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Original Research Article

Chest Injuries due to Blunt Trauma : A Descriptive Prospective Study

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ABSTRACT

Background
Trauma cases, particularly those resulting from high-speed accidents, are becoming increasingly prevalent and contribute significantly to morbidity and mortality rates. The thoracic cage, despite its robust structure, is susceptible to injuries that can lead to severe consequences. Chest injuries account for a substantial portion of trauma-related deaths, necessitating a comprehensive understanding of their scope and management.

Methods
This prospective study aims to investigate the clinico-pathological profile of patients with chest injuries due to blunt trauma, focusing on their demographic characteristics, etiology of trauma, clinical presentation, associated injuries, and management approaches. The study was conducted at a tertiary care center, and data were collected from 115 patients presenting to the Casualty department. Patients with chest trauma such as rib fractures or lung contusions, were admitted for observation and further management.

Results
Majority of the patients were males in the young and middle age groups. Road traffic accidents were the leading cause of chest trauma, followed by falls. Alcohol consumption was prevalent among male patients involved in road traffic accidents. The most common presenting complaint was pain, often accompanied by dyspnea. Rib fractures were present in a significant portion of patients, with some individuals having multiple fractured ribs. Pneumothorax, hemothorax, and combined injuries were also observed. In terms of management, a significant proportion of cases underwent tube thoracostomy, while a small number required thoracotomy. Mortality rates were low, and complications such as empyema were infrequent.

Conclusion
This study provides valuable insights into the clinico-pathological profile of patients with chest injuries. Understanding the demographics, etiology, clinical presentation, associated injuries, and

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management approaches can aid healthcare professionals in providing timely and appropriate care. Emphasizing the importance of early evaluation, appropriate imaging, and effective management strategies, such as tube thoracostomy, can help improve outcomes and reduce the burden on tertiary care centers.

Keywords: Blunt trauma, Chest trauma, Hemothorax, Pneumothorax, Thoracostomy.

INTRODUCTION

Trauma is getting more common with each passing day. The fascination for speed and the nature of the infrastructure development works is contributing heavily to the number of trauma cases. Trauma related deaths are also on the rise. The ever increasing number of trauma cases attending the Emergency departments means that every physician must have working knowledge about the scope and the management of trauma cases.

The thoracic cage, despite having a sturdy bony framework, is subject to injuries and because of the vital nature of the organs contained in it, can contribute to morbidity and mortality in a trauma setting. Chest injuries are found to be the primary or a contributing cause of about a quarter of all trauma related deaths. The basic pathologic mechanism involved in high speed accidents is usually the abrupt application of a shearing force to fixed and non-fixed contiguous intra-thoracic structures as the vehicle suddenly decelerates. The mechanism underlying low speed accidents is the application of a more localized crushing type of injury to the thorax. The consequences of shearing and crushing associated with non-penetrating thoracic trauma are less commonly seen in patients under the age of 7 years, due to the greater elasticity of the child's thorax [1].

Rib fractures are a marker of severe injury and evidence supports the admission of cases with rib fractures for observation. Not only are rib fractures associated with severe thoracic injury, but they are also associated with head, abdomen and extremity injuries. Rib fractures themselves are painful, which can lead to pulmonary insufficiency and prolonged convalescence[2].

Physical exam is often not rewarding but the presence of distended neck veins, tracheal deviation, subcutaneous emphysema, chest wall instability, absent breath sounds or muffled heart sounds may all provide crucial information. A portable Chest X-Ray(CXR) yields rapid information about the pleural space including presence of pneumothorax or haemothorax, which may require tube thoracostomy. A Focused Abdominal Sonography for Trauma (FAST) of the abdomen and precordium should also be rapidly performed. The need, if any, for additional imaging and/or procedures is driven by the patient’s cardiopulmonary stability, physical examination, and laboratory and radiographic findings. Most blunt trauma is managed non-operatively (in the form of intercostal tube drainage, analgesics and appropriate respiratory support), whereas penetrating chest trauma requires operative intervention [3].

Due to the significant nature of the injuries that involve the chest cage, a proper understanding of these injuries will provide valuable insight into the patho-physiology and appropriate management of this condition. With this intention, we constituted this research. In this study we aim to study the clinico-pathological profile of patients with chest injuries due to blunt trauma attending a tertiary care centre.

MATERIALS AND METHODS

This was a Descriptive Prospective Study carried out in a tertiary care centre. Patients attending the General Surgery Casualty department of Government Medical College, Thiruvananthapuram, were included in the study. The sample size was calculated from a reference study [4] (n=115).

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The study was carried out as per the Declaration of Helsinki, after obtaining Institutional Review Committee and Human Ethics Committee approvals.

Inclusion Criteria

Patients who present with history of blunt chest injury of any cause to the Emergency Department of Medical College Hospital, Thiruvananthapuram.

Exclusion criteria

- History of penetrating injuries
- Presented with history of pre existing respiratory diseases i.e., COPD
- Patients with associated blunt abdomen trauma
- Patients with associated moderate to severe head injuries (GCS <13 on presentation)

On arrival all patients were evaluated by primary survey and were managed appropriately with necessary investigations and procedures. All the patients attending our emergency department were initially assessed as per the latest ATLS guidelines and a primary survey was done to look for any immediately life threatening injuries. Subsequently a secondary survey was carried out and necessary investigations like a Chest X ray, FAST and CT head were done. Among patients with chest trauma alone, those with rib fractures/lung contusions were admitted and observed.

Once the patient was stabilized, the patient details were collected using the semi structured proforma. Informed Consent was obtained from all patients or from responsible bystanders after informing about the study. The data was collected and analyzed using Google sheets. The age distribution and time interval were subjected to statistical analysis and the mean and standard deviation were calculated. The other data have all been expressed in absolute numbers and percentages. Statistical significance was set at a p value of 0.05.

RESULTS

The majority of victims in our study fell in the young and middle age groups. The age group 20-50 constituted 66% of the case. Males constituted 68% of the victims. Road Traffic accidents were responsible for 52% of the cases in our study (Figure 1). Falls were the next major contributor and accounted for 31% of cases. Trauma due to falls were seen mainly in the elderly population and construction workers. Half of the male patients who were studied had consumed alcohol and the majority of patients involved in road traffic accidents had also consumed alcohol.

To study the time interval of reporting, we could not assess all patients first hand, (because most patients were referred cases, who had taken first aid somewhere), we could not analyze the influence of time interval factor on prognosis of chest injuries. But in this study, the majority of patients have reached here within 8 hours of the trauma.

Pain alone was the most common (59%) presenting complaint (Figure 2). Pain along with dyspnea was the second most common presenting complaint. 65% of patients with chest trauma had fractured rib/ribs. In a similar study (5) rib fractures were present in 78% of the cases. 32 out of the 75 patients with rib fractures had more than 3 ribs fractured in our study.

Pneumothorax was present in 50 cases, Hemothorax was present in 10 cases and both Hemo and Pneumothorax were present in 12 cases (Figure 3). In our institution all patients detected to have a rib fracture are admitted and most patients undergo a CT scan of the chest. In the study [5] quoted above pneumothorax was present in 45% of cases. There was one case of diaphragmatic injury in our study.

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Tachycardia (Pulse >100 bpm) was present in 47% of the subjects while tachycardia and hypotension (BP < 90/60 mm Hg) were present in one subject (the diaphragm injury patient). Around 83% of the patients had associated injuries (Figure 4). 43% had head injuries and 21% had extremity injuries and around 9 % had extremity and head injuries.

In the analysis of the management done for the patients, 48% of the cases underwent a Tube thoracostomy. 2 patients in this study underwent a thoracotomy and these were the most severely injured of all patients (both patients underwent tube thoracostomy initially but have not been included in the above result). One patient underwent thoracotomy for diaphragmatic injury and the other patient underwent the same for a flail chest. These were also the two patients who died in this study. As mentioned previously both patients developed ventilatory insufficiency and subsequent MODS. The morbidity that was studied in this study was mainly empyema. Empyema was diagnosed in just one patient for whom the ICD had to be retained for more than 10 days.

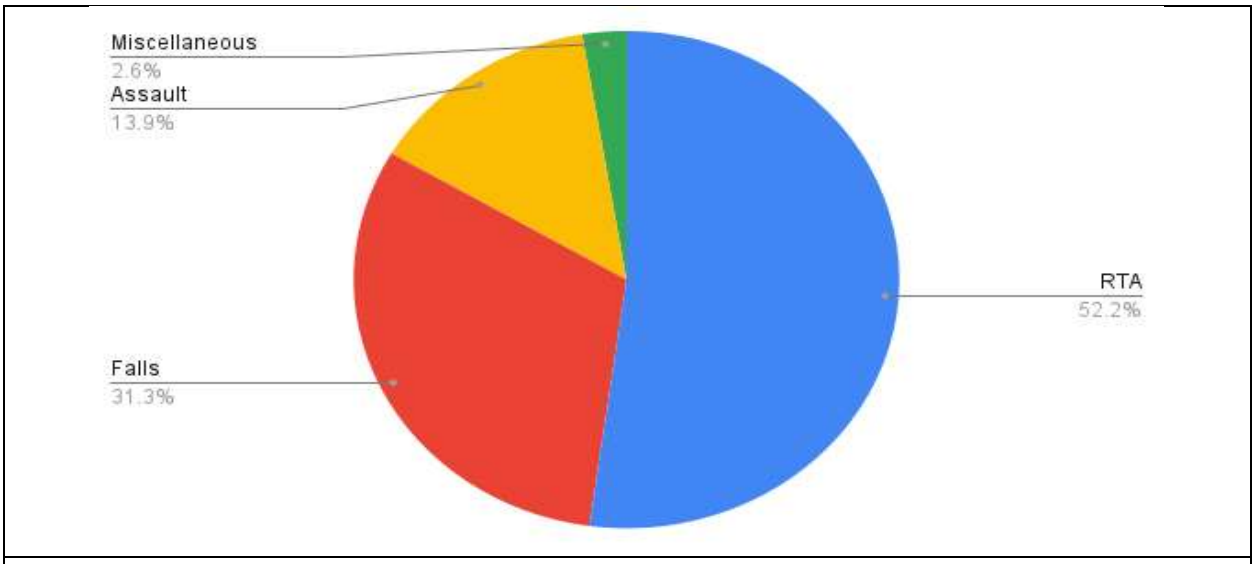

Figure 1 - Pie Chart showing the causes for chest injury

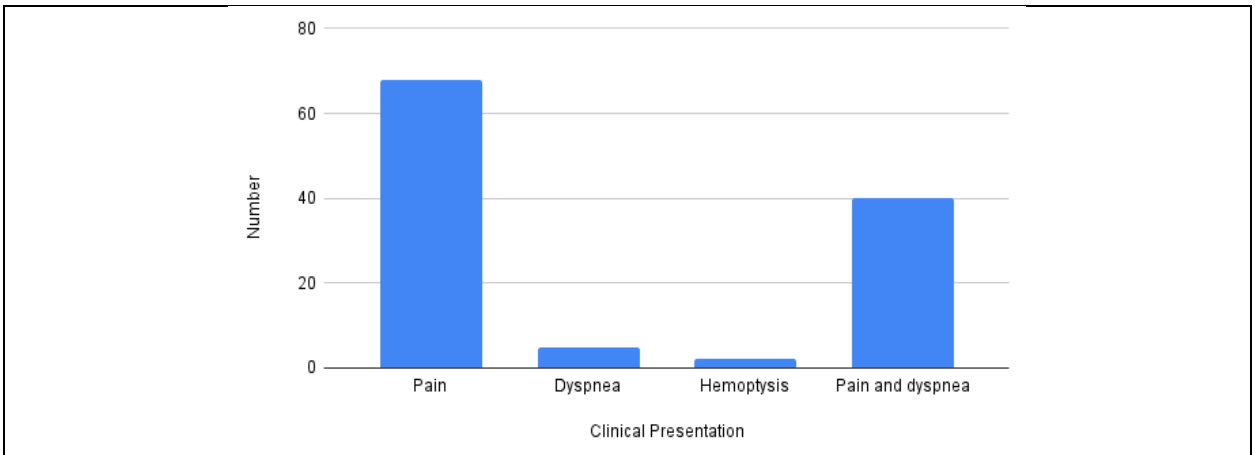

Figure 2 - Bar Chart showing the presentation of chest trauma patients

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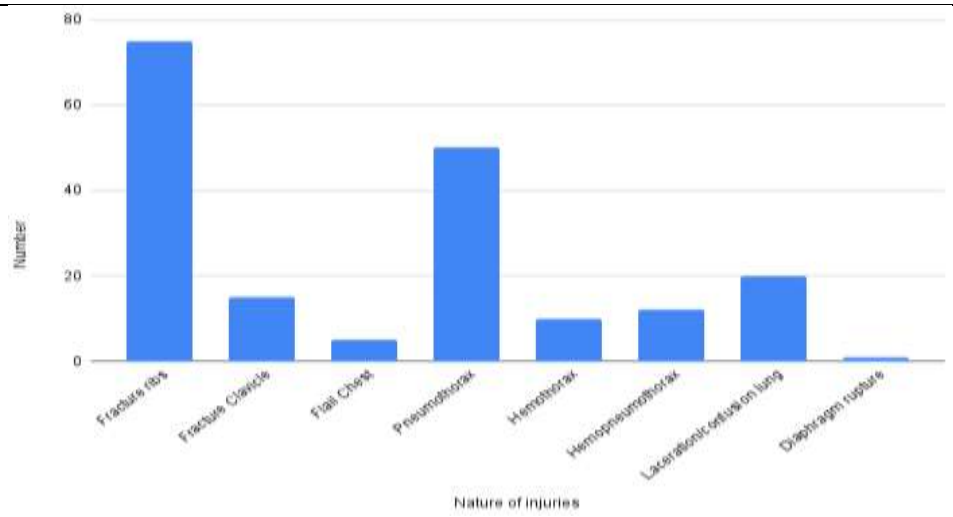

Figure 3 - Bar chart showing the nature of injuries in our subjects

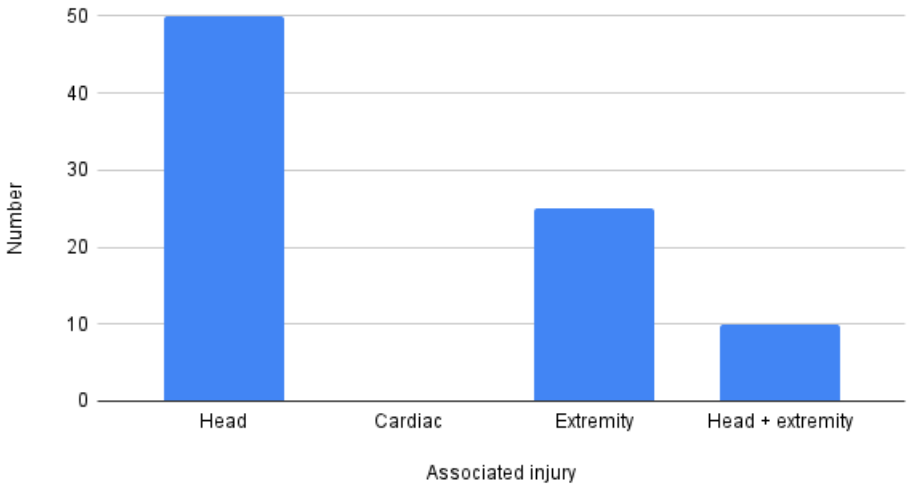

Figure 4 - Bar chart showing associated injuries

DISCUSSION

The majority of patients in our study were males and of the middle age group. These results were similar to other studies that were carried out in tertiary care centres [6]. Road Traffic accidents were responsible for the chest trauma in more than 50 % of subjects studied. This finding was also similar to findings from previous studies [2,7].

Flail chest is a serious problem in blunt chest trauma practice because of the risk of respiratory insufficiency associated with it. A low threshold for operative fixation of the flail chest has been advocated by some studies , but in our study none of the patients with flail chest underwent fixation of the fractured segment. The indications for surgical stabilisation of rib fractures (SSRF) have evolved over the last decade and its use has increased with modern techniques and hardware. The most widely studied indication is chest wall instability. The Chest Wall Injury Society Guideline[8] recommends chest wall stabilisation in patients with:

- respiratory failure with unstable fracture patterns e.g. flail chest, offset rib fractures

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- 3 severely displaced acute rib fractures in ribs 3-10, with 2 pulmonary physiologic derangements despite adequate anesthesia
- RR>20, <50% predicted volumes on incentive spirometry, pain score >5/10, inability to cough
- Failure to wean from the ventilator.

Contraindications for surgical stabilisation of rib fractures include:

- shock or ongoing resuscitation
- fractures outside of ribs 3–10
- severe traumatic brain injury (TBI) or intracranial hypertension
- acute myocardial infarction (MI)

Mortality rates from previous studies have been found to be as high as 40% for flail chest injuries[9]. There were only 2 mortalities in our study. The number of patients needing Thoracotomy for Blunt chest trauma has been on the decline with most of the injuries being managed conservatively with procedures like intercostal drain tube insertions, analgesia and mechanical ventilation. In our study only 2 patients underwent thoracotomy(1.74%). In a similar study 4.5 % patients underwent thoracotomy[10].

Our study does have its own share of limitations. The single center setting reduces the external validity of the results. The follow up period was not long enough to study the long term consequences. Also, we did not have CT results in all study subjects.

CONCLUSIONS

The majority of young adults are at major risk for trauma because they spend most of their time outdoors and partake in activities that predispose to trauma. The distance from site of injury, availability of bystanders and transport are the important contributing factors deciding on the time interval between accident and arrival at casualty. The awareness of city people about the serious complications may have helped in most patients reaching hospital in the shortest possible time.

The majority of road traffic accident victims were males and this may be due to the fact that the majority of two wheeler use is by males . Alcohol consumption is also more common in males and thus contributes to the predisposition of males to trauma. The majority of patients presented with pain as their main symptom. Patients under the influence of alcohol may not complain of pain and this underlines the importance of a quick but thorough examination to look for signs of chest injury. CT is a powerful modality to pick up injuries (like a very small pneumothorax or hemothorax) missed by clinical examination and X rays .

Tachycardia in the setting of a trauma should alert the physician to consider ongoing bleeding. But tachycardia can also be caused by other factors like pain, alcohol consumption, the increased adrenaline from the traumatic incident. Tube thoracostomy is a simple procedure with which a majority of patients can be managed. The training of physicians in the periphery to perform a tube thoracostomy can help decrease the burden on a tertiary care centre and thus the care given to the gravely injured can be improved.

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