## **Research Article**

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# Blunt trauma chest: our experience at rural tertiary care centre

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## **ABSTRACT**

**Background:** Every hour, 40 people under the age of 25 die in road accidents around the globe. According to the WHO, this is the second most important cause of death for 15 to 29 year olds. According to the latest report of National Crime Records Bureau or NCRB, Over 1, 37,000 people were killed in road accidents in 2013. Thoracic trauma forms one of the major parts of multiple traumas and is responsible for significant mortality and morbidity especially at younger ages.

**Methods:** We carried out a retrospective study to assess the prevalence of chest injury patients at Geetanjali medical college and hospital, Udaipur (Tertiary care rural centre) in last two years. Clinical details of the patients were recorded from their case sheets and were analyzed with reference to their age, sex, mode of injury, severity of injury, treatment employed, complication and final outcome etc.

Results: Males were predominantly involved (88.2%). Majority (61.9%) were in the age group of 21-30 years.

**Conclusions:** Chest injury occurs in a significant number of trauma patients and commonly affected victims are males of 20-40 years age. The majority of these patients were managed by simple intervention i.e., intercostals chest tube drainage and non –invasive ventilation, only less than 3% require thoracotomy.

Keywords: Blunt trauma, Flial chest, Haemothorax, Inter costal chest tube drainage

### **INTRODUCTION**

Accidents which are unexpected and unplanned events are becoming the major epidemic of non-communicable disease in the present century. The number of accidental deaths in India is even higher than in the Western World<sup>1</sup>. Thoracic trauma contributes heavily to these figures which may present as isolated injury or as a part of polytrauma. Blunt thoracic injuries are thought to result from a combination of crushing, compression, stretching and shearing forces. The magnitude of these forces directly related to the rate of their acceleration and deceleration and also their relative direction of impact. Although most of the fractures of bony thorax are benign

entities and can be followed up without hospitalization, trauma limited to the thoracic cage itself may cause profound pathophysiological alterations, which may be fatal if not promptly treated. On the other hand, the accurate identification of a patient at high risk for major chest trauma is essential for regulation of over and under triage within a trauma system. The present study focuses on blunt chest injuries, especially rib fractures and associated injuries. In spite of the high mortality rates, about 90% of the patients with life-threatening thoracic injuries can be managed by a simple intervention like intercostals tube drainage and non invasive ventilation. <sup>12</sup>

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Figure 1: X-Ray chest showing multiple rib fracture right side.

#### **METHODS**

We carried out a retrospective study to assess the prevalence of chest injury patients at Geetanjali medical college and hospital, Udaipur (Tertiary care rural centre) in last two years. Clinical details of the patients were recorded from their case sheets and were analysed with reference to their age, sex, mode of injury, severity of injury, treatment employed, complication and final outcome etc.

## **RESULTS**

A total of 1620 patients were admitted to emergency department of GMCH, Udaipur following trauma in the last 2 years. Out of these, 730 patients were admitted primarily because of chest injury, others were having head injury, abdominal injury or other multiple injuries.

Table 1: Associated injuries in patients with rib fractures.

Injuries	No. of patients	Percentage
Extremity & pelvis	38	
Intra abdominal	58	
Spinal trauma	6	
Diaphragmatic injury	2	
Aortic injury	0	
Facial trauma	16	
Cranial trauma	42	

Out of a total of 730 patients, the maximum (452) was in the age group of 21-30 years and the next common decade was the 4<sup>th</sup> i.e., 31-40 years, with 98 patients. So more than half of all the patients were in the 3<sup>rd</sup> and 4<sup>th</sup> decades of life and the incidence was low for very young and very old patients. There were 644 male (88.22%), and 86 female (11.78%) patients. Road traffic accidents were the most common reason for blunt chest injuries

(79.72%) (Table 2). Followed by fall from height (11.50%) and assault (6.43%). Out of 730 patients, 670 (91.78%) were hospitalized and the remaining 60 (8.21%) patients were treated as outpatient. Mean hospitalization time was 7.5 days, ranging from 1 to 35 days.

Table 2: Mode of blunt chest injuries.

Cause Out	tpatient	Hospitalized	Total	Percentage
Traffic accident	52	530	582	79.72
Fall from height	8	76	84	11.50
Assault	0	47	47	6.43
Compression under heavy object	-	12	12	1.64
Blast	-	3	3	0.41

Chest pain and dyspnea were the most common symptoms at presentation whereas tenderness over the chest wall, bone crepitation and subcutaneous emphysema were the most common findings on physical examination. All patients with chest discomfort with minimal findings on physical examination or patients with non-complicated one or two rib fractures were treated without hospitalization. Soft tissue trauma and rib fractures were the most common problems observed following blunt thoracic traumas. The right side was involved in 511, left side in 163 patients and bilateral involvement in 56 patients with blunt injury.

Table 3: Distribution of Patients according to number of rib fractures.

Number of rib fracture	Number of patients	Percentage
Single rib	56	7.67
2 rib fracture	186	25.47
More than 2	410	56.17

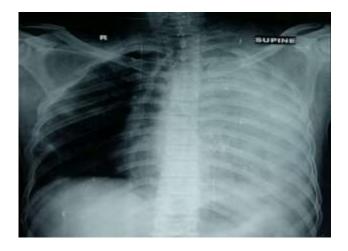


Figure 2: X-RAY Chest showing fracture of left 1,2 rib with left haemothorax.

Single rib fracture was evident on x-ray in 56 patients, two fractured ribs were seen in 186 patients and in 410 patients there were multiple ribs fractured. In 46 patients, multiple rib fractures were also associated with flail chest. In 30 cases there was no evidence of fractured ribs on x-ray but still they developed either pneumothorax or haemopneumothorax or occult pneumothorax.



Figure 3: CT- THORAX showing occult pneumothorax.

Rib fractures were associated with subcutaneous emphysema in 186 patients (25.47%). Hemo/pneumothorax with subcutaneous emphysema was observed in 89 patients (12.19%). Subcutaneous emphysema without another complication was observed in 42 patients (5.75%), in most of patients it resolve spontaneously.



Figure 4: X-Ray chest showing surgical emphysema associated with flial chest.

Hemo-/pneumothorax were observed in 437 patients (59.86%) with rib fractures: In 13 (2.97%) patients with single rib fracture, in 109 patients (24.94%) with two rib

fracture and 315 patients (72.08%) in more than two rib fractures out of 437 patients. The differences between the groups were statistically significant (P<0.001).

**Table 4: Treatment modality.** 

Treatment	umber of itients	Percentage
No. active treatment	225	30.82
ICTD	331	45.34
Thoracotomy	12	1.64
Non invasive ventilation	134	18.35
Invasive ventilation	28	3.83

Chest tube drainage was performed in 331 patients with pneumothorax, hemothorax or hemopneumothorax. Patients with minimal (<20%) pneumothorax followed without chest tube drainage and patients with minimal hemothorax underwent thoracentesis alone. Chest tube was performed successfully in all. But five of these patients required thoracotomy (in 4 patients with massive bleeding, one patient with chylothorax).



Figure 5: Inter costal tube drainage for left haemothorax.

46 patients presented with flail chest. All patients with flail chest were kept in the Intensive Care Unit. The management of these patients was based on the trend of serial measurements for arterial blood gases and serial xray chest PA view. In all patients with flail chest, tube thoracostomies was done and patient was put on non invasive ventilation whenever required. Analgesia was provided through administration of parenteral analgesics and epidural analgesics. In 10 of these patients, percutaneous tracheotomy was performed aiming suctioning of secretions and giving oxygen to the patients more effectively (reduction of dead space). These patients developed acute respiratory failure and invasive mechanical ventilation was indicated. In spite of aggressive critical care management seven patients died out of 46. Mean hospitalization time for these patients was 23 days.

**Table 5: Indication for thoracotomy.** 

Indication	No of patients
Massive bleeding	4
Oesophageal rupture	1
Chylothorax	1
Multiple displaced fracture	3
Diaphragmatic rupture	3

Thoracotomy was needed for twelve patients. Removal of intrathoracic hematoma and control of massive bleeding in four patients, for esophageal repair in one patient, for chylothorax in one patient, and thoracic wall stabilization and control of bleeding in three patients. Three patients underwent thoracotomy or laparatomy due to diaphragmatic rupture.

If we analyse the final outcome of all the chest injury patients (730), 615 patients were discharged in satisfactory condition within 7-9 days, while hospital stay was prolonged in 98 patients because of multiple rib fracture associated with other extra thoracic injury and various complication. Various complication were noted in 43 patients mainly residual hemothorax, recurrent pneumothorax, deep vein thrombosis, broncho pleural fistula, ARDS, aspiration pneumonitis ,pressure sore etc..17 patients could not be saved despite adequate and aggressive treatment. Out of 17 patients who expired, 10 were having multiple fractured ribs with associated abdominal injury and pelvic fracture. 7 patients were having flail chest with massive bilateral pulmonary contusion.

Table 6: Final outcome.

Final result	No. of patients
Discharge	615
Complication	43
Death	17

#### **DISCUSSION**

Trauma is the leading cause of mortality and morbidity during the first four decades of life, and one of the commonest causes of death all over world, more in India. The major reasons for blunt chest injuries are traffic accidents with an incidence of 70-80%.2 Increased automobile traffic and ever increasing population together with intentional or unintentional ignorance of traffic rules account for the predominance of road-side accidents producing chest trauma. In 79.7% of our patients, traffic accidents were the cause of injuries which is consistent with the literature. These findings were in accordance with the studies of Helling and Mattox, in which road accidents constituted the maximum number of cases.<sup>3,4</sup> The right side of the chest was involved commonly. The higher percentage of younger age group patients in the present study is comparable to studies of Muckart and Locurto et al Males outnumbered females

by a huge margin because of their greater exposure to outdoor activities like drivers, industrial workers and labourers etc. These findings were comparable to findings of other studies.<sup>5</sup>

Subcutaneous emphysema is a clear indication of injury to the respiratory tract. All of the patients with subcutaneous emphysema had fractured ribs, which also led to lung injury. Kalyanaraman et al reported that lung injury seems to be associated with rib fractures in 74% of cases with subcutaneous emphysema.

The presence of more than two rib fractures is a marker of severe injury. 59.86% of our patients had hemothorax and/or pneumothorax and most of them presented with associated extrathoracic injuries. Mortality rate was nil in patients with less than two rib fractures versus 4.14% in patients with more than two rib fractures. Lee reported that mortality doubles (1.8 versus 3.9%) for patients with three or more rib fractures and those with no rib fractures.<sup>7</sup> The presence of fractures of the first or second ribs has also been reported to be indicative of severe trauma. Poole reviewed all series of fractures of first and second ribs and found a 3% risk for aortic injury and a 4.5% risk for injury to a brachiocephalic vessel 8. However, no association between victims of trauma with or without rib fractures and aortic injury was reported.<sup>7,8</sup> In our series, we did not observe any major vascular injury.

In our study, the majority of patients (410) had fractures of more than two ribs and additionally 46 patients had flail chest; 242 patients had fracture of either one or two ribs and most of them could be managed by just observation with check x-ray of the chest after 24 hours of injury. With single or two rib fractures the incidence of pneumothorax/haemothorax is not as high but there is increasing likelihood of this complication as the number of fractured ribs increases.11 Flail chest was present in 46 patients in our series which was consistent with Pate who described flail chest occurring in about 8-10% percent of chest trauma patients.<sup>9</sup>

Regarding treatment profile, intercostal drainage was required in 331 patients and thoracotomy was needed in 12 patients only. Various indications of thoracotomy were as per Table 5. The commonest indication was massive bleeding, following ICD. Out of 730 patients, 331 patients were treated by simple Inter Costal tube drainage. Time taken for full expansion of the lung and removal of the chest tube was 2-8 days. In a study by Locurto, the chest tube was kept for an average 4.5 days with simple underwater seal drainage. <sup>5</sup>

Residual haemothorax was the commonest complication in our series, 24 of which were treated by simple aspiration while the remaining 2 required repeat ICD. Drummond observed residual haemothorax in about 15% of patients with haemopneumothorax where simple ICD was done. 6 there was no evidence of empyema in any

patient. The incidence of empyema has been reported about 2 to 3 percent in patients with chest injury requiring tube thoracostomy in various studies.<sup>6,12</sup>

Overall, there were 17 deaths in this series, with most of patients having multiple fractures with flail chest and massive pulmonary contusions associated abdominal injuries and pelvic fracture. The mortality rate after severe chest injury was comparable with other studies reported in the literature. The clinical state of the patient, severity of the trauma, age, presence of more than two rib fractures, presence of flail chest, and possible intrathoracic injury help in making the decision for proper treatment plan.

#### **CONCLUSION**

After comprehensive review of the present study, it is concluded that:

- Blunt trauma, mainly road-side accidents formed the most common cause of chest injury, followed by assault and falls from height etc. and commonly affected victims are males of productive age.
- The majority of these patients can be managed by simple intervention i.e., intercostal drainage. Patient with multiple rib fracture can be managed by non invasive ventilation and only few require thoracotomy.
- The risk of mortality in chest trauma has been associated with the presence of more than two rib fractures, age older than 60 years and with associated head and abdominal injury.
- The ability to identify those patients having significantly higher risk for morbidity and mortality ensures the establishment of treatment priorities and efficient management of existing injuries.

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