

## Case Report

# Delayed presentation of traumatic rupture of the diaphragm

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## ABSTRACT

Diaphragmatic injuries occur frequently after penetrating rather than blunt trauma and account for 8% of all organ injuries from penetrating trauma. Motor vehicle accidents account for approximately 50% of blunt injuries, followed in frequency by falls from height. The mechanism of injury in these accidents is that the body quickly decelerates while the organs continue to move downward or forward at maximal velocity, tearing vessels and tissues from their points of attachment. In this paper we are presenting 3 cases of traumatic diaphragmatic rupture due to motor vehicle accidents and fall from height, in which the diagnosis was delayed. Patient one was initially diagnosed with hemorrhagic pleural fluid for investigation, patient 2 was diagnosed 4 months later and patient 3 presented 7 years after the initial trauma. All were successfully treated surgically once the diagnosis was established.

**Keywords:** Diaphragmatic injuries, delayed presentation, diagnosis, management.

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The earliest descriptions of traumatic diaphragmatic rupture are credited to the 16<sup>th</sup> century physician Sennertus and later to Ambrose Pare.<sup>1</sup> The diagnosis of traumatic diaphragmatic rupture and related complications by Bowditch, Riolfi appeared in the mid to late 19<sup>th</sup> century literature.<sup>2</sup> Motor vehicle accidents account for approximately 50% of blunt injuries,<sup>3</sup> followed in frequency by falls from height. The mechanism of injury in these accidents is that the body quickly decelerates while the organs continue to move downward or forward at maximal velocity, tearing vessels and tissues from their points of attachment.<sup>4</sup> Diaphragmatic rupture is an injury that is commonly missed or mis-diagnosed unless a high index of clinical suspicion is maintained.<sup>5</sup> It occurs in 1-6% of patients following major blunt abdominal trauma and in 3-7% of patients who have already undergone laparotomy for abdominal trauma.<sup>6</sup> The incidence of diaphragmatic injuries from penetrating trauma ranges from 10-80%.<sup>7</sup> The true incidence of diaphragmatic injuries is unknown, because some

may remain asymptomatic in particular, those of the right hemidiaphragm and are therefore never diagnosed. The left copula of the diaphragm is affected in 70-86% of cases, the right in 12-24% and 2% are bilateral.<sup>8</sup> Injury to the left copula is more frequent due to either the protective effect of the liver or because of underdiagnosis of right-sided injuries.<sup>9</sup> Late presentation of traumatic diaphragmatic hernia, particularly in the strangulation phase, is associated with greatly increased mortality.<sup>10</sup>

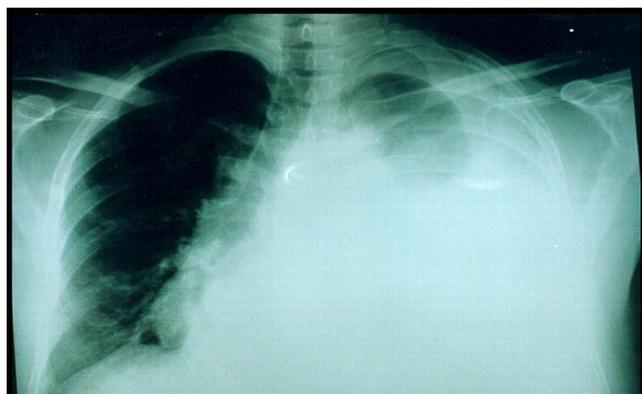
**Case Report. Patient 1.** A 56-year old male patient presented to the Emergency Room (ER) with a history of shortness of breath, abdominal pain, and vomiting of 4 days duration. There were no other gastrointestinal or chest symptoms. His past medical history revealed a history of blunt chest trauma associated with left lower rib fractures one year ago. On examination, the patient was hemodynamically stable, with blood pressure 130/85 mmHg, pulse rate 90 per minute and temperature 38.5°C. On

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auscultation, heart sounds were muffled and breath sounds were absent on the left side of the chest, which was dull on percussion. Abdominal examination revealed mild tenderness in both hypochondrial regions, and bowel sounds were sluggish. Apart from high white cell count (15.700/l), the rest of his blood picture, serum amylase and liver function tests were within normal. Chest x-ray on admission showed large left pleural effusion (Figure 1). Pleural tap was carried out which showed hemorrhagic pleural fluid. The patient was admitted under the care of the medical team as a case of hemorrhagic pleural effusion for investigation. During the next day, the patient underwent a computerized tomography scan of the chest which showed left pleural effusion and collapse of the left lung. There was also intrathoracic herniation of the stomach, old multiple rib fractures (8<sup>th</sup>-12<sup>th</sup>) and mediastinal shift to the right. In retrospect, lateral x-ray of the chest showed air fluid level. Barium meal study showed displaced esophagus and intrathoracic dilated, twisted stomach associated with total gastric outlet obstruction. These investigations confirmed the diagnosis of delayed traumatic rupture of the diaphragm with the possibility of gastric strangulation because of the presence of hemorrhagic pleural fluid. Fortunately, no chest tube was inserted at that stage. After appropriate preoperative preparation, the patient underwent exploratory laparotomy. An initial left paramedian incision was extended into a left thoraco-abdominal one. There was gangrene of the omentum and greater curve of the stomach, total collapse of the left lung and hemorrhagic pleural fluid. The gangrenous areas were resected and the stomach was repaired. The patient had uneventful postoperative period both in



**Figure 1** - Chest x-ray poster-anterior view showing large opacity of the left side.

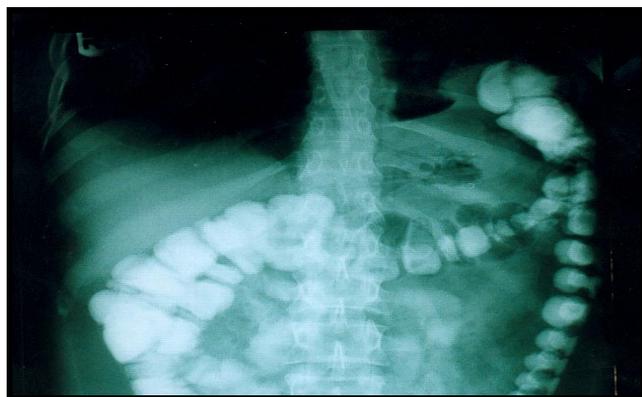


**Figure 2** - Chest x-ray lateral view showing intrathoracic bowel.

the intensive care unit and on the ward, and was discharged home 11 days later.

**Patient 2.** A 12-year old male patient was brought to the ER after a road traffic accident. He was a front seat passenger, not wearing a seat belt whose vehicle was involved in a head on collision accident. There was no history of loss of consciousness. On examination, the patient was conscious, hemodynamically stable with tenderness over the left lower ribs. However, his abdomen was soft and lax. Chest x-ray showed fracture of left 7<sup>th</sup> and 8<sup>th</sup> ribs, without hem or pneumo-thorax. White blood cell count was 15.000/l but hemoglobin and platelet count were normal. The patient was discharged home 3 days afterwards in a satisfactory condition, to re-appear 4 months later, with left flank pain. Systemic review was unremarkable. Both postero-anterior and lateral chest x-rays showed bowel shadow in the left side of the chest (Figure 2). The patient underwent laparotomy and repair of his left hemidiaphragm. He did well postoperatively and was discharged home 7 days later.

**Patient 3.** A 24-year old male patient, presented to the ER with repeated attacks of epigastric and left upper quadrant pain. The pain was radiating to the back and to the left shoulder and was associated with vomiting of one days duration. He gave a history of road traffic accident 7 years previously, when he was



**Figure 3** - Barium enema study showing herniation of the splenic flexure intrathoracic.

admitted as a case of blunt chest trauma and was discharged home 2 days later. On admission, he was afebrile and hemodynamically stable. On examination breath sounds were absent over the back of the left lower lobe. There was also tenderness in epigastric and left hypochondrial regions, but the bowel sounds were normal. Chest x-ray suggested intrathoracic herniation of the splenic flexure of the colon. This was confirmed by barium enema study (Figure 3) and computerized tomography scan. Through a left thoracotomy, the omentum and the splenic flexure were reduced and the diaphragm was repaired. He did well postoperatively and was discharged home 7 days later.

**Discussion.** The preoperative diagnosis of traumatic diaphragmatic rupture due to blunt trauma is difficult. The injury may be initially overlooked in the patient with multiple trauma because of other immediate life-threatening conditions. In addition, specific clinical signs are usually lacking, and results of initial radiologic studies may be normal or non-specific.<sup>11</sup> The early morbidity and mortality from blunt diaphragmatic rupture results from the severity of associated injuries.<sup>12</sup> Diaphragmatic rupture, whether the result of penetrating or blunt trauma, is unlikely to close spontaneously. The missed diaphragmatic rupture can result in herniation of abdominal contents into the chest because of the normal intra-abdominal to intrathoracic pressure gradient of 2-10 mmHg, reaching up to 100mmHg during Valsalva manoeuvre.<sup>13</sup> Progressive herniation produces respiratory embarrassment, chronic abdominal complaints and possible strangulation of abdominal viscera, contributing to the late morbidity and mortality of the missed injury.<sup>10</sup> The clinical diagnosis of traumatic diaphragmatic rupture with herniated viscera is difficult, and may be suggested by unilateral absence of breath sounds, respiratory

distress (as in patient one), audible bowel sounds in the lower thorax and or scaphoid abdomen.<sup>14</sup> In the absence of herniated organs, diagnostic tests for diaphragmatic injury including chest radiography, pneumoperitoneum, diagnostic peritoneal lavage, upper gastrointestinal tract contrast examination, ultrasound and CT scans lack both, sensitivity and specificity.<sup>13,15,16</sup> Magnetic Resonance (MR) scan and liver-spleen scintigraphy can also be used. The success of these imaging techniques depends largely on the demonstration of herniated abdominal contents rather than on direct visualization of the diaphragmatic tear. Chest x-ray is currently the best available test in the acute setting, although abnormalities on initial chest x-ray are often attributed to other thoracic rather than diaphragmatic injuries (as in patient 2). Gelman et al,<sup>16</sup> suggests that the sensitivity of initial chest radiography interpretation can be increased by heightened awareness of such injuries. On chest x-ray, diaphragmatic injury may often be mimicked or masked by concurrent atelectasis (as in patient 3), pulmonary contusions or lacerations, aspiration, pleural effusion (as in patient one), loculated pneumothorax near the base of the lung, phrenic nerve palsy or acute gastric distention<sup>17</sup>. Once the diagnosis is confirmed, the next question would be which approach to choose. The transabdominal approach is highly recommended in acute traumatic diaphragmatic rupture because of associated abdominal injuries. In chronic traumatic diaphragmatic rupture when adherence of the hernial contents within the chest may have occurred, many authors would prefer thoracotomy to reduce the hernia and repair the diaphragm at the same time (as in patient 3).<sup>18,19</sup> Transabdominal approach in left-sided chronic diaphragmatic hernia is convenient, since small or large bowel resection would be easier and safer (as in patient one). We prefer and recommend to approach each case separately and individually upon its own merits.

In conclusion, diaphragmatic rupture due to blunt trauma is difficult to diagnose and can sometimes be confused with chest pathology. To reduce the incidence of missed cases, diaphragmatic rupture should always be suspected on examining chest x-ray with obliteration, distortion or elevation of the hemidiaphragm, pleural effusion, air-fluid levels in the thorax, contralateral shift of the mediastinum and fractures of lower ribs or both.

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