



Post-traumatic diaphragmatic hernia: A case report and literature review

¹Fatima Zohra Benbrahim, Department of Emergency Radiology, Ibn Sina University Hospital, Mohammed V University, Rabat, Morocco

²Majda Ankri, Department of Emergency Radiology, Ibn Sina University Hospital, Mohammed V University, Rabat, Morocco

³Omar El Aoufir, Department of Emergency Radiology, Ibn Sina University Hospital, Mohammed V University, Rabat, Morocco

⁴Fatima Zahra Laamrani, Department of Emergency Radiology, Ibn Sina University Hospital, Mohammed V University, Rabat, Morocco

⁵Laila Jroundi, Department of Emergency Radiology, Ibn Sina University Hospital, Mohammed V University, Rabat, Morocco

Corresponding Author: Fatima Zohra Benbrahim, Department of Emergency Radiology, Ibn Sina University Hospital, Mohammed V University, Rabat, Morocco

Citation this Article: Fatima Zohra Benbrahim, Majda Ankri, Omar El Aoufir, Fatima Zahra Laamrani, Laila Jroundi, “Post-traumatic diaphragmatic hernia: A case report and literature review ”, IJMSIR - January - 2024, Vol – 9, Issue - 1, P. No. 101 – 105.

Type of Publication: Case Report

Conflicts of Interest: Nil

Abstract

Post-traumatic diaphragmatic hernia is a rare pathology that occurs as a result of a high-energy accident, and whose diagnosis can easily be missed in the acute phase. If diagnosed late, it carries a high risk of morbidity and mortality. Diagnosis is easy based on imaging, treatment is surgical, and the prognosis depends above all on the associated lesions.

We report a rare case of a large left diaphragmatic rupture in a young victim of a high-velocity road accident, causing a herniation of several abdominal viscera into the thorax. The diagnosis was made in the acute phase. The clinician and radiologist must be able to think about the diagnosis and request a thoraco-

abdominal scan, and not confine themselves to the false negatives of standard radiography.

Keywords: Injury, Diaphragmatic Rupture, Diaphragmatic Hernia, CT scan.

Introduction

Although trauma is the most common cause of death in young people under 44 years of age, diaphragmatic injury remains uncommon, with an incidence varying between 0.8% and 8%; Usually it results from a high-speed impact or penetrating trauma to the thorax [1,2].

Detection of post-traumatic diaphragmatic rupture in the acute phase is a major diagnostic problem for both the radiologist and the surgeon, as there are often no obvious specific clinical signs. Clinical presentation may be acute, with respiratory distress, or insidious, with late

revelation associated to high morbidity and mortality. Left-sided hernias are much more common than right-sided hernias, and bilateral hernias are rarer. Thoracic CT scans are more effective in making the diagnosis. Surgical access may be achieved by laparotomy, thoracotomy [3] or minimal surgical access.

Case Report

A 53-year-old man with no previous medical history was the victim of a high-kinetic road traffic accident: a motorcyclist was struck by a car, with a thoraco-abdominal and cerebral impact. On admission to the emergency department, the clinical examination revealed an agitated, obtunded patient with a Glasgow score of 12/15, dyspnoeic with a saturation of 80% on room air, polypnoeic (respiratory rate of 34 cycles per minute). Auscultation revealed a decreased vesicular murmur in the left hemi-lung. Hemodynamically, the patient was tachycardic (with a heart rate of 115 beats/minute), with a blood pressure of 100/55 mmHg. The abdomen was soft and painless.

A chest X-ray was taken in the patient's bed and showed a watery opacity with subtotal atelectasis of the left hemi-lung (Fig.1).

The body scan performed as an emergency revealed a large left diaphragmatic rupture with intra-thoracic herniation of the stomach, spleen, tail of the pancreas, transverse colon and left colonic angle occupying 2/3 of the left lung cavity, causing atelectasis of the homolateral lung (Fig.2). There were also areas of contusion of the left upper lung, with homolateral pneumothorax and haemothorax, associated to splenic contusions with multiple fractures of the lumbar spine and ribs.

Emergency laparotomy revealed a large left diaphragmatic tear with intra-thoracic herniation of the abdominal viscera, permitting the repositioning of the herniated organs into the abdominal cavity, evacuation of

the haemothorax and closure of the diaphragmatic breach. The evolution was marked by clinical improvement with simple post-operative management.



Fig. 1: Chest X-ray showing a water-toned opacity with subtotal atelectasis of the left lung.

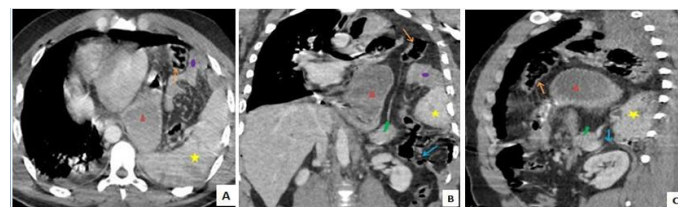


Fig. 2: Thoracoabdominal CT scan in axial (A), coronal (B) and sagittal (C) sections showing a large left diaphragmatic rupture (blue arrow) with herniation of the stomach (▲), left colon (orange arrow), tail of the pancreas (♣), and spleen (★) producing the "viscera-dependent" sign, associated with a homolateral haemothorax (●).

Discussion

Diaphragmatic rupture is an uncommon post-traumatic complication. Sennertus was the first to describe traumatic diaphragmatic hernia in 1541 [4,5]. It can result from both penetrating and closed trauma, and rarely occurs spontaneously during pregnancy. Penetrating trauma is the most frequent cause of diaphragmatic rupture, with an incidence varying between 10% and 15% [6], whereas closed trauma is only involved in 1 to 5% [7]. Gunshots and stabbings are

the most common causes of penetrating trauma, and road traffic accidents are the most common cause of closed trauma [8]. Our case presented with a diaphragmatic hernia secondary to a closed, high-kinetic trauma caused by a road traffic accident. The occurrence of diaphragmatic rupture by blunt trauma is a sign of significant crushing or deceleration transmitted through the abdominopelvic cavity, and is associated with a higher mortality rate than penetrating trauma [4, 9]. Hernia associated with diaphragmatic rupture can affect the cardiorespiratory system secondary to impaired diaphragmatic function, compression of the lung, mediastinal deviation and affect venous return to the heart [4]. Preoperative diagnosis is made in the acute phase in only half of cases, which may be explained by the presence of serious concomitant lesions in the foreground that are potentially life-threatening given the high energy of the trauma, or by the presence of a small lesion that is often asymptomatic, and it is often only secondarily that abdominal viscera are herniated into the thorax [10,11].

The symptoms will depend on the period of latency: in the acute phase, the symptoms are mainly dyspnoea, shoulder pain and epigastric pain, whereas in the case of late onset, the presentation is more atypical, with chest pain, abdominal pain, dyspnoea, tachypnoea, cough, gastro-oesophageal reflux and faeco-pneumothorax. These suggestive symptoms appear only when the herniated organ suffers, as in the case of strangulation of the small intestine occurring 20 years after diaphragmatic rupture [10], or gangrene of the chest wall with perforation [12]. These late presentations are responsible for an increase in the morbidity/mortality of the disease.

The diagnosis of diaphragmatic rupture and hernia is often missed on the chest X-ray alone, and it is the multi-beam CT scan with multi-planar reconstructions that

constitutes the gold standard for pre-operative diagnosis. Chest X-rays are the initial investigation to be performed for any suspected diaphragmatic injury in cases of major closed trauma. The diagnosis is made in 27-60% of cases of left-sided injury, but only in 17% of cases of right-sided injury [13]. Diagnosing a diaphragmatic hernia as a hydro-pneumothorax on radiography is not uncommon in the literature [14].

A study of 19 patients [1] reported a number of signs predictive of diaphragmatic rupture: diaphragmatic discontinuity (13 patients, 68%), diaphragmatic thickening (10 patients, 53%), neck sign (8 patients, 42%), herniation of the viscera (12 patients, 63%), dependent viscera sign (8 patients, 42%), segmental non-recognition of the diaphragm (1 patient, 5%), haemothorax and haemoperitoneum.

The left side of diaphragmatic hernia is the most common, given the resistance of the diaphragm on the right, which is usually protected by the large surface area of the liver [16], whereas bilateral lesions are the rarest [17,18]. On average, 74.1% of patients have a lesion on the left and 4% of patients have a bilateral lesion. Our case was a diaphragmatic hernia on the left. The most frequently herniated organ is the stomach, followed by the colon, omentum, small intestine, spleen and liver. If the stomach is herniated, the patient may present with regurgitation without abdominal distension; if the intestine is herniated the patient may present with intestinal obstruction, post prandial abdominal pain, nausea, vomiting and abdominal distension [19]. Our patient presented with a multivisceral herniation: stomach, spleen, tail of the pancreas, transverse colon and left colon. Diaphragmatic rupture is always associated with other lesions. The most frequent lesions are pulmonary (26.1%), hepatic (20.8%), splenic (37.3%) and, more rarely, abdominal wall lacerations. Gastric

lesions, intestinal lesions, fractures of the extremities [20], vertebral and calcaneal fractures are frequently described. Our patient presented with pulmonary contusions, splenic lacerations, costal and vertebral fractures, pneumothorax and haemothorax.

Treatment is exclusively surgical, and the approach varies depending on associated lesions: thoracotomy is performed in 38% of cases, laparotomy in 40%, or both in 20.6% of cases. For right-sided ruptures, a thoracic approach is preferable because of the interposition of the liver, whereas laparotomy is preferable for left-sided ruptures. At present, laparoscopy is increasingly used, enabling good exposure, correct replacement of the herniated organs, and repair of the rupture [21]. This technique is preferred because it reduces morbidity and mortality. Small lesions can be repaired with a simple suture (71.4% to 93.3%), while larger lesions require a prosthesis (8.7% to 28.6%) [22]. Biological prostheses are associated with good results and reduced risk of infection.

Despite advances in surgical techniques, mortality remains high, with an average mortality rate of 14%. Certain factors increase mortality in the acute phase, in particular the occurrence of haemorrhagic shock on arrival at the emergency department, with the need to transfuse more than 3 units, and the association with splenic lesions. Mortality is higher in cases of blunt trauma. Pulmonary complications and the location of the rupture had no effect on mortality or clinical course. Sepsis and multivisceral failure are late causes of death [11].

Conclusion

Post-traumatic diaphragmatic hernia is a rare entity whose diagnosis is a challenge for both the radiologist and the surgeon. Atypical clinical presentation and associated lesions, which are often in the foreground,

mean that the diagnosis is often made late, with a high morbidity and mortality rate. The diagnosis of diaphragmatic hernia should be raised in the event of any high-kinetic trauma with a thoraco-abdominal impact site, and a CT scan should be performed to confirm the diagnosis.

References

1. Fair KA, Gordon NT, Barbosa RR, Rowell SE, Watters JM, Schreiber MA. Traumatic diaphragmatic injury in the American College of Surgeons National Trauma Data Bank: a new examination of a rare diagnosis. *Am J Surg.* 2015;209(5):864-869.
2. Kumar S, Pol M, Mishra B, et al. Traumatic Diaphragmatic injury: a marker of serious injury challenging trauma surgeons. *Indian J Surg.* 2015;77(Suppl 2):666-669.
3. Simpson J, Lobo DN, Shah AB, Rowlands BJ. Traumatic diaphragmatic rupture: associated injuries and outcome. *Ann R Coll Surg Engl.* 2000;82(2):97-100
4. Shah R, Sabanathan S, Mearns AJ, et al. Traumatic rupture of diaphragm. *Ann Thorac Surg* 1995;60:1444-9.
5. Reber PU, Schmied B, Seiler CA, Baer HU, Patel AG, Büchler MW (1998) Missed diaphragmatic injuries and their long-term sequelae. *J Trauma* 44:183-188
6. Brandt ML, LuksFI, Spigland NA, et al. Diaphragmatic injury in children. *J Trauma* 1992; 32:298-301
7. Bryan F. Meyers, M.D.,* and Charles J. McCabe, M.D., F.A.C.S. Traumatic Diaphragmatic Hernia. 1993; Vol. 218(6), 783-790 ©
8. Aronoff RJ, Reynolds J, Thal ER. Evaluation of Diaphragmatic injuries. *Am J Surg* 1982;144:571-5.
9. Hanna WC, Ferri LE, Fata P, et al. The current status of traumatic diaphragmatic injury: lessons learned

- from 105 patients over 13 years. *Ann Thorac Surg* 2008;85:1044–8.
10. Beigi AA, Masoudpour H, Sehat S, Khademi EF. Prognostic factors and outcome of traumatic diaphragmatic rupture. *Ulus Travma Acil CerrahiDerg.* 2010;16(3):215-9
11. Düzgün AP, Ozmen MM, Saylam B, Co°kun F. Factors influencing mortality in traumatic ruptures of diaphragm. *Ulus Travma Acil CerrahiDerg.* 2008;14(2):132-8.
12. Hwang SW, Kim HY, Byun JH. Management of patients with traumatic rupture of the diaphragm. *Korean J Thorac Cardiovasc Surg.* 2011;44(5):348-54.
13. Shanmuganathan K, Mirvis SE (1999) Imaging diagnosis of nonaortic thoracic injury. *Radiol Clin N Am* 37:533–551
14. Zieren J, Enzweiler C, Muller JM (1999) Tube thoracostomy complicates unrecognized diaphragmatic rupture. *Thorac Cardiovasc Surg* 47:199–202.
15. Magu S, Agarwal S, Singla S. Computed Tomography in the Evaluation of Diaphragmatic Hernia following Blunt Trauma. *Indian J Surg.* 2012;74(4):288-93
16. Hofmann S, Kornmann M, Henne-Bruns D, Formentini A. Traumatic diaphragmatic ruptures: clinical presentation, diagnosis and surgical approach in adults. *GMS InterdiscipPlastReconstr Surg DGPW.* 2012;1:Doc02.
17. Smithers BM, O'Loughlin B, Strong RW. Diagnosis of ruptured diaphragm following blunt trauma: results from 85 cases. *Aust N Z J Surg.* 1991;61(10):737-741.
18. Mattila T, Ketonen P. Traumatic diaphragmatic hernia. Report of 50 cases. *Acta Chir Scand.* 1977;143(5):313-318
19. Nursal TZ, Ugurlu M, Kologlu M, Hamaloglu E. Traumatic diaphragmatic hernias: a report of 26 cases. *Hernia.* 2001;5(1):25-29
20. Ganie FA, Lone H, Lone GN, Wani ML, Ganie SA, Wani NU et al. Delayed presentation of traumatic diaphragmatic hernia: a diagnosis of suspicion with increased morbidity and mortality. *Trauma Mon.* 2013;18(1):12-6.
21. De Nadai TR, Lopes JC, Inaco Cirino CC, Godinho M, Rodrigues AJ, Scarpelini S. Diaphragmatic hernia repair more than four years after severe trauma: Four case reports. *Int J Surg Case Rep.* 2015;14:72-6.
22. Gao JM, Du DY, Li H, Liu CP, Liang SY, Xiao Q et al. Traumatic diaphragmatic rupture with combined thoracoabdominal injuries: Difference between penetrating and blunt injuries. *Chin J Traumatol.* 2015;18(1):21-6.