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Postoperative Late Gastrointestinal Symptoms Following Laparoscopic Sleeve Gastrectomy

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ABSTRACT

Background: Laparoscopic sleeve gastrectomy (LSG) has emerged as a preliminary technique for high-risk patients before undergoing a more intricate surgery.

Aim: To assess late GI symptoms after LSG including reflux, vomiting, diarrhea, constipation, etc.

Patients and methods: This was a combined prospective and retrospective trial included a total of fifty individuals The retrospective part included 30 patients from January 2020 till December 2020, whereas the prospective part included the remaining 20 cases from January 2021 till January 2022 at General Surgery Department, Mansoura University Hospitals, Mansoura, Egypt. **Results:** Oral intake was allowed after a mean duration of 1.22 days, while the duration of hospitalization had a mean value of 3.28 days. No patients developed bleeding or leakage in our study. However, only one patient had transient vomiting (2%) that was conservatively managed by IV fluids and antiemetics. The sleeve procedure was associated with a significant improvement in body weight manifested by the increased % excess weight loss (EWL) with time. Suter questionnaire and Bristol scale showed a significant decline after the procedure indicating decreased food tolerance after the procedure ($p < 0.001$).

Conclusion: LSG was associated with excellent weight loss outcomes, low morbidity rates, and marked improvement of obesity-associated comorbidities. Nonetheless, it was associated with a marked negative impact on food intake and bowel habits, manifested in the decreased quality of food ingestion, increased tendency for constipation, and increased burden of reflux symptoms.

Keywords: Postoperative, Gastrointestinal symptoms, Laparoscopic sleeve gastrectomy

INTRODUCTION

In 1997, the World Health Organization (WHO) classified obesity, a recognized global health issue, as an epidemic [(1)].

Major co-morbidities, including cardiovascular disease and type 2 diabetes mellitus (T2DM), are more likely in people with an elevated body mass index (BMI). Issues affecting the joints, cancer, and degenerative diseases [(2)]. In 2019, the "100 million health" survey was administered in Egypt, screening 49.7 million adult Egyptians (≥ 18 years old). As per the survey, 39.8% of adult Egyptians were obese (BMI ≥ 30 kg/m^2) [(3)].

The current state of the art in the treatment of obesity and its associated complications is bariatric surgery [(4)]. Laparoscopic sleeve gastrectomy (LSG) has emerged as a preliminary technique for high-risk patients before undergoing a more intricate surgery. Over the past decade, it has been conducted as an independent technique and has achieved significant global appeal [(5)]. The fundus is removed and 75 to 80% of the larger curvature is excised during that operation, leaving a small stomach tube [(6)].

Dietary intake, weight reduction, metabolic rate, and defecation stereotypes are all profoundly affected by bariatric surgery. Some studies have shown that individuals who undergo malabsorptive operations, like biliopancreatic diversion (BPD) or Roux-en-Y gastric bypass (RYGB), are more likely to have diarrhea and fecal incontinence after the operation than they were before [(7)].

Data on the late gastrointestinal effects of LSG, such as gastroesophageal reflux disease (GERD) emesis, constipation, diarrhea, and food intolerance, is rather lacking, despite the procedure's high incidence [(8)]. That is why we conducted the present study. This study aimed to assess late GI symptoms after LSG including reflux, vomiting, diarrhea, constipation, etc.

PATIENTS AND METHODS

This was a combined prospective and retrospective trial included fifty individuals. The retrospective part included 30 patients from January 2020 till December 2020, whereas the prospective part included the remaining 20 cases from January 2021 till January 2022 at General Surgery Department, Mansoura University Hospitals, Mansoura, Egypt.

For retrospective group of the study

All patients were subjected to the following:

Data collection included: Preoperative data [Age, gender, height, weight, BMI, disorders associated with obesity (diabetes, hypertension, hyperlipidemia, and GERD), previous attempts of weight loss, ASA class, preoperative hemoglobin, albumin, HbA1c, and vitamin B12 levels as well as preoperative Suter questionnaire and Bristol scale.

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Intraoperative data: Operative time, blood loss, distance from pylorus from which devascularization was started, number of cartridges, need for intraoperative blood transfusion and size of the inserted bougie**.**

Postoperative data: Duration of hospitalization, duration to start oral intake and early postoperative complications including bleeding, leakage, and transient vomiting.

Follow-up data (measured one, three, and six months after the operation): BMI, %EWL, Albumin, hemoglobin, HbA1c, and vitamin B12 levels as well as Suter questionnaire and Bristol scale. Also, changes in obesity-related comorbidities including diabetes, hypertension, dyslipidemia, and GERD and Incidence of denovo GERD in patients without preoperative GERD.

For the prospective group of the study

Inclusion criteria: Aged from 18 to 60 years, both genders were included, BMI ≥ 40, or ≥ 35 with ≥ one of obesity-related co-morbidities for example hypertension, type II diabetes (T2DM), sleep apnea & other respiratory disorders.

Exclusion criteria: Unfitness for the surgical operation, refusal of follow up, previous bariatric operation, recurrence and weight regain, patients with psychological problems and patients with marked restriction of pulmonary functions.

All patients were subjected to the following:

Patient evaluation: History (Personal history**,** dietary history**,** obesity history)**,** sequelae of obesity **(**Diabetes mellitus, cardiovascular problems, respiratory disorders), gastrointestinal system assessment, diseases of the reproductive system & gynecology, orthopedic & rheumatologic problems, urinary incontinence, neurological complications and Psychological disabilities.

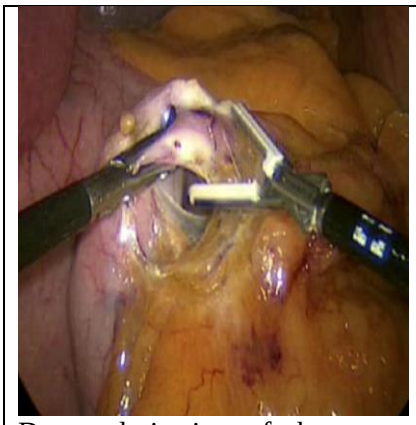
Clinical examination: General examination**,** routine abdominal examination**,** anthropometric measurements of weight, laboratory workup**,** upper GI endoscopy**,** pelviabdominal ultrasonography and anesthetic consultation **[**All cases were evaluated by anesthetic team as well as they were categorized in relation to ASA score system for physical status (American Society of Anesthesiologists)].

Preoperative care:

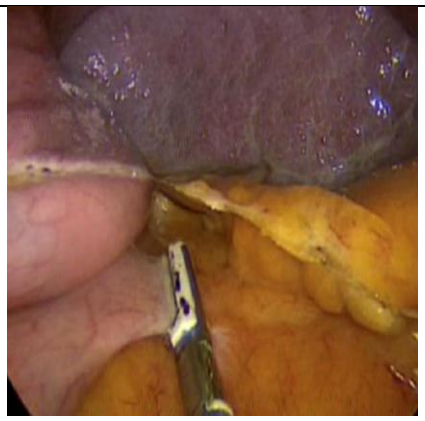
Diet regimen was given to all patients in form of low carbohydrate with high protein diet for two weeks prior to operation. A day prior to an operation, patients were admitted to ensure a stable glucose level below 200 mg/dl. Minimal molecular mass in order to prevent deep vein thrombosis along with other thrombo-embolic complications, heparin was recommended in every patient.

Surgical procedure:

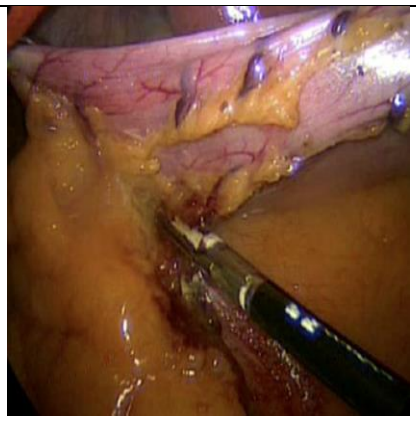
General anesthesia was administered to each patient, and the procedure was carried out while the patient was lying in the French position. The Veress needle was used to execute abdominal insufflation treatment. Following the insertion of the camera port in the midline, two working ports were introduced in the right and left midclavicular lines. Additionally, two assistant ports were inserted, one at the epigastrium and the other at the left anterior axillary line. The camera port was positioned above the umbilicus. Following the completion of the abdominal exploration, we began the process of devascularization of the larger stomach curve approximately two to four centimeters below the pylorus. Ligature of harmonic hemostatic devices was utilized in order to accomplish the devascularization process. Dissection was continued proximally, with dividing the short gastric vessels, till reaching the angle of His and identifying the left diaphragmatic crus. A 38 bougie was inserted into the stomach till reaching the pylorus. Division of the stomach was done to create the sleeve. Ethicon endostaplers were used, starting with green cartridges, followed by the golden and bluish ones. Any bleeding points over the staple line were controlled by clipping. A methylene blue test was done through the bougie to exclude leakage. A surgical drain was inserted along the staple line. Finally, the laparoscopic ports were closed.



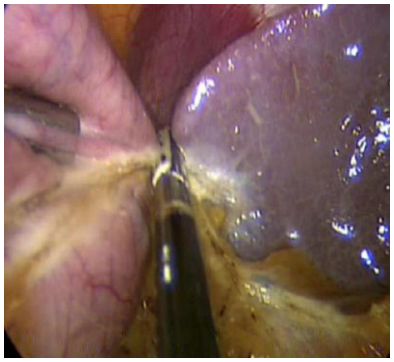
Devascularization of the greater gastric curve.



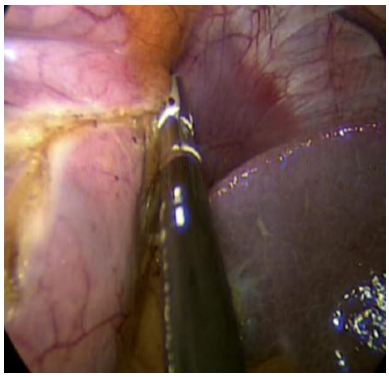
Division of posterior adhesions between the stomach and pancreas.



Dividing the antrum from the related greater omentum.



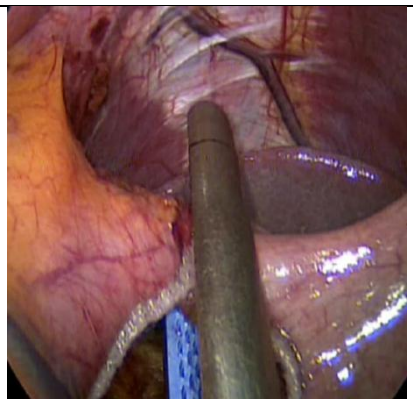
Dividing the fundus from the upper spleen



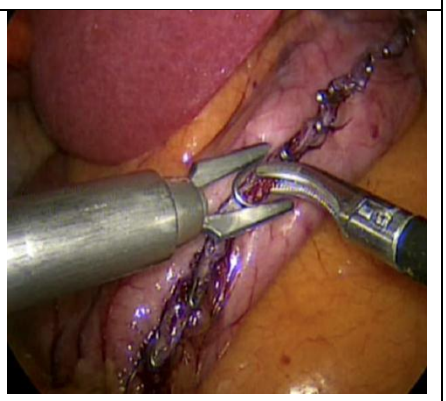
Dissection of the fundus from the left diaphragmatic crus.

Application of the first cartridge.

After the first stapler.



The last staple taken lateral to the angle of His.



Controlling bleeding points in the staple line by clipping.

Figure (1): Surgical procedure details

Post-operative care

Patients were transferred to recovery rooms, internal wards, or ICUs for close monitoring. Post-operative complications like bleeding, leakage, post-operative nausea and vomiting (PONV), and surgical site infection were managed. Pain was managed with IV paracetamol, ketorolac, and morphine. Patients were kept nothing by mouth (NPO) for the first day, and IV fluids were initiated. Antiemetics and proton pump inhibitors were administered. By the end of the first post-operative day (POD), patients were allowed to start oral fluids after excluding leakage. Most patients were discharged the following day after ensuring good oral fluid tolerance, pain management, and emptiness from complications. PONV was considered significant if it led to hospital discharge on POD1 or 2 [(9)].

Primary outcomes:

GERD, Bowel habits, including constipation and diarrhea and Food intolerance.

Secondary outcomes:

Operative time, post-operative complications, duration of hospitalization, changes in obesity related comorbidities and nutritional outcomes.

Ethical consideration: The research obtained agreement from The Local Ethical and Scientific Committee of The Faculty of Medicine, Mansoura University. All cases felt free to withdraw from the research at any period point in accordance with their demands. The study was conducted in accordance with Helsinki Standards. An informed written consent has been signed by all patients following a full explanation of the advantages, benefits, and potential complications of each intervention. The collected data were utilized exclusively for scientific purposes. The confidentiality of the individuals was preserved.

Statistical analysis

The investigation was conducted with a power of 80% and a significance level of 95%. Software developed by SPSS Inc. of Chicago, Illinois, USA, was used to code, process, and analyze the data that was collected. The software version 22 for Windows® was used. Quantitative data was shown as percentages and numbers (frequency). The patients in the same groups were compared at different time points using a paired samples t-test. A statistically significant result was defined as $P \leq 0.05$.

RESULTS

The examined cases had an average age of 34.82 years, which varied from 18 to 45. A total of 58% of the people who took part in the survey were women, while the other were men (Table 1).

Table (1): Demographic data in the study cases

Variables		**Study cases n= 50**
Age (years)	Mean ± SD	34.82 ± 10.50
	Median (min-max)	36 (18-45)
Sex		
Males		21 (42%)
Females		29 (58%)

Continuous data expressed as mean ± SD and median (range) Categorical data expressed as number (%).

Oral intake was allowed after a mean duration of 1.22 days, while the duration of hospitalization had a mean value of 3.28 days. No patients developed bleeding or leakage in our study. However, only one patient had transient vomiting (2%) that was conservatively managed by IV fluids and antiemetics (Table 2).

Table (2): Postoperative data among the studied cases

Items		**Study subjects (n= 50)**
Hospital stay (Days)	Mean ± SD	3.28 ± 2.13
	Median (min-	3 (1-15)
Start oral intake (Days)	Mean ± SD	1.22 ± 0.59
	Median (min-	1 (1-4)
Early postoperative complications		
Bleeding		0 (0%)
Leakage		0 (0%)
Transient vomiting		1 (2%)

The % EWL had mean values of 13.78%, 43.13%, and 59.2% after one, three, and six months respectively. The sleeve procedure was associated with a significant improvement in body weight manifested by the increased % EWL with time (Table 3).

Table (3): Follow up of EWL (%) along the study period.

EWL	**Follow up 1 month**	**Follow up 3 months**	**Follow up 6 months**	**Test of significance**
Mean ± SD	13.78 ± 3.48	43.13 ± 4.17	59.20 ± 3.89	F= 103.014 P <0.001**
P_1		<	<	
P_2			<	

Suter questionnaire showed a significant decline after the procedure indicating decreased food tolerance after the procedure ($p < 0.001$). It had a mean value of 25.4 prior to the operation, which decreased down to 22.54, 15.14, and 18.24 after one, three, and six months respectively (Table 4)

Table (4): Follow up of Suter questionnaire along the study period

Suter scale	Basal	Follow up 1 months	Follow up 3 months	Follow up 6 months	Test of significance
Mean ± SD	25.40 ± 1.12	22.54 ± 0.99	15.14 ± 1.85	18.24 ± 1.56	
P_1		0.002*	<0.001**	<0.001**	F= 18.428
P_2			<0.001**	0.004*	P <0.001**
P_3				0.008*	

The Bristol scale showed a significant decline after the sleeve procedure ($p < 0.001$). It had a median value of 4 prior to the procedure, which decreased to medians of 3, 2, and 3 after one, three and six months respectively (Table 5).

Table (5): Follow up of Bristol scale along the study period

Bristol scale	Basal	Follow up 1 months	Follow up 3 months	Follow up 6 months	Test of significance
Median	4 (3-4)	3 (-4)	2 (1-3)	3 (2-4)	
P_1		<0.001**	<0.001**	<0.001**	Fr= 18.428
P_2			<0.001**	0.780	P <0.001**
P_3				<0.001**	

In patients with preoperative GERD, resolution of GERD symptoms was reported in one patient (12.5%), while worsening occurred in 62.5% of them. The remaining two cases reported no change regarding their GERD state (Table 6).

Table (6): Fate of cases with GERD at last follow up

	GERD cases (N= 8)
Resolution	1 (12.5%)
Worsening	5 (62.5%)
Unchanged	2 (25%)

Categorical data expressed as Number (%).

DISCUSSION

The mean age of our patients was 34.82 years (range, 18 – 45), and women represented 58% of the study population. Another study reported a relatively older patient age (mean = 47.3 years). Nevertheless, females were also more than males as they represented 57.8% of cases, and that agrees with our findings [(10)].

In this research, intraoperative blood loss had a mean value of 91 ml. **Lasheen *et al.*** [(11)] reported a mean intraoperative blood loss of 70 ml.

In our study, we did not encounter any patients with postoperative bleeding. This is in accordance with previous reports, which stated that the incidence of that complication ranges between 0% and 10% after LSG [(12)].

No patients developed postoperative leakage in our trial. An analysis of 15 studies including 1021 individuals indicated an average leak rate for LSG of 2.8 ± 2.6% (range 0-8 percent) [(13)]. Our occurrence falls within the range that has been previously documented.

In the current study, only one patient developed transient postoperative vomiting (2%) that was successfully managed with conservative treatment. The LSG has many positive aspects, however when compared to other bariatric surgery options, it produces a shockingly high rate of PONV [(14)]**.** Patients receiving laparoscopic Roux-En-y Gastric Bypass (LRYGB) had a 19% incidence of PONV, but patients undergoing LSG had an incidence of almost 60% [(15)].

In the present trial, the mean duration of hospitalization was 3.28 days (range, 1 – 15). **Mahmoud *et al.*** [(16)] reported that the median length of hospital stay was 2 days (range 1 – 8). Additionally, **Zakaria and Matar** [(17)] reported that the mean length of hospital stay was 1.2 (range 1-3) days. Difference between studies regarding this parameter could be attributed to different complications rate and postoperative management protocols among surgical centers.

In the current study, the sleeve procedure was related to a significant improvement in body weight manifested by the increased % EWL with time. The % EWL had mean values of 13.78%, 43.13%, and 59.2% after one, three, and six months respectively.

In the current study, LSG was associated with a significant beneficial impact on the diabetic state in patients with preoperative diabetes. Complete remission was noted in 35.3% of them, whereas partial remission occurred in 29.4% of them. In addition, improvement was noted in 17.6% of cases. LSG has proved itself as an antidiabetic procedure, with high diabetes improvement or remission rates. Reduced insulin resistance, enhanced insulin production, and better tissue responses to insulin are the mechanisms responsible for the beneficial impact

on glucose homeostasis [18]. Our findings agree with those reported by **Buchwald *et al.*** [19] who indicated that 78.5% of patients who had LSG experienced resolution or improvement in their hypertension.

In the current study, Suter questionnaire showed a significant decline after the procedure indicating decreased food tolerance after the procedure ($p < 0.001$). It had a mean value of 25.4 prior to the operation, which decreased down to 22.54, 15.14, and 18.24 after one, three, and six months, respectively. LSG entails the formation of narrow high-pressure tube leading to a significant rise in intragastric pressure and less tolerance of the ingested food. In contrast to the previous findings, **Coluzzi *et al.*** [20] reported gradual improvement of the same scale from 6 to 24-months follow up. It had a median values of 18, 22, and 23 points at 6. 12, and 24 months respectively ($p = 0.004$).

Our findings showed that Bristol scale had a significant decline after the sleeve procedure ($p < 0.001$). It had a median value of 4 prior to the procedure, which decreased to medians of 3, 2, an

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