

SHORT AND MID-TERM MEDICAL OUTCOMES OF SLEEVE GASTRECTOMY IN OBESITY IN SULAIMANI CITY. AN ANALYTICAL CROSS-SECTIONAL STUDY

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ABSTRACT

Background

The laparoscopic sleeve gastrectomy (LSG) is a frequently performed bariatric procedure. Studies indicate that LSG can facilitate successful and sustainable weight loss.

Objectives

To examine the short-term (weight reduction) and mid-term (weight maintenance, quality of life, and medical conditions) outcomes following sleeve gastrectomy in Sulaimani.

Patients and Methods

A cross-sectional study was conducted on 114 participants from both high-quality and Zhyan hospitals in Sulaimani. From Feb 3, 2020, to Jul 22, 2021, data was gathered by evaluating the patient data records of 114 patients. Data included patients' demographics, preoperative BMI & comorbidities, complications, and weight loss in the first week, second, 4th, sixth months, and sixth months. Also, after the sixth month, complications were recorded and analyzed by SPSS software (IBM, version 25), including frequency and percentage, mean, and standard deviation, also obtained for parametric data. The associations between the variables were tested at a P value <0.05.

Results

The study consists of 114 patients (71.9% female and 28.1% male), with an average age of 34.0 years (range 20- 51 years). The average preoperative BMI and weight were 41.2 kg/m² and 110.80 kg, respectively. Six months after surgery, the average \pm SD of BMI was 32.8 kg/m² \pm 2 4.5, and the average \pm SD of weight was 87.8 kg \pm 14.4. The prevalence of early postoperative problems (leak, upper GI bleeding, and intraperitoneal hemorrhage) among 114 patients was 0.9% for each complication, while the proportion of early postoperative nausea was 66.7%, and vomiting was 39.5%. Preoperative sleep apnea was 34.2%; after six months of surgery, the percentage was 0%; 19.3% of patients had joint pain; after six months of surgery, the percentage was 0.9%. In addition, 14 out of 114 patients (12.3%) had preoperative Hypertension, and 2 out of 114 patients (1.75%) had diabetes; after six months, 50% of both groups discontinued medical treatment. The incidence of gallstone development six months after surgery was 13.2%. Six months following LSG, 68.4% of individuals had hair loss.

Conclusion

laparoscopic sleeve gastrectomy can considerably reduce BMI six months following surgery and may help improve or eliminate obesity-related comorbidities such as Hypertension and type 2 diabetes. A laparoscopic sleeve gastrectomy is an effective option for obese adults, resulting in significant weight loss with a low incidence of postoperative complications. LSG could be recommended as a valuable single intervention therapy for patients who typically fail to achieve and obtain real benefits from a structured weight loss program.

Keywords: *Obesity, sleeve gastrectomy, medical outcomes.*

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INTRODUCTION

The twenty-first century is known for the increased use of technology to save time and increase work efficiency, reducing the energy spent on daily responsibilities. In addition, changes in eating habits and the availability of ready foods have significantly impacted daily life. As a result, the prevalence of obesity has skyrocketed. Obesity is a medical condition in which excess body fat causes increased health problems and a shorter life expectancy ⁽¹⁾. For many years, the problem has been persistent among adults, with an upward trend, but it has recently spread to children and adolescents ⁽²⁾. Obesity is defined by the National Health Service (NHS, 2022) as the accumulation of excess fat in the body, such that a person's body mass index (BMI) exceeds the desirable weight-to-height ratio. BMI is widely regarded as a risk factor for obesity. It is defined mathematically as body weight in kilograms divided by height in meters squared. Obesity is a body mass index (BMI) greater than 30. Childhood obesity is linked to many conditions, including Hypertension, hyperinsulinemia, impaired glucose tolerance, type 2 diabetes, dyslipidemia, nonalcoholic fatty liver, sleep apnea, gastroesophageal reflux, and others ⁽³⁾.

Nowadays, more emphasis is placed on prevention than treatment; however, with such a high morbid obesity rate, a focus on treatment is required. The first approach is to consider lifestyle changes such as diet, exercise, and behavioral therapy. However, evidence suggests that behavioral interventions only achieve minor weight loss, usually maintained for a short period ⁽⁴⁾. There is also the option of incorporating pharmacological treatment, resulting in greater weight loss than diet alone; however, side effects and patient compliance must be considered ⁽⁵⁾. Bariatric surgery has been the most effective way of managing adult obesity and has resulted in clinically significant weight loss ⁽⁶⁾. Several bariatric surgeries are used worldwide, but they can be classified into two major groups. The first group is restrictive, and food intake is limited by shrinking the stomach. The second adds a malabsorptive component - the duodenum is shortened, and the point at which it connects to the stomach is changed, limiting the amount of food digested. The most common procedures among adults are gastric bypass (malabsorptive type) and adjustable gastric banding (restrictive type). Adjustable gastric banding (AGB) is considered less invasive and more reversible than other surgeries, whereas gastric bypass (GBY) is irreversible ⁽⁷⁾.

The majority of bariatric procedures are now performed laparoscopically. The laparoscopic adjustable gastric banding technique necessitates using an external band wrapped around the stomach to reduce its size and may be adjusted over time. LAGB is a relatively new, reversible, easier-to-perform method with fewer malnutrition complications, so it appears to be a promising way to treat severely obese adolescents ⁽⁸⁾. This study aimed to assess the short-term (weight loss) and mid-term (weight maintenance, QOL, and medical conditions) outcomes of bariatric surgery in Sulaimani.

METHODS

A cross-sectional study was conducted to determine the short-term (weight reduction) and mid-term (weight maintenance and medical issues) effects of sleeve gastrectomy in Sulaimani. Subjects were recruited from a single obesity treatment center. Data were collected from Feb 3, 2020, to Jul 22, 2021, by examining the patients' records.

Recruitment

Subjects were selected from the medical records of a single obesity treatment center and medical and demographic data. By contacting the patients, further information was acquired. A structured questionnaire was utilized to collect the necessary patient information. Before the study began, consent forms and respondent information sheets were delivered to the successfully recruited individuals.

Inclusion requirements

Patients older than 18 years of age and either gender were included in the current study. Patients had had LSG, had not previously undergone bariatric surgery, and attended a follow-up visit six months after. Men and women

Criteria for exclusion

- Currently receiving psychiatric advice or medication
- Patient had yet to complete six months of surgical follow-up.

Principal outcome

The primary endpoint of this study was the mean weight loss and BMI overall reduction in bariatric surgery at three months, six months, and one and a half years. Changes in blood glucose and blood pressure were the secondary outcome for people with type 2 diabetes

and Hypertension. The result was the distribution of complications (short and long-term) following the surgery.

Statistical analysis

We transferred the data from a Microsoft Excel spreadsheet to IBM SPSS version 22.0 software. For the Categorical and continuous variables, frequency, mean, and percentage were calculated. An Independent T-test was used to determine the mean difference between the participant’s weight and BMI reduction. A P-value less than 0.05 was considered statistically significant.

RESULTS

A total of 114 patients enrolled in the current study. The mean ± SD of age, weight, and Body Mass index were 34.2 ± 7.4, 110.8 ± 19.9, and 41.2 ± 6.8, respectively. Most of the patients were female, 71.9%. The early symptom of the enrolled patients was that 12.3 % had Hypertension, 1.75% had type 2 diabetes mellitus, 19.3% had joint pain, and 34.2 % had sleep apnea, respectively. The finding shows that most patients had moderate pain after the surgery (59.0%). The most common symptom after the surgery was nausea, vomiting, and dyspnea, with 66.7%, 39.5%, and 9.6%, respectively. Findings also demonstrated that staple line leak after the operation, upper GIT bleeding, and intraperitoneal bleeding were rarer (0.9%) Table (2). The current study showed that the main late symptoms after the Sleeve Gastrectomy were Gall stone, hair loss, and epigastric pain (13.2%), (68.4%), and (6.1%) respectively. However, other symptoms such as; Vomiting, Gastroesophageal Reflux Disease (GERD),

Sleep apnea, joint pain, and Psychological Upset were less common (0.9%), (1.8%), (0.0%), (0.9%), and (0.0%) respectively. Data also indicated that half of the patients who had Hypertension and diabetes were withdrawn from their medications Table 3. One of the main outcome variables, weight and BMI changes after the surgery, was found that the weight and the BMI were significantly reduced after the surgery, and this reduction was observed throughout the follow-up. The highest reduction was in the first year, p-value <0.001. Table 4. This figure shows the Mean percentage of weight change after one year of sleeve gastrectomy, and it was clear that a significant weight reduction was observed though out of the study period; the highest reduction was observed during the first six months, but the weight reduction was decreased after the six months and reach 5 kg during the second 6 months. This figure shows the Mean percentage of BMI changes during the first year of sleeve gastrectomy. It was clear that a significant BMI reduction was observed throughout the study period, and the highest reduction was observed during the first six months. However, the removal of BMI decreased after six months and reached a mean of 6.0 kg/m2 during the second 6 months, whereas it was 15.40 kg/m2 in the first six months. The results also showed that males significantly reduced their weight and BMI compared to females; for instance, the mean reduction of the weight for males from 6 months to 1 year was 7.9kg, whereas for females was 5.9kg, and the p-value was 0.01. This reduction was also observed for the BMI, and the p-value was 0.04.

Table 1. Demographical presentation of the patients.

Characteristics of the patients	Number	%
Gender		
Male	32	28.1
Female	82	71.9
Hypertension		
Yes	14	12.3
No	100	87.7
Diabetes mellitus (type 2)		
Yes	2	1.75
No	112	98.5
Joint pain		
Yes	22	19.3
No	92	80.7
Pre-operation sleep apnea		
Yes	39	34.2
No	75	65.8
Mean ±SD of Age	34.2 ± 7.4	
Mean ±SD of weight	110.8 ± 19.9	
Mean ±SD of Body Mass Index	44.2 ± 6.8	

Table 2. Distribution of (immediate, within one week) symptoms after the operation.

Early symptoms after surgery	Number	%
Pain		
Mild	41	36.0
Moderate	65	59.6
Sever	5	4.4
Nausea		
Yes	76	66.7
No	38	33.3
Vomiting		
Yes	45	39.5
No	69	60.5
Dyspnea		
Yes	11	9.6
No	103	90.4
Staple line leak after the operation		
Yes	1	0.9
No	113	99.1
Upper GIT bleeding		
Yes	1	0.9
No	113	99.1
Intraperitoneal bleeding		
Yes	1	0.9
No	113	99.1

Table 3. Distribution of late complications (six months) after sleeve gastrectomy.

Late complications after surgery	Number	%
Gall stone		
Yes	15	13.2
No	93	81.6
Hair loss		
Yes	78	68.4
No	36	31.6
Epigastric pain		
Yes	7	6.1
No	107	93.9
Vomiting		
Yes	1	0.9
No	113	99.1
Gastroesophageal Reflux Disease (GERD)		
Yes	2	1.8
No	112	98.2
Sleep apnea		
Yes	0	0.0
No	114	100.0
Joint pain		
Yes	1	0.9
No	113	99.1
Psychological Upset		
Yes	0	0.0
No	114	100.0
Anti-Hypertension Drug Withdrawal		
Yes	7	50.0
No	7	50.0
Type 2 diabetes mellitus drugs withdrawal		
Yes	1	50.0
No	1	50.0

Table 4. Distribution of weight and Body mass index (BMI) change over the one year.

Weight change	Mean ± SD	BMI change	Mean ± SD
Weight at baseline	110.8 ± 19.9	BMI at baseline	41.2 ± 6.8
Weight in the first month	105.8 ± 19.4	BMI in the first month	39.4 ± 5.6
Weight in the second month	100.15 ± 18.2	BMI in the second month	37.3 ± 5.4
Weight in the fourth month	93.26 ± 16.4	BMI in the fourth month	34.7 ± 4.9
Weight in six months	87.8 ± 14.4	BMI in six months	32.8 ± 4.5
Weight in the first year	82.2 ± 14.1	BMI in the first year	30.6 ± 4.4
P value	<0.001	<0.001	

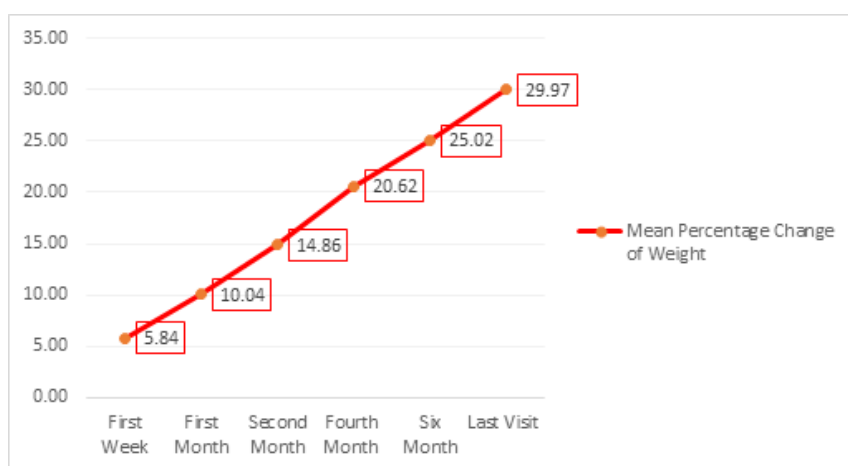


Figure 1. Mean percentage of weight change after one year of sleeve gastrectomy from baseline.

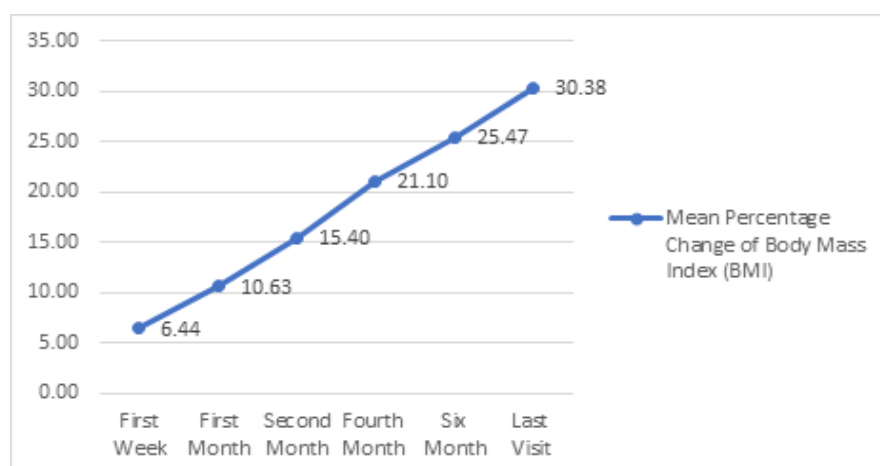


Figure 2. Mean percentage of BMI change after one year of sleeve gastrectomy from baseline .

Table 5. Gender difference in the mean percentage of weight and BMI after sleeve gastrectomy.

	Gender	Mean	Std. Deviation	P value
Percentage of Weight Change first year	Male N= 32	7.9	6.1	0.01
	Female N= 82	5.9	2.6	
Percentage of BMI change in the first year	Male N= 32	32.5	8.6	0.04
	Female N= 82	29.5	6.3	

DISCUSSION

Laparoscopic sleeve gastrectomy is a successful and reliable bariatric procedure that has grown globally ⁽¹⁰⁾. Since 2005, the LSG has been described as a standard-alone surgical therapy for obesity ^(11,12). Although it is technically simpler to carry out than other types of bariatric surgery, the results are comparable ^(11,13). Since the gastric fundus, where most of the human ghrelin is produced, is removed after LSG, this procedure can greatly reduce appetite. Following a drop in plasma ghrelin levels, growth hormone secretion and the urge to eat will significantly reduce ⁽¹⁴⁾. This study details an 18-month follow-up of 114 patients who had sleeve gastrectomy as a standalone treatment from Feb 3, 2020, to Jul 22, 2021. Age, weight, and Body Mass Index had mean SD values of 34.2 7.4, 110.8 19.9, and 41.2 6.8, respectively. Patients in the research were mostly women (71.9 percent). For adults, laparoscopic sleeve gastrectomy may be a significant intervention in lowering BMI and weight. ⁽¹⁵⁾ These findings agreed with those of earlier research. One study, for instance, involved extremely obese patients who underwent LSG. The results revealed that after one year of follow-up, patients who underwent LSG had a substantial mean weight SD drop from 161.42 34.3 to 112.91 25.55 kg (p 0.01) and a significant mean SD of BMI decrease from 57.5 9.55 to 39.85 7.1 kg/m² (p 0.01). ⁽¹⁶⁾ According to a different study, the mean BMI significantly decreased after surgery, going from (mean SD) 47.23 7.89 kg/m² pre-operatively to 36.74 7.74 kg/m² post-operatively (P-value 0.001). The mean SD of weight alone decreased from 134.68 27.17 kg pre-operatively to 104.50 26.95 kg post-operatively, which is statistically significant (P-value 0.001). After an average follow-up (postoperative period) of roughly 7.2 months (SD = 5 months), these results were discovered ⁽¹⁵⁾.

After one year of follow-up, our study's mean weight SD fell from 110.8 19.9 to 82.2 14.1 kg (p 0.001), and the mean SD of BMI reduced from 41.2 6.8 to 30.6 4.4 kg/m² (p 0.001). The most crucial element that determines if bariatric surgery is successful is the percentage of excess weight lost (percent EWL) ⁽¹²⁾. In a systematic evaluation of 54 articles, Fischer et al. calculated a mean EWL of 59 percent at one year (30-83 percent) ^(17,18). According to the authors, the peak EWL occurred 24 and 36 months after surgery. It is impossible to make a trustworthy claim about the EWL course in our patients following LSG due to the short follow-up duration in our study (>6 months -18 months). In our study, the mean excess weight loss percentage (percent EWL) after one year was 29.97%, and the mean BMI change percentage after one year of LSG was 30.38%.

Studies have generally shown that significant improvements in or remissions of diabetes indicators were frequently seen following bariatric surgery and improvements in co-morbid disorders following LSG ⁽¹⁵⁾. For example, after a few months after LSG, about half of our patients who had type 2 diabetes Mellitus before surgery experienced complete remission more than six months after surgery. The remission rates aligned with encouraging data from Yu et al.'s meta-analysis ⁽¹⁹⁾, which comprised 6373 diabetic patients following various bariatric procedures and had a follow-up of more than two years revealed that 89 percent of the patients had improved glycemic control and that 64.7% had completely cured themselves of type 2 diabetes. One of the most dangerous cardiovascular illnesses to human health is Hypertension. Weight loss has long been believed to be an effective treatment for Hypertension, but there is growing evidence that bariatric surgery also lowers blood pressure ^(15,20). Studies on long-term follow-up following bariatric procedures showed varying complete remission rates

of HTN, ranging between 48 percent and 86 percent depending on baseline features and various definitions of remission. Hypertension was cured in 50% of our patients six months after LSG. GERD is significant comorbidity that may be affected by LSG; in this study, two patients (1.8%) out of 114 patients who did not previously have GERD developed this disorder post-operatively; this is a significantly lower percentage than the postoperative GERD rate in a study by Michael et al. ⁽²¹⁾ in which 36.7 percent of patients were affected.

Most of the articles mentioned above and others describe GI symptoms in the several months after surgery. Our data shows a relatively high rate of early postoperative nausea in 66.7 percent and vomiting in 18.7 percent of patients. Various GI symptoms are common after bariatric surgeries and may affect the quality of life. Postoperative emesis, mainly due to inappropriate diet, was previously described in 30-60 percent of the patients with gradual remission during several months ^(22,21). Another intriguing finding in our study was the prevalence of alopecia six months after LSG, with up to 68.4% of patients reporting this symptom. Alopecia was previously described primarily in the first year following bariatric surgery. Hair loss is thought to be caused by rapid weight loss, a lack of protein, and a lack of certain vitamins (iron, zinc, and biotin). ^(22,21,23). The incidence of hair loss in the first year after LSG was determined to be 72 percent in an O et al. ⁽²³⁾ study. Hair loss occurred in 79 percent of patients between 3 and 4 months and lasted an average of 5.5 months. Hair loss in these patients was observed to stop after biotin supplementation. In their study of 118 patients, Bruginsky discovered hair loss in 17% of the patients after surgery and found that hair loss stopped in all patients after the administration of 100 mcg of biotin.

Gallstones are a common complication after rapid weight loss from LSG. However, the incidence of complicated stones is low because most patients with new gallstones remain asymptomatic in the short term. ⁽²⁴⁾ A previous study found that the risk of gallstone formation during active weight loss increases dramatically above 1.5 kg per week ⁽²⁵⁾. Although changes in gallbladder bile composition with increased content of bile mucin have been reported, the mechanisms by which weight loss periods—due to a very low-calorie diet or bariatric surgery—actually promote gallstone formation remain unknown ^(26,24). Most current studies on postoperative gallstone formation are retrospective and focus on a follow-up period ranging from months to 5 years after bariatric surgery ^(26,24). In our study, the rate of

symptomatic gallstones during the first six months after surgery was 13.2 percent. In a study conducted on 253 patients by Manatsathit et al. ⁽²⁷⁾, the incidence of symptomatic gallstones was 22.9 percent (22/96), including 13 patients with biliary colic, five patients with cholecystitis, three patients with obstructive jaundice, and one patient with pancreatitis. In Yousef et al. 's study ⁽²⁴⁾, seven of 40 patients developed gallstones after one year of Sleeve Gastrectomy surgery (17.5 percent).

Major complications after LSG were uncommon (2.5%); however, LSG has an excellent safety profile, with an overall mortality rate of 0.07 percent. Postoperative staple line leak and bleeding were both less than 1% ⁽⁷⁾, but gastric leaks can occur in up to 5% of LSG patients and are classified as early (within three days of surgery) or late (more than eight days after surgery) ^(11,28). The percentage of 30-day mortality, as reported in the study's review by Diamantis et al., was 0.2 percent ⁽²⁹⁾. Both post-LSG leak and bleeding from the staple line were 0.9 percent in our study. Nath et al. ⁽²⁹⁾ discovered a 2% postoperative gastric bleeding rate in 100 patients after LSG. Our patient with bleeding from a staple line was diagnosed clinically and via trans-abdominal, which revealed intra-abdominal collection around the spleen, and was treated conservatively before being discharged on postoperative day 3. A severe complication of sleeve gastrectomy is a gastric leak. The gastric leak from the staple line may occur due to a change in the normal healing process. Local risk factors include inadequate blood supply, which leads to poor suture line healing, and ischemia caused by electrocautery ⁽³²⁾. Bashah et al. ⁽³¹⁾ reported a 0.4 percent leak after primary LSG and a 0.6 percent leak after revisional LSG in 4250 patients. Because of poor tissue vascularity and delayed healing, the risk of post-LSG is higher in revisional surgeries.

Similarly, Moy et al. ⁽³²⁾ reported a 1.4 percent leak rate after LSG in 135 super-obese patients (mean BMI, 60.1 kg/m²). The proximal third of the stomach is the most common location for gastric leaks, accounting for approximately 85 percent of all cases. The treatment options considered the leak's classification as early or late. Only 97.1 percent of CTs revealed an intra-abdominal collection in patients who had undergone LSG and had a suspicious clinical picture ⁽³¹⁾. Patients who do not appear well after bariatric surgery should raise the suspicion index of a leak, according to the surgeon's clinical judgment. Unstable patients required immediate surgical wash and drainage. After seven postoperative days, our patient complained of shoulder

pain, and an abdominal CT scan revealed an intra-abdominal collection in the left sub-diaphragmatic region. The patient was conservatively treated with percutaneous drainage under US guidance and broad-spectrum antibiotics. However, unfortunately, the patient's condition deteriorated, resulting in severe shoulder pain, tachycardia, and shortness of breath, a laparoscopic washout for abscess collection, and a drain placed seven days after the second operation; after removing the drain, the patient's symptoms returned. He complained of severe left shoulder pain and a productive cough. A new CT Scan of the abdomen and chest revealed a gastric leak and a fistula to the left lower bronchus, an endoscopic fully covered esophageal stent was placed, and conservative fistula treatment was initiated. An upper GI series was performed after two days, which unfortunately revealed stent migration⁽²⁸⁾. The stent was removed via endoscopy, and the patient was discharged from the hospital after six weeks. Roux-en-Y gastrojejunostomy for fistula site performed with feeding jejunostomy and drain placed in the left sub-phrenic region, TPN started for five days after the operation, and enteral feeding through jejunostomy tube started after five days. Bashah et al.^(30,31) assume that 97.1 percent of patients healed their leaks without requiring surgical conversion.

In conclusion, six months following laparoscopic sleeve gastrectomy, the BMI can be drastically reduced. It may help alleviate or eliminate obesity-related comorbidities such as Hypertension and type 2 diabetes. LSG is an excellent treatment option for obese people, resulting in considerable weight loss with few complications. LSG could be advised as a beneficial and single intervention therapy for patients who typically fail to achieve and get substantial advantages from an organized weight loss program.

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