Original articles

ᔕURGICAL
ᴇNDOSCOPY

and Other Interventional Techniques

Long-term outcome of laparoscopic repair of paraesophageal hernia

S. G. Mattar, S. P. Bowers, K. D. Galloway, J. G. Hunter, C. D. Smith

Department of Surgery, Emory University School of Medicine, 1364 Clifton Road, Atlanta, GA 30322, USA

Abstract

Background: It has been reported that the laparoscopic repair of paraesophageal hernias is associated with higher complication and recurrence rates than the open methods of repair.
Methods: We identified 136 consecutive patients who underwent laparoscopic repair of a paraesophageal hernia between 1993 and 1999. Patient demographics and symptom scores for regurgitation, heartburn, chest pain, and dysphagia at presentation and at last follow-up were recorded (0 = none, 1 = mild, 2 = moderate, 3 = severe). The operative records were reviewed, and early and late complications were noted. Only patients with a follow-up of 1 were included in the analysis.
Results: The median age was 64 years, and there was a female preponderance (1.8:1). Most patients had some medical comorbidity; the American Society of Anesthesiologists (ASA) scores were < 2 in eight patients and ≥2 in 117 patients. Three laparoscopic operations were converted to open procedures. There were nine intraoperative complications, five early complications, and three related deaths (morbidity and mortality rates of 10.2% and 2.2%, respectively). Follow-up data were available for 83 patients (66%), and the mean follow-up time was 40 months (range, 12–82). The percentage of patients experiencing chest pain, dysphagia, heartburn, and regurgitation in the moderate to severe range dropped from a range of 34–47% to 5–7% ($p < 0.05$). Three patients underwent repeat laparoscopic repair for symptomatic recurrence.
Conclusion: The laparoscopic repair of paraesophageal hernias provides excellent long-term symptomatic relief in the majority of patients and has a low rate of symptomatic recurrence. The complication and death rates

may be related in part to the higher incidence of comorbidities in this somewhat elderly patient population.

The importance of true paraesophageal hernias (type II) and the more common mixed paraesophageal hernias (type III) lies in their potential for the development of acute, potentially fatal complications as a result of gastric obstruction, acute dilatation, perforation, or bleeding [11]. This potential for lethal outcome has traditionally been the main indication for their treatment, even when they are asymptomatic. Because there is no effective nonsurgical treatment, the onus falls exclusively on surgeons to provide definitive therapy.

Recently, as more patients with paraesophageal hernias have been treated laparoscopically, there has been a spate of reports on the outcomes following this procedure [1, 3, 4, 5, 7, 9]. At the same time, although symptomatic relief appears to be comparable to that obtained with the traditional open methods of repair, there has been growing criticism that the laparoscopic repair is associated with an unacceptable level of anatomic failure and occult hernia recurrence [4]. Reports of hernia recurrence have ranged from 4% to 42%, leading some surgeons to call for a moratorium on the laparoscopic repair of paraesophageal hernias and a return to the traditional open methods of repair [4]. However, the clinical long-term importance of recurrent hiatal herniation is still unclear; to date, the longest reported follow-up is 36 months in 41 patients [5].

We initiated the laparoscopic repair of paraesophageal hernias at our institution in 1993. We have previously presented our experience, highlighting the incidence and characteristics of surgical complications [10]. The aim of this study was to review the clinical outcomes in the total group, with a particular focus on symptom improvement.
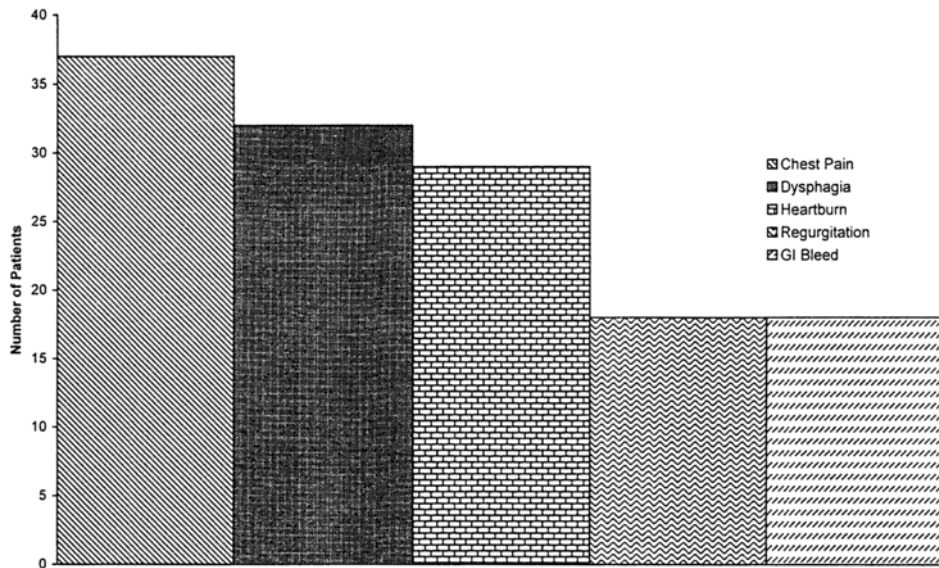
Fig. 1. Presenting symptoms of patients undergoing laparoscopic repair of paraesophageal hernia.

Patients and methods

Patients

A total of 136 patients who underwent the laparoscopic repair of primary paraesophageal hernias between February 1993 and August 1999 were identified from a prospectively designed and maintained database. Only those patients whose follow-up was 12 months were considered for this study. Eleven patients who had an iatrogenic paraesophageal hernia as a result of failed antireflux surgery were also excluded. Thus, the study group was comprised of 125 patients.

All patient evaluations included the administration of a questionnaire that specifically established a symptom severity score for chest pain, dysphagia, regurgitation, and heartburn using a four-point scale (0 = none, 1 = mild, 2 = moderate, 3 = severe). Patients completed these surveys preoperatively and at periodic intervals postoperatively. Additionally, they were queried as to their satisfaction with the results of the operation. Comorbidity was represented by the American Society of Anesthesiologists (ASA) scoring system. Preoperatively, all patients were assessed by esophagogastroduodenoscopy (EGD) and barium swallows. Motility studies were attempted in all patients. Operative records were reviewed, and early and late complications were noted. Additionally, symptomatic patients had esophagrams when indicated, and these records were also reviewed.

Statistical analysis

Comparisons of preoperative and postoperative data were made with the Wilcoxon signed-rank test. Statistical significance was set at $p < 0.05$ for each symptom.

Surgical technique

We have previously described our operative technique [10]. However, it must be emphasized that several critical maneuvers are carried out to optimize the outcome. After gentle reduction of the paraesophageal hernia, a careful dissection and complete excision of the hernia sac is performed. This important step has been shown to minimize mediastinal seroma formation [7]. The crura are exposed and the esophageal hiatus reconstructed using pledgetted nonabsorbable interrupted sutures. Maintaining the pneumoperitoneum at a low level facilitates hernia reduction and crural repair. Finally, a fundoplication

is created to minimize the reflux that may result from the hiatal dissection, and also to aid in anchoring the stomach below the diaphragm. We do not perform a gastrostomy or undertake any other gastropexy maneuvers.

Results

The median age was 64 years (range, 18–92). There were 85 women and 40 men. Presenting symptoms are detailed in Fig. 1. The majority of patients presented with postprandial chest pain (30%), dysphagia (25%), and chronic heartburn (23%). All patients had a preoperative barium swallow and EGD, and 96 patients also completed an esophageal motility evaluation. Nineteen of these 96 patients demonstrated an esophageal peristaltic abnormality (< 70% peristalsis). However, none of the patients had significant esophageal body hypotension (esophageal body pressure < 30 mmHg). Eight patizents had an ASA score of < 2; 117 patients had an ASA score of ≥2.

Most of the operations were done on an elective basis, with the exception of three emergent cases (2.5%). The average length of operation was 218 min (range, 55–426). The mean hospital stay was 3.9 days (range, 1–127). The patient who remained in the hospital for 127 days developed multiple system organ failure as a complication of gastric necrosis. The median length of stay was 2 days. An esophageal lengthening procedure (Collis gastroplasty) was necessary in six patients (5%). Three patients underwent conversion to open procedures. Two of these conversions were carried out to repair esophageal perforations created during intraoperative passage of the esophageal dilator; the third patient was converted to an open procedure because extensive adhesions prevented safe laparoscopy.

There were nine intraoperative complications (Table 1) and five early postoperative complications (Table 2). Three deaths occurred within the 1st postoperative month. Two of these patients died of complications of
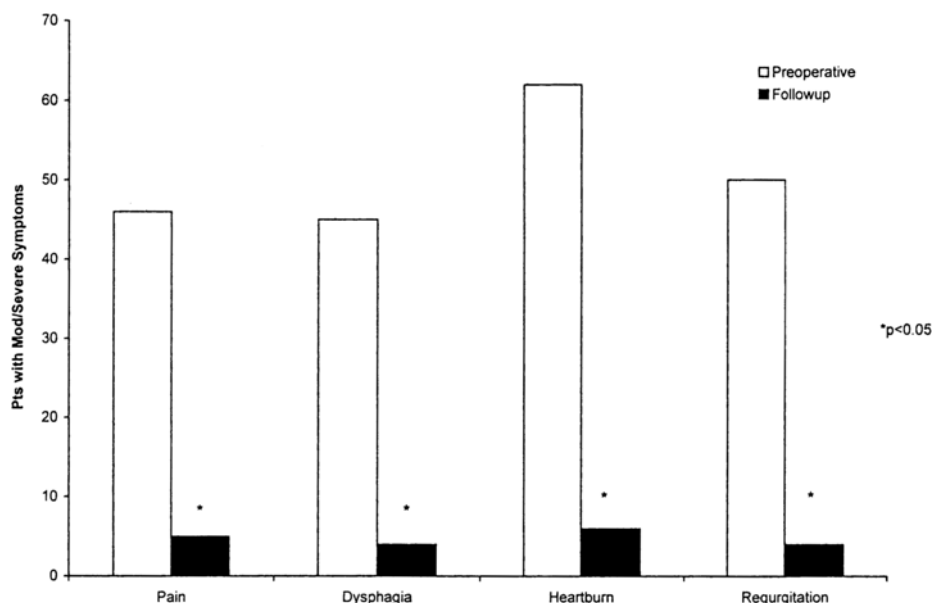
Fig. 2. Comparison of preoperative and follow-up data for patients with symptoms of pain, dysphagia, heartburn, and regurgitation in the moderate to severe range.

Table 1. Intraoperative complications

Complication	n
Esophageal perforation	5
Gastric perforation	2
Hypercarbia	1
Cardiac arrest	1

Table 2. Early postoperative complications

Complication	n
Myocardial infarction	2
Pleural effusion	1
Gastric necrosis and sepsis	1
Mediastinal abscess	1

Table 3. Comparison of pre-1996 outcome measures to post-1996 data

	Pre-1996 (n = 60)	Post-1996 (n = 65)	p value
Mean operating time (min)	236 (55–426)	207 (97–405)	0.001
Mean length of hospital stay (days)	6.9 (1–127)	2.3 (1–20)	NS
Median length of hospital stay (days)	2	2	NS
Combined morbidity[a] (no. of patients)	12	5	0.0004

NS, not significant
[a] Combined morbidity and 30-day mortality

esophageal perforation, and the third developed multiple system organ failure secondary to perforation of a necrotic portion of the stomach wall. The resulting overall morbidity and mortality rates were 10.2% and 2.2%, respectively.

Two patients have undergone reoperation for recurrent hiatal hernia with the fundoplication herniated into the chest. One patient underwent early repeat repair after a retching episode that occurred during the immediate postoperative period. The second patient presented 15 months postoperatively with recurrent dysphagia. A recurrent paraesophageal hernia was confirmed with a barium swallow.

Long-term follow-up of a mean of 40 months (range, 12–82) was available in 83 patients (66%). Completed symptom severity score questionnaires demonstrated significant improvement following laparoscopic repair (Fig. 2). The percentage of patients experiencing chest

pain, dysphagia, heartburn, and regurgitation in the moderate to severe range dropped from a range of 34–47% to 5–7% ($p < 0.05$).

We used the time of our earlier report (1996) as a temporal landmark from which to compare our early operative experience with our more recent experience. As shown in Table 3, there was a significant reduction in operating time as our experience accumulated. Although the *mean* length of hospital stay was markedly prolonged in the period prior to 1996, the *median* length of hospital stay remained essentially unchanged throughout the study period (1993–99). This discrepancy was caused by the inclusion of the patient who remained in hospital for 127 days in the early phase of the study (pre-1996). The overall combined morbidity and mortality rate pre-1996 was 20%; this rate was significantly reduced to 7.6% in the post-1996 period ($p < 0.001$).

From our total of 125 patients, 32 (26%) underwent contrast swallows at ≥1 year after surgical repair. Twenty-eight of these patients completed symptom questionnaires at the time of their follow-up esophagram, and 90% expressed satisfaction with the results of the operation. Twenty-two patients (74%) were off

medications. The remaining patients were on medication as per clinician or patient preference.

Fourteen patients (33%) had an anatomic recurrence on esophagram, but only six of them reported more than mild symptoms. The indications for requesting esophagrams are vague. In many cases, the studies were ordered by primary care physicians or other clinicians for a variety of atypical symptoms. Symptom scores of the patients with anatomic recurrence were not different from those without recurrence. Only one of the 14 patients with recurrence has undergone reoperation; the indication was postprandial pain.

Discussion

This paper, which expands on a previous report detailing our early experience with laparoscopic paraesophageal hernia repair, represents the longest follow-up currently reported with this technique. Despite generally favorable clinical outcomes, questions still remain about the appropriateness of a laparoscopic approach, especially in the context of objective evidence of an 18–42% rate of anatomic failure after laparoscopic repair [1, 4, 5, 13]. Although anatomic success is certainly a factor in assessing patient outcome, the overall outcome, as reflected in the resolution of preoperative symptoms, perioperative complications, and the elimination of the long-term risk of serious sequelae of the unrepaired paraesophageal hernia, probably best reflects the success of the operation. In this group, with an average follow-up of 40 months, there were no serious long-term sequelae in any patient.

In this study, the overall morbidity and mortality rates were 10.2% and 2.2%, respectively. This compares very favorably with the documented experiences of open paraesophageal hernia repair, where a morbidity rate in the 11.8–60% range and a mortality rate of 0.5–20% have been reported [2, 3, 6, 8, 12]. Perhaps the comparison is unfair, since there have been advances in perioperative care that only became available more recently, during the laparoscopic era. However, it is clear that the perioperative risk with the laparoscopic technique is no greater than that associated with the open approach.

Perhaps more important, the response to preoperative symptoms obtained with the laparoscopic approach is dramatic. Based on symptom severity scores, heartburn, regurgitation, dysphagia, and chest pain were all significantly improved. The majority of patients had either no or only mild symptoms postoperatively, and this success has been sustained throughout the average follow-up period of 40 months (range, 12–82).

However, there is still some concern that the outcomes achieved with laparoscopic hernia repair may ulltimately prove to be inferior to the open approach due to a high rate of anatomic failure and hernia recurrence. The reported rates of anatomic failure range from 18% to 42% [4]. In one comparative study, anatomic failures occurred in 42% of patients after laparoscopic repair, as compared with only 15% following

open repair [4]. It has been suggested that the most likely reason for hernia recurrence is the lack of appreciation of esophageal shortening, and that many of these anatomic failures occurred early in the surgeon's experience [13]. As our experience has grown, morbidity and mortality rates have certainly fallen. Also, the use of Collis gastroplasty for esophageal shortening increased in our series over time. Although this study has not directly addressed anatomic failure, it is clear from the 90% satisfaction rate expressed by our patients that laparoscopic repair provides durable relief of symptoms and an excellent clinical outcome, despite the fact that 33% of patients had radiological evidence of recurrence. This finding may indicate that hiatal hernias that occur following laparoscopic foregut surgery should be considered as distinct entities, separate from de novo paraesophageal hernias. The established dogma that paraesophageal hernias should be operated on immediately after their diagnosis may need revision. Future longitudinal studies of postoperative patients will helpo determine if recurrent lesions have a specific natural history and a distinct array of clinical manifestations.

Notably, the morbidity rate dropped significantly from 20% in the period prior to 1996, when we initially reported our complications, to 7.6% since that report was published [10]. Although there are several potential factors that may account for this tangible improvement in outcome, it seems likely that our accrued experience played a key role. Gentle retraction and reduction of the hernia, followed by excision of the hernia sac starting at the left crus, greatly aid in achieving adequate anatomical restoration. It is also helpful to reduce the pneumoperitoneum to <10 mmHg prior to crural defect closure, which should be performed posterior to the esophagus to provide extra intraabdominal length. In accordance with our standard current practice, a fundoplication is uniformly created and the short gastric vessels are always divided.

An acknowledged limitation of this study is the extent of follow-up. Due to attrition of patients from follow-up, outcome data were available in only 66% of patients. However, this cohort of 83 patients with a mean follow-up of 40 months does represent one of the largest long-term outcome series reported to date.

In conclusion, this review of our experience of laparoscopic repair of paraesophageal hernias in a large group of patients shows that the treatment is effective and durable. It should be pointed out that the management of these patients is not analogous to patients with gastroesophageal reflux. Patients with paraesophageal hernias are, in general, elderly individuals with comorbid factors. Correspondingly, there is an appreciable morbidity rate that, even as it decreases with increasing operative experience, is still higher than that for patients undergo antireflux surgery.

References

1. Edye MB, Canin-Endres J, Gattorno F, Salky BA (1998) Durability of laparoscopic repair of paraesophageal hernia. Ann Surg 228: 528–535

2. Ellis FH, Crozier RE, Shea JA (1986) Paraesophageal hiatus hernia. Arch Surg 121: 416–420

3. Geha AS, Massad MG, Snow NJ, Baue AE (2000) A 32-year experience in 100 patients with giant paraesophageal hernia: the case for abdominal approach and selective antireflux repair. Surgery 128: 623–630

4. Hashemi M, Peters JH, DeMeester TR, Huprich JE, Quek M, Hagen JA, Crookes PF, Theisen J, DeMeester SR, Sillin LF (2000) Laparoscopic repair of large type III hiatal hernia: objective follow up reveals high recurrence rate. J Am Coll Surg 190: 553–561

5. Horgan S, Eubanks TR, Jacobsen G, Omelanczuk P, Pellegrini CA (1999) Repair of paraesophageal hernias. Am J Surg 177: 354–358

6. Maziak DE, Todd TR, Pearson FG (1998) Massive hiatus hernia: evaluation and surgical management. J Thorac Cardiovasc Surg 118: 53–62

7. Oddsdottir M, Franco AL, Laycock WS, Waring JP, Hunter JG (1995) Laparoscopic repair of paraesophageal hernia. Surg Endosc 9: 164–168

8. Schauer PR, Ikramuddin S, McLaughlin RH, Graham TO, Slivka A, Lee KKW, Schraut WH, Luketich JD (1998) Comparison of laparoscopic versus open repair of paraesophageal hernia. Am J Surg 176: 659–665

9. Swanstrom LL, Jobe BA, Kinzie LR, Hoevath KD (1999) Esophageal motility and outcomes following laparoscopic paraesophageal hernia repair and fundoplication Am J Surg 177: 359–363

10. Trus TL, Bax T, Richardson WS, Branum GD, Mauren SJ, Swanstrom LL, Hunter JG (1997) Complications of laparoscopic paraesophageal hernia repair. J Gastrointest Surg 1: 221–228

11. Wichterman K, Geha AS, Cahow CE, Baue AE (1979) Giant paraesophageal hiatus hernia with intrathoracic stomach and colon: the case for early repair. Surgery 86: 497–506

12. Williamson WA, Ellis FH, Streitz JM, Shahian DM (1993) Paraesophageal hiatal hernia: is an antireflux procedure necessary? Ann Thorac Surg 56: 447–452

13. Wu JS, Dunnegan DL, Soper NJ (1999) Clinical and radiologic assessment of laparoscopic paraesophageal hernia repair. Surg Endosc 13: 497–502