

Left Post-Traumatic Diaphragmatic Rupture with Intra-Thoracic Abdominal Organs Dislocation: A Case Report

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Abstract

The diaphragm is a dome-shaped respiratory muscle located at the base of the chest. It originates from the greek word “diaphragma” meaning partition. The diaphragm separates the abdominal cavity from the thoracic cavity in humans and it is also the chief muscle of respiration. Diaphragmatic rupture is a medical condition caused by blunt or penetrating trauma, which often leads to herniation of abdominal viscera into the thoracic cavity. We present the case of a 39-year-old man who came complaining of left chest pain and abdominal pain radiating to his back, after getting involved in a motor vehicle accident. On physical examination, his left thoracic rib cage was not rising with each breath, while the right thoracic ribcage did expand with each breath. There was dullness on percussion of the left lung field, and he had diffuse abdominal tenderness on palpation [1]. A chest X-Ray was performed, and it revealed that there was displacement of abdominal visceral organs into the thoracic cavity, accompanied by a collapse of the left lung most likely secondary to blunt trauma. The patient underwent exploratory laparotomy with the aim of confirming the presumptive diagnosis and repairing his diaphragmatic rupture. Diaphragmatic ruptures can only be repaired via a surgical approach. The surgical approach could be via either a laparotomy or a thoracotomy. The decision to utilize either approaches leans/ is dependent on a composite of factors which include; are there any other intra-abdominal organ abnormalities, is this an acute diaphragmatic rupture or a latent diaphragmatic rupture, is the patient hemodynamically stable or unstable, and the experience of the surgeon.

Keywords: diaphragmatic rupture; diaphragmatic injury; diaphragmatic repair; blunt trauma, organs displacement

Introduction

Traumatic rupture of the diaphragm is a rare injury that occurs as a consequence of blunt and penetrating abdominal and thoracic trauma. This condition is associated with a high rate of morbidity and mortality, the latter at 14-21% [2,3] in initially diagnosed cases. Preoperative diagnosis continues to be a challenge in the evaluation of all multiple trauma patients and is achieved in less than 50% of cases [3,4]. Only 5% of the cases diagnosed in the acute phase are not associated with vitally threatening visceral lesions for the patient, such as the case we present; for early diagnosis, a high level of suspicion is necessary together with appropriate radiological examinations [5].

Case Presentation

A 39-year-old male was referred to our emergency department for persistent hypotension following blunt trauma during a motor vehicle accident which occurred a few hours prior to admission, he was in the car and wasn't wearing his security belt.

On primary physical examination, upper airways were free; SaO₂: 77% (Oxygen was given); RR: 36 cycles per minute; BP: 90/66 mmHg; HR: 92 bpm; Glasgow Coma Score: 15/15 with a reactive isochoric; Gly: 1.54 g/l (6.1 mmol/l) Body Temperature: 37.3°C. On secondary examination: We had a patient presenting with fatigue and diaphoresis. On the left side, chest movement and bronco-phony were reduced. During auscultation of the chest, bowel sounds were heard on the left side while moist crackles were heard on the right side. Heart sounds were normal with no murmurs or rubs, but on percussion, there was a mediastinal shift to the right. The abdominal cavity

was flat but painless. There was also a painful swelling of the left thigh but peripheral pulse was symmetrically felt on both sides. We concluded that the patient had a left diaphragmatic rupture associated with a Trochanteric fracture type A3.1.

Blood work up and imaging exams included CBC, Urea/Creatinine, comprehensive metabolic panel, PT/PTT, HIV test, Blood type, Chest X-ray (Figure 1), Left thigh X-ray (Figure 2).



Figure 1: Chest X-Ray showing diaphragmatic elevation with intra-thoracic abdominal organs.

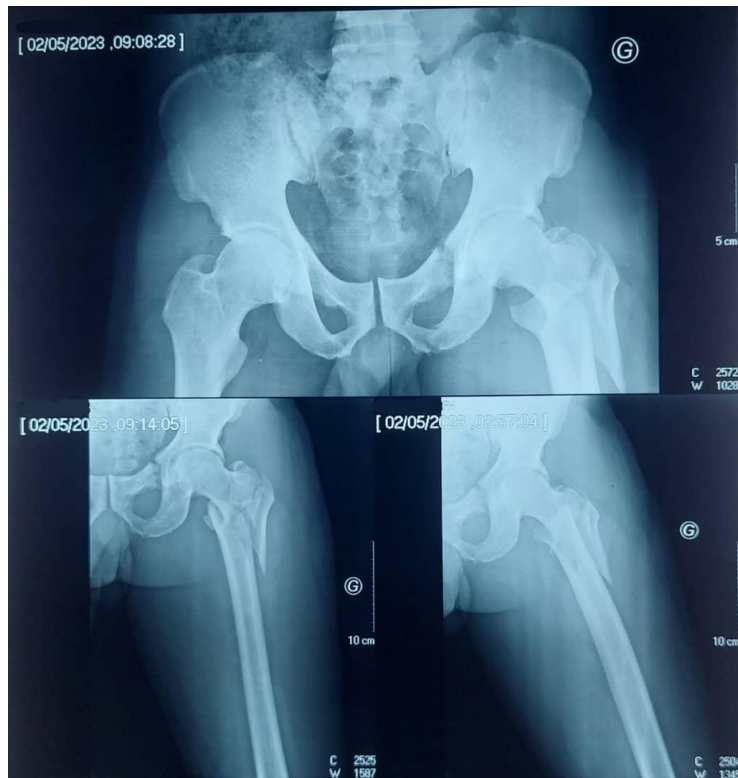


Figure 2: Pelvic and left thigh X-Ray showing left trochanteric fracture.

Therapeutic Intervention and outcome: The conducted Treatment included fluid therapy, pain management, and anticoagulation, broad spectrum antibiotic regimen. Before the trochanteric fracture was surgically fixed, the patient underwent an exploratory laparotomy for diaphragmatic rupture repair. During the surgery, findings included a diaphragmatic tear of about 15 cm (about 5.91 in) long on the left posterior diaphragm (Figure 3), with displacement of the left lobe of liver, the stomach, the spleen, the transverse colon and the bowels (both transverse colon and bowels seems like repetition to me) into the chest. They were returned back into the abdominal cavity. No ischemia of any abdominal organ was noted on gross examination. The

diaphragm was sutured with the help of non-absorbable sutures, this was made possible by the use of the ford-interlocking suture technique. (Figure 4), a chest tube was placed with left intrapleural water sealed drainage (WSD) and an intra-abdominal drain was placed below the diaphragm on the left side. Post-operative follow-up day 1 was marked by an improvement of the dyspnea and hypoxia with a pulse oximetry going initially from SpO₂: 77% to 87% on room air. We drained about 650 ml of serous fluid. At day 3, patient SpO₂ improved to 93%. 12 days after follow-up, trochanteric fracture repair was still to be done. Later, the patient became hypoxic again, dyspnea worsened, and the patient passed away 2 days later from massive post trochanteric fracture pulmonary embolism.

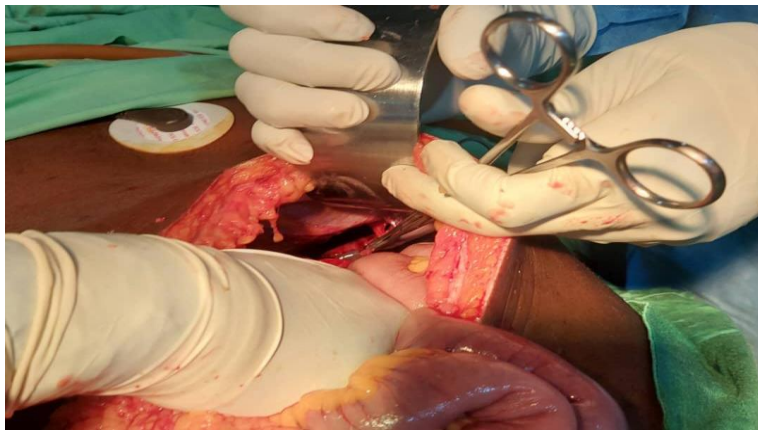


Figure 3: Left posterior diaphragmatic tear after abdominal organs were moved back to their original positions.



Figure 4: Image of the sutured diaphragm.

Discussion

Diaphragmatic rupture with abdominal organ herniation was first described by Sennertus[6, 7]. Diaphragmatic injury is a recognized consequence of high velocity blunt and penetrating trauma to the abdomen and chest rather than from a trivial fall [7]. These patients usually have multi-system injuries because of the large force required to rupture the diaphragm [8].

Blunt trauma to the abdomen increases the trans-diaphragmatic pressure gradient between the abdominal compartment and the thorax [9]. This causes shearing of a stretched membrane and avulsion of the diaphragm from its points of attachments due to sudden increase in intra-abdominal pressure, transmitted through the viscera [10]. Delay in presentation of a diaphragmatic hernia could be explained by various different hypotheses. Delayed rupture of a devitalized diaphragmatic muscle may occur several days after the initial injury [7]. This is best exemplified in the case report of bilateral diaphragmatic rupture [11], where the left diaphragmatic rupture was identified 24 hours after the motor vehicle accident and the right diaphragm, which was explored at the initial laparotomy, manifested 10 days later. Intra operative findings at the right thoracotomy revealed thin, inflamed diaphragm with necrotic muscle. The devitalized diaphragmatic muscle continues as a barrier until the inflammatory process weakens it [11]. Extubation precipitates this phenomenon b/c the intrathoracic pressure becomes negative [8]. However, the more likely explanation is a possible delayed detection assuming that the diaphragmatic defect did occur at the time of the injury. The effects of the defect become apparent when herniation occurs, and patient becomes unstable or starts to be more symptomatic.[8]. Traumatic diaphragmatic hernia is a frequently missed diagnosis and there is commonly a delay between trauma and diagnosis [12].

The surgical treatment usually performed includes hernia reduction, pleural drainage and repair of the diaphragmatic defect. This may be performed either through an open laparotomy or thoracotomy or through laparoscopy or thoracoscopy. The mortality from elective repair is low but the mortality from ischemic bowel secondary to strangulation may be as high as 80% [6].

A high clinical index of suspicion is needed to diagnose and effectively manage diaphragmatic rupture even with a remote history of high-velocity injury [13]. This is particularly true when other signs of severe trauma are present such as multiple rib fracture, lacerations of liver and spleen or a history of deceleration injury [14]. Ramdass et al [15] have emphasized that when tension pneumothorax and diaphragmatic hernia coexist, the contents of the visceral sac may be completely reduced, and the hernia is thus masked. The drainage of a considerable amount of serous fluid in addition to air, in the presence of tension pneumothorax, may suggest communication with the peritoneal cavity [15].

Conclusion

Diaphragmatic rupture should be suspected in all trauma patients, especially if they have blunt abdominal and thoracic trauma. High suspicion with detailed information about the mechanism of injury and the use of appropriate imaging modalities are the most important factors in establishing a prompt and correct diagnosis of diaphragmatic rupture. There are several differential diagnoses which fit the clinical picture of an adult patient with upper abdominal symptoms or chest x-ray depicting diaphragmatic elevation, with diaphragmatic rupture being one of them therefore it is necessary to ask whether there is a history of trauma, whether it occurred a few days ago or years ago. If no abnormalities are found on imaging, serial chest X-rays and high-quality CT scans in stable patients can be performed

to diagnose diaphragmatic rupture and other abnormalities in the thoracic and abdominal organs. Surgery is a mandatory action to repair the affected diaphragm. The management approach can be in the form of laparotomy, thoracotomy, or laparoscopy which is dependent on whether the rupture is acute or latent, the hemodynamic stability of the patient, and expertise of the attending surgeon. In most cases, a repaired diaphragmatic rupture has a good prognosis. The mortality rate is around 15-40% but the presence of any other visceral organ injury plays a major role in shaping/determining the prognosis [1].

References

1. Kusuma, Sindhu, Prasista "Traumatic Diaphragmatic Rupture with Visceral Herniation: A Case Report." e-Journal AMJ (Aesculapius Medical Journal) Vol. 3 No.1 | Pebruari | 2023 | Hal. 112 -116
2. Pastor Fuente EC, Pérez Serrano L, González García E, Mínguez García F, Gil Piedra F, Seco Gil JL, et al. Diaphragmatic rupture. Review of 38 cases. *Cir Esp*, 61 (1997), pp. 121-124
3. Mihos P, Potaris F, Gadikis J, Paraskevopulos J, Varvatsoulis P, Gougoutas B, et al. Traumatic rupture of the diaphragm: experience with 64 patients *Injury*, 34 (2003), p. 169-172
4. Shah R, Sabanathan S, Mearns AJ, Choudhury AK. Traumatic rupture of diaphragm. *Ann Thorac Surg*, 60 (1995), pp. 1444-1449
5. García-Navarro et al. Traumatic diaphragmatic rupture. *Cir Esp*. 2005 Feb;77(2):105-107
6. Christie DB, Chapman J, Wynne JL, Ashley DW: Delayed right-sided diaphragmatic rupture and chronic herniation of unusual abdominal contents. *Journal of the American College of Surgeons*. 2007, 204 (1): 176-180. 10.1016/j.jamcollsurg.2006.05.007
7. Goh BK, Wong AS, Tay KH, Hoe MN: Delayed presentation of a patient with a ruptured diaphragm complicated by gastric incarceration and perforation after apparently minor blunt trauma. *Canadian Journal of Emergency Medicine*. 2004, 6 (4): 277-280.
8. Meyers BF, McCabe CJ: Traumatic diaphragmatic hernia. Occult marker of serious injury. *Ann Surg*. 1993, 218 (6): 783-790.
9. Sangster G, Ventura VP, Carbo A, Gates T, Garayburu J, D'Agostino H: Diaphragmatic rupture: a frequently missed injury in blunt thoracoabdominal trauma patients. *Emerg Radiol*. 2007, 13 (5): 225-230. 10.1007/s10140-006-0548-y.
10. Walchalk LR, Stanfield SC: Delayed Presentation of Traumatic Diaphragmatic Rupture. *Journal of Emergency Medicine*. 2008
11. Sirbu H, Busch T, Spillner J, Schachtrupp A, Autschbach R: Late bilateral diaphragmatic rupture: challenging diagnostic and surgical repair. *Hernia*. 2005, 9 (1): 90-92. 10.1007/s10029-004-0243-4.
12. Faul JL: Diaphragmatic rupture presenting forty years after injury. *Injury*. 1998, 29 (6): 479-480. 10.1016/S0020-1383(98)00082-5.
13. Shah R, Sabanathan S, Mearns AJ, Choudhury AK: Traumatic Rupture of the Diaphragm. *Ann Thoracic Surgery*. 1995, 60 (5): 1444-1449. 10.1016/0003-4975(95)00629-Y
14. Disler DG, Deluca SA: Traumatic rupture of the diaphragm and herniation of the liver. *Am Fam Physician*. 1992, 46 (2): 453-456.
15. Ramdass M, Kamal S, Paice A, Andrews B: Traumatic diaphragmatic herniation presenting as delayed tension faecopneumothorax. *Emergency Medical Journal*. 2006, 23 (10): e54-10.1136/emj.2006.039438.



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