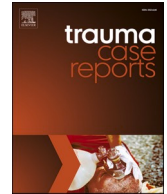




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## Case Report

# Successful management of 72-h delay-detected blunt esophageal injury with trans-gastric primary repair; a case report and literature review

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## ABSTRACT

Diagnosis of blunt esophageal injury is currently a challenging issue. Early surgical interventions still play as the mainstay of treatment. There was no consensus about appropriate treatment options. However, it was potential morbidity if delayed management. We report a 33-year-old man with a history of a motorcycle accident who presented with hematemesis and epigastric pain. He was initially diagnosed with left pneumothorax and low-grade gastric injury. The patient developed a high-grade fever with complex left pneumothorax 72-h after admission. The diagnostic studies revealed a lower esophageal rupture. He was treated with trans-gastric primary repair and recovered well with no complications. We propose the trans-gastric intraluminal repair is one of the surgical options in a blunt lower esophageal rupture.

## Case profile

A 33-year-old man was sustained in a motorcycle crash and presented to the emergency department 4-hour after injury with hematemesis and epigastric pain. His initial vital signs were BP 140/90 mmHg, P 90/min, R 22/min, and T 37.6 °C. He was alert and well-cooperative. A minor contusion in the left lower chest with moderated tenderness in the epigastric was noted. The initial upright chest film revealed the left pneumothorax with no rib fractures. A 24-F chest drain was placed into the left chest and yielded 750 ml of thin blood and minimal coffee-ground content in the gastric tube.

The initial abdominal computed tomography (CT) demonstrated left pneumothorax with mild edematous gastric cardia. There was no evidence of intra-abdominal solid organ injuries or hemoperitoneum (Fig. 1A-B). The patient was treated with left pneumothorax and low-grade stomach injury. During admission, the patient developed a high-grade fever (38–39 °C) with retained left pleural fluid in the follow-up chest film. The laboratory showed no significant leukocytosis or anemia with a lactate level of 2.2 mmol/L. He was re-examined with a chest CT at 72-h post-admission and revealed complex air-fluid content in the left pleural space with no evidence of GI perforation (Fig. 1C). He underwent video-assisted thoracoscopic surgery (VATS). Surprisingly, we found mixed saliva, blood, and food content in the left thorax with a suspicious hole in the lower thoracic esophagus just above the hiatus

*Abbreviations:* BEI, blunt esophageal injury.

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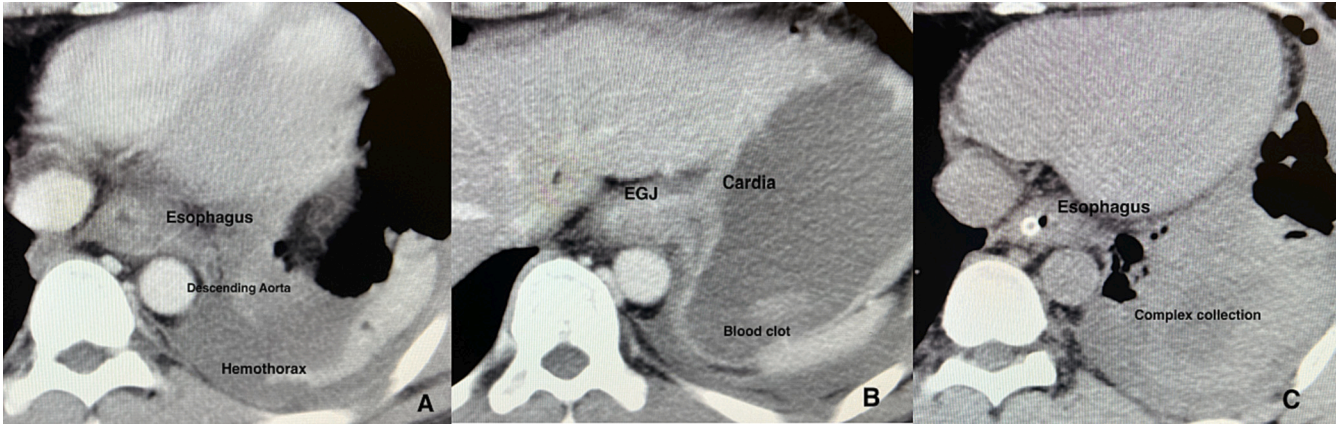


Fig. 1. A-B: Initial CT scan (axial post-contrast), and C: 72-h post injury (axial non-contrast)

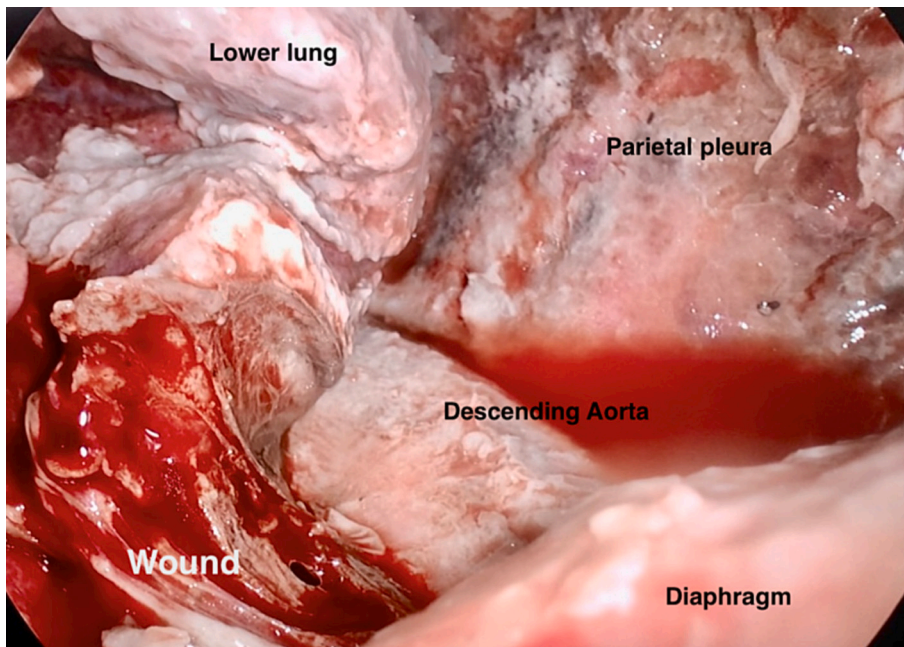


Fig. 2. VATS findings.

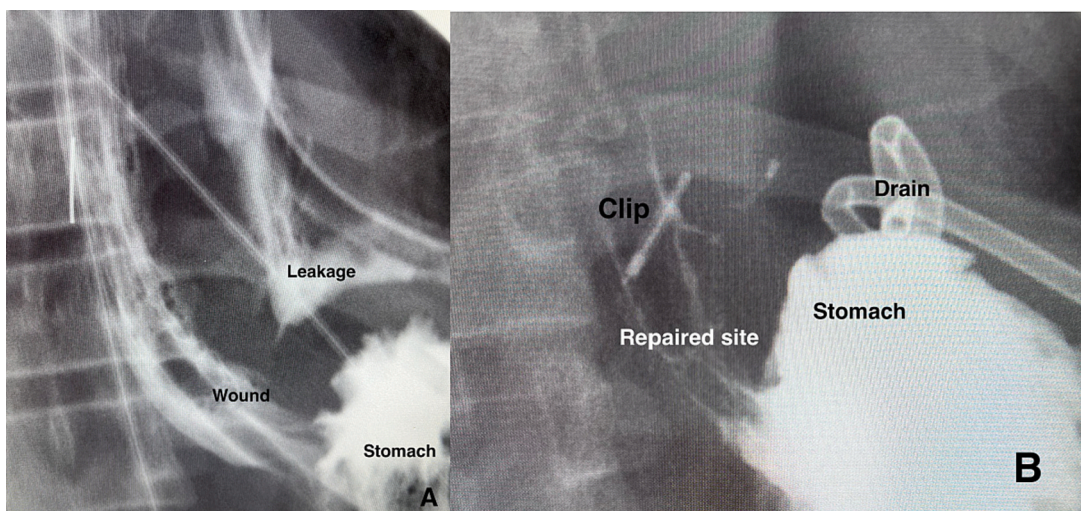


Fig. 3. A: Contrast esophagography at 72-h post injury, and B: follow up in 10-day post repair.

(Fig. 2). 2 large chest tubes were placed into the left chest.

The barium esophagography showed contrast leakage in the lower thoracic esophagus to the left pleural space (Fig. 3A). We brought him to the operating room again, and the esophagoscopy was performed. A 3-cm full-thickness laceration in the esophagogastric junction (EGJ) was compatible with AAST grade 3 injury. The wound failed to be clipped with a 9-mm EZ clip (HX-610-090L; Olympus Corporation, Tokyo, Japan) (Fig. 4A-C). We decided to repair the injured site. The abdomen was opened, a high-transverse gastrotomy was made on the anterior stomach body, and a full-thickness laceration wound in the left posterolateral aspect of the lower esophagus was identified using the previously deployed clip as an indicator. The wound edges were grasped with non-traumatic bowel clamps. The wound was primarily repaired with interrupted 3-0 polyglactin sutures. The drainage gastrotomy was placed through the gastrotomy site. As a feeding jejunostomy, a 12-F silicone catheter was inserted into the proximal jejunum (Fig. 5). The patient recovered very well after this operation with no signs of sepsis. The left pleural content decreased. The follow-up esophagography 10 days after repair revealed no significant contrast leakage (Fig. 3B). He was allowed to eat afterward. All chest drainage tubes were removed, and the patient was discharged home 14 days after admission. He was planned for elective removal of gastrotomy and feeding jejunostomy subsequently.



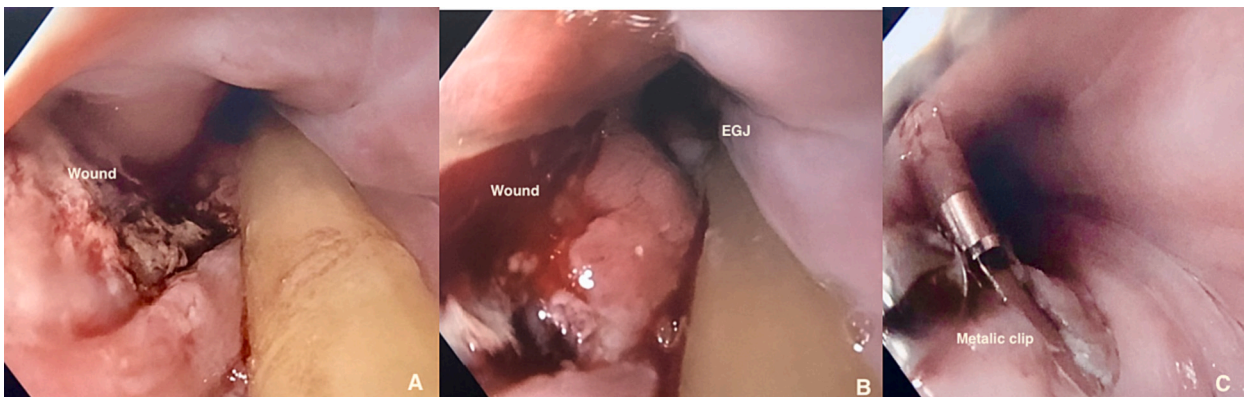


Fig. 4. A-C: Esophagoscopy view of injury and clipping.

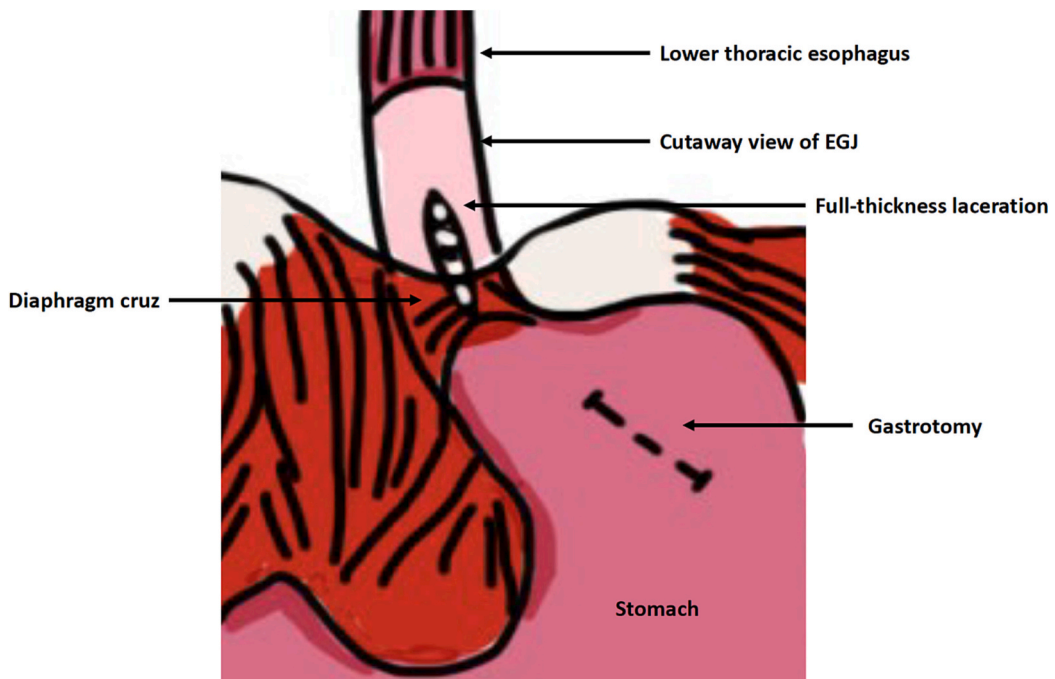


Fig. 5. Operative scheme.

## Discussion

Blunt esophageal injury (BEI) is an extremely rare traumatic condition (<0.1 %) [1] and is recorded in approximately 39 % of all thoracic esophageal injuries with a mortality rate of 14 % [2]. BEI may occur by overpressure of the esophageal lumen. The common mechanism is the steering wheel injury, a crush injury that causes the sternum to push back against the thoracic spine [3]. The sudden stretching of the esophagogastric junction against the hiatal crura results in the laceration of the esophageal wall and usually appears with a full stomach state. The torn esophagus may be resulted from fracture dislocation of the nearby vertebrae, especially in the mid-cervical or upper thoracic esophagus and usually with osteophytes. A high index of suspicion is essential for diagnosing BEI. The presence of subcutaneous emphysema, tachycardia, tachypnea, and fever in the patient with high-energy thoracoabdominal injury should be aware of BEI. Unfortunately, the clinical signs may occur in <25 % of patients [4]. In the case of tube thoracostomy, saliva and food particle drainage suggest BEI and urgent evaluation [2,5]. Unrecognized BEI may rapidly develop into sepsis, multi-organ failure, and death within 24–48 h [6].

Laboratory studies may present systemic inflammatory response resulting from mediastinitis and respiratory impairment in the case of perforated BEI, including leukocytosis, metabolic acidosis, hypoxemia, elevated serum lactate level, and electrolyte imbalance. The pleural fluid analysis typically demonstrated exudative changes with glucose of <60 mg/dL, a pH of 5–7, a lactate dehydrogenase (LDH) of >1000 IU/L, and a pleural fluid to serum amylase ratio of >1 [7]. Chest radiographs may demonstrate widening of the mediastinum, pneumomediastinum, pneumothorax, or pleural effusion. However, the chest film findings may not be specific to BEI. Computed tomography (CT) is currently famous for diagnosing BEI because it can define the extension of injury and associate pathologies that can guide subsequent interventions. CT findings in BEI include esophageal wall thickening or discontinuity, extraluminal air bubbles, fluid collections in the mediastinum, pneumothorax, hydropneumothorax, or pleural effusion [8]. Administration of water-soluble oral contrast such as Gastrografin can be used to demonstrate a leakage site from the esophagus into the mediastinum, pleural cavity, or peritoneal cavity. Contrast esophagography has traditionally been used to identify a leakage site; however, the significant inflammation and edema may lead to miss injury. The false negative rate is approximately 10 % [9]. Esophagoscopy allows direct visualization of the ruptured site and extension of damage with a negative predictive value of 100 %, and a positive predictive value of 33 % [5,10].

There are no high-quality RCTs to define the appropriate treatment for BEI. However, surgical repair remains the mainstay treatment in several recent studies, and early surgical treatment within the first 24 h is associated with survival [2,3,5,9,10]. The operative principle consists of primary repair with esophageal length preservation, buttressing with the autologous tissue, wide drainage, proximal diversion, and enteric feeding access. The intrathoracic BEI requires extensive exposure and usually refers to a right posterolateral thoracotomy. Exceptional in distal thoracic BEI and EGJ injury, a left lower posterolateral thoracotomy or laparotomy is preferred [3,5,11,12]. Endoscopic repair is currently a challenge and increasingly uses in many centers. Available techniques include endoscopic clipping, suturing, and stenting [13]. There is no consensus about the appropriate endoscopic treatment of BEI. A multi-center study in 2014 reported the success of endoscopic therapy in esophageal perforation, but a small traumatic population including

in this study [14]. The infected effusion caused by BEI requires adequate drainage, with available techniques such as a tube thoracostomy, percutaneous drainage, or VATS. VATS may be the most effective method to ensure complete drainage, particle removal, copious irrigation, and lung decortication [3].

There are some reports of successful management of delayed diagnosed esophageal injury. Two penetrating esophageal injuries were diagnosed at 12-h and 36-h after admission, and both were treated with thoracotomy to primary repair [15]. Only one blunt esophageal injury from Kim et al. [16] in 2022 was diagnosed at 5-day after admission and success treated with thoracotomy to debridement, irrigation, and primary repair. However, this case had postoperative esophageal leakage and required esophageal stenting. Our patient presented to a medical-school tertiary care hospital (mimicking a level-1 trauma center) with a blunt thoracoabdominal injury. The initial evaluation cannot identify the injured esophagus. The patient developed mediastinitis afterward, and the CT scan demonstrated complex air-fluid collections in the left hemithorax. These findings may be highly concerned with esophageal rupture even though there was no evidence of GI discontinuity. The contrast esophagography revealed lower esophageal tearing with free leakage to the left pleural cavity. We tried to treat this damage with endoscopic clipping; however, the procedure failed because of a large laceration. The primary repair was success performed via laparotomy with a high gastrotomy (intraluminal repair). Despite delayed diagnosing, this procedure was triumphantly done with no buttressing and proximal diversion. This technique is not previously mentioned in recent studies. To the best of our knowledge, this technique may be one of the safe options for BEI.

## Conclusion

Diagnosis of BEI requires a high index of suspicion. Prompt diagnosis and surgical management are needed to improve outcomes of blunt esophageal injury. Many surgical and endoscopic options are available with no consensus. We want to propose the trans-gastric intraluminal primary repair as one of the appropriate options for BEI, which involves the lower esophagus and EGJ.

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