Orginal Article

Prospective Study of Blunt Trauma Chest

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Abstract

Introduction: Trauma is a major cause of morbidity and mortality in both developed and developing countries. Globally 10% of all trauma admissions results from chest injury and 25% of trauma related deaths are attributed to chest injuries. Chest trauma may present as isolated injury or as a part of polytrauma.

Aim & Objectives: To study the clinical profile of cases with blunt trauma chest in reference to mode of injury, hospital stay, diagnosis, severity of injury, treatment offered morbidity and mortality.

Material & Methods: A prospective, observational, clinical study was conducted at Department of Surgery, MMIMSR, Mullana, and Ambala. Consecutive type of non-probability sampling was used for the selection of study subjects during study duration. A total of 50 consecutive cases fulfilling the eligibility criteria were taken for study after informed consent. Data was collected from these patients admitted in surgical wards and ICU. All the patients admitted with provisional diagnosis of blunt trauma chest were admitted in surgical ward/ ICU. Data was analyzed using statistical software SPSS vesion 21.

Results: As per injury severity score, low to medium severity injury was observed in 66% and 22% cases respectively. Severe injury was seen in 12% cases. As per injury severity score, low to medium severity injury was observed in 66% and 22% cases respectively. Severe injury was seen in 12% cases. Conservative management was sufficient in 36% cases while remaining cases required surgical intervention. Tube thoracotomy was required in 62% while mechanical ventilation was seen in 36% cases. Laparotomy was required in 20% cases. Pneumonia developed in 10% cases while pyothorax and septicaemia was seen in 4% and 8% cases respectively. Acute renal failure and Multi-organ dysfunction was seen in 1 case each. Increased injury severity score was associated with poly-trauma patients ($p<0.01$). Mean hospital and ICU stay was more in polytrauma cases as compared to isolated chest trauma cases ($p<0.05$). Incidence of Mortality was 4% in present study.

Conclusion: Blunt trauma chest is more common among the young males. Increased outdoor activities and vehicular

Key Words: - *Blunt Trauma, Laprotomy, Tube Thoractomy, Pyothorax, Septicemia*

Introduction

Trauma represents a major epidemic of non-communicable disease in present century. They are no longer considered accidental but are part of the price we pay for the technological progress[1]. Trauma is a major cause of morbidity and mortality in both developed and developing countries. The usual causes are road traffic accidents (RTAs), fall from height, occupational injuries, and assault. According to the World Health Organization report on road safety, RTAs would be the fifth leading cause of death worldwide by the year 2030[2].

Globally 10% of all trauma admissions results from chest injury and 25% of trauma related deaths are attributed to chest injuries [4, 5]. It is a major problem for India, also due to a very high incidence of vehicular accidents (6% of global vehicular accidents), other accidental injuries, crime and violence. In India approximately 16000 deaths per year alone are a result

of chest trauma

[6].

According to the National Trauma Database (NTDB)[12], chest injuries are present in 13.8% of all blunt trauma patients. The overall mortality rate of chest trauma is 8.4%. The mortality rate of blunt thoracic trauma ranges from 9.5%-47.5%, depending upon the severity of injury sustained. The most common cause is motor vehicular accident (MVA), followed by fall. MVAs account for 70-80% of such injuries.

Blunt thoracic trauma is often associated with injuries to other organs, especially the abdominal solid organs as the upper part of the abdomen is overlapped by the thoracic cage. Optimal care of severely injured patients requires a coordinated approach from the point of injury, through a hospital facility organised to cope with the demands of looking after multisystem problems,

to a rehabilitation structure that can return the patient to his or her maximum potential level of function within society. Although sophisticated prehospital and trauma centre systems have been shown to reduce the number of preventable deaths after trauma, maximum impact in reducing the burden of trauma must come from injury prevention strategies[13].

This study takes into account blunt trauma chest cases being admitted to our hospital and different modalities of treatment being offered to them.

Very few studies have been conducted to analyse the magnitude and management of Blunt trauma chest in Indian scenario. This study is carried out to determine the epidemiology of the aetiology of chest trauma along with analysing the management scheme and outcome of chest injuries in a tertiary care set up in a rural area.

Methodology

Study Setting: Department of Surgery, MMIMSR, Mullana, Ambala

Study Population: Cases of Blunt Trauma Chest coming to our hospital.

Study Design: A Prospective, observational, Clinical study

Sample Size: Consecutive type of non-probability sampling was used for the selection of study subjects during study duration. A total of 50 consecutive cases fulfilling the eligibility criteria were taken for study after informed consent.

Study Duration: Oct 2016 - April 2018

Inclusion Criteria

All the adult patients of more than 18 years of age presenting with Blunt Trauma Chest admitted in Emergency or OPD.

Exclusion Criteria

Patient with Head Injury would be excluded from this study.

Data Collection Procedure

Data was collected from these patients admitted in surgical wards and ICU. All the patients admitted with provisional diagnosis of blunt trauma chest were admitted in surgical ward/ ICU.

Following investigations were done in all cases:

1. Routine Hemogram.
2. Bleeding Time, Clotting Time, Blood Group.
3. Chest X-Ray PA view, USG Abdomen, USG Thorax.
4. CT Chest and Abdomen wherever required.

A special note was made of patients with Rib fracture, Hemothorax, Surgical Emphysema and so on. Injuries of Clavicular, Sternal and Scapular Fracture were also noted down. Severe injuries to tracheobronchial tree, lungs and heart were noted down.

Management in the form of conservative, tube thoracostomy, incision for surgical emphysema, thoracotomy were studied and recorded in the proforma. Number of blood transfusion required, morbidity and mortality was noted down for every patient.

Results

Table 1 Distribution of study subjects as per mode of transport of patient to hospital

Mode of Transport of Patient to Hospital	N	%
Ambulance	17	34.0%
Police	6	12.0%
Personal	21	42.0%
Self	3	6.0%
Unknown	3	6.0%
Total	50	100%

Most of the cases reached hospital either by ambulance (34%) or personal conveyance (42%).

Table 2 Distribution of study subjects as per duration of Injury before admission (hrs)

Duration of Injury before admission(hrs)	N	%
0 to 2	12	24.0%
2 to 6	13	26.0%
6 to 12	6	12.0%
12 to 24	4	8.0%
24 to 48	6	12.0%
48 to 72	8	16.0%
>72	1	2.0%
Total	50	100%

In half of the cases, duration of injury was either less than 2 hours (24%) or between 2 to 6 hours (26%).

Table 3 Distribution of study subjects as per pattern of trauma

Pattern of Trauma		N	%
Pre-hospital Care offered		34	68.0%
Arrived From	Referral	15	30.0%
	Accident site	20	40.0%
	Delayed	15	30.0%

Table 3 Distribution of study subjects as per pattern of trauma

Mode of Injury	Assault	2	4.0%
	Fall	17	34.0%
	Industrial	4	8.0%
	RTA	27	54.0%
Pattern	Accelerated	12	24.0%
	Decelerated	38	76.0%
Type of Injury	Chest Trauma Only	32	64.0%
	Poly-trauma	18	36.0%

Pre-hospital care was offered in 68% cases while direct admission from injury site was seen in 40% cases. Mode of injury was road traffic accident in 54% cases while it was fall in 34% cases. Decelerated injury was observed in 76% cases while polytrauma was seen in 36% cases.

Most common presenting symptom was chest pain (58%) followed by dyspnea (54%), abdominal pain (24%), nausea/vomiting (22%) and hemoptysis (12%).

Table 4 Distribution of study subjects as per Chest X-ray findings

Chest X-Ray	N	%
Rib Fractures	29	58.0%
White opacification	9	18.0%
Hemothorax	26	52.0%
Pneumo-thorax	13	26.0%
Pneumo-hemothorax	6	12.0%
Clavicle Fracture	8	16.0%
Scapula Fracture	3	6.0%

Associated rib fractures were seen in 58% cases while white opacification s/o lung contusion and scapula-clavicular fracture was seen in 18% and 22% cases respectively. Hemothorax, pneumothorax and pneumo-hemothorax was seen in 52%, 26% and 12% cases respectively.

Table 5 Distribution of study subjects as per USG Thorax fixation

USG Thorax	N	%
Pleural effusion	5	10.0%
Internal echoes	2	4.0%
Surgical Emphysema	16	32.0%
Diaphragmatic hernia	0	0.0%
Pericardial effusion	0	0.0%

Emphysema was seen in 4% and 32% cases respectively.

Table 6 Association of type of trauma and Injury Severity Score

ISS Score	Type of Trauma		Total
	Chest Trauma	Poly-trauma	
< 15	31	13	44
	70.5%	29.5%	100.0%
>/= 15	1	5	6
	16.7%	83.3%	100.0%
Total	32	18	50
	64.0%	36.0%	100.0%
p- value <0.01			

Increased injury severity score was associated with poly-trauma patients ($p<0.01$).

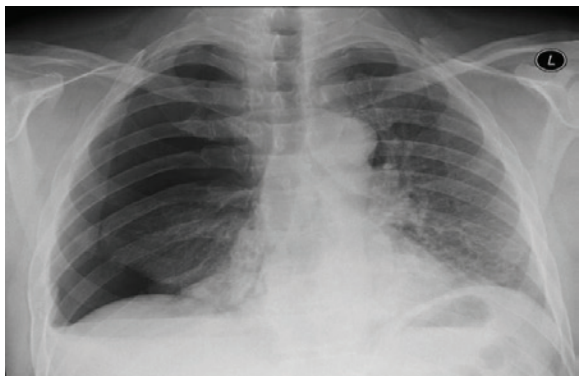

Figure 1: Right sided Pneumothorax with Rib Fracture

Figure 2: A Patient of Blunt Trauma Chest

Discussion

Trauma is usually considered as the main cause of mortality and morbidity in individuals between 1 to 44 years. Chest injuries are common reasons for emergency medical care. Most of the injuries are found among young adult males between the ages of 20 and 40 years i.e. the very productive period of life. In present study too, mean age of the subjects with Blunt Trauma Chest was 33.32 years with almost two third of cases belonging to 18-40 years of age (64%). Male predominance was seen among

study cases with 74% males to 26% females.

Demirhan R et al in their study of 501 cases of chest trauma, observed mean age as 32.2 years with 87.5% male and 12.5% females. Mean age in the study by Sirmali M et al. on 1417 cases of thoracic trauma was 43 years with 331 males to 217 females. Basoglu A et al. studied 521 patients of chest trauma with 399 males, and 122 females, with average age of 42 years. A similar study by Segers P et al. showed male: female ratio of 2.9:1 with average age of admission of 41.1 years. In a study by Sanjay Datey et al, 216 patient of chest trauma showed most cases from age group 21 to 30 years (31.95% , 69 of 216), with 174 males and 42 females. Saaiq M et al. studied 143 patient with chest trauma, 119(83%) males and 24 (17%) females with most common age group of 21 to 50 yrs. Esme H et al. studied 141 patients with 102 (72.3%) males and 39 (27.7%) females and mean age of 40 years. Kumar BA et al. conducted a cross sectional study on 200 patients with various forms of chest injuries. Males were commonly affected than female with 4.5:1 ratio, with mean age as 44.78 years. Kasbe PA et al. conducted a prospective observational study involving chest injury patients. A total of 150 chest injury patients were studied out of 864 patients of chest injury during the said period. Males outnumbered females by a ratio of 5:1. Their ages ranged from 10 to 80 years (mean = 37.27 years). Okonta AE et al. conducted a prospective study for a 4-year period at two tertiary hospitals in Nigeria. On

hundred and twenty-six (52.3%) of 241 patients had blunt chest injuries (BCI), the average age was 40.4 years with a range of 0.8-79 years. There were 104 (82.5%) male with a ratio of 4.7:1.

Mode of Injury

Mode of injury was road traffic accident in 54% cases while it was fall in 34% cases. Decelerated injury was observed in 76% cases while polytrauma was seen in 36% cases.

In the study by Demirhan R et al., RTA (72%) was most common causative factor and polytrauma was seen in 37.5% of cases. Most common aetiology observed by Sirmali M et al. was RTA (330 cases) fall from height (122 cases), assault (54 cases) and industrial accidents (42 cases). In the study by Datey S et al., RTA was most common etiological factor (114, 57.4%)

followed by fall (20.8%), assault (14.4%), industrial accident (4.2%) and animal attack (3.2%). RTA was also the most common mode of injury in the studies by Basoglu et al. (62%), Segers P et al. (72.2%), Saaig M et al. (72%), Kumar A et al. (78%), Kasbe PA et al. (60%), Shah JV et al. (76%) Okonta AE et al. (74.6%) and Alassal M et al. (66%).

The results observed by other authors regarding incidence of polytrauma are as follows: Basoglu et al. (33%), Esme H et al. (66%).

Clinical Presentation

Most common presenting symptom was chest pain (92%) followed by dyspnoea (82%), abdominal

pain (24%), nausea/vomiting (22%) and hemoptysis (12%). On general examination, abrasions, contusions and hematoma was seen in 70%, 54% and 26% cases respectively. Paradoxical chest movements and CCT was seen in 22% and 90% cases. In the study by Datey S et al, most common signs and symptoms comprised of pain and tenderness of chest wall (93.5%) and respiratory distress in 83.8%. Chest pain and respiratory distress were the commonest presentation observed in various other studies.

Esme H et al. in their study observed hypotension in 11.3% cases of chest trauma.

Type of Injury

Rib fractures were seen in 58% cases while white opacification (s/o lung contusion) and scapula- clavicular fracture was seen in 18% and 22% cases respectively. Hemothorax, pneumothorax and Pneumo-hemothorax was seen in 52%, 26% and 12% cases respectively. As per injury severity score, low to medium severity injury was observed in 66% and 22% cases respectively. Severe injury was seen in 12% cases.

In a study by Sirmali M et al. on 1417 cases of thoracic trauma showed 38.7% had rib fracture. In a study by Sirmali M et al 38.7% cases had rib fracture followed by pneumothorax (37.2%), hemothorax (26.8%), haemopneumothorax

(15.3%), pulmonary contusion (17.2%), flail chest

(5.8%) and surgical emphysema (2.2%). Basoglu et al. in a similar study observed following injuries: Multiple rib fracture was present in 56%, single rib fracture in 24% and flail chest in 8.4%. Extra thoracic injuries was in 33.2% with the involvement of extremities at 41% and skull at 40%. Common injuries observed in the study by Segers et al.were: rib fracture (n=133), pulmonary contusion (n=110), pneumothorax (n=78) and hemothorax (n=65). Datey S et al. observed 82.4% cases of Blunt trauma chest with pneumothorax in 44.4%, haemopneumothorax in 18% and contusion of lung in 17.6%. Musculoskeletal injury was present in 58, head injury in 52 with abdominal and pelvic trauma in 19 patients. In the study by Saaig M et al. [109], rib fracture (74%) was the most common chest injury. Ziegler DW et al. studied 7147 patients. Out of which 711 patients had rib fractures, 274(32%) had hemothorax or pneumothorax, 187(26%) had a lung contusion. Commonest injury observed by Kumar et al. were rib Fracture (78%) followed by hemothorax (60%) and Pneumothorax (44%). In the study by Kasbe et al, rib fracture was the commonest type of chest injury followed by pneumothorax, 88% and 62% respectively. In the study by Shah JV et al, of the 100 studied patients, 64% had rib fractures, 17% had flail chest, 12% had pneumothorax, 24% had hemothorax, and 5% had haemopneumothorax and 24% had extrathoracic injury. Common injuries observed in the study by Sah S et al. were pneumothorax followed by isolated multiple rib fracture, hemothorax, isolated single rib fracture haemopneumothorax, flail chest, subcutaneous emphysema, lung contusion, open pneumothorax and tension pneumothorax.

Abdominal Injuries

Injury to intra-abdominal organs was seen in 22% cases with liver being the most common organ involved (10%) followed by spleen – 8%, renal – 2% and pancreas -2%.

In the study by Kumar et al, commonest associated solid abdominal organ injury is Liver (16%) followed by Spleen (8%). Associated injuries in the study by Okonta AE et al. were extremities 25 (19.8%), cranio-spinal injuries in 10% cases while internal echoes and surgical

17(13.5%) and blunt abdominal injuries13 (10.3%). Liver is the most common affected intra- abdominal organ in the studies by Esme H et al., Ziegler DW et al., Kumar A et al., Kasbe PA et al. (11.97%) and Mohta M et al.

Management

Conservative management was sufficient in 36% cases while remaining cases required surgical intervention. Tube thoracotomy was required in 62% while mechanical ventilation was seen in 36% cases. Laparotomy was required in 20% cases. In the study by Demirhan R et al, management offered in 501 cases of chest trauma were Intercostal Tube Drainage in 332 (58%), conservative in 185 (32.5%), thoracotomy in

41(7.1%) and mechanical ventilation in 14 (2.4%). In the study by Segers et al.most of cases were managed with observation and/or Intercostal Tube Drainage (52.4%) and/or mechanical ventilation (61.0%). A total of 10.2% patient required thoracotomy (n=19). Main indications of thoracotomy were pulmonary laceration (n=5),

aortic rupture (n=3) and diaphragmatic rupture (n=3). In the study by Datey S et al., 25% cases needed only conservative treatment while 162 (75%) needed surgical intervention with 159 patients requiring Intercostal Tube Drainage. In the study by Saaig M et al, Intercostal Tube Drainage was done in 65 (45%) patient and mechanical ventilation was given in 17(11.88%) patients. In the study by Esme H et al., symptomatic management was done in 76 (53.9%), Intercostal Tube Drainage in 59(41.8%) and thoracotomy in 11(7.8%) patient. In the study by Kumar A et al, overall 76 % patients required tube thoracostomy and 24% patients were managed conservatively.

Complications & outcome

Pneumonia developed in 10% cases while pyothorax and septicemia was seen in 4% and 8% cases respectively.

Common complications observed in the study by Segers et al. were pneumonia (38%) and Acute Respiratory Distress Syndrome (7.0%). Pneumonia as the commonest complication is also observed by Esme H et al, Kumar A et al. [120], Kasbe PA et al. (11.97%) and Mohta M et al. (9%).

Mortality rates observed in the studies by various authors is as follows: Demirhan R et al. (6.8%), Sirmali M et al. (5.7%), Basoglu et al. (7.1%).

CONCLUSION

Blunt chest trauma is common among the middle age group and male sex. Increased outdoor activities and vehicular accidents are responsible for increased blunt chest trauma. The commonest injury was rib fracture followed by hemothorax and pneumothorax. Often a combination of these injuries were present. The most common associated injury was clavicle fracture while most common abdominal solid organ injury was that of liver. About two third cases required tube thoracotomy while 36% of cases were managed conservatively. Pneumonia was the most common complication encountered followed by septicemia

and pyothorax. The overall mortality rate in this series was 4%. The determinant of severe injury was polytrauma which leads to increased hospital/ ICU stay.

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Conflict of Intrest: Nil

Ethical Clearance - Taken from Maharishi Markandeshwar University Ethical committee members.

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