



DIAGNOSIS AND TREATMENT OF THORACIC INJURIES AND TRAUMATIC HEMOPNEUMOTHORAX

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SUMMARY

Purpose: The purpose of the study is to analyze the diagnosis and treatment of patients with traumatic chest injuries and traumatic hemopneumothorax in UMHATEM "N. I. Pirogov".

Material and Methods: Data on 113 patients with thoracic trauma were processed within a retrospective clinical analysis for the period of 1.1. 2016 to 1.1. 2018 in the General, Visceral and Emergency Surgery Section of the UMHATEM "Pirogov. Of the hospitalized women are 38 (33.63%), men 75 (66.37%). The age in this retrospective analysis varied from 18 to 83 years (average 57.4 years).

Results: In our study, among 113 patients, 43 patients had a pneumothorax, 29 patients were with hemothorax, 18 patients with hemopneumothorax, 2 patients had tension pneumothorax and others 21 had only rib fractures. Associated injuries were confirmed in 43 patients (38.05%). From all patients group, 21 patients were managed conservatively, 89 patients with chest tube insertion and only 3 with thoracotomy.

Conclusions: The majority of the patients with a thoracic injury can be performed in emergency surgery by conservative management or by mini-intervention- thoracic chest tube. Tube thoracostomy was evaluated to be important for pleural collections from blunt or penetrating trauma. Therefore it was recommended as a first-line therapeutic approach.

Keywords: thoracic injury, hemothorax, pneumothorax, chest tube, management,

INTRODUCTION

Thoracic trauma is a major public health problem around the world. It is related to a very high complication rate and death. The thoracic cage plays an important role in respiration and protection of the vital intrathoracic and upper abdominal organs from the externally applied force. It is composed of rigid structures- rib cage, clavicle, sternum, scapula, and heavy overlying musculature.

Chest trauma implies trauma of anatomical structures from four thoracic regions- chest wall, pleural space, lung parenchyma, and the mediastinum [1]. Approximately 25% of trauma deaths are caused by the trauma of

the thorax, and many of the cases can be performed by precise diagnosis and proper management [2]. In thoracic injury, emergency care is conducted to the evaluation of the severity of the injury, estimation of the volume of blood loss and its treatment by intravenous transfusion, the recognition of hypoxia and respiratory distress and correction by an assurance of a clear airway, full pulmonary expansion and mechanical support of ventilation when necessary [3]. Many of these injuries of thoracic structures can be surgery performed by simple intervention-tube thoracostomy. Most of these thoracic injuries are caused by road traffic accidents, fall from a height, blunt trauma, and stab wounds. They take the major share in thoracic surgery. Pre-hospital deaths from thoracic injuries are a result of great vessel rupture and massive hemorrhage, cardiac tamponade [4], tension pneumothorax, and bilateral flail chest with deep refractory hypoxia.

Traumatic pneumothorax is defined as the presence of air in the pleural cavity, i.e., the space between the chest wall and the lung itself. Itard first recognized pneumothorax in 1803, and Laennec described the full clinical picture of the condition. Without the negative intrapleural pressure holding the lungs against the chest wall, their elastic recoil properties cause them to collapse. The main physiologic consequences of pneumothorax are a decrease in the vital capacity and a decrease in the partial pressure of arterial oxygen (PaO₂). If there is a pathological respiratory function before the pneumothorax, the decrease in the vital capacity may lead to respiratory insufficiency with alveolar hypoventilation and respiratory acidosis. In a tension pneumothorax, the intrathoracic air pressure is much higher than atmospheric pressure. The mechanism of these injuries like tension pneumothorax is caused by some kind of a one-way valve process in which the valve is open during inspiration and closed during expiration. If extrapleural air pressure remains relatively higher than the pressure in the intrapleural cavity over a period of time, then the air in pleural space and extra-thoracic space will begin to equalised. This may cause a mediastinal shift, compression of the superior vena cava, compression of the contralateral lung. The shorten volume returning to the heart causes a reduced stroke volume and consequently reduced cardiac output. This may result in hemodynamic collapse and obstructive

shock [5].

Blunt thoracic injuries could lead to hemothorax, pulmonary contusion, pulmonary laceration, traumatic pulmonary pseudocyst, pulmonary hematoma, traumatic asphyxia, and skeletal injuries. Multiple rib fractures prevailed in most cases with blunt chest injuries and occurred in about 36-50% of the patients (about 36% on the right side and 51% on the left side).

A minor hemothorax may be missed during a physical examination and even on chest radiography.

Thoracic trauma is divided into simple and complex chest wall injury.

A simple thoracic injury includes less than three single rib fractures and superficial soft tissue injuries. This type of trauma could be treated by conservative treatment.

Fractures of three or more sequential ribs and a flail chest are classified as complex chest wall injuries and frequently caused a significant hemothorax.

A hemothorax can develop after a time interval of trauma. Variable mechanisms of progression of delayed hemothorax are displacement of fractured ribs with pulmonary parenchymal laceration, lesion of the diaphragm, or intercostal vessel disruption [6, 7]

The purpose of the study is to analyze the diagnosis and treatment of patients with traumatic chest injuries and traumatic hemopneumothorax in UMHATEM "N. I. Pirogov".

MATERIAL AND METHODS

Data on 113 patients with thoracic trauma were processed within a retrospective clinical analysis for the period of 1.1. 2016 to 1.1. 2018 in the General, Visceral and Emergency Surgery Section of the UMHATEM "Pirogov". The clinical diagnosis was based on history, physical examination, laboratory results, radiography, echography, and CT. Thoracic pain was recorded in 95% of cases. Of the hospitalized women are 38 (33.63%), men 75 (66.37%). In this study, the parameters - age, gender distribution, clinical symptoms, mode of treatment, morbidity, and mortality were analyzed. The age in this retrospective analysis varied from 18 to 83 years (average 57.4 years).

Patients who came to the emergency surgery department

with chest and associated trauma and who had clinical and radiological findings of thoracic trauma were included in this study.

Most of the cases in this study were with:

a) an accumulation of more than 700 cc of blood in the pleural cavity,

b) nonhomogeneous opacity more than almost half of a hemothorax on the PA chest radiograph and CT,

c) ongoing drainage and hemodynamic stability in patients with a diagnosis of hemothorax.

They were defined as massive hemothorax. The diagnosis was verified with the presence of blood from the chest tube. The thoracic ultrasonographic (USG) and CT findings were performed in patients with stable general status and vital parameters. The blood transfusion was planned until the insertion of the chest tube, and adequate blood replacement was applied in most of the cases. A first-line emergency approach, a 24-32F chest tube was inserted at the intersection in the fifth or sixth intercostal space and mid- or posterior-axillary line of the chest with hemothorax. The presence of continuous acute bleeding of 1500 ml from the thoracic tube and bleeding of more than 150-200 ml per 4 h was considered a significant factor for emergency thoracotomy. The tube thoracostomy was extracted upon the end of hemorrhagic drainage or the serious transformation of the drainage that was fall below 50 ml per day. Postoperative and follow-up complications were recorded. Patients with a good general condition were discharged after 24-48 h of the removal of the thoracic tube.

Patients under 18 years of age were excluded from the study.

The data from all patients admitted with thoracic trauma were carefully systematized, analyzed, and summarized. The results were summarized by tracking the morbidity up to one-month post-discharge.

RESULTS

The main causes of the thoracic trauma were road traffic accidents - 42 cases (37.17%), followed by domestic accidents-39 (34.51%), criminal accidents-16(14.16%), high altitude injuries-9 (7.96%) and industrial accidents-7 (6.2%)(Table 1).

Table 1. Main causes of the thoracic trauma

Main causes of the trauma	113 (100%)
road traffic accidents	42 (37.17%)
domestic accidents	39(34.51%)
criminal accidents	16 (14.16%)
high altitude injuries	9(7.96%)
industrial accidents	7(6.2%)

Thoracic pain (107 patients-95%) and dyspnea (70-61.95%) were recorded from the physical examinations. There were 21 patients (18.48%) with hypotension (<90 mmHg) or shock. Associated injuries were confirmed in

43 patients (38.05%), like major trauma of the musculoskeletal system (21 patients), followed by intra-abdominal lesions (13 patients) and cranio-cerebral trauma (9 patients)(Table 2).

Table 2.Associated injuries

Associated injuries	43 (38.05%)
trauma of the musculoskeletal system	21 (18.58%)
intra-abdominal lesions	13 (11.5%)
cranio-cerebral trauma	9 (7.96%)

All enrolled patients had decreased hematological parameters (hemoglobin and hematocrit), and a large group of them - leukocytosis.

In our study, among 113 patients, 43 patients had

a pneumothorax, 29 patients were with hemothorax, 18 patients with hemopneumothorax, 2 patients had tension pneumothorax and others 21 had only rib fractures (Table 3).

Table 3.Type of thoracic injury

Type of thoracic injury	100%
pneumothorax	43 (38.05%)
hemothorax	29(25.66%)
hemopneumothorax	18 (15.93%)
tension pneumothorax	2 (1.77%)
thoracic trauma with rib fractures only	21 (18.58%)

From all patients group, 21 patients were managed conservatively, 89 patients with chest tube insertion and only 3 with thoracotomy.

Hospital stays varied from 2 to 16 days (average

4.8 days).

Morbidity was 11.5% (13 patients). Of these, 4 were with wound infection, 6 with recidive pneumothorax, and 3 with pulmonary abscess(Table 4).

Table 4.Morbidity distribution

Morbidity distribution	13 (11.5%)
wound infection	4 (3.54%)
recidive pneumothorax	6 (5.31%)
pulmonary abscess	3 (2.65%)

Mortality was 4.42% - 5 died. Mainly due to severe associated injuries and shock and were not directly related to surgical intervention.

DISCUSSION

Many western studies suggest that conservative management or thoracic tube insertion, sufficient volume replacement, occasional respiratory support, and control chest radiography are the treatment required in 80-85% of the cases with thoracic injury [8, 9]. In our study, 81.42% of patients were improved with conservative and intercostal chest drain management, which is similar to world literature today.

The most common clinical presentation in this study was minor thoracic injury with chest pain followed by rib fracture, almost the same other world studies. They also revealed that the fracture of ribs is the most common thoracic injury followed by lung contusion [10].

In this study, 81.42% of patients have a pleural collection (i.e. hemothorax, pneumothorax, or hemopneumothorax) and were treated with an intercostal

chest drain. The rest of the 21 have been improved with conservative management. Patients having mild pneumothorax were observed. Conservative management for all of the group included analgesics, antibiotics, fluids, chest physiotherapy and bronchosecretolytics. Vital signs were monitored.

In some large African series of predominantly penetrating thoracic trauma[11], traumatic pneumothorax was mostly performed conservatively if there was a 20% reduction in lung volume. Most of the world studies suggest that chest tube is compulsory for patients with significant pleural collections (>600ml.), in respiratory distress as a clinical sign, patients who require invasive positive pressure ventilation (IPPV), cases with significant associated injuries, and those who are manifesting respiratory distress syndrome during conservative management [12, 13].

Nowadays, using a VATS drainage in isolated massive hemothorax cases is very common. This was confirmed in various publications in recent years. We use VATS drainage in some rare cases, and because of that, it

was not presented in this clinical study. The main reason was that most of the patients indicated for emergency surgery with massive hemothorax had an unstable status, including cardiac complications [14, 15].

CONCLUSION

The majority of the patients with a thoracic injury can be performed in emergency surgery by conservative management or by mini-intervention- thoracic chest tube.

Tube thoracostomy was evaluated to be important for pleural collections from blunt or penetrating trauma. Therefore it was recommended as a first-line therapeutic approach.

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