

Traumatic Diaphragmatic Ruptures at the University Hospital Center of Brazzaville

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Abstract

Original Research Article

Introduction: the objective of the work was to determine the epidemiological, diagnostic, therapeutic and prognostic aspects of traumatic diaphragmatic ruptures (RTD) in adults at the University Hospital of Brazzaville (CHUB). **Patients and Methods:** descriptive retrospective study, conducted in the multipurpose surgery and digestive surgery departments of the CHUB, between January 2018 and December 2022 (5 years), on patients operated for RTD. **Results:** we collected 20 cases or 5.55% of hospitalized thoraco-abdominal trauma. There were 17 men (85%) and 3 women (15%) for a sex ratio of 5.67. The mean age was 39.11 ± 6.91 years. The most common reasons for consultation were thoraco-abdominal pain (60%). The average consultation time was 7 months and 9 days. Road accidents (50%) were the main etiology. Seven patients (35%) developed occlusive syndrome and seven patients (35%) experienced respiratory distress. Radiological signs were the absence of the left diaphragmatic cupola and intrathoracic hydro-aeric levels. Thoracoabdominal computed tomography confirmed diaphragmatic breaches. Twelve patients (60%) were operated on urgently. Left midaxillary thoracotomy was performed in 16 patients (80%). The mean diameter of the diaphragmatic breccias was 9.1 ± 2 cm. The most herniated loops were the omentum and stomach (81.8%). All cures were done by raffia. Immediate postoperative follow-up was simple for 16 patients (80%) and complicated for 4 patients (20%). The average length of hospital stay was 9.6 days. **Conclusion:** at CHUB, left RTD is common in young adult males. Diagnosis remains late and treatment results are satisfactory.

Keywords: Rupture, Diaphragm, Traumatic, Thoracic, Brazzaville.

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INTRODUCTION

Traumatic rupture of the diaphragm (RTD) is a classic pathological entity in thoraco-abdominal traumatology. This involves the passage of the abdominal viscera into the thoracic cavity through an acquired orifice secondary to trauma [1]. RTD are present in 0.2 to 4% of polytrauma patients [2]. In 80 to 90% of cases, the circumstance of occurrence is a public highway accident, they can also be found after attacks by firearm or stab or after a fall [2]. The risk of strangulation of the loops makes this traumatic pathology a surgical emergency [3]. The diagnosis is suggested on a frontal chest X-ray and a chest-abdominal computed tomography. In Sub-Saharan Africa, RTD remain poorly documented in surgical practice. In Congo Brazzaville, few studies have been done on the subject. The objective of our work was to determine the epidemiological, diagnostic, therapeutic

and evolutionary aspects of RTD in adults at the Brazzaville University Hospital.

PATIENTS AND METHODS

- Type and setting of study: This is a descriptive retrospective study, conducted in the thoracic surgery and digestive surgery departments of the University Hospital Center of Brazzaville (CHUB), over a period of 5 years, between January 2018 and December 2022.
- Inclusion criteria: were included all patients aged 17 and over, operated on at the CHUB for a traumatic rupture of the diaphragm
- Exclusion criteria: patients with an unusable file were excluded
- Data collection: The exploitation of the files was made on pre-established sheets after review of the literature. Our variables of

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interest were epidemiological (age, sex, method of recruitment), clinical (reasons for consultation, time to consultation, circumstances of trauma occurrence, patient history, physical signs), paraclinical (X-ray data and scanographic), therapeutic (type of surgery, approach, herniated loops, gestures) and evolutionary (operative follow-up and results)

- Statistical analysis: The analysis consisted of a description of the different variables of the study. The quantitative variables were represented by the mean and the qualitative variables by percentages (%). Tables and graphs were produced using Excel 2013 software.

RESULTS

Epidemiological Data

We collected 20 patients treated for RTD, which represents 5.55% of thoraco-abdominal trauma hospitalized during the study period. The sample consisted of 17 men (85%) and 3 women (15%), a sex ratio of 5.67. The average age of the patients was 39.11 ± 6.91 years with extremes of 20 and 68 years, the age group of 30 – 39 years represented 40% (table I).

The recruitment method was emergency for 12 patients (60%) and ordinary consultation for 8 patients (40%).

Clinical Data

The most common reason for consultation was thoraco-abdominal pain (60%) and dyspnea (25%) (table II). The average consultation time was 7.9 months with extremes of 1 day to 2 years. The circumstances of occurrence were dominated by public road accidents (AVP) with 50% (figure 1)

In their history, two patients (10%) had undergone laparotomy respectively for penetrating abdominal wound and abdominal contusion. A patient had a history of childbirth with notion of abdominal pressure two years before admission.

All patients had a good general condition, the hemodynamic status was stable for 18 patients (90%) and 2 (1%) patients with poorly tolerated anemia.

Seven patients (35%) presented an occlusive syndrome and seven patients (35%) respiratory distress. The physical examination was normal for 6 patients (30%).

Paraclinical Data

Chest X-ray (Figure 2) was performed in all patients. The radiological signs were: intrathoracic air-

fluid levels, absence of the left diaphragmatic cupola, absence of the gastric air sac, deviation of the mediastinum and rib fractures (table III). Thoraco-abdominal computed tomography was performed in nine patients (45%) and showed a diaphragmatic breach with digestive viscera in the intrathoracic position (Figure 3).

Therapeutic and Evolutionary Data

Twelve patients were operated on urgently (60%) and eight patients had scheduled surgery (40%). The thoracic surgical approach (left midaxillary thoracotomy) was performed in 16 patients (80%) of which 3 were associated with a Kocher approach (left subcostal) and the abdominal approach by a midline laparotomy in 4 patients (20%). Surgical exploration confirmed the diaphragmatic rupture with the loops in the intrathoracic position (figures 4A and 4B). The herniated loops were: omentum and stomach in 9 patients (81.8%), colon in 8 patients (72.7%), hail in 3 patients (27.3%), spleen in 2 sick (9.1%). Herniated viscera were viable in all patients. The average diameter of the rupture was 11.1 ± 2 cm with extremes of 5 and 16 cm.

The surgical procedure consisted of reintroducing viable viscera intraperitoneally followed by suture of the diaphragm using an overlock reinforced with separate stitches using absorbable sutures No. 2 in all patients (figure 5). A drain was placed intrathoracically in all our patients.

The immediate postoperative follow-up was simple for 16 patients (80%). They were complicated by respiratory disorders which were suppressed in 4 patients (20%). The average hospital stay was 6.6 ± 2.7 days with extremes of 5 and 11 days.

Table I: Distribution of patients by age group

age group	Effectifs	%
20 – 29 years	4	20
30 – 39 years	8	40
40 – 49 years	5	25
50 – 59 years	2	10
60 – 69 years	1	5
Total	20	100

Table II: Breakdown of patients by reason for consultation

Reasons of consultations	Effectifs	%
Thoraco-abdominal pain	12	60
Dyspnea	5	25
Thoraco abdominal blunt	1	5
basithoracic open trauma	2	10
Total	20	100

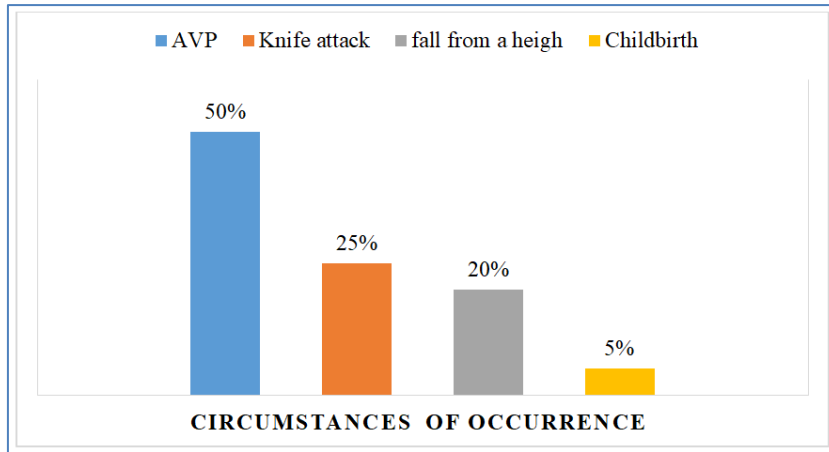


Figure 1: Circumstances of occurrence of diaphragmatic ruptures

Table III: Radiological signs

Radiological signs	Effectifs	%
Absence of the left diaphragmatic dome	18	90
chest NHA	18	90
Absence of gastric air sac	18	90
Deviation of the mediastinum	12	60
Rib fractures	8	40

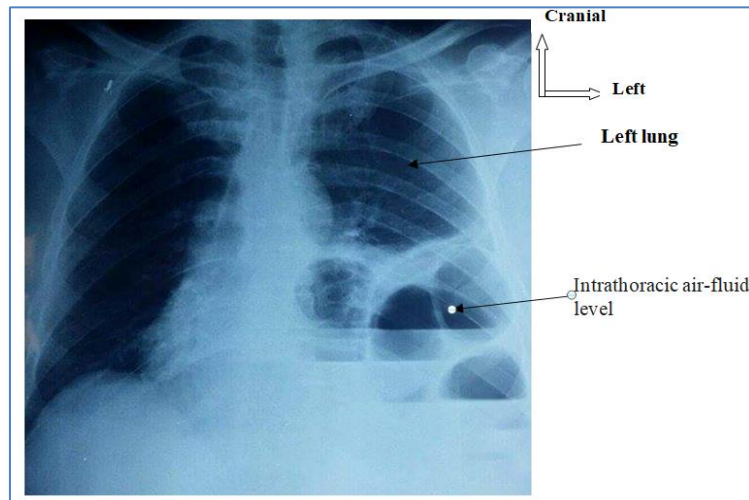


Figure 2: image of left intra-thoracic air-fluid levels

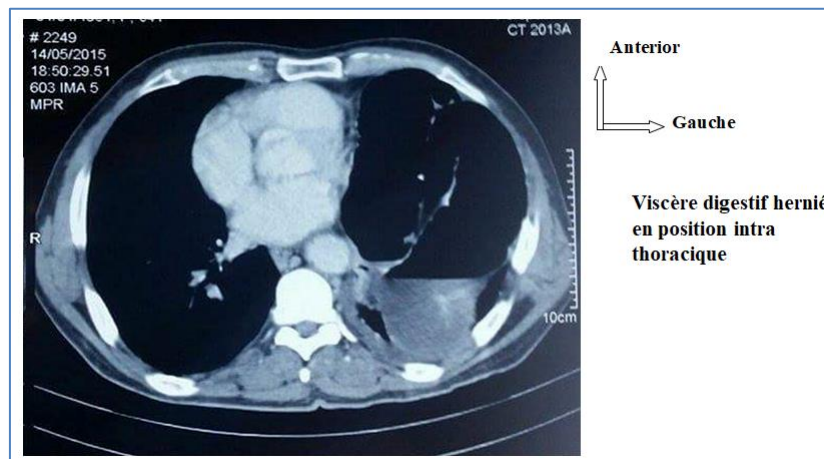


Figure 3: CT image of the digestive viscera intrathoracically

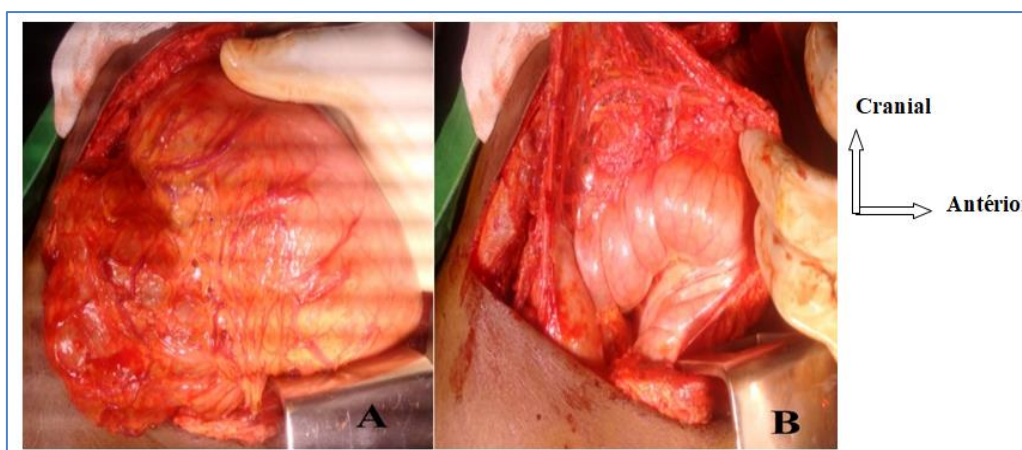


Figure 4: intraoperative images showing the stomach (A) and the transverse colon (B) in the intrathoracic position through a left mid-axillary thoracotomy



Figure 5: image of the diaphragmatic raphia (blue arrow)

DISCUSSION

Epidemiological Aspects

Traumatic ruptures of the diaphragmatic correspond to a solution of continuity of the diaphragmatic dome which can be complicated by the intrathoracic issue of the abdominal viscera in the vicinity [1]. It is often included in the context of polytrauma, for which it is a severity criterion [2].

RTD accounted for 5.55% of thoraco-abdominal trauma hospitalized in our departments. For Smith-Singares in the USA, RTD is only encountered in 0.5 to 5% of thoraco-abdominal trauma [3]. In South Africa in 2017, D'Souza N *et al.*, reported a prevalence of 1.6% of thoraco-abdominal trauma [4]. In Senegal in 2016, Ousmane Thiam *et al.*, in Dakar found a prevalence of 1.3% with 90% of left diaphragmatic rupture [5].

With regard to sex, men are the most exposed [4, 5]. In our sample, men predominated with 85%, i.e. a sex ratio of 5.67. Our result is superimposable to those of Abdel Shafy *et al.*, in Egypt with 84% [6] and

Kyoung *et al.*, in Korea with 84.2% [7]. Some authors like N D'Souza *et al.*, in South Africa [4], Al-Thani *et al.*, in Qatar [8] and Cardoso *et al.*, in Brazil [9], had found the predominance of the male sex with respective rates of 92.4%, 92.3%, 90.3%. It is customary in our society that it is men who are the most mobile by their profession, which predisposes them more to accidents which are the main causes of thoraco-abdominal trauma.

In our series, the most affected age group was that of 30 to 39 years with 40%. Our patients are relatively young with an average age of 39.11 years (extremes: 20 and 61 years) thus joining the results of the literature [10, 11, 12]. In Egypt [6], the RTD interests a much younger age group, the average age is estimated at 25 years, we explain it by the inclusion of the adult population as well as pediatric (24%) in their study.

Clinical Aspects

Nearly half of our patients consulted after the trauma, sometimes years later. Thus the average

consultation time in our series was 7.9 months with extremes of 1 day to 2 years. For our patients, this average delay finds its explanation on the one hand in the lesional mechanism of the RTD, that is to say that the intrathoracic penetration of the abdominal viscera does not always take place in the immediate aftermath of the diaphragmatic rupture [12, 13]. Thus, a rupture that is too small to be detected early may gradually enlarge during intrapleural depression on inspiration; hence the aspiration of the mobile abdominal viscera into the breach [14, 15]. Thus, an unrecognized rupture can reveal itself very late, up to several years after the trauma [16, 17]. On the other hand, in our context, this late consultation period can be explained by the first recourse of certain patients to traditional therapies.

Thoraco-abdominal pain (60%) and dyspnea (25%) were the main reasons for consultation. For Zhang *et al.*, [18], these two symptoms accounted for 52.2% and 17.4% respectively. Mancini *et al.*, [11] found dyspnea to be the most frequent sign with a proportion of 71%, which is higher than that of our study. Indeed, in RTD, thoraco-abdominal pain and dyspnea are obvious clinical signs related to mechanical compression [8].

In our study, AVP was at the forefront of RTD etiologies with 50%. Corbellini *et al.*, [10] as well as Azhar *et al.*, [19] made the same observation but with an estimated frequency of 86% in each study. Public road accidents come back in first place in almost all studies as the main etiology of RTD, this is all the more topical in recent years, especially with the proliferation of two-wheeled vehicles but also with the degradation of road infrastructure and the growing lack of civic-mindedness. The frequency of knife attacks in our study is high compared to that of other authors [10- 20]. Knife attacks are due to the resurgence of crime and especially to the “black babies” phenomenon in Brazzaville.

We recorded among our patients, a woman with a history of abdominal pressure during her last delivery. We think that its rupture would rather be due to the obstetric maneuver, because these maneuvers can be the source of diaphragmatic rupture. This has indeed been described in the literature [21].

We recorded two patients with a history of laparotomy for penetrating abdominal wound and thoraco-abdominal contusion. Diaphragmatic ruptures may be overlooked even during abdominal surgical exploration [21]; which may lead to late diagnosis.

Paraclinical Aspects

Chest X-ray (front and side, in supine and semi-seated position) remains a necessary element for diagnosis, especially in left locations [22]. On the right, most often, everything comes down to a simple ascent of the diaphragmatic dome. Due to the presence of

hepatic mass on the right which plays a protective role. In the literature, the most specific radiological sign of RTD is the presence of single or multiple intrathoracic air-fluid level with colonic haustrations and also the intrathoracic positioning of the gastric tube [22]. Ruptures are more frequent on the left, on average 75% versus 25% on the right, due to the presence of hepatic mass which plays a protective role [7- 17].

In more difficult cases, thoraco-abdominal computed tomography is very useful [17]. For the majority of authors, the most reliable examination is magnetic resonance imaging (MRI) [18] but its accessibility remains low in the emergency setting. If we have the possibility of performing an MRI, the images perfectly show the diaphragmatic rupture, thus confirming the diagnosis. In our study, thoraco-abdominal computed tomography confirmed the diagnosis in 9 patients.

Therapeutic and Evolutionary Aspects

Treatment is exclusively surgical, including repair of the diaphragmatic breach and treatment of associated lesions [19]. Even if the surgical approach depends on the habits of the surgeons, the clinical picture and the type of associated lesions will dictate the choice of the approach.

Laparotomy is rather indicated in cases of left diaphragmatic rupture because of the importance of the herniated organs which can pose a problem of reintegration and thoracotomy remains a good approach in right locations [19]. The mixed route is recommended in case of associated lesions both thoracic and abdominal. Laparoscopy in the lateral position is possible in patients in good hemodynamic condition, with no associated lesions [2].

In our work, the approach via the posterolateral thoracotomy in the sixth left intercostal space was performed in 12 patients, 3 of whom were associated with a Kocher approach (left subcostal). The abdominal approach was performed in 8 patients, it was a supra-umbilical midline incision.

We first proceeded to the reduction of the ascended elements, then to the exposure of the breach, to the thoracic drainage and to the suture edge to edge of the edges of the rupture by a Vicryl 2 overcasting reinforced by separate stitches at the same thread. It should be noted that the consensus was for a suture with separate points with non-absorbable thread, even if there is no scientific proof of its superiority over the overlock or the use of absorbable thread [2].

In terms of vital prognosis, that of traumatic ruptures of the diaphragm is not dreadful in itself. In our study, the postoperative course was simple, there was no mortality. For our patients, four of them

presented respiratory complications which were brought under control.

CONCLUSION

Ultimately, at the Brazzaville University Hospital, left traumatic diaphragmatic ruptures are frequent. Young adult males are most affected. Road accidents, stabbings and falls are the main causes. Thoraco-abdominal pain and dyspnea were frequent reasons for consultation. The diagnosis remains late in our context. This diagnosis is evoked on the frontal chest X-ray which makes it possible to objectify the absence of the left diaphragmatic dome, the intrathoracic fluid-aeric levels and the absence of the gastric air pocket. Computed tomography remains the key examination for definitive diagnosis. The thoracic surgical approach with low opening of the 6th or 7th left intercostal space remains a better alternative, it gives a good view of the operating field and gives comfort in the gesture. It should be noted that the surgical habits differ according to the operators and according to the clinical pictures of the patient. The evolution is favorable for the operated patients.

CONFLICTS OF INTEREST: The authors declare that they have no conflicts of interest.

AUTHOR CONTRIBUTIONS: All authors contributed to this article and have read and approved the final version of this manuscript.

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