CASE REPORTS

Laparoscopic transhiatal repair of esophageal rupture in Boerhaave Syndrome is a safe and effective treatment

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ABSTRACT

Boerhaave Syndrome, also known as spontaneous esophageal rupture, is a rare condition with an estimated mortality of 20%-40%. Conventional surgical repair with the intention of primary repair remains the mainstay of treatment in esophageal rupture in Boerhaave syndrome. We present our experience with 2 cases that underwent laparoscopic transhiatal repair of esophageal rupture in Boerhaave Syndrome. Both cases presented with left chest and abdominal pain after vomiting, and were normotensive on admission. In both cases, the diagnosis of Boerrhaave Syndrome were made on Computer Tomographic (CT) scan. The patients underwent laparoscopic repair of the esophageal rupture successfully, and were subsequently discharged well on post-operative day 13 and 15 respectively. The laparoscopic transhiatal repair of esophageal rupture in Boerhaave Syndrome results in shorter length of hospital stay. The mean length of stay in the laparoscopic approach was 14 days (13 & 15days) in our series, as opposed to a mean of 20.5 days in patients who underwent open thoracotomy and washout with primary repair. There were no mortalities in either of the patients who underwent laparoscopic transhiatal repair in our series, however open thoracotomy and primary repair was associated with a mortality of 20%. The rarity of a ruptured esophagus makes comparison between the various treatment methods difficult. From our own experience and successful outcome in 2 such patients, we conclude that laparoscopic transhiatal repair of Boerhaave syndrome is a safe alternative to open repair in patients as the rupture often occurs in the lower end of the esophagus, provided there are no contraindications to laparoscopy.

Key Words: Laparoscopic; Transhiatal; Esophageal rupture; Boerhaave Syndrome

1. INTRODUCTION

Boerhaave Syndrome, also known as spontaneous esophageal rupture, is a rare condition with an estimated mortality of 20%-40%,[1] and was first described in 1724 by Dr Herman Boerhaave. It results from a sudden increase in intra-esophageal pressure, combined with a negative intra-thoracic pressure that is seen in vomiting or severe straining. The leakage of gastric and esophageal contents into the mediastinum and pleural or abdominal cavity may result in a necrotizing inflammatory process, leading to sepsis, multi-organ failure and death.[2]

Conventional surgical repair with the intention of primary repair remains the mainstay of treatment in esophageal rupture in Boerhaave syndrome. The surgical approach depends on the level of the esophageal perforation; a right thoracotomy would be used to approach a mid-esophageal perforation, a

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left thoracotomy and/or laparotomy for a distal esophageal perforation.[2,3] Primary repair of the esophagus can be carried out in patients who present early and the mucosa at the site of rupture is still viable and healthy. The longer the delay in presentation, the lower the likelihood of successful primary repair. In situations where the viability of the mucosal edges is questionable, other options include a buttress with the fundus of the stomach, intercostal muscle or parietal pleura flap, or esophagectomy and diversion in severe cases.[4,5]

Laparoscopic transhiatal repair of Boerhaave syndrome is a safe alternative to open repair in patients as the rupture often occurs in the lower end of the esophagus, provided there are no contraindications to laparoscopy. While the rarity of Boerhaave syndrome makes a randomized controlled trial or systematic review improbable due to the paucity of data, we draw this conclusion from our own experience and successful outcome in 2 such patients.

2. CASE PRESENTATION

The patients: Our experience stems from 2 cases, occurring in 2010 and 2015 respectively.

2.1 Case 1

The first case was a 35-year-old female who presented with a one-day history of sharp upper abdominal pain of sudden onset, left-sided pleuritic chest pain after 2 episodes of vomiting and hematemesis. She was normotensive and not tachycardic. A computer tomography (CT) scan of the thorax showed extensive pneumomediastinum and subcutaneous emphysema in the neck (see Figure 1), bilateral lower lobe consolidation and a left pleural effusion. A swallow study with water-soluble contrast showed a leakage in the distal esophagus. After insertion of a left-sided chest tube, commencement of intravenous amoxiciilin/clavulanate (augmentin) and adequate resuscitation, the patient was brought to the operating theatre. An on-table oesophagogastroduodenoscopy (OGD) was performed to confirm and locate the site of perforation, before proceeding with a laparoscopic transhiatal repair of the esophageal perforation.

On post-operation day (POD) two, the chest tube was removed. The patient remained febrile until POD eight, where a CT scan of the thorax, abdomen and pelvis with oral contrast showed no evidence of contrast leakage at the repair site, resolution of the pneumomediastinum, and a small pelvic abscess. The pelvic abscess was successfully drained percutaneously, and she was started on liquid feeds orally on POD 9, which was eventually progressed to soft diet. The patient was discharged well on POD 15.

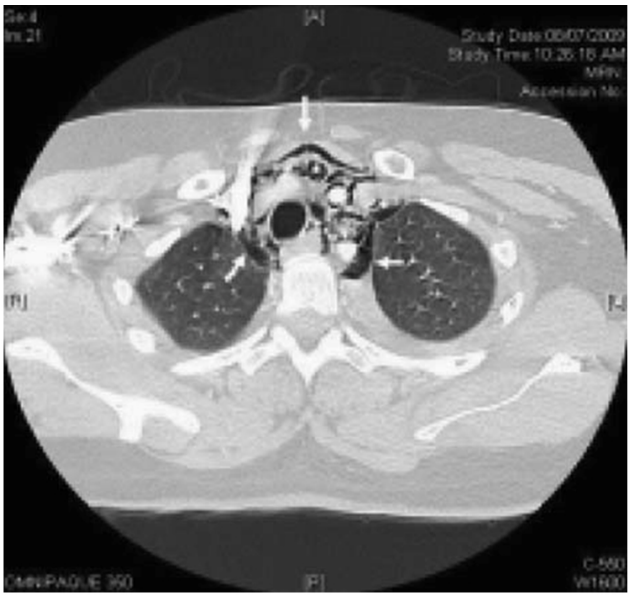

Figure 1. Computed tomography thorax showing extensive pneumomediastinum (arrows)

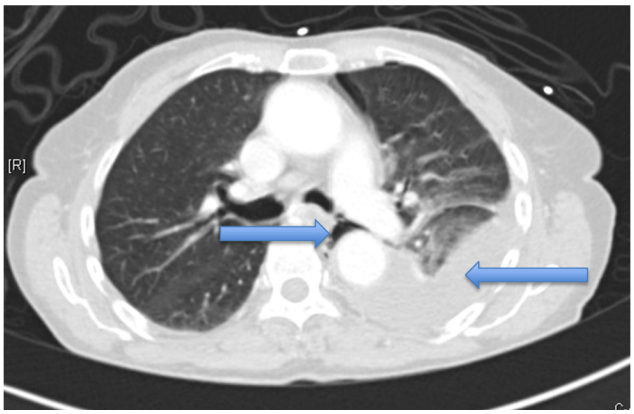

Figure 2. Computed tomography of the thorax showing pneumomedistinum and left pleural effusion with pneumothorax (arrows)

2.2 Case 2

The second case is a 70-year-old female who presented with sudden onset of left chest pain and left hypochondrial pain from 6 h prior. She reported nausea with retching but no vomiting, and was tachycardic but normotensive on admission. Chest radiograph showed left lower zone haziness and blunting of the left costophrenic angle. CT thorax, abdomen and pelvis showed pneumomediastinum and mild wall thickening of the distal esophagus. A small left pneumothorax with left pleural effusion is also seen (see Figure 2). The diagnosis of Boerhaave syndrome was made, and a left chest tube was inserted in the Emergency Department, with drainage of what appeared to be vegetable matter. Intravenous amoxicillin/clavulanate (augmentin) was commenced and patient

was resuscitated prior to transfer to the operating theater for an emergency exploratory laparoscopy, approximately 12 h after the initial onset of pain.

Post operation, she continued to have fever spikes until POD 4, when a repeat CT thorax showed residual left pleural effusion despite a chest drain in-situ. A barium swallow done on POD 4 did not show extravasation of contrast. She was started on liquid feeds on POD 5, and was progressed to soft diet on POD 7. The chest tube was removed and the pleural effusion was percutaneously drained via a small pig-tail catheter. The second chest drain was eventually removed on POD 11. Her condition improved and she was discharged well on POD 13.

2.3 The operation – Laparoscopic transhiatal esophageal repair

The first patient was placed in a modified Lloyd-Davies position, while the second patient was placed in a supine position. In both cases, and on-table OGD was performed prior to laparoscopy.

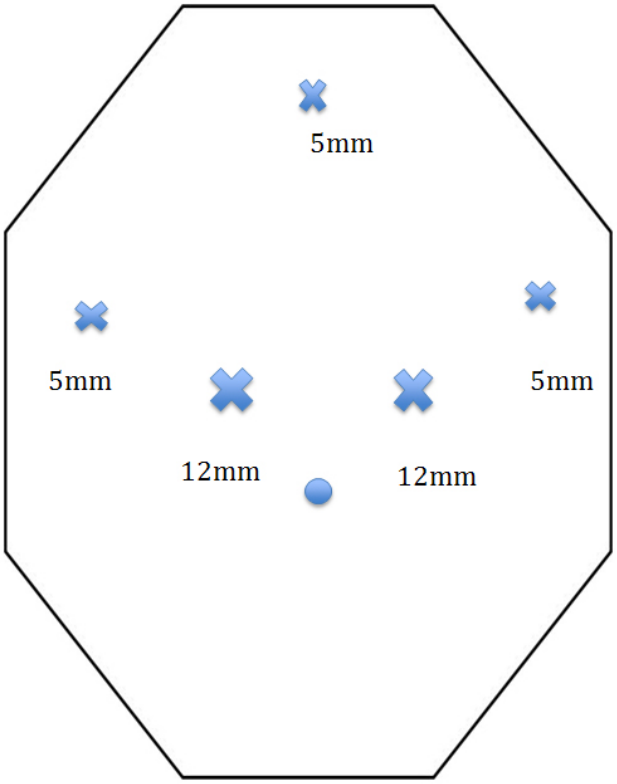

Figure 3. Port placement for laparoscopic surgery

The laparoscopic port placements are as follows: two 12 mm ports were placed just above the umbilicus, to the right and to the left, two 5 mm ports were placed in the right hypochondrium and left flank, and a 5mm port was placed in the epigastric region (see Figure 3). The 5 mm epigastric port was replaced with a Nathanson retractor to retract the liver in the first case, while a fan retractor was used to retract the liver via the epigastric 5 mm port in the second case.

An energy device was used for dissection. There was no peritoneal soiling in either case. After incising the phreno-esophageal ligament, the mediastinum was entered. The esophagus was dissected free and retracted. Further proximal dissection revealed contamination of the lower mediastinum with intestinal content. In both cases, the esophageal perforation was clearly identified at the usual position of left posterolateral quadrant of the lower esophagus just above the gastro-esophageal junction (see Figure 4). Suture repair was successfully completed with no difficulty with Vicryl 3/0 sutures, and the tissue for suturing was still healthy and held sutures well. Exposure and access to the tear site was more than adequate.

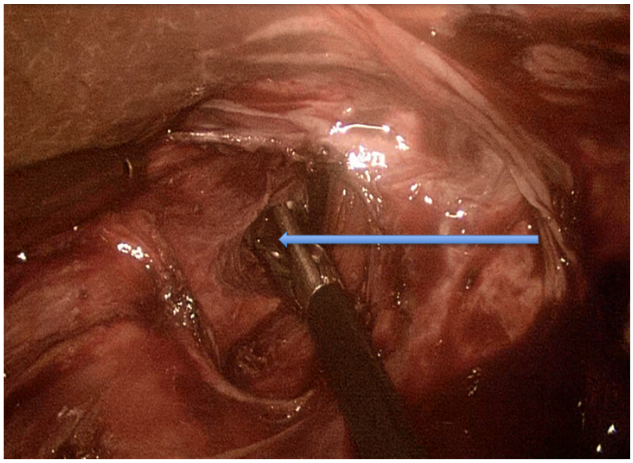

Figure 4. Intraoperative picture showing the instrument within the esophageal perforation (arrow)

A large bore drain was left in the lower posterior mediastinum and coming out through the upper abdomen.

3. Discussion

Esophageal perforation in Boerhaave Syndrome most often occurs at the left posterolateral aspect of the distal third of intra-thoracic esophagus, 2–3 cm from the gastro-esophageal junction.[6] Rupture of the intra-thoracic esophagus leads to chemical mediastinitis, and rupture of the overlying pleura by medistinal inflammation or by the initial perforation leads to contamination of the pleural cavity.

Patients with Boerhaave syndrome often present with non-specific retrosternal chest pain, dyspnea and sepsis. Mackler triad, comprising of subxiphoid chest pain, subcutaneous emphysema and history of forceful emesis, is only present

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in 14% of patients,[7] while Hamman's sign, where mediastinal crackling is heard with each heartbeat on auscultation is equally uncommon.[8] A history of retching or vomiting preceding the onset of pain is absent in 25%-45% of patients.[9]

The principles of management of a ruptured esophagus in Boerhaave Syndrome are to arrest further leakage of contents from the esophagus (either through restoration of continuity of the esophagus or diversion), control of extra-luminal contamination, nutritional support and management of sepsis.

While the exact treatment or surgical option may vary according to the site of the esophageal perforation and the patient's clinical status, the current gold standard of treatment would be either an open thoracotomy or laparotomy to repair the rupture. The general principles for esophageal repair are to debride necrotic or devitalized tissue, close the mucosa with absorbable sutures and the muscularis layer with non-absorbable sutures.

Besides surgery to restore continuity of the esophagus, there are self-expanding metal stents and over-the-scope clips. The use of self-expanding metallic stents in esophageal perforation is controversial. Currently there are no guidelines on the use of self-expanding metal stents in esophageal perforations. The use of stents in the lower esophagus, especially across the lower esophageal sphincter, will result in severe regurgitation and aspiration.[10] There are also other adverse events associated with the use of stents, such as stent migration, tracheoesophageal or bronchoesophageal fistula formation, perforation, strictures at the level of the uncovered portion of the stent.[11]

A newer modality is the use over-the-scope clips to close the esophageal tear.[12–14] Three separate case reports describe successful management of Boerhaave's syndrome with over-the-scope clips, although two out of three patients only had pneumomediastinum without any pleural contamination.

In both our cases, the perforations occurred in the left posterolateral aspect of the distal esophagus, near the gastroesophageal junction. Both cases presented and were diagnosed within 24 h of the onset of chest pain, were hemodynamically stable, and had no contra-indications to laparoscopic surgery. The use of on-table OGD allowed confirmation and visualization of the site of the esophageal laceration with minimal disruption to the conduct of the surgery.

The distal esophagus can be easily accessed via the transhiatal route, and the laparoscopic approach confers short-term improvement in post-operative pain, early return to intestinal function as well as lower incidence of wound complications. The laparoscopic transhiatal approach allows exposure of the mediastinum up to the tracheal bifurcation,[15] as well as access to all four quadrants of the abdomen without the attendant morbidity of a long laparotomy incision. In 2002, Landen *et al.*[15] reported a pilot study of three cases of Boerhaave's syndrome that were managed with minimally invasive techniques, although one patient subsequently succumbed to multi-organ failure.

Chest tubes were sufficient to deal with the chest contamination in both patients who had successful control of repair of the esophageal perforation. General principles for repair of esophageal perforations dictate that the perforation should be closed in two layers, first the mucosal with absorbable sutures, then the muscularis layer with non-absorbable sutures. In both our cases, the patients presented within 24 h of symptoms, and the edges of the esophageal perforation were clean with minimal devitalized tissue. Both perforations were successfully managed with full-thickness closure using absorbable sutures.

Laparoscopic surgery has many advantages over open surgery, including shorter hospitalization, less blood loss, faster bowel recovery and earlier ambulation.[16,17] The laparoscopic transhiatal approach to esophageal rupture in Boerhaave Syndrome results in shorter length of hospital stay. The mean length of stay in the laparoscopic approach was 14 days (13 & 15days) in our series, as opposed to a mean of 20.5 days in patients who underwent open thoracotomy and washout with primary repair.[18] In patients who presented after 48 h and underwent primary closure over a T-tube, the length of stay was even longer (mean of 35.7 days).[18] There were no mortalities in either of the patients who underwent laparoscopic transhiatal repair in our series, however open thoracotomy and primary repair was associated with a mortality of 20%.[18]

4. CONCLUSION

The rarity of a ruptured esophagus makes comparison between the various treatment methods difficult. Laparoscopic transhiatal repair of Boerrhave syndrome in a patient who is hemodynamically stable and without contraindications to laparoscopy is a feasible alternative to the traditional open laparotomy. The laparoscopic transhiatal approach, aided by other adjuncts such as chest tubes and on-table OGD, can be used in the repair of a distal esophageal perforation. Until further results emerge on novel techniques such as over-the-scope clips, surgery still remains the gold standard in restoring esophageal continuity.

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