



Blunt Chest Trauma with Diaphragmatic Laceration Presenting as Delayed Hemothorax

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We report a case of delayed hemothorax resulted from diaphragmatic laceration after blunt chest trauma and its successful treatment. Initial chest X-ray and initial computed tomography (CT) scan revealed no hemothorax in this 19-year-old male with a stable hemodynamic condition although there were multiple contusion wounds with ecchymoses over the right chest wall, shoulder, back and right upper quadrant of abdomen. In the following day, he experienced progressive dyspnea and conscious disturbance. Massive hemothorax was verified through repeated chest X-ray and CT scan. A laceration wound about 3 cm in length with continuous oozing at the dome of the right hemidiaphragm was noted in emergent thoracotomy. The laceration was repaired, and the patient had an uneventful recovery after the surgery. We proposed that traumatic diaphragmatic injury should be considered in any patient who has sustained blunt trauma to the lower chest and upper abdomen regions, watchful observation and high index of suspicion are necessary.

Key words: Diaphragmatic laceration, hemothorax, blunt chest trauma

INTRODUCTION

Diaphragmatic injury presenting as a delayed hemothorax after blunt trauma is a rare and potentially life-threatening event.¹ The underlying mechanism for diaphragmatic rupture in blunt injuries is due to high energy acceleration-deceleration impact that results in a sudden increase in the intra-abdominal pressure. These high-energy injuries are often associated with considerable comorbidity, contributing to an early mortality rate as high as 16.6%.² Even with the advances of noninvasive or minimally invasive tools in the evaluation of trauma patients, diaphragmatic injuries are still not easy to diagnose if not associated with conditions that require exploration. Massive hemothorax resulted from a diaphragmatic laceration in the absence of rib fracture, or any thoracoabdominal organ injury is rarely seen.

CASE REPORT

A 19-year-old male was attacked with a wooden bat and was brought by to emergency room due to multiple contusion

wounds over head, chest, abdomen, and extremities. On initial presentation, he was awake and alert with a Glasgow coma score of 15, and a blood pressure of 116/56 mmHg. His heart rate was 78 beats/min, respiratory rate was 20 breaths/min, and temperature was 36.5°C. Oxygen saturation on room air was 99%, and laboratory test showed a hemoglobin level of 15 g/dl. There were multiple contusion wounds with ecchymoses over the right chest wall, shoulder, back and right upper quadrant of abdomen. No open wound or penetrating wound over chest and abdomen regions. The breathing sounds were present over bilateral lung field without crepitus. The abdomen was nontender. There was a deformity of the left index finger and X-ray verified fracture over distal phalanx. Other radiologic image including chest X-ray [Figure 1a], chest and abdomen contrast-enhanced computed tomography (CT) of chest and abdomen showed negative finding.

The patient underwent open reduction and internal fixation for an open fracture of left index finger. He remained stable through this procedure and was admitted to the ordinary ward after the operation with an uneventful immediate postoperative

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Delayed hemothorax in BCI

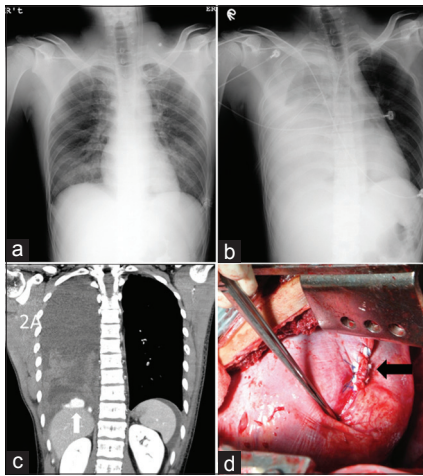


Figure 1: (a) Initial chest X-ray in the emergency room and (b) followed up chest X-ray taken 12 h later. (c) Contrast-enhanced computed tomography scan of chest showed right-sided massive hemothorax with contrast extravasation (white arrow) at the dome of right hemidiaphragm. (d) Operative photograph showed one laceration wound over right-sided hemidiaphragm which was repaired with interrupted horizontal mattress sutures (black arrow)

period. On the second day, he experienced progressive dyspnea and conscious disturbance. The follow-up chest X-ray [Figure 1b] and contrast-enhanced CT scan [Figure 1c] of the chest revealed right-sided massive hemothorax with marked extravasation of contrast material. Immediate insertion of chest tube drained more than 1500 ml of blood. The patient was resuscitated with fluid and blood transfusion to stabilize his vital signs.

An emergent right posterolateral thoracotomy was done under the suspicion of inferior vena cava injury in a relatively stable hemodynamic condition after resuscitation. During the operation, the inferior vena cava and azygos vein were intact. The bleeding focus was a laceration wound with continuous oozing at the dome of right hemidiaphragm about 3 cm in length. No hepatic tissue or other visceral organs were seen from the thoracic side of the diaphragm and no evidence of other bleeding source. The laceration wound was repaired with nonabsorbable, interrupted horizontal mattress sutures [Figure 1d]. The postoperative course was uneventful, and the patient was discharged on the seventh postoperative day without complication.

DISCUSSION

Previous studies have reported that the incidence of delayed hemothorax in blunt chest trauma was ranged from 5% to 7.4%.^{3,4} In these studies, all cases who developed delayed hemothorax had at least one rib fracture on X-ray examination. Chest radiography has been reported the sensitivity to be as high as 70%.⁵ CT scan has become the priority in the current imaging

modality of hemodynamically-stable patients after blunt chest trauma in emergency condition. Helical CT has been reported to identify diaphragmatic injuries with a higher sensitivity and specificity compared to chest radiographs.^{4,6}

The diaphragmatic injury is uncommon in blunt chest injury and is usually associated with involvement of other thoracic and abdominal organs. Previous reports showed that the wearing of a seat belt during sudden deceleration may result in a dramatic increase in intra-abdominal pressure with consequent transmission to the diaphragm.⁷ Our presented patient sustained repetitive lateral impact force, and the mechanism of injury was thought to involve distortion of the thoracic and abdominal wall, resulting in ipsilateral diaphragmatic laceration and subsequent bleeding. A high degree of clinical suspicion and continued assessment of trauma victims is the only way to early detect such unusual clinical presentations. The best surgical intervention and incision are ultimately determined by the presence of other associated injuries. Under the initial impression of inferior vena cava injury, thoracotomy is more suitable for this case due to massive intrathoracic hemorrhage without the involvement of abdominal organs and contralateral chest injuries. With the advancement of surgical technique, video-assisted minithoracotomy for blunt diaphragmatic injury may be a feasible alternative for delayed hemothorax, especially in hemodynamically stable patients.⁸⁻¹⁰

Uniquely, our presented case demonstrated a delayed massive hemothorax who underwent successful surgical treatment in the absence of open wound or rib fractures. This injury is often missed at the time of the initial event because of low specificity and sensitivity of various imaging tools. The diagnosis of traumatic diaphragmatic injury should be considered in any patient who has sustained blunt trauma to the lower chest, and upper abdomen regions, watchful observation, and high index of suspicion are necessary.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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