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ORIGINAL ARTICLE**Delayed Hemothorax: Don't Miss It**Walid Hassan¹, Ahmed Kadry¹, Gehad Awad¹, Hysam Abdelmohty^{1*}, Ahmed Mostafa Elsaid¹¹Cardiothoracic Surgery Department, Faculty of Medicine, Mansoura University, Dakahlia, Egypt***Corresponding Author:**Hysam Abdelmohty,
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ABSTRACT**Background:** Delayed hemothorax is defined as a sequela that may ensue after 24 hours of blunt chest trauma. Accordingly, hospital admission and observation for at least 48 hours is endorsed to evade missing such sequela.**Methods:** We reviewed 44 patients who developed delayed hemothorax 24 hours after blunt chest trauma and having rib fractures admitted to Emergency Hospital, Mansoura University, Egypt from January 2011 to December 2014.**Results:** We included twenty-nine males (65.9%) and 15 females (34.1%) with mean age of 33.84 years. Right side hemothorax was encountered in 24 patients (54.54%). The causes of trauma were motor car accident in 56.8% and falling from height in 11% of cases. Rib displacement was identified in 52.2% of patients and exploratory thoracotomy was performed only for 4 patients (11.4%).**Conclusions:** Patients with displaced multiple fracture ribs and no hemothorax are at high risk of evolving delayed hemothorax, and they should be dealt with high degree of suspicion. Several days of observation and close follow up are mandatory.**Keywords:** Hemothorax, Delayed, Fracture rib, Chest trauma**INTRODUCTION**

Delayed hemothorax (DHTX) is a rare sequela of blunt chest trauma and it is reported to occur in 2.1% to 5% of all blunt thoracic trauma [1, 2]. The masking of pain by strong analgesia can result in DHTX as the patient's violent movement or vigorous coughing can cause internal lung injury by the fractured ribs [4]. Simon et al. stated that most cases of DHTX seemed to be arise from intercostal vessels injury due to the displaced multiple fractured ribs [5]. Hospital admission and close monitoring for several days with avoidance of vigorous movements along with chest physiotherapy in the first days after trauma were recommended by Ross and his colleagues to avoid the development of DHTX or to early diagnose and manage it once developed [6]. In this study, we aim to review cases of delayed post traumatic hemothorax to diagnose it as early as possible, and to guide proper management.

METHODS

This is a retrospective descriptive study in which we reviewed all patients admitted to Emergency hospital, Mansoura University, Egypt during the period between January 2011 to December 2014 with blunt chest trauma that resulted in multiple fracture ribs without initial hemothorax which developed after the first 24 hours post-trauma. Patients with delayed referral were excluded from the study. Patients who presented to our infirmary

with chest trauma underwent meticulous history taking, their relatives or eyewitness of the trauma. They were evaluated clinically and radiologically by chest x-ray. Conservative treatment was applied to cases of fractured ribs with free pleural space in the form of good analgesics. Besides, chest x-ray was repeated every 12 hours. If the patients did not develop either hemothorax or pneumothorax, they were discharged after 48 hours.

Patients who developed hemothorax, documented by chest x-ray, were dealt with by intercostal tube thoracotomy. Substantial hemothorax that affected patient's hemodynamic or required repeated blood transfusion was dealt with by exploratory thoracotomy.

STATISTIC ANALYSIS

The data were tabulated and analyzed using the Statistical Package for the Social Sciences (SPSS) version 22.0 (IBM, Chicago, USA). Qualitative data was presented as number and percent. Quantitative data was presented as mean and standard deviation.

RESULTS

Our study included 44 patients, 29 males (65.9%) and 15 females (34.1%) (Fig. 1) with a mean age of 33.84 ± 13.25 years. The timing of DHTX ranged between one to five days (mean 44.07 ± 18.297 hours). Most patients (36 cases) were discovered on follow up chest x-ray that was ordered every 12 hours. Seven patients presented with sudden onset

chest pain and dyspnea. One patient was discharged after 3 days and was re-admitted after 2 days with tachypnea and tachycardia.

Right hemothorax was diagnosed in 24 patients (54.54%) whereas left hemothorax was present in the remaining 20 patients (45.45%). The type of blunt trauma was mainly motor car accident (MCA) in 25 patients (56.8%), followed by falling from height (FFH) in 11 patients (25%). Other modes of trauma included direct chest impact in 7 patients (15.9%) and horse kick in only one patient (2.3%). (Table 1) (Fig. 2). The number of fractured ribs ranged between 3 and 7 ribs. Twenty-three patients (52.3%) showed significant rib displacement. Seventeen patients (38.6%) showed pulmonary contusion on CT films, most of them (fifteen patients) had displaced ribs. Eight patients (18.2%) had flail chest, while no patients required

mechanical ventilation. Regarding other injuries, 3 cases had fracture ribs on the other side, while 2 cases had sternal fracture. Five patients developed hemopneumothorax (Fig 3). The initial drainage ranged between 200 and 1500cc blood (mean 718.18±347.43 cc), and the total drainage ranged between 350 and 2600cc blood (mean 1095.45±529.130cc). Nine patients (20.5%) required blood transfusion. Four patients required thoracotomy exploration either to control bleeding (2 cases, from intercostal artery in one patient and diaphragmatic injury in the other), or later on to evacuate clotted hemothorax (one female patient readmitted after discharge and the other one had early removal of the chest tube) (Fig 4). Hospital stay ranged from 5 to 20 days (mean 9.32±3.820 days). In our study, there was one case of empyema but there was no mortality.

Table 1: Data of the studied group.

		All patients (n= 44)
Age (years)		33.84 ± 13.549
Gender	Male	65.9% (29)
	Female	34.1% (15)
Onset (hours)		44.07 ± 18.297
Diagnosis	Chest x-ray	81.8% (36)
	Chest pain and dyspnea	15.9% (7)
	Tachypnea and tachycardia	2.3% (1)
Side	Right	54.5% (24)
	Left	45.5% (20)
Trauma	MCA	56.8% (25)
	FFH	25.0% (11)
	Direct chest impact	15.9% (7)
	Horse kick	2.3% (1)
Pulmonary contusion		38.6% (17)
Rib displacement		52.3% (23)
Number of fractured ribs		3.93 ± 1.043
Flail chest		18.2% (8)
Sternal fracture		4.5% (2)
Other side fracture ribs		6.8% (3)
Need for MV		0% (0)
Exploratory thoracotomy		11.4% (5)
Initial drain yield (ml)		718.18 ± 347.431
Total drain yield (ml)		1095.45 ± 529.130
Blood transfusion		20.5% (9)

All patients (n= 44)

Hospital stay (days)	9.32 ± 3.820
Complications	2.3% (1)
Mortality	0% (0)

Data is expressed as mean and standard deviation or as percentage and frequency.

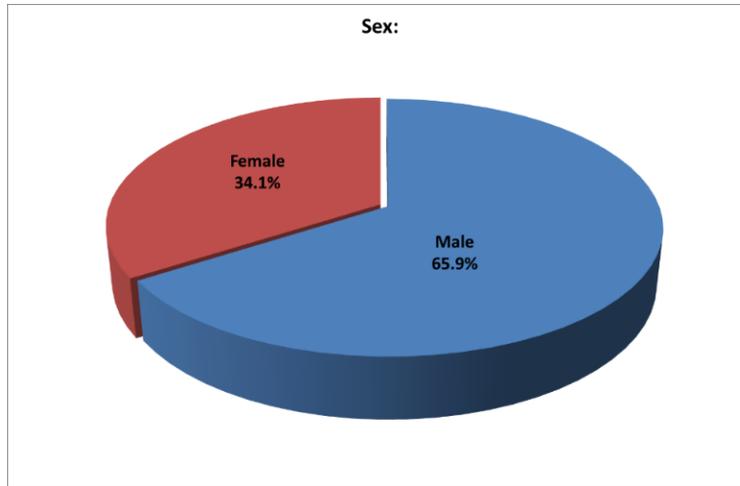


Fig 1: Sex distribution

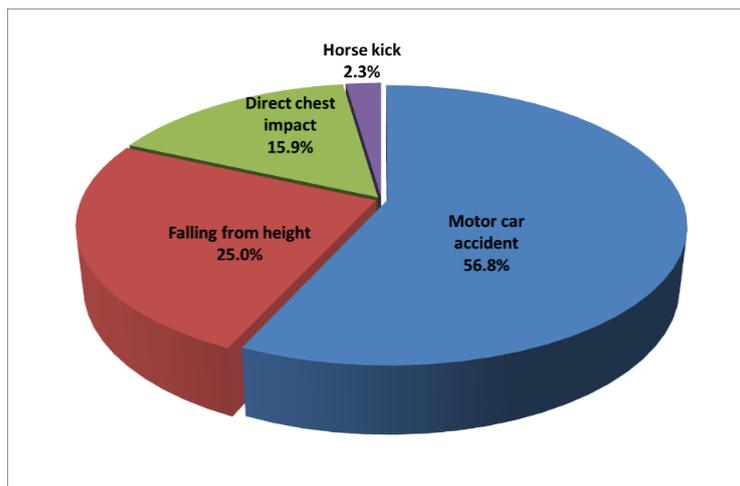


Fig 2: Mode of trauma of studied group

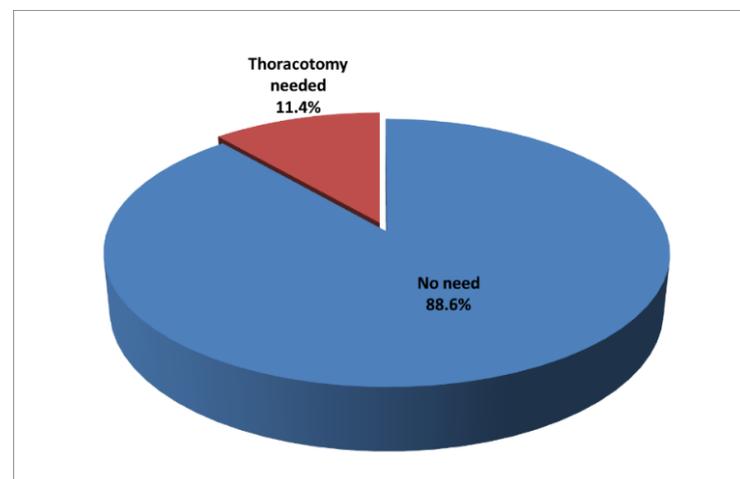


Fig 3: Type of surgical interference

DISCUSSION

The most common finding in patients with chest trauma is fracture ribs which may be complicated by hemothorax. This hemothorax usually present at the time of presentation or shortly after, but delayed hemothorax after 24 hours is infrequent. As Mansoura Emergency Hospital is a tertiary referral center, most of trauma varieties are encountered. We described our experience with such entity over a time period of 4 years.

This study included 29 males (65.9%). Sharma et al. [1], reported similar male contribution. This ratio was 61.3% in Dongel et al. study [7], 77.2% in Cobanoglu et al. study [8], and 85.4% in Cansever et al. study [9]. As regard age, the mean age for our patients was 33.84 years. Most series reported mean age in the 4th decade of life as Cobanoglu et al. [8] and Cansever et al. [9]. It is clear that middle aged males are more active so they are more exposed to trauma. Delayed hemothorax was more on right side 54.54% in our study. Cansever reported right side DHTX in 58.25% [9] while trauma equally affected both sides in Cobanoglu et al [8]. The cause of trauma was mainly MCA 56.8% which may be related to our community with crowded under-developed roads and lack of respect for traffic laws. Cobanoglu et al. [8] reported that MCA accounted for 53.84% of cases. Haberal et al. [10] reported that 63.4% while Dongel et al. [7] reported only 22.3% of their cases were due to MCA. Other forms of chest trauma were 25% FFH, 15.9% direct physical insult, and one patient exposed to horse kick. The number of fracture ribs ranged from 3 to 7. Three ribs affection was diagnosed in 34.1% of the patients. Most of the fractured ribs (86.36%) showed no displacement initially but on follow up CXR, displacement was encountered in 52.3% of cases. This finding may explain why this group of patients developed hemothorax. Other contributing factors may be meticulous respiratory care to evade pulmonary atelectasis by aggressive physiotherapy along with effective pain killers.

Rib fractures are recognized as an underlying factor for the delayed complications in different studies. Eleven out of 12 patients in the study of Simon et al. [5] had multiple or displaced fracture ribs. Limanet al. [11] discovered a correlation between number of fractured rib and DHTX incidence. Regarding other injuries, 3 cases had fracture ribs on the other side, while 2 cases had sternal fracture. Five patients developed hemo-pneumothorax. One quarter of patients in the study of Dongle et al. [7] had other injuries. Haberat et al. [10] reported other injuries in the form of head injury (12.1%), abdominal injury (8.4%), pelvic injury (5.6%), and extremities injury (22.2%). Thirty four percent of their patients had associated

pneumothorax. Our protocol is to admit and follow up any patient with fracture ribs. According to the number of fractured ribs, degree of rib displacement, and presence or absence of flail chest, we determine when to discharge patient safely to be followed up closely at outpatient clinics. Following this protocol, we did not miss any patient except one female who was discharged after 3 days and readmitted again after 2 days with the onset of new chest pain, dyspnea, and tachycardia.

The timing of DHTX incidence ranged from 16 to 107 hours (mean 44.07 ± 18.297 hours). The onset of bleeding was suspected by abrupt chest pain, increasing dyspnea, tachycardia, or by follow up chest x-ray. Intercostal tube was inserted in all patients with hemothorax and drained 200 to 1500cc blood initially (mean 718.18 ± 347.43 cc). The total drain ranged from 350 to 2600cc blood (mean 1095.45 ± 529.130 cc).

Simon et al. [5] reported that the incidence of DHTX ranged between 18 hours to 6 days. Misthos et al. [12] reported that timing was ranging between 2 to 14 days. Siafakas et al. [13] presented a case on oral anticoagulant who developed DHTX thirty-one days after blunt trauma with fracture ribs. Chinnan and colleagues [14] reported a case of massive hemothorax 16 hours after blunt chest trauma without rib fracture. Ross and Cordoba [6] reported 2 patients who developed delayed life threatening hemothorax and required exploration. The mean amount of drainage was 1011.6 ± 37 cc and mean amount of transfused blood was 1.2 ± 0.09 units in the study of Cobanoglu et al. [8].

To our knowledge, no series in literature dealt with DHTX with extensive blood loss, only few scattered case reports were published. Sharma et al. [1] reported 2000 ml at 3 days, Ogawa et al. [15] reported 2100 ml blood loss after 6 days. In addition, Ross and Cordoba [6] reported 3500 blood loss at 4 days. Only 9 patients (20.5%) required blood transfusion. Four patients (11.4%) required thoracotomy either to control bleeding (2 patients) or to evacuate clotted hemothorax (2 patients). In one patient, the bleeder was intercostal artery, the second one had left lower fracture ribs and the source was the injured diaphragm. Yamanashi et al. [16] reported a case of DHTX after blunt chest trauma with inferior phrenic artery injury. We reported only 2 cases of clotted hemothorax and one case of empyema, there was no mortality. The mean hospital stay was 9.31 days. Cansever et al. [9] reported a mortality rate of 0.9% and a mean hospital stay of 8.7 days. Cobanoglu et al. [8] reported 2 patients out of 54 required thoracotomy to evacuate clotted hemothorax, two patients developed empyema with no mortality. Dongle et al. [7] reported 1.1%

mortality. It is the sharp edges of the fractured displaced ribs which make the patient at risk of injury of intercostal vessels or the lung. Accordingly, we recommend the avoidance of vigorous physiotherapy. Repeated nebulization and strong mucolytic with only full deep breathing may be all needed to help prevent pulmonary atelectasis with subsequent infection and possibility of catching pneumonia. In patients with flail chest with no hemothorax, we suggest avoiding external fixation of the flail segment directing the sharp edges of the broken edges inward making possibility of lung and/or intercostal vessels injury high. Other alternative methods like chest belt, mechanical ventilator which help expansion of the lung and sealing of the chest wall may be of benefit or even surgical repair in selected cases [17].

CONCLUSIONS

After minor blunt chest trauma, patients should be closely followed for at least 2 weeks after the accident and screened for DHX; using expiration chest radiograph upon discharge and scheduled to outpatient clinic strict follow-up 2 weeks' time. Patients with multiple fracture ribs especially with rib displacement and free pleural space are at high risk of evolving DHTX and they should be managed with high degree of suspicion.

Conflict of Interest: None.

Financial Disclosures: None.

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