



Penetrating Chest Injuries after Egyptian Revolution

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Abstract

Background: Penetrating thoracic trauma is mostly attributed to violence and has a higher mortality rate than blunt trauma. It is more common in men due to their propensity to violence and the mechanism of injury is usually a gunshot wound or stab wound.

Aim: To describe the prevalence of penetrating chest injuries cases after Egyptian revolution admitted to the Emergency Department University Hospital.

Methods: The records were reviewed of 180 patients seen at our thoracic surgery hospital over a 7-year period.

Results: The group comprised 162 male (90%) and 18 female (10%) patients, with a mean age of 23.0 years. Of those, 108 patients (60%) had left-sided penetrating injury, 63 patients (35%) had right-sided penetrating injury, and 9 patients (5%) had bilateral injury. The left -to-right injury ratio was 1.7:1. Stab wounds were the most frequent mode of injury, comprising 162 cases (90%); the remaining 18 patients (10%) suffered from gunshot wounds, comprising both homicidal and suicidal penetrating traumas. In terms of management, 117 patients (65%) were treated with only tube thoracostomy, 36 patients (20%) had conservative management, and 27 patients (15%) had thoracotomy and exploration. In the 18 gunshot wound patients, 6 (33.3%) had thoracotomy, whereas only 11 (6.8%) of the 162 stab-wound patients had exploration.

Conclusion: In this study we emphasize that chest tube thoracostomy should remain by far the most common and appropriate method of treating penetrating injury to the thorax.

Keywords: Penetrating Thoracic Trauma; Chest Trauma; Tube Thoracostomy; Thoracotomy; Egyptian Revolution

Introduction

Chest trauma has quickly risen to be the second most common traumatic injury in non-intentional trauma [1]. Trauma to the chest is also associated with the highest mortality; in some studies, up to 60% depending on the mechanism of injury. While penetrating chest trauma is less common than blunt trauma, it can be more deadly. Quick thinking and early interventions are key factors for evaluations, management, and survival [2,3]. All age ranges are at risk for chest trauma. After head and extremity trauma, chest trauma is the third most common blunt injury and quickly rising to second [4]. Gunshot and stabbing account for 10% and 9.5% of penetrating chest injuries in the United States. This incidence changes worldwide, and it is as high as 95% in countries engaged in war [5-8].

The 2011 Egyptian revolution took place following an uprising that started on 25th January 2011. There were up to 840 reported deaths, while injuries were over 6000. Cairo University Hospitals (Kasr El Aini) is not just the biggest hospital providing free service to the people of Cairo and Egypt, but also, is the nearest hospital (1 km away) from 'Tahrir' (Liberation) square which was the heart of confrontations and incidents, and subsequently casualties during the uprising [9].

Aim of the work

The aim of this study is to describe the prevalence of penetrating chest injuries cases after Egyptian revolution admitted to the emergency department university hospital.

Patients and Methods

Study population: Patients with penetrating chest injuries.

Inclusion criteria: Any age, both sexes and patients with penetrating chest injuries.

Exclusion criteria: Blunt chest injuries.

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Study methods

The study retrospectively reviewed the records of patients presenting to the hospital with penetrating chest trauma during the previous 7 years (January 2012 to June 2019). There were no cases of both blunt and penetrating chest injury in combination. The selected patients were subjected to the following:

- A standard posteroanterior chest X-ray was the most frequently used diagnostic modality in patients who sustain traumatic lung injury. Chest X-ray was the initial radiographic diagnostic tool for all cases.
- When pneumothorax and/or hemothorax were suspected or confirmed from chest X-ray, a computerized thorax tomography was performed.
- Chest tube thoracostomy was the initial treatment modality in cases of advanced pneumothorax or hemothorax.
- If there was only subcutaneous emphysema or minimal pneumothorax, conservative treatment modalities were performed.
- Immediate thoracotomy was performed if the chest was full of blood, if more than 1000 cm³ of blood had drained with insertion of a chest tube, if drainage exceeded 200 cm³/h for 3 h, or if there was a major air leak. In those patients who had massive drainage or air leakage, standard exploratory posterolateral thoracotomy was performed in order to control bleeding and to remove destroyed or devitalized lung tissues.
- Primer saturation of lung parenchyma, with or without wedge resection, was performed in lung trauma cases.
- All patients postoperatively had appropriate antibiotic and analgesic medicines. Removal of chest tubes depended on air leakage and drainage of the chest tube.
- If the patient ceased air leakage and drainage of the effusion was less than 100 cm³/day, then chest tubes were removed.
- Data were analyzed using SPSS 23.0 with the help of a statistician.

Results

Our study included 162 male (90%) and 18 female (10%) patients with a mean age of 23.0 years (range: 14 to 57 years). Of those, 108 patients (60%) had left-sided penetrating injury, 63 patients (35%) had right-sided penetrating injury, and 9 patients (5%) had bilateral injury. The left -to-right injury ratio was 1.7:1.

Stab wounds were the most frequent mode of injury, comprising 162 cases (90%); the remaining 18 patients (10%) suffered from gunshot wounds, comprising both homicidal and suicidal penetrating traumas.

In terms of management, 117 patients (65%) were treated with only tube thoracostomy, 36 patients (20%) had conservative management, and 27 patients (15%) had thoracotomy and exploration. In the 18 gunshot wound patients, 6 (33.3%) had thoracotomy, whereas only 11 (6.8%) of the 162 stab-wound patients had exploration.

Mean duration until removal of chest tubes (range: 2 to 10 days) was 8.8 days in the exploration group and 4.1 days in the tube thoracostomy group. 117 patients (65%) were treated with only tube thoracostomy. The indications for tube thoracostomy were hemothorax in 24 patients (20.5%), pneumothorax in 43 patients

Table 1: Demographic characteristics of study patients.

	(n=180)
Age (years)	23 (14-57)
Male/Female	162/18
Side	
Left sided injury	108 (60%)
Right sided injury	63 (35%)
Bilateral	9 (5%)

Table 2: Types of injuries among study patients.

	(n=180)
Stab wound	162 (90%)
Gun shot	18 (10%)

Table 3: Management of the patients.

	(n=180)
Tube thoracostomy	
Hemothorax	24 (20.5%)
Pneumothorax	43 (36.7%)
Both	50 (42.8%)
Conservative TTT	
Pneumothorax	30 (83.3%)
No injury beyond pleura	6 (16.7%)
Exploration	
Hemothorax	21 (77.8%)
Chylomediastinum	3 (11.1%)
Foreign bodies	3 (11.1%)

(36.7%), and both hemothorax and pneumothorax in 50 patients (42.8%).

Thirty-six patients (20%) had conservative management, of which 30 patients (83.3%) had accompanying pneumothorax whereas only 6 patients (16.7%) did not have injury beyond pleura. The exploration group included 27 patients (15%). The indications of exploration were hemothorax for 21 of the patients; three patients had chylomediastinum and chyloptysis, and another three patients underwent exploration for a foreign body in his chest. Of those 21 patients who underwent exploration for hemothorax, 12 patients had bleeding from the pulmonary parenchyma, 3 patients from intercostal arteries, 3 patients from the pulmonary hilus, and 3 patients from the right auricula.

Duration of hospitalization ranged between 1 and 15 days (median: 4 days; mean: 5.5 days). Median hospitalization time in the exploration group was 11 days. Mean hospitalization time was 4.5 days in the tube thoracostomy group compared with 1.5 days in the conservative management group.

Thirty-six patients (20%) had accompanying penetrating injuries (30 in extremities, 2 abdominal, and 2 facial; and 2 lumbar region stab wounds). Only one patient had additional cardiac injury in which auricular laceration was observed. This case was operated by cardiac surgeons and simple suturation of the right auriculae without cardiopulmonary bypass successfully controlled bleeding.

One patient had a major morbidity of chylomediastinum and chyloptysis following a handgun attack. The patient was initially

Table 4: Post-operative management.

	Tube thoracostomy group (n=117)	Exploration group (n=27)	P value
Time to tube removal	4.1 ± 1.3 (1-11)	8.8 ± 1.5 (2-20)	0.03 (S)

Table 5: Mean hospitalization time between study groups.

	Conservative group (n=36)	Tube thoracostomy group (n=117)	Exploration group (n=27)	P value
Mean hospitalization time	1.5 ± 2.1	4.5 ± 2.4	10 ± 1.2	0.018 (S)

Table 6: Outcomes between study patients.

	(n=180)
Died	0 (0.0%)
Recovered	180 (100%)

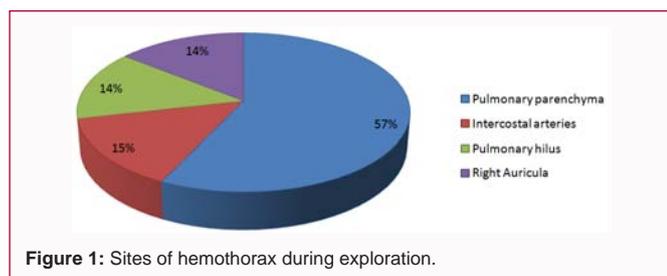


Figure 1: Sites of hemothorax during exploration.

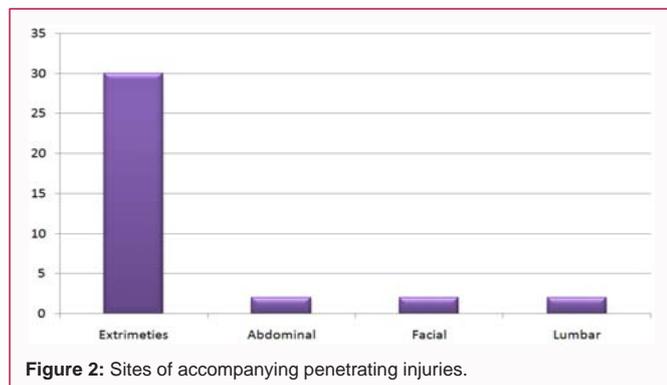


Figure 2: Sites of accompanying penetrating injuries.

treated by conservative management, with nil-by-mouth and total parenteral nutrition. This was unsuccessful, and he later underwent a left thoracotomy along with drainage of the mediastinal pouch, wedge resection of the left upper lobe, and mass ligation of the thoracic duct. No patient died and the mortality rate in the study was 0.0%.

Discussion

The true incidence of pulmonary injuries is unknown and difficult to estimate from the literature [9]. The reported incidence of civilian pulmonary injuries varies according to authors and institutions. Graham [10] reported a 1-year experience in which 373 patients sustained penetrating pulmonary injuries. Robison [11] described a 13-year civilian experience in the management of pulmonary injuries in 1168 patients. Tominaga [12] described a 7-year single institutional experience of 2934 patients sustaining both blunt and penetrating chest trauma. Petrone [13] described 101 patients who sustained complex penetrating pulmonary injuries.

Mechanism of injury is important; penetrating injury is usually the result of direct application of a mechanical force to a focal area and depends on the velocity and biomechanics of the projectile. Penetrating injuries can be divided into 3 groups (low, medium, or high) according to the velocity of the projectile. Low-velocity injuries include stab wounds that disrupt only the structures penetrated.

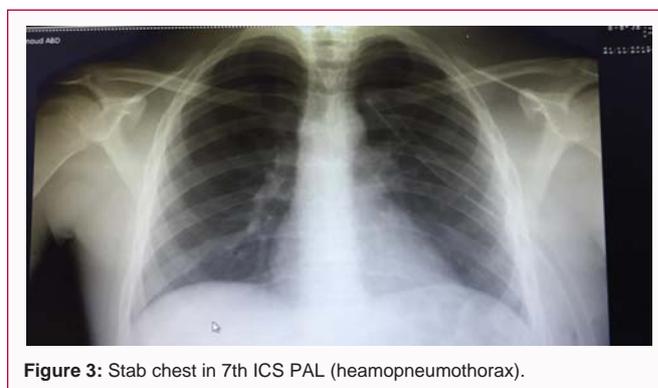


Figure 3: Stab chest in 7th ICS PAL (hemothorax).

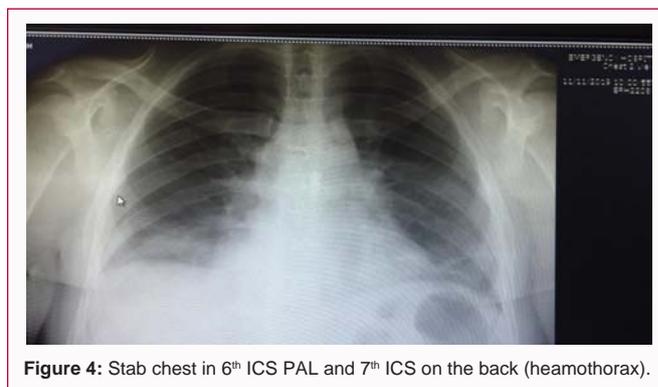


Figure 4: Stab chest in 6th ICS PAL and 7th ICS on the back (hemothorax).

Medium-velocity injuries include bullet wounds from handguns and are characterized by much less primary tissue destruction than wounds caused by high-velocity injuries. Those injuries include bullet wounds caused by rifles, which produce injury in adjacent structures in addition to that in the bullet path, tissue cavitation, and shock waves that extend beyond the area of tissue damage. The velocity of the penetrating projectile is the single most important factor that determines the severity of the wound. The degree of injury also depends on the biomechanics of the penetrating projectile, in which energy is transferred from the object to the body tissues [14].

Studies have shown that most chest injuries can be treated by relatively simple nonsurgical methods, such as tube thoracostomy, appropriate analgesics management, oxygen inhalation therapy, and good pulmonary toilet [15]. In our study, Stab wounds were the most frequent mode of injury, comprising 162 cases (90%); the remaining 18 patients (10%) suffered from gunshot wounds, comprising both homicidal and suicidal penetrating traumas.

In terms of management, 117 patients (65%) were treated with only tube thoracostomy, 36 patients (20%) had conservative management, and 27 patients (15%) had thoracotomy and exploration. In the 18 gunshot wound patients, 6 (33.3%) had thoracotomy, whereas only 11 (6.8%) of the 162 stab-wound patients had exploration. Males outnumbered females by a huge margin of 10:1 due to their greater

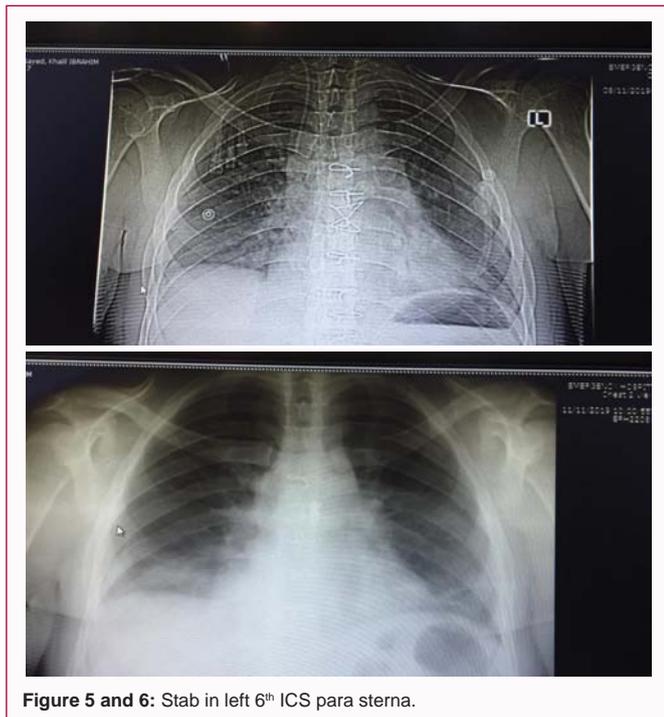


Figure 5 and 6: Stab in left 6th ICS para sterna.

exposure to outdoor activities and propensity to violence. The male preponderance of 10:1 is higher than the 5.5:1 ratio reported in a prospective analysis of 168 patients in Nigeria [15]. A higher incidence of 14.9:1 was found in a Pakistani study with 191 cases.

Left-sided injuries outnumbered right-sided injuries with a margin of 1.7:1 because culprits were mostly right handed [16]. This is very similar to the 10.2% reported in a Belgian study, but much less than the 16.1% reported in Nigeria by Thomas et al. [17]. One patient with diaphragmatic injury underwent primary suturation of the diaphragm and another patient had right auricular laceration. In their study, Özyazıcıoğlu [18] mentioned that mortality rates from penetrating cardiac injuries have declined over the years. Our case was operated successfully by simple suturation of right auriculae. The estimated mortality for penetrating chest trauma patients is also very variable. The overall mortality rate reported in the literature for patients with traumatic pulmonary injuries ranges from 1.7% to 37%. [19,20].

Conclusion

The results of our study add further data on the knowledge that penetrating thoracic trauma is not a negligible cause of morbidity and mortality in our hospital. In conclusion, chest tube thoracostomy should remain by far the most common method of treating penetrating injury to the thorax, with only 15% of patients requiring thoracotomy.

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