Chest Trauma Evaluation and Outcome of Management in a Tertiary Hospital-One year experience

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ABSTRACT

Background: Chest trauma is responsible for 50% of deaths due to trauma. This kind of death usually occurs immediately after trauma. Various therapeutic options have been reported for management of chest injuries like clinical observation, thoracocentesis, tube thoracostomy and open thoracotomy.

Methods: This is an observational study carried out in the department of Casualty, Chittagong Medical College Hospital over a period of one year (from April 2015 to March 2016). All the patients (both male and female) admitted in the casualty units within the specified period were included in this study.

Result: The mean age was found 37.7±18.1 years and male-female ratio was 11.8:1. Almost one third (35.7%) patients were affected by road traffic accident. 42(27.2%) patients were found open pneumothorax followed by rib fracture-41(26.6%), haemopneumothorax-31(20.1%), pneumothorax-14(9%), haemothorax-12(7.8%), chest wall injury-6(3.9%), tension pneumothorax-5(3.2%), and flail chest-3(1.9%). More than three fourth (80.5%) patients were managed by tube thoracostomy followed by 28(18.2%) observation and 2(1.3%) ventilatory support. No thoracotomy was done in emergency department. Re-insertion of ICT was done in 6(4.7%) patients. More than two third (68.2%) patients recovered well, 43(27.9%) patients developed complications and 6(3.9%) patients died.

Conclusion: Most of the patients were in 3rd decade with male predominance. Road traffic accident was the commonest cause and open pneumothorax was the commonest chest trauma. Three-fourths were managed by tube thoracostomy. Nearly one third of the patients had developed complications and about four percent of patients died.

Keywords: Chest trauma; Tube thoracostomy.

Introduction

Chest injuries are often life threatening. They account for 25% of all trauma death.¹ Despite of its severity, less than 10% of blunt chest injuries and 15% -30% of penetrating thoracic trauma require thoracotomy.² Most patients are cared for with simple interventions such as tube thoracostomy.³⁻⁶ Hippocrates was the first to report from chest decompression in case of pleural empyema.⁷ In 1978 Hewitt was the first to use a completely closed intercostal drainage system.⁸ Many patients with chest injury can be managed non-operatively and the key is early physiological resuscitation followed by diagnosis. A reproducible and safe approach to diagnosis and management of chest injury is taught by the Advanced Trauma Life Support course.

The life threatening injuries in case of chest injury are airway obstruction, tension pneumothorax, pericardiac tamponade, open pneumothorax, massive haemothorax, flail chest etc. Efficient initial assessment should focus on identifying and correcting the immediate threats of life by using ATLS protocol. The management range from observation to tube thoracostomy, thoracotomy and ventilatory support. Patients having minor chest wall injuries, rib fractures without haemopneumothorax
and mild lung contusion can be treated conservatively. Patients having blood or air in the pleura can be treated with tube thoracostomy. Initial management of life threatening thoracic injuries carried out according to type and nature of injury. In particular ATLS recommends that all traumatic pneumothoraces be treated by tube thoracostomy on the basis that any simple pneumothorax left untreated could convert into a life threatening tension pneumothorax. ATLS also recommends that acute haemothorax, sufficiently large to appear on chest radiograph, best treated with a chest drain. The drain evacuates blood, reduces the risk of clotted haemothorax and provides a mean of continuously monitoring blood loss. In case of sucking chest wound (open pneumothorax) no attempt should be made to close the wound until tube thoracostomy in done\(^9\).

The purpose of the study is to observe the outcome of chest trauma and identify the factors related to mortality and morbidity regarding chest trauma in a tertiary hospital.

**Materials and Methods**

This is an Observational study carried out in Casualty units of Chittagong Medical College Hospital (CMCH), Chittagong, Bangladesh from April 2015 to March 2016. All patients, both male and female, admitted at Casualty units of Chittagong Medical College Hospital following chest injury were included. Patients with polytrauma e.g. head injury, abdominal injury, limb trauma were excluded from the study. Sample size was 154. All the data were recorded through the preformed data collection sheet.

Entire group of patients admitted with chest trauma were managed according to Advance Trauma Life Support. In haemodynamically unstable patients, features of tension pneumothorax or open pneumothorax, immediate tube thoracostomy was done on affected side. Haemodynamically stable patient were investigated on an emergency basis. Chest X-ray both A/P and Lateral view were mostly diagnostic. As soon as diagnosis has been made, decision was taken about type of management whether conservative or surgical procedure should be adopted.

All the relevant data will be summerized in form of proportion and frequency table for categorical variables.

The quantitative observations were indicated by frequencies and percentages. Statistical analyses were carried out by using the Statistical Package for Social Sciences version 16.0 for Windows (SPSS Inc., Chicago, Illinois, USA).

**Chest trauma**

Chest trauma implies trauma to any or combination of different thoracic structures, which can arbitrarily be divided into 4 distinct anatomical regions i.e. the chest wall, the pleural space, the lung parenchyma and the mediastinum. It may be classified into blunt and open chest trauma.

**Tube Thoracostomy**

Insertion of water seal drain tube into chest cavity through triangle of safety to drain out air, blood or any collection

**Results**

Almost one third (29.9%) patients belonged to age 21-30 years. The mean age was found 32.7±18.1 years with range from 12 to 80 years (Table 1). 92.2% patients were male and 7.8% patients were female (Fig. 1). Male female ratio was 11.8:1. The mean time elapsed after trauma was found 6.1±3.1 hours with range from 1 to 72 hours. Majority (72.7%) of patients were found with 6-12 hours of elapse after trauma. More than three fourth (80.5%) patients were found treated with tube thoracostomy followed by 28(18.2%) observation and 2(1.3%) ventilatory support with ICT (Table 3). No thoracotomy was done on emergency basis.

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>No. of Patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤20</td>
<td>29</td>
<td>18.8</td>
</tr>
<tr>
<td>21-30</td>
<td>46</td>
<td>29.9</td>
</tr>
<tr>
<td>31-40</td>
<td>23</td>
<td>14.9</td>
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<tr>
<td>41-50</td>
<td>19</td>
<td>12.3</td>
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<tr>
<td>51-60</td>
<td>19</td>
<td>12.3</td>
</tr>
<tr>
<td>61-70</td>
<td>13</td>
<td>8.4</td>
</tr>
<tr>
<td>&gt;71</td>
<td>5</td>
<td>3.2</td>
</tr>
</tbody>
</table>

Mean±SD    32.7±18.1

SD=Standard deviation
Pattern of injury of the study patients revealed that 42 (27.2%) patients was found open pneumothorax followed by 41 (26.6%) rib fracture and 31 (20.1%) haemopneumothorax (Table 4). It was observed that 25 (16.2%) patients had hypertension, 16 (10.4%) had diabetes and 4 (2.6%) had ischemic heart disease. 13 (30.0%) patients had persistent haemothorax followed by 12 (29.0%) outside triangle, 6 (13.9%) kinked/blocked, 6 (13.9%) port side infection, 2 (4.5%) too shallow, 2 (4.5%) empyema thoracis and 2 (4.5%) broncho-pleural fistula following ICT insertion (Table 5).
behavior. In this series, the mean time elapsed after trauma was found 6.1±3.1 hours with range from 1 to 72 hours which indicate a lack of pre-hospital management of trauma victims in our country.

One-third (35.7%) patients were affected by road traffic accident followed by 27.3% assault, 22.7% stab injury, 9.7% fall and 4.5% gun shot in this study. Gabal et al.\textsuperscript{14} found road traffic accidents in 65(81.25%) patients; Mohammadzadeh et al.\textsuperscript{12} found in the blunt trauma group, the most frequent cause of trauma was car accidents (72%). In another study Khan et al.\textsuperscript{13} found road traffic accident was 40.0% and Shorr et al.\textsuperscript{1} observed motor vehicle accidents were responsible for 78.0% of the injuries.

In this present study, it was observed that more than three fourth (80.5%) patients were undergone tube thoracostomy followed by 18.2% observation and 1.3% needed ventilator support with tube thoracostomy. No emergency thoracotomy was done but 2 patients underwent thoracotomy later for management of complication. Khan et al.\textsuperscript{13} mentioned that thoracotomy was required in 21% patients, in which only 22% were emergency thoracotomy. All thoracotomies were performed in penetrating injuries; tube thoracostomy was done in 62.0% and thoracotomy in 9%. Farooq et al.\textsuperscript{10} also reported that 80% of thoracotomies were performed in penetrating injury because of bleeding vessels. Overall thoracotomy rate was 9% which is same as Hanif et al.\textsuperscript{12} has mentioned and 8% reported by Farooq et al.\textsuperscript{10} in their studies. It shows thoracotomy rate is more in penetrating injury than blunt trauma.

Regarding the pattern of injuries, it was observed in this study that 42 (27.2%) patients was found open pneumothorax followed by 26.6% rib fracture, 20.1% haemopneumothorax, 9% simple pneumothorax, 7.8% haemothorax, 3.9% chest wall injury, 3.2% tension pneumothorax and 1.9% flail chest. Similarly, Mohammadzadeh et al.\textsuperscript{12} found the incidence of haemothorax was 38% in blunt traumas and 45% in penetrating ones. The incidence of pneumothorax was 43% in blunt trauma and 20% in penetrating cases. In another study Khan et al.\textsuperscript{13} found rib fracture was 85.0%, lung contusion 6%, haemothorax 5%, pneumothorax 59%, haemopneumothorax 7%, diaphragmatic rupture 5%, flail chest 3% and multiple trauma two systems involvement 19%. Rib fracture were found in 44% of cases in the study by Farooq et al.\textsuperscript{10} and 76% in Hanif et al.\textsuperscript{16}, while Flail chest was

\begin{table}[h!]
\centering
\begin{tabular}{lccc}
\hline
Length of hospital stay (day) & No. of patients & Percentage \\
\hline
≤10 & 99 & 66.9 \\
11-20 & 43 & 29.1 \\
>20 Mean±SD & 611.0±8.6 & 4.1 \\
\hline
\end{tabular}
\caption{Distribution of the study patients by length of hospital stay (n=148) }
\end{table}
found in 3% in comparison to 20% shown by Farooq et al., and 6.6% by Hanif. In another study, Farooq et al. detected pneumothorax was in 39.0% of the patients, haemopneumothorax in 29.0%, haemothorax in 12.0% and flail chest in 9.0%. Bailey reported that the commonest indications for tube thoracostomy were pneumothorax 54.0% and haemothorax 20.0%.

In this present study, it was observed that among the complications 30% patients had persistent haemothorax followed by 29% tube was found outside triangle of safety, 13.9% tube was kinked, 13.9% port side infection, 4.5% too shallow, 4.5% empyema thoracis and 4.5% broncho-pleural fistula. Mohammadzadeh et al. reported that the most (54.9%) frequent complication was haemothorax, as has been mentioned by Haratian et al. Khan et al. obtained that 2% patients developed empyema in comparison to 3% by Helling et al. Complications were experienced in 28% of the patients of which 9% had pneumonias, 14% empyema and 5% suffered from wound infections observed by Farooq et al. Bailey mentioned that the overall complication rate related to tube thoracostomy was 30.0%; Etoch et al. encountered an overall complication rate of 21% per tube thoracostomy in their series in 1995. Collop et al. encountered 14 complications in 126 tube thoracostomies (11% complication rate) whereas Chan et al. encountered 18.2% complication rate.

Two third (63.1%) patient's ICT removal was done between 6-10 days. The mean ICT removal information was found 8.8±3.6 days with range from 4 to 18 days. Similarly, Gabal et al. observed ICT stayed in their patients from 2 to 15 days with mean duration was 5.91±2.6 days. In this series, it was observed that (95.3%) patients not needed re-insertion of ICT and 4.7% needed re-insertion of ICT which was managed in this center. But persistence of ICT in 11.6% patient (8.8% persistent haemothorax, 1.2% empyema thoracic, 1.2% bronchopleural fistula) who were referred to higher center for better management.

Furthermore, two third (68.2%) patients recovered well, 27.9% developed complications and 3.9% died. Similarly, Battle et al. recorded a total of 31 (6%) deaths. Apart from dead cases, more than two third (66.9%) patients had length of hospital stay less than 10 days. The mean length of hospital stay was found in 11±3.6 days with range from 1 to 39 days. Similarly, Mohammadzadeh et al. and Gabal et al. found 12±3.2 days' and 9.1±2.73 days' of hospital stay respectively. Among different complications, 47.4% were procedure related (29.0% improper placement, 4.5% too shallow, 13.9% tubes were kinked) and 18.4% were infection related (13.9% port site infection and 4.5% empyema thoracis). So, a good training of the trauma team and a sterile operation theatre and clean ward environment can reduce the infection rate and better outcome of the chest trauma patient.

**Conclusion**

Chest trauma is a major health problem worldwide and associated with high morbidity and mortality. Most of the victims are young adult males in their productive age group. Road traffic accident was the most common cause, open pneumothorax was common presentation and tube thoracostomy was the commonest treatment modality. The pattern of chest trauma and its management and outcome is almost similar to many series. Urgent preventive measures targeting at reducing the occurrences of road traffic accidents and social violence are necessary to reduce the incidence of chest injury.

**References**


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