Case Report

Journal of Emergency Medicine Case Reports

Traumatic Left Tension Pneumothorax with Concomitant Congenital Diaphragmatic Hernia

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Abstract

Blunt thoracic trauma with clinical identification of a tension pneumothorax necessitates immediate decompression. Concomitant diaphragmatic hernia is challenging and rather uncommon; there is potential bowel perforation due to the thoracocentesis. We report a case of traumatic left tension pneumothorax, prompting an immediate left thoracostomy and an incidental finding of an uncomplicated congenital diaphragmatic hernia from a chest x-ray and computed tomography (CT) thorax. Early identification with clinical assessment and bedside imaging is essential, and surgical repair is the definitive management.

Keywords: Thoracic injuries, pneumothorax, diaphragmatic hernia

Introduction

Blunt thoracic trauma represents approximately 15% of all emergency department visits worldwide and is the second leading cause of death in a motor vehicle accident after traumatic brain injury (1). Tension pneumothorax is a rapidly lethal condition that should be diagnosed on clinical grounds during the initial primary survey. A finger thoracostomy followed by rapid chest tube insertion is life-saving.

Congenital diaphragmatic hernia (CDH) usually presents in childhood but may not be diagnosed in healthy adult patients with good reserves. Presentation at a later age is rarely reported in the literature. Traumatic diaphragmatic rupture only occurs in 0.8–1.6% of blunt trauma cases, and it frequently manifests asymptomatically at the time of injury (2). However, congenital or traumatic injuries are clinically undifferentiable if no previous record or imaging is available.

There have only been a few cases described of simultaneous traumatic pneumothorax and diaphragmatic hernias. The physician's goal in treating a blunt thoracic injury is to identify any actual or impending life-threatening illnesses, treat them, and avoid complications. Early identification of pathologies with bedside ultrasound and imaging helps to prevent complications.

Case Report

A 24-year-old Malay gentleman was brought to the emergency department after being involved in a motor vehicle accident. The car skidded and hit a tree on the roadside. The patient wore a seatbelt on the passenger seat, but the airbag was not deployed. The fireman evacuated him from the wrecked car. Upon retrieval, he was alert but complained of left-sided chest pain and difficulty breathing. He appeared tachypnic and in shock, with a blood pressure of 79/59 mmHg and an oxygen saturation of 86% on room air. He was put on a high-flow oxygen mask and given an intravenous fluid bolus.

Upon arrival at the emergency department, the primary survey revealed a left-sided tension pneumothorax. The trachea shifted to the right side; there was a decreased chest rise, hyperresonance on percussion, a positive chest spring on palpation, and a reduced air entry on auscultation over the left chest. Bedside lung ultrasound noted the absence of a sliding sign over the left lung and a partial absence of a hyperechoic line representing a normal diaphragmatic profile. Following an immediate left-sided finger thoracostomy over the safety triangle, there was a gushing of air, and chest tube insertion revealed fluctuations and bubbling in the underwater seal.

The chest x-ray showed a left chest tube in situ and residual left pneumothorax but also noted a rounded hyperdense ring lesion in the lower zone (Figure 1). The patient complained of persistent left-sided chest pain and colicky abdominal pain and was urged to pass motion despite regular analgesia and well-functioning chest drainage. Contrast-enhanced computed tomography (CECT) thorax and referral to the surgery team followed the suspicion of a concurrent traumatic diaphragmatic hernia (TDH).

The CECT thorax showed focal thickening and discontinuity of the central left hemidiaphragm. There

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Received: 12.07.2023 • **Revision:** 31.10.2023 • **Accepted:** 08.12.2023
DOI: 10.33706/jemcr.1326209

Cite this article as: Tan CC, Nazee Mudeen N, Osman M. Traumatic left tension pneumothorax with concomitant congenital diaphragmatic hernia. Journal of Emergency Medicine Case Reports. 2023;14(4): 84-86

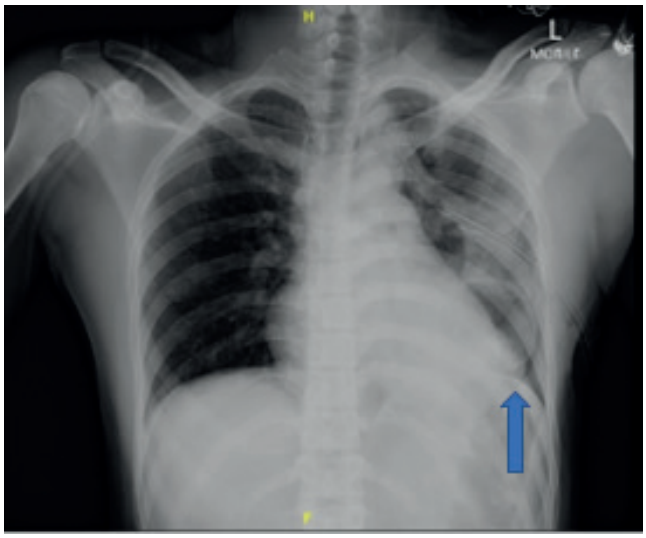

Figure 1. Chest x-ray post left chest tube insertion shows left chest tube in site, residual left pneumothorax and a rounded hyperdense ring seen in the left lower zone (blue arrow)

was intrathoracic herniation of the stomach and peritoneal fat and focal constriction of the stomach at the herniation site. The herniated stomach was distended with the air-fluid level seen within. No diaphragmatic or peri-diaphragmatic contrast extravasation was identified. There was a left pneumothorax with evidence of a left chest tube traversing the left fifth intercostal space. Consolidation involving the left upper and lower lobes was suggestive of a pulmonary contusion. There was no haemothorax or pleural effusion bilaterally, and there was no significant mediastinal shift. Left second- to seventh-rib fractures were seen (Figure 2).

The features suggested a traumatic left diaphragmatic rupture or injury, with associated left pneumothorax, left pulmonary contusion, and multiple left rib fractures. The patient was sent for a surgical laparotomy and diaphragmatic plication. During the surgery, a smooth, well-defined, non-traumatic defect measuring 6 cm by 4 cm and involving part of the stomach and omentum was found at the left posteromedial diaphragm. The hernia contents were reduced, and the diaphragm was repaired. The patient recovered well post-operation, had the chest tube removed on day three, and was eventually discharged well after five days. Written informed consent was obtained from the patient.

Discussion

Motor vehicle accidents, workplace accidents, and falls are the main causes of blunt injuries, and 70% of all are chest trauma (3). The mechanism of blunt trauma involves compression, acceleration, and deceleration injuries, as well as direct strikes on the thorax, resulting in a serious blunt impact injury. High-impact blunt thoracic trauma commonly results in rib fractures and may cause damage to underlying tissues, such as pulmonary contusions and pneumothorax. Tension pneumothorax is a deadly condition that mandates decompression manoeuvres as life-saving measures. It happens when the air becomes trapped in the pleural space under positive pressure, dislodging mediastinal structures and impairing cardiac function. The diagnosis is made based on clinical evidence, while extended-focused assessment sonography for trauma (E-FAST) is sensitive in ruling out pneumothorax (4).

In this case, an emergency finger thoracostomy relieved the tension in the pneumothorax. The gushing of air and the lack of abdominal content that can be felt when the finger is swept across the pleural space can differentiate other rare pathologies like fecopneumothorax or gastrothorax. An improper thoracostomy may result in an intestinal injury or stomach perforation. The CECT thorax shows that the chest tube is just one intercostal space away from the upper border of the herniated stomach. Fortunately, complications like an iatrogenic bowel injury are avoided in this case.

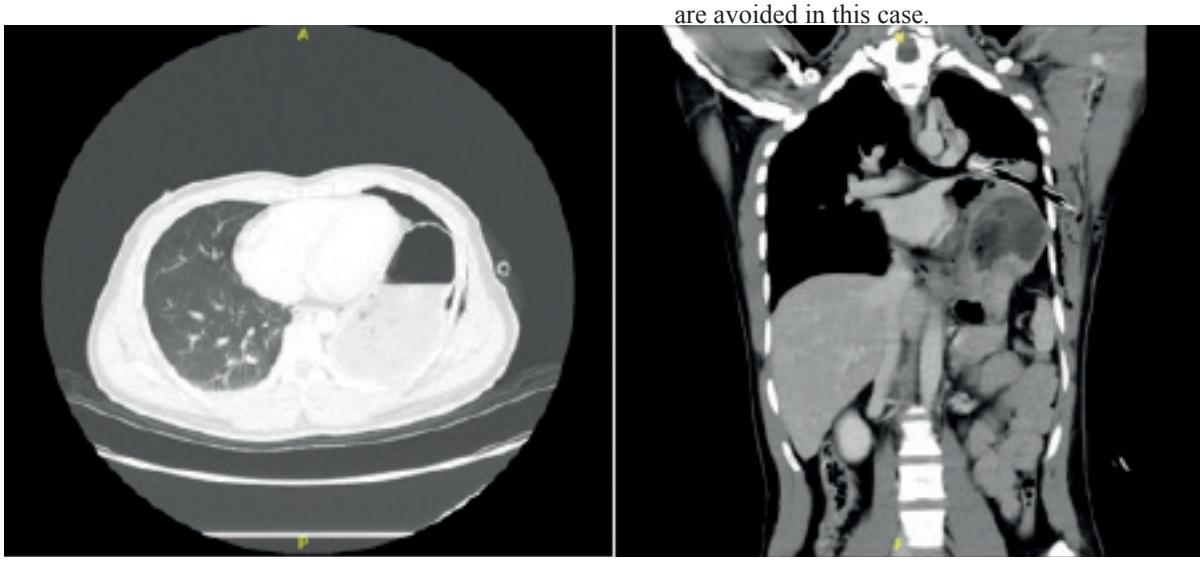

Figure 2. CECT thorax Axial and sagittal view shows focal thickening and discontinuity of the central left hemidiaphragm, intrathoracic herniation of the stomach and peritoneal fat, and focal constriction of the stomach at the herniation site. The herniated stomach is distended with the air-fluid level seen within. No diaphragmatic or peri-diaphragmatic contrast extravasation is identified. There was a left pneumothorax with evidence of a left chest tube traversing the left fifth intercostal space. No haemothorax or pleural effusion bilaterally. No significant mediastinal shift.

DOI: 10.33706/jemcr.1326209
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Diaphragmatic hernia is an uncommon, potentially fatal ailment that can arise congenitally or from trauma. It occurs when abdominal contents protrude into the thoracic cavity through a diaphragmatic defect. Congenital diaphragmatic hernia (CDH) is most commonly detected in the neonatal period and is more common on the left side of the chest, most frequently a Bochdalek hernia (5). The pathology is infrequent in adults, who can be diagnosed incidentally or when symptomatic. The patient may present with respiratory or gastrointestinal symptoms or be acutely ill due to strangulation, volvulus, or perforation of hernia contents.

Traumatic diaphragmatic hernia (TDH) can occur due to penetrating and blunt injuries, yet it is hard to find due to the concealment of accompanying organ injuries. It rarely causes death on its own, but delay in diagnosis may lead to higher mortality with respiratory problems and strangulation of eviscerated organs. The concomitant injuries and complications determine the outcome (6). TDH's clinical symptoms include respiratory discomfort, diminished breath sounds on the affected side, chest auscultation of bowel sounds, palpable abdominal contents upon chest tube insertion, and a less full abdomen on palpation. The diagnosis of a diaphragmatic hernia could go unnoticed, but luckily it was detected in the initial chest x-ray without complication. An emergency operation to reduce the herniated organs and repair the diaphragm was performed. However, the CDH is identified intraoperatively.

Some clinical evaluations and bedside ultrasonography indicators support the presence of a diaphragmatic hernia. First off, having both respiratory and gastrointestinal symptoms at the same time raises the suspicion of a coexisting diaphragmatic hernia. In this case, even after the installation of a chest tube, the patient complained of ongoing chest and stomach pain and an intermittent urge to defecate. Bedside ultrasonography of the left hemithorax suggests a diaphragmatic hernia if there is no A profile in the left lower zone and only part of a hyperechoic line is seen, which is an abnormal diaphragmatic profile. There are a variety of ultrasound characteristics of a diaphragmatic hernia, including (i) a partial absence of the hyperechoic line representing the normal diaphragmatic profile; (ii) a partial absence of the pleural line in the affected hemithorax; (iii) the absence of A-lines in the affected area; (iv) the presence of a multi-layered area with hyperechoic contents in motion (normal gut); and (v) the possible presence of parenchymatous organs inside the thorax (i.e., liver or spleen) (7).

The chest x-ray revealed a round, hyperdense ring lesion in the lower left zone, which represented the abdominal content of the thorax and had focal constriction (collar sign). Other signs of a diaphragmatic hernia include a raised hemidiaphragm (more than 4 cm higher on the left), a distorted diaphragmatic border, and a visible nasogastric tube (8). 73% of TDH detected on the initial chest radiography has an additional 25% found on subsequent films (8). A CT scan is also the preferred modality whenever there is suspicion of diaphragmatic damage. Various significant signs are described in the literature with variable significance, which can be divided into three categories: direct signs of rupture, indirect signs that are consequences of rupture, and signs of uncertain origin (9). Blunt diaphragmatic rupture should be considered if any signs are present. The reference standard is multidetector computed tomography (MDCT), with a sensitivity and specificity of 61–87% and 72–100%, respectively (10).

This case serves as a reminder that tension pneumothorax and diaphragmatic hernia can coexist in blunt trauma patients. Evaluating the patient's history, performing a thorough clinical evaluation, and using imaging can help determine the specific types of thoracic injuries and their related issues. This information can also serve as a guide for life-saving and definitive surgical intervention. Diaphragmatic hernia's delayed consequences can be avoided by early discovery and surgical treatment, which also has a favourable prognosis and low recurrence.

Conclusion

CDH might be asymptomatic in childhood and manifest later in life due to a traumatic chest injury. It's possible to confuse this uncommon disorder with tension pneumothorax or have both life-threatening conditions together. Vigilant clinical examination and imaging aid in early detection and life-saving intervention.

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