

Routine Intraoperative Use of Esophageal Bougie in Minimally Invasive Hiatal Hernia Repair is Not Necessary

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ABSTRACT

Background: Laparoscopic hiatal hernia repair can be performed with an antireflux procedure. Routine use of an esophageal bougie has been advocated to avoid an excessively tight fundoplication. The use of an esophageal bougie carries a risk of iatrogenic complications, such as perforation or laceration of the viscera. However, there is equivocal evidence for the routine use in the surgical literature.

Methods: We present a retrospective analysis of patients with Types 3 and 4 paraesophageal hiatal hernias who underwent laparoscopic hiatal hernia repair with fundoplication without the use of an esophageal bougie, between December 1, 2010 and February 28, 2020, by a single surgeon at a community-based, academic hospital. Patients with a diagnosis of achalasia and gastroesophageal dysmotility were excluded. Perioperative outcome measures included: recurrence; prolonged postoperative proton pump inhibitor use; dysphagia; re-operation, and mortality.

Results: A total of 174 patients (34 males, 140 females) underwent laparoscopic hiatal hernia repair with fundoplication. The average age was 63-years old. Four patients (2.3%) developed dysphagia with narrowing of the gastroesophageal junction, with one patient (0.6%) requiring postoperative esophageal dilation with bougie and eventual re-operation. Postoperative proton pump

inhibitor use was 31.0% after 1 month. Overall hernia recurrence rate was 14.9% and the rate of re-operation was 6.3%. Overall mortality was 0.6%.

Conclusion: We conclude that laparoscopic hiatal hernia repair with fundoplication without an esophageal bougie is safe, effective, and efficient. Furthermore, bougie related risks are obviated with a comparable reported incidence of postoperative dysphagia and hiatal hernia recurrence.

Key Words: Esophageal bougie, Esophageal dilation, Fundoplication, Laparoscopic hiatal hernia repair.

INTRODUCTION

Gastroesophageal reflux disease (GERD) is a condition that affects approximately 7% of the population on a daily basis.¹ The presence and the size of hiatal hernias have been associated with more gastroesophageal reflux and acid-related symptoms.² The symptoms of GERD may be alleviated with repair of the hiatal hernia defect augmented by a fundoplication.^{3,4} In more extreme cases, the presence of a large hiatal hernia has an increased risk of gastric volvulus and surgical repair is usually recommended. Furthermore, the surgery may obviate the need for prolonged proton-pump inhibitor (PPI) use and their inherent risks, such as osteopenia.

Numerous modifications to the technical aspects of the operation have been suggested; however, the most basic aspects have remained the same and include: dissection and reduction of the hernia sac, mobilization and circumferential dissection of the esophagus from the mediastinum; cruroplasty with or without a mesh, and fundoplication. In more modern practice, the procedures are typically done laparoscopically. Also, some authors routinely use a bougie to facilitate the approximation of the hiatus and fundoplication.

The role of the esophageal bougie is to help approximate the repair and reduce the risk of an inadequate fundoplication or obstruction. Prior studies have supported the routine

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Acknowledgements: The authors are very grateful to Jeffrey Flynn, PhD and Olives Nyugen, MA for the contributions made to this research project.

Disclosure: none.

Funding sources: none.

Conflict of interests: none.

Informed consent: Dr. Michael Jacobs declares that written informed consent was obtained from the patient/s for publication of this study/report and any accompanying images.

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DOI: 10.4293/JLS.2022.00054

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use of a size 56F esophageal dilator to reduce postoperative dysphagia.^{1,5,6} Use of an esophageal bougie has inherent risks of esophageal/gastric perforation or laceration (00.6–1.2%)^{7–9} and although uncommon, serious long-term morbidities and even mortality may be associated with these complications.

Surprisingly, there is limited literature supporting the routine use of an esophageal bougie during fundoplication after a hiatal hernia repair.⁵ One must therefore question the value of routine use of the esophageal bougie and whether the benefits are worth the risks. Thus, the purpose of this study was to evaluate the outcomes of laparoscopic hiatal hernia repair with fundoplication (LHHR-F) performed without an esophageal bougie.

METHODS

A retrospective analysis of patients with a diagnosis of Types 3 or 4 hiatal hernia who underwent LHHR-F by a single surgeon at a community-based academic institution was performed. The study was approved by the Ascension Providence Institutional Review Board. All patients underwent a history, physical, pre-operative diagnostic evaluation with endoscopy, and an upper gastrointestinal study with contrast. Patients with achalasia confirmed by manometry or those who did not undergo a 360-degree fundoplication were excluded. Perioperative outcomes that were measured included: operative time, recurrence, postoperative PPI use, stricture, postoperative dilation(s), re-operation, and mortality.

Following discharge, patients were evaluated in the clinic within two weeks and again at 2–3 months. Patients who continued to take PPI postoperatively beyond 1 month were deemed to have persistence of symptoms. Patients with these symptoms as well as dysphagia underwent an esophagogastroduodenoscopy (EGD) and radiographic imaging to look for recurrence, stricture, obstructions, or other pathology such as peptic ulcer disease or gastritis. Descriptive statistical analyses were performed.

Operative Technique

Following induction of anesthesia and supine positioning, the trocars were positioned in the following manner: Supraumbilical 10-mm Hasson trocar; three 5-mm trocars in the epigastrium, right upper quadrant, and left lower quadrant, respectively; and a 10-mm in the left upper quadrant. An orogastric tube was placed and the patient transitioned to reverse-Trendelenburg, mild right-side

down position. Pneumoperitoneum is maintained at 15-mmHg and reduced to 10 mm Hg – 12 mm Hg during the repair.

The hernia content was mobilized from the mediastinum and circumferential dissection of the esophagus performed and the esophagus encircled and taped. During this process, the hernia sac and short gastric vessels are secured with an electro-surgical device (LigaSure™, Medtronic, Minnesota). Adequacy of mobilization is confirmed to achieve reduction of the gastroesophageal junction, such that it remains approximately five cm below the diaphragm without tension or torsion. A cruroplasty was performed to approximate that of a 54-French bougie tube; however, a bougie was not used in this study. A tailored, “horse-shoe” style mesh (Ventralight ST™, BD, New Jersey) may or may not be used depending on the size of the defect, integrity of the diaphragm, and tension on the cruroplasty. A 360-degree fundoplication was created by bringing the anterior and posterior fundal leaflets around the esophagus without tension or torsion. A proximal suture is incorporated in the manner of fundus-to-fundus to anterior crus, followed by fundus-to-esophageal wall of the fundus, followed by fundus-to-fundus; all in less than 2.5 cm for a short 360-degree fundoplication. Bilateral single tacking sutures from the fundus to the crura were placed.

RESULTS

Between December 1, 2010 and February 28, 2020, 174 patients with symptomatic, refractory GERD and hiatal hernia underwent LHHR-F with fundoplication (34 males, 140 females). The mean age was 63.0 years (range, 32 – 90 years). The mean body mass index was 29.4 (range, 17 – 44) (**Table 1**). There were no conversions to open technique. Ninety-three percent of patients pre-operatively used a PPI mixed with structured lifestyle and dietary modifications.

The average operative time was 110.9 minutes. Overall, the hernia recurrence rate after LHHR-F was 14.9% and mesh was used in 28.7% of cases, typically for large hernia defects or a tenuous cruroplasty. The overall re-operation rate for recurrent hiatal hernia or dysphagia was 6.3% (n = 11). One patient developed Boerhaave’s Syndrome following combined LHHR-F and distal esophageal diverticulectomy and developed a stricture at the esophageal perforation site. Prolonged postoperative PPI use after 1 month was 31.0% when evaluated at the 2–3 month follow-up period. Four patients (2.3%) developed dysphagia with narrowing of the gastroesophageal junction

Table 1.

Pre-operative Patient Characteristics Undergoing Laparoscopic Hiatal Hernia Repair with Fundoplication

Characteristics	n (%)
Total patients	174
Males	34
Females	140
Age (years)	63.0
Body mass index (range)	29.4 (17–44)
Symptomatic GERD	174 (100%)
Patients using PPI	162 (93.1%)
HTN	95 (54.6%)
DM	24 (13.8%)
CAD	11 (6.3%)

Abbreviations: GERD, gastroesophageal reflux disease; PPI, proton pump inhibitor; HTN, hypertension; DM, diabetes mellitus; CAD, coronary artery disease.

and of those four, one patient (0.6%) required esophageal dilation and eventually re-operation (**Table 2**).

A single mortality (0.6%) occurred in a 90-year-old female who had presented with a Type IV hiatal hernia with an intrathoracic pancreas and organo-axial gastric volvulus. The postoperative recovery was further complicated by oropharyngeal dysphagia, associated malnutrition, and delirium after a prolonged hospitalization.

Table 2.

Operative Results of Patients Undergoing Laparoscopic Hiatal Hernia Repair with Fundoplication

Intraoperative and Perioperative characteristics	n (%)
Length of Procedure (Min)	110
Mesh used	50 (28.7%)
Fundoplication	174 (100%)
Conversion to open	0
Intraoperative complications	0
Recurrence of hiatal hernia	26 (14.9%)
Reoperation	11 (6.3%)
90-day readmission	8 (4.6%)
30-day mortality	1 (0.57%)
Stricture	4 (2.3%)
Dilation	1 (0.57%)
Postoperative PPI use at 1 month	54 (31.0%)

Abbreviation: PPI, proton pump inhibitor.

DISCUSSION

This study looked to evaluate the outcomes of LHHR-F performed without an esophageal bougie. The rates of recurrence, complications related to the fundoplication, and symptoms of postoperative gastro-esophageal reflux were found to be comparable to published reports. In a meta-analysis comparing mesh versus suture repair by Tam et al. (2016) the recurrence rate averaged 13% with mesh and 24% after suture cruroplasty.¹⁰ This was comparable to our overall hernia recurrence rate of 14.9%. The overall rate of re-operation was found to be about 3.7% with mesh and 6% after suture cruroplasty¹⁰ in literature and is comparable to our data of 6.3%.

In a 2002 retrospective review by Novitsky et al., the authors suggested that low rates of postoperative dysphagia and reflux recurrence were achievable without an esophageal bougie.¹¹ Other retrospective studies have supported that omission of an esophageal bougie did not increase postoperative dysphagia rates.¹² These studies were published subsequent to a prospective, blinded, randomized control study in 2000 by Patterson et al. who recommended the routine use of an esophageal dilator to calibrate the degree of tightness during fundoplication. In this study, the use of an esophageal dilator was associated with decreased long-term incidence of dysphagia. Also, the authors reported a 30-day dysphagia rate requiring endoscopic dilation of 9.9% in the bougie group and 7.8% in the nonbougie group. It should also be noted that the rate of esophageal perforation was 1.2%.¹ Comparatively, the rate of dysphagia in our population that required dilation was 2.3%. None of the patients developed intraoperative complications or required conversion to an open technique. The improvement in this outcome may simply reflect provider technical advances, i.e., learning curve, as opposed to the omission of the esophageal bougie. For those patients that did require re-operation, the most common finding was a “slipped” or retracted fundoplication. Furthermore, the surgery allowed for a 67% reduction in the need for prolonged (> 30-days) PPI therapy, obviating additional risks associated with chronic PPI usage.

Though comparable results can be achieved without the use of a bougie, this does not mean that there are no instances where it may be beneficial. Walsh et al. (2003) encouraged the selective rather than routine use of esophageal dilators.¹³ For example, the use of bougie should be limited in those with large paraesophageal hernias who may have acute angulation of the gastroesophageal junction or those with planned placement of posterior crural stitches (as it creates angulation).¹³ We agree that selective

use should be based on surgeon skill and judgment; however, the current population of patients did not require placement of an esophageal bougie. To further that point, we do not advocate the routine use of a bougie, as the increased risk of perforation or laceration inherent to its use are not justified. Thus, based upon our data, the risks outweigh the benefits.

We acknowledge that this retrospective review has limitations, especially since the data is derived from a single surgeon, single institution database. Furthermore, longitudinal outcomes were limited, as follow-up was generally kept at 6 months, unless patients came back with ongoing complications. We rely upon the rapport maintained with well-established referring provider relationships for subsequent follow-up of any prolonged or delayed complications. Also, the rate of GERD-like symptom recurrence was not measured using validated, standardized questionnaires such as GERD-Health-related Quality of Life,¹⁴ but rather based on ongoing symptoms, postoperative use of PPI related to GERD, or need for adjunctive therapies.

We conclude that laparoscopic hiatal hernia repair with fundoplication without an esophageal bougie is safe, effective, and efficient.

CONCLUSION

The routine of an esophageal bougie in LHHR-F is not necessary and omission of it can be safe and efficient. Surgeon judgment and technical skill likely play a major role in the consideration for use and certainly should be considered for difficult anatomy, reoperations, or during the surgeon's learning curve. Furthermore, bougie-related risks are obviated with a comparable reported incidence of postoperative dysphagia, hiatal hernia recurrence, and significant reduction in prolonged postoperative PPI use.

References:

1. Patterson EJ, Herron DM, Hansen PD, Ramzi N, Standage BA, Swanström LL. Effect of an esophageal bougie on the incidence of dysphagia following Nissen fundoplication: a prospective, blinded, randomized clinical trial. *Arch Surg*. 2000;135(9):1055–1061.
2. Franzén T. Is the severity of gastroesophageal reflux dependent on hiatus hernia size? *WJG*. 2014;20(6):1582.
3. Stylopoulos N, Rattner DW. The history of hiatal hernia surgery: from Bowditch to laparoscopy. *Ann Surg*. 2005;241(1):185–193.
4. Kohn GP, Price RR, DeMeester SR, et al. Guidelines for the management of hiatal hernia. *Surg Endosc*. 2013;27(12):4409–4428.
5. Jarral OA, Athanasiou T, Hanna GB, Zacharakis E. Is an intra-oesophageal bougie of use during Nissen fundoplication? *Interact Cardiovasc Thorac Surg*. 2012;14(6):828–833.
6. Edelman DS, Jacobs M, Lopez-Penalver C, Moses K. Safe esophageal bougie placement for laparoscopic hiatal hernia repair. *JLS*. 1998;2(1):31–33.
7. Ng A, Yong D, Hazebroek E, et al. Omission of the calibration bougie in laparoscopic repair of paraesophageal hernia. *Surg Endosc*. 2009;23(11):2505–2508.
8. Hüttl TP, Hohle M, Wichmann MW, Jauch KW, Meyer G. Techniques and results of laparoscopic antireflux surgery in Germany. *Surg Endosc*. 2005;19(12):1579–1587.
9. Lowham AS, Filipi CJ, Hinder RA, et al. Mechanisms and avoidance of esophageal perforation by anesthesia personnel during laparoscopic foregut surgery. *Surg Endosc*. 1996;10(10):979–982.
10. Tam V, Winger DG, Nason KS. A systematic review and meta-analysis of mesh vs suture cruroplasty in laparoscopic large hiatal hernia repair. *Am J Surg*. 2016;211(1):226–238.
11. Novitsky YW, Kercher KW, Callery MP, Czerniach DR, Kelly JJ, Litwin DEM. Is the use of a bougie necessary for laparoscopic Nissen fundoplication? *Arch Surg*. 2002;137(4):402–406.
12. Somasekar K, Morris-Stiff G, Al-Madfai H, Barton K, Hassn A. Is a bougie required for the performance of the fundal wrap during laparoscopic Nissen fundoplication? *Surg Endosc*. 2010;24(2):390–394.
13. Walsh JD, Landercasper J, Boyd WC, Lambert PJ, Havlik PJ. Patient outcomes and dysphagia after laparoscopic antireflux surgery performed without use of intraoperative esophageal dilators. *Am Surg*. 2003;69(3):219–223.
14. Chang CG, Thackeray L. Laparoscopic hiatal hernia repair in 221 patients: outcomes and experience. *JLS*. 2016;20(1):e2015.00104.