
Case Report

Tension Hydropneumothorax Due to Delayed Colonic Strangulation from Traumatic Diaphragmatic Hernia: A Case Report and Literature Review

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Diaphragmatic injuries resulting from either blunt or penetrating trauma are relatively rare. The well-known mechanism is a sudden increase in intra-abdominal pressure, especially during vehicle collision, which tears a weak point on the diaphragm. Small diaphragmatic hernias are often not diagnosed until months or years later when the patients become symptomatic. We present a case of traumatic diaphragm hernia with bowel strangulation six years after a motorcycle accident. Relevant literature on this topic was also reviewed.

Key words: diaphragmatic hernia, trauma, diaphragmatic rupture, tension hydropneumothorax.

Introduction

Although timely surgical intervention can be provided for patients with early presentations of symptoms from acute traumatic rupture of the diaphragm,¹ delayed non-specific clinical manifestations of this potentially life-threatening condition may be easily overlooked. The diagnosis has been reported to be missed in about 7.2% of patients with multiple trauma.² Among all the complications associated with traumatic diaphragmatic rupture including liver and spleen herniation, gastrothorax, colothorax, gangrene of stomach, intestine, large bowel obstruction, and

fecopneumothorax that usually occur at a relatively early stage, tension hydropneumothorax may present as a late complication.²⁻⁵ Tension hydropneumothorax is one of the most critical scenarios in emergency department (ED) that required immediate medical attention. We described a patient with delayed tension hydropneumothorax complicated with colonic strangulation from a traumatic diaphragmatic hernia that was successfully treated surgically with antibiotic coverage. Literature search on the PubMed database was performed using the key words “traumatic diaphragmatic hernia”, “blunt abdominal trauma”, and “hydropneumothorax” between the year 1960 and September 2011.

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Case Report

A 46-year-old woman presented to our ED with complaints of shortness of breath, epigastric colicky pain, and severe constipation for one week. Her past medical history was unremarkable except for her involvement in a motorcycle accident six years ago. She denied any systemic diseases, recent history of trauma or surgical procedures. Due to progressive dyspnea, she visited a district hospital where chest radiograph (CXR) revealed massive left pleural effusions for which a pigtail catheter was inserted for symptomatic relief. She was then transferred to our hospital, a tertiary care center, because of her drowsiness and persistent respiratory distress. On arrival, she was afebrile with a body temperature of 36.4°C, an obvious tachycardia with a pulse rate of 116 beats per minute, a respiratory rate of 22 breaths per minute, blood pressure of 140/79 mmHg, oxygen saturation level of 88% at room air, and a Glasgow Coma Scale (GCS) of E2V2M5. Laboratory evaluation revealed a remarkably elevated white blood cell count of 27,300/ μ L with 93.9% neutrophils, Hb of 13.9 g/dL, serum creatinine of 1.1 mg/dL, alanine transaminase of 14 U/L, and a C-reactive protein of 391 ng/dL. Initial physical examination showed asymmetric respiratory pattern, decreased breath sounds and dullness on percussion over the left lung field and diffuse abdominal tenderness without peritoneal signs. After drainage of the left pleural effusion and adequate pain control, empirical antimicrobial therapy with intravenous ceftriaxone 2 g every 12 hours was initiated under the tentative diagnosis of left empyema. Pleural effusion analysis showed turbid appearance, low glucose, and white blood cell count of 480 per cubic milliliter with neutrophil predominance. Exudative pleural effusion was impressed. On the next day, physical examination of the chest demonstrated obvious high pitch bowel sound with rales in left lower



Fig. 1 Chest radiograph showing abnormal bowel gas accumulation over left lower lung field with tracheal deviation and gross shifting of mediastinum towards right side.

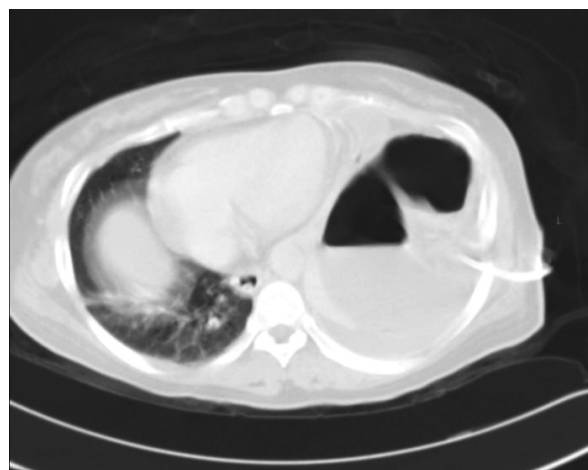


Fig. 2 Computed tomography of the chest on lung window revealing loops of bowel herniating through the disrupted left hemi-diaphragm.

lung field. The follow-up CXR showed suspicious abnormal bowel gas accumulation over left lung field with tracheal deviation and gross shifting of mediastinum towards the right side (Fig. 1).

Computed tomography (CT) of the chest confirmed the herniation of large bowel into the left pleural cavity (Fig. 2) through a disrupted diaphragm (Fig. 3).

Thoracic surgeon was consulted for left diaphragmatic hernia for which an emergent

laparotomy was performed. A large defect (8 cm × 2 cm) over the posterior portion of



Fig. 3 Coronal view of computed tomographic scan of the chest and abdomen showing disrupted diaphragm and herniated viscera (white arrow).



Fig. 4 A large defect (8 cm × 2 cm) noted over posterior portion of the dome of diaphragm during operation.

phrenic dome (Fig. 4) and colon incarceration with gangrenous change (15 cm) were noted intraoperatively.

Segmental colostomy with primary anastomosis and transabdominal primary repair of the diaphragmatic laceration were performed. After being treated with broad-spectrum antibiotics and tube thoracostomy drainage for 7 days in the intensive care unit, the patient had an uneventful recovery and was discharged 12 days after the procedure. She was complication-free with satisfactory quality of life on postoperative Day 40 follow-up at our outpatient clinic.

Discussion

Traumatic diaphragmatic rupture or hernia is a rare complication of abdominal injuries with an estimated occurrence of 5% among patients with blunt abdominal trauma because of motor vehicle accident.⁶ A sudden increase in intra-abdominal pressure tearing the weak point of diaphragm is the proposed mechanism. It can also result from penetrating injuries of the chest and abdomen.⁷ However, early diagnosis is usually difficult due to a wide range of clinical presentations. Grimes, in 1974,⁸ described the three phases of diaphragmatic rupture. In the initial phase, most patients with diaphragmatic rupture can only be diagnosed accidentally during surgical exploration for concomitant intra-abdominal injuries, while the majority of ruptured diaphragm without intra-abdominal lesions may be missed. During the delayed phase, on the other hand, visceral herniation is transient and the non-specific symptoms could be neglected. The third phase, also known as the obstruction phase, is associated with visceral incarceration with or without strangulation that leads to gangrenous change or rupture. The first case of small bowel perforation as a delayed presentation of traumatic diaphragmatic rupture was reported by Hahn et al. in

1990.⁴ Chaudhary et al. also reported a case of traumatic rupture of diaphragm presenting with flail chest in 2009.²

Tension hydropneumothorax is a rare but critical condition resulting from acute traumatic diaphragmatic rupture or delayed post-traumatic diaphragmatic hernia after severe blunt injury of the chest. Severe respiratory distress is the usual non-specific presentation, while air-fluid level, tracheal deviation, and gross shifting of the mediastinum on standing CXR are the tell-tale signs leading to the diagnosis. The horizontal fluid level is usually well-defined and extends across hemithorax. Literature search revealed nine cases of colon perforation resulting in tension fecopneumothorax between 1986 and 1997 when high resolution CT was unavailable.^{5,9} An acute tension diaphragmatic herniation leading to mediastinal shift and cardiac arrest has also been reported.¹⁰ These severe complications resulting from delayed diagnosis and treatment of diaphragm rupture can lead to high morbidity and mortality. A past history of abdominal or thoracic blunt or penetrating injury and bowel sounds auscultated over the thorax may be helpful in diagnosing post-traumatic diaphragmatic hernia. CXR with bowel loops displacement, elevation of the left diaphragmatic dome, mediastinal shift, and hydropneumothorax may prompt further imaging studies to confirm the diagnosis.² The sensitivity of CXR is 46% for left-sided ruptures and 17% for right-sided ruptures.¹¹ Barium studies are often used to exclude esophageal and gastric perforation. Focused abdominal sonography for trauma (FAST) can be extended above the diaphragm to observe diaphragmatic motions and to look for hemothorax.¹² CT of the chest with axial, sagittal, and coronal reconstruction increases the sensitivity to 73% and the specificity to 90%.¹¹ Immediate surgical intervention is the gold standard for treating delayed diaphragmatic rupture. Many successful experiences have been reported by reducing the herniated

intestines and primary repair of the opening of diaphragm by laparotomy, thoracotomy, laparoscopy, or thoracoscopy.

Conclusions

The diagnosis of diaphragmatic rupture can sometimes be missed during the acute phase when associated abdominal surgical condition is absent. It becomes obvious during the obstructive phase when visceral incarceration through the diaphragmatic defect is evident. When intestinal incarceration occurs with gangrenous change or perforation, the mortality rate can reach as high as 80%.¹³ Therefore, early diagnosis with appropriate surgical management is crucial in improving patient's survival. Emergency physicians should always suspect the diagnosis of diaphragmatic rupture on encountering patients with trauma history presenting with respiratory distress and gastrointestinal complaints.

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