The laparoscopic approach for epiphrenic diverticula with achalasia

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ABSTRACT

INTRODUCTION Epiphrenic diverticulum (ED) is an uncommon disease that is invariably associated with an underlying oesophageal motility disorder such as achalasia. Management of ED should always be accompanied by treatment of the underlying motility disorder to prevent recurrence of symptoms. Traditionally, ED were approached via a left thoracotomy but as laparoscopy offers better access to the distal oesophagus, its use is becoming more widespread.

METHODS A total of 72 patients with oesophageal achalasia underwent laparoscopic surgery at our centre over a period of 7 years. Five (6.9%) of these had associated symptomatic ED. These patients were treated with a laparoscopic transhiatal epiphrenic diverticulectomy using intraoperative oesophagoscopy guidance, combined with a Heller myotomy and Dor fundoplication. Patients were followed up regularly and symptoms were assessed at 12 months.

RESULTS The median age of the five patients with associated symptomatic ED was 56 years (range: 38–69 years). Three were male. The mean duration of surgery was 150 minutes (range: 120–180 minutes). One patient (20%) developed a postoperative oesophageal leak. The mean follow-up duration was 25 months (range: 12–36 months). At 12 months, the mean Eckardt score reduced from 6.8 to 1.6. Three patients (60%) reported an excellent outcome, one (20%) reported a good outcome and one (20%) reported a fair outcome.

CONCLUSIONS Along with diverticulectomy, treating the underlying motility disorder with an adequate Heller myotomy and partial fundoplication is of prime importance for a good surgical outcome without symptom recurrence. Laparoscopy offers better access to the distal oesophagus than the conventional thoracic approach for ED.

KEYWORDS

Epiphrenic diverticulum – Achalasia – Laparoscopic

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Epiphrenic diverticulum (ED) is a rare condition where a pulsion pseudodiverticulum is formed in the distal 10cm of the oesophagus by the outpouching of mucosa and submucosa through the muscularis propria. Owing to the rarity of the disease, its true incidence is unknown although this is estimated to be 1 in 500,000.¹ Patients usually suffer from a concomitant oesophageal motility disorder, most commonly oesophageal achalasia (60% of ED cases).² Among all cases of achalasia, 3.6–7.4% are associated with the formation of ED.³

Uncoordinated oesophageal contractions due to an underlying motility disorder lead to increased intraluminal pressure and formation of pulsion diverticula. Consequently, when dealing with symptomatic ED, treating the underlying disorder is essential to prevent recurrence and complications. As this is a rare condition (especially in the setting of oesophageal achalasia), it is important to understand the approach needed for such cases. We share our experience of five patients with ED and describe our management of the primary aetiology of achalasia in symptomatic patients in a single sitting via a minimally invasive laparoscopic approach.

Methods

Between January 2010 and January 2017, 72 laparoscopic procedures were performed at our centre for oesophageal achalasia. All patients with suspected achalasia were clinically assessed using the Eckardt scoring system, and all were subjected to an upper gastrointestinal endoscopic evaluation, a barium swallow study and oesophageal manometry using a 16-channel water perfused video system.

Diagnosis of achalasia was confirmed by barium swallow findings (dilation of the oesophagus, narrow gastro-oesophageal junction with ‘bird beak’ appearance, poor emptying of barium) and manometric findings (incomplete lower oesophageal sphincter [LOS] relaxation with aperistalsis, increased basal LOS pressure, elevated baseline oesophageal body pressure, simultaneous non-propagating contractions) (Figs 1 and 2). High resolution computed tomography (CT) of the chest was performed only in selected patients with associated respiratory complaints ($n=16$). Among these, five had associated ED, distinctly revealed by outpouching in the distal oesophagus with

Figure 1 Endoscopy showing epiphrenic diverticulum with oesophageal achalasia, with residual food particles in dilated oesophagus

delayed oesophageal emptying of barium. A combined approach was employed in these patients, and both the achalasia and the ED were managed in the same sitting.

Operative technique

Under general anaesthesia, the patient was placed in the split leg position with the surgeon standing between the legs. Five ports were used. Two of these were 10mm ports (in the supraumbilical region and in the left midclavicular line) while three were 5mm ports (in the right and left anterior axillary lines, and in the epigastric region).

The left lobe of the liver was held back with a Nathanson retractor via an epigastric port. The lesser curve of the stomach was identified, the gastrohepatic omentum dissected and the lesser curvature traced to the oesophagus. The anterior vagus nerve was identified, as were both crura of the diaphragm. The mediastinum was accessed transhiatally and the oesophagus mobilised. The ED was identified and the pouch dissected (Fig 3). The neck was obliterated with the stapler jaws (3-row 60mm endoscopic linear cutter stapler with closed staple height of 0.75mm). Intraoperative endoscopy confirmed complete obliteration of the ED and the patency of the oesophageal lumen (Fig 4). The stapler was fired and the ED divided (Fig 5). The oesophageal staple line was oversewn with 3/0 Vicryl® sutures (Ethicon, Somerville, NJ, US).

A Heller myotomy was performed on the contralateral side of the ED until pouting mucosa was seen extending 4cm cephalad and 3cm caudal to the gastro-oesophageal junction. Once the adequacy of the myotomy was confirmed, and the integrity of the stomach and oesophageal mucosa was assessed by endoscopic insufflation while submerged under irrigation fluid (normal saline), a Dor fundoplication was performed. All patients had transabdominal tube drains placed.

Figure 2 Barium study and computed tomography showing epiphrenic diverticulum with oesophageal achalasia

All patients were kept nil by mouth for 72 hours. On the third postoperative day, contrast CT was performed in all patients to assess the integrity of the oesophageal mucosa. They were then started on oral feeds with clear liquids, which was gradually advanced to solid food.

Results

In total, 72 patients (58% male, 42% female) had laparoscopic surgery for oesophageal achalasia. The mean patient age was 54.8 years (range: 23–68 years). The mean Eckardt scores before and after surgery were 7.2 (standard deviation [SD]: 1.1) and 1.4 (SD: 1.1) respectively. Seven patients underwent a 'redo' Heller myotomy for recurrent achalasia.⁴ (They had had their initial surgery elsewhere.)

Figure 3 Complete dissection of diverticular pouch

Figure 4 Intraoperative endoscopy confirming complete obliteration of the diverticulum neck by the linear stapler

Figure 5 Epiphrenic diverticulum being dissected with linear stapler parallel to long axis of oesophagus

Of the remaining patients, 60 had an uneventful postoperative course and were discharged on days 3–5, with no evidence of recurrence during the two-year follow-up period.

Five patients (6.9%) among the total cohort had associated ED with respiratory complaints. Their median age was 56 years (range: 38–69 years). Three of these patients were male. Two patients had type II achalasia and three had type III. All ED were located in the distal oesophagus within the first 8cm from the hiatus on the right-hand side. The mean duration of symptoms was 45.6 months (range: 36–60 months).

All five patients underwent a laparoscopic transhiatal epiphrenic diverticulectomy combined with a Heller myotomy and Dor fundoplication in a single sitting. The mean operative duration was 150 minutes (range: 120–180 minutes). Four patients were discharged from the hospital within ninety-six hours. One patient developed a postoperative oesophageal leak leading to a prolonged hospital stay: a right mediastinal collection was seen on postoperative CT, which was managed with thoracoscopic lavage and a laparoscopic feeding jejunostomy. Repeat imaging after two weeks revealed a small persistent leak, which was subsequently managed with a dumbbell shaped expanding stent. The patient's symptoms improved following stenting and as there was no leak visible on CT at six weeks, the stent was removed.

The mean follow-up duration was 25 months (range: 12–36 months). Only one patient required subsequent surgical intervention; this was to manage the abovementioned oesophageal leak resulting from the first operation. There was no mortality. At 12 months, the mean Eckardt score reduced from 6.8 to 1.6. Three (60%) of the five patients reported an excellent outcome following surgery (resolution of symptoms), one patient (20%) reported a good outcome (significantly improved symptoms) and one patient (20%), who had the postoperative leak, reported a fair outcome with slightly improved symptoms. None of the patients reported a poor outcome (ie no improvement or worsening of symptoms).

All five patients showed significant weight gain (mean: 4kg, range: 3–6kg) over the initial six months after surgery. None required proton pump inhibitors on a regular basis at one month. The GERD-HRQL [Gastroesophageal Reflux Disease-Health Related Quality of Life] symptom severity instrument⁵ gave a mean score of <2 at six months. Table 1 compares patient data on LOS pressure, Eckardt score and follow-up outcome.

Discussion

An ED was first described in 1833.⁶ ED are pulsion pseudo-diverticula formed in the distal 10cm of the oesophagus, usually on the right side, and around 50% of patients are asymptomatic.⁷ The most common presenting symptoms are regurgitation, heartburn and chest pain. Patients also have pulmonary complaints due to regurgitation and aspiration. Chest pain can be attributed to the underlying oesophageal motility disorder. The majority (75–90%) of patients with ED have an associated oesophageal motor abnormality on manometry.⁸ In 1934, just over 100 years following the first description of ED, its association with an

Table 1 Comparison of pre and postoperative patient data

Case	Age / sex	Lower oesophageal sphincter pressure	Type of achalasia	Preoperative Eckardt score	Symptom duration	Distance between diverticulum and hiatus	Postoperative period	Follow-up duration	Outcome and Eckardt score at 1 year
1	64 M	30mmHg	III	7	48 mths	7cm, right lateral	Uneventful	33 mths	Excellent, 1
2	57 M	32mmHg	III	8	60 mths	6cm, right anterolateral	Postoperative leak	20 mths	Fair, 3
3	38 F	28mmHg	II	6	30 mths	7cm, right posterior	Uneventful	24 mths	Excellent, 1
4	69 F	29mmHg	II	7	54 mths	8cm, right anterior	Uneventful	12 mths	Good, 2
5	52 M	31mmHg	III	6	36 mths	8cm, right posterior	Uneventful	36 mths	Excellent, 1

underlying oesophageal motility disorder was recognised by Vinson.⁹

In the absence of pulmonary symptoms and in patients with mild sporadic episodes of regurgitation and dysphagia, surgical treatment of ED is not indicated and surgery should only be offered to patients with severe symptoms.¹⁰ Symptom severity is not linked to the size of the diverticulum and so size alone should not be the only criterion for performing surgery.¹¹ Allaix *et al* reported on 7 patients with small ED treated only for their underlying motility disorder without diverticulectomy.¹² At 11 months, their symptoms had improved. Owing to the morbidity associated with the complications of surgery, careful patient selection is of the utmost importance. Complications linked to ED are not unheard of. Mediastinitis due to perforation and rupture of the ED (and less commonly, progression to carcinoma in the ED) has been reported.^{7,13} Our patients had not experienced any such complications at the time of presentation.

Excision of ED has customarily been carried out via thoracotomy, as first described in 1927.¹⁴ Until the 1990s, resection of ED via a transthoracic approach with a Heller myotomy was the mainstay of treatment. One of the largest case series of transthoracic excision of ED with diverticulectomy was published in 1993 by the Mayo Clinic.¹⁵ This showed major postoperative complications in 33.3% of patients with a 9.1% perioperative mortality rate.

Compared with traditional open surgery, video assisted thoracoscopic surgery (VATS) has proved to be better in terms of outcome and complications.¹⁶ In 1998 Rosati *et al* described the laparoscopic approach.¹⁷ Laparoscopic access has advantages including better visualisation of the gastro-oesophageal junction. It is also easier to achieve an adequate Heller myotomy and to add the antireflux fundoplication wrap to prevent postoperative gastro-oesophageal reflux disease, which is not possible in VATS or thoracotomy. Furthermore, the laparoscopic approach provides better alignment of the stapler with the ED, and is associated with fewer and less severe anaesthetic complications than the transthoracic approach.¹⁸

Richards *et al* found that when a wrap procedure is not included in the initial antireflux surgery, the incidence of postoperative reflux is 47.6% compared with 9.1% when a Dor fundoplication is performed.¹⁹ The Society of American Gastrointestinal and Endoscopic Surgeons recommends only a partial fundoplication and a Nissen fundoplication is contraindicated.^{20,21} Few authors advocate the Toupet fundoplication as it reinforces the staple line and naturally keeps the myotomy edges apart.²² Fraiji *et al* also noted higher postoperative dysphagia with the Toupet fundoplication and therefore began to perform the anterior Dor fundoplication instead to prevent postoperative gastro-oesophageal reflux.²³

A laparoscopic epiphrenic diverticulectomy with a myotomy combined with fundoplication provides symptomatic relief in 85–100% cases but it comes with complications such as leaks (8–23%), pulmonary complications (8–10%) and mortality (0–7%).^{10,24} For this reason, all cases should be selected carefully.

Conclusions

Along with diverticulectomy, treating the underlying motility disorder with an adequate Heller myotomy and partial fundoplication is crucial for ensuring a good surgical outcome, and for preventing complications and symptom recurrence. Small asymptomatic ED can be left in place as treating only the underlying motility disorder offers good relief. In cases with a larger ED with pulmonary symptoms, diverticulectomy should be considered. Advances in laparoscopic surgery together with the ability to ensure stapler alignment using intraoperative oesophago-gastroduodenoscopy and to confirm the adequacy of the myotomy mean that laparoscopic stapler assisted diverticulectomy with a Heller myotomy and Dor fundoplication is a safe option for patients, achieving effective results. However, owing to the possible complications associated with the procedure, cases should be selected carefully.

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