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DIAPHRAGMATIC INJURIES: A FREQUENT MISSED DIAGNOSIS IN A LOW INCOME COUNTRY

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ABSTRACT

Objectives: To evaluate the current reported incidence of diaphragmatic injuries (DI) and to determine criteria that could help make the diagnosis of DI and improve its recognition in traumatised patients in Cameroon.

Design: A retrospective study.

Subjects: The cases of all diaphragmatic injuries repaired and diagnosed in two major hospitals in Cameroon.

Setting: The General Hospital of Douala and the University Hospital centre of Younde, Cameroon.

Results: During a ten-year period we have repaired eight diaphragmatic injuries. Five of them were consecutive to penetrating trauma and three after blunt trauma. All the patients were males. The mean age was 34.5 years. Seven injuries occurred on the right side. The average Injury Severity Score was 37.5 and all the patients had associated injuries to other organs. DI represents only 0.05% of all trauma cases. DI is underestimated in Cameroon and under diagnosed because physicians are not trained to think or to recognise it and autopsy is rarely performed after a traumatic death. Although there are no specific signs or symptoms, we have found some criteria which can raise suspicion of DI.

Conclusion: Diaphragmatic injury is a very difficult diagnosis, and it is under diagnosed in Cameroon. We suspect that many patients severely injured may have associated DI which is not recognised and may contribute to increased mortality rate after major trauma.

INTRODUCTION

Diaphragmatic (DI) injuries account for 6.8% of all chest trauma in one study carried out in Nigeria (1) and it is found in 1 to 5% of blunt trauma cases in Western countries (2). Few studies on DI have been published in Africa. The incidence and prevalence of these injuries have not been determined in Cameroon. An accurate diagnosis requires a high index of suspicion as missed DI may result in death or in delayed herniation of abdominal viscera in the chest (1 to 2). Recognising DI needs some clinical experience because there is no specific clinical symptom or paraclinical test which can help to make this diagnosis (3). DI is more common in blunt injury and has been associated in severely injured and polytraumatised

patients (4). In Cameroon we suspect that many cases go unrecognised and DI is underestimated. We report our experience with DI over a ten year period in two major hospitals in Cameroon. The objectives are to educate physicians about the existence of this clinical entity and to define criteria that may help raise suspicion of DI in our environment.

MATERIALS AND METHODS

From July 2001 to March 2011 we performed a medical record search looking for diagnosed or repaired DI in two major hospitals in Cameroon: the General Hospital of Douala and the University Hospital Centre of Yaoundé. These hospitals are tertiary care and major trauma centres and are located in the

two major cities in Cameroon (the administrative capital in Yaounde and the economic capital which is Douala). Initially we performed the search in four Hospitals, but we did not find any recorded case in two hospitals, the Central Hospital of Yaoundé and Laquintinie Hospital of Douala where most of the traumatised patients were transported after accident. So we excluded them from the study. We looked for emergency room files, operative reports, intensive care unit and surgical service files. The charts were reviewed for demographics, the mechanisms of injury, associated injuries, the treatment received, the complications and the outcome. We used the SPSS software to analyse the data.

RESULTS

During this ten-year period, we found eight recorded patients in a total number of 16750 patients admitted for trauma in both hospitals with a diaphragmatic injury (DI). This represents 0.05% of all cases of trauma (Table 1).

Table 1
Mechanism of injury

Age/Sex	Mechanism of injury	Side of injury	Delay to surgery(days)
43M	MVA	Right	0
36M	GSW	Right	0
51M	GSW	Right	0
26M	GSW	Right	0
38M	Fall	Right	5days
18M	GSW	Right	14days
38M	MVA	Right	5days
26M	SW	Left	0

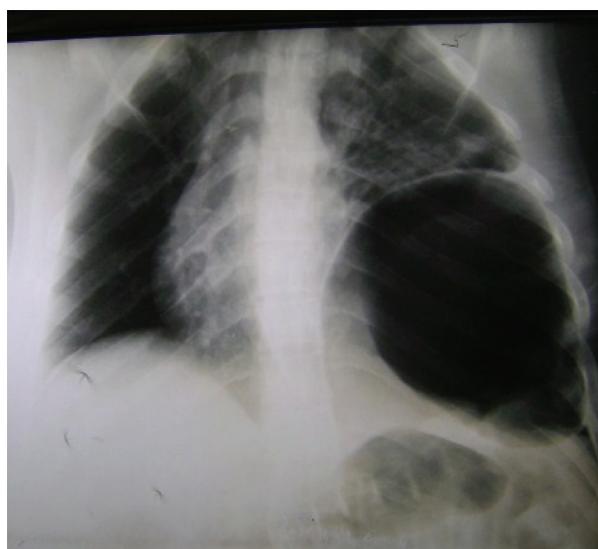
It was difficult to estimate the incidence of chest injuries. All the patients were male. The mean age was 34.5 years with a minimum of 18 and a maximum of 51 years. Five patients underwent a penetrating injury, four patients were shot in the chest and one was stabbed, three patients had blunt trauma, two following a motor vehicle accident and one patient fell from height a (10m). Seven patients had their injury on the right side and the only injury to the left hemi diaphragm was following a stab wound to the left chest (Fig: 1).

The clinical presentation involved dyspnea, tachypnea and decreased breath sounds in the involved hemithorax. A Chest Xray was done in five

patients, two with penetrating injuries and three with blunt trauma. From all the patients who had chest X ray, the diagnosis was recognised early in one patient (Fig 1). The diagnosis was missed in three patients; they were treated first as a haemothorax, a second chest X ray was requested because of the persistence of the dyspnea and worsening of the symptoms.

Figure 1

Left diaphragmatic hernia with the stomach compressing the lung after a stab wound below the tip of the left scapula. The knife made a 6cm cut in the diaphragm and injured the spleen. The patient was brought in just after the injury. He was in hypovolemic shock and severe respiratory distress.



One patient with total blow out of the right hemidiaphragm had the diagnosis made by CT scan. The three remaining patients were diagnosed at surgery. The Injury severity score (ISS) on admission ranged from 25 to 50 with a mean of 37.5. Five patients were taken to the operating room because of haemodynamic instability and hypovolemic shock on admission (Table 1). In the remaining patients the diagnosis was done many days after the accident or discovered in the operating room. At surgery, a laparotomy or thoracotomy or both were necessary for injury repair (Table 2). In two patients who sustained a motor vehicle accident, the diaphragmatic defect was very large causing herniation of the whole liver into the chest, adjunctive laparotomy and thoracotomy was necessary to maintain the liver in the abdomen and to repair the diaphragmatic laceration. The repair was done using two rows of non-absorbable continuous suture.

Table 2*Procedures: associated to the diaphragmatic repair*

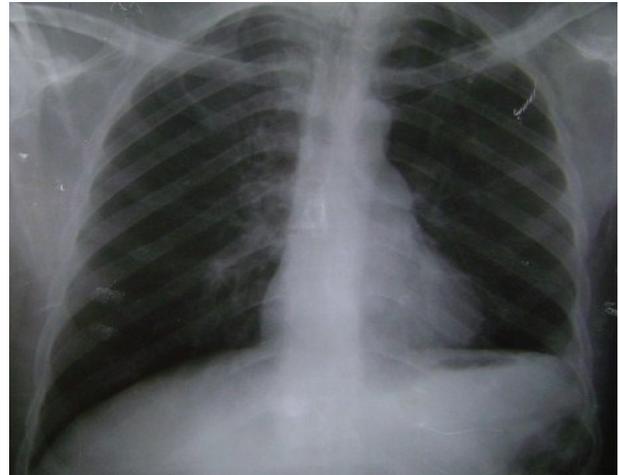
A/S/M	Procedure
18M/GSW	RtT: resection of rt lower lobe
26M/SW	L: splenectomy, chest drain
26M/GSW	RtT: middlelower lobe repair, L: liver hemostasis
36M/GSW	RtT: lung repair, liver hemostasis
38M/MVA	Rt Thoracotomy and laparotomy
38M/FALL	laparotomy
43M/GSW	RtT: lung repair; L: liver resection (II and III)
nglish51M/GSW	RtT: lower lobectomy, liver hemostasis

Legend: Rt: right, T: thoracotomy, L: laparotomy

All the patients had associated injuries to other organs in the chest and the abdomen (Table 3). The average length of hospital stay was ten days after the surgery.

Table 3*Associated injuries*

18M	GSW	Ribs fractures and scapula, lung diaphragm and liver injuries
26M	GSW	Lung, liver and retroperitoneum
26M	SW	Spleen laceration
36M	GSW	Lung and liver injuries
38M	MVA	Lung contusion
38M	Fall	Rt femoral and pelvic fracture
43M	MVA	Lung, liver stomach, duodenum and pancreas
51M	GSW	Lung and liver injuries

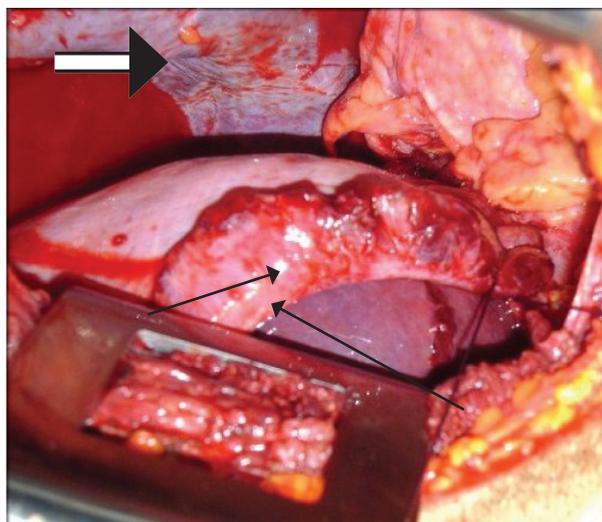
Figure 2*The postoperative chest radiograph three weeks after the laparotomy for splenectomy and diaphragmatic repair*

There was no mortality. Most of the patients recovered quickly and well (Figure 2). Two patients developed a complication, the 18 year old male after a gun shot wound to the chest had multiple rib and scapula communitive fractures. He was shot by the police while he was involved in an act of robbery, and was operated on the 14th days after the trauma. The next day after surgery, the police handcuffed him strongly to the bed for two weeks. Being unable to do chest physical therapy he developed a wound, scapula and ribs infection. When we succeeded to have him released by the police he eventually recovered and was discharged home on antibiotics.

The second patient was a 36-year-old male with a total blow-out of his diaphragm with associated lung contusion (Figure 3), he developed acute respiratory distress syndrome in the post-operative period and remained in the intensive care unit for one week and was discharged home after two weeks.

Figure 3

Complete rupture of the right diaphragm (double arrow); The liver is below the double arrow. One head arrow points to the lacerated diaphragm. The white arrow is showing the collapsed lung. This was repaired through a thoraco laparotomy incision



DISCUSSION

In this study like in other western studies published in the literature, DI is usually associated with severely injured and polytraumatised patients and is considered a marker of severe injury (2,3,5). The average ISS in our patients was 37.5 which is close to the ISS of 38 found in a major trauma centre in Canada (2). Compared to the literature, all our patients were male and had their injury mostly on the right side. DI has been reported to be more common on the left side and in blunt trauma (1-5). Instead many of our patients had a penetrating injury (62.5%) and this was found more on the right side. This may be because we have a very small number of patients and as we suspect many cases of DI were not recognised. We have found that all of our patients with DI had associated injuries to the chest and abdominal organs as many studies have reported that DI is usually associated with injury to other organs (2,5). DI has been associated with high mortality 35.4% in the study by Adeboye *et al* (1) in Nigeria and 28.8% in one Canadian study (2). Ngowe *et al* have reported a mortality of 35% in severely injured patients in the emergency room following trauma at the Central Hospital of Yaoundé, while waiting for surgery (6). Many of these patients have sustained blunt trauma. Some of them may have had associated unrecognised diaphragmatic injuries.

The incidence of DI is unknown in Cameroon. In this study we found an incidence of 0.05% in all cases

of trauma. This represents all cases of DI diagnosed in these two major hospitals for ten years. In Nigeria, DI has been found in 6.8% of all chest trauma (1). This very low incidence and the fact that no case was diagnosed in two major trauma centre for a ten-year period made us believe that DI is under diagnosed in Cameroon. The diagnosis of DI was very challenging and is usually made with a high index of suspicion (1,5). The experience with this type of injuries is very low in Cameroon so we suspect that many cases are missed. Many physicians and surgeons are not trained to recognise DI on the chest X ray; the diagnosis was missed in all the cases of blunt trauma by the receiving surgeon. Many dead patients may have a DI and since autopsy is rarely done after a traumatic death because of poverty, this injury goes unrecognised. We suspect that missed DI may contribute to increase in mortality in severely injured patients. In one study the authors reported 35% of diaphragmatic blunt injuries diagnosed at autopsy (2). In our country with limited and very low medical resources expensive procedures cannot be carried out because very few patients can afford paying for them in the emergency room. Laparoscopy has been found to be helpful in the diagnosis of DI, but it is not a common practice in Cameroon (7,8). In the three blunt cases of our series, the chest X-ray shows a rising hemidiaphragm which was mistaken for a hemothorax and treated with chest tube and observation. The patients were referred for "clotted hemothorax" without improvement after the drainage or because the chest radiograph remained the same after drainage. We found five clinical and radiological signs which must raise the suspicion of DI. DI must be suspected in: 1) patients with a high injury severity score (ISS) whatever the mechanism of the injury, 2) polytraumatised patients with chest, pelvic, abdominal or head injury, 3) patient who had sustained a penetrating injury to the thoraco-abdominal region, 4) initial or persistent low drainage from the drain with a moderate hemothorax seen on the chest X Ray; 5) persistence of severe dyspnea and polypnea after insertion of the chest drain for isolated hemothorax. If there is no lung contusion or pneumothorax, the likelihood of DI is very high in these situations.

In conclusion in ten years period we found only a few cases of DI in two major hospitals among all trauma cases with an incidence of 0.05%. This is underestimated because many cases are undiagnosed and due to the poverty preventing multiple modalities diagnostic tools, the lack of autopsy after trauma death, untrained physicians to recognise DI. Missed DI may contribute to increased mortality in polytraumatised patients.

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