

Laparoscopic primary repair and isoperistaltic endoluminal drain for Boerhaave's Syndrome



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Laparoscopic primary repair and isoperistaltic endoluminal drain for Boerhaave's syndrome

Spontaneous oesophageal rupture, also known as Boerhaave syndrome (BS), is a rare and potentially lethal pathological condition. BS recognition is difficult, while rapidity of diagnosis, along with extension of the lesion, affects type and outcome of treatment.

BS was classically treated by thoracotomy, but laparoscopic (LS), thoracoscopic (TS) surgery, and nonsurgical procedures as endoscopic stent positioning or use of glues have been described. Still, there is no model treatment, and selection of the most appropriate therapeutic procedure is complex in the absence of standardised criteria.

We successfully managed a patient affected with BS by LS approach and present our experience along with a review of treatment options so far described.

Our treatment integrated positioning of an oesophageal isoperistaltic endoluminal drain (IED), that we routinely use in oesophageal sutures at risk of leakage, and of which there is no previous report in the setting of BS.

A 68 year old man presented to our attention with true BS, suspected on chest-abdominal CT scan and confirmed by upper GI contrast swallow test, showing leakage of hydro-soluble contrast from the lower third of the oesophagus. Of note, pleural cavities appeared intact. We performed an urgent laparoscopy 12 hours after the onset of symptoms. Laparoscopic toilet of the inferior mediastinum and dual layer oesophageal repair with pedicled omental flap were complemented by positioning of IED, feeding jejunostomy and two tubular drains. The patient had a slow but consistent recovery where IED played as a means of oesophageal suture protection, until he could be discharged home.

We think that, when integrity of the pleura is documented, LS should be priority choice to avoid contamination of the pleural cavities. We have to consider every type of oesophageal repair in BS at risk of failure, and every means of protection of the suture is opportune. In our patient the oesophageal suture, covered with a flap of omentum isolated on a pedicle, has also been protected from excessive oesophageal endoluminal pressures by means of a multi-fenestrated two-way endoesophageal drain (IED, two way tube type Salem). Oesophageal drain has the finality of relieving tension and monitoring the healing of the oesophageal repair.

KEY WORDS: boerhaave syndrome

Introduction

Spontaneous oesophageal rupture, also known as Boerhaave syndrome (BS), is a rare and serious pathological condition, often lethal and with no standard treatment.

Despite the current availability of a number of means of investigation, its recognition is not always easy and timely, with consequent repercussions on the prognosis¹. Extension of the lesion and rapidity of diagnosis affect the type and outcome of treatment².

Once exclusively surgical and by means of thoracotomy, treatment has evolved not only under a technical standpoint, with input coming from laparoscopic (LS) and thoracoscopic (TS) surgery, but also through nonsurgical operative procedures like positioning of endoscopic prosthesis, use of glues, etc.^{3,4}. These contributions sparked new interest in BS and more in general in all

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the lesions of oesophageal continuity. Still, selection of the most appropriate therapeutic procedure is complex in the absence of standardised criteria.

Our observation and successful management of a patient affected with BS offers an occasion for a review of the treatment options including cases treated by minimally invasive approach and the outcome of open procedures. We routinely integrate oesophageal sutures at risk of leakage with an isoperistaltic endoluminal drain (IED) ⁵, of which there is no previous report in the setting of BS, so we will also comment on its effects.

Patient and Methods

A 68-year-old man was admitted at night time in a community hospital for violent, acute retrosternal pain arising after repeated episodes of vomiting. He had been vomiting food and drinks, following copious ingestion. Chest and abdomen CT scan revealed pneumomediastinum and thickening of the distal oesophageal wall, in proximity of which a voluminous air-fluid level was visible, between aorta and heart. CT was also showing pleural effusion with associated atelectasis, more prominent on the left (Fig. 1).

A few hours later, the patient was transferred to our Division. He was complaining of marked epigastric pain with bilateral irradiation to the hypochondria. On examination he was pale, tachycardic, and it was possible to appreciate subcutaneous neck emphysema.

He had an upper GI contrast swallow test for suspect spontaneous oesophageal rupture, and the exam confirmed leakage of hydro-soluble contrast from the lower third of the oesophagus, with no spread to the pleural cavity (Fig. 2). We decided for an urgent surgical explo-



Fig. 1: Contrast chest and abdomen CT, showing gas fluid level in the inferior mediastinum and pleural effusion with associated atelectasis, more prominent on the left.

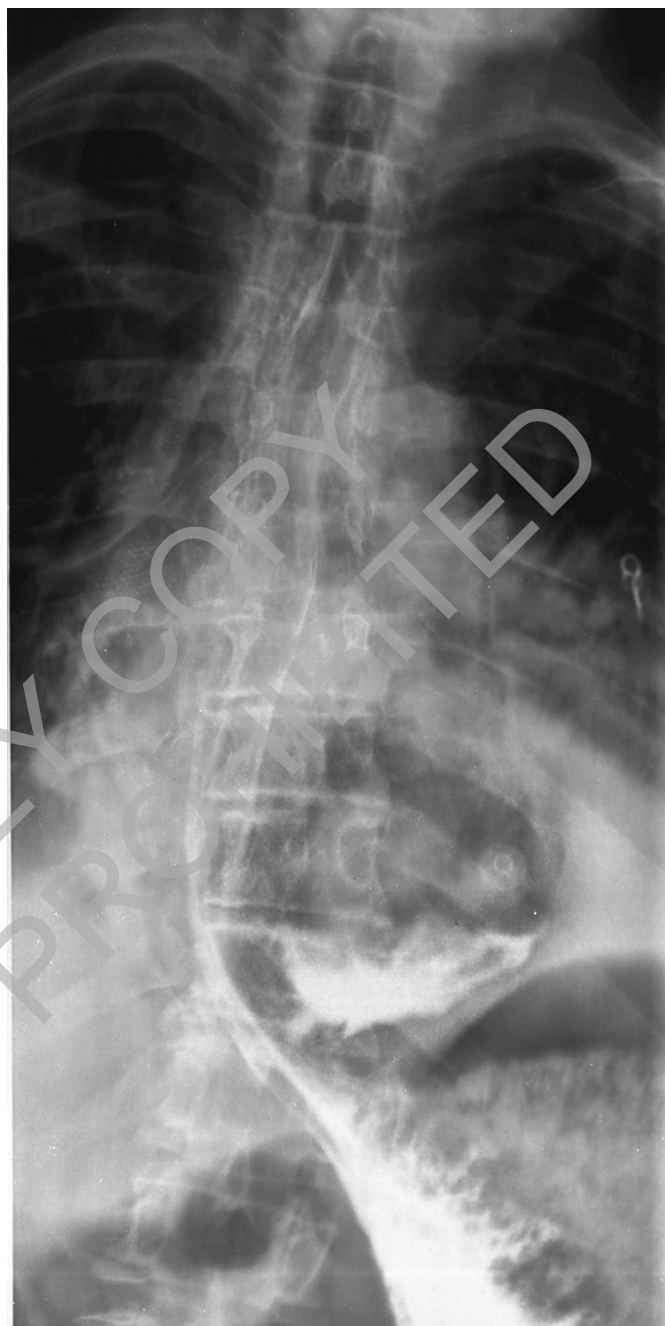


Fig. 2: Upper GI contrast swallow study for suspect spontaneous oesophageal rupture, confirming leakage of hydro-soluble contrast from the lower third of the oesophagus, with no apparent spread to the pleural cavity.

ration by laparoscopy; it was then 12 hours after the onset of symptoms.

We performed a laparoscopy through 5 ports, positioned as we use in hiatus hernia repair, with the first trocar placed by open technique on the midline, half the way between umbilicus and xiphoid appendix. The remaining trocars were respectively xiphoid, in right and left hypochondrium and left flank. After dividing adhesions from a previous cholecystectomy we explored the peri-

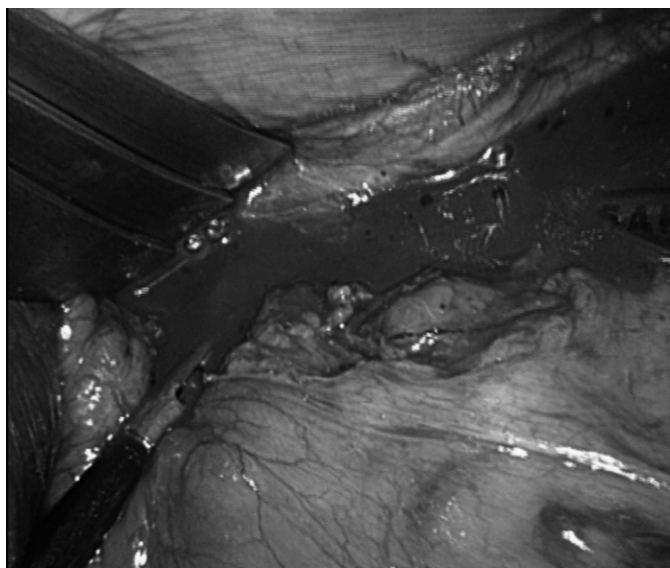


Fig. 3: Laparoscopic exploration of peritoneal cavity. Blackish fluid matter with alimentary residues flows out at the trans-hiatus passage after isolation of the gastro-oesophageal junction.

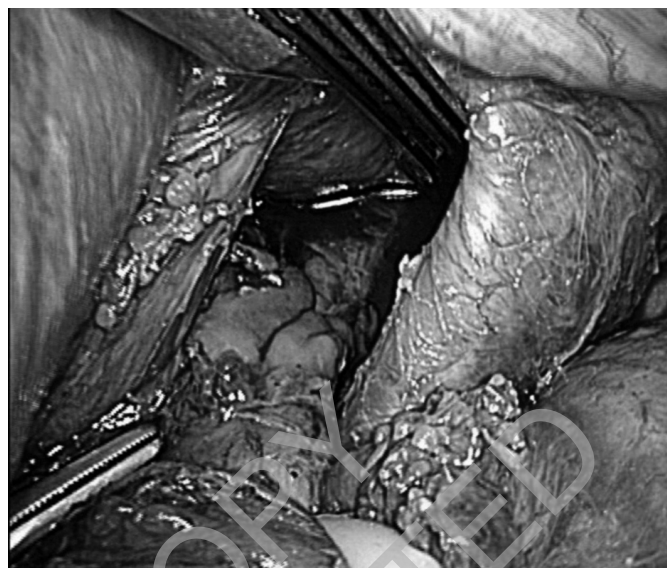


Fig. 4: Assessment of oesophageal rupture. The inferior oesophagus is isolated and encircled with vessel-loop, retracted downwards and laterally; a fan retractor lifts the right crus of the diaphragm: it is possible to see the mucosa protruding like a lip from the longitudinal 3 cm full-thickness lesion, on the left postero-lateral aspect of the oesophageal wall, immediately above the cardiac.

toneal cavity and verified its integrity. We then isolated the gastro-oesophageal junction, verifying outflow of blackish fluid matter with alimentary residues at the trans-hiatus passage (Fig. 3).

Surgical access to the hiatus was extended to evacuate the inferior mediastinum, predominantly occupied by abundant ingests that dislocated the intact mediastinal pleura laterally.

Once clearance was completed with abundant washings, the inferior oesophagus was isolated and encircled with a vessel-loop: it was thus possible to evidence the longitudinal 3 cm full-thickness lesion, on the left postero-lateral aspect of the oesophageal wall, immediately above the cardiac (Fig. 4).

We proceeded to a double-layer repair (continuous suture to mucosa and interrupted suture to the muscular layer) with slow-reabsorption material, overlapped by an omental patch pedicled on the gastric fundus. The procedure completed with minimal gastrotomy on the greater curvature (then stomach wall was retracted sideways to face the 12 mm left subcostal port site) to position two endoluminal probes, one oesophageal and one jejunal. The oesophageal probe is a two-way tube (Salem, 18 fr.), guided upstream to the level of the mid-thoracic oesophagus (Isoperistaltic endoluminal drain, IED). The other one (Nelaton, 14 fr.) was pushed downstream towards the D-J flexure, for enteral nutrition. The operation ended with further positioning of two abdominal drains: the first (Silastic, 24 fr.) in the inferior mediastinum, trans-hiatal (from the

right subcostal port site) and the other in the left subphrenic space (Blake-Drain, 19 fr.).

Soon after intervention the patient was transferred to ITU for continuous postoperative care, ventilator support (he had a background of chronic obstructive pulmonary disease), monitoring of the vital functions and nutritional support.

Postoperative course was complicated by bilateral pleural effusion, and serous fluid was drained from chest. On the 25th postoperative day the patient was transferred back to the ward: control contrast study showed a modest leakage from the oesophageal suture (Fig. 5). Radiologically but not clinically evident, as the patient conditions, blood test and drain output were unremarkable. A bland suction was applied to the larger canal of the two-way drain (IED). The following contrast control studies documented complete healing (Fig. 6). Oral alimentation could be restarted and the abdominal drains were removed. The patient was discharged on the 40th postoperative day and was found well at 12 months follow up check.

Discussion

The case we describe corresponds to the true BS with acute onset after vomiting induced by copious meal and with the classic triad of symptoms described by Macler: chest pain, dyspnoea and subcutaneous emphysema⁶. In the presence of such a clinical picture, detailed his-



Fig. 5: Postoperative control contrast study on the 25th postoperative day, showing a modest leakage from the oesophageal suture radiologically but not clinically evident. A bland suction was applied to the larger canal of the two-way drain (IED).



Fig. 6: Control contrast study before discharge documenting absence of leak. Oral alimentionation could be restarted and the abdominal drains were removed.

tory taking and an accurate clinical exam are sufficient to formulate a correct working diagnosis; unfortunately it is not infrequent today, due to the acute onset or to another anomalous manifestation, that confusion can be made with other acute pathologies including perforated peptic ulcer, pneumothorax, myocardial infarction or dissecting aortic aneurysm¹.

CT scan is needed to confirm clinical suspicion and to integrate diagnosis with further useful signs, including early evidence of pneumomediastinum (as seen in our patient), oesophageal wall thickening, pleural effusion and above all presence of an eventual interruption of the mediastinal pleura.

An upper GI swallow test is indicated to provide elements for differential diagnosis and to evaluate the site and extension of oesophageal rupture⁷.

Typically this condition soon evolves into respiratory failure and shock, and this makes celerity of diagnosis and adequacy of treatment fundamental to avoid precipitating of mediastinitis⁶.

Although conservative management has been proposed in stable, non-septical patients with a late presentation⁸, and the use of covered self-expanding metal stents has also been presented as a viable approach, surgical intervention still seems to be the therapy of choice for cases diagnosed early: mortality rates however vary from 0% to 29%, with significant difference if treatment is accom-

plished within the first 24 hours or on the second day after onset⁹⁻¹¹. There is no consensus on the operative strategy: depending on the site of damage, it varies from oesophagectomy with gastric and cervical oesophageal stoma for wide and high intrathoracic lesions to simple closure, patching and fundoplication for minimal peri-hiatus ruptures. Primary repair and patching with omentum or gastric wall is anyway the most often used technique¹¹.

Surgical morbidity is high whatever procedure is chosen and severe complications including dehiscence, pleural empyema and sepsis are frequently expected; these complications aggravate prognosis in an inversely proportional fashion to the rapidity of diagnosis and therapy. The first report of minimally invasive treatment of BS dates back to 1995¹². Thoracoscopic suture of oesophageal laceration was performed in a 77-year-old patient, and was followed by mild leak recovering with medical therapy alone. The second report of successful thoracoscopic repair followed in 2001, in a 39-year-old male¹³. In 2002 Landen and El Nakadi¹⁴ reported the first three cases operated by LS: the first patient (72 years old) treated with only protective fundoplication healed in two weeks; the second (74 Years old) with a 3 cm lesion of the lower oesophagus was repaired with suture but had fatal outcome due to pleural empyema and mediastinitis; in the third case (48 years of age), with two ruptures, cervical and supra-hiatal, a LS repair

with fundoplication of the inferior laceration was performed, while the first rupture, repaired through cervicotomy, resulted in salivary fistula, reversed after two months with the aid of an endoscopic stent.

Garcia and Coll. Reported in 2004 the fourth case with LS approach but fatal outcome on 22nd postoperative day after suture and fundoplication, due to pleural empyema¹⁵.

In 2007 two further successfully treated cases were published: one with combined TS repair and gastric and jejunal ostomy by LS (16); the other (fifth) in LS⁷.

In 2008, Fison and Coll. reported favourable thoracoscopic repair (with PEG and jejunostomy) for mid thoracic oesophageal rupture⁴. In this small group of 10 males (mean age 62.3, range 39-81), perioperative mortality was 20% and morbidity 70%, of which at least 4 out of ten were reportedly suture leaks. The average balance of this series is rather unsatisfactory and does not differ from the figures of severe morbidity and mortality connected with open procedures^{11, 17}.

Two further series describing thoracoscopic approach were produced in 218,^{18,19}.

Haveman and coll. compared 12 cases treated by video assisted thoracoscopic (VATS) debridement and mediastinal drainage to 12 cases managed by conventional nonresectional drainage approach; less than half patients, in each group, received surgery within 24 hours; postoperative complications occurred in two thirds (66.7%) of the VATS patients, against all patients (100%) treated with conventional drainage; two patients in each group (17%) underwent reoperation, and in-hospital mortality was of one patient (8%) in each group.

The other series, from Korea, compared 7 patients treated with VATS to 8 cases treated by thoracotomy, with a mean interval between perforation and surgery above 40 hours. There was no mortality in the VATS group, versus one postoperative death in the thoracotomy group¹⁹. Authors of these two series conclude that results of VATS were at least comparable to those for an open thoracotomy, and that thoracoscopic oesophageal repair may be an alternative in patients with Boerhaave's syndrome and relatively stable vital signs or mild inflammation.

If then, as repeatedly reported in literature, the prognosis of BS does not show association to a type of surgical drainage or repair there is no either consensus on the type of surgical access chosen.

Among minimally invasive approaches our patient is the seventh case operated by LS, being another one reported in 2011, where LS treatment of a perforation of the lower oesophagus apparently confined to the lower mediastinum also had favourable outcome²⁰.

In principle, it seems to be rationale to prefer transhiatal LS approach for lesions of the lower oesophagus – the prevalent type in this pathology –, as recent experience has shown that it is possible to reach and manage the lower mediastinum. In our case, distal site of oesophageal rupture and integrity of the pleural cavities,

as documented by CT scan and oesophageal contrast study, conditioned our choice towards LS. Our plan of primary repair was supported by the precocity of treatment (circa 12 hours after traumatic event). LS was conducted trans-hiatally without section of the crus of diaphragm, caring not to procure lesions to the pleural cavities. We think that, when integrity of the pleura is documented, LS should be priority choice to avoid contamination of the pleural cavities.

Even though BS lesions are predominantly linear and not very extensive, we have to consider every type of repair at risk of failure due to the background of traumatic rupture, the surrounding septic ambient where the repair happens and the characteristic "lip-like" presentation of the mucosal wound with undermined corners and raised borders.

This is why every means of protection of the suture is opportune, be it covering with gastric fundus when feasible, or patching with omental or pedicled peritoneal flaps. In our patient the oesophageal suture, covered with a flap of omentum isolated on a pedicle, has also been protected from excessive oesophageal endoluminal pressures by means of a multi-fenestrated two-way endoesophageal drain (IED, two way tube type Salem).

The positioning of IED in the thoracic oesophagus, percutaneously inserted through the stomach and pushed upstream, is in our experience a common precautionary measure to protect anastomosis in the thoracic oesophagus or in cases of surgical repair of oesophageal dehiscence.

Oesophageal drain has the finality of relieving tension and monitoring the healing of the oesophageal repair. Comparing with the usual NG tube, IED is asymptomatic, and can be held in place for the whole necessary time. IED drains the oesophagus from below the repair and in the same direction of peristalsis and, once removed, its percutaneous access heals quickly.

In the present case IED has not avoided suture leak but probably minimized it and prevented dehiscence. Our impression that IED favoured spontaneous healing with no need for further invasive therapies.

In cases where LS approach and repair can be contemplated in BS, IED may be a beneficial addition, providing long term drainage of sutures at risk that is well tolerated by the patient.

Riassunto

La rottura spontanea dell'esofago, nota anche come Sindrome di Boerhaave (BS), è una condizione patologica rara e potenzialmente letale. Riconoscere la BS è difficile, mentre per converso la rapidità della diagnosi, oltre all'estensione della lesione primitiva, hanno impatto sulla scelta e riuscita del trattamento.

La BS è stata classicamente trattata chirurgicamente per via toracotomica, ma sia la chirurgia laparoscopica che toracoscopica e trattamenti non chirurgici come il posizionamento di stent endoscopici ed uso di collanti sono approc-

ci descritti. Non vi è ancora tuttavia un modello definito di trattamento, e la selezione di una procedura terapeutica appropriata è complessa in assenza di criteri standardizzati. Abbiamo trattato con successo un paziente affetto da BS mediante approccio LS e presentiamo la nostra esperienza assieme ad una revisione delle opzioni di trattamento descritte fino ad ora.

Il nostro trattamento integrava il posizionamento di un drenaggio endoluminale esofageo isoperistaltico (IED), che già utilizziamo abitualmente nelle suture esofagee a rischio di deiscenza, e del cui uso non vi è precedente menzione nell'ambito della BS.

Un uomo di 68 anni è stato portato alla nostra attenzione con vera BS, sospettata su una TC torace-addome e confermata con studio contrastografico del tratto digerente prossimale, che evidenziava stravaso di contrasto dal terzo inferiore dell'esofago. Le cavità pleuriche apparivano invece intatte. Abbiamo avviato una laparoscopia in urgenza quando erano trascorse circa 12 ore dall'inizio dei sintomi. Toilette laparoscopica del mediastino inferiore e riparazione dell'esofago in duplice strato con lembo peritoneale pedunculizzato, sono stati complementati dal posizionamento di IED, digiunostomia nutrizionale e due drenaggi tubulari. Il paziente ha avuto una lenta ma costante guarigione chirurgica, dove IED ha giocato il ruolo di protettore della sutura esofagea fino alla dimissione. Riteniamo che, quando vi è documentata integrità della pleura, un approccio LS dovrebbe essere prioritario rispetto ad altre opzioni che possano comportare contaminazione degli spazi pleurici. In principio dovremmo considerare ogni forma di riparazione esofagea, nel contesto di una BS, a rischio di fallimento, sicché ogni forma di protezione della sutura è da ritenersi opportuna. Nel nostro paziente la sutura esofagea, ricoperta da un lembo di peritoneo viscerale pedunculizzato, è stata inoltre protetta dalla eccessiva pressione esofagea endoluminale attraverso un drenaggio endoesofageo a due vie multifenestrato (IED, tubo a due vie tipo Salem). Il drenaggio dell'esofago aveva la finalità di alleviare la tensione sulla sutura e monitorare la guarigione della riparazione esofagea.

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