Case report

Ruptured diaphragmatic hernia with grade I splenic injury: A case report

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ABSTRACT

Introduction and importance: Traumatic diaphragmatic injury (TDI), although rare, is associated with high mortality and morbidity and timely recognition is important.

Case presentation: We present a case of a 44-year-old male who fell from a three-story building and presented with complaints of shortness of breath and chest pain. On examination, his chest compression test and extended focused assessment with sonography in trauma (E-FAST) were positive. Chest X-ray showed loss of diaphragmatic contour, fracture of fifth to eleventh ribs on the left side, and opacities in the left hemithorax. Contrast-enhanced computed tomography of chest, abdomen, and pelvis showed bowel loops over the left hemithorax with grade 1 splenic injury. A diagnosis of ruptured diaphragmatic hernia with grade I splenic injury was made and emergency primary repair of the diaphragm was done via thoracotomy.

Discussion: Clinical diagnosis of TDI is difficult and can be misdiagnosed as a pneumothorax. In addition, the subtle presentation can often be missed. CT scan of the chest and abdomen is the imaging of choice to reach a diagnosis. Once diagnosed, emergency surgery via laparotomy or thoracotomy is mandatory. Delay in diagnosis can have a fatal consequence or delayed complications which have high mortality.

Conclusion: Diaphragmatic injury should be suspected in all blunt thoracoabdominal traumas, and the presence of this injury should be excluded to prevent late complications. Timely intervention can provide excellent outcomes.

1. Introduction

Traumatic diaphragmatic injuries (TDI) are rare complications resulting from a thoracic-abdominal blunt or penetrating trauma with a reported incidence in the literature between 0.8% and 8% [1]. Although blunt TDIs are rarely life-threatening by themselves in the acute phase, patients with this condition show high mortality rates, ranging from 5% to 50%, because of associated abdominal, thoracic, and brain injuries [2].

The life-threatening consequences of traumatic diaphragmatic rupture are respiratory failure, circulatory collapse, and hemodynamic instability. This occurs due to loss of the thoracoabdominal pressure gradient and subsequent migration of abdominal viscera into the thorax, compression of the vena cava, and bleeding from abdominal viscera [3].

As TDI is uncommon, it poses a diagnostic and therapeutic challenge for the emergency physician and trauma surgeon. A high index of suspicion based on the mechanism of injury, meticulous physical examination, and an appropriate radiological investigation can help reach a diagnosis in most acute cases of TDI. We report a case of TDI in a 44-year male who suffered a blunt thoracoabdominal injury after a fall injury, which was successfully managed. This case has been reported in line with the SCARE criteria [4].

2. Case presentation

A 44-year-old male presented to the emergency department with an alleged history of fall from a three-story building sustaining injury over the left side of the chest and abdomen. At the time of presentation, he complained of shortness of breath and chest pain. However, there was no history of head injury, headache, loss of consciousness, nausea, vomiting, ENT bleeding, abdominal pain, and abnormal body movements. He had no past co-morbidities and did not report any drug allergies.

On examination, he was alert and well oriented to time, place, and
person with a Glasgow coma scale of 15/15 and bilaterally reactive pupils. The airway was intact without cervical tenderness. His respiratory rate was 22 breaths/min and oxygen saturation was 93% on room air. Pulse was 120 beats/min and blood pressure was 90/60 mm of Hg. On chest examination, the chest compression test was positive and there was a decrease in air entry on the left side. The abdomen was soft and non-tender. Examination of all other systems was unremarkable. All blood investigations including liver function tests, renal function tests, and arterial blood gas analysis were normal. The extended focused assessment with sonography in trauma (EFAST) scan was positive and showed a minimal fluid collection in the left pleura and subphrenic space and splenorenal space. After the patient was stabilized, a chest X-ray was performed which showed loss of diaphragmatic contour, opacity of the left hemidiaphragm with 5th to 11th rib fracture, and loss of gastric bubble under the left cupola with slight mediastinal shift to the right (Fig. 1). To further delineate the injury, a contrast-enhanced CT of the chest, abdomen, and pelvis was done which revealed stomach and bowel loops elevated in the left hemithorax along with multiple rib fractures (Figs. 2 and 3).

With the diagnosis of traumatic diaphragmatic herniation, the patient was planned for emergency primary repair of the defect by a team of thoracic surgeons. Empirical antibiotics, IV fluids, analgesics, and antipyretics were administered. The patient underwent a left posterolateral thoracotomy. Intraoperatively, there was an approximately 10 cm rent in the left hemidiaphragm with herniation of bowel loops in the left hemithorax. The herniated bowel loops were reduced and the defect was closed in two layers with the insertion of an extrapleural chest drain. The splenic injury was managed conservatively. He made an uneventful recovery, having stayed in the intensive care unit for 3 days. He was discharged after five days of hospital stay. On follow-up after two weeks, the patient was doing fine and had no complaints.

3. Discussion

Diaphragmatic injuries can present promptly after trauma or have a subtle initial presentation and manifest many months or years later with abdominal organ herniation [5]. Young males in their third decade are most susceptible to traumatic diaphragmatic rupture. Left blunt TDIs are significantly more frequent than right ones (2:1–7:1 ratios). This is probably due to the relative weakness of the left hemidiaphragm and the protective effect of the liver on the right hemidiaphragm [6]. Most of the tears of the left hemidiaphragm are located in the postero-lateral region of the diaphragm and are often large radial tears (5–15 cm) [7]. Our patient had an acute presentation after the blunt injury due to a rupture of the left hemidiaphragm.

Shortness of breath, chest pain, abdominal distention, and loss of breath sounds over the affected hemithorax are the most common signs and symptoms of TDI. As the condition is uncommon and can be misdiagnosed as pneumothorax, incorrect interventions such as inserting a chest tube through a herniated organ can further complicate things. This mandates the clinician to have a high index of suspicion to correctly
diagnose TDI and its timely management [8]. Many other factors that should arise suspicion for TDI/diaphragmatic rupture and prompt further diagnostic investigation include fractured ribs, flail chest, auscultation of bowel sounds in the chest, and dullness on percussion of the chest [9]. However, it should always be kept in mind that TDI can produce subtle to no symptoms and can distract the attention of the clinician from the underlying diaphragmatic injury. Hemothorax, rib fractures, and pneumothorax are the commonest associated thoracic injury, and splenic, hepatic, and renal injuries are the most frequent abdominal lesions [6]. The spleen is more commonly injured among patients with diaphragmatic tears on the left side occurring in up to 3 % of the patients, and the liver is more commonly injured among patients with tears on the right side [10,11]. Our patient had a grade I splenic injury as well.

As a clinical diagnosis of blunt traumatic diaphragmatic rupture is virtually impossible, and thus imaging plays a central role. Though plain chest X-ray represents the most accessible and first-line imaging modality in trauma patients, it has poor accuracy with non-specific alterations present in only 20–50 % of the patients [6]. Interruption of diaphragm silhouette, hemidiaphragm elevation, costophrenic sulcus obliteration, or distorted diaphragmatic profile are some of them. The only direct sign is represented by the visualization of herniated bowels or the nasogastric tube in the thoracic cavity. Thus, contrast CT scan with multiplanar reconstructions is the imaging modality of choice as it has very high accuracy (60 %–90 % sensitivity and 70 %–100 % specificity) in detecting TDIs [6,7]. Chest X-ray in our case showed loss of diaphragmatic contour and opacification of left hemidiaphragm with loss of gastric bubble under the left cupola. Contrast-enhanced CT of the chest, abdomen, and pelvis confirmed the diagnosis and extent of the traumatic left diaphragmatic injury with herniation of the bowel into the left thorax.

As any further delay can cause herniation of abdominal organs due to pressure difference between two cavities which might result in strangulation and perforation of the abdominal organs with fatal consequences, surgery must be performed at the earliest when the diagnosis of traumatic diaphragmatic rupture is made [12]. Insertion of the nasogastric tube will not only help in the diagnosis but also helps to decompress any abdominal herniation and to lessen the abdominal thoracic pressure gradient that favors herniation into the chest. A chest tube can be inserted to drain any associated hemothorax or pneumothorax [13]. A nasogastric tube was inserted in our case too after the diagnosis was made.

Emergency surgery is mandatory when TDI is diagnosed. Laparotomy is done in the majority of cases as the treatment of blunt TDI, laparoscopy, and thoracotomy are less frequently performed [14]. As a ruptured diaphragm is often associated with other abdominal injuries, a laparotomy is a preferred approach. In addition, laparotomy has additional benefits of directly inspecting all intra-abdominal organs including the contralateral hemidiaphragm during surgery [1,7]. However, a study has found that it is easier to reduce the herniated contents and to repair the diaphragm through a thoracotomy when there are no intra-abdominal injuries [15]. Importantly, in cases of delayed presentation, thoracotomy is an accepted approach as it is difficult to release the intrathoracic adhesions through a laparotomy [16]. Irrespective of the approach, the general principles for repairing an acute diaphragmatic rupture include reducing the herniated organs and forming a watertight closure of the diaphragm with the placement of a chest tube into the associated hemithorax [8]. In our case, left posterolateral thoracotomy was done to reduce the bowel loops into the abdominal cavity and to repair the tear in the left hemidiaphragm. Following this, a chest tube was placed.

4. Conclusion

One must maintain a high index of suspicion based on the mechanism of injury to diagnose TDI and prevent late complications, particularly in stable traumatic patients who could have a subtle presentation. Failure to diagnose and repair the diaphragm can result in fatal consequences.

Consent for publication

Written informed consent was obtained from the patient’s wife for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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Declaration of competing interest
None to declare.

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