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Hiatal Hernia Repair with or without Esophageal Lengthening: Is There a Difference?

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Summary

Objective—The need for esophageal lengthening (EL) as part of hiatal hernia repair is perceived to elevate perioperative risk and provide functionally inferior outcomes. Our objective was to determine the risk factors for undergoing EL and to compare outcomes between operations with or without EL. We hypothesized that operative and functional outcomes for hiatal hernia repair were similar in patients whether they required EL or not.

Methods—Review of institutional experience with EL as part of hiatal hernia repair. Patients underwent before and after symptom evaluation using a validated tool.

Results—Between 1999 and 2009, 375 patients underwent hiatal hernia repair. The operative approach was: Thoracotomy 153 (41%), Laparotomy 18 (5%), Laparoscopy 167 (44%) or combined 37 (10%). Of these, 168 (45%) required EL. There was a higher need for thoracotomy in patients undergoing EL (79/168 vs 74/207, $X^2=4.88$ $p=0.034$). The incidence of perioperative complications (leak, pneumonia, ileus, respiratory failure, bleeding) was similar between the groups. Sixty five selected patients undergoing EL were compared to 63 patients with comparable demographics not requiring EL. In a well-validated before and after symptom questionnaire, patients undergoing EL showed significant improvement in their heartburn (76.8%), dysphagia (67.6%), regurgitation (71.7%), chest pain (91.9%) and nausea (86.5%) ($p<0.05$). The patients not undergoing EL also showed significant improvement in their heartburn (81.1%), dysphagia (71.1%), regurgitation (64.4%), chest pain (64.1%) and nausea (61.0%) ($p<0.05$). Improvement in symptoms, the continued use of antacid medications and overall surgery satisfaction score were statistically similar between the two groups.

Conclusions—Operative and functional outcomes for hiatal hernia repair with or without esophageal lengthening are acceptable and comparable. Thoracic surgeons should utilize EL without reservations for appropriate indications.

Keywords

Benign esophageal disease; Esophageal surgery; Outcomes

Introduction

It is widely accepted that a tension-free, infradiaphragmatic fundoplication over the lower esophagus is critical for successful hiatal hernia (HH) repair. Short esophagus (SE) is a

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condition that is confirmed intraoperatively when, in the absence of tension on the esophagus or the stomach, there is less than 2 – 3 cm of intra-abdominal esophageal length. (1) Depending upon the population sampled, the incidence of SE has been reported to vary from 0–80% in patients undergoing HH repair. (2–5) SE is perceived to contribute to recurrence after hiatal hernia repair in 15–25% of patients.(2, 6, 7)

The ideal approach for patients with SE is a matter of controversy, with extended transmediastinal dissection and esophageal lengthening (EL) procedures being the two alternatives. Collis gastroplasty is the most commonly utilized EL procedure and may be performed transabdominally or via the chest. (1, 8–12) The addition of an esophageal lengthening procedure adds a degree of complexity to the operation and may lead to complications at the additional suture or staple lines. Long-term problems with Collis gastroplasty have been previously described. (13–15) These include distal esophageal aperistalsis, persistence of acid-producing gastric mucosa above the wrap, and also asymptomatic recurrences.

Thus the need for esophageal lengthening (EL) as part of hiatal hernia repair is perceived to elevate perioperative risk and possibly provide functionally inferior outcomes. Our objective was to determine the risk factors for undergoing EL and to compare outcomes between operations with or without EL. We hypothesized that operative and functional outcomes for hiatal hernia repair were similar in patients whether they required EL or not.

Methods

With IRB approval, an institutional retrospective review of our database was performed to identify patients who had undergone hiatal hernia repair between 1999 and 2009. Patients younger than 18 years of age, or pregnant at the time of surgery were excluded. The prospectively maintained database was utilized to abstract information about patient demographics, diagnosis, workup, operation, perioperative course and outcomes. Missing data were abstracted by a review of patient charts. A start date of 1999 was chosen for the study as we started offering laparoscopic repair of hiatal hernias at the time and additionally, electronic patient records were available for review from then on.

This patient list was compared to the social security death index database. Living patients were contacted via mail or telephone to administer a previously-validated symptom assessment questionnaire (Appendix 1).(1) An informed consent was obtained prior to administering the questionnaire. All interviews were conducted by author KJ.

Patients' responses were collected for two time-points. The preoperative symptoms were recorded using symptom recall strategy and the postoperative symptoms were recorded at the time of the interview. Symptoms were scored on a scale of 0–3 (ordinal data) (Appendix I) (1). If patients had a 2 point improvement in their symptoms, it was apriori deemed to be significant. Patient satisfaction after surgery was analyzed on a scale of 1–10, with a score of 8 or greater considered as a satisfactory result. Patients were also asked if they would recommend the procedure to a friend (binomial response). Symptom scores were expressed in terms of median and mean values for matched pairs, but were compared based on median values (ordinal data).

Data were analyzed only on patients with at least 12 months of follow-up. Data were managed using Microsoft Excel and analyzed using SPSS 21.0 for Windows (SPSS Inc., Chicago, IL). Continuous data were analyzed using a Student's *t*-test, matched ordinal data using Wilcoxon's rank test and categorical data using a chi-square test. *P*-values of less than 0.05 were considered significant. Logistic regression analysis was used to discriminate

independent risk factors for undergoing an esophageal lengthening procedure, which was selected as the primary outcome. The likelihood ratio method was used to determine hazard ratios, and the hazard ratio was used to approximate the relative risk.

Surgical technique – Laparoscopic hiatal hernia repair and EL was performed as described by Terry et al. (11) Briefly, after dissection of the greater curvature and division of the short gastric vessels, at least 5 – 6 cm of esophagus was circumferentially mobilized to assess intraabdominal esophageal length in a tension-free situation. The location of the gastroesophageal junction was determined by a combination of intraoperative endoscopy and visual determination of where tubular esophagus meets the gastric fundus. If less than 2 cm of esophagus was present intra-abdominally, a decision was made to perform EL. A wedge fundectomy was performed using multiple firings of an endoscopic stapler to excise a segment of stomach approximately 3 × 3 cm with a resulting “neoesophagus” about 3 cm long. A 48 Fr or 54 Fr bougie was utilized for ensuring adequate lumen of the “neoesophagus” during the gastropasty. A 360 degree fundoplication was performed if esophageal motility and peristalsis were normal and a partial wrap was created if esophageal peristalsis was abnormal and for most patients who required EL.

The transthoracic open repair was performed as described by Garg et al.(1) Briefly a 7th interspace left thoracotomy is performed, the esophagus mobilized up to the inferior pulmonary vein and the greater curvature mobilized as in the transabdominal approach. If esophageal lengthening is needed, it is performed over a bougie using a articulating GIA stapler.

Results

Between 1999 and 2009, three hundred seventy-five patients underwent hiatal hernia repair. Of these, 227 (61%) were females and the median age was 58 years (range 16–97). One hundred fifty nine of 375 (42.4%) patients were smokers and the mean number of co-morbidities was 0.72 ± 0.77 . The operative approach was: thoracotomy 153 (41%), laparotomy 18 (5%), laparoscopy 167 (44%) or combined 37 (10%). A combined approach involved an initial laparoscopy followed by a thoracotomy. The vast majority (367/385, 95.3%) of patients underwent a fundoplication of which 286/367 (78%) were partial funduplications.

One hundred and sixty eight of 375 patients (45%) required EL. (Table 1) The two groups were comparable in demographics and comorbidities. There was a higher need for thoracotomy in patients undergoing esophageal lengthening (79/168 vs 74/207, $X^2=4.88$ $p=0.034$). The incidence of perioperative complications (leak, pneumonia, ileus, respiratory failure, bleeding) was similar between the patients requiring EL and those who did not. In the first phase of our experience (1999–2004) 55/78 (71%) of patients requiring EL underwent a thoracotomy. This proportion fell to 24/90 (27%), $p < 0.0001$ in the period from 2005–09, reflecting our increasing comfort with laparoscopic EL. Figure 1 shows the relative proportions of open and laparoscopic approaches in 2 year increments over the study period.

We received completed feedback on symptom assessment questionnaires from 128 of 328 (39%) alive patients. The median duration from surgery for these patients was 52.9 (9.2 – 139.4) months. Of these, 65 patients had undergone EL and were compared to 63 patients not requiring EL. The gender distribution and time since surgery between the 2 groups were similar, but the EL group was older (63.3 ± 13.0 years) than the non-EL group (56.7 ± 14.1 years) ($p=0.007$). Using the before and after symptom questionnaire, five main symptoms of hiatal hernia and gastroesophageal reflux were assessed. Patients undergoing EL showed

significant improvement over preoperative symptoms in their heartburn (76.8%), dysphagia (67.6%), regurgitation (71.7%), chest pain (91.9%) and nausea (86.5%) ($p < 0.05$). The mean preoperative and postoperative scores for the symptoms are shown in Table 2. The patients not undergoing EL as part of their hiatal hernia repair also experienced significant improvement in their heartburn (81.1%), dysphagia (71.1%), regurgitation (64.4%), chest pain (64.1%) and nausea (61.0%) ($p < 0.05$). Improvement in the degree of individual symptoms from the preoperative period was statistically similar between the two groups except for chest pain. The degree of improvement in chest pain was higher in the EL group ($p = 0.003$). The continued use of antacid medications was 39/65 (60%) in the EL group and 37/63 (59%) in the non-EL group and was statistically similar ($p = 1.00$). Also, there was no difference in the overall surgery satisfaction scores between the two groups.

Additionally, we looked at possible predictors of the need for EL in all 375 patients. A univariate analysis was initially performed. (Table 3) In a subsequent multivariate analysis, the presence of a large hiatal hernia (> 5 cm on contrast swallow), presence of Barrett's esophagus, and reoperative hiatal hernia repair were predictors of a short esophagus. (Table 4)

A subgroup analysis of pre-operative variables including age, comorbidities, surgical approach, hiatal hernia size, Barrett's esophagus, Re-do surgery, obesity and post-operative variables including surgical complications revealed that the 128 pts who returned the symptom questionnaires were older (mean age 60.0 ± 13.9 vs. 56.5 ± 16.5 , $p = 0.03$) and more likely to be female (68% (87/128) vs. 57% (140/247), $p = 0.04$) but otherwise similar to the 247 patients who did not.

Discussion

The subject of short esophagus is a controversial one, with some groups doubting its very existence as an entity. (16, 17) This viewpoint is likely based upon the fact that some surgical series demonstrate successful hiatal hernia repair without the need for esophageal lengthening in any of their patients (17) while others base their conclusions on comparable manometric esophageal length in patients with varying degrees of reflux. (16) However, over the last decade the number of publications supporting the presence of short esophagus and describing techniques to circumvent the problem far outnumber those questioning its validity. (1, 8, 10, 12, 18–20) Thus, surgeons have voted with their feet and there is little doubt that acquired short esophagus is a true entity, though its frequency in the population at risk is variably reported.

How to deal with a short esophagus is also a matter of much debate. Extended transmediastinal dissection of the esophagus has been proposed as a technique to obtain adequate intra-abdominal esophageal length. (19, 20) Here the esophagus is circumferentially dissected for at least 7–10 cm or higher, cephalad from the hiatus. Some series have utilized this to avoid esophageal lengthening altogether (20) while others have been able to diminish the need for a Collis gastroplasty. (19) At the other end of the spectrum, some authors have used esophageal lengthening more frequently, with good outcomes. (12) During laparoscopic hiatal hernia repair with a short esophagus, we perform a type II transmediastinal dissection of the esophagus (19) for at least 5–7 cm and then assess intra-abdominal esophageal length. For the transthoracic approach, the esophagus is mobilized to the level of the aortic arch. We perform esophageal lengthening if these maneuvers fail to provide 3 cm of intraabdominal esophageal length. As a group of six surgeons, five of us trained at our institution (the 6th is the senior surgeon in the group), we have a relatively uniform approach to the short esophagus. In general, at the current time we prefer to approach these patients laparoscopically and convert to thoracotomy if needed. The

presence of massive morbid obesity, multiple prior foregut operations, extremely foreshortened esophagus, and massive herniation of multiple abdominal viscera generally lead to a thoracotomy as the initial approach.

While it is universally agreed that the gold standard for diagnosis of a short esophagus is intraoperative assessment, much has been written about the preoperative predictors that may help plan the need for esophageal lengthening. Several authors have found manometric esophageal length, the ratio of manometric esophageal length to height, presence of stricture, presence of Barrett's mucosa, size of hernia and reoperative surgery to be indicators of short esophagus. (18, 21–23) Similarly, we found that the presence of a large (>5cm) hiatal hernia, presence of Barrett's esophagus, and reoperative surgery was predictive of the need for esophageal lengthening. While these indicators may be useful in planning the operation, they should not prematurely lead to a decision for esophageal lengthening prior to adequate esophageal mobilization and intraoperative assessment.

We did not find any appreciable increase in the perioperative complications in patients who required esophageal lengthening despite the EL patients being somewhat older. The rate of morbidity was relatively low and there was no mortality. Specifically, the incidence of leak, a complication that may be related to esophageal lengthening was similarly low between the two groups. These results are similar to those published in literature. (1, 8, 9, 12) Our length of stay, especially for the EL group, was longer than other published reports and reflects more than a decade of experience. Early on in our experience, a higher proportion of patients underwent a thoracotomy and we advanced the patients' diet slowly as in-patients. With the increasing use of a laparoscopic approach and the group's surgeons accepting adequate liquid intake as a discharge criterion, our average stay for laparoscopic hiatal hernia repair with or without esophageal lengthening is currently 3 days.

Significant improvement in symptoms has been reported after hiatal hernia repair with EL by other authors. (1, 5, 10, 12, 24, 25) Most of these studies have utilized postoperative symptom assessment and quality of life questionnaires showing acceptable to good outcomes. (1, 5, 9, 10, 25) Only a few studies have utilized a uniform approach to assessment in the preoperative and postoperative period (12), often due to changing practice patterns, evolution of tools of assessment and the resource-intense nature of the follow-up. Similar to our findings, most studies note an improvement in heartburn, dysphagia, chest pain and regurgitation. We did note that 59% of the patients we assessed were taking some form of antacid medication (proton pump inhibitor, H2 receptor antagonist or over the counter acid-neutralizing medications). This is similar to the nearly 50% use of proton pump inhibitors in one of the largest series till date. (12) The vast majority of our patients had not been studied for presence of acid reflux prior to taking these medications. This persistent use of antacids is merely a reflection of the willingness of the medical community to label any foregut symptom as gastroesophageal reflux and the relatively innocuous side effect profile of the medications. Dysphagia and dilation of the collis segment have been reported possible complications of esophageal lengthening however, in our series we did not find a significant difference in improvement in dysphagia between the EL and non-EL groups.

Our paper has certain limitations. The analysis is based upon a combination of prospective administration of symptom questionnaires and retrospective evaluation institutional data. Thus our analysis is subject to the biases of a retrospective study, including selection bias in treatment allocation. Additionally, we received feedback from only 40% of alive patients, thus adding a potential source of bias. Since the report spans nearly eleven years, the overall results are also a reflection of evolving clinical practices and adoption of less invasive surgical approaches. The preoperative symptom assessment was conducted by symptom recall, thus the study results are subject to recall bias. We understand that given the

limitations of our study, the data should be interpreted with caution. Some of these limitations can be addressed by a prospective administration of validated instruments to assess functional outcomes after hiatal hernia repair and we have now instituted such a protocol at our center.

Operative and functional outcomes for hiatal hernia repair with or without esophageal lengthening are acceptable and comparable. Thoracic surgeons should utilize EL without reservations for appropriate indications.

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Figure 1.

Esophageal lengthening procedures done via open (thoracotomy or laparotomy) and laparoscopic approach noted by 2 year increments. (EL = Esophageal lengthening)

Table 1

Demographics and perioperative outcomes in entire population (N=375)

Variable	EL group (n=168)	Non-EL group (n=207)	P value
Mean age (years)	61 ± 14.7	55 ± 16.1	<0.0001
Mean no. of co-morbidities	0.86 ± 0.78	0.75 ± 0.72	0.39
Thoracotomy approach	79	74	0.03
Complications			
Leak	1	0	0.45
Pneumonia	5	4	0.52
Bleeding	3	1	0.33
Ileus	7	9	1.00
Respiratory failure	6	4	0.35
Mean hospital stay (days)	6.7 ± 6.6	4.8 ± 6.0	0.004

Table 2

Mean symptom scores in patients undergoing hiatal hernia repair with or without esophageal lengthening (EL)

	Pre-surgery EL	Post-surgery EL	P value	Pre-surgery non-EL	Post-surgery non-EL	P value
Heartburn	2.1	0.8	0.0001	2.1	0.8	0.0001
Dysphagia	1.2	0.5	0.0001	1.8	0.8	0.0001
Regurgitation	1.4	0.4	0.0001	1.8	0.8	0.0001
Chest Pain	1.2	0.3	0.0001	1.2	0.7	0.001
Nausea	1.4	0.4	0.0001	1.2	0.7	0.005

Table 3

Univariate analysis of risk factors for short esophagus in all patients (N=375)

	Esophageal Lengthening (n=168)	No Esophageal Lengthening (n=207)	P value
Presence of large hiatal hernia	123 (73%)	66 (32%)	<0.0001
Barrett's Esophagus	19 (11%)	9 (4%)	0.016
Obesity (BMI ≥30)	70 (42%)	62 (30%)	0.02
Stricture	9 (5%)	12 (6%)	1.00
Early time period ('99-'04)	78 (46%)	101 (49%)	0.68
Open approach	107 (64%)	100 (48%)	0.003
Re-do surgery	53 (32%)	44 (21%)	0.03
Smoking history	65 (39%)	94 (45%)	0.21
ETOH history	20 (12%)	26 (13%)	0.88

Table 4

Multivariate analysis of risk factors for short esophagus in all patients (N=375)

	Odds ratio	95% CI	P value
Presence of large hiatal hernia	6.37	3.99 – 10.16	<0.0001
Barrett's Esophagus	2.96	1.20 – 7.31	0.015
Re-do surgery	1.99	1.18 – 3.37	0.009
Obesity	1.48	0.92 – 2.39	0.11