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Diaphragmatic Trauma About 14 Cases

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Abstract **Original Research Article**

***Introduction*:** Traumatic injury or rupture of the diaphragm is a rare consequence of thoracic and abdominal trauma. The aim of this study was to determine the epidemiological profile, the etiological mechanisms, the elements of the diagnosis, as well as the therapeutic modalities. ***Patients and Methods*:** This was a retrospective study carried out in the visceral surgery department of the Mohammed VI University Hospital of Marrakech over a period of 5 years between January 2017 and December 2022. Epidemiological parameters, clinical characteristics, treatment and prognosis of patients operated for diaphragm trauma were studied. ***Results*:** Fourteen patients with diaphragmatic trauma were operated on. Road accidents were the most representative etiological mechanism with 71% of cases (10 cases out of 14), including cars, motorcycles and pedestrians, For the remaining 4 cases, the rupture occurred following falls with basithoracic reception in 2 cases and following a thoraco-abdominal penetrating wound in 2 cases. The rupture involved the left diaphragmatic dome in eight cases, the right dome in four cases and it was bilateral in two patients. The diagnosis was confirmed in pre-operation by different imaging techniques, in particular computed tomography and in two cases by MRI. Essentially by the median route, treatment consisted of closure of the diaphragmatic breach by simple sutures and in some patients, the use of prosthetic equipment was indicated. ***Conclusion*:** Diaphragmatic ruptures occupy a special place in traumatology. They are evidence of severe trauma. They are sometimes unrecognized, either because of dominant associated lesions or because of the povertý of clinical signs and the low sensitivitý of common paraclinical examinations.

Keywords: Diaphragm rupture, Thoracoabdominal trauma, Surgery, Marrakech.

INTRODUCTION

The wound or traumatic rupture of the diaphragm is defined as a continuity solution of traumatic origin involving the three tunics of the diaphragm (pleura, muscle and peritoneum), and can deliver passage to the abdominal viscera attracted by the thoracic aspiration. It is a rare and underestimated consequence of trauma, occurring in about 1 to 7% of thoraco-abdominal contusions and 10 to 15% of penetrating wounds [1-3]. Because it is often associated with damage to other organs that can be life-threatening. Diaphragm injury is considered a marker of severe trauma [1-4]. Mortality can reach 30% in the presence of penetrating trauma and 15 to 45% in the case of blunt trauma [1]. In Western countries, ninety per cent of traumatic diaphragm ruptures are the result of traffic accidents, a fall from a high place, a crash by landslide [3]. In most African series, the trauma of the diaphragm is due to penetrating thoraco-abdominal wounds. These are caused by a knife or firearm depending on the degree of control over the movement of firearms in civilian practice [4, 5]. The aim of this study was to describe the epidemiological and clinical characteristics of diaphragmatic trauma in the visceral surgery department of the Mohammed VI University Hospital in Marrakech, Morocco.

PATIENTS AND METHODS

This was a retrospective study conducted in the visceral surgery department of the Mohammed VI University Hospital in Marrakech over a period of 5 years between January 2017 and December 2022. All patients operated for diaphragmatic trauma following open or closed abdominal and/or thoracic trauma were registered.

The studied parameters were incidence, sociodemographic parameters (age, sex), clinical (circumstances of occurrence, main signs, associated lesions), therapeutic (diaphragmatic suture, thoracic drainage, the trimming of associated lesions) and evolution after management.

RESULTS

During the study period, 280 cases of thoraco-abdominal contusions were managed, including 14 cases of diaphragm trauma, a frequency of 5%. These were 12 men and 2 women of average age 29.5 years (extreme 17 years and 70 years). Road accidents were the most representative etiological mechanism with 71% of cases (10 cases out of the 14), including cars, motorcycles and pedestrians, For the remaining 4 cases, the rupture occurred following falls with basithoracic reception in 2 cases and following a penetrating thoraco-abdominal wound in 2 cases.

The distribution of diaphragmatic ruptures on the two cupolas was as follows: eight of our patients presented a rupture of the left cupola (58%), four cases of straight ruptures (28%) and two cases of bilateral rupture, secondary to very violent trauma. (14%)

The mean lesion size was 4.1 3.4 centimetres. Associated thoracic or abdominal lesions were found in all cases.

In our series, diaphragmatic rupture has always been associated with an ascent of one or more abdominal organs in intra-thoracic, the most commonly found are:

Stomach (in 8 cases), colon, epiploon and spleen (2 cases) in left ruptures. In straight ruptures: liver (2 cases), colon, hail and epiploon (1cas).

The diagnosis of diaphragmatic rupture was diagnosed in the acute phase in eight of our patients (58%), with a delay ranging from a few hours to four days. Among these, a patient presented with a strangled organ necrosis after a period of three days. For other cases diagnosed in the late or latent phase, the average time is 10 years, with extremes ranging from five to twenty years.

For the eight cases of diaphragmatic rupture diagnosed in the acute phase, the associated lesions showed the severity and importance of the causal trauma. These were mainly lung and skeletal lesions: rib fractures (8 cases), pelvic and lower limb fractures (6 cases), pulmonary contusion (4 cases), hemothorax (4 cases), liver damage (4 cases), strangulation (colon 1 case).

In the acute phase, the context of violent thoraco-abdominal trauma and the systematic conduct of radiological examinations evoked the diagnosis of diaphragmatic rupture in four of our patients.

On the other hand, it was necessary to wait four days in the remaining four, before seeing appear in three patients: dyspnea associated with diffuse chest pain, while the last was admitted in a shock table, with severe abdominal and thoracic pain.

For cases discovered in the latent phase: dyspnea, chest pain, the presence of gastroesophageal reflux and cardiac symptomatology made of palpitations and precordialgies are the main clinical signs.

In all cases, the diagnosis was established preoperatively by different imaging techniques that contributed in different ways. The standard chest x-ray requested in all patients, was very evocative in six cases by showing a gastric tube coiled intra thoracic and hydro-aeric levels with colic haustrations (figure 1). It was even sufficient to retain the diagnosis of diaphragmatic rupture in the last patient. For the remaining cases, the signs were little specific (an elevation of the diaphragmatic dome or a mediastinal deviation). The CT scan requested in twelve patients confirmed the diagnosis of rupture and gave us an idea about the herniated organs and the presence of associated lesions (Figure 2).

MRI was requested in two cases before the presence of hepatic contusion foci at the CT without obvious diaphragmatic rupture. She confirmed the diagnosis of bilateral rupture. The ultrasound requested in only one case, (not for the purpose of finding the rupture), it highlighted a diaphragmatic vent without showing the breach.

Surgical management was initially performed abdominal in 10 patients, eight of whom were diagnosed immediately after the trauma. This allowed the exploration of intra-abdominal organs, which is essential in the context of violent contusion. The surgical procedure was a reduction of the herniated viscera and a suture of the diaphragmatic lesion in all these cases. This suture was performed by non-absorbable threads and a chest tube was placed on the affected side. The average drainage time was 4.2 2.6 days.

Prosthetic repair was necessary in 3 patients, since simple suturing was not possible due to the size of the orifice and the retraction of the edges of the breach not allowing sutures under excessive tension. The prostheses used are Mersuture plates (polyterephthalate of etylene) lined with Vicryl plate (polyglactin) and for once a PTFI plate.

The associated gestures are represented essentially by a segmental colectomy with colocolic anastomosis in a patient who has presented a necrosis of the strangled colon. The average length of hospitalization was 7.6 3.4 days, with extremes of 0 and 12 days.

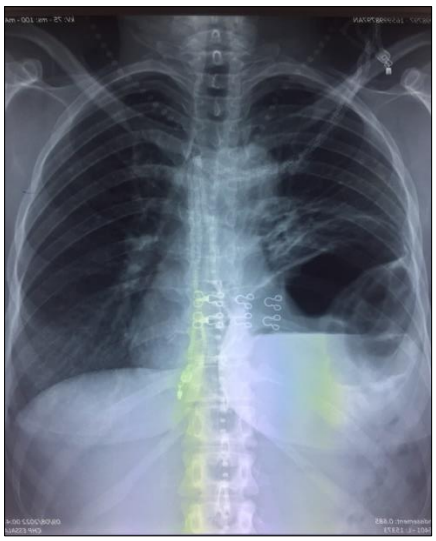

Figure 1: Chest X-ray. Presence of NHA in the right pleuro-pulmonary area

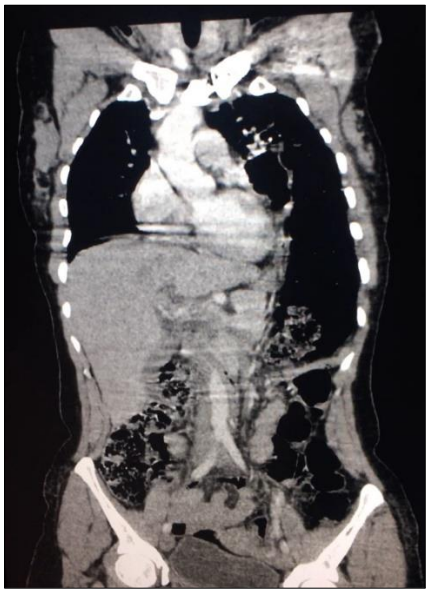

Figure 2: Thoraco-abdominal CT showing the ascension of intra-thoracic organs

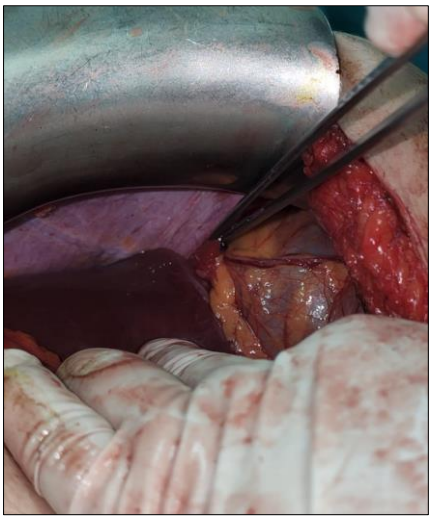

Figure 3: Diaphragm wound

The postoperative follow-up was marked by the death of a patient on the second day after surgery and the occurrence in a patient of bronchial congestion controlled by medical treatment and respiratory physiotherapy.

The other patients seen in consultation after several months have no complications. Clinical examination and standard chest x-rays showed no abnormalities.

DISCUSSION

The wound or rupture of the diaphragm is a rare cause of trauma. The frequency of 5% of this series is consistent with those of the literature which reports 0.5 to 8%. Diaphragmatic ruptures are found in most cases in polytrauma or trauma thoraco-abdominal [1-5]. They are linked to the violence of impact and trauma. In our series as elsewhere [2-5], diaphragm trauma is the prerogative of a young male population, with an average age of 29.5 years. The male predominance could be explained by the socio-professional activity making men more exposed than women [2-6].

Road accidents, falls and penetrating wounds are the main causes of rupture in our series with 71%, 14.5% and 14.5% respectively. This is also often the case in the developed countries series [1-7] where a predominance of closed injuries (traffic accidents, falls from a height) causing a traumatic rupture of the diaphragm is classically described [1-9]. However, it should be noted that during this decade, several studies report a predominance of penetrating thoraco-abdominal wounds in these countries. This could be explained by a higher incidence of interpersonal violence in study populations [4-10].

Our series was devoted to diaphragmatic ruptures secondary to thoraco-abdominal contusions. It is in this context that the early diagnosis of diaphragm trauma is the most difficult, either because of the isolated nature of diaphragmatic rupture, or because it is masked by predominant thoraco-pulmonary lesions, or finally because the treatment of abdominal lesions is non-operative. It is posed only in 30 to 50% of the wounded according to the literature [1-7].

In six patients in our series, chest x-rays show digestive elements in the pulmonary field. Preoperative diagnosis requires a thoraco-abdominal CT scan with specificity ranging from 56 to 87% [2-8]. 20 to 40% of diaphragm ruptures are discovered during laparotomy performed for another lesion [1-10].

The surgical indication is dictated by hemodynamic instability or peritonitis after brief resuscitation. Median laparotomy was the preferred route. This route provides good access to herniated organs and is often adopted [9-13]. Elsewhere, minimally invasive surgery with thoracoscopy is more frequently used in stable patients [13]. In our series the left localization is predominant, which corresponds to the data of the literature [1-7]. This left predominance is explained by the buffer effect that the liver causes in the right hemidiaphragm [1-10]. A study made on two series of autopsy (426 cases) objective a similar right/left distribution. Thus, this predominance would only reflect a pre-hospital excess mortality in the presence of a right lesion [3-9].

We note, as in the literature [4-11], an intra-thoracic migration especially of the viscera of the mesocosm stage: the stomach, the colon. Mesocosm organs can also be found in the thorax such as the small intestine. Our surgical strategy is based on visceral injuries and associated post traumatic syndromes. Surgical treatment must include a reduction phase of herniated viscera, as well as the trimming of associated lesions. Traumatic lesions of the diaphragm must be sutured to separate points with non-absorbable thread even if there is no scientific evidence of superiority over the continuous point, in order to avoid late release of sutures [1-10]. The postoperative follow-up was marked by the death of a patient on the second day after surgery and the occurrence in a patient of a bronchial congestion in our series. Mortality does not appear to be related to the severity of the diaphragmatic lesion, but especially to associated lesions [7-10].

We note the absence in this series of lesions of the mediastinum and heart, subject to heavy thoracic surgery.

CONCLUSION

Diaphragmatic ruptures are unique in trauma. They are evidence of severe trauma. They are sometimes unknown, either because of the dominant associated lesions or because of the poverty of clinical signs and the low sensitivity of routine paraclinical examinations.

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