

Diaphragmatic injury in trauma: an entity that may be unnoticed

Lesión diafragmática en trauma: una entidad que puede pasar desapercibida

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ABSTRACT

Background: Traumatic diaphragmatic injuries are rare, but their incidence has escalated due to the increase in traffic accidents and cases of urban violence. This pathology can be unnoticed under many circumstances, so a high level of suspicion is required to establish an early diagnosis and to prevent life-threatening complications. **Case presentation:** A 43-year-old male patient who is found in public street presenting a generally poor condition, with stigmata of trauma in the right frontotemporal region, deformity in the right humerus, multiple excoriations caused by friction, presumed to have suffered a traffic accident. The thorax was found with no deformities, no bone crepitus, and no signs of breathing difficulty. **Discussion and literature review:** Based on the injury mechanism, diaphragmatic trauma can be classified as blunt and penetrating trauma, attributing approximately two-thirds of cases to penetrating trauma (gunshots, stab wounds) and one-third to blunt trauma (car accident). The injured diaphragm presents a solution of continuity whose healing does not occur spontaneously and in the course of its evolution, migration from the abdominal organs to the pleural cavity may occur. The initial study in patients with suspected diaphragmatic lesion is usually a chest X-ray with diagnostic sensitivity in left-sided lesions ranging from 27%-62%, and for right-sided lesions, it is 17%-33%. Suggestive findings of diaphragmatic lesion include the collar sign (compression of the herniated organ at the point of the diaphragmatic lesion), bowel loops within the chest, arcing shadows in the left hemithorax, and the presence of the gastric chamber in the chest. Computed tomography is the study of choice in the polytraumatized patient for the evaluation of abdominal and thoracic trauma, due to its high sensitivity and specificity in the diagnosis of associated lesions.

Key words: Diaphragm. Wounds and Injuries. General Surgery. Case Reports.

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I. INTRODUCCIÓN

Traumatic diaphragmatic injuries are rare, but their incidence has escalated due to the increase in traffic accidents and cases of urban violence. According to the data presented by the National Trauma Data Bank of the United States, for the year 2012, 33% of cases of diaphragmatic injury were caused by closed trauma and 77% by penetrating trauma (1). This pathology can be overlooked on many occasions, so a high level of suspicion is required to establish an early diagnosis and to prevent life-threatening complications. This manuscript aims to present a case of trauma with an asymptomatic diaphragmatic lesion, highlighting the importance of clinical suspicion and the utility of imaging studies under these case scenarios. Written informed consent was obtained from the patient.

II. CASE REPORT

A 43-year-old male patient who is found in public street presenting a generally poor condition, with stigmata in the right frontotemporal region, deformity in the right humerus, multiple excoriations caused by friction, presumed to have suffered a traffic accident. A physical examination shows BP: 155/80 mmHg, HR: 78 beats per minute, BF: 20 breaths per minute, presenting alcohol breath, irregular frontal wound with significant tissue loss with 10 cm bone exposure, 8 cm left parietal wound, 5 cm right parietal wound with irregular edges, right humerus deformity, friction burns on the ventral face of the right forearm, and deep lacerations on both knees. The thorax was found with no deformities, no bone crepitus, and no signs of breathing difficulty. A thorax X-ray is solicited, showing normal-looking cardiomeastinal silhouettes, signs of elevation of the left hemidiaphragm, and bilateral parahilar interstitial infiltrates (Figure 1). A thorax tomography was requested, showing diaphragmatic herniation with gastric chamber content and part of the spleen on the left hemithorax, pulmonary parenchymal collapse and consolidation involving the upper segment of the lower left lobe (Figure 2).

Figure 1. Thorax X-ray exhibiting elevation of left hemidiaphragm and bilateral parahilar interstitial infiltrates.



Fuente: Elaboración propia.

Figure 2. Thorax tomography displaying diaphragmatic herniation with gastric chamber content and part of the spleen on the left hemithorax, collapse of pulmonary parenchyma, and consolidation involving the upper segment of the lower left lobe.



Fuente: Elaboración propia.

Based on the information above, a diagnosis of diaphragmatic rupture with herniation of abdominal cavity structures is established. The patient is transferred to surgery where a median, supra and infraumbilical laparotomy is performed, gastric chamber is found, a segment of the transverse colon and spleen protrude by default in the diaphragm, so the content is reduced with no evidence of ischemic involvement of the viscera, and correction of the diaphragm is performed.

III. DISCUSSION

The diaphragm is a dome-shaped muscle that separates the thoracic cavity from the abdominal cavity, with a central aponeurosis surrounded by radially arranged striated muscle, covered by parietal pleura and peritoneum except in the bare area of the liver in the right hemidiaphragm (2,3). Based on the injury mechanism, diaphragmatic trauma can be classified as blunt and penetrating trauma, attributing approximately two-thirds of cases to penetrating trauma (gunshots, stab wounds) and one-third to blunt trauma (car accident) (4,5). Lu et al (6) found

that the main etiologies underlying diaphragmatic trauma are car accidents (70%) and falls (22%). The lesion in the right hemidiaphragm occurred more frequently than in the left segment (56% vs 43% respectively). Thirty-two percent of rib arch fractures had 1 or 2 arcs, while 36 percent had 3 or more rib fractures (6).

The injured diaphragm presents a solution of continuity whose healing does not occur spontaneously and in the course of its evolution, migration from the abdominal organs to the pleural cavity may occur (7). Factors associated with the abolition of spontaneous scarring include the constant mobility of the diaphragmatic muscle during breathing, the difference in pleuro-peritoneal pressures that tend to keep muscle fibers apart, and finally, the organs protruding from the lesion because they keep the edges of the lesion apart. Organs such as the stomach, colon, omentum, and spleen are the most commonly herniated structures when there is a lesion in the left hemidiaphragm, while the liver protrudes in case of injury on the right side. Herniated structures are at risk of imprisonment and ischemia with possible subsequent perforation (8).

The initial study in patients with suspected diaphragmatic lesion is usually a chest X-ray with diagnostic sensitivity in left-sided lesions ranging from 27%-62%, and for right-sided lesions, it is 17%-33% (9). Suggestive findings of diaphragmatic lesion include the collar sign (compression of the herniated organ at the point of the diaphragmatic lesion), bowel loops within the chest, arcing shadows in the left hemithorax, and the presence of the gastric chamber in the chest (10,11). Computed tomography is the study of choice in the polytraumatized patient for the evaluation of abdominal and thoracic trauma, due to its high sensitivity and specificity in the diagnosis of associated lesions. Principally X-ray diaphragmatic injury signs are structurally similar to the CT scan signs, consisting of herniation of abdominal viscera to the chest cavity, discontinuity, or thickening of the diaphragm, and contact of the abdominal organs with the posterior wall of the chest cavity (12). Desser et al (13) showed that the multidetector CT scan is a useful tool in the detection of closed diaphragmatic trauma, presenting a sensitivity of 77% and specificity of 98% (13). Dreizin et al (14) reported a sensitivity range of 73-100% and specificity of 50-92%, for the diagnosis of penetrating diaphragmatic lesion using a 64-slice multidetector CT (14).

The treatment of choice consists of surgical reduction of the herniated organs if present and closure of the diaphragmatic defect. The surgical approach of choice is abdominal in acute diaphragmatic lesions since it allows the complete examination of the abdominal cavity and the reparation of the associated lesions. However, a thoracotomy is sometimes required to manage secondary lesions such as massive hemothorax, aerodigestive tract injury, and in case the diaphragm needs to be repaired through the chest (15). Lopez et al (16) reported in 124 patients with diaphragmatic lesions, that those with closed diaphragmatic trauma had a high injury severity index and severe concomitant lesions with a mortality rate of up to 17%.

Also comment that the increase in mortality in patients with closed diaphragmatic trauma was the result of the associated serious injuries, concluding that patients with closed trauma should be assessed for life-threatening serious injuries, especially in the presence of hemorrhagic shock (16).

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