

Intra-thoracic Gastric Pouch Migration Following Laparoscopic Sleeve Gastrectomy – Short Term Study

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Highlights

- Incidence of Intra-thoracic Gastric Pouch Migration Following Laparoscopic Sleeve Gastrectomy was 16% in the current study.
- The most common presentation of ITSM was persistent vomiting followed by refractory GERD.
- Re-operation was needed to manage ITSM in 22 (out of 300 cases included in the study) (7.3%).
- Mean GERD-HRQL score improved after ITSM management from 47.13 to 29.19.

Abbreviations:

ITSM: Intra-thoracic sleeve migration;
LSG: laparoscopic sleeve gastrectomy;
GERD: gastroesophageal reflux disease;
RYGB: Roux-en-Y gastric bypass;
GEJ: gastroesophageal junction;
PPI: proton pump inhibitors;
EGD: Esophagogastroduodenoscopy.

ABSTRACT

Background: Intra-thoracic sleeve migration (ITSM) is an underreported complication of laparoscopic sleeve gastrectomy (LSG), its occurrence is incriminated in the suffering from many symptoms like epigastric pain, persistent vomiting, and gastroesophageal reflux disease (GERD) with subsequent affection of the quality of life of the bariatric patient. **Aim:** To determine the incidence of ITSM, evaluate its impact on the patient & its management efficacy.

Methods: Patients enrolled in this study must have completed at least one year after LSG performed at our department of bariatric surgery, Patients with troublesome gastroesophageal symptoms who failed to respond to medical treatment underwent assessment through esophagogastroduodenoscopy. Confirmed ITSM patients were offered Roux-en-Y gastric bypass (RYGB) plus cruroplasty. Quality of life was assessed before and after re-operation using GERD-HRQL questionnaire.

Results: Three hundred LSG cases were included in the study. Incidence of ITSM was found to be 16%, the most common presentation of ITSM was persistent vomiting (66.7%) followed by refractory GERD (58.3%). Regarding management, (45.83%) cases agreed to undergo surgical revision (RYGB plus cruroplasty). Mean GERD-HRQL score improved after revision from 47.13 to 29.19 (P-value <0.001).

Conclusion: ITSM should be considered in LSG patients presenting with vomiting and/or GERD. RYGB plus cruroplasty is a valid option if not the best for repair of ITSM even after successful weight-loss LSG. Search for preventive measures of ITSM must be pursued to improve quality of life and outcome of LSG.

Key words: sleeve gastrectomy, Roux-en-Y gastric bypass, obesity surgery, bariatric surgery, gastroesophageal reflux disease, sleeve migration

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INTRODUCTION

The bariatric patient is at increased risk for hiatal hernia due to increased intra-abdominal pressure causing a trans-diaphragmatic pressure gradient at the gastroesophageal junction (GEJ) weakening the crura and widening the hiatus (1). Sliding hiatal hernias are most associated with GERD (2).

ITSM refers to the gastric sleeve that was intra-abdominal during the sleeve gastrectomy procedure then migrated up some time after the surgery (3).

ITSM is an underreported phenomenon, its occurrence is incriminated in the suffering of the patients from many symptoms postoperatively like epigastric pain, persistent vomiting, and GERD either de novo or already present GERD (3).

Therefore, detailed study of ITSM and correction of this abnormality is expected to resolve distressing symptoms caused by it and thereafter improve quality of life.

MATERIALS AND METHODS

The study was conducted at the bariatric surgery department in our hospital. Three hundred patients who underwent LSG and completed at least one year from the surgery were included in the study, any case with pre-operative history or endoscopic findings of GERD as well as patients with concomitant hiatal hernia repair in the primary procedure was excluded in the study.

The cases were screened for symptoms suggestive of hiatus hernia (epigastric pain, GERD, dysphagia, vomiting), those who complained from any of the previous symptoms were first advised to follow lifestyle adjustment with optimization of proton pump inhibitors (PPI) therapy, also they underwent abdominal ultrasonographic examinations to exclude gall stones as a possible etiology to their complaints. Cases who failed to respond partially or completely to medical treatment as well as those who had recurrent symptoms underwent further assessment through esophagogastroduodenoscopy.

Patients (N=300) were categorized into group (A) (N=252) (patients with no endoscopic evidence of ITSM) and group (B) (N=48) (patients with endoscopic evidence of ITSM) when needed in comparisons.

Confirmed ITSM patients were offered RYGB plus cruroplasty. Quality of life was assessed before and after revision using GERD-HRQL questionnaire (GERD-health related quality of life questionnaire)(4).

Statistical analysis

Statistical analysis was performed with the statistical software SPSS version 20.0 (SPSS Inc., IL, USA). Quantitative variables were defined by mean and standard deviation, whereas qualitative variables were determined by number and percentage. A comparison of quantitative variables was performed with Student's t test, while the Chi-square test was done for categorical variables. P value of < 0.05 was considered significant, and p < 0.001 as highly significant.

RESULTS

Three hundred patients were enrolled in the study. Mean age was 34.40 ± 9.806 years, range (12-60 years). The study included "32 (3.2%) males and 268 (96.8%) females".

All the patients underwent LSG at the bariatric surgery unit in our hospital; Simultaneous cholecystectomy was performed in 39/300 (13%) patients.

The most prevalent Complaints during follow-up were epigastric pain (36%) followed by persistent vomiting (29.3%). Water and protein intolerance were described by 45.3% and 38.7% of the cases respectively as shown in (table 1).

Esophagogastroduodenoscopy (EGD) was undertaken in 105 cases (patients with persistent, or recurrent symptoms despite optimal medical therapy) and showed evidence of ITSM in 48 cases, as shown in (fig. 1).

So, the incidence of ITSM by endoscopy was found to be 16% (48 cases), being higher in the females 46 (17.1%) than in males only 2 (6.25 %).

We then reviewed the whole sample again and conducted comparison between group (A) (N=252) (patients with no evidence of ITSM in the endoscopy) and group (B) (N=48) (patients with evidence of ITSM).

No major difference between Group (A) and (B) regarding the age, percent excess weight lost and BMI

Table 1 - Clinical findings from screening the whole sample (N=300)

Symptom or sign	Number of cases	Percentage
Epigastric pain	108	36%
Dysphagia	14	4.7%
Persistent vomiting	88	29.3%
Reflux symptoms	66	22%
Additional symptoms & signs investigated		
Water intolerance	136	45.3%
Protein intolerance	116	38.7%

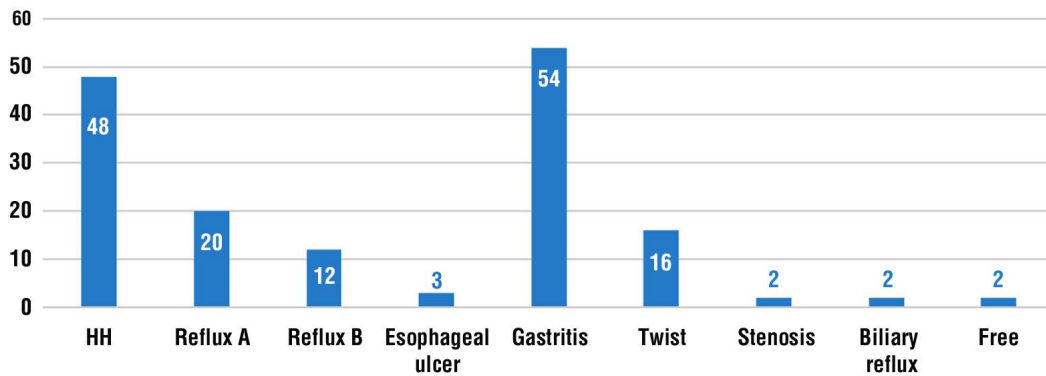


Figure 1 - EGD findings (N=105): 48 cases had endoscopic evidence of ITSM, 54 cases had gastritis and sleeve twist was found in 16 cases

Table 2 - Comparison between group (A) and group (B) patients' demographics using T-test parameter

Variables	Group A (N=252)	Group B (N=48)	T-test	P value
Age	33.88 ± 9.92	37.13 ± 8.88	-2.275	.764
BMI before the operation	48.56 ± 6.17	49.61 ± 6.78	-1.000	.257
BMI at follow up	33.21 ± 5.39	34.43 ± 4.95	-1.533	.375
% Excess weight lost	66.57 ± 17.41	62.06 ± 17.59	1.630	.916

(at the time of LSG and at one-year follow-up) as shown in (table 2).

For group (B); the most common presentations were persistent vomiting (66.7%) followed by Refractory GERD (58.3%) then epigastric pain in (45.8%), as shown in (table 3).

All the cases with ITSM were offered revisional surgery to RYGB and cruroplasty with variable adjusted limb lengths according to end weight and BMI. Twenty-two cases approved conversion to RYGB. The rest of the cases decided to continue medical treatment for their symptoms.

Re-operation successfully eliminated the complaints that the patients suffered from in all the cases (followed up for 6 more months) except for one case who needed

prolonged hospital course for management of resistant gastritis.

All the 22 cases who underwent surgery answered the GERD-HRQL questionnaire before and after Surgical revision (fig. 2). Mean score before ITSM management was 47.13±21.4 and it improved to 29.19 after revision (P-value <0.001).

DISCUSSION

Due to the large number of LSG performed worldwide, we are learning more about its late complications. Obesity itself is an independent risk factor for hiatal hernia, found preoperatively in more than half of the morbidly obese patients (5). This predisposition is

Table 3 - Comparison between clinical findings in group (A) and (B)

variables	Groups		Pearson Chi-Square	P value
	A (N=252)	B (N=48)		
Epigastric pain	86 (34.2%)	22 (45.8%)	2.398	0.121
Persistent vomiting	56 (22.2%)	32 (66.7%)	38.422	<0.001 *
Refractory GERD	38 (15.1%)	28 (58.3%)	43.960	<0.001 *
Dysphagia	4 (1.6%)	10 (20.8%)	54.829	<0.001 *
Water intolerance	100 (39.7%)	36 (75.0%)	20.594	<0.001 *
Protein intolerance	76 (30.2%)	40 (83.3%)	48.072	<0.001 *

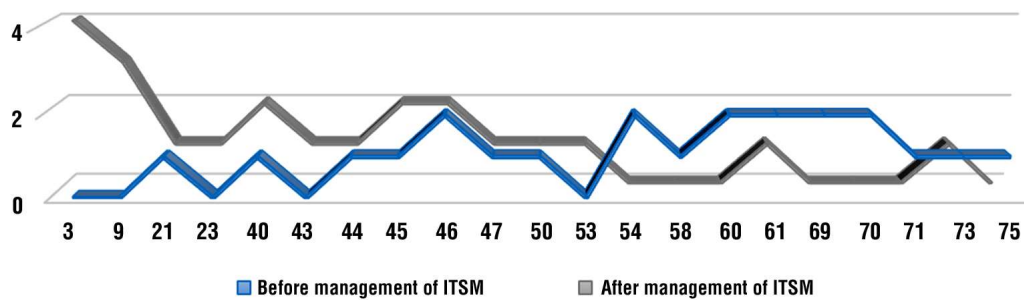


Figure 2 - Change in GERD-HRQL score after ITSM surgical repair (N=22), with notable improvement of the score post-surgical revision

explained by higher intragastric pressure due to intra-abdominal or visceral fat, reduced inferior esophageal sphincter pressure, and esophageal motility problems. Defective motility can be explained by the production of cytokines by visceral fat, reduced elastin in the diaphragmatic crura, and abnormal changes in the extracellular matrix and collagen (6).

Mena Boules et al., investigated the incidence of HH in obese subjects undergoing bariatric surgery over four years duration and 2623 cases, they found HH in 83 (3.2%) of the cases, HH was diagnosed before bariatric surgery in 32 (39%) subjects, whereas 51 (61%) asymptomatic patients were diagnosed intraoperatively. So, they concluded that the true incidence of HH may be underestimated before bariatric surgery (7).

A hiatal hernia found in the postoperative period could be a hiatal hernia that was missed during or developed after the original bariatric procedure. However, when Saber et al., described ITSM, they were particularly describing the gastric sleeve that was intra-abdominal during the sleeve gastrectomy procedure then migrated up some time after the surgery (3).

Incidence of ITSM in our study was 16% by endoscopy (all were 7 symptomatic) (48/300 cases). This is not an accurate estimate for the real incidence of HH, this is because many cases go asymptomatic, unless the hernia is large enough or there is an associated distal resistance by any sort of obstruction e.g.: stenosis or twist, even when there are symptoms, they are non-specific besides there is no accurate diagnostic modality for the hiatus hernia.

This is consistent with the findings of Jorge Saba et al., who explored the esophageal hiatus in 51 patients undergoing abdominal operations with history of LSG and found ITSM in 37/51 (72.5%), all these cases were operated upon for other causes than bariatric or HH

repair which means that all the cases were asymptomatic (8).

The mechanisms responsible for this outcome are not well understood but they appear to differ from the mechanisms leading to hiatal hernias in the non-obese population (9). The increased intra-gastric pressure because of a narrow gastric sleeve, enlarged natural orifice due to a rapid postoperative weight loss and visceral fat loss leading to melt down hiatal fat, the transection at the angle of His and partial removal of the sling diaphragmatic fibers have been inconsistently proposed as a possible underlying mechanism (10).

Complaints of the patients with ITSM at follow up varied between the current study and Saber et al., study (3), with the most common presentation in the current study being persistent vomiting and in the other study being refractory GERD.

The prevalence of Water and protein intolerance was much higher in group (B) than group (A) with statistical significance, which means that ITSM is incriminated in occurrence to some extent in water and protein intolerance. Khalifa et al., reasoned it in two published studies in 2018 and 2019 by the Loss of ligament fixation in the first study that may result in mal-positioning of the gastric sleeve with subsequent food intolerance and persistent GERD, and so they support performing omental reattachment as a form of gastropexy (11) whereas in the second study they added that antral resection is a solid reason concluding that preservation of the pyloric antrum during LSG is associated with significantly better food tolerance up to 6 months postoperatively when compared with total antral resection (12).

EGD sensitivity in diagnosing HH was found to be (50%) in the pre-operative screening and (87.5%) in the post-LSG follow-up in the current study. When Mustafa

et al. studied the efficacy of EGD in diagnosing HH pre-operatively over 402 sleeve gastrectomy patients, they found that despite being a valuable informative tool in preoperative evaluation of bariatric patients; it has high negative predictive value in ruling out HH but also with relatively low positive predictive value to prove its presence (13).

The International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO) position is clear towards post-operative endoscopic assessment. The IFSO recommends a surveillance endoscopy routinely for all patients after bariatric surgery at 1 year and then every 2-3 years for patients who have undergone LSG (14).

Management of ITSM varies widely with no guidelines till now, Some surgeons prefer to do cruroplasty (posterior and/or anterior) with or without fixation of the gastric tube, this preserves the original LSG with its restrictive action if no dilatation happened and avoids conversion of the sleeve to another type of procedures (bypass surgery), On the other hand; some surgeons believe that RYGB is the ultimate cure for the Post-LSG reflux with the repair of the hiatus hernia.

Soong et al., 2019 assessed the efficacy of cruroplasty plus gastropexy over 28 subjects with ITSM, after a period of 24 months of follow-up 50% only of the cases were satisfied whereas 21.4% were dissatisfied and 11.1% agreed to undergo RYGB (22). In our study on (3/22) 13.6% of the cases were dissatisfied with the RYGB option.

The change in GERD-HRQL varied widely among patients. Some patients had a very good response, and some had a worse response, others were neutral; we had an improvement of the mean score from 47.13 ± 21.4 before ITSM management to 29.19 after ITSM management ($P < 0.01$). On the other hand; Soong et al., had a score of 24.3 ± 8.4 prior to revision; this value decreased to 16.8 ± 12.5 at 6 months after surgery ($P < 0.01$). they reasoned this response as the patients with severe gastric tube kinking and torsion tended to have a better response, but those with a very wide esophago-gastric junction tended to have a worse response after revision surgery (15).

Finally, the search for preventive measures of ITSM must be pursued to improve quality of life and outcome of LSG. I. Hutopila et al., tried a new technique for repair of HH hernia during LSG by reconstruction of the phreno-esophageal ligament (R-PEL) to decrease incidence of ITSM, they claim that it reduced the rate of ITSM by 7 times (16).

CONCLUSION

Surgical complications in relation to LSG seem to be under-reported in the literature. Awareness of such complications would help surgeons to wisely select the candidates for each bariatric procedure and be prepared to promptly diagnose and effectively manage those complications postoperatively. Sleeve herniation should be included in differential diagnosis of LSG patients presenting with mainly by vomiting and/or GERD postoperatively. Although routine use of post-operative radiographic modalities has not been justified yet, Pre and post-LSG endoscopic assessment is recommended. Conversion to RYGB showed better results than cruroplasty and gastropexy, however; management of ITSM should be tailored according to the patient condition, taking into consideration the patient weight and BMI status, associated functional and anatomical abnormalities, financial state of the patient and his own well.

Conflict of interest

The authors declare that there is no conflict of interest or financial ties to disclose.

Ethical statement

This study has been approved by the appropriate institutional and/or national research ethics committee and have been performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. All the patients were given an explanation of the study and about the investigative and operative procedures with their merits and demerits, expected results, and possible complications.

Informed consent statement

Informed consent was obtained from all individual participants included in the study and all the patient data was used anonymously.

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