Gastropexy as a primary approach in the management of post-sleeve gastric twist

Karim Sabry, Yasser El Gamry, Basem H. Abd-El Aziz El Shayeb

Bariatric Division, Department of General Surgery, Faculty of Medicine, Ain Shams University, Cairo, Egypt

Correspondence to Basem H. Abd-El Aziz El Shayeb, MD in Surgery; Bariatric Division, Department of General Surgery, Faculty of Medicine, Ain Shams University, 11 Hassan Assem Street, Zamalek, Cairo, 11211, Egypt. Tel (office): +201285552468; e-mail: mabasem@yahoo.com

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Introduction
Bariatric surgery is one of the most effective means of treating severe obesity, constituting more than 46% of the performed bariatric surgery in the past 5 years. Despite its advantages, complications of laparoscopic sleeve gastrectomy may be fatal if not diagnosed early and managed well. Gastric twist is a recognized serious complication of sleeve laparoscopic sleeve gastrectomy. The current management includes repeated endoscopic dilatation and stenting or conversion to Roux-en-Y gastric bypass. Gastric fixation is a novel approach as a primary management of gastric twist.

Aim
Our study aims at introducing gastric fixation as a primary management of gastric twist after sleeve gastrectomy.

Patients and methods
A total of 24 patients (12 men and 12 women) presenting with gastric twist were treated using laparoscopic gastric fixation of the gastric tube. Patients with organic stricture and hiatus hernia were excluded. Gastropexy was performed using proline 2-0 in three stitches: between the left crus of diaphragm and posterior part of upper sleeve, between pancreatic fascia and midbody, and between posterior antrum and mesocolon. In some cases, two more stitches were used to fix the posterior antrum to the mesocolon.

Results
The patients underwent gastropexy with an average operative time of 67 min. Following the procedure, the mean time of symptom resolution was 7±5 days (2–12 days). Recovery was uneventful in all patients, and success rate was 99.0%, with neither post-procedure complications nor recurrence of twist in the 2-month follow-up of the patients.

Conclusion
Gastric fixation is a relatively safe, easy, and cost-effective one-time procedure, which presents as an alternative to stenting and dilatation in the management of post-sleeve gastrectomy gastric twist.

Keywords:
gastric fixation, gastric twist, gastric volvulus, gastropexy, post-sleeve complications

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Introduction

Bariatric surgery remains the most effective means of treating severe obesity. Laparoscopic sleeve gastrectomy (LSG) is dominating the scene, with more than 46% of the performed bariatric surgery in the past 5 years [1]. The reason behind the rising popularity of LSG can be attributed to its easy technique, effectiveness in treating morbid obesity, and lower incidence of comorbidities compared with laparoscopic gastric bypass [2]. Despite its advantages, a number of complications are occasionally encountered. Complications of LSG may be fatal if not diagnosed early and managed well [3]. Complication rates vary between 1 and 29% [4], including staple line leak (1–3.9%), major organ injury (0–5%), and stenosis (2–5%) [5].

Gastric stenosis is a serious complication that presents with nausea, vomiting, epigastric pain, and reflux, and if untreated, can lead to dehydration and malnutrition [6]. Stenosis is classified into mechanical or functional and is most likely to occur at the incisura angularis [7]. Mechanical stenosis is caused by fibrosis and stricture [8]. On the contrary, functional stenosis is precipitated by twist of the gastric tube along its longitudinal axis with a valve-like mechanism that hinders the stomach from proper emptying [9].

The pathogenesis of gastric twist is largely unknown. Theories include the disruption of the supporting ligaments of the stomach (gastrosplenic, gastrohepatic, and gastrocolic and posterior attachments) during sleeve

gastrectomy, leading to twist or kink of the remaining gastric tube [10]. Another suggested pathogenesis is unequal traction on anterior and posterior wall of the stomach during firing of the staples with spiral pattern of stapling [11]. Sharp angulation, adhesion formation, edema, or hematomas at the staple line are also added to the possible underlying causes [12].

Diagnosis of gastric twist is done by either upper gastrointestinal endoscopy, which will demonstrate the appearance of a functional sphincter allowing the passage of the endoscope, or computed tomographic scan with tridimensional reconstruction, which gives a better view of spiral staple line around the stomach [13].

There is substantial variation in therapeutic approaches to gastric twist, with no clear algorithm [14]. Endoscopic management includes dilatation using an achalasia balloon or placement of an endoprosthesis like self-expanding metal stents in case of failure of repeated dilatations [15]. Surgical management involves revision sleeve gastrectomy, seromyotomy, and conversion of sleeve gastrectomy to Roux-en-Y gastric bypass [16]. Nevertheless, the rate of adverse events after these surgical procedures is high, and the success rates are not promising [17].

Gastric fixation is reported as a reliable technique for the management of gastric twist in case of failure of balloon dilatation. Its use as a primary technique has not been attempted [9].

Aim

Our study aims at introducing gastric fixation as a primary management of gastric twist after sleeve gastrectomy.

Patients and methods

A total of 24 patients (12 male patients and 12 female patients) presenting with gastric twist were enrolled in this study. Consent of the patients was taken, and data were collected prospectively and included age, sex, BMI, and comorbid conditions at the time of admission. The mean age of the patients was 30.6 years. Average BMI of the patients was 30 at the time of presentation. The procedures were performed at Ain Shams University Hospital.

Ethical considerations

This study was approved by the Ain Shams Ethics Committee. An informed consent was obtained from the patients after full explanation of the procedure and its possible complications.

Presenting complain

The patients presented with vomiting, regurgitation, reflux, and excessive weight loss 1–2 months within an average of 1 month after gastric sleeve for weight loss.

Inclusion criteria were patients presenting with gastric stenosis symptoms with successful passage of endoscope.

Exclusion criteria were presence of organic stricture, failure of passage of endoscope in preoperative assessment, and hiatus hernia.

Diagnosis of gastric twist

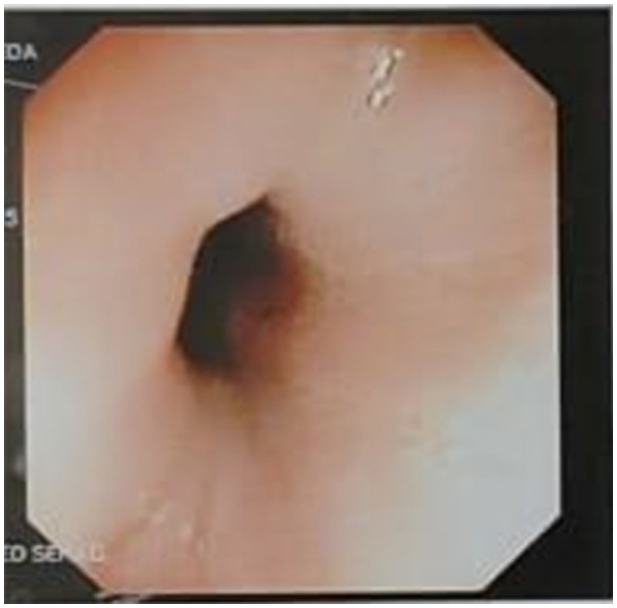
Preoperative endoscopy was performed to confirm absence of an organic stricture. Passage of the endoscope freely through the twisted portion was a prerequisite for including the patients in the study (Figs 1 and 2).

Contrast computed tomography with tridimensional reconstruction was done. It showed localized twist of the gastric tube and confirmed absence of organic stricture (Figs 3 and 4).

Surgical technique

Preoperative optimization of the patient's general condition was done.

Figure 1



Upper GI endoscopy image show passage of endoscopy through the lumen. GI, gastrointestinal.

Figure 2

Upper GI endoscopy image showing tortuous course. GI, gastrointestinal.

Figure 3

CT volumetry with 3D reconstruction of the twisted stomach (anterior view). 3D, three dimensional; CT, computed tomography.

Figure 4

CT volumetry with 3D reconstruction of the twisted stomach (posterior view). 3D, three dimensional; CT, computed tomography.

Following draping, we insufflated through the left subcostal Palmer's point. A 10-mm camera port was inserted through the supraumbilical area 20 cm beneath the xiphisternum preferably on the scar of the previous operation. Two working ports were used initially. Larger ports of 12 or 15 mm were introduced as needed if staplers were used (Echelon Flex 60-mm stapler and Echelon Flex 60-mm cartridges; Ethicon, Johnson & Johnson Inc., Cincinnati, Ohio, USA).

Nathanson liver retractor was used in some cases. An assistant 5-mm port in left subcostal lateral to the right working port 5 cm from it was introduced.

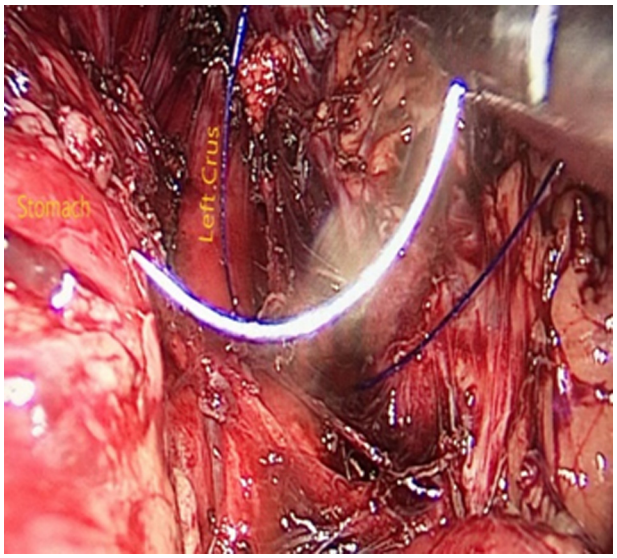
In some cases, adhesiolysis is done to identify the anatomical landmarks and visualize the site of twist.

A 36-Fr bougie is introduced to confirm the site of the twist. The passage of the bougie affirmed the absence of organic stricture.

Complete mobilization of the gastric fundus, body, and antrum was performed especially the distal antrum to help complete mobilization of the whole gastric tube. Excess retained fundus and antrum are excised using the stapler. The bougie was withdrawn to allow free mobility of the gastric tube.

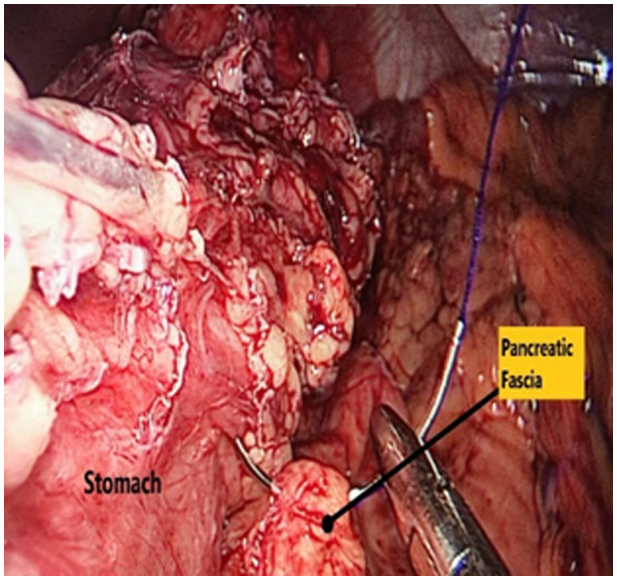
Gastropexy is performed using proline 2-0 in three stiches: the first is between the left crus of the diaphragm and the posterior part of the fundus of the sleeved stomach, the second one is between the pancreatic fascia and midbody of stomach, and the third stitch between the posterior antrum of stomach and the transverse mesocolon (Figs 5–7). In some cases, two more stiches are used to fix the posterior antrum to the transverse mesocolon.

Figure 5



A laparoscopic image showing the site of stitch that is created between fundus of stomach and the left crus of the diaphragm.

Figure 6



A laparoscopic image showing the second stitch between midbody of stomach and the pancreatic fascia.

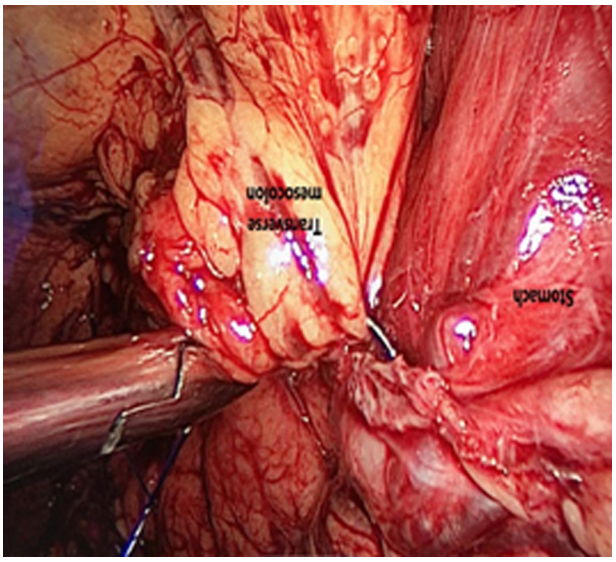
Following the fixation of the gastric sleeve, the bougie is reintroduced to test its free mobility through the gastric tube.

The average time of the operation was 1 h, with an average of 12 h of postoperative hospital stay.

Data collection and statistics

All data were prospectively collected using a standardized protocol. Fisher's exact test and *t* test were applied. For all statistical tests, a *P* value less than 0.05 was considered significant. For quantification of weight loss, the percentage of excessive BMI loss was used.

Figure 7



A laparoscopic image showing the third stitch between posterior antrum of stomach and the transverse mesocolon.

Results

This study included 24 patients who were diagnosed with gastric twist following LSG. The ratio of female : male patients was 1 : 1. The average BMI at the time of presentation was 29.7 kg/m^2, with an average of 30.1 kg/m^2 for female patients and 29.3 kg/m^2 for male patients (Fig. 8). The mean weight of the patients was 81.6 kg, with a mean age of 30.6 years.

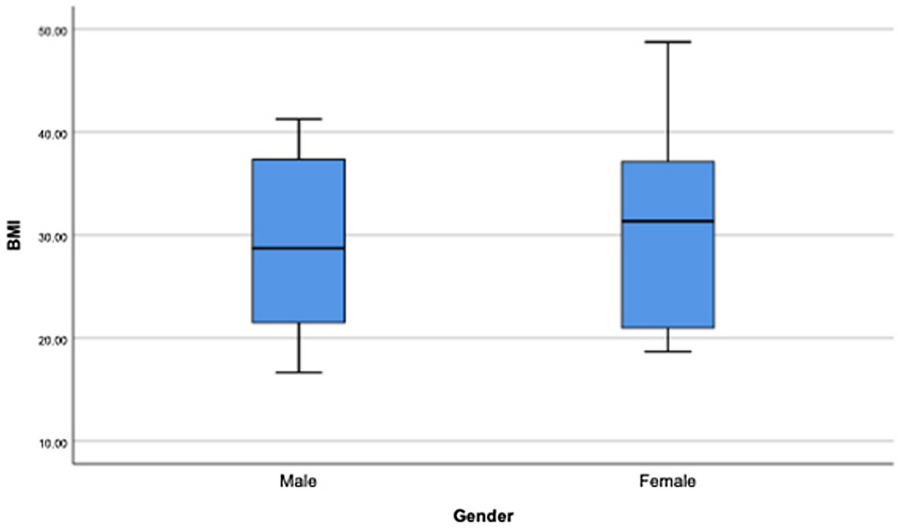
The presenting complaints for these patients were vomiting in 37.5%, reflux in 21%, and regurgitation in 21% (Table 1). The diagnosis of gastric twist was confirmed by endoscopy and three-dimensional reconstructed computed tomography.

The presence of regurgitation and reflux was significantly higher in correlation with increased BMI, with *P*=0.013.

The difference between prevalence of reflux, regurgitation, and vomiting between males and females was statistically insignificant.

The differences between the means of age, BMI, and duration of the procedure between males and females were statistically insignificant (Table 2, Fig. 9). However, there was a significant difference in the blood pressure measurement between males and females, with *P*=0.01 (Table 2, Fig. 10).

Figure 8



Bar chart showing mean of BMI by sex.

Table 1 General characteristics of the study sample

Categorical variables	Count	%
Sex		
Female	12	50
Male	12	50
Sweet		
No	17	70.8
Yes	7	29.2
Ex_wt		
No	23	95.8
Yes	1	4.2
Regurgitation		
No	19	79.2
Yes	5	20.8
Vomiting		
No	15	62.5
Yes	9	37.5
Reflux		
No	19	79.2
Yes	5	20.8
Other		
Fatigue	1	4.2
Smoking	1	4.2
Weight regain	1	4.2
No weight loss	3	12.5
Insufficient weight loss	1	4.2
No complain	17	70.8
HTN		
No	16	66.7
Yes	8	33.3
DM		
No	22	91.7
Yes	2	8.3
Others		
Depression	1	4.2
PCO	1	4.2
Smoking	8	33.3
Depression	1	4.2
BA	1	4.2
Nothing	12	12
Continuous variable		
	Mean±SE	
Age	30±1.49	
Height	166±42	
Weight	81.58±4.65	
BMI	29.72±1.84	
Time (min)	67.08±3.61	

DM, diabetes mellitus; HTN, hypertension; PCO, polycyctic ovary

Significant past medical history included hypertension in 33.3%, diabetes mellitus in 8%, deep venous thrombosis in 4%, polycyctic ovary in 4%, and smoking in 33% (Fig. 11).

The percentage of sweet addicts among these patients was 29%.

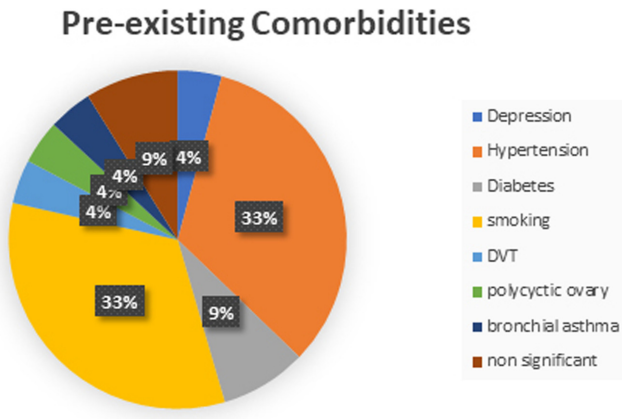
The time of presentation of the patients ranged between 30 and 60 days after gastric sleeve gastrectomy operation, with an average of 34 days.

The patients underwent gastropexy with an average operative time of 67 min. Following the procedure, the mean time of symptom resolution was 7±5 days (2–12 days). Recovery was uneventful in all patients, and success rate was 99.0% with neither post-procedure complications nor recurrence of twist in the 2-month follow-up of the patients.

Table 2 Independent sample *t* test to comparison between two sex (male and female) of age, weight, height, BMI, and time of operation

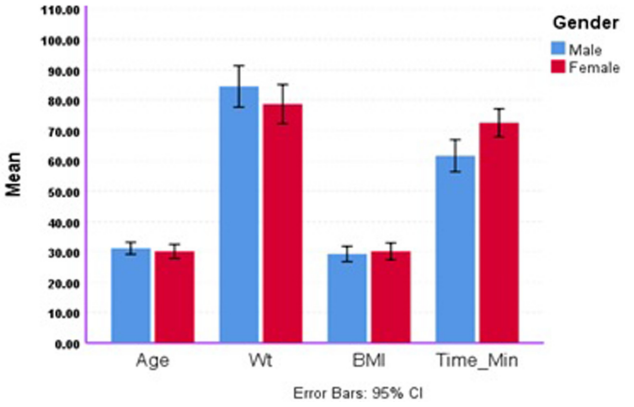
	Mean±SE		*t* value	*P* value	Significance	95% confidence interval of different	
	Male	Female				Lower	Upper
Pairs							
Age	31.17±1.99	30.17±2.29	0.33	0.74	NS	−5.29	7.29
Height	170.25±2.25	162.58±2.03	2.53	0.01	S	1.38	13.94
Weight	84.5±6.85	78.67±6.47	0.62	0.54	NS	−13.71	25.37
BMI	29.29±2.51	30.14±2.79	0.23	0.82	NS	−8.62	6.93
Time (min)	61.67±5.27	72.50±4.63	1.55	0.14	NS	−25.37	3.71

Figure 9



Clustered Barr mean of hypertension (HT), weight (WT), age and operative time between sexes.

Figure 10

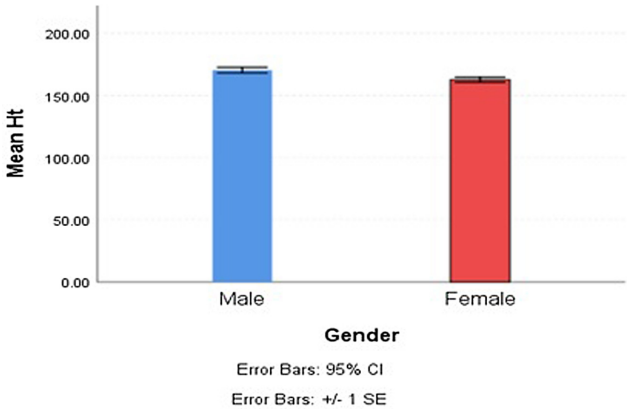


Bar chart of the mean blood pressure between male/female.

Discussion

Sleeve gastrectomy is a safe and reproducible procedure with a comparatively low rate of complications [18]. Hence, it is increasingly being used worldwide. However, it is not an uncomplicated operation. LSG is still associated with complications such as staple line leakage (1.17%), postoperative hemorrhage (3.5%), and stenosis (0, 2–4%) [19].

Figure 11



Pie chart of preexisting comorbidities in our patient sample.

Functional stenosis after LSG is triggered by a twist or sharp angulation of the stomach, hematoma, or adhesion formation or support suture issues [6]. The stomach is normally fixed in position by gastric ligaments. The disruption of these ligaments during LSG increases the mobility and ability of the stomach to rotate organo-axially or mesentero-axially. This possibility may be especially true when patients have lost weight [20].

The twist is manifested in two pictures: a localized twist of the gastric tube at the junction between the body and the antrum that behaves like a sphincter that prevents the stomach from emptying effectively or a spiral course of gastric stapling that winds around the stomach from bottom to top. The consequence is an ineffective emptying of the stomach owing to uncoordinated contractions [13].

In our study, we aimed at restoring the normal support to the gastric tube by a technique that is used in gastric volvulus in children, which is similarly precipitated by laxity of gastric ligaments [21].

Gastric fixation was first introduced in gastric sleeve surgery as a technique consisting in a pexy of omentum

(omental patch) along the suture line which decreases the risk torsion or rotation caused by a lack of fixation of the new gastroplasty [22].Gastropexy is currently used as a secondary line of management. Abd Ellatif *et al*. [9] reported the use of gastropexy after repeated failure of endoscopic balloon dilatations in some of their patients in their study.

The technique is increasingly being used as a precautionary measure during sleeve gastrectomy. Kizilkaya and Bozkurt [23] used posterior fixation technique using fibrin sealant during sleeve gastrectomy with decreased incidence of postoperative dysphagia.

In another prospective study, fixation of gastric tube during LSG in one group eliminated the incidence of gastric twist and showed lower incidence of nausea and vomiting compared with the control group with classic LSG. It was observed that fixing the gastric sleeve by attaching to the omentum or the peripancreatic fat tissue may prevent functional stenosis [24].

The postoperative stay and resumption of normal daily activities are comparable to other methods, with the advantage of being a one-time cost-effective procedure in comparison with endoscopic dilatation.

Conclusion

Gastric fixation is a relatively safe, easy, and cost-effective procedure that presents as an alternative to stenting and dilatation in the management of post-sleeve gastrectomy gastric twist.

Recommendations

More studies on the efficacy of gastropexy in long-term outcome of management of gastric twist are needed. Studies involving a larger number of patients are recommended. A comparison of the use of fibrin sealants versus sutures is recommended.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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