

Clinical and management profile of thoracic trauma patients

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Abstract

Background: Field of traumatology has been developing over the past 25 years or so, it is only recently that trauma has come to be recognized as a discrete disease entity by the medical and lay communities. Trauma represents a significant portion of the world's morbidity and mortality. Of the 11 million deaths each year in the developed world, 0.8 million are the result of trauma. **Aims and Objectives:** To study the clinical profile of thoracic trauma patients and compare various management options. **Material and Methods:** This prospective study was carried out on one hundred consecutive patients of thoracic injuries who required indoor admission due to chest trauma. **Results:** Males predominated females in thoracic trauma patients. Blunt trauma mainly road accidents formed the commonest cause of thoracic trauma with right side of chest as most commonly while left side was more commonly involved in penetrating injuries. Out of total 17 patients of flail chest, 3 had mortality. Duration of tube thoracostomy and its complications were more in blunt thoracic injury patients as compared to penetrating injury patients. 68% patients underwent tube thoracostomies and haemothorax was the commonest indication. Operative intervention was required in 12% cases. Six cases underwent splenectomy mainly for associated abdominal injuries. Overall mortality rate in the present study was 6% and it was more in blunt injuries as compared to penetrating injuries. **Conclusion:** Chest injury constitutes a significant number of trauma patients and commonly affected victims are males of productive age. Majority of these patients can be managed by conservative management and simple intervention like intercostal chest drainage.

Keywords: Clinical profile, Management profile, Thoracic trauma.

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Introduction

An accident is a major epidemic of non communicable disease in the present century. Since high mortality and morbidity is associated with it, it is of vital importance in day to day practice to know about the patterns of these un-expected and unplanned form of injuries. They are no longer considered mere accidental but the price we have to pay for rapid technological progress like mechanization, industrialization and high speed vehicles both in urban and rural areas[1]. India has one of the highest road accident rates in the world and its road accidents fatality rate is 20 times that in developed countries. Peak mortality and morbidity from road accidents are seen in 15-24 years age group of males[2]. Incidence of penetrating injuries following gunshot wounds in civilian population has increased significantly due to easy availability of country made weapons, ammunition and terrorist activities[3]. Thoracic injuries following blunt and penetrating trauma are common and are responsible for one fourth of total deaths caused by trauma[4]. These lives can be saved by prompt diagnosis and correct management[5]. Males by virtue of greater exposure to outdoor activities grossly outnumber females in the ratio of 6:1.[6] Chest trauma is one of

the common surgical emergency in the modern era of rapid industrialization and increased traffic on roads. It poses many important problems in management and keeps the attending staff on toes. Since high speed surface travel is becoming more universally available, thoracic trauma will certainly continue to comprise an important fraction of the other major injuries which the surgeon is called upon to treat. The mortality rate in hospitalized patients with isolated thoracic injuries is 4-8% in various studies. It is 10-15% when one other organ system is involved and rises to 35% when multiple organ systems are involved[7]. Majority of deaths occur within 4 hours and are related to uncontrolled haemorrhage, uncorrected hypoxia or delay in surgical intervention.[8] Survival of patients after hospitalization not only depends on the nature and severity of the injuries but also on the first aid and resuscitative measures, continued care, comfortable and safe transportation[9]. Thoracic trauma contributes heavily to mortality and disability caused after trauma besides head injury, abdominal injury and orthopaedics injury. Thoracic trauma patients are managed similarly following advanced trauma life support (ATLS) system and ABCDE of trauma care. Patient management consist of maintenance of airway, breathing, circulation and vital functions in rapid primary evaluation and proper assessment of disability by exposing patient in a detailed secondary survey and imitation of definitive care. It appears that introduction of improved communication techniques, the rapid transportation of trauma victim and the use of aggressive resuscitative techniques have added a lot in management of thoracic trauma. Only 10%

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of patients of chest injuries require thoracotomy for treatment of these injuries, the rest of the patients can be adequately treated by resuscitative measures, endotracheal intubation and tube thoracostomy[10]. So acute chest trauma can be caused by many ways like blunt or penetrating injuries and can present in number of ways ranging from mild chest pain to severe injuries of underlying organs. Similarly management can range from conservative to operative intervention in form of thoracotomy. Thus, this prospective study was conducted to study the clinical profile of thoracic trauma patients and compare various management options with special emphasis on flail chest management.

Material and methods

This prospective study was carried out in the Department of General Surgery, Pandit B.D. Sharma Postgraduate Institute of Medical Sciences, Rohtak. One hundred consecutive patients of thoracic injuries were included in the present study who required indoor admission primarily due to chest trauma were included in the study. Patients with minor injuries like abrasions, contusion etc. of chest wall who did not require admission and patients having associated severe head injuries with Glasgow coma index below 5 were excluded from the study. As soon as patient was received in accident and emergency department, after prompt initial evaluation and resuscitation, a detailed history was taken with special reference to 1. Nature of Injury: Accidental, Homicidal, Suicidal; 2. Mode of Injury; 3. Type of Injury; 4. First aid or pre-hospital care if received; 5. Duration between time of injury and reaching the hospital (lag period) and any pre-existing illness such as respiratory, cardiac, hepatic, renal, diabetes mellitus or intake of drug or alcohol. General physical examination included pulse, blood pressure, respiration rate & pattern, pallor, dyspnoea, airway patency and Glasgow coma scale. Systematic examination included subcutaneous emphysema, thoracic wall and rib cage, paradoxical movements, sucking or open wound, fracture of ribs with number, unilateral / bilateral, flail chest / stove in chest, fracture of clavicle, scapula, sternum or thoracic spine and hemothorax, pneumothorax or both. If any injury of trachea, bronchus, diaphragm, oesophagus, heart, pericardium or great vessels was suspected patient was kept under constant observation and thoroughly investigated either to prove or disprove the injury[11-15]

Investigations-Routine biochemical investigations and radiological examination were carried out for diagnostic and management purposes, unless clinical suspicion was so high that an urgent need was felt for chest decompression. Basic management protocol included oxygen inhalation, analgesics,

intercostal nerve blocks, intravenous fluids and prophylactic antibiotics. Blood transfusion, bronchodilators and assisted ventilation were given as per requirements of individual patient. Patients with massive flail chest or where assisted respiration was indicated were treated in Intensive Care Unit (ICU), if possible. Lot of emphasis was given to chest physiotherapy in all the patients. The chest tube was removed only after establishing at least 24 hours period free of air leak or pleural drainage not more than 20-30ml per day or non functional tube. Post tube clinical course of patients was noted with reference to duration of tube thoracostomy, complications like fever, pneumonitis, empyema, wound sepsis etc. Total duration of hospital stay was also recorded. The patients with persistent abnormality on X-ray examination or where doubt about haemothorax existed, were further subjected to ultrasonographic examination for residual haemothorax / empyema. Contrast enhanced computed tomography of thorax was conducted if required. In cases of suspected mediastinal or sternal injuries enzyme study in the form of creatinine phosphokinase-MB and troponin-I were carried out to detect these injuries at the earliest. Associated injuries were managed in consultation with concerned specialists. Thoracotomy was done only in three patients for different indications, spleenectomy was done in six patients and diaphragmatic repair was done in three patients through the abdominal route. All the patients were followed up fortnightly after discharge from hospital for three months. At each follow up visit detailed clinical examination was done and chest X-ray in full inspiration (postero-anterior view) was taken of all the cases in the study. The management profile of each patient was also recorded with details of follow up and complications.

Statistical analysis-At the end of the study, the data was analysed statistically by using appropriate statistical methods.

Results

In the present study, highest incidence of blunt thoracic injuries was found in third and fourth decades of life and lowest at extremes of age. Penetrating thoracic injuries were also found more in second and third decades of life. Male to female ratio in blunt thoracic injuries was 8:1 and in penetrating injuries was 5.3:1, but overall male to female ratio was 7.3:1. 83% patients reached the accident and emergency department within 6 hours of trauma and mortality in this group was 05 (83.3%). Another 6 (6%) patients in next 6 hours, in this way 89% of patients presented within 12 hours. Only 5 (5%) patients came after 24 hours. Various types of modes and mechanism of injuries were recorded in all the patients and their relationship with mortality was studied (Table 1).

Table 1: Patterns of thoracic trauma and its relation with mortality

	Mechanism	No. of Patients (%age)	Mortality (%age)
Blunt	Road side accidents	48 (59.3%)	05 (83.3%)
	Fall from height/stairs (FFH)	22 (27.2%)	
	Physical assault (PH)	06 (7.4%)	
	Miscellaneous	05 (6.2%)	
	Total	81	
Penetrating	Stab	15 (78.9%)	01(16.7%)
	Gun shot wound	01 (5.2%)	
	Road side accidents	03 (15.6%)	
	Total	19	
			06(100%)

Right side of chest was more commonly injured in blunt thoracic injuries while the left side of the chest was most commonly involved in penetrating injuries. Number of ribs fractured were studied with the help of chest radiograph and its association with mortality was also recorded in all the thoracic trauma patients. In 13 patients of penetrating injury and 8 patients of blunt thoracic injuries no rib fracture was detected even after repeated chest x-rays. Out of 81

patients of blunt thoracic injuries 61 were having 4 or more ribs fractured with mortality of 6.33%. There was no mortality in patients of thoracic injury having 3 or less ribs fractured (Fig. 1). The thoracic trauma patients were managed depending upon the severity of the injuries. Pattern of management was studied for all patients and they were divided in different groups on this basis (Table 2).

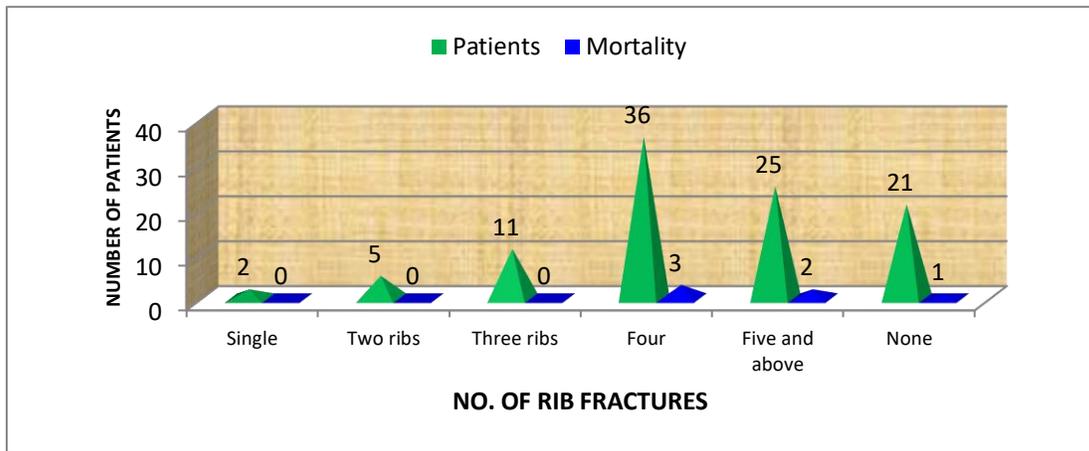


Fig 2:Patients and mortality rate

Table 2:Management profile of patients of chest injury

Sr.No.	Treatment Modality	Blunt	Penetrating	Total
1	Conservative with analgesics only	19	4	23
2	Tube Thoracostomy	54	16	70
3.	Tube Thoracostomy with strapping	14	00	14
4	ICU Care	05	02	07
5	Operative intervention	10	02	12

Tube thoracostomy was done in many patients for different indications and this pattern was studied. In 68 patients tube thoracostomy was done. Two patients had bilateral thoracic injuries so in total 70 tube thoracostomies were done. Haemothorax (60%) was the most common indication followed by hemopneumothorax and pneumothorax (18.6%) & (14.3%) respectively. Comparatively haemothorax was more common after blunt thoracic injuries and massive subcutaneous emphysema was more common after penetrating injuries. Duration of tube thoracostomy was studied in both types of chest injury patients and their relationship was studied. In general duration of tube thoracostomy was longer in blunt thoracic injuries than penetrating injuries. About 67% of patients required tube thoracostomy for 4-5 days in blunt trauma patients as evident in above table. Only one patient of penetrating injury required ICU for more than 5 days. Some of the patients who were treated with tube thoracostomy developed complications related to tube thoracostomy. It has been observed that 18.87% of blunt thoracic trauma patients and 13.3% of penetrating injury patients developed complications after tube thoracostomy. Empyema chest developed in two patients who required intercostal chest drain for more than 5 days. Unilateral or bilateral involvement of flail chest was studied with side of involvement. Out of 17 patients of flail chest, 9 patients had flail on right side while 7 patients had flail on left side and one patient had

bilateral flail chest. Three patients out of 17 had mortality. Only three patients shifted to ICU and remaining 14 (82.4%) patients were managed in ward with analgesia in the form of intercostal blocks & NSAIDS, intercostal tube thoracostomy and strapping of chest. Three patients of flail chest had mortality (17.6%), out of them two patients of flail chest (11.8%) expired in ward and one patient (5.9%) expired in ICU. Out of 100 patients, 8 patients were shifted to ICU for some or other indication, 5 patients recovered well while three patients succumbed to their injuries. Some of the patients of thoracic trauma were associated with abdominal trauma requiring operative procedure for that[16-19] Overall 12 Patients were managed by operative intervention. Splenic injury and diaphragmatic injuries were more common in blunt thoracic trauma confined to lower part of chest. Thoracotomy was done in only three patients for different indications. One patient required thoracotomy for excess bleeding due to extensive lung laceration while other two patients required thoracotomy for injury to tracheobronchial tree. One of these two patients had tracheal injury while the other had injury to right main bronchus. Both these cases recovered well while the other patient who had thoracotomy due to lung laceration could not be saved and died in postoperative period probably due to complication of massive blood transfusions. Certain number of thoracic trauma patients had associated injury to other organs system (Table 3).

Table 3:Mortality in relation to associated trauma in chest injury

Type of Injury	No. of Patients		Mortality No. (%age)
	Blunt	Penetrating	
Isolated chest trauma	51	11	03(4.84%)
Bruises/Abrasions/Lacerated wounds	10	05	00
Extremities fractures	13	03	01 (6.25%)
Abdominal injury	07	01	00
Head injury	06	00	02(28.6%)
Fracture pelvis	01	00	00
Fracture mandible	01	00	00

No associated injury was seen in 62 patients of thoracic injuries, out of which only three died with mortality rate of 4.84%. Out of remaining 38 patients some patients were having injuries of two or more organ systems and these patients had higher mortality rates. Duration of hospital stay of patients of thoracic trauma was studied.

Majority of the patients of blunt and penetrating trauma had hospital stay between 4 to 9 days but overall patients of blunt thoracic injuries required comparatively longer hospital stay as compared to penetrating injuries.

Table 4:Summary of Total Patients

INJURIES	TOTAL NUMBER
Single rib fracture	02
Multiple rib fracture	77
Hemo-pneumothorax	13
Pneumothorax	10
Heamothorax	42
Diaphragm rupture	03
Flail chest	17
Lung laceration	01
Tracheal injury	01
Bronchial injury	01
Surgical management	Total-12
Lung-injury	01
Tracheal-injury	01
Bronchus-injury	01
Spleenic-injury	06
Diaphragm injury	03
Mortality	Total-06
Respiratory insufficiency	02
Excessive blood loss	01
Associated Head injury	02
Associated Femur fracture	01



Fig 1:Peroperative photograph showing a rent in left dome of diaphragm

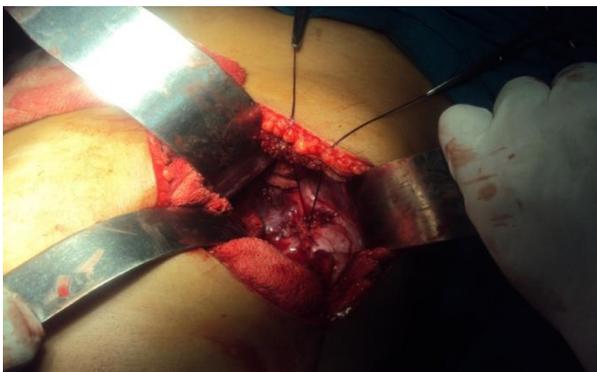


Fig 2:Peroperative photograph showing repair of rent in progress



Fig 3:Clinical photograph showing intercostal chest drain and care of tube

In the present study, 8 (8%) patients were admitted in intensive care unit, out of which three patients were of flail chest. Now-a-days ideal management of the flail chest involves shifting the patient to ICU and to provide ventilatory support till the flail segment stabilises. Out of 17 (17%) patients of the flail chest – only three could be shifted to ICU in our series due to limited resources at our setup. One patient out of these expired. Three patients after thoracotomy were shifted to intensive care unit, out of them one expired. One patient of diaphragmatic injury and one patient of poly trauma was shifted to intensive care unit and one patient out of these two expired. So out of 8 patients admitted to intensive care unit, 5 patients recovered well and 3 patients had mortality (37.5%). Mahjoob et al has reported that thoracic trauma victims constituted 13.93% of total admission to intensive care units with overall 30% mortality[21]. So results of these studies are comparable with present study. In the present study, overall mortality rate was 6% i.e. six patients, out of 100 patients of thoracic trauma expired. Out of this, 5 mortalities were due to blunt injury and one mortality was due to penetrating injury. Suri et al has reported a mortality rate of 7% in their study of 200 thoracic injury patients. Iyer et al has reported a mortality rate of 6.59% in their study of 91 thoracic injury patients. So the mortality rates in chest trauma patients in present study are comparable with literature[19,20]. After comprehensive analysis of the records of these one hundred patients of thoracic trauma, it is concluded that thoracic trauma forms one of the major part of multiple trauma and is responsible for significant mortality and morbidity specially at younger ages. Many of these deaths can be prevented by prompt diagnosis and correct management. Despite the high mortality rate about 90% patients of life threatening thoracic injuries can be managed by effective conservative treatment including tube thoracostomy[22,23].

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