

Dysphagia after Bougie-guided Crural Repair in Laparoscopic Nissen Fundoplication

Mohab G Elbarbary¹, Islam Hossam El-Din El-Abbassy², Ahmed Samy Omar³, Medhat Helmy Khalil⁴

ABSTRACT

Purpose: Nissen fundoplication is still assumed as the perfect lifelong management for gastroesophageal reflux disease (GERD). Despite the marked progress in performing the operation laparoscopically, dysphagia remains the most common postoperative morbidity. The use of an intraesophageal bougie during fundoplication to decrease the risk of postoperative persistent dysphagia (PD) by a forming proper tension-free wrap has been reported before in the literature. However, the aim of our study was to highlight the role of using a bougie in allowing a more guided way to repair the crura and avoiding blinded posterior repair, and the effect of that in reducing the incidence of postoperative PD in laparoscopic Nissen fundoplication.

Materials and methods: A prospective study including 40 patients undergoing laparoscopic Nissen fundoplication for repairing hiatal hernia with refractory GERD. The crural repair was guided by 50 Fr bougie. Postoperative collection of GERD–health-related quality of life (GERD–HRQL) questionnaire was done at 1 and 6 months for all the patients. The postoperative dysphagia was assessed regarding both severity and frequency.

Results: The GERD symptoms significantly improved in all patients, with marked postoperative satisfaction. No patients required dilation for postoperative dysphagia. Ten patients (25%) had mild dysphagia that resolved with conservative management, but no recurrence of GERD symptoms was observed.

Conclusion: Laparoscopic Nissen fundoplication is more efficient on using a bougie, allowing proper identification of the direction of esophageal descent through the hiatus, resulting in proper crural repair and the formation of an ideal wrap with a low-risk of prolonged dysphagia.

Keywords: Bougie, Dysphagia, Gastroesophageal reflux, Hiatal hernia, Nissen fundoplication.

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INTRODUCTION

Postoperative dysphagia is considered one of the most annoying complications for patients having laparoscopic fundoplication. About 40–70% of patients would suffer from transient dysphagia.¹ Despite the unclearness of the exact cause, the ineffective esophageal motility (IEM) and postoperative edema at the gastroesophageal junction (GEJ) may give an idea about that.²

Dysphagia commonly resolves spontaneously within 2–3 months postoperatively;³ however, PD may occur in 3–24% of patients after Nissen fundoplication.⁴ Laparoscopic fundoplication was believed to have a higher incidence of PD than the open approach.⁵ Construction of a tight wrap, slippage or displacement of fundoplication, a peptic ulcer stricture, as well as dividing the short gastric vessels during fundus mobilization are all possible causes.⁶

Unfortunately, undiagnosed IEM and unrecognized achalasia preoperatively may have a role in raising the incidence of postoperative PD.⁷

The use of an intraesophageal bougie during fundoplication to decrease the risk of postoperative PD by forming proper tension-free wrap has been reported before in the literature.⁸ However, the aim of our study was to highlight the role of using a bougie in allowing a more guided way to repair the crura and avoiding blinded posterior repair and the effect of that in reducing the incidence of postoperative PD in laparoscopic Nissen fundoplication.

MATERIALS AND METHODS

This was a prospective observational study conducted during the period from July 2017 to December 2019 at Ain Shams University Hospitals, Cairo, Egypt.

^{1,3,4}Department of General Surgery, Ain Shams University, Cairo, Egypt

²Department of General Surgery, Faculty of Medicine, Ain Shams University, Cairo, Egypt; Raigmore Hospital, NHS Highland, United Kingdom; Institute of Medical Sciences, University of Aberdeen, Aberdeen, United Kingdom

Corresponding Author: Islam Hossam El-Din El-Abbassy, Department of General Surgery, Faculty of Medicine, Ain Shams University, Cairo, Egypt; Raigmore Hospital, NHS Highland, United Kingdom; Institute of Medical Sciences, University of Aberdeen, Aberdeen, United Kingdom, Phone: +44 7871798087, e-mail: islamelabbassy@hotmail.com

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We included patients having hiatal hernia with refractory GERD who were not compliant with medical therapy. Patients who suffered from achalasia or any esophageal motility disorders were excluded along with patients having previous esophageal or gastric surgery, or those over 60 years of age. All patients had laparoscopic Nissen fundoplication by a team of two skilled surgeons using the same technique.

We conducted this study in compliance with the principles of the Declaration of Helsinki. The study's protocol was reviewed and approved by the institutional ethical committee. Written informed consent was obtained from all patients included in the study.

A standardized GERD–HRQL questionnaire^{9,10} was used for all patients preoperatively and at 1 and 6 months postoperatively.

Preoperative Evaluation

Preoperative assessment of the patients was done by a detailed history taking and physical examination. A 24-hour PH monitoring, upper gastrointestinal (GI) endoscopy, and esophageal manometry were done for all patients to reach the exact diagnosis of refractory GERD, to exclude esophageal motility disorders or achalasia and also to detect any esophagitis or Barrett's esophagus caused by GERD.

As posted by DeMeester et al., pathologic reflux was defined by esophageal acid exposure with a DeMeester score¹¹ greater than 14 without having any proton pump inhibitors (PPIs).¹ However, amplitudes of 30 mm Hg of mean distal esophageal contraction and failed peristalsis in less than half of the esophageal contractions were deemed normal. The use of any pre-operative PPIs was recorded.

Surgical Technique

The operation was carried out under general anesthesia. A prophylactic dose of IV antibiotics was given during the induction.

The patients were placed in a supine position with abducted both legs and arms along with the table in reverse Trendelenburg position where the surgeon stood between the legs and the cameraman to the patient's right side.

A five-trocar approach was applied, where a 12-mm optical port (used to create pneumoperitoneum) was placed in Palmer's point. A 5-mm trocar was placed just below the xiphoid process; another 5-mm port at the left anterior axillary line and one in the right mid-clavicular line. The liver was retracted by a self-retained S-shaped liver retractor through the upper 5-mm port opening.

Greater omentum was transected with an energy device (Ligasure–Medtronic) starting high up 4-cm distal to the hiatal hernia. Dissection of the greater omentum was done till complete identification of left crus with great importance to divide all the short gastric vessels above the starting point allowing complete mobilization of the fundus of the stomach.

The gastro–hepatic ligament was then transected followed by dissection of the right crus, allowing about 2–3 cm of the distal esophagus to be in the abdomen. Dissection was done carefully with attention not to injure the posterior vagus trunk during the posterior dissection.

After identifying the hiatal hernia and the confluence of both crura, a stitch approximating the right and left crus was taken posteriorly. Then guided by a 50 Fr bougie, inserted by an experienced anesthetist from the mouth down to the stomach, the direction of the esophagus was identified and further stitches to close the hernial defect were taken either posteriorly, anteriorly, or both according to the hiatal size using interrupted non-absorbable 2/0 Ethibond sutures [Figures 1 and 2](#).

A short redundant posterior 360° fundoplication wrap was performed using the properly mobilized fundus. A “shoe-shine” maneuver to ensure a tension-free wrap was done. A 1–2 cm fundoplication wrap was done around the delivered intraabdominal esophagus using interrupted non-absorbable 2/0 Ethibond sutures. The first suture included bites from the fundus of the stomach on both sides of the esophagus and a fine bite of the anterior wall of the esophagus to prevent slippage of the wrap. Then one or two stitches were taken above the first stitch (the first stitch was around the GEJ so all the stitches should be above, but not below, the first stitch to avoid an improper wrapping of the stomach around itself). The second or third stitches were taken only between the stomach sidewall around the esophagus but not fixed to its anterior wall guided by the intraesophageal bougie that moved in and out by the

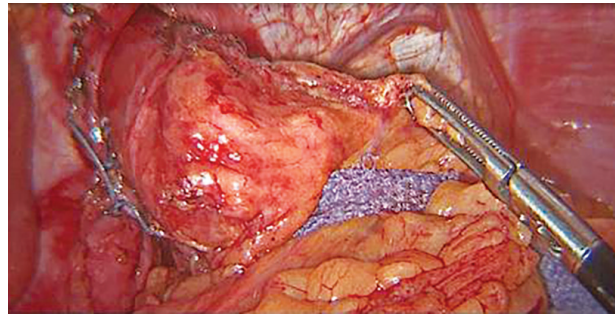


Fig. 1: Bougie introduction after taking a posterior crural stitch showing the direction of the esophageal descent through the hiatus and complete closure of the posterior defect was done guided by the bougie, leaving a small gap anteriorly

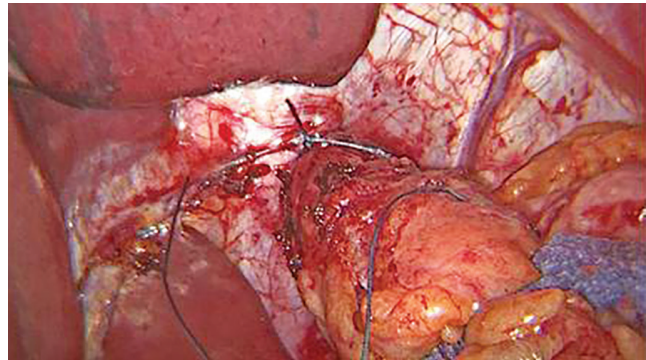


Fig. 2: Single anterior stitch was taken to close the anterior gap and smooth passage is checked using a 50 Fr bougie

Table 1: Frequency and degree of postoperative dysphagia based on the classification of Saeed et al.¹²

<i>Frequency and degree of postoperative dysphagia</i>	
0	Unable to swallow.
I	Swallowing liquids with difficulty, solids impossible.
II	Swallowing liquids without difficulty, solids impossible.
III	Occasionally difficulty swallowing with solids.
IV	Rarely difficulty swallowing with solids.
V	Swallowing normally.

anesthetist to avoid tight wrap. The last stitch was taken between the wrap and the right crus to fix the wrap and prevent its displacement. The operative time and complications either during or after the operation were recorded.

Postoperatively, patients were discharged on the second postoperative day. The oral clear fluids were allowed for the first 24 h, then soft diet for the following 7 days.

Follow-up was carried out by phone or clinic attendance at 2 weeks, 1–6 months postoperatively to assess the postoperative GI symptoms, PPI intake, GERD–HRQL questionnaire which was collected at 1 and 6 months postoperatively for all the patients.

Both frequency and severity of postoperative dysphagia were evaluated using a classification defined by Saeed et al.¹² who scored the ability to swallow from 0 to 5 in which the lowest score was given for the inability to swallow and the highest for normal swallowing ([Table 1](#)). Early dysphagia was defined by having dysphagia that

resolved within 8 weeks postoperatively, while late dysphagia was defined by having PD that time and requires endoscopic intervention and/or surgery for resolution.^{13,14}

Any investigations required for postoperative dysphagia were recorded.

RESULTS

All our 40 patients had laparoscopic Nissen fundoplication using our technique for chronic GERD with sliding hiatal hernia during the given period of time.

The study included 10 males (25%) and 30 females (75%). The median age was 44 years. Sliding hiatal hernias were detected in all patients as proven by preoperative upper GI endoscopy with sizes ranging from 1 to 5 cm. Four patients (10%) showed Barrett’s metaplasia with no dysplasia in the histology taken upon esophagogastroduodenoscopy (EGD) before the procedure. All patients showed various degrees of esophagitis.

The preoperative symptoms were heartburn (*n* = 34, 85%) and regurgitations (*n* = 24, 60%). Aspiration was manifested as chronic cough or asthma with recurrent pneumonia.

All patients were diagnosed to have refractory GERD with prolonged usage of PPIs. Demography and preoperative symptoms are shown in (Table 2).

The median operation time was recorded to be 85 minutes in the range 30–180 minutes. All operations were done laparoscopically with no conversion to open. We had no intraoperative complications. The introduction of the 50 Fr bougie was done by a senior experienced anesthetist with no intraoperative complications associated with its use.

Postoperatively, GERD symptoms (heartburn, regurgitation, and aspiration) significantly improved in all patients and the GERD–HRQL scores showed marked postoperative satisfaction. Symptoms resolved without using PPIs in 38 patients (95%), whereas occasional PPI intake was reported in 2 patients (5%)

Early dysphagia was reported postoperatively in ten patients (25%). Four patients (10%) had rare difficulties in swallowing solids, whereas six patients (15%) were reported to have occasional difficulties in swallowing solids.

All patients were reachable for follow-up (either by phone or attending the clinic), and they were willing to take part in the questionnaire.

Guided by the classification of Saeed et al.,¹² both severity and frequency of dysphagia following our procedure were evaluated at 1 and 6 months as shown in Figure 3. Postoperative gas-bloat syndrome was reported in 28 patients (70%); however, these symptoms improved in all patients within 4 weeks postoperatively. Only two patients (5%) with repeated vomiting needed postoperative upper GI endoscopy, which showed mild narrowing not requiring dilatation. Those patients were managed conservatively.

Table 2: Demographic data and the preoperative findings

Data	Number of patients (total, N = 40)	Percentage (%)
Males	10	25
Females	30	75
Preoperative heartburn	34	85
Preoperative regurgitation	24	60
Barrett’s metaplasia	4	10

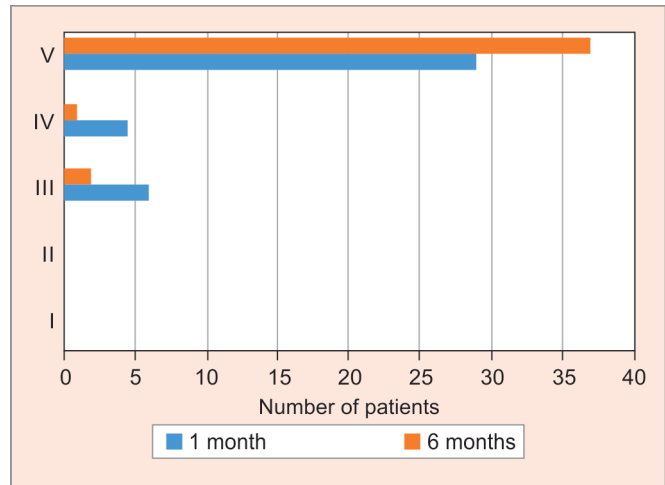


Fig. 3: Degree of postoperative dysphagia in our patients guided by Saeed et al.¹² classification at 1 and 6 months postoperatively

No further investigations were required for the rest of the patients included in the study influenced by the marked improvement of their symptoms.

DISCUSSION

Despite the marked effect of PPIs in treating GERD, the surgical approach is considered the most effective long-term management of the disease. Laparoscopic Nissen fundoplication is still the most effective anti-reflux surgery, with marked patient satisfaction and minimal postoperative complications.¹⁵

However, the prevalence of complications such as postoperative dysphagia and gas-bloat syndrome may occasionally require further surgical intervention and decrease the postoperative patients’ satisfaction.¹⁶ Postoperative dysphagia could be caused by slipping of the wrap¹⁶ or local edema and hematoma resulting from excessive manipulation during the procedure.¹³

In our study, 25% of our patients were managed conservatively for early dysphagia and only two patients required upper GI endoscopy due to repeated vomiting, which showed mild narrowing not requiring dilatation. The passage of the scope itself may have contributed to achieving some sort of calibration. It has been reported that early postoperative mild dysphagia is common shortly after the operation and improves spontaneously when edema or hematoma subsides, whereas PD that lasts more than 8 weeks occurs in 20% of cases and is considered a challenge in further diagnosis or treatment.¹⁷ Postoperative dysphagia could also be due to possible technical errors by the surgeon due to closing the hiatus too much or making a too-tight wrap.¹⁸ Proper preoperative diagnosis for the cause of GERD is very important as the presence of preoperative dysphagia or esophageal motility disorder, increases the development of PD postoperatively.¹⁹

There have been some suggestions in the literature to decrease the chance of developing postoperative dysphagia. DeMeester¹ reported that reducing the wrap length from 4 to 1 cm, along with division of the short gastric vessels and increasing the size of the bougie from 36 to 60 Fr was enough to reduce the incidence of postoperative dysphagia from 83 to 40%. However, the effect of division of the short gastric vessels to perform a better tension-free wrap, on decreasing the incidence of PD is still controversial.^{20,21} In our study, using a 50 Fr bougie along with doing a short wrap



(1–2 cm) and dividing the short gastric vessels was effective in preventing PD among our patients.

The use of intraesophageal bougie guide during the wrap formation was first adopted by a study in 1986 showing a lower risk of developing postoperative dysphagia when a larger bougie was used.²² The Society of American Gastrointestinal and Endoscopic Surgeons (SAGES)²³ recommended the bougie use supported by another study.²⁴ However, on the other hand, several studies assumed that the rates of postoperative dysphagia were not affected and the possible benefit decreased by the risk of esophageal perforation.^{22,25,26} In our study, no esophageal perforations were reported while introducing the bougie by experienced anesthetists.

The idea of using a bougie in our study was not only to decrease the risk of postoperative dysphagia by forming proper tension-free wrap but also to allow a more guided way to repair the crura and avoid blinded posterior repair. Due to the presence of posterior esophageal sagging (which commonly occurs with those patients due to repeated reflux and esophageal inflammation), a blinded posterior repair without checking the direction of the esophageal descent through the hiatus may result in incomplete closure of the hiatus or tightening of the hiatal defect resulting in fundoplication failure (by wrap migration into the chest due to wide hiatus or postoperative dysphagia, respectively).

Therefore, in our technique the use of a 50 Fr bougie was considered the gold standard step in deciding how to repair the crura (either anteriorly, posteriorly or both) and forming the ideal wrap, minimizing the risk of too much or too loose crural repair. To our knowledge, our study is the first to highlight the importance of repairing the crura under vision guided by the bougie, whereas there is no documentation in the literature about the effect of crural repair, which may be a cause of the reported incidence of PD after laparoscopic Nissen fundoplication.

No cases of PD were reported in our study, whereas, in other studies where they did not use a bougie during their laparoscopic Nissen fundoplication, PD was reported to range 3–24%.^{16,27}

Gas-bloating syndrome with various degrees was reported in 70% of our patients, all of which resolved conservatively within 4 weeks. In the literature, the incidence of postoperative gas-bloating syndrome was reported to reach 85%.¹⁵ This could be related to the extensive division of the short gastric vessels²⁸ or due to the intraoperative manipulation of the vagal nerves during proper esophageal dissection.¹⁵

The pre-operative symptoms of our patients were mainly heartburn and regurgitation, which is similar to other studies.²⁹ In our study, 95% of the preoperative symptoms resolved postoperatively without using PPIs, while 5% reported occasional PPI intake. This is almost similar to other studies that reported 93.8% improvement of preoperative symptoms.^{15,30}

The disappearance of the GERD symptoms postoperatively and relatively the low usage of PPIs after our operation, along with the marked patient satisfaction and low-risk of PD are all supportive to encourage other surgeons to repair the crura guided by a bougie (rather than doing the repair blindly) to form an ideal wrap. However, we acknowledge the limited number of patients included in our study and the short period of their follow-up. Therefore, other multicenter studies are encouraged.

CONCLUSION

A proper diagnosis of the cause of GERD preoperatively may help in avoiding possible postoperative dysphagia. The laparoscopic Nissen

fundoplication is more efficient by using a bougie, allowing proper identification of the direction of esophageal descent through the hiatus resulting in proper crural repair and the formation of an ideal wrap with a low-risk of prolonged dysphagia.

Clinical Significance

In our technique, the use of a 50 Fr bougie was considered the gold standard step in deciding how to repair the crura (either anteriorly, posteriorly or both) and forming the ideal wrap in laparoscopic Nissen fundoplication, minimizing the risk of too much or too loose crural repair with low-risk of prolonged dysphagia. To our knowledge, our study is the first to highlight the importance of repairing the crura under vision guided by the bougie, whereas there is no documentation in the literature about the effect of crural repair, which may be a cause of the reported incidence of PD after laparoscopic Nissen fundoplication.

ORCID

Islam ElAbbassy  <https://orcid.org/0000-0001-9359-9726>

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