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External air compression: A rare cause of blunt esophageal injury, managed by a stent



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ABSTRACT

INTRODUCTION: Blunt esophageal injuries secondary to external air compression of anterior chest and abdomen complicated with esophageal perforation are uncommon events associated with worse outcomes.

PRESENTATION OF CASE: We reported a rare case of esophageal perforation following an external air-compression injury along with the relevant review of literatures. The patient presented with chest pain and shortness of breath and was managed with tube thoracostomy, followed by thoracotomy and eventually with temporary endoscopic stenting.

DISCUSSION: In such trauma case, the external pressurized air forms a shock wave which usually directed to the hollow viscus. Patients with external air-compression injury presented with chest pain and pneumothorax should be suspected for esophageal perforation.

CONCLUSION: High index of suspicion is needed for early diagnosis of esophageal perforation after blunt trauma. Appropriate drainage, antibiotic and temporary endoscopic esophageal stenting may be an optimal approach in selected patients, especially with delayed diagnosis.

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1. Introduction

Although, esophageal injuries are uncommon, patients with esophageal perforation may have significant complications with worse outcome.¹ Therefore, high index of suspicion is needed for early diagnosis and timely management of such injuries. Overall blunt esophageal perforation is rare event. This hollow viscus structure is susceptible to damage by external blast wave compression and the risk of perforation is greater at points where tissue density changes.² However, the incidence of external air compression of the anterior chest wall causing esophageal perforation is an uncommon event that can be missed initially. Herein, we report a rare case of esophageal perforation following an external air-compression injury along with the relevant review of literatures.

2. Case presentation

A 38-year-old male worker who mistakenly tried to dismantle a cylinder which was a full of nitrogen gas, suddenly a high pressure gas released and hit his chest at a distance of 30 cm. The patient was transferred immediately to the trauma unit with a complaint of chest pain and shortness of breath. On the initial examination, he was found to have normal vital signs and his chest X-ray revealed large left sided pneumothorax (Fig. 1, upper panel) that was managed by chest tube insertion. On the third post-injury day, the chest tube drained 1500 ml of foul smelling cloudy fluid. Cultures were obtained and patient was started empirical intravenous antibiotics. However, due to continued drainage, anaerobic growth with *Methicillin-resistant Staphylococcus aureus* (MRSA) on culture of pleural effusion, and increased white blood cells, a left anterior–lateral thoracotomy with decortication was performed on the 7th day (for removal of empyemic membrane) and 2 chest tubes were inserted (Fig. 1, lower panel). Postoperatively, the patient continued to accumulate large milky effusion. As the physician was suspecting chylothorax, oral methylene blue test was performed. The blue color of the dye was observed inside the chest tube within 15 min (Fig. 2) suggesting the presence of esophageal

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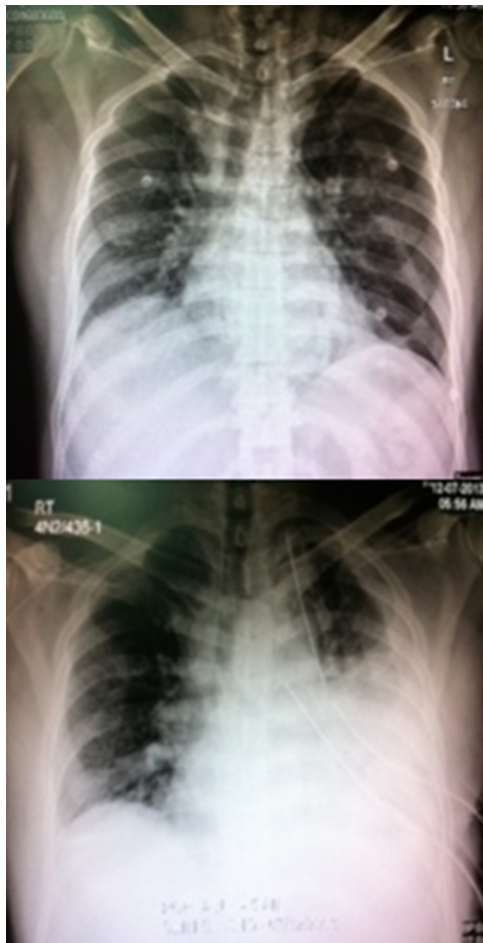


Fig. 1. The initial chest X-ray showing pneumothorax (upper panel) and after chest tubes insertion after thoracotomy and developing effusion (lower panel).

leak into the pleural cavity and hence, chylothorax was excluded. Injury in the lower third of the esophagus was subsequently confirmed on chest CT scan with oral contrast and gastrografen study (Figs. 3 and 4). The patient underwent endoscopic placement of a temporary esophageal expandable covered stent (Fig. 5). Patient was kept on parental nutrition and within 2 weeks, repeated endoscopic and gastrografen study revealed healing of the esophageal injury. The stent had migrated in the stomach and was successfully



Fig. 2. Chest tube drainage of yellowish fluid then blue colored fluid after using oral methylene blue.



Fig. 3. Post-thoracotomy chest CT scan showing chest tube, empyema, oral contrast leak into the pleural cavity.

retrieved endoscopically. Patient condition improved and was discharged to home.

3. Discussion

Blunt esophageal injuries are uncommon particularly, post-external air-blast trauma which has been reported in <0.01% of the esophageal perforation cases.² In such trauma cases, the external pressurized air forms a shock wave which usually directed to the hollow viscus including esophagus through the mouth.³ We were able to identify 19 published cases with variable anatomical distribution.^{3–5} Injuries to the lower, middle and upper esophagus were reported in 12, 4 and 4 cases, respectively. Previously, we have reported a case of blunt trauma due to fall of heavy object that resulted in injury to the middle esophagus requiring surgical repair through the right thoracotomy.⁶ The low incidence of esophageal injuries is attributed to its protection by hard shell



Fig. 4. X-ray showing the esophageal fistula after using oral gastrografen.

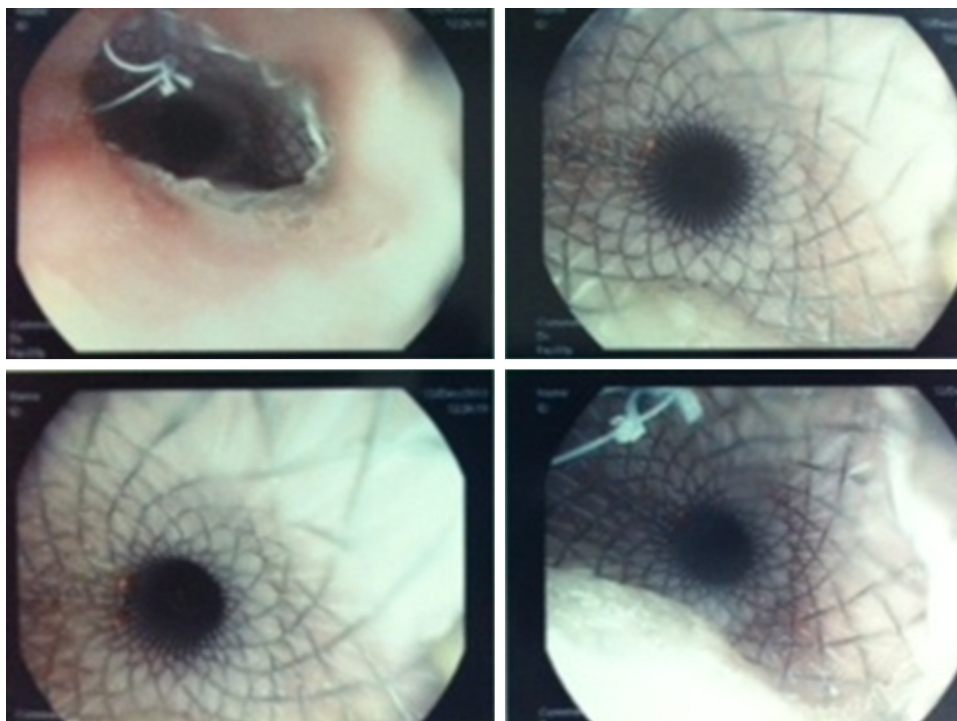


Fig. 5. Endoscopic esophageal stenting.

of chest wall, flexibility and deep seated location in the posterior mediastinum. Experimental studies have investigated the pressure needed to cause esophageal rupture and showed that rupture of the esophagus may occur with an average pressure of 5 psi.³ Anatomically, the lower end of the esophagus is the weakest portion, so the majority of spontaneous ruptures occur in the distal third.³

The diagnosis of esophageal perforation is relatively difficult when the perforation site is located in the lower thoracic region. In the present case, the diagnosis of perforation in the lower third esophagus was not expected and was missed initially even after thoracotomy, mainly due to extreme inflammatory process and empyema. In retrospect, given the foul smelling odor during thoracotomy should have raised the suspicion, however, there was significant difficulty performing decortication to release the trapped lung.

Usually, patients suffering from lower esophageal perforation presented with pneumomediastinum and pneumothorax and this could be attributed to the same mechanism of injury, as rapid compression/decompression of internal organs.³

Though, chest pain and dyspnea are frequently observed in patients with esophageal perforation, these signs are not specific indicators of esophageal rupture.³ Chest pain is considered as the primary symptom of esophageal perforation and is persistently observed in the majority (>70%) of cases with full thickness perforation.¹

Early diagnosis of esophageal rupture is of vital importance, and once the diagnosis is confirmed, esophageal perforation should be management on urgent basis by a team of experts.^{3,6} The role of oral methylene blue in the differential diagnosis of esophageal injury was appreciated in our case. Early diagnosis of esophageal perforation (<12 h) requires direct surgical repair, although the data on use of stent in traumatic injuries are lacking. However, iatrogenic injuries to the esophagus are often managed by temporary stenting. In case of delayed diagnosis; conservative management is preferable as surgical closure might be contraindicated in some patients.⁷ In contrast, Port et al.⁸ reported successful repair of delayed esophageal rupture that was diagnosed >72 h post-injury.

Current literatures have demonstrated an increasing utility of temporary endoscopic esophageal stents for closure of esophageal leakage and to recover gastrointestinal continuity.⁹ Our case was managed successfully by an endoscopic stenting and the patient was kept on parental nutrition, although enteral nutrition is advisable. Naso-enteric tube should be placed at the time of stent placement.

The mortality rate of esophageal perforation has been reported as up to 20%, however, this figure may reach the double with treatment beyond the first 24 h post-injury.¹⁰ In general, the outcome of esophageal perforation is influenced with many factors including the cause, location of injury, coexistent esophageal disease, and the time elapsed between perforation and initiation of therapy.

4. Conclusion

patients with external air-compression injury presented with chest pain and pneumothorax should be suspected for esophageal perforation. For early diagnosis of such rare injuries, high index of suspicion and thorough radiological evaluation are needed. Appropriate drainage, antibiotic and temporary endoscopic esophageal stenting seem to be the promising treatment approach in selected patients.

Conflict of interest

The authors declare that there is no conflict of interest in undertaking this article.

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Ethical approval

This case report has been approved by the Medical Research Center (IRB #14012/14), Hamad Medical Corporation, Doha, Qatar.

Author contributions

MM: data collection, drafting and approval of manuscript. HA: data collection, drafting and approval. AE: data analyses, drafting

and approval. IA: data interpreting, drafting and approval. AH: manuscript drafting and approval. AA: data collection, drafting and approval. RL: data collection, drafting and approval. HAL: data interpreting, drafting and approval.

Key learning points

- Blunt esophageal injuries are uncommon particularly, after external air-blast trauma.
- High index of suspicion for early diagnosis of this injury is needed.
- Appropriate drainage, antibiotic and temporary endoscopic esophageal stenting may be an optimal approach in selected patients.

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