

Right Diaphragmatic Rupture with Total Passage of the Liver into the Thorax: A Case Report

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Abstract

Case Report

Traumatic rupture of the right diaphragmatic dome with herniation of the liver into the thorax is a rare lesion. It is often part of a polytrauma, for which it is a criterion of severity. Whether early or late, it exposes the patient to cardiopulmonary complications due to compression. Right diaphragmatic rupture is difficult to diagnose. Its clinical signs are not very specific, and imaging can be misleading, as it visualizes the ascending organs but not the rupture itself. The thoracic approach is often preferred because of the difficulty of exposing the diaphragm in the presence of the liver. We report a case of right diaphragmatic rupture with total passage of the liver into the thorax following an MVA in a polytrauma patient.

Keywords: Diaphragmatic Rupture, Liver, organs, diaphragm, MVA.

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INTRODUCTION

Right diaphragmatic rupture is rare, occurring in around 5% to 20% of all diaphragmatic injuries [1]. The incidence of herniation of intra-abdominal organs into the pleural cavity is low, occurring in only about 19% of right ruptures [1]. The aim of this case report is to investigate the pathophysiological mechanisms, diagnostic and therapeutic modalities of this complication.

OBSERVATION

An 18-year-old patient with no notable pathological history was involved in a road traffic accident 10 years ago. Examination revealed a conscious patient with a Glasgow score of 15.

He reported recurrent episodes of acute dyspnea since the trauma. Physical examination revealed the absence of a right-sided vesicular murmur, with a long-standing right basi-thoracic abrasion. The patient was polypneic, SpO₂ was 92% on room air, and hemodynamics were good.

Radiographs taken during his hospitalization showed an opacity of the right pulmonary hemi chamber obliterating the homolateral diaphragmatic dome (Figure 1). Thoracic CT = On the thoracic plane, persistence of a thin layer of liquid pleural effusion on the right and a small intrathoracic ascension of the hepatic dome, the small intestine and part of the transverse colon without signs of strangulation (Figure 2 and Figure 3).

The patient was operated on through an abdominal approach by median supra-umbilical laparotomy with the help of thoracic surgeons, with the discovery of a total passage of the liver intrathoracically through a 15cm breach on the long axis of the right dome (Figure 4). The hepatic pedicle was stretched without detectable rupture. The procedure consisted of careful release of adhesions and reintegration of the liver intra-abdominally with suturing of the diaphragmatic wound with separate stitches with absorbable suture. The postoperative period in intensive care was mainly marked by a calm awakening after 48 hours of sedation allowing extubation without any particular respiratory incident and by deglobulization due to parietal bleeding but the patient responded well following the use of a transfusion with 2 CG.

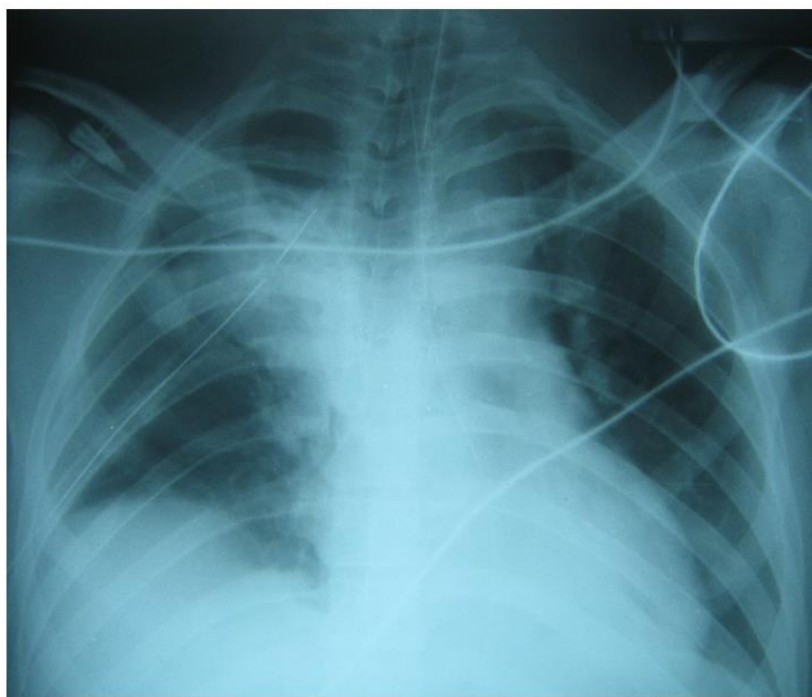


Figure 1
Radiographie thoracique montrant une opacité de l'hémi-champs pulmonaire droit effaçant la coupole diaphragmatique homolatérale, drain thoracique en place

Figure 1: Chest X-ray showing an opacity of the right pulmonary hemi-field effacing the diaphragmatic dome

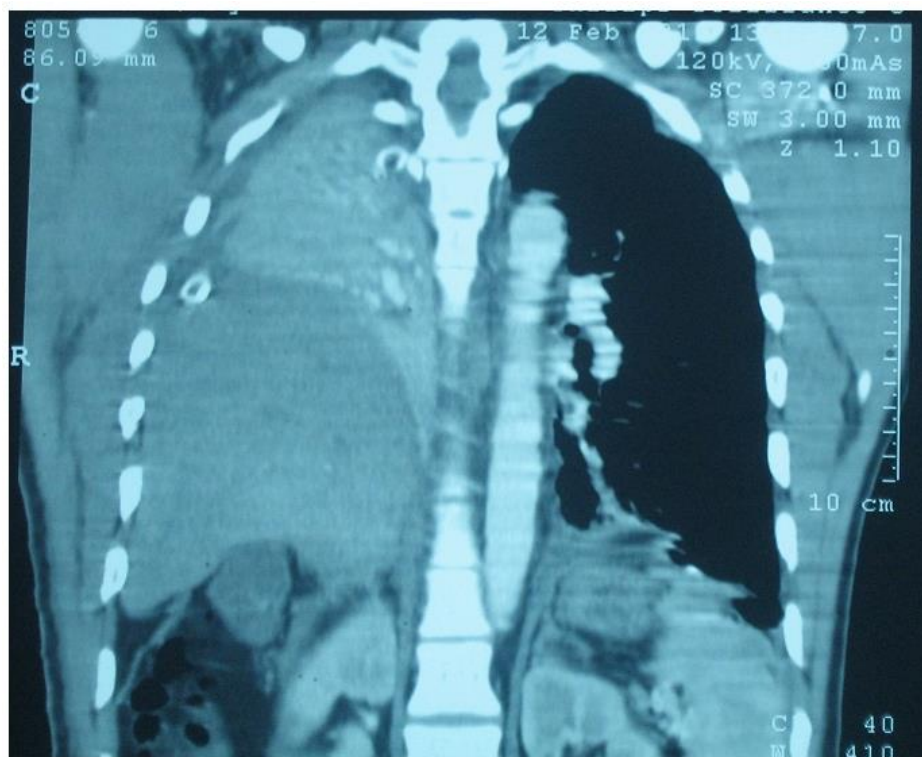


Figure 2
Scanner thoracique (coupe coronale) montrant le passage du foie dans l'hémi-thorax droit à la hauteur du tronc de l'artère pulmonaire avec un poumon droit collabé et non aéré

Figure 2: Chest CT scan (coronal section) showing passage of the liver into the right hemi-thorax at the level of the pulmonary artery trunk, with the right lung collapsed and not aerated

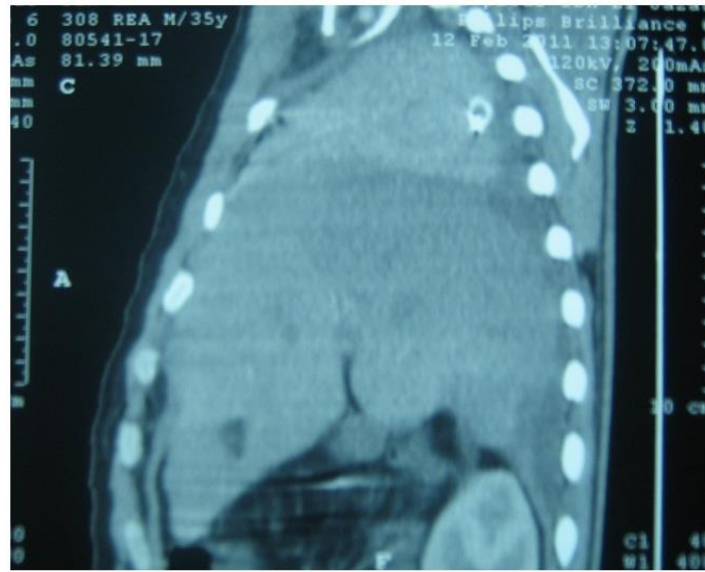


Figure 3

Scanner thoracique (coupe sagittale) montrant la rupture diaphragmatique droite avec passage du foie en intra-thoracique

Figure 3: Chest CT scan (sagittal section) showing right diaphragmatic rupture with intrathoracic passage of liver

Removal of both abdominal and thoracic drains successively on D4 and D7 postoperatively.

The patient was operated on via a median supra-umbilical laparotomy abdominal approach, with assistance from the thoracic surgeons. On exploration, the liver was found to have passed completely into the thoracic cavity through a 15cm gap in the long axis of the right dome (Figure 4). The hepatic pedicle was stretched with no detectable rupture. The operation consisted of careful release of adhesions and intra-abdominal

reintegration of the liver, with suture of the diaphragmatic wound using separate absorbable sutures. The post-operative period in the intensive care unit was essentially marked by a calm awakening after 48 hours of sedation, enabling extubation without any particular respiratory incident, and by deglobulation due to parietal bleeding. The patient responded well, however, following transfusion with 2 GCs.

Removal of both abdominal and thoracic drains successively at D4 and D7 postoperatively.

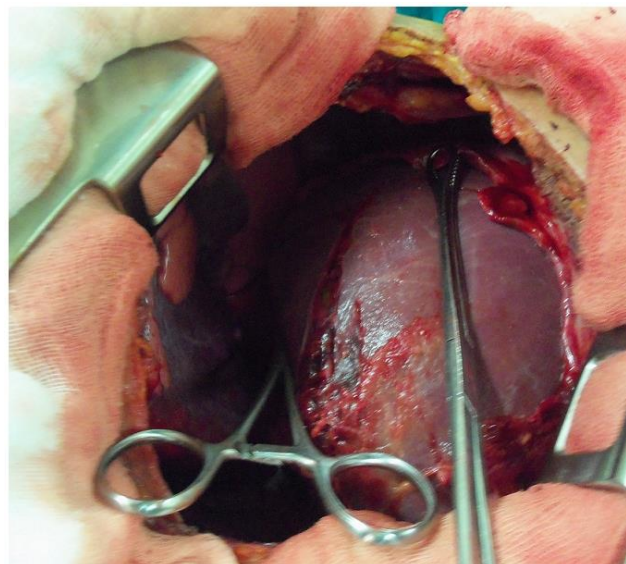


Figure 4

Vue per-opératoire par thoracotomie postéro-latérale droite montrant le passage total et isolé du foie en intra-thoracique à travers une brèche de 15cm sur le grand axe de la coupole droite

Figure 4: Intra-operative view showing total and isolated passage of the liver intrathoracically through a 15cm breach on the long axis of the right dome

DISCUSSION

Diaphragmatic rupture should always be suspected in cases of high-energy thoracic and/or abdominal trauma. The mechanism of rupture is a sudden rise in abdominal pressure, up to ten times normal, due to compressive forces [2]. Data from the most recent series show that ruptures of the right diaphragm can account for up to 35% of all diaphragmatic lesions [3]. This is generally explained by the protective role of the liver mass, and above all by the fact that right-sided ruptures are often associated with severe life-threatening injuries leading to death before hospital arrival [3].

The main risks of right diaphragmatic rupture are inadequate diaphragmatic function, pulmonary compression, mediastinal displacement and reduced venous return [4]. In fact, ascending organs in the thorax cause a paradoxical rise in central venous pressure, in the same way as a tamponade or a compressive pneumothorax.

Preoperative diagnosis of diaphragmatic rupture is difficult. 20-40% of ruptures are discovered during laparotomy for another lesion, as clinical signs are inconsistent and rarely specific [1]. Late intrathoracic passage of the liver is explained by abrupt changes in the trans-diaphragmatic pressure gradient during inspiratory efforts.

Diagnostic techniques include chest X-ray, ultrasound, computed tomography (CT) and magnetic resonance imaging (MRI). Chest X-rays have a relatively low sensitivity, but remain a screening tool with findings suggestive of the diagnosis only in 17 to 40% of patients [5]. Right rupture should be suspected in the presence of any marked elevation of the diaphragmatic dome with intrathoracic herniation of the abdominal viscera [6]. Extended abdominal ultrasonography above the diaphragm can be useful for diagnosis. It allows observation of absence of diaphragm movement, herniation of viscera, or planes of membrane rupture [6]. Helical CT is the preferred diagnostic modality due to its ability to acquire volumetric data and good quality coronal and sagittal reconstructions [7]. CT, in right diaphragmatic ruptures, has a sensitivity of 50-90% and a specificity of 90-100% [1, 8]. MRI, currently unusable in the emergency setting, offers information identical to that of helical CT, but with direct frontal and sagittal images and better spatial resolution [9].

In the acute phase, the abdominal approach is the reference approach. It allows exploration and treatment of the abdominal viscera.

In the late phase (after day 7) and in the absence of associated abdominal lesions, a right thoracotomy with intra-abdominal reintegration of the liver and repair using separate stitches with non-absorbable sutures appears to be the most common strategy for right diaphragmatic rupture. This allows any thoracic

adhesions to be controlled, and prosthetic devices to be fitted if required [10].

CONCLUSION

Traumatic rupture of the right diaphragm can result in significant morbidity and mortality. It is a rare condition, usually masked by multiple associated lesions, which can worsen the patient's condition. Patients who suffer violent thoracoabdominal trauma should have a high index of suspicion for diaphragmatic injury. The diagnosis can be made by thoracoabdominal CT scan. Surgical strategy at the time of diagnosis is variable and needs to be discussed on a case-by-case basis.

Ethical Aspects: The patient's consent was obtained for the use of his data for possible. We strictly respect anonymity and no image allows identification of the patient.

Authors' Contribution: All authors contributed to the elaboration of the work and approved the document.

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