

**Research Article****A Study of 50 Cases of Chest Injury in Trauma Patients**

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Email: drkalyanwatd93@gmail.com**Abstract**

Introduction: Chest trauma constitutes 10-15% of all trauma patients and is cause of 25% of mortality. There are many vital organs in chest (heart, lung, major vessels, esophagus) that may injured due to trauma. Usually patients with chest trauma can be managed conservatively. The aim of this study was to investigate the prevalence of chest trauma, management strategies and outcome of chest trauma in terms of morbidity and mortality.

Material & Methods: It was an observational study done on 50 consecutive cases of chest trauma of age >16years, who required hospitalization. A case was included when patient was having chest injury with or without rib fracture or those with hemothorax, pneumothorax or hemopneumothorax. Diagnosis was initially made by chest X-ray and further, computed tomography of chest was performed in suspected cases of lung parenchymal injury. Management of the patients was followed and recorded in term of morbidity and mortality.

Results: Out of fifty patients 49 were males. Most common cause of chest trauma was road traffic accident followed by fall from height. 64% succumbed ribs fracture and lung contusion present in 36% whereas flail chest found in 4% patients. Head injury and fracture of upper and lower limb bones (16% each) were commonly associated with chest trauma. Most of the patients managed conservatively with only one (2%) patient required thoracotomy. ICDT on one side done in 72% patients and 2% required bilateral ICDT. Blood transfusion was done in 28% and ventilator support given in 3 (6%) patients. No mortality reported in the study.

Conclusion: It was concluded that with simple supportive measures like analgesia, antibiotics, breathing exercise, pulmonary toilet, oxygen therapy and ICDT morbidity and mortality rate in chest trauma patients can be reduced significantly.

Keywords: Chest injury; pneumothorax; hemothorax; rib fracture.

Introduction

Chest trauma constitutes about 10-15% of all the trauma cases and is responsible for 25% death due to trauma¹. Trauma to chest may occur due to fall

from height, road traffic accidents, assault or being hit by an object or an animal. It may also occur as a result of penetrating injury either by firearms or stab injuries or may also be seen in

natural disasters like earthquake/floods. Whichever be the mechanism injury to chest become serious due to vital organs in chest (lung, heart, esophagus, great vessels). Various forms of injuries in chest trauma include chest wall contusions, bruise, hematomas, abrasions, rib fractures (most commonly involving 5-9 ribs), flail chest, sternal fractures and fractures of the shoulder girdle.

Pulmonary injury (injury to the lung) and injuries involving the pleural space include contusion, laceration, pneumothorax, hemothorax or hemopneumothorax. There may be injury to the airways, cardiac injury and esophageal injury (Boerhaave syndrome) and diaphragmatic injury. The chest trauma may be isolated or it may be associated with other organ injury like head injury, spinal injury, orthopedic injury or abdominal injury. The association of these injuries is a serious consequence because other associated injury can misguide clinician and result may be fatal².

For the management of chest trauma includes supportive care in the form of as analgesia, antibiotics, oxygen therapy, chest physiotherapy and pulmonary toilet; Stabilization of flail segment (by strapping of chest wall); ventilatory support for needful; intercostal tube insertion and in rare cases thoracotomy may be required.

Pain management is also crucial which may be in the form of NSAIDS, narcotics, intercostal nerve block or epidural anesthesia. Management of chest wall injury is directed towards protecting the underlying lung and allowing adequate oxygenation, ventilation and pulmonary toilet. This strategy is aimed at preventing the development of pneumonia, which is the most common complication of chest wall injury. Analgesia is the mainstay of therapy for rib fractures. Patient controlled administration of an opioid infusion (PCA) is the best method for cooperative patients. This provides complete analgesia allowing normal inspiration and coughing without the risks of respiratory depression. Where a chest tube is present,

instilling a local anaesthetic solution into the pleural space. However the volume needed is large, the results are very variable, and local anesthetic toxicity due to rapid pleural absorption may be a possibility^{3,4,5}. Adult Respiratory Distress syndrome (ARDS) is most common complication during chest trauma treatment and atelectasis is most frequent complication after treatment⁶. The purpose of this study therefore was to investigate the prevalence of chest trauma, management strategies and Outcome of chest trauma in terms of morbidity and mortality.

Material & Methods

It was an observational study done on 50 consecutive cases of chest trauma admitted in P.B.M. Hospital, Bikaner. Analysis was done for mechanism of injury, associated injuries; management and outcome in terms of morbidity and mortality, any surgical intervention during the course of management were also recorded. All patient with chest trauma of age >16 years who required hospitalization were included in the study. A patient was labeled as a case of chest injury when he was having injury to chest associated with or without rib fracture along with hemothorax, pneumothorax or hemopneumothorax. For diagnosis, a chest X-ray was the initial radiological investigation done. Further, computed tomography of chest was performed in suspected cases of lung parenchymal injury.

Details of all the patients were entered in study from the records with specifying reference to age, sex, mode of injury, severity of injury, side of chest injury (Right or Left), number of ribs fractured, type of lung injury (contusion, laceration), cardiovascular injuries (pericardial tamponade, major vessels injuries), treatment and final outcome in term of morbidity and mortality.

Intercostal tube drainage was done through fifth intercostal space in pneumothorax and hemothorax. The tube was removed when chest x-ray showed full lung expansion with minimum output. Thoracotomy was done in patients presenting with >1500 ml of blood drainage

following intercostal tube insertion or drainage of >300 ml of blood continuously for > 3 hours.

Observation

Out of total 50 patients, forty-nine were males while only a single patient was female. Table 1 shows distribution of cases in different age groups. Maximum numbers of cases were in 36-55 age groups (50%).

Table - 1: Distribution of cases according to Different Age Groups

Age Group	No. of Cases
16-25 Yrs.	06 (12%)
26-35 Yrs.	09 (18%)
36-45 Yrs.	13 (26%)
46-55 Yrs.	12 (24%)
56-65 Yrs.	05 (10%)
66-75 Yrs.	04 (08%)
>75 Yrs.	01 (02%)

Table 2 shows distribution of cases according to different mechanism of Injury. Most common cause (44%) of injury was Road Traffic Accidents (RTA), followed by fall from height (FFH) (36%). Most common mechanism of injury (in 20% cases) was road traffic injury in age group 16-35. Age group 36-55 yrs shared equal percentage (each share 18%) in two mechanisms of injury (RTA and FFH).

Table 2 Distribution of cases according to Mechanism of Injury (MOI)

Mechanism of Injury	No. of Cases
Road Traffic Accident (R.T.A.)	22 (44%)
Fall From Height (F.F.H.)	18 (36%)
Fire Arm/Blast Injury	02 (04%)
Assault	06 (12%)
Hit by Animal	02 (04%)

Table 3 shows distribution of lung side that was affected in chest trauma. Right side chest was involved in maximum no. cases (58%). Left side was affected in 26% while bilateral involvement was seen in 16% cases. In road traffic injuries right side was affected most commonly (34%). In assault and fall from height left side was most commonly affected.

Table 3 Distribution of cases according to Mechanism of Injury and Lung side affected.

Mechanism of Injury	Lung side Affected		
	Right Side	Left Side	Bilateral
Road Traffic Accident (R.T.A.)	17 (34%)	03 (06%)	02 (04%)
Fall From Height (F.F.H.)	09 (18%)	03 (06%)	06 (12%)
Fire Arm/Blast Injury	02 (04%)	-	-
Assault	01 (02%)	05 (10%)	-
Hit by Animal	-	02 (04%)	-
Total	29 (58%)	13 (26%)	8 (16%)

The most common finding on chest x-ray was rib fracture (64%) followed by lung contusion (36%) (Table 4). Flail chest was least common (4%) finding.

Table - 4: Distribution of cases according to Chest X-ray findings

X-Ray Findings	No. of Case (Total Cases 50)
Rib Fracture	32 (64%)
Pneumothorax	09 (18%)
Pulmonary Contusion	18 (36%)
Pleural effusion (Hemothorax)	14 (28%)
Flail Chest	02 (04%)
Surgical Emphysema	04 (08%)

Most common associated injury in chest trauma patients was head injury and upper or lower limb bone fracture (each share equal number of cases 16%) (Table 5).

Table - 5: Distribution of cases that had any Associated Injury with Chest Trauma

Associated Injury	No. of Case
Head Injury	08 (16%)
Facial Injury	06 (12%)
Abdominal Injury	06 (12%)
Upper or Lower Limb Injury (Bone fracture)	08 (16%)

Analgesia, antibiotics, breathing exercise and pulmonary toilet were used in every case, followed by oxygen therapy (in 84% cases) and intercostal chest drain tube was used in 72% patient.

Table - 6: Distribution of cases according to Treatment given

Treatment given	No. of Cases
Analgesia, Antibiotics, Breathing-exercise, Pulmonary toilet	50 (100%)
Oxygen Therapy	42 (84%)
Chest wall Strapping	02 (04%)
Blood Transfusion	14 (28%)
Intercostal Chest Drain Tube (ICDT)	36(72%)
Bi-lateral ICDT	01 (02%)
Intensive Care, Ventilatory Support	03 (06%)
Thoracotomy	01 (02%)

Discussion

The present study was carried out with the aim to investigate the prevalence of chest trauma, management strategies and outcome of chest trauma in terms of morbidity and mortality with the aim to improve outcome of chest trauma.

Distribution of patients according to sex showed the male: female ratio of 1:0.02. The reason for male predominance is probably that males are more mobile with active participation in high risk taking activities, outdoor activities, labourer, drivers and also in violence. Substance abuse like alcohol, illicit drug use are also important factor for male predominance. The predominance of males over females (49:1) in the study is in agreement with most studies conducted in India as well as foreign^{2,7,8}.

In our study distribution of cases according to different age groups showed that the most of the cases (50%) were in age group 36-55. Very young and very old patients were affected rarely. Regarding productive age group patients (3rd, 4th and 5th decade of life) these group constitute about 70% of chest injuries, making chest trauma a preventable cause of morbidity and mortality of present century in productive age group. Similar results have been reported in other studies also^{2,9,10}. A study conducted in 2009⁹ showed that the trauma is the leading cause of mortality and morbidity during the first four decades of life, and one of the commonest causes of death.

In our study road traffic accidents accounted for maximum no. (44%) of cases according to mechanism of chest injury. This is due to fact that

there is alarming rise in number of motor vehicle. This is also due to ignorance of traffic rules and alcohol or other illicit drug abuse during driving (Drinking and Driving). Fall from height was second most common (36%) mechanism of chest trauma. Assault also constitutes a significant number (12%) of cases, showing the violence is an important factor for chest trauma. Other authors have reported similar experience.^{1,8,9} 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.

Right side lung was most commonly (58%) injured following chest trauma in our study, left side in 26% cases while bilateral involvement was seen in 16% cases. It was observed that right side lung was more commonly affected in road traffic injury left side in assault and fall from height and bilateral involvement of lung occurred in most commonly as result of fall from height. These figures show the fact that most of the people are right handed so in trauma cases person try to cover his body on right side and in assault a right handed assailant trauma a victim of left side. A retrospective study of 2009² showed that the right side of the chest was involved commonly after blunt injury while left side involvement was more common after penetrating injuries, which is consistent with assault by a right handed assailant. In our study X-ray chest findings in different mechanism of chest trauma were as that the rib fracture was the most common (64%) finding in x-ray chest followed by pulmonary contusion in 36% cases, pleural effusion (Hemothorax) in 28% of cases. Pneumothorax occurred in 18% cases, surgical emphysema in 8% cases and flail chest in 4% of cases.

Albadani *et al*⁷ in a study over 112 patients noted rib fracture 38 (33.9%) most commonly followed by pneumothorax 36 (32.14%) and hemothorax 30 (26.8%). Dalal *et al*⁹ found that the majority of patient 210 (52.23%) had fractures of more than two ribs and 101 (25.12%) patient had fracture of

either one or two ribs and most of them were managed by just observation with check x-ray of chest after 24 hours of injury. They concluded that with single or two rib fractures the incidence of pneumothorax/hemothorax is not as high but there is increasing likelihood of this complication as the number of fractured ribs increases. Contrasting results were reported in study conducted at Rawalpindi¹⁰ which showed hemothorax as the most commonly observed consequence of penetrating chest injury.

Most common associated injury was head injury and upper or lower extremity bone fracture which both share equal number (each 18%) of cases Albadani *et al*⁷ showed that the most common extra thoracic associated injuries was abdominal injuries in 10.7% followed by head injuries in 5.4%. The study at Tanzania in 2011⁸ showed head/neck (33.3%) and musculoskeletal region (26.7%) were commonly affected in chest trauma and the presence of associated injuries was an important determinant of the outcome of chest injury patients. More associated injury more was the risk of complication in patients with chest injuries.

In our study according to treatment given showed that analgesia, antibiotics, pulmonary toilet and breathing exercise (in the form of deep breathing, balloon insufflations and incentive spirometry), treatment used in every case (100%) of chest trauma. Second most common (84%) treatment employed was oxygen therapy by nasal cannula or venti mask. Intercostal chest drain tube (ICDT) was employed in 72% of cases. Blood transfusion was required in 28% of cases. Intensive care in the form of ventilatory support was employed in 6% of cases while thoracotomy had to be done in one case (2%) only. Other studies also show similar findings with intercostal tube insertion being most common^{7,9}. Lema *et al*⁸ noted that the majority of patients can be managed by non operative approach. Majority of patients presenting with chest injury without associated injuries can be managed with procedures which can be readily performed in rural hospitals by well trained junior

surgeons or experienced general practitioners using simple equipment such as chest tubes and under water seal bottles. Thoracic surgeons also agree that most patients with especially penetrating chest injuries could be managed adequately by closed thoracostomy tube drainage alone.

Analgesia is the mainstay of therapy for rib fractures. As described earlier also that patient controlled administration of an opioid infusion (PCA) is the best method for cooperative patients. Best analgesia for a severe chest wall injury is a continuous epidural infusion of local anaesthetic agent while for one or two isolated rib fractures posterior rib block may be appropriate.^{3, 4} The goal of first line clinical therapy for chest trauma patients is to achieve an adequate level of oxygenation and to protect the lungs from further injury using reduced tidal volumes. In our study distribution of cases according to outcome in the term of morbidity and mortality showed that maximum number of cases (98%) were discharged from the hospital with oral analgesic, antibiotics and breathing exercise. The long term follow up of patients was not done. Patients were advised to consult in surgical OPD for their follow up. Patient who required thoracotomy for massive hemothorax was referred to higher center after initial stabilization. Albadani *et al*⁷ reported overall mortality was 10 out of 112 (8.9%). In which four had multiple trauma and three had associated neuro surgical trauma, one with septicemia, one with flail chest and one following emergency thoracotomy. Hospital mortality rates for isolated chest trauma have been reported to range from 4-8% and increased to 13-15% when another organ system was involved and to 30-35% when more than one organ system was involved^{7,8,9,10}.

The mortality in present study was nil. This would again justified the use of simple, supportive treatment for chest trauma patients which is life saving. Intercostal chest drain is a simple procedure, done in local anesthesia is life saving. This should be applied in every case of chest trauma where we clinically suspect pneumothorax

or hemothorax and can be life saving in tension pneumothorax. The accurate identification of patients at high risk for major chest injuries is necessary to avoid delay that may lead to significant mortality and morbidity. Aggressive management of chest trauma along with prompt treatment of associated injuries is essential for optimal outcome.

Conclusion

In the view of this study this is concluded that in every trauma patient chest injury should be suspected and investigated, unless proved otherwise. With simple supportive measures like analgesia, antibiotics, breathing exercise, pulmonary toilet, oxygen therapy and ICDT morbidity and mortality rate in chest trauma patients can be reduced significantly.

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