruroplasty undoubtedly results in more acceptable weight loss and relief of GERD. The short sample size of our study was a limitation; as a result, the distribution of GERD severity across the two groups was impacted, and the LRYGB group had a higher number of patients with severe GERD.

4. Conclusion

Although LSG with cruroplasty is not as effective as LRYGB in reducing GERD symptoms and severity at one year post-surgery, it does a good job of helping patients lose weight and feel better overall.

Disclosure

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Authorship

All authors have a substantial contribution to the article

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Conflicts of interest

There are no conflicts of interest.

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