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Original Research Article

Pattern and management of penetrating and nonpenetrating thoracic injuries

Naresh Pal*, Vineet Mishra, Udit Jain, Poonam

Department of Surgery, Pandit Bhagwat Dayal Sharma, PGIMS, Rohtak, Haryana, India

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***Correspondence:**
Dr. Naresh Pal,
E-mail: nareshpalsinghdr@gmail.com

ABSTRACT

Background: Chest trauma constitutes a major public health problem which includes the injuries to chest wall, pleura, tracheobronchial tree, lungs, diaphragm, oesophagus, heart and great vessels. It consist of more than ten percent of all traumas and twenty five percent of death due to trauma occurs because of chest injury. Chest trauma is increasing in frequency in urban hospitals. Penetrating and nonpenetrating thoracic injuries the most serious injuries leading to significant morbidity and mortality.
Methods: This study was prospective observational study of 220 patients of thoracic trauma both penetrating and non-penetrating. These patients admitted in general surgical units from August 2017 to May 2018 of Pandit Bhagwat Dayal Sharma, PGIMS Rohtak Haryana India. The study was pertaining to both penetrating and non-penetrating chest trauma.
Results: Out of 220 chest injury patients who were studied during the said period, Males were 203 and females 17 by a ratio of 12:1 and age ranged from lowest 18 years to 85 years of age. Majority of the patients (90.45%) sustained blunt injuries. RTA was the common mechanism of blunt injury affecting (50.45%) of patients. Multiple Rib fractures was the commonest type of chest injury (21.36%) followed by head injury (17.27%). Head injury was the commonest associated injury seen in our patients.
Conclusions: Chest trauma resulting from road traffic accident remains a major mechanism of chest injury. The measures to decrease the trauma are, educating people about traffic rules and regulations and strictly implementing them is necessary to reduce incidence of chest injuries.

Keywords: Chest trauma, Head Injury, Multiple rib fractures , RTA (Road Traffic Accident), Tube thoracostomy

INTRODUCTION

Thoracic trauma is contributing about a quarter of all trauma related deaths. It is one of the most serious injuries, causing significant disability and mortality. Trauma to thorax is one of leading cause of death from physical trauma after head injury.[1] Accidents which are unexpected and unplanned are becoming the major epidemic of the present century. The number of accidental deaths in India is even higher than in the Western World.[2] Thoracic trauma is often associated with other injuries like head injury, abdominal injury and orthopaedic injuries.[3] Despite of the high mortality rate, more than ninety percent of patients even with life threatening thoracic injuries can be managed by tube thoracostomy.[4] It is the major accidental injuries in India, due to increased incidence of vehicular accidents due to increased road traffic, availability of new high-speed vehicles, and ignorance of traffic safety rules.[5]

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 penetrating and non-penetrating chest injuries, different modalities of investigations and management of chest trauma, especially rib fractures, associated injuries and our experience in institute.

METHODS

This was prospective observational study which was conducted on 220 patients of thoracic trauma both penetrating and non- penetrating . These patients initially presented in accident and emergency department of trauma centre. After initial management they were admitted and transferred to general surgical wards. This study was done from August 2017 to May 2018 at our institute, Pandit Bhagwat Dayal Sharma, PGIMS Rohtak Haryana India. The study was pertaining to both penetrating and non-penetrating chest trauma. When patients of chest trauma arrived in trauma centre ,a thorough clinical examination was done. All the vital parameters were recorded, history about the type of injury, site of injury were obtained from the patient himself, when patient was not in condition to give proper history it was obtained from the relatives, accompanying person or police. If the patient was found in hypotension then resuscitative measures were undertaken. When the patient became hemodynamically stable then shifted for necessary radiological investigations like USG thorax and abdomen and X-rays thorax and abdomen. On admission if it was found that the patient is having apnoea, tachypnoea, stridor, prompt tracheal intubations was done. Once the condition of the patient becomes stable then further necessary investigations were carried out. According to the protocol from ATLS, early diagnosis and management are fundamental, and treatment within the first hour of trauma, the golden hour, is associated to a greater possibility to reduce morbidity and mortality

Additional workup includes the following. Chest radiograph, complete blood count, serum investigation, blood grouping and cross matching, ultrasonography of chest and abdomen, computed tomography of the head, thorax and abdomen if required were done.

Inclusion criteria were all the patients of chest injury of more than 18 years of age and either sex who were requiring admission included in the study.

Exclusion criteria were severely traumatized patients who expired before investigation for chest trauma, and patients not transferred to ward were excluded from the study. Any patient <than 18 years of age was also excluded from study.

RESULTS

Two hundred and twenty patients were included in this study to know the pattern and management of penetrating and non-penetrating of chest injury. All these patients were treated as Indore patients. Majority of patients belonged to the age group (21-40) years. 203 (92.27%) patients were male and 17 (7.72%) patients were females. Male to Female ratio was observed in our study is 12:1. From the Table 1, it is evident that 21-30 years is the most vulnerable and maximum patients were seen in this age group in our study. The Youngest patient observed in our study was 18 year old and the oldest patient was 85 years old. From the Table 2, it is clearly evident that non-penetrating(blunt trauma) (90.45%) to the chest is far more common than penetrating chest injury. Chest pain and dyspnoea were the most consistent symptoms at presentation in almost all patients. Whereas other findings over the chest wall were ,bone crepitation and subcutaneous emphysema can be felt on physical examination.

It is evident from the Table 3, that RTA (50.45%) is the commonest mechanism of blunt chest trauma followed by fall from height seen in 16.81%. It is evident that stab injury is the common mechanism of penetrating chest injury by sharp and pointed weapons (5.45%) and firearm injury is seen in nine patients. Injuries by animal hit was seen in thirteen patients. Nineteen patients were found of chest trauma by other modes of injuries-simple on ground, heavy fall over chest and unknown presentation in cases of some unknown patients. Sixteen patients had flail chest. Forty seven patients had multiple rib fracture. In our study all the patients were treated with parenteral analgesia using either NSAID or opioid analgesia along with local analgesia whenever required. Associated injuries with penetrating and non-penetrating chest trauma can be the head injury, solid viscera of abdominal, injury long bones and extremities, spinal injury or pelvis injury and multiple rib fractures were seen as Table 4. Multiple rib fractures were detected in 21.36% of patients. Long bones spine fractures were detected in 8.18% of patients. From above table, it is evident rib fracture is the most common type of injury seen in this study. Head injury is the commonest associated injury detected in our patients of chest trauma followed by solid viscera injury. followed by skeleton injury. Sixteen patients presented with flail chest. In all patients with flail chest, analgesia was provided through administration of parenteral narcotic analgesics and local analgesics. In patient's laparotomy was done for repair of diaphragmatic injuries. Isolated thoracic trauma associated with minor injuries like-small abrasions and contusions were seen in 42.72% of patients. These patients were admitted for observation in case any complication arise. Most of the patients (78.64%) were managed by tube thoracotomy. left side (37.72) is more than right (32.72)and bilateral tube thoracotomy is seen in eighteen patients the conservative line of management may be in the form of relief of pain by analgesics, sedation, nerve block, oxygen inhalation spirometry and physiotherapy. From Table 5 it is evident that tube thoracostomy is the commonest procedure performed in our chest trauma patients and not a single patient needed thoracotomy in this study. Four patients were died during treatment despite of our best efforts.

Table 1: Showing Age and sex wise distribution of thoracic trauma patients.

Age group	Male	% Age	Female	% Age	Total	% Age
≥20	13	6.40	4	23.52	17	7.72
21-30	49	24.13	1	5.88	50	22.72
31-40	44	21.67	2	11.76	46	20.90
41-50	41	20.19	3	17.64	44	20.00
51-60	35	17.24	6	35.29	41	18.63
>60	21	10.34	1	5.88	22	10.00
All	203	92.27	17	7.72	220	100

Table 2: Types of Thoracic Trauma.

Type of Trauma	Patients	% Age of total
Blunt	199	90.45
Penitrating >>	21	9.54

Table 3: Distribution according to mechanism of thoracic trauma.

Mechenism	Numbers	% Age of total
Road trafic accident	111	50.45
Hit by animal	13	5.90
Fall from height	37	16.81
Assualt by blunt	19	8.63
Assualt by sharp	12	5.45
Firearm injury	9	4.09
Others mode of inj.	19	8.63

Table 4: Associated major injuries with thoracic trauma.

Type of asso. Injury	No.	% Age of total
Long bones and spine	18	8.18
Solid viscra Injury	23	10.45
Head Injury	38	17.27
Flail chest	16	7.27
Multiple ribs fractures	47	21.36
Diaphragmatic Inj.	5	2.27
Isolated chest Inj. (including minor other inj.)	94	42.72

Table 5: Intervention/Management.

Site of intervention	No.	% Age
Right ICD	72	32.72
Left ICD	83	37.72
Bilateral ICD	18	8.18
Conservative	47	21.36
Laparotomy	5	2.27
Mortality	4	1.88
Total	220	100

DISCUSSION

Trauma as a whole is a major cause of morbidity and mortality throughout the world due to rapid development of technology and the increasing crime rates in the society.[6] Only thoracic trauma is responsible for 25% of all deaths from trauma and in another 25% is contributing to the morbidity and mortality.[7] Trauma management must therefore be understand not only the patterns of thoracic injury, but also the pathophysiology and its outcome of management. This study is aimed at identifying the patterns at time of presentation and the outcome of management and relevant recommendations for prevention and management of thoracic trauma both penetrating and non-penetrating. Non-penetrating chest injuries compared to penetrating injuries are seen very frequently in most of region of world. The major reasons for blunt chest injuries are road traffic accidents with an incidence of 70-80%.[8]

Rapid industrialization and tremendous increasing in the high-speed vehicle flow we will have to face the problems arising from this and one of the problems would be thoracic trauma. According to the protocol from ATLS, early diagnosis and management are fundamental, and treatment within the first hour of trauma, the golden hour, is associated to a greater possibility to reduce morbidity and mortality.[9] The causes of chest injuries can be falling from height, injuries like fall of heavy objects due to increased construction activities, injuries by animals and violence in society. It is now expected that injuries due to road traffic accidents should decrease to some extent with the advancement in automobile technology equipped with air bags and seat belts applications and increased traffic rules awareness.[10]

Seventy percent of chest injuries are blunt and remaining is penetrating injury.[11] In the 50.45% of our patients, traffic accidents were the cause of injuries. Rib fractures, single/multiple are reported as the most common pathologies associated with chest trauma (35-40%).[12] In our series, the incidence of multiple rib fractures was 21.36%, and all of these patients were admitted in general surgical wards. Although some authors have suggested that patients with rib fractures require hospitalization not

only for their associated injuries but also for pain control and to observe pulmonary complications if any.[13]

Mortality rates depend on the severity and complexity of the trauma and older people. Mortality rates in hospitals for isolated chest injuries were reported to range from 4 to 8% and increased to 13-15% when another organ system was involved and to 30-35% when more than one organ system was involved.[14] Lee et al, reported the mortality rate as 1.8% in all patients with blunt chest trauma.[15] This rate is 1.88% in our study. Most common age groups affected were 30 to 39 years which is most productive age group.[16] In our present prospective study the most commonly affected age group is 21-40 years; similar findings are observed by Atri M et al.[16] In all the studies males are more commonly affected than female as more commonly involved in outdoor activities as compared to females. The Incidence of male : female ratio is comparable with Lema et al, (n=150) 3.8:1 ,Dehgan et al. 18, (n=3467) 3.34:1 and in Present study, (n=220) 12:1.[17] Comparison of type of chest injury in various studies in Blunt trauma and Penetrating injury shows high blunt injuries may be due regional violence. In the studies by Lema et al, (n=150) 72.7% 27.3% , Mohan Atri et al, (n=2571) 81.7% 18.7% show high incidence of penetrating injuries.[16,17] This mechanism of injury is very rarely reported in English literature, but it is commonly seen in patients from rural areas in India, as animals are frequently used for agriculture and transportation. The incidence of penetrating injuries in the present study was low (9.54%). A higher incidence of about 43% was reported in one study in Indian study by Beg et al,[19] Comparison of mechanism of injury in various studies. Liman et al 20 reported (n=1490) RTA 67.79% , Lema et al.[17] (n=150) RTA 50.7% , Dehgan et al (n=3467) RTA 79% and Present study shows, (n=220) RTA 50.45% It has been observed that the mechanism of chest injuries varies from one country to country, also varies within the same country. RTA is the commonest mechanism of chest injury noted in our study which is in accordance with various other studies. In the major associated injuries in various studies: Lema et al, (n=150) reported Head injury- 33.33%, Skeletal injury 26.7% and Abdominal injury 5.3% of cases.[17] Ibrahim AlKoudmani et al (n=888) reported- Head injury 8%, Skeletal injury19% and Abdominal injury13% of patients. The study by Anupam Choudhary et al , (n=52) reported Head injury 38.46% ,Skeletal injury15.4% and Abdominal injury15.4% of patients. Mehboob Alam Pasha et al, (n=504) reported Head injury 39.6%,Skeletal injury 54.4% and Abdominal injury11.5% of cases. In the present study, (n=220) Head injury17.27%, Skeletal injury 8.18% and Abdominal injury10.45% of patients. In our study head injury is the commonest associated injury detected. Almost Similar findings are also noted compared to other studies.[21-23] Generally it is accepted that the majority of thoracic injured patients (97.6%) require no more than simple tube thoracostomy for adequate management and reserving thoracotomy for those patients with significant haemorrhage or for patients who are hemodynamically unstabl.[24] In our study conservative line of management was observed in 21.36% of patients and simple operative intervention was done in >77% patients. No thoracotomy was done in any of our patient. Thoracostomy/ Thoracotomy Khan ZLM et al, (n=103 patients) 29% 62% 9% Atri M et al, (n=2571 patients) 42.6% 48.4% 9%.[16,25]

Rising level of population, accelerated urbanization, industrialization and rapid increase in vehicles , have contributed to an annual increase in road traffic accidents by 3%.[26] Death due to accidental is reported every 1.9 minutes in India.[27] Although trauma centres have emerged in various parts of the country, trauma care still seems to be at early developmental stage.[28]

The present study included only chest trauma patients that were admitted to our hospital. The data revealed that most of the victims of thoracic trauma were in young age males. The incidence of blunt trauma in our study was more than 90 % and injury due to road traffic accident was more than fifty percent. Injuries due to falls were another common mechanisms of injury seen in 16.81% of patients. Similar pattern of injuries has also been reported by other studies.[29,30] which could have been due to a higher prevalence of violence in that region. Variable mortality rates in chest trauma patients have been reported in different literature.[31,32]

CONCLUSION

Blunt trauma is more common than penetrating trauma leading to chest injury in our study. Road traffic accident is the commonest mechanism of injury in blunt trauma group, while stab injury is the commonest mechanism of injury in penetrating trauma group. Multiple fracture ribs are the most common type of chest injury detected in our study. Age at the time of presentation, type of chest injury (blunt/penetrating), presence of other associated injuries increases morbidity and mortality in chest trauma patients.

Among the various radiological investigations (chest radiograph, USG thorax, CT-scan thorax, abdomen, head) has a definite role in the diagnosis and management of chest trauma patients. Prompt diagnosis and treatment, judicious use of radiological investigations and timely simple surgical intervention improves the final outcome in chest trauma patients. Intercostal tube drainage with under seal is an acceptable and safe management for majority of chest trauma patients. Every patient with chest trauma has to be checked for respiratory distress and patency of airway must be maintained. The outcome and prognosis for the majority of chest trauma are excellent with liberal use of systemic and local analgesia.

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