

Case Report

Right-sided Pericardio-Diaphragmatic Rupture with Complete Liver and Partial Heart Herniation after Blunt Trauma

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ABSTRACT

Rupture of the diaphragm and pericardium is an uncommon injury, most frequently caused by high velocity trauma. We present a rare case of right-sided pericardio-diaphragmatic rupture (PDR) with complete

herniation of the liver which prevented the complete herniation of the heart. Diagnostic pitfalls and possible mistakes in the treatment strategy are discussed.

KEY WORDS: cardiac herniation, liver herniation, traumatic diaphragmatic rupture

INTRODUCTION

Diaphragmatic rupture (DR) occurs in up to 5% of patients sustaining blunt trauma^[1,2]. Right-sided DR occurs even less frequently (24% of all patients with DR). The herniation of the liver (partial or total) is always present^[3]. Incidence of the isolated rupture of the pericardium is reported to be 0.08%^[4], 25% being on the right side (0.02%)^[4,5]. We report a case of the right-sided DR with complete herniation of the liver and omentum, accompanied with long right-sided pericardial rupture and intermittent heart herniation.

CASE HISTORY

A 39-year-old passenger was involved in a road accident. He presented to the local hospital with dyspnea and severe right-sided chest pain. Physical examination revealed a blood pressure (BP) of 80/30 mmHg, variable heart rate of 130-160 beats/min, according to his position, and no evidence of cardiac tamponade. He received intravenous fluids, oxygen and analgesics. Abdominal ultrasound did not reveal free fluid collection. Chest X-ray showed elevation of the right hemi-diaphragm with haziness (Fig. 1). Decision to place a chest tube was made and 800 ml of blood was drained. However the patient's condition worsened, he became hemodynamically unstable, and was transferred to the intensive care unit (ICU). Computed tomography (CT) showed complete herniation of the liver into the right hemi-

thorax (Fig. 2). Soon after, patient became more tachypneic and BP dropped to 60/30 mmHg. His heart rate was very variable – from 120-190 beats/min, depending on patient's position (worsening in the prone and improving in the left decubital position). He required intubation and a decision for emergency right thoracotomy was made.

A posterolateral thoracotomy through the 5th intercostal space revealed the whole liver occupying the right hemi-thorax, along with omentum and the chest tube lacerating the liver. After retracting the liver, rupture of the pericardium was seen, extending from superior vena cava to cardiophrenic angle (18 cm long), while the herniating liver was leaning on the heart, preventing it from complete herniation through this defect. Diaphragm was avulsed anteriorly from the chest wall and the rupture extended from anterior to the posterior insertion. Another rupture extended posteriorly from the pulmonary ligament to the costophrenic angle. Herniated liver and omentum were reduced and the diaphragm was reinserted anteriorly to the ribs and sternal periosteum. The tear was repaired using figure-of-eight 0-prolene sutures. The liver laceration was minimal and required only local compression and surgical to control bleeding. Pericardium was closed with 3/0-prolene sutures. The patient had an uneventful postoperative recovery, lung fully expanded and echocardiographic findings were normal.

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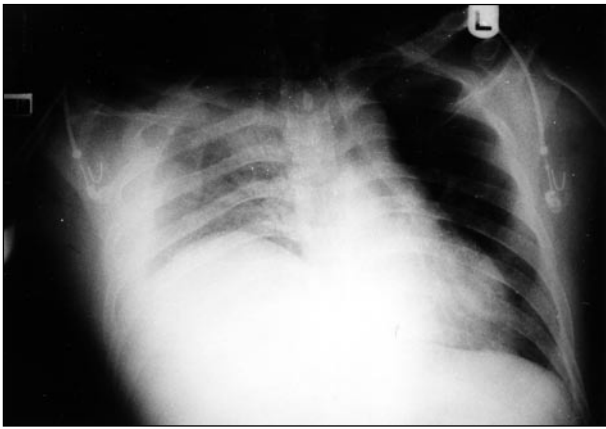


Fig. 1: Chest X-ray showing right hemi-diaphragm elevation with haziness of the right pleural space.

DISCUSSION

Traumatic diaphragmatic rupture (TDR) occurs rarely – in 0.8-5% of all traffic accident victims and 5% of all trauma patients requiring laparotomy^[3,6,7]. Involvement of the pericardium is even more rare - 0.2-0.7% of all patients having TDR^[4,8]. Right sided rupture of the diaphragm, occurs in 25-33% of all patients with this entity, giving a final incidence of 0.05-0.25%^[4,5]. Isolated rupture of the pericardium (without involvement of any cardiac chamber) is reported to be 0.08%^[4], 25% being on the right side (0.02%)^[4,5]. Only around 70 cases of pericardio-diaphragmatic rupture have been reported so far, 12 lesions of the diaphragm being located on the right side^[9], without details about the side of pericardium being involved. Moreover, we believe that this is the first reported case of the total liver herniation along with the partial herniation of the heart.

Associated injuries are present in over 90% of patients, which often dominates the clinical picture, making diagnosis of TDR difficult and of pericardial rupture even more so. Hence, correct diagnosis of pericardio-diaphragmatic injury is missed in up to 66% of multiple injured patients^[3,9]. Thus, in the absence of other injuries requiring laparotomy and/or thoracotomy, repeat evaluation is necessary to discern injury to the diaphragm or pericardium. Keeping in mind that overall survival after pericardial rupture may be as low as 24%, and for isolated pericardial rupture still only 67%^[4], this must be considered a very serious traumatic lesion, that requires prompt diagnosis and immediate treatment. If recognized, treatment is usually simple and effective.

We would like to focus on two details regarding this case. Profound hemodynamical instability of the patient, particularly in the prone position, with immediate rise in the heart rate up to 190 beats/min, and prompt improvement with the patient placed to the left side, should have raised a suspicion that pericardial lesion with the herniation of the heart

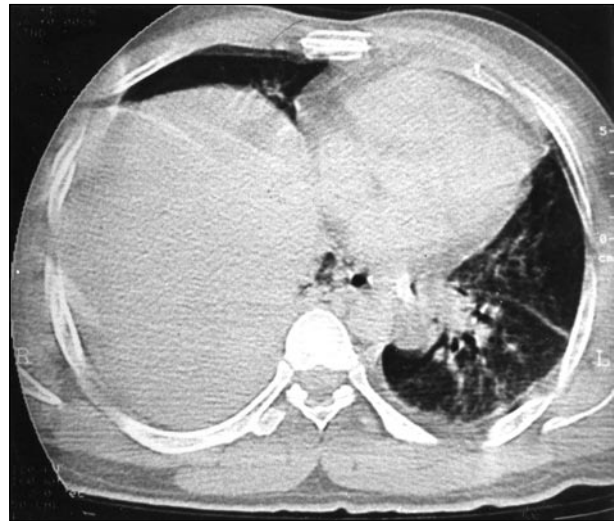


Fig. 2: CT-scan showing complete liver herniation into the right pleural space.

may be present. Secondly, after the placement of the chest tube, the patients' status worsened. Decision to drain the right pleural space was made solely based on the chest X-ray, which proved to be misleading. It has been shown that chest X-ray can be diagnostic or suggestive of diaphragmatic rupture in only 28-70% of cases^[1]. CT-scan clearly showed the herniation of the whole liver into the right pleural space. This diagnostic method may as well be insufficient, particularly for the right-sided ruptures (correct in only 50% of cases)^[10]. Without excluding the possibility of organ herniation through the ruptured diaphragm, a chest tube was placed under the wrong assumption that right-sided hemi-diaphragm elevation with haziness is only the collection of blood. Placement of the chest tube, luckily, resulted in only minor liver injury, but could have been fatal otherwise.

CONCLUSION

We have presented a very rare case of the right-sided pericardio-diaphragmatic rupture, with complete liver herniation and partial herniation of the heart (liver preventing the possibly lethal complete heart herniation). We stress the need for prompt and meticulous diagnosis of this type of lesion, using all available, but most efficient diagnostic tools according to the patients' actual status. Only then, an accurate treatment plan may be devised and favorable outcome expected.

REFERENCES

1. Athanassiadi K, Kalavrouziotis G, Athanassiou M, *et al*. Blunt diaphragmatic rupture. *Eur J Cardiothorac Surg* 1999; 15:469-474.
2. Rubikas R. Diaphragmatic injuries. *Eur J Cardiothorac Surg* 2001; 20:53-57.
3. Shah R, Sabanathan S, Mearns AJ, Choudhury AK.

- Traumatic rupture of diaphragm. *Ann Thorac Surg* 1995; 60:1444-1449.
4. Fulda G, Brathwaite CE, Rodriguez A, Turney SZ, Dunham CM, Cowley RA. Blunt traumatic rupture of the heart and pericardium: a 10-year experience (1979-1989). *J Trauma* 1991; 31:167-172.
 5. Mattila S, Sivola H, Katonen P. Traumatic rupture of the pericardium with luxation of the heart: case report and review of the literature. *J Thorac Cardiovasc Surg* 1975; 70:495.
 6. Gallan G, Penalver JC, Paris F, *et al*. Blunt chest injuries in 1696 patients. *Eur J Cardiothorac Surg* 1992; 6:284-287.
 7. Voeller GR, Reisser JR, Fabian TC, Kudsk K, Mangiante EC. Blunt diaphragm injuries: a five year experience. *Am Surg* 1990; 56:28-31.
 8. Sharma OP. Pericardio-diaphragmatic rupture: five new cases and literature review. *J Emerg Med* 1999; 17:963-968.
 9. Troop B, Myers RM, Agarwal N. Early recognition of diaphragmatic injuries from blunt trauma. *Ann Emerg Med* 1985; 14:97-101.
 10. Killeen KL, Mirvis SE, Shanmuganathan K. Helical CT of diaphragmatic rupture caused by blunt trauma. *Am J Roentgenol* 1999; 173:1611-1616.