

## Right Diaphragmatic Rupture Post Earthquake

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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 integrated into the context of multiple trauma, of which it is a criterion of severity. It exposes you, early or late, to cardiopulmonary complications due to compression. The diagnosis of a right diaphragmatic rupture is difficult to establish. Indeed, its clinical signs are not very specific and the imaging can be faulty because it visualizes the ascended organs but more difficultly the rupture itself. The thoracic approach is often preferred due to the difficulties of exposing the diaphragm in the presence of the liver. We report a case of a right diaphragmatic rupture with isolated and total intra-thoracic passage of the liver diagnosed on the fifth day of hospitalization in a multiple trauma patient.

**Keywords:** Diaphragm, trauma, thorax, Surgery, liver, earthquake, Morocco.

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## INTRODUCTION

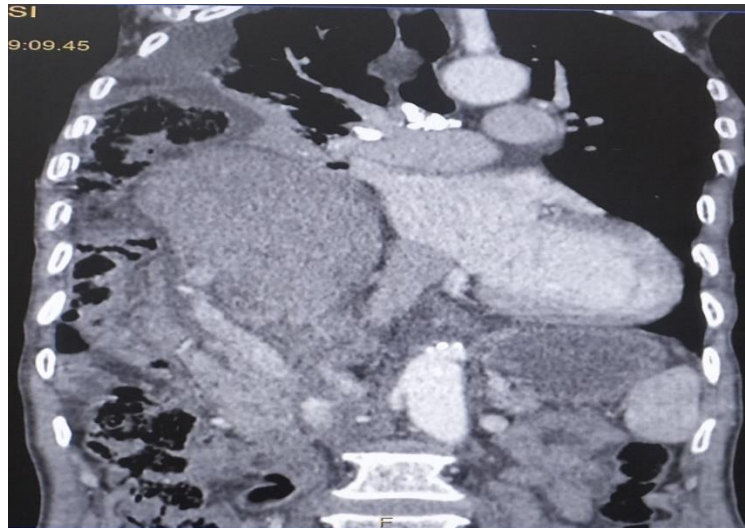
Right diaphragmatic rupture is rare and occurs in approximately 5% to 20% of all diaphragmatic injuries [1]. The incidence of herniation of intra-abdominal organs into the pleural cavity is low and is only observed in approximately 19% of right ruptures [1]. The objective of this clinical case is to study the physiopathological mechanisms, diagnostic and therapeutic modalities of this complication.

## OBSERVATION

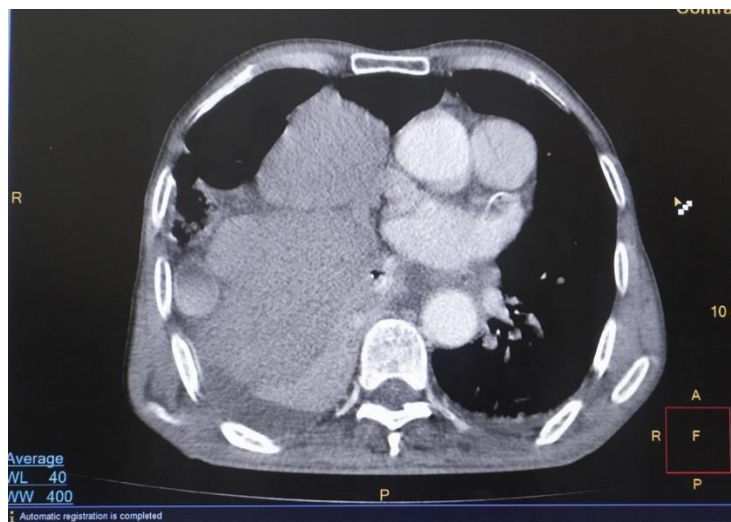
58-year-old patient with no notable pathological history was the victim of severe trauma following an earthquake at Haouz Morocco 09/08/2023. The examination found an agitated patient with a Glasgow Coma of 12. The physical examination revealed the absence of gallbladder murmur on the right side with right basi-thoracic abrasion. The patient was polypneic, SpO<sub>2</sub> was 92% on room air with good hemodynamic status. The patient was intubated, ventilated and sedated. The chest x-ray revealed a large right hemothorax which was drained.

CT thoraco abdomino pelvic: at the thoracic level right diaphragmatic rupture through a defect measuring 13 cm with intrathoracic ascension of the liver, the right transverse colon, the right colic angle and some grelic loop, slightly displaced fracture line of the posterior arches of the 6,8,10th left sides (Figure 1 & 2). At the abdominopelvic level, slightly displaced fracture line of the left iliac wing, comminuted fracture of the sacral side of the left sacroiliac joint, communitive fracture of the bilateral ilio-pubic and ischio-pubic fins.

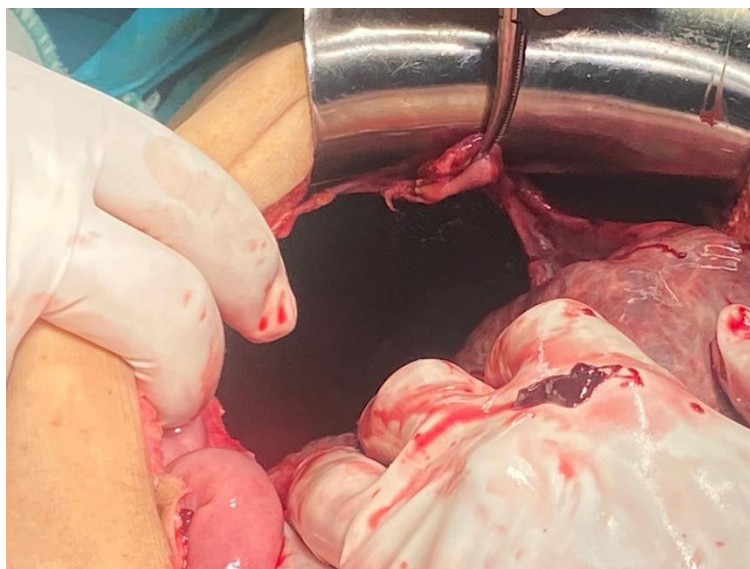
The patient was operated on via a right posterolateral thoracic approach, with the discovery of a total and isolated intra-thoracic passage of the liver through a 15cm breach on the long axis of the right dome (Figure 3). The hepatic pedicle was stretched without detectable rupture. The intervention consisted of careful release of adhesions and reintegration of the liver intra-abdominally with suturing of the diaphragmatic wound with separate stitches with non-absorbable suture (Figure 4).



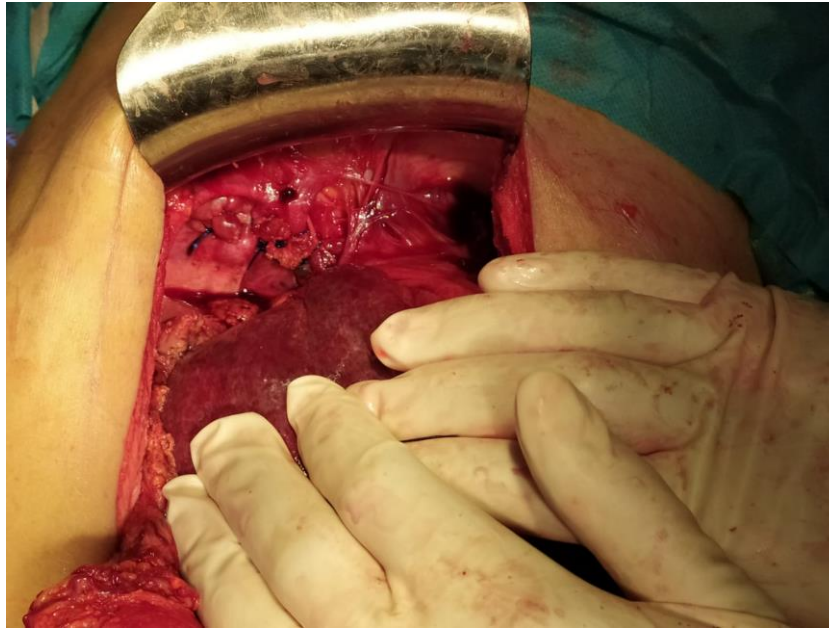
**Figure 1: Intrathoracic ascension of the liver, the right transverse colon, the right colic angle and some grelic loops**



**Figure 2: Right diaphragmatic rupture through a defect measuring 13**



**Figure 3: Large diaphragmatic defect with hepatic content**



**Figure 4: Diaphragmatic rupture with hepatic contents**

## DISCUSSION

A diaphragmatic rupture must systematically be considered during high-energy thoracic and/or abdominal trauma. The rupture mechanism consists of a sudden increase in abdominal pressure, up to ten times normal, following compressive forces [2]. Data from the most recent series show that ruptures of the right diaphragm can represent nearly 35% of all diaphragmatic injuries [3]. This is generally explained by the protective role of the liver mass, and especially the fact that right ruptures are often associated with serious vital injuries leading to death before arrival at the hospital [3].

The main risks of a right diaphragmatic rupture are represented by insufficient diaphragmatic function, pulmonary compression, displacement of the mediastinum and reduced venous return [4]. Indeed, the organs ascended in the thorax cause a paradoxical rise in central venous pressure, in the same way as a tamponade or a tension pneumothorax.

Preoperative diagnosis of diaphragmatic rupture is difficult. Twenty to 40% of ruptures are discovered during a laparotomy performed for another lesion because the clinical signs are inconsistent and rarely specific [1]. In our case, the diagnosis is only made after extubation of the patient and the appearance of unexplained respiratory distress. The late intra-thoracic passage of the liver is explained by the sudden modifications of the trans-diaphragmatic pressure gradient during inspiratory efforts.

Diagnostic means include chest x-ray, ultrasound, computed tomography (CT), magnetic resonance imaging (MRI). Chest radiographs have relatively low sensitivity, but remain a screening tool with results suggestive of the diagnosis only in 17 to 40%

of patients [5]. Rupture must be suspected in the face of any marked elevation of the diaphragmatic dome with an intra-thoracic herniation of the abdominal viscera [6]. Abdominal ultrasound extended above the diaphragm can be useful for diagnosis. It makes it possible to observe the absence of movements of the diaphragm, the herniation of the viscera, or the planes of membrane rupture [6]. Helical CT is the preferred diagnostic modality due to its ability to acquire volumetric and good quality data from coronal and sagittal reconstructions [7]. CT, in right diaphragmatic ruptures, has a sensitivity of 50 to 90% and a specificity of 90 to 100% [1, 8]. MRI, currently unusable in the emergency context, offers information identical to that of the helical scanner, but with direct frontal and sagittal images and better spatial resolution [9].

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

In the late phase (after the 7th day) and in the absence of associated abdominal lesions, it seems that a right thoracotomy with intra-abdominal reintegration of the liver and repair by separated non-resorbable suture stitches constitute the most effective strategy. more common in front of a right diaphragmatic rupture. It allows the control of possible thoracic adhesions and the installation of prosthetic material, if necessary [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 experience violent thoracoabdominal trauma should have a high index of suspicion for

diaphragmatic injury. The diagnosis can be made by a thoraco-abdominal CT scan. The surgical strategy, at the time of diagnosis, is variable and must be discussed on a case-by-case basis.

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