Blunt Diaphragmatic Rupture: A Case Report and Review of the Literature

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We present a 19-year-old male motorcyclist slipped and bumped his back against the asphalt. He was presented to our emergency department with dramatically deteriorated vital signs. Chest x-ray and computed tomography (CT) showed left diaphragmatic rupture with intrathoracic herniation of stomach and spleen. Exploratory laparotomy was performed. Our article aims to remind the physical and radiological findings of the diaphragmatic rupture to emergency physicians.

Key words: diaphragmatic rupture, herniation, trauma

Introduction

Traumatic diaphragmatic rupture (DR) remains a diagnostic challenge especially in blunt thoracoabdominal trauma. The difficulties of immediately diagnosing traumatic diaphragmatic rupture are the most common causes of morbidity and mortality1. According to the literatures, the mortality rates are around 17% and 25-66% with acute and delayed diagnoses2,3. The major morbidity of the late presenting DR is generally associated with coexistent vascular and visceral injuries, such as acute cardiorespiratory compromise or intestinal infarction with perforation2-4. The associated vascular and visceral injuries including pneumohemothroaces and rib fracture, pelvic fracture, or spleen, liver and renal injuries usually determine the outcome in those diagnosed DR1,5.

Case Report

A 19-year-old male motorcyclist slipped and bumped his back against the asphalt. The patient was sent to our emergency department immediately. On arrival, his Glasgow Coma Scale was 15, respiration rate was 24 breaths/min, pulse rate was 90 beats/min, and blood pressure was 140/50mmHg. Physical examination revealed a decreased breathing sound over left lung, and contusions with an open wound, 8 cm in length, over left lumbar region. The chest X-ray showed left hemidiaphragm elevation and air fluid level within left hemithorax. (Fig. 1) The pelvic X-ray showed a complex left ilium fracture. Then, chest pain and respiratory distress (respiratory rate of 40 breaths/min and oxygen saturation of 90%) were noted two hours later. Computed tomography (CT) revealed intrathoracic herniation of stomach and spleen, in contact with posterioriorhacic wall. (Fig. 2) Urgent surgical
Fig. 1  Anteroposterior chest radiograph showed left hemidiaphragm elevation and air fluid level within left hemithorax (arrows)

Fig. 2  Computed tomography revealed intrathoracic herniation of stomach (arrows) and spleen (arrowhead), in contact with posterior thoracic wall {transverse (A) and sagittal (B) view}
exploration revealed, grade IV diaphragm injury with an 11.0 x 5.0 cm sized defect at the posterior part of left hemi-diaphragm accompanied with herniated stomach and spleen in left pleural cavity. Reposition of stomach and spleen, repair of diaphragm were administered. This patient made an uneventful recovery and discharged 2 weeks later.

Discussion

Frequency of traumatic DR is raising by increasing motor vehicle accidents in the present age. Motor vehicle collisions account for 90% of all diaphragmatic injuries from blunt trauma\(^{(5-7)}\). It is present in 1-6% of major thoracic injuries, and 3-8% of patients undergoing emergency celiotomy after trauma\(^{(2,5,8)}\). This injury affects predominantly males (male: female = 4:1) in the third decade of life\(^{(5)}\). It occurs on left side in 65-85% of patients, right side in 15-35% and bilaterally in 1-12%\(^{(1,9)}\). This is because of the protective effect of the liver, which beneath most of the right diaphragm, and there is an anatomic weak point in the left posteriorlateral diaphragm\(^{(10)}\). The defects caused by blunt trauma are usually about 10 to 15 cm. The abdominal viscera herniation could occur through these large defects, such as the stomach, spleen, colon, small intestine and liver may enter the chest\(^{(11,12)}\).

The most important factors in early and correct diagnosis of DR depend on a high index of suspicion and careful scrutiny of diagnostic studies. The commonly presented symptoms are dyspnea, chest pain, abdominal pain and vomiting\(^{(2)}\). On auscultation, a decrement of the respiratory sound. Bowel sound in the thorax may be found. Besides, cardiovascular insufficiency and respiratory dysfunction may occur.

There are various investigations for diagnosing DR. The radiography, fluoroscopy, abdominal sonography and computed tomography are accepted to perform easily and effectively in the emergency room\(^{(2)}\). The chest radiography usually is the first technique to perform with sensitivities of 46% for left sided ruptures and 17% for right-sides ruptures\(^{(12,13)}\). The radiological signs suggesting diaphragmatic disruption include abnormally elevated diaphragm, unclear diaphragmatic borders and abnormal gas pattern in the lung fields\(^{(1)}\).

In our case, the chest radiograph taken at emergency room revealed all the aforementioned radiographic signs. Besides, a hernia sac containing visceral gas was recognized in the left thorax. (Fig. 1) The CT performed after the chest plain film also revealed the traits of DR, such as diaphragm discontinuity, segmental nonrecognition of diaphragm, intrathoracic herniation of stomach and spleen, waist-like constriction of stomach (collar sign), thickening of the diaphragm (curled diaphragm sign), left 3\(^{rd}\) rib fracture and left hemothorax\(^{(2,8,14)}\). (Fig. 2)

The “gold standard” for diagnosis and treatment DR is intraoperative identification either with laparotomy or laparoscopy\(^{(15)}\). Immediate reduction of the herniated viscera and primary closure of the diaphragmatic defect is are the cornerstones of DR treatment\(^{(10)}\).

Conclusion

Traumatic diaphragmatic rupture is uncommon after blunt chest or abdominal trauma, difficult to diagnose clinically and easily missed on supine plain films. In modern time, helical CT offers higher sensitivity and specificity for diagnosis. Discreet survey and competent radiological study may reduce the misdiagnosis at ER.

References

創傷性橫膈膜破裂：容易誤診的傷害

邱毓惠۱,۲,۴  徐家揚۳,۴  顏鴻章۱,۴
甘睦舜۱,۴  黃俊一۱,۴

本病例是一名19歲男性，某日騎機車打滑而摔車，送至就診室時，生命徵象惡化。X光及電腦斷層顯示左側橫膈膜破裂併胃和脾臟疝氣，於是緊急行橫膈修補術。本文旨在表現橫膈破裂之理學及影像學特徵，藉以提醒就診醫師此一需緊急手術之病症。

關鍵詞：橫膈膜破裂，疝氣，外傷