



Original Article

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 haemo/pneumothorax

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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 is done⁹.

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 Observetional 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 1. Distribution of the study patients by age (n=154)

Age (years)	No. of Patients	Percentage
≤20	29	18.8
21-30	46	29.9
31-40	23	14.9
41-50	19	12.3
51-60	19	12.3
61-70	13	8.4
>71	5	3.2
Mean±SD		32.7±18.1

SD=Standard deviation

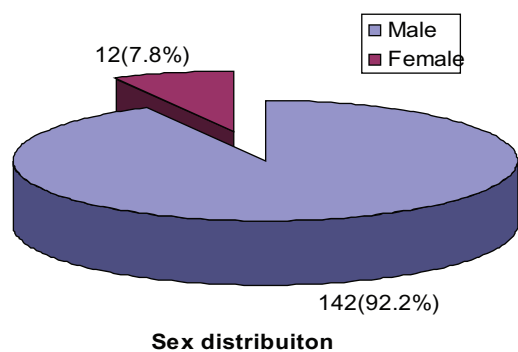


Figure 1. Pie chart showing sex distribution of the patients

Table 2. Distribution of the study patients by mechanism of injury (n=154)

Mechanism of injury	No. of patients	Percentage
Blunt		
Road traffic accident	55	35.7
Assault	42	27.3
Fall	15	9.7
Penetrating		
Stab injury	35	22.7
Gun shoot	7	4.5

Table 3. Distribution of the study patients by management (n=154)

Management	No. of patients	Percentage
Tube thoracostomy	124	80.5
Observation	28	18.2
Ventilator support with ICT	2	1.3
Thoracotomy	0	0.0

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).

Table 4. Distribution of the study patients by pattern of injury (n=154)

Pattern of injury	No. of patients	Percentage
Rib fracture	41	26.6
Haemopneumothorax	31	20.1
Open pneumothorax	42	27.2
Simple pneumothorax	14	9.0
Haemothorax	12	7.8
Chest wall injury	6	3.9
Tension pneumothorax	5	3.2
Flail chest	3	1.9

Table 5. Distribution of the study patients by complication (n=43)

Complication	No. of patients	Percentage
Persistent haemothorax	13	30.0
Improper position	12	29.0
Kinked /blocked tube	6	13.9
Port side infection	6	13.9
Too shallow	2	4.5
Empyema thoracic	2	4.5
Broncho-pleural fistula	2	4.5

Table 6. Distribution of the study patients by re-insertion of ICT (n=126)

Re-insertion of ICT	No. of patients	Percentage
Needed	6	4.7
Not needed	120	95.3

It was observed that more than two third (68.2%) patients recovered well, 43(27.9%) developed complications and 6(3.9%) patients died (Fig. 2). More than two third (66.9%) patients had length of hospital stay was less than 10 days. The mean length of hospital stay was found 11.0 ± 8.6 days with range from 1 to 39 days (Table 7).

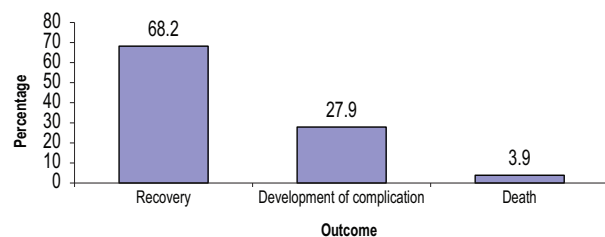


Figure 2. Bar diagram showing outcome of the patients

Table 7. Distribution of the study patients by length of hospital stay (n=148)

Length of hospital stay (day)	No. of patients	Percentage
≤10	99	66.9
11-20	43	29.1
>20 Mean±SD	611.0±8.6	4.1

Discussion

This observational study was carried out with an aim to see the patterns of chest injury and to evaluate morbidity and mortality. In this study, it was observed that almost one third (29.9%) patients were in 3rd decade and the mean age was found 32.7±18.1 years with range from 12 to 80 years. Similarly, Khan *et al.*¹³ found the mean age of patients was 36 years with the range of 12-70 years, while Farooq *et al.*¹⁰ showed 37 years and Hanif *et al.*¹⁶ 30 years in their studies, which are comparable with the current study. Mohammadzadeh *et al.*¹² found the mean age of the patients was 24.7 ± 3.1 years. The most frequent age group affected was 20-30 (35%) year olds, which is lesser than the current study. On the other hand, Gabal *et al.*¹⁴ found the mean age of the patients was 40±1 years varied from 15-70 years, which is higher with the current study. Similarly, Bailey¹¹ also had higher mean age in their study where they found the mean age was 43 years. This may be due to geographical variations, racial and ethnic differences and different lifestyles have influence on chest trauma.

In this current study, majority (92.2%) patients were male and 7.8% patients were female. Male female ratio was 11.8:1, which is consistent with Mohammadzadeh *et al.*¹² study, where they found male was 80.0% and female 20.0%. Similarly, male predominance was also observed by Khan *et al.*¹³ and Bailey¹¹; this is probably due to male are more mobile with active participation in high risk tasking

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.*¹⁴ found road traffic accidents in 65(81.25%) patients; Mohammadzadeh *et al.*¹² found in the blunt trauma group, the most frequent cause of trauma was car accidents (72%). In another study Khan *et al.*¹³ found road traffic accident was 40.0% and Shorr *et al.*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.*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.*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.*¹⁶ has mentioned and 8% reported by Farooq *et al.*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.*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.*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.*¹⁰ and 76% in Hanif *et al.*¹⁶, while Flail chest was

found in 3% in comparison to 20% shown by Farooq *et al.*¹⁰ and 6.6% by Hanif.¹⁶ In another study Farooq *et al.*¹⁰ detected pneumothorax was in 39.0% of the patients, haemopneumothorax in 29.0%, haemothorax in 12.0% and flail chest in 9.0%. Bailey¹¹ 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.*¹² reported that the most (54.9%) frequent complication was haemothorax, as has been mentioned by Haratian *et al.*²⁶ Khan *et al.*¹³ obtained that 2% patients developed empyema in comparison to 3% by Helling *et al.*^{25w} 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.*¹⁰ Bailey¹¹ mentioned that the overall complication rate related to tube thoracostomy was 30.0%; Etoch *et al.*²² encountered an overall complication rate of 21% per tube thoracostomy in their series in 1995. Collop *et al.*²³ encountered 14 complications in 126 tube thoracostomies (11% complication rate) whereas Chan *et al.*²⁴ 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.*¹⁴ 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.*¹⁵ 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 11.0 ± 8.6 days with range from 1 to 39 days. Similarly, Mohammadzadeh *et al.*¹² and Gabal *et al.*¹⁴

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.

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