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Case Report

Anaesthesia Section

Spontaneous Oesophageal Rupture: Anaesthetic Challenges in a Case of Boerhaave Syndrome Surgery

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ABSTRACT

Boerhaave syndrome is characterised by a rare but life-threatening spontaneous rupture of the oesophagus, which poses significant challenges in anaesthesia management. This condition typically results from sudden intraluminal pressure elevation within the distal oesophagus and is often associated with forceful vomiting. Boerhaave syndrome carries a high mortality rate, ranging from 20 to 40%, with the majority of ruptures occurring in the lower third of the oesophagus, particularly in the left lateral wall of oesophagus. The diagnosis of this syndrome is often complicated by errors, with common misdiagnoses including perforated ulcers, myocardial infarction, pulmonary embolism, dissecting aneurysms, and pancreatitis. Hereby, the authors present a case report of a 52-year-old male who presented with Boerhaave syndrome, outlining the patient's clinical presentation, diagnostic journey, surgical intervention, and the comprehensive anaesthesia approach employed during the repair of a 3 cm esophageal perforation. Due to the rarity of Boerhaave syndrome, it is essential to highlight potential anaesthetic considerations, such as managing haemodynamics, securing the airway, ensuring adequate oxygenation during one-lung ventilation, controlling peak and plateau pressures, conducting thorough blood gas analysis, and providing prompt treatment. These factors underscore the critical role of anaesthesia in the successful management of this surgery. The present report sheds light on the multifaceted challenges and strategies involved in providing safe and efficient anaesthesia care to patients with Boerhaave syndrome.

Keywords: Empyema, One lung ventilation, Pleural effusion, Thoracic surgery video-assisted

CASE REPORT

A 52-year-old male laborer, 66 kg, 168 cm, presented to the Emergency Department with a one-day history of multiple episodes of vomiting and left-sided chest pain. He experienced approximately 5 to 6 episodes of vomiting, which contained food particles, were non-projectile, and were not accompanied by blood.

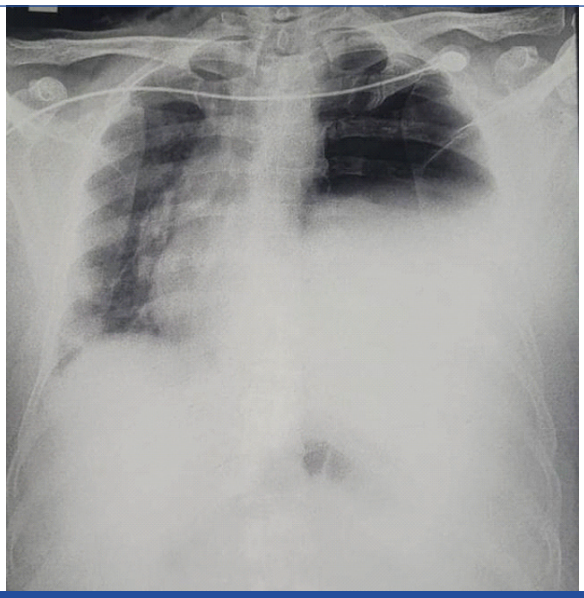
The patient's chest pain had a sudden onset, radiated to the back, worsened with exertion, and improved with rest. He had a fever of 101°F, mild abdominal distension, tenderness in the epigastric region, and decreased breath sounds with crepitations on the left side. He did not have any known co-morbidities.

Routine blood investigations, including complete blood count, liver function tests, renal function tests, serum electrolytes, serum amylase, and lipase, were performed. All results were within normal limits, except for a serum sodium level of 129 mmol/L. A 12-lead Electrocardiogram (ECG) indicated sinus tachycardia, and a chest X-ray revealed blunting of the left costophrenic angle [Table/Fig-1].

Further evaluation showed a negative troponin test and a 2D echocardiogram with an ejection fraction of 60% and no regional wall abnormalities. Abdominal and pelvic Ultrasound (USG) revealed mild left-sided pleural effusion. An USG-guided thoracocentesis drained 129 mL of dark, straw-coloured fluid, followed by the placement of a 28 F Intercostal Drain (ICD).

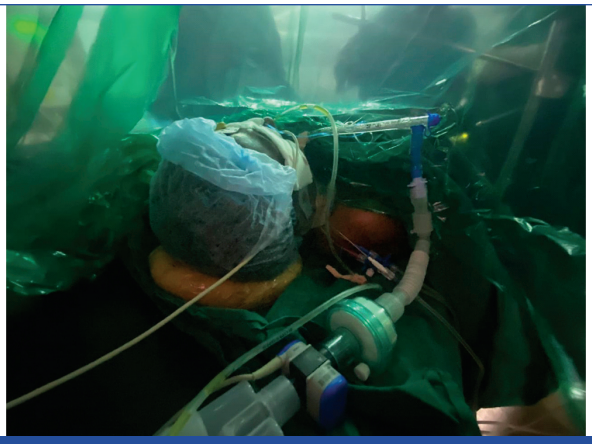
High-resolution Computed Tomography (CT) of the chest, abdomen, and pelvis revealed a left hydropneumothorax with the Intercostal drain in place, left lung collapse, mediastinal and surgical emphysema, and a 3 cm perforation in the left lateral wall of the lower oesophagus with contrast extravasation into the pleural cavity. A provisional diagnosis of Boerhaave syndrome was made, and the patient was scheduled for emergency oesophageal perforation repair with left lung decortication.

The anaesthesia plan for this procedure was general anaesthesia. Two intravenous (i.v.) access points were established: one with a 20 G cannula and the other with an 18 G cannula. A 14 F Ryle's tube was inserted before induction of anaesthesia using fluoroscopy guidance.



[Table/Fig-1]: Preoperative chest X-ray showing blunting of the left costophrenic angle.

Standard monitoring was initiated, including continuous monitoring of the patient's Electrocardiogram (ECG), Non Invasive Blood Pressure (NIBP), and Oxygen saturation (SpO_2). Prior to the induction of anaesthesia, the patient was pre-oxygenated with 100% oxygen for three minutes. Rapid sequence intubation was planned. The patient received the following medications intravenously: midazolam 1 mg, fentanyl 100 mcg, propofol 100 mg, and succinylcholine 100 mg. After induction, intubation was performed using a 37 French, left-sided Robertshaw Double-lumen Tube (DLT) [Table/Fig-2]. The correct placement of the DLT was confirmed using USG as fiber optic bronchoscope was unavailable.



[Table/Fig-2]: Double lumen endotracheal tube.

Throughout the procedure, neuromuscular blockade was maintained with vecuronium at a dose of 0.1 mg/kg, and the volatile agent sevoflurane was kept at a concentration of 1.2% to ensure adequate depth of anaesthesia, with carrier gases of air and oxygen in a ratio of 60:40 at 1.5 liters each, with adjustments made as needed. Additionally, a 7 F triple-lumen central venous catheter was inserted into the right Internal Jugular Vein (IJV) under Ultrasonography (USG) to facilitate central venous access. Intraoperative analgesia was provided by an additional dose of i.v. fentanyl 25 mcg, injection paracetamol 1 g, and injection tramadol 50 mg. Postoperatively, fentanyl patch (25 mcg/hr) was applied for postoperative analgesia.

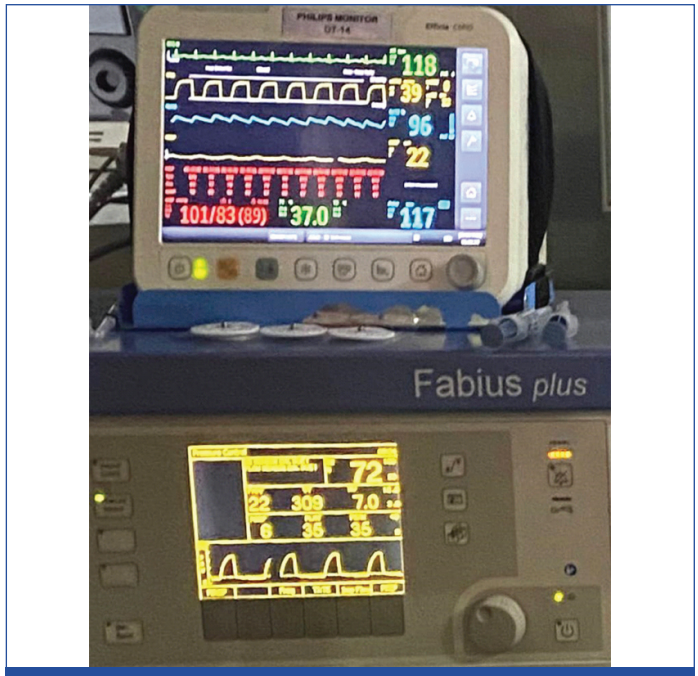
Invasive Blood Pressure (BP) and Central Venous Pressure (CVP) monitoring were initiated to monitor the patient's haemodynamic status. CVP-guided fluid therapy was administered to maintain the CVP between 10-12 mmHg. When hypotension was observed, norepinephrine was administered at a rate of 0.05 mcg/kg/min, with the dosage adjusted to maintain a Mean Arterial Pressure (MAP) of 70 mmHg.

Baseline Arterial Blood Gas (ABG) analysis revealed mixed respiratory and metabolic acidosis, with a pH of 7.21, pCO_2 of 59 mmHg, pO_2 of 64 mmHg, and a bicarbonate level of 20.7 mEq/L. Throughout the surgery, the patient's blood gas parameters were carefully managed, resulting in improved values by the end of the procedure. The final ABG measurements showed a pH of 7.40, pCO_2 of 41 mmHg, pO_2 of 140 mmHg, and a bicarbonate level of 25.4 mEq/L.

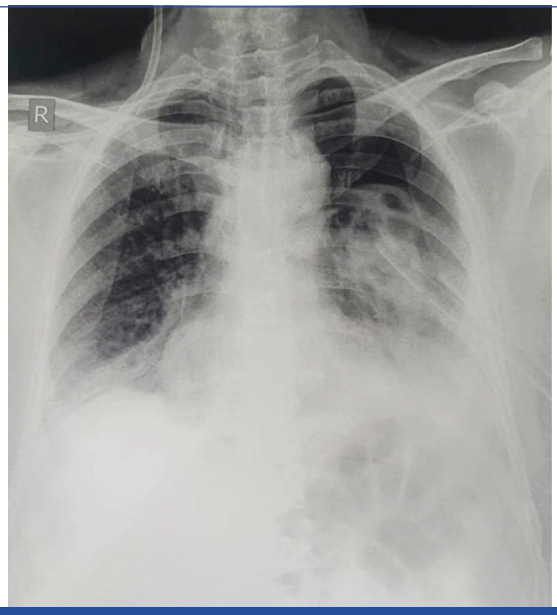
During one-lung ventilation, high airway pressures were noted. The patient was ventilated using pressure control mode to mitigate high peak pressures [Table/Fig-3]. Pressures were set between 28-35 cm H_2O, and frequency was adjusted between 18-22 breaths per minute to attain adequate tidal volume and oxygenation. Additionally, challenges were encountered in maintaining adequate SpO_2 levels, requiring an increase in the Fraction of inspired Oxygen (FiO_2) to 1.0 on 4-5 occasions.

The patient was positioned in trendelenburg position, and a 3 cm oesophageal perforation was discovered on the left lateral aspect of the lower third of the oesophagus. The perforation was promptly repaired laparoscopically. The thoracic portion of the surgery was done in right lateral position and revealed multiple adhesions between the left lung and the chest wall, which were released until healthy lung tissue was visible. A 28 Fr ICD with an underwater seal was placed. Additionally, intra-abdominal and thoracic lavage was performed, and a feeding jejunostomy was established using a size 12 Ryle's tube. The surgery lasted five hours, during which the patient experienced a blood loss of 250 mL, received 3000 mL of crystalloid fluids, and had a urine output of 800 mL.

Throughout the intraoperative phase, no significant events occurred. The decision was made to electively maintain the patient on mechanical ventilation during the postoperative period. The DLT was replaced with a single-lumen tube of size 8 mm, and the patient was transferred intubated to the Intensive Care Unit (ICU). Lung-protective ventilation strategies were followed in the ICU. Broad-spectrum antibiotics were promptly initiated as part of the postoperative care regimen. On the first Postoperative Day (POD 1), a weaning trial was conducted using a T-piece. ABG analysis revealed a pH of 7.39, pCO_2 of 45 mmHg, pO_2 of 135-182 mmHg, and HCO_3 of 27 mEq/L, indicating favorable progress in the patient's respiratory status. A chest X-ray on POD 1 showed the expansion of the left lung [Table/Fig-4].



[Table/Fig-3]: Ventilatory setting showing that the patient was ventilated on pressure control mode in view of high peak and plateau pressures.



[Table/Fig-4]: Postoperative chest X-ray showing ICD in-situ with expansion of left lung.

On the following day {Postoperative Day 2 (POD) 2}, the patient was safely extubated without complications. Further assessment on POD 9 with a gastrografin swallow demonstrated smooth passage of contrast material from the oesophagus into the stomach, with no signs of leakage or obstruction. As a result, the patient was discharged on POD 15, having successfully transitioned to oral feeding.

DISCUSSION

Boerhaave syndrome, first documented by H. Boerhaave in 1724, is a rare but severe condition characterised by spontaneous oesophageal rupture due to sudden increases in intraluminal pressure, often from

forceful vomiting. It typically involves the lower third of the oesophagus and has a high mortality rate of 20-40% [1,2].

Diagnosis is challenging and frequently misdiagnosed; chest and abdominal Computed Tomography (CT) scans are crucial for confirming the diagnosis [1,3-5]. Given the rarity of Boerhaave's syndrome, this report is presented to highlight potential anaesthetic considerations associated with this condition. Patient was taken up for surgery on the same day of admission. Induction of anaesthesia in patients with Boerhaave's syndrome requires caution, involving rapid sequence induction to prevent increases in oesophageal and intra-abdominal pressures [4]. Thoracotomy and lung decortication necessitate the use of a DLT, which can present challenges in placement. In this case, lung USG was utilised to confirm DLT placement by detecting the loss of lung sliding on the clamped side due to unavailability of a Flexible Bronchoscope (FOB). According to Elsabeeny WY et al., lung USG is a sensitive, specific, and cost-effective tool for confirming DLT placement, offering advantages over traditional auscultation [6]. Various case reports, including those by Ashok K et al., and Bhargava J et al., have suggested that rapid sequence intubation is the preferred choice for induction of anaesthesia in Boerhaave's syndrome [7,8].

Ensuring haemodynamic stability is crucial in anaesthesia management. Central Venous Pressure (CVP) monitoring and arterial line placement are necessary for effective fluid and haemodynamic management. This patient required CVP-guided (8-10 mmHg) guided i.v. fluid resuscitation, and inotropic support was provided with inj. noradrenaline 0.05 mcg/kg/min to maintain MAP of 65 mmHg. Ashok K et al., also mentioned the requirement of CVP-guided fluid therapy and inotropic support to achieve adequate MAP in their report [7].

Patients with Boerhaave's syndrome are at significant risk of pulmonary complications, necessitating the use of lung-protective ventilation strategies. This involved employing low tidal volume of 4-6 mL/kg, maintaining Positive End-expiratory Pressure (PEEP) at 5-8 cm H_2O, and ventilating on pressure control mode to mitigate the elevating peak airway pressure. A particular challenge during one-lung ventilation was difficulty in maintaining SpO_2, which is exacerbated in the lateral decubitus position due to increased Ventilation/Perfusion (V/Q) mismatch. To address this, interventions included increasing FiO_2 to 1.0, performing recruitment maneuvers on the ventilated lung, and intermittently reverting to two-lung ventilation [9,10]. Similar challenges were faced by Ashok K et al., during one-lung ventilation, despite increasing the FiO_2 to 1.0 and PEEP to 8 [7]. Pressure control ventilation is suggested by Bhargava J et al., for overall better outcomes and early extubation of the patient [8].

Postoperatively, patient required continued mechanical ventilation in pressure control mode, vigilant pain control with fentanyl transdermal patch, and close monitoring in the Intensive Care Unit (ICU). Adequate pain management is crucial for patient comfort while minimising the risk of respiratory complications [4].

CONCLUSION(S)

In conclusion, the anaesthesia management of Boerhaave syndrome is a complex endeavor that requires thorough preoperative evaluation and smooth induction of anaesthesia. Intraoperative challenges include maintaining haemodynamic parameters and adequate oxygenation, especially during one-lung ventilation and lateral positions. Robust postoperative management in the ICU, with lung-protective ventilation strategies and adequate analgesia, leads to early extubation and recovery of the patient.

REFERENCES

[1] de Schipper JP, Pull ter Gunne AF, Oostvogel HJ, van Laarhoven CJ. Spontaneous rupture of the oesophagus: Boerhaave's syndrome in 2008. Literature review and treatment algorithm. Dig Surg. 2009;26:01-06.
[2] Onyeka WO, Booth SJ. Boerhaave's syndrome presenting as tension pneumothorax. J Accid Emerg Med. 1999;16:235-36.
[3] Chu HN, Chang CH, Hui CK, Hui YL. Anesthetic management of Boerhaave's syndrome. Acta Anaesthesiol Taiwan. 2004;42:103-06.
[4] Barbara DW, Benjamin C, Hartman WR. Boerhaave's syndrome: Spontaneous rupture of the oesophagus. Anesthesiology. 2012;117:11274.
[5] Teh E, Edwards J, Duffy J, Beggs D. Boerhaave's syndrome: A review of management and outcome. Interact Cardiovasc Thorac Surg. 2007;6:640-43.
[6] Elsabeeny WY, Ibrahim MA, Abed SM, Shehab NN. Role of lung ultrasound in confirmation of double-lumen endotracheal tube placement for thoracic surgeries: A prospective diagnostic accuracy study. Anesth Pain Med. 2022;12(5):e132312. Doi: 10.5812/aapm-132312. PMID: 36937173; PMCID: PMC10016132.
[7] Ashok K, Mahalakshmi A, Hariesh A, Kalyanaraman A. Anaesthetic and haemodynamic management of Boerhaave's syndrome. Indian J Anaesth. 2017;61:182-83.
[8] Bhargava J, Tiwari RL, Jain S. Anesthetic management in spontaneous esophageal rupture (Boerhaave's syndrome). J Anaesthesiol Clin Pharmacol. 2016;32(1):126-27. Doi: 10.4103/0970-9185.175726. PMID: 27006565; PMCID: PMC4784201.
[9] Michelet P, D'Journo XB, Roch A, Doddoli C, Marin V, Papazian L, et al. Protective ventilation influences systemic inflammation after esophagectomy: A randomized controlled study. Anesthesiology. 2006;105:911-19.
[10] Mehrotra M, Jain A. Single-lung ventilation. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. [Updated 2023 May 7]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK538314/.

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