

# Unrecognized diaphragm hernia

## **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 university 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**

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). Diaphragmatic rupture arises in 10-15% with penetrating trauma and in 1 - 7% of blunt trauma to the lower chest (2). Its diagnosis can quickly go unnoticed at the time of the initial management and can be revealed late by complications such as herniation and strangulation of intraabdominal organs. In contrast, the diaphragmatic injury can be diagnosed at laparotomy in the presence of simultaneous organ injury (3). 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.

32 The aim of this study was to describe the epidemiological, clinical, therapeutic, and evolutionary  
33 characteristics of diaphragmatic trauma.

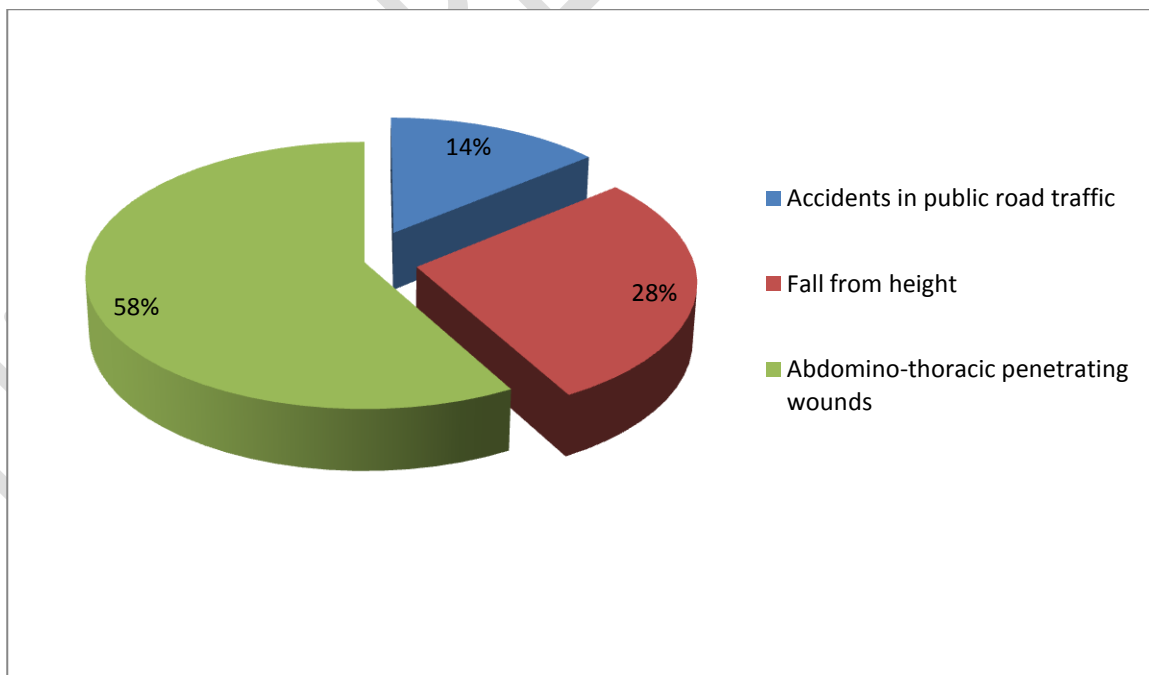
## 34 MATERIALS AND METHODS

35 This retrospective study was carried out on seven patients who had delayed presentation and  
36 diagnosis for diaphragmatic hernia managed in the visceral emergency department of the Ibn Rochd  
37 University Hospital in Casablanca, Morocco from December 2018 to January 2021 after approval from  
38 Institutional Ethical Committee.

39 We reviewed and examined all the records of the patients, to do age, gender, mechanism of injury,  
40 clinical presentation, time to diagnosis, diagnostic methods, localization of rupture, associated injuries,  
41 surgical approach and procedure, hospital stay, postoperative morbidity and mortality using data sheet  
42 pre and post-surgery. All patients and investigators were blinded through the whole duration of the  
43 study.

## 44 RESULTS

45  
46 The study identified 07 male patients ranging in age from 18 to 43 years (mean 30 years). The  
47 mechanism of the trauma were accidents in public road traffic (14%), a fall from height (28%), and  
48 abdomino-thoracic penetrating wounds (58%) (Figure 1). The mean time from trauma to symptoms  
49 was 2.5 years. This delay was variable, ranging from as early as four months of trauma to years later,  
50 even up to 4 years.



52  
53 **Figure 1:** Pie chart displaying the mechanism of trauma of all patients

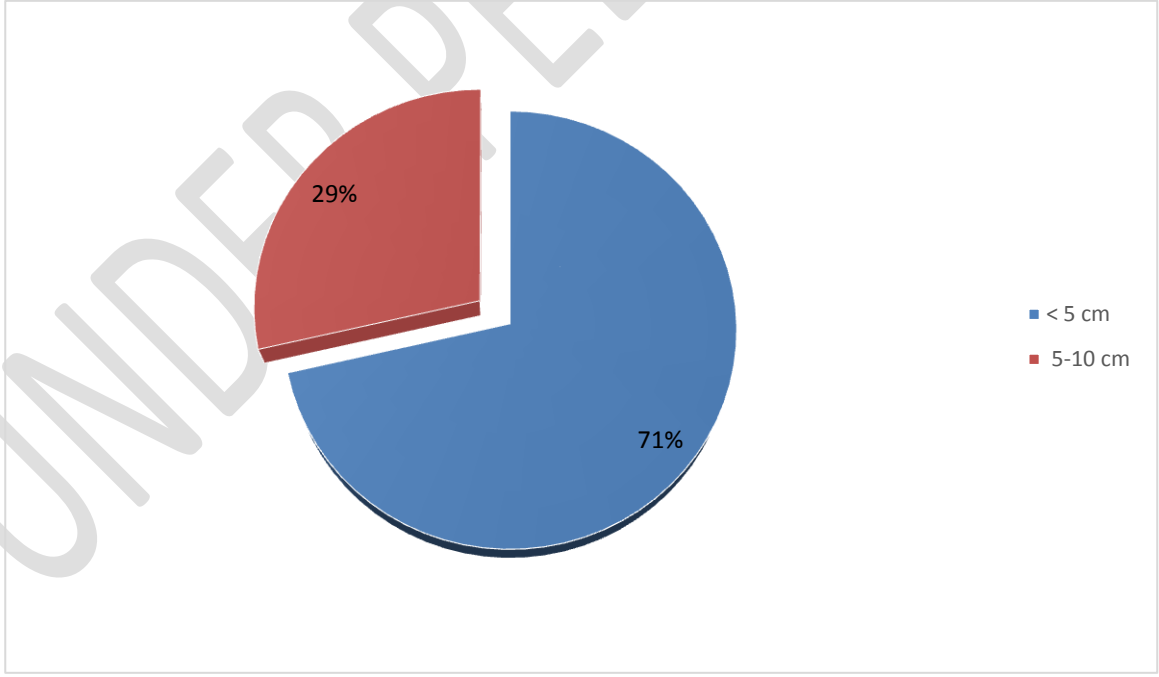
54

55 Patients were admitted to the emergency department for chest pain with respiratory distress  
56 associated with low-abundance hematemesis in 1 patient (14%), an occlusive syndrome in 4 patients  
57 (58%), and low chest pain associated with vomiting in 2 patients (28%).

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

60 Thoracoabdominal computed tomography (CT) scan was preformed to all patients and chest X ray was  
61 performed only in three patients (42%). For patients who were performed chest X ray, we found that  
62 the left diaphragmatic ascension was found in two patients (28%), left basal fluid and air image with  
63 mediastinal backflow in one patient (14%). The abdomen radiography without opacification was  
64 performed in 4 patients (58%) and showed left basal thoracic air-fluid levels.

65 For the thoracoabdominal CT scan (figure3), it showed ascension of abdominal viscera in the left  
66 hemithorax: the colon in five patients (70%), the colon and omentum in one patient (15%), and the  
67 stomach in one patient (15%). Pulmonary collapse and mediastinal reflux, observed in 4 patients (58%).  
68 During the surgery we found out that all patients had the diaphragmatic lesion located in the left side (Figure4).  
69 There was no right or bilateral rupture. The size of the diaphragmatic ruptures varied between 5 and 10  
70 cm in 2 patients (29%). They were smaller than 5 cm in 5 patients (71%).



71

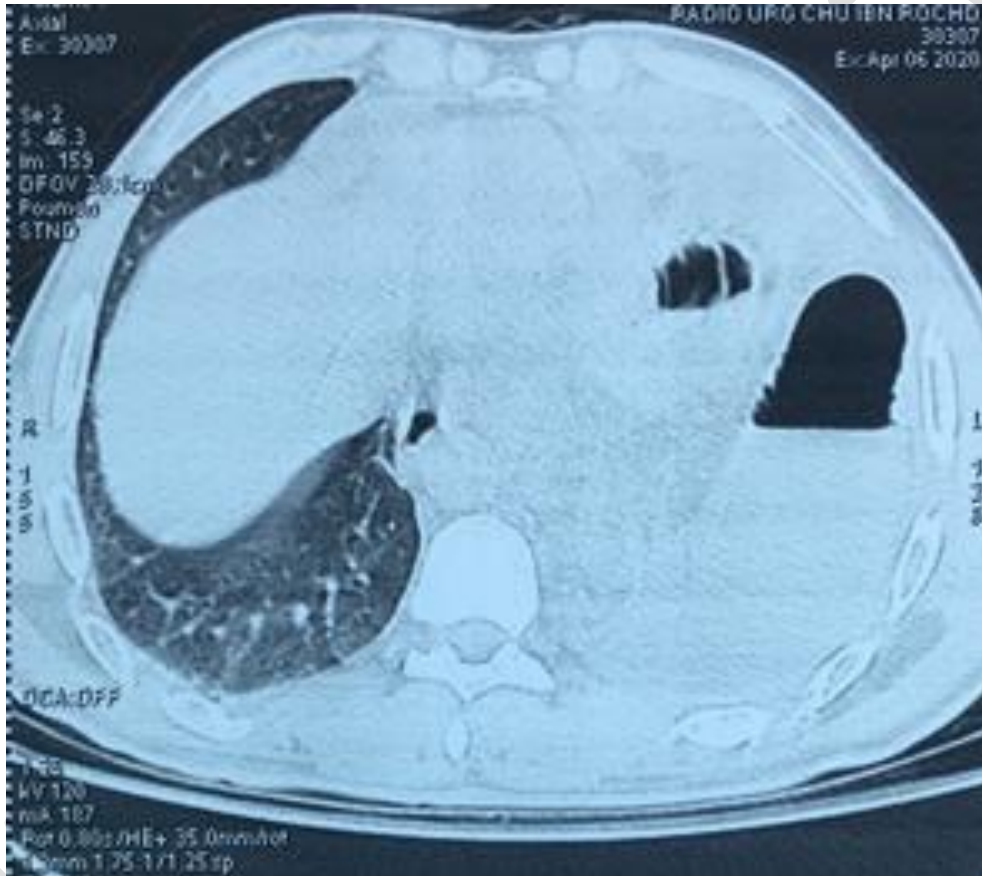
72

**Figure 2:** dimensions of the diaphragmatic breach

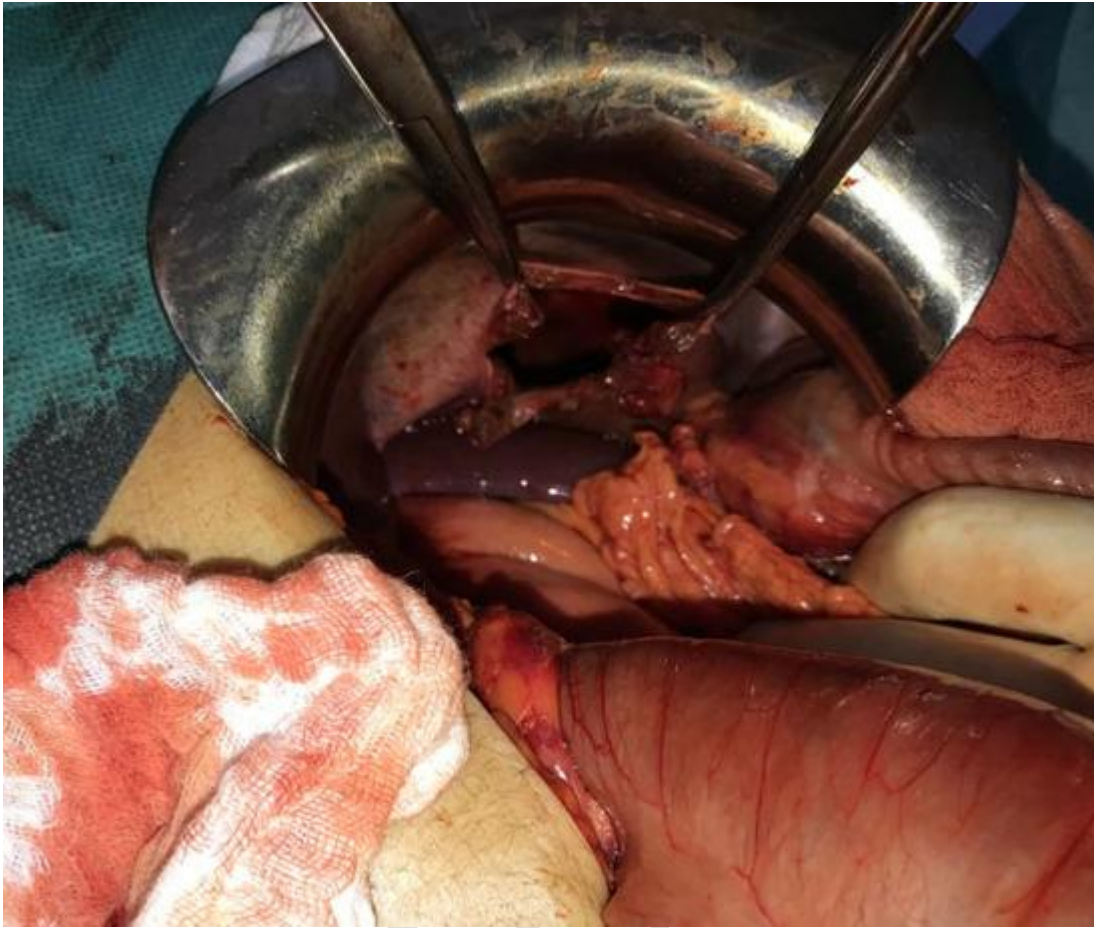
73 The herniated viscera were: colon and greater omentum in 2 Patients (29%), colon in 2 patients (29%),  
74 stomach with a colon in 1 patient (14%), colon, small intestine, and greater omentum in 1 patient  
75 (14%).

76 After the reduction of hernia, two patients were presented by necrosis of the transverse colon and one  
77 patient presented gastric necrosis due to an organism-axial volvulus through the diaphragmatic hernia  
78 **(figure 5)**.

79 Postoperative surgery undergone well without any complications. Patients were discharged after five  
80 days of hospitalization. A follow up with a clinical examination and thoracic radiography.



81  
82 **Figure 3:** Abdominal scan: left diaphragmatic hernia with colonic involvement, collapsed  
83 left lower lobe and mediastinal elements in lateral control  
84  
85



**Figure 4:** Peroperative image showing the diaphragmatic rupture



89  
90  
91 **Figure 5:** peroperative image after reduction of the herniated necrotic colon  
92  
93

## 94 **Discussion**

95  
96 **Post-traumatic diaphragmatic injury is a rare complication, but severe problem which can occur from**  
97 **penetrating or blunt thoracoabdominal injuries. It occurs in 0.8% to 8% of all traumas (5).** The  
98 diagnosis of the post-traumatic diaphragmatic injury is often difficult during the initial management of  
99 which it goes unnoticed in 10 to 30% (6). In the long term, the evolution is marked by the herniation of  
100 the abdominal organ in the thoracic cavity and complicated by strangulation and cardiorespiratory  
101 distress by compression (7).

102 In diaphragm rupture, the mechanism is indirect (8). **Rupture of the diaphragm occurs when intra-**  
103 **abdominal pressure suddenly rises above the tensile strength of the diaphragmatic tissue. Blunt trauma**

104 produces larger, radial tears. Unlike the wound trauma patients, the diaphragm is injured directly and  
105 the size of the lesion is small.

106 The majority of post-traumatic diaphragmatic hernias, approximately 80-90%, often occur in the left  
107 leaflet because it is congenitally weaker than the right leaflet and is not protected from the compressive  
108 forces transmitted by the trauma as is the right dome (7,9). Bilateral hernias are exceptional because  
109 they are most often due to more violent trauma. In our series, the diaphragmatic rupture was located at  
110 the level of the left dome in all patients.

111 **The use of diagnostic methods in the evaluation of diaphragmatic rupture is beneficial.** Chest X-ray is  
112 requested in the first intention to look for specific images of aeric or hydroaeric type almost always on  
113 the left, evocative images such as the elevation of the diaphragmatic dome-shaped, mediastinal  
114 compression on the side opposite to the rupture and sometimes can be expected. A Chest CT scan is  
115 necessary to confirm the diagnosis.

116 Surgical management is the emergency treatment performed in delayed and complicated diaphragmatic  
117 trauma (10). Laparotomy is the most commonly used approach in an emergency. It allows exploration,  
118 reduction, and treatment of the abdominal viscera(11,12) . In the case of the presence of intrathoracic  
119 adhesions of the ascended organs, the associated thoracic approach is justified. Different stitches must  
120 perform the repair of the diaphragmatic lesion with non-absorbable sitches to avoid later later  
121 recurrence (1,10). However, if a sizeable diaphragmatic tear is present, prosthetic plastic is necessary  
122 to reinforce the raphe(12,13) . Thoracic drainage on the side of the hernia is usual. The prognosis of  
123 traumatic diaphragm rupture is not dreadful in itself. The severity is related to the associated injuries,  
124 particularly in the presence of sepsis, multi-visceral failure, hemodynamic shock, severe head trauma,  
125 and respiratory distress. The presence of strangulation and gangrene worsens the prognosis; in our  
126 series, the evolution was good in all patients, except for one patient who died having undergone a total  
127 gastrectomy (10).

## 128 **Conclusion:**

130 **Post-traumatic diaphragmatic hernias can go unnoticed and can be life-threatening in case of associated**  
131 **to lesions or complications. The diagnosis must be systematically evoked in any person admitted to**  
132 **emergency services with blunt or penetrating trauma, especially on the left diaphragm, must suspect a**  
133 **diaphragmatic injury. Laparoscopy is a new approach and should be performed whenever a**  
134 **diaphragmatic lesion is suspected.**

135 **Consent Disclaimer:**

136 As per international standard or university standard, patient's consent has been collected and preserved by the  
137 authors.

139  
140 **Reference:**

- 141 1. Kafih M, Boufettal R. Hernie diaphragmatique post-traumatique révélée par une pleurésie stercorale (à propos  
142 d'un cas). *Rev Pneumol Clin.* févr 2009;65(1):23-6.
- 143 2. FILIZA, Ali Ilker, KURTA, Yavuz, SUCULLUA, Ilker, *et al.* Traumatic diaphragma rupture: an experience of 13  
144 cases. *Eastern J Med*, 2008, vol. 13, p. 25-29.
- 145 3. Ganie FA, Lone H, Lone GN, Wani ML, Ganie SA, Wani N, et al. Delayed Presentation of Traumatic Diaphragmatic  
146 Hernia: a Diagnosis of Suspicion with Increased Morbidity and Mortality. *Trauma Mon.* 26 mai 2013;18(1):12-6.
- 147 4. Aissa A, Hassine A, Hajji H, Ben Salah K, Morjène A, Alouini R. Complication rare d'une hernie diaphragmatique  
148 gauche post-traumatique. *Rev Pneumol Clin.* déc 2013;69(6):331-5.
- 149 5. Nusretoğlu R, Dönder Y. Faecopneumothorax due to missing diaphragmatic hernia: a case report. *J Med Case*  
150 *Reports.* déc 2021;15(1):19.
- 151 6. Atoini F, Traibi A, Elkaoui H, Elouieriachi F, Elhammoumi M, Sair K, et al. Les lésions diaphragmatiques post-  
152 traumatiques droites méconnues : une revue de six cas. *Rev Pneumol Clin.* juin 2012;68(3):185-93.
- 153 7. Dorgam Maués CA, de Vasconcelos ELC, da Silva Galvão R, Rios Rodriguez JE, Bastos Voronaya AL, de Castro GL.  
154 Diaphragmatic herniation after 3 years of penetrating trauma managed through laparotomy: A case report. *Int J*  
155 *Surg Case Rep.* févr 2021;79:58-61.
- 156 8. Nistor CE, Tsui S, Kirali K, Ciuche A, Aresu G, Kocher GJ, éditeurs. *Thoracic Surgery: Cervical, Thoracic and*  
157 *Abdominal Approaches* [Internet]. Cham: Springer International Publishing; 2020 [cité 20 oct 2021]. Disponible  
158 sur: <https://link.springer.com/10.1007/978-3-030-40679-0>
- 159 9. Lu J, Wang B, Che X, Li X, Qiu G, He S, et al. Delayed traumatic diaphragmatic hernia: A case-series report and  
160 literature review. *Medicine (Baltimore).* août 2016;95(32):e4362.
- 161 10. Testini M, Girardi A, Isernia RM, De Palma A, Catalano G, Pezzolla A, et al. Emergency surgery due to  
162 diaphragmatic hernia: case series and review. *World J Emerg Surg.* déc 2017;12(1):23.
- 163 11. GU, Pengcheng, LU, Yang, LI, Xigong, *et al.* Acute and chronic traumatic diaphragmatic hernia: 10 years'  
164 experience. *Plos one*, 2019, vol. 14, no 12, p. e0226364.
- 165 12. Campos Costa F, Cardoso V, Monteiro AM, Guerreiro J. Laparoscopic Repair of an Acute Traumatic Diaphragmatic  
166 Hernia: Clinical Case. *Cureus* [Internet]. 21 oct 2020 [cité 22 oct 2021]; Disponible sur:  
167 [https://www.cureus.com/articles/40316-laparoscopic-repair-of-an-acute-traumatic-diaphragmatic-hernia-](https://www.cureus.com/articles/40316-laparoscopic-repair-of-an-acute-traumatic-diaphragmatic-hernia-clinical-case)  
168 [clinical-case](https://www.cureus.com/articles/40316-laparoscopic-repair-of-an-acute-traumatic-diaphragmatic-hernia-clinical-case)

169 13. DA COSTA, Ketlen Gomes, DA SILVA, Rafaelle Taynah Soares, DE MELO, Marineide Santos, *et al.* Delayed  
170 diaphragmatic hernia after open trauma with unusual content: Case report. *International journal of surgery case*  
171 *reports*, 2019, vol. 64, p. 50-53.

172

173

UNDER PEER REVIEW