

Blunt thoracic trauma — an analysis of 264 patients in Rawalpindi, Pakistan

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Abstract

Objective: To analyse the outcome in terms of morbidity and mortality in blunt thoracic trauma patients in tertiary care hospitals, Rawalpindi.

Methods: The prospective study was conducted from March 2008 to February 2012 in surgical wards of public and private sector hospitals in Rawalpindi. A total of 221 patients were included from the Combined Military Hospital during 2008-10, and 43 patients from the Heart's International during 2011-12. The patients reported to emergency department within 48 hours of trauma. All patients were subjected to detailed history and respiratory system examination to ascertain fracture of ribs, flail segment and haemopneumothorax. The diagnosis of chest wall injuries, parenchymal pulmonary injuries and pleural involvement were made on the basis of chest radiographs and computed tomography scan of the chest. The lung contusion was assessed by the number of lobes involved. SPSS 19 was used for statistical analysis.

Results: Of the 264 patients in the study, 211 (80%) were males and 54 (20%) females. The overall mean age was 44.8 ± 17.1 years. Over all morbidity was 222 (84.2%); morbidity (minor) was 128 (48.5%), and morbidity (major) was 94 (35.7%). Mortality was 26 (9.8%) and 16 (6%) cases had normal outcome.

Conclusion: Early identification and aggressive management of blunt thoracic trauma is essential to reducing significant rates of morbidity and mortality.

Keywords: Blunt chest trauma, Poly trauma, Thoracic trauma, Blunt thoracic trauma. (JPMA 64: 375; 2014)

Introduction

Blunt chest trauma is the second leading cause of death among trauma patients in the world and is also associated with poly trauma.¹ Blunt thoracic trauma can result in significant morbidity in injured patients, both chest wall and the intra-thoracic visceral injuries can lead to life-threatening complications if not anticipated and treated.² Early identification and aggressive management of blunt thoracic trauma is essential to reduce the significant rates of morbidity and mortality.³ Pain control, aggressive pulmonary toilet, and mechanical ventilation when necessary are the mainstays of supportive treatment. The elderly with blunt chest trauma are especially at risk for pulmonary deterioration post-injury and should be monitored carefully regardless of their initial presentation. Blunt thoracic trauma is also a marker for associated injuries, including severe head and abdominal injuries.⁴

Traumatic injuries still constitute one of the leading causes of death in all age groups,^{5,6} with penetrating and blunt thoracic trauma accounting for 25-50% of all injuries, as well as being a contributing cause in 50% of

fatal civilian trauma.⁷ The majority of patients with thoracic trauma can be managed non-operatively, with or without tube thoracostomy.⁸ As a result, careful monitoring of vital signs, appropriate fluid replacement and analgesia constitute adequate therapy in up to 90% of such patients. However, there is still a small, but significant (10-15%), subgroup of thoracic trauma victims who require emergency thoracotomy.⁹

Thoracic trauma is one of the most common injuries in multiple trauma patients and has major prognostic relevance with regard to an increased risk for the development of post-traumatic complications and unfavourable outcome.¹⁰ A prompt and accurate assessment of trauma diagnosis and injury severity is crucial for the further treatment and diagnostic procedures.

The present study aimed to provide the overview of outcomes of 264 patients with blunt thoracic trauma reported to emergency department (ED) within 48 hours of trauma in two different public and private sector hospitals in Rawalpindi, Pakistan.

Patients and Methods

The prospective study was conducted during March 2008-February 2012 over a period of 4 years in surgical wards of a public and a private sector hospitals in Rawalpindi. Among 2008-10, 221 patients were included from the

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Combined Military Hospital, Rawalpindi, and during 2011-12, 68 patients, from the Heart's International Rawalpindi, were enrolled who had reported to ED within 48 hours of trauma. Penetrating chest trauma, complicated chest trauma cases i.e. empyema, clotted haemothorax and bronchopleural fistula were excluded.

Data was collected from all patients who were subjected to detailed history and respiratory system examination to ascertain fracture ribs, flail segment and haemopneumothorax. The lung contusion was assessed by the number of lobes involved. The diagnosis of chest wall injuries, parenchymal pulmonary injuries and pleural involvement were made on the basis of chest radiographs and computed tomography (CT) scan chest. Pressure of arterial oxygen/Fractional inspired oxygen concentration (PaO₂/FiO₂) horovitz quotient was calculated on admission and daily for ventilator-dependent patients.

Outcome was assessed in terms of morbidity and mortality. On the basis of post-trauma course, patients were categorised into four groups; 1) No post-trauma complications were taken as normal outcome; 2) Morbidity (minor) was taken as tenderness at the site of fracture ribs, haemothorax and pneumothorax managed with tube thoracostomy; 3) Morbidity (major) was taken as atelectasis, pneumonia, prolonged air leak, haemothorax requiring thoracotomy, all patients requiring ventilatory support, developing ventilation pneumonias and acute respiratory distress syndrome (ARDS); 4) Mortality meant death.

Written and informed consent was taken from each patient ahead of enrollment in the study. Permission was taken from the ethical committees of the two hospitals.

After discharge from the hospital, regular follow-up was done; minor morbidity patients were followed up weekly for a month, and patients with major morbidities were followed up initially weekly and then fortnightly for 3 months. No significant loss of follow-up was reported.

Data was collected from both the hospitals on the same proforma. Statistical analysis was done using SPSS Version 19. Descriptive statistics were used to calculate mean and standard deviation for age, PaO₂/FiO₂, ribs fracture and lung contusion. Frequencies and percentages were calculated to assess the outcome i.e. normal, morbidity and mortality in blunt thoracic trauma along with Univariate analysis.

Results

The mean age of 264 patients in the study was 44.8±17.1 years. There were 211 (80%) male and 53 (20%) female patients. The mean duration since injury was 12.2±11.7

Table-1: Distribution of rib fractures in blunt thoracic trauma patients and its association with mortality (n =264).

Number of ribs fractured	Frequency (Percentage)	Mortality
0	3 (1.1%)	None
1-2	60 (22.7%)	None
3-6	100 (37.8%)	2%
>3 Bilateral	46 (17.4%)	8.6%
Flail Chest	55 (21%)	36%

Table-2: Outcome in blunt thoracic trauma patients (n = 264).

Outcome	Frequency (Percentage %)
Normal (No post-trauma complications)	16 (6%)
Morbidity (minor) (tenderness at the site of fracture ribs, haemothorax and pneumothorax managed with tube thoracostomy)	128 (48.5%)
Morbidity (major) (Atelectasis, pneumonia, prolonged air leak, haemothorax requiring thoracotomy, patients requiring ventilatory support, developing ventilation pneumonias and ARDS)	94 (35.7%)
Mortality (death taken as fatal outcome)	26 (9.8%)

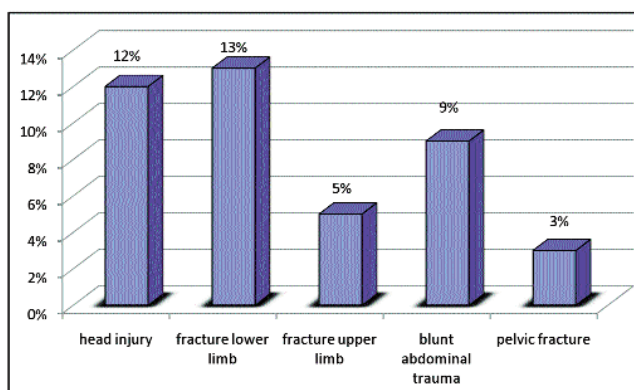


Figure-1: Associated injuries in blunt thoracic trauma patients (n = 111).

hours, and the mean hospital stay was 11.07±7.4 days.

Overall morbidity was 222 (84.2%); morbidity (minor) was seen in 128 (48.5%), and morbidity (major) in 94 (35.7%). Mortality was encountered in 26 (9.8%). Mortality for patients below 41 years of age was 22(8%) whereas mortality for patients of 42 years and above was 49(18.6%). Mortality occurred mainly due to flail chest 20 (36%), and lung contusions 6 (10.6%). The mean duration of hospital stay in mortality was 17.5±5.5 hours. Normal outcome was seen in 16 (6%) cases.

In terms of presentation, 153 (58%) patients presented with isolated blunt chest trauma and 111(42%) presented with poly trauma (Figure).

Chest radiograph of all blunt chest trauma patients was done. The number of ribs fractured in blunt thoracic trauma patients and its association with mortality was noted (Table-1). Lung contusion was assessed on chest radiograph and CT scan. No contusion was found in 101(38.2%). Unilateral 1 lobe was involved in 56(21%), bilateral 1 lobe in 56(21%), <2 lobes bilateral in 22(8%) while >2 lobes bilateral were contused in 30(11%) of the patients

PaO₂/FiO₂ horovitz quotient of all patients was calculated. It ranged from 133 to 406. On admission, PaO₂/FiO₂ ratio was <300 in 208(78.8%) cases with bilateral lung contusion; 189 (71.5 %) of these cases required ventilatory support. In unilateral lung contusion PaO₂/FiO₂ ratio was >400 in 9.6% and 300-400 in 47% of cases. Unilateral lung contusion had the mortality of 28(10.6 %) and that of bilateral was 110(41.6 %).

Pleural involvement was present in 233(88.2%) cases, 88(33.3%) cases of blunt chest trauma presented with unilateral, while 24(9.1%) with bilateral pneumothorax. Unilateral haemothorax was present in 145(55.5%), while bilateral was in 56(21%) cases.

Outcome was assessed as post-trauma course of the patient during hospital stay i.e. normal, morbidity and mortality (Table-2).

Discussion

In contrast with the mortality rate of 9.8% in the current study, previous studies have reported mortality rates reaching up to 60%.¹¹

According to a study in younger patients, the mortality associated with blunt trauma chest was 5% as compared to 10-15 % in older patients.¹² In the present study the mortality for patients below 41 years of age was 8%, whereas mortality for patients of 42 years and above was 18.6%. These results are comparable with the reported values in other studies.¹²

There was significant association between the mortality rate and number of rib fractures. Mortality rate 4.7% in patients with more than two rib fractures and 17% for those with flail chest.¹³ Another study also mentioned that greater the number of fractured ribs, the higher were the mortality and morbidity rates.¹⁴ It has been reported that flail chest is associated with a higher morbidity compared with multiple rib fractures. Flail chest patients had a higher need for mechanical ventilation and

significant respiratory complications. It proved to be an independent marker of poor outcome among patients with thoracic cage trauma.¹⁵

Evidence shows that PaO₂/FiO₂ was positively correlated with the volume of contused lung during the first 24 hours.¹⁶ In the current study, on admission PaO₂/FiO₂ ratio was < 300 in 78.8% of cases with bilateral lung contusion, and 71.4% of these cases required ventilatory support. According to a study, the presence of radiographic evidence of pulmonary contusion, and later need for mechanical ventilation were risk factors for increased mortality and were the main determinant of outcome for patients with thoracic trauma.¹⁷

A study described that injuries to the lung parenchyma, as determined by plain radiography, were associated with chest-related death, especially if the injuries were bilateral. Unilateral lung contusion had mortality of 25.2% and bilateral lung contusion had mortality of 53.3%.¹¹ In the present study, unilateral lung contusion had the mortality of 10.7% and bilateral had 41.5% mortality.

It has been reported previously that the development of pneumothorax and haemothorax was directly related with number of ribs fractured and it was highest 81.4% in patients with more than two rib fractures.¹³ Our findings are in line with this.

According to a study, the management of haemothorax related to trauma mostly required only tube thoracostomy. Only in true minority of individuals, operative intervention was necessary.¹⁸ Similarly in the current study, 3% of patients required thoracotomy for haemothorax and the rest of them were managed by tube thoracostomy.

Conclusion

Early identification and aggressive management of blunt thoracic trauma is essential to significantly reduce rates of morbidity and mortality.

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