

## Posterior fixation in Laparoscopic Sleeve Gastrectomy: Could We Lower Postoperative Complications? A Prospective Cohort Study

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**Introduction:** Laparoscopic Sleeve Gastrectomy (LSG) has become the most commonly performed bariatric procedure. LSG is known for its safety and effectiveness, shorter operative time, feasibility, and easiness of revision and conversion to a malabsorptive surgery. Surgeons are tailoring different techniques to avoid complications from arising. Twisting of the sleeved gastric tube is one of the causes of sleeve obstruction and persistent nausea and vomiting. This study aims to compare between the postoperative complications in sleeve gastrectomy with and without posterior fixation.

**Patients and methods:** In this prospective comparative cohort study 643 patients were included; divided into two groups according to the surgical technique. Group 1 included 364 LSG operations without fixation and Group 2 included 279 LSG with sleeve fixation. The operations were performed at Ain Shams University Hospitals between June 2017 and June 2021. Fixation of the sleeve was performed by two or three absorbable stitches to the prepancreatic fascia and root of the mesocolon. Incidence of postoperative complications were compared in each group.

**Results:** There were no statistically significant differences in baseline characteristics between the two groups included in the study. Group 2 showed highly significant increase in operative time ( $p < 0.001$ ) the overall incidence of complications was significantly less in the fixation group ( $p < 0.0001$ ). Incidence of vomiting, bleeding, GERD and re-operation was significantly lower in group 2 ( $p < 0.05$ ). Seven patients from group 1 were diagnosed with gastric twist as post operative complication with one patient suffering from leakage compared to three patients in group 2. There were no mortalities in both groups.

**Conclusion:** Adding posterior fixation to LSG ensures decreases incidence of complications. Many randomized controlled trials are needed to draw a solid outcome.

**Key words:** Gastric twist, post-sleeve complications, Laparoscopic Sleeve Gastrectomy, gastric fixation, posterior fixation.

### Introduction

Sleeve gastrectomy has become the most commonly performed bariatric procedure worldwide.<sup>1</sup> The reasons behind the widespread adoption of sleeve gastrectomy is its perceived technical simplicity, the absence of a laparoscopic anastomosis, and its physiological nature where no bypass is carried out. However, sleeve gastrectomy has its limitations and complications. Sleeve stricture and twist is reported as one of the short-term complications of sleeve gastrectomy with an incidence ranging from 0.5%,<sup>2</sup> to 1.6% as reported by Siqueira et al. (2022).<sup>3</sup>

The aim of this study is to evaluate the impact of gastric sleeve fixation on the incidence of post operative complications including gastric twist, postoperative bleeding or leakage, postoperative Gastroesophageal reflux and vomiting.

### Patients and methods

This is a prospective comparative study that included 643 patients divided into two groups. Group 1 included 364 patients who underwent LSG without fixation (LSG) and Group 2 included 279 performed LSG with fixation (LSG-F). The operations were performed at Ain Shams University Hospitals

between June 2017 and June 2021. In the first 20 months, sleeve gastrectomy was performed without sleeve fixation. In the later 28 months of the study period the technique of sleeve fixation was adopted and performed for all patients. The number of patients in the second group was less than the first group despite the longer duration because of the Covid-19 pandemic that erupted in March 2020. The criteria for selection of all the patients were the same for sleeve gastrectomy patients. We included patients with BMI  $\geq 40$  Kg/m<sup>2</sup> and patients with BMI  $\geq 35$  Kg/m<sup>2</sup> associated with comorbidities such as diabetes mellitus, hypertension, dyslipidemia, osteoarthritis, infertility, and severe sleep apnea. We excluded patients with proved gastroesophageal reflux, psychiatric disorders, history of previous gastrointestinal pathology or surgery, and patients with previous bariatric surgery. Preoperative evaluation included routine laboratory workup, cardiopulmonary assessment, and psychiatric counseling.

Intraoperative data collected included operative time, operative technique, the incidence of complete sleeve mobility after dissection, and intraoperative mishaps and complications. Postoperative evaluation included hospital stay, postoperative nausea and

vomiting, postoperative bleeding, leakage, gastric twist, or stenosis. Patients were followed up for one year for weight loss and resolution of comorbidities.

### Surgical Procedures

All patients signed a written informed consent of the procedure with all possible complications and expected outcome. Group 1 voluntarily signed a separate consent to enroll in the study. At induction an antibiotic (Cefotaxime), tanexamic acid (Kapron), and sodium bisulphite (Dicynone) were injected. We used a Verres needle in Palmer's point for initiating pneumoperitoneum. We performed sleeve gastrectomy by the 5-trocar technique, with a self-mounted liver retractor. The trocars were placed and the operation performed as described by Ramos et al. (2015).<sup>4</sup> The bougie size was 36 F. Ligasure™ was the preferred energy device.

After complete dissection of the sleeve the presence of posterior gastric adhesions were noted and written in the operative notes. The posterior gastric adhesions between the stomach and pancreas were well developed in a subset of patients. Division or preservation of the posterior gastric adhesions was decided according to the anatomical arrangement of the adhesions. If the adhesions would compromise correct stapling positioning, division of the adhesions was carried out. If the adhesions could be preserved without affecting the integrity of the sleeve, they were preserved. Stapling was performed by Covidien cartridges (Covidien, NH, CT) 60 mm reloads. A green cartridge was used to staple 4 cm from the antrum, followed by stapling with blue cartridges. Stapling is applied 5 mm from the bougie, and the last staple is placed at least 1 cm from the gastroesophageal junction. After completion of stapling and separation of the gastric sleeve tube, the methylene blue test is performed. After it is found negative, fixation of the gastric

sleeve tube is performed in group 2 patients. Fixation was performed with 3 stitches of 0/2 polyglycolic acid suture on 26 mm needle. One stitch was placed distally at the junction between the first staple (Antral staple) and the second staple (The incisura staple) to fix the distal part of the sleeve to the mesocolic fat distal to the pancreas. The second and the third stitches were taken to fix the incisura and midbody of the sleeve to the prepancreatic fascia. In both groups the bougie passage test was carried out. In this test the bougie was withdrawn and advanced back and forth to make sure the sleeve was not rotated or obstructed at any point.

### Outcome Assessment

The patients were followed up for incidence of postoperative complications including: gastric sleeve twist or rotation, postoperative bleeding or leakage, postoperative GERD, vomiting, operative time and hospital stay.

### Statistical Analysis

Statistical analysis was carried out using SPSS version 22. Data were expressed as mean ± standard deviation, and range. Quantitative data were analyzed using student's t test, whereas qualitative data were analyzed by chi-square test or Fisher's exact test. A P value less than 0.05 was considered significant.

### Results

We included 643 patients: 364 patients had laparoscopic sleeve gastrectomy only, 279 patients had laparoscopic sleeve gastrectomy with posterior fixation. There were no statistically significant differences in baseline characteristics between the two groups included in the study (**Table 1**) (**Figures 1,2**).

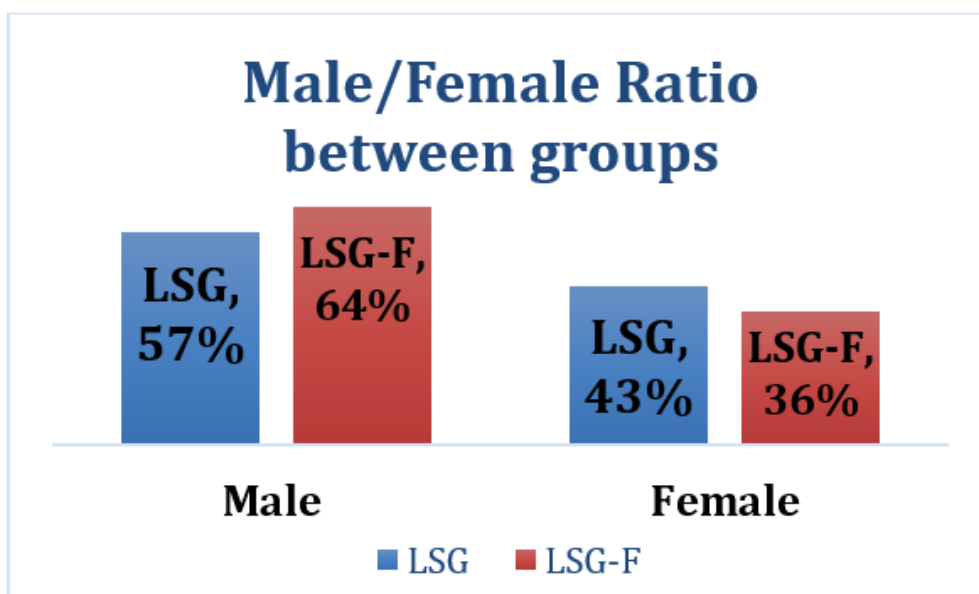


Fig 1: Female/ male percentage in group 1 compared to group 2.

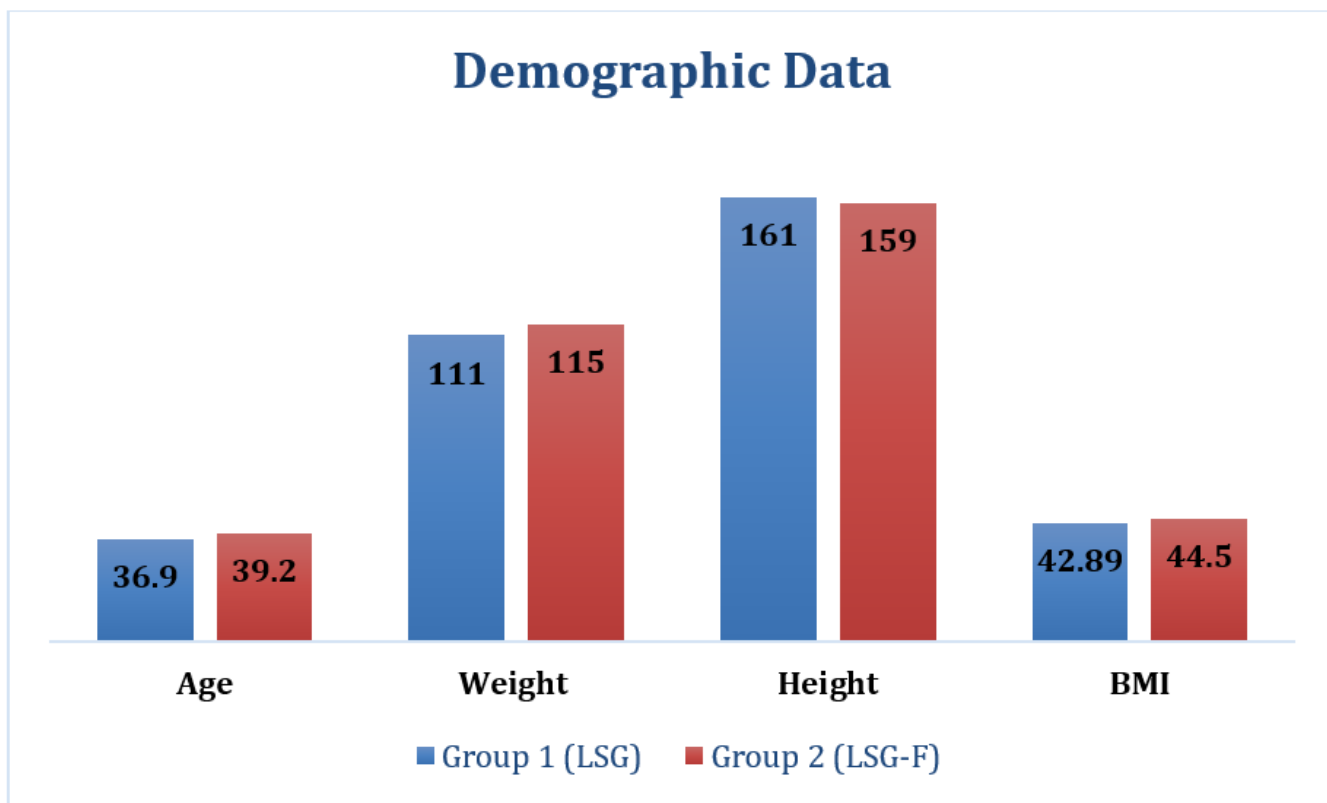


Fig 2: Demographic data comparison between group 1 and group 2.

Table 1: Patients' Demographics in both groups

Characteristic	Group 1 (LSG)	Group 2 (LSG-F)	Significance
Number of Patients	364	279	
M	208 (57.1%)	179 (64.1%)	NS
F	156 (42.8%)	100 (35.8%)	
Age	36.9 ± 5.8	39.2 ± 3.9	NS
Weight	111 ± 18.3	115 ± 16.7	NS
Height	1.61 ± 3.5	1.59 ± 3.8	NS
BMI	42.89 ± 5.3	44.5 ± 5.6	NS

LSG: Laparoscopic Sleeve Gastrectomy, LSG-F: Laparoscopic Sleeve Gastrectomy with Fixation M: Male, F: Female, BMI: Body Mass Index, NS: Not Significant.

The difference in operative time for each group was highly significant ( $p < 0.001$ ) with group 2 (LSG-F) requiring longer operative time (mean  $72.77 \pm 8.65$ ) compared to group 1 (LSG) (Mean  $43.69 \pm 8.4$ ) (**Figure 3**).

The overall incidence of complications was significantly less in the fixation group ( $p < 0.0001$ ). Incidence of vomiting, bleeding, GERD and reoperation was significantly lower in group 2 ( $p < 0.05$ ) (**Table 2**).

In LSG, 16 patients had GERD that was confirmed with upper GI endoscopy. 14 patients had postoperative bleeding, which was managed conservatively

except 5 patients had reoperation for evacuation of hematoma and suture line reinforcement.

On the other hand, no significant difference was found between incidence of abdominal pain and of gastric twist in the two groups.

Seven patients from group 1 were diagnosed with gastric twist as post operative complication with one patient suffering from leakage compared to three patients in group 2. Patients with gastric twist were either managed by endoscopic stenting (5 patients) or underwent gastropexy (4 patients). There were no mortalities in both groups (**Table 2**).

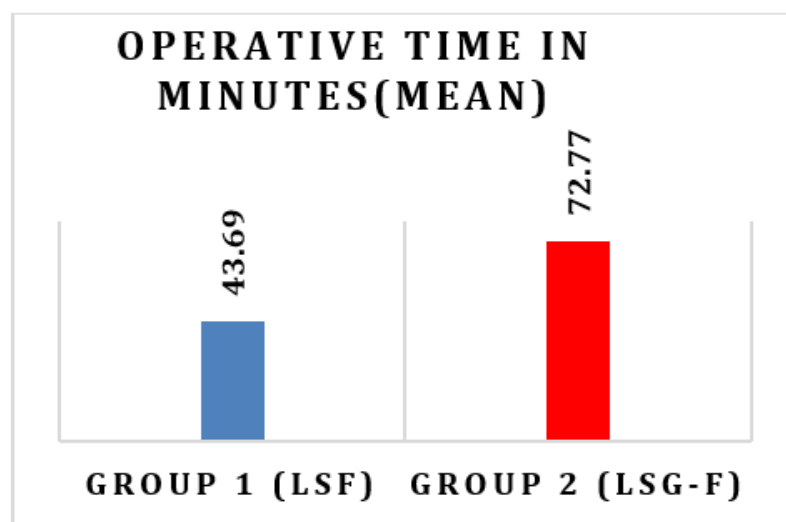


Fig 3: Comparison of operative time between group 1 and group 2 ( $p < 0.0001$ ).

**Table 2: Operative time and incidence of complications and gastroesophageal reflux after LSG with and without fixation**

	Group 1 (LSF)	Group 2 (LSG-F)	Significance
Operative time, minutes (Mean $\pm$ SD)	43.69 $\pm$ 8.4	72.77 $\pm$ 8.65	<0.0001**
Number of Patients	364	279	
Non-complicated	271 (74.5%)	256 (91.7%)	<0.0001**
Complicated	93 (25.5%)	23 (8%)	<0.0001**
Abdominal pain:	26 (7%)	10 (3.6%)	
Epigastric pain	9	4	NS
LT hypochondrial pain	6	2	
RT hypochondrial pain	11	4	
Vomiting	21 (6%)	4 (1%)	$p < 0.05^*$
Bleeding	14 (4%)	2 (0.8%)	$p < 0.05^*$
Twist (Total)	7 (0.02%)	2 (0.8%)	NS
Twist with Leakage	1	0	
De Novo GERD at 1 Y	16 (4%)	4 (1%)	$p < 0.05^*$
Reoperation	8 (2%)	1 (0.4%)	$p < 0.05^*$

## Discussion

LSG is the leading bariatric operation in the world with more than (46%) of the performed bariatric surgeries in the past 5 years.<sup>5</sup> Several techniques are adopted to reduce the incidence of complications in LSG.<sup>6</sup> Our study Addressed one of these techniques by aiming to compare between the postoperative complications in sleeve gastrectomy with and without posterior fixation.

The results rendered by our study showed a statistically significant decrease in overall incidence of postoperative complications in the posterior fixation group, most pronounced difference was seen in incidence of vomiting, bleeding, GERD and reoperation. These results are consistent with previous studies by Abdallah et al., (2017),<sup>7</sup> Şen et al., (2020),<sup>8</sup> and Kizilkaya et al., (2021).<sup>9</sup>

The decreased incidence of complications can

be attributed to fixation overcoming improper positioning and gastric tube alterations which are likely to arise in LSG.<sup>10</sup>

The incidence of gastric twist in laparoscopic sleep gastrectomy alone was 7 cases with one case diagnosed with leakage as opposed to 2 cases only in the posterior fixation group. However, there was no statistically significance difference between the two groups. These results are in concordance with the trial done by Negm et al., (2022).<sup>11</sup> These results can be attributed to the fact that gastric twist is a rare albeit serious complication of LSG.<sup>12</sup>

In comparison with anterior fixation; in a retrospective multicenter study, Arslan et al. (2018).<sup>13</sup> studied 1385 patients who had LSG with omentopexy. Authors reported that three patients had postoperative bleeding and one had staple line leakage. However, in a retrospective cohort, AlHaddad et al. (2018),<sup>14</sup> compared LSG to LSG

with omentopexy. Seventy patients were included in each arm. Authors reported no significant difference between both groups in postoperative leak, bleeding, GERD, and vomiting. In a meta-analysis done by Zarzycki et al. (2021),<sup>15</sup> four studies (1396 patients) were included. Their results showed an overall significantly lower morbidity and gastric leak in LSG with omentopexy compared to LSG only. No difference is detected regarding hospital stay. Filho et al. (2019).<sup>16</sup> studied postoperative GERD symptoms after LSG with omentopexy in 20 patients. They concluded that LSG with omentopexy improved GERD in most cases

LSG presents a disruption of the normal support mechanisms for the stomach; the stomach is strongly fixed proximally at the cardiac end and distally by the retroperitoneal first part of duodenum. Additionally, the gastrophrenic, gastrosplenic, gastrocolic, and gastrohepatic ligaments hold the stomach in place in order to prevent gastric torsion.<sup>12</sup> During sleeve gastrectomy, the gastrophrenic, gastrocolic, gastrosplenic, and the posterior gastric attachments are divided so the probability of twisting, turning, or folding is quite high.<sup>17</sup>

Study limitations were present in the form of lower number of patients in the second group; a consequence of low hospital admissions and decreased rate of elective procedures during the pandemic

## Conclusion

Adding posterior fixation to LSG ensures decreases incidence of complications. Many randomized controlled trials are needed to draw a solid outcome.

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