Unrecognized diaphragm hernia: a review of 07 cases

Comment [MA1]: A case series! no place to submit the numbers in the main title!

Abstract:

Introduction: - Post-traumatic diaphragmatic hernia is defined as the passage of abdominal viscera into the thorax through a post-traumatic diaphragmatic breach. They are rare and may be unrecognized in 10-30% of cases at initial management.

Materials and methods: A retrospective descriptive study including all the patients taken in charge for post-traumatic neglected diaphragmatic lesions over two years between December 2018 and January 2021 within the service of visceral emergencies of the universitary hospital center Ibn Rochd of Casablanca. Our work aims to define the epidemiological, clinical, and therapeutic characteristics of patients admitted for post-traumatic diaphragmatic lesions.

Results: The average age of the patients was 30 years (range 18 to 43 years). All patients were male. They were due to a closed trauma in 11 patients (32%) and a penetrating trauma in 58%. The diagnosis was guided preoperatively by the different imaging techniques, in particular chest radiography and CT scan. Treatment was mainly by laparotomy and consisted of closure of the diaphragmatic breach by simple sutures.

Conclusion: - Post-traumatic diaphragmatic hernias can go unnoticed and can be life-threatening in case of associated lesions or complications.

Keywords: post-traumatic diaphragmatic hernia, surgery, emergency

Introduction

Comment [MA2]: The authors should re-organize this section for the journal readers to include a good background about the pathology supported by references, in this presentation, the audiences can not follow the subject as many of them may read the abstract or the background only!

The post traumatic diaphragmatic blunt rupture and/or diaphragmatic wound are uncommon and involve the three tunics of the diaphragm (pleura, muscle, and peritoneum), leading to the passage of abdominal viscera into the thoracic cavity(1). It occurs in 10 to 15% of penetrating wounds and 1 to 7% of thoraco abdominal blunt trauma (2), after a road accidents.

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Its diagnosis can quickly go unnoticed at the time of the initial management and can be revealed late by complications.

It is a surgical emergency, and the choice between the abdominal and thoracic approach is conditioned by the age of the rupture and the lesion assessment. This study aimed to describe the epidemiological,

clinical, therapeutic, and evolutionary characteristics of diaphragmatic trauma in the visceral emergency department of the Ibn Rochd University Hospital in Casablanca, Morocco.

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Materials and methods

Comment [MA5]: Please the authors should follow the journal guidelines to see how we can submit such methods sections! what sort of work up the authors were did! The study design! Funding, consent form, health authorities approval, consent form, any conflict(s) of interest, and what type of data analysis the authors used to evaluate the results.

It is a retrospective study of patients admitted for diaphragmatic rupture in the service of emergency of visceral surgery from December 2018 to January 2021 at Ibn Rochd University Hospital Center of Casablanca. We collected epidemiological, clinical, therapeutic, and evolution data from the patient's medical records using questionnary exploitation.

Results

In our study, all patients were male. The mean age was 30 years, with extremes from 18 to 43 years. The circumstances of the trauma were a public road accident (14%), a fall from a great height (28 %), and a thoracoabdominal stab wound (58%) **(Figure 1).** The mean time from trauma to symptoms was 2.5 years. This delay was variable, ranging from as early as four months of trauma to years later, even up to 4 years.

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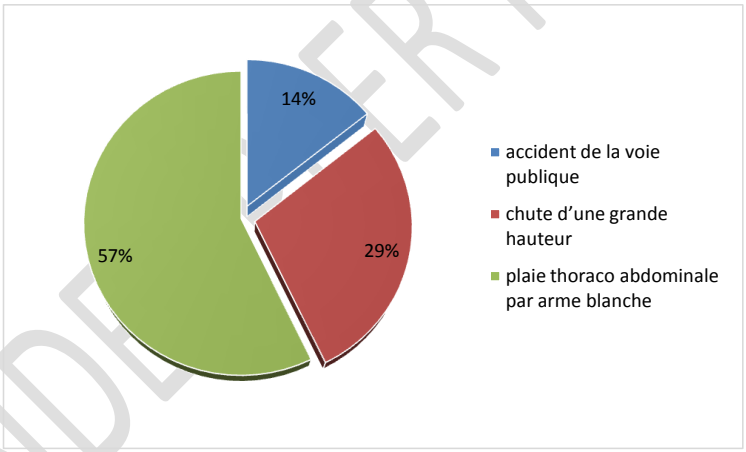

Figure 1: trauma Circumstances.

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Patients were admitted to the emergency department for chest pain with respiratory distress associated with low-abundance hematemesis in 1 patient (14%), an occlusive syndrome in 4 patients (58%), and basithoracic pain associated with vomiting in 2 patients (28%).

Comment [MA8]: The authors should be precise with the medical terminology !!

Clinical examination finds abdominal distension and tympanism in 4 patients (58%), displaced heart sounds with left basal intestinal sounds in 1 patient (14%).

Chest X ray was performed in 3 patients (42%). The left diaphragmatic ascension was found in two patients (28%), left basal fluid and air image with mediastinal backflow in one patient (14%). The Te abdomen radiography without opacification was performed in 4 patients (58%) and showed left basal thoracic air-fluid levels.

A thoracoabdominal CT scan was performed in all patients **(figure3)**. It showed ascension of abdominal viscera in the left hemithorax: the colon in five patients (70%), the colon and omentum in one patient (15%), and the stomach in one patient (15%). Pulmonary collapse and mediastinal reflux, observed in 4 patients (58%).

Emergency therapeutic management included resuscitation measures and surgical treatment. Median laparotomy was performed in all patients. The location of the diaphragmatic lesion was in the left diaphragmatic in all patients **(Figure4)**. There was no right or bilateral rupture. The size of the diaphragmatic ruptures varied between 5 and 10 cm in 2 patients (29%). They were smaller than 5 cm in 5 patients (71%)

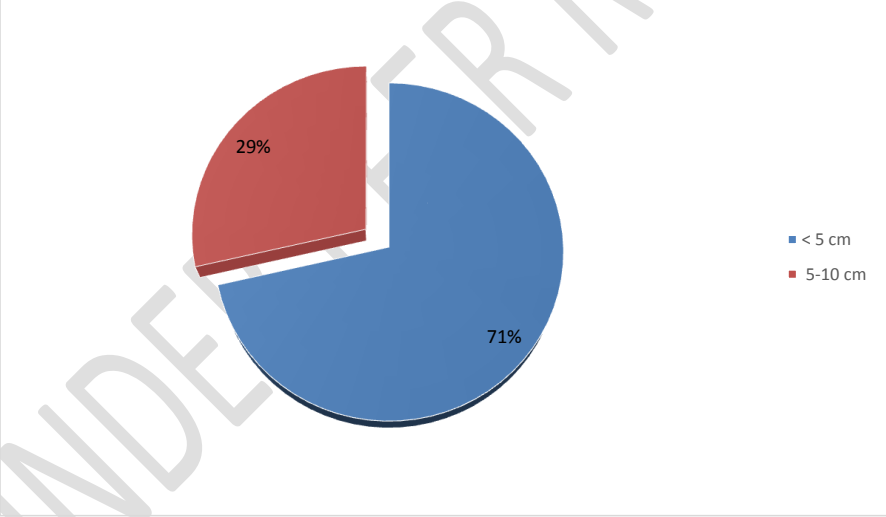

Figure 2: dimensions of the diaphragmatic breach

The herniated viscera were: colon and greater omentum in 2 Patients (29%), colon in 2 patients (29%), stomach with a colon in 1 patient (14%), colon, small intestine, and greater omentum in 1 patient (14%).

The emergency surgical procedure performed allowed:

- reduction of the herniated organs and treatment of the associated abdominal organ lesions: two patients presented necrosis of the transverse colon for which resection and a Bouilly Volkmann

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colostomy were performed, and one patient presented gastric necrosis due to an organo-axial volvulus through the diaphragmatic hernia, for which a total gastrectomy with esophagostomy and a Pezzer tube, feeding jejunostomy was performed **(figure 5).**

- Suture of the diaphragmatic lesions by separate stitches using a non-absorbable thread
- Thoracic drainage was performed in all patients and left within three days (3-7 days).
- Abdominal drainage was performed in all patients by a Redon tube in the left subphrenic for three days (3-6 days).

The postoperativewas good uneventfull for all patients except for one patient who died having undergone a total gastrectomy following hypoglycemia in the framework of a dumping syndrome.

The patients are regularly followed up in consultation with a clinical examination and thoracic radiography. The two patients who underwent a colonic resection and a Bouilly Volkmann colostomy benefited from a restoration of colonic continuity, which was simple to perform.

Figure 3: Abdominal scan: left diaphragmatic hernia with colonic involvement, collapsed left lower lobe and mediastinal elements in lateral control

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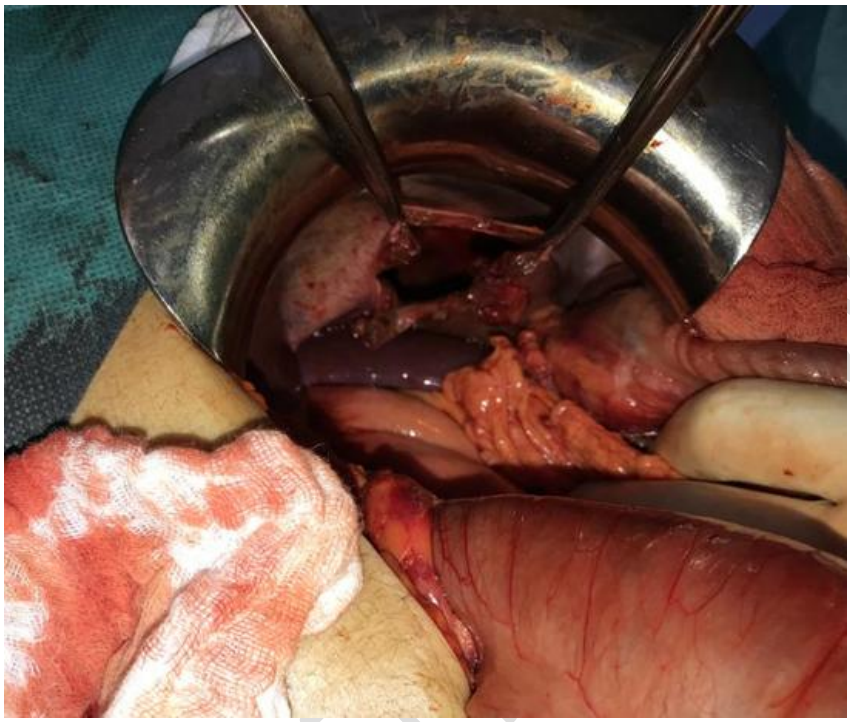

Figure 4 : peroperative image showing the diaphragmatic rupture

Figure 5: peroperative image after reduction of the herniated necrotic colon

Discussion

Post-traumatic diaphragmatic injury is a rare complication, involving direct communication between the positive pressure abdominal cavity and the negative pressure thoracic cavity, which allow herniation of abdominal viscera to the thorax (3). It occurs in 0.8% to 8% of all traumas (2). It is due to blunt and penetrating thoracoabdominal trauma with a prevalence of about 75% and 25%, respectively (2).

The diagnosis of the post-traumatic diaphragmatic injury is often difficult during the initial management of which it goes unnoticed in 10 to 30% (4). In the long term, the evolution is marked by the herniation of the abdominal organ in the thoracic cavity and complicated by strangulation and cardiorespiratory distress by compression (5).

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In diaphragm rupture, the mechanism is indirect (6). The severe hyperpressure of the abdominal cavity, which is maximal during a frontal impact, and the lower orifice of the thorax deformation, which is maximal during a lateral impact, favoring the shearing of the diaphragm at the level of its insertion zones, there are two possibilities that can explain it. The size of these lesions is generally significant. Unlike wounds, the diaphragm is injured directly in the path of the penetrating agent (knife or firearm), and the size of its lesions is small (6).

The majority of post-traumatic diaphragmatic hernias, approximately 80-90%, often occur in the left leaflet because it is congenitally weaker than the right leaflet and is not protected from the compressive forces transmitted by the trauma as is the right dome (5,7). Bilateral hernias are exceptional because they are most often due to more violent trauma. In our series, the diaphragmatic rupture was located at the level of the left dome in all patients.

Paraclinical examinations allow confirming the diagnosis (7). Chest X-ray is requested in the first intention to look for specific images of aeric or hydroaeric type almost always on the left, evocative images such as the elevation of the diaphragmatic dome-shaped, mediastinal compression on the side opposite to the rupture and sometimes can be expected. A Chest CT scan is necessary to confirm the diagnosis.

Surgical management is the emergency treatment performed in delayed and complicated diaphragmatic trauma (8). Laparotomy is the most commonly used approach in an emergency. It allows exploration, reduction, and treatment of the abdominal viscera(9,10) . In the case of the presence of intrathoracic adhesions of the ascended organs, the associated thoracic approach is justified. Different stitches must perform the repair of the diaphragmatic lesion with non-absorbable sitches to avoid later later recurrence (1,8). However, if a sizeable diaphragmatic tear is present, prosthetic plastic is necessary to reinforce the raphe(10,11) . Thoracic drainage on the side of the hernia is usual. The prognosis of traumatic diaphragm rupture is not dreadful in itself. The severity is related to the associated injuries, particularly in the presence of sepsis, multi-visceral failure, hemodynamic shock, severe head trauma, and respiratory distress. The presence of strangulation and gangrene worsens the prognosis; in our series, the evolution was good in all patients, except for one patient who died having undergone a total gastrectomy (8).

Conclusion:

Post-traumatic diaphragmatic hernias can go unnoticed and can be life-threatening in case of associated lesions or complications. The diagnosis must be systematically evoked in case of blunt

Comment [MA14]: The comments need more clarification to be understandable by the readers!

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thoracoabdominal trauma: chest X-ray, an essential element of the diagnosis. In case of doubt, a CT scan confirmed the diagnosis. Once diagnosed, the surgical treatment is suture by abdominal approach, often referred to as the thoracic approach with limited indications. A laparoscopy is a new approach, legitimate in stable trauma patients.

Comment [MA16]: For the authors, please what is the new ideas other than such comments to be claimed from the study, all these measures already highlighted in many texts or articles, we agree that the numbers of the patients not so that one to allow the more apprehensive conclusion, but here we should highlit some things validate the core of our effort to submit such workup!

Reference:

1. Kafih M, Boufettal R. Hernie diaphragmatique post-traumatique révélée par une pleurésie stercorale (à propos d'un cas). Rev Pneumol Clin. févr 2009;65(1):23‑6.
2. Nusretoğlu R, Dönder Y. Faecopneumothorax due to missing diaphragmatic hernia: a case report. J Med Case Reports. déc 2021;15(1):19.
3. Aissa A, Hassine A, Hajji H, Ben Salah K, Morjène A, Alouini R. Complication rare d'une hernie diaphragmatique gauche post-traumatique. Rev Pneumol Clin. déc 2013;69(6):331‑5.
4. Atoini F, Traibi A, Elkaoui H, Elouieriachi F, Elhammoumi M, Sair K, et al. Les lésions diaphragmatiques post-traumatiques droites méconnues : une revue de six cas. Rev Pneumol Clin. juin 2012;68(3):185‑93.
5. Dorgam Maués CA, de Vasconcelos ELC, da Silva Galvão R, Rios Rodriguez JE, Bastos Voronaya AL, de Castro GL. Diaphragmatic herniation after 3 years of penetrating trauma managed through laparotomy: A case report. Int J Surg Case Rep. févr 2021;79:58‑61.
6. Nistor, C. E., Tsui, S., Kırali, K., Ciuche, A., Aresu, G., & Kocher, G. J. (Eds.). (2020). *Thoracic Surgery: Cervical, Thoracic and Abdominal Approaches*. Springer Nature.
7. Lu J, Wang B, Che X, Li X, Qiu G, He S, et al. Delayed traumatic diaphragmatic hernia: A case-series report and literature review. Medicine (Baltimore). août 2016;95(32):e4362.
8. Testini M, Girardi A, Isernia RM, De Palma A, Catalano G, Pezzolla A, et al. Emergency surgery due to diaphragmatic hernia: case series and review. World J Emerg Surg. déc 2017;12(1):23.
9. Gu P, Lu Y, Li X, Lin X. Acute and chronic traumatic diaphragmatic hernia: 10 years' experience. Maerz LL, éditeur. PLOS ONE. 12 déc 2019;14(12):e0226364.
10. COSTA, Filipa Campos, CARDOSO, Vasco, MONTEIRO, Ana Maria, *et al.* Laparoscopic Repair of an Acute Traumatic Diaphragmatic Hernia: Clinical Case. *Cureus*, 2020, vol. 12, no 10.
11. da Costa KG, da Silva RTS, de Melo MS, Pereira JTS, Rodriguez JER, de Souza RCA, et al. Delayed diaphragmatic hernia after open trauma with unusual content: Case report. Int J Surg Case Rep. 2019;64:50‑3.