



Clinical Presentation and Management of Chest Trauma

Running title: Management of Chest Trauma

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Abstract

Background: Chest trauma constitutes a major public health problem, which is observed as increasing frequency in urban areas. Its epidemiology and management vary from region to region.

Objectives: To assess various clinical presentations and management of thoracic injuries in South India region.

Methodology: A prospective study consisting of 200 chest trauma patients was conducted for a period of 18 months. Data regarding demographic details, medical history, family history, social history were recorded with the help of standard, semi-structured pre-validated case record proforma. Statistical software R version 4.0.3 and Excel was used to analyze the data. Chi-square test was used to check the association between attributes. P -value ≥ 0.05 indicated statistical significance.

Results: The mean age of the study cohort was observed to be 40.99 ± 15.23 years with male predominance (69.5%). The most commonly affected age group was 31-40 years (27%). Industrial worker was found to be more vulnerable to chest trauma (24%). Blunt chest trauma was more frequent (83%). The main cause of chest trauma (51.5%) was found to be road traffic accident (RTA). Conservative management was often performed (56%). Mortality rate observed was 4%. There was significant association of mechanism of injury with the type of chest trauma ($p=0.0299$).

Conclusion: The most physically active age group and male persons were affected mainly with RTA. Mortality from chest trauma can be significantly reduced by developing better trauma care systems and management. Creating a dedicated well-designed management protocols in various hospitals can further improve the outcome.

Key Words: Chest trauma, Conservative management, Traffic accident, Thoracic injuries

DOI Number: 10.14704/nq.2022.20.8.NQ44757

NeuroQuantology 2022; 20(8): 7342-7346

Introduction

Trauma is the medical condition which is often irreversible, sudden, and dramatic. It is

significantly associated with mortality.¹ Chest trauma is the second most common traumatic injury in non-intentional trauma and has



increased drastically.²It implies trauma in combination of different thoracic structures, which are randomly divided into four distinct anatomical regions including chest wall, pleural space, lung parenchyma, and the mediastinum.³It plays an important role in the management of the polytraumatized patient, which is either a blunt trauma or a penetrating trauma.⁴

Chest trauma risk is implacable to all irrespective of all the ages.²It is present in about 50% of trauma victims and causes death in about 25% of the victims. Less than 10% of blunt chest injuries and only 15%-30% of penetrating chest injuries require an operative intervention.⁵Early deaths i.e., in the first 30 min up to 3 h that results from chest trauma are frequently preventable. The causes of these early deaths include tension cardiac tamponade, pneumothorax, airway obstruction, and uncontrolled bleeding.⁴

Data analyzed for the management of chest trauma in India is limited. Furthermore, the strategies for dealing with the patients suffering from chest trauma need to be optimized. Therefore, this study was conducted with an aim to determine the demographic distribution, etiology, predominant pattern of injuries following chest trauma, and to study various complications of thoracic injuries and their management.

Methods

This prospective study was held in surgery ward of a tertiary care hospital, Karad for the duration of 18 months. Prior to study initiation, the ethical clearance was obtained from the Institutional Ethics Committee. A written informed consent was obtained from all the patients, who were included in this study.

Sample size and patient selection

The study included only patients admitted with chest trauma during December 2017 to June 2019. Polytrauma patients with chest trauma component were also included in the study. Patients with chest trauma taking discharge against medical advice were excluded from this study.

The universal sampling method was used and the following formula was used to calculate the sample size:

$$N = Z^2 * P (1-P) / D^2$$

where Z = standard score corresponding to a given confidence level. At 95% confidence level or 5% level of significance; $z = 1.96$; $P = 35$; $D = 7$ (20% of P). The sample size calculated was, $n = 178.36$. Considering 10% attrition rate, corrected sample size was 196.19, which was rounded up to 200 patients for the study.

Procedure

Patients were evaluated for injuries and resuscitative measures like endotracheal intubation, starting intravenous (IV) line was conducted when required. A detailed history of accident, including details of time elapsed between the accident and admission and probable type of the impact received was recorded. Demographic details, type of chest trauma, mechanism of the injury, other injuries, complications, and outcomes were also noted. Personal, social, and medical histories were recorded with the help of standard, semi-structured pre-validated case record proforma. These cases were studied from time of admission to death or discharge and the first and second follow-up of the study was conducted after 7 days and 15 days, respectively.

Statistical analysis

Data were analyzed using the statistical software R version 4.0.3 and Excel. Frequency tables were used to represent categorical variables. Continuous variables were presented in mean \pm standard deviation (SD) form. Chi-square test was used to analyze the association between attributes. P -value less than or equal to 0.05 indicated the statistical significance.

Results

In this study, there were total 200 subjects with mean age of 40.99 ± 15.23 years. Table 1 presents the summary of the variables.

Out of 200 patients, majority were male patients (69.5%) and belonged to the age group of 31-40 years (27%), followed by 21-30 years (24%), and 41-50 years (19%).

Majority of the patients who presented with chest trauma were industrial workers (24%), farmers (23%), and laborers (19.5%).

Total 83% patients experienced blunt chest injuries and 17% patients experienced



penetrating injuries. It was observed that maximum cases had rib fractures (66.5%) followed by pneumothorax (40.5%) and hemothorax (27%). Majority of the patients reported to have pain in the chest (93.5%), 56% patients received conservative management and 94.5% patients were found to have no complications. In the present study, 4% was the rate of mortality among the patients and 96% patients got discharged.

For all 192 patients who survived, the report of 1st and 2ndnd follow-up was found to be satisfactory. Table 2 presents the association of mechanism of injury with type of chest trauma. From Chi-square test, it was reported that there was significant association of mechanism of injury with type of chest trauma ($p=0.0299$).

Discussion

Trauma to chest can lead damage to internal organs such as heart, lungs, and other tissues of chest, thereby threatening and endangering the life of an injured person.⁶ Although trauma centers have emerged in various parts of the country, trauma care still seems to be at a developmental stage.⁷ Therefore, this study focuses to study various clinical presentations of thoracic injuries admitted in surgery ward.

The study included 200 subjects with chest trauma. The mean age of the patients was 40.99 ± 15.23 years. Maximum patients ranged from age 31-40 (27%) followed by age of 21-30 (24%). Predominance of male (69.5%) was observed in the study. These results were parallel with the studies conducted by Alam et al. with majority of the participants belonging to the age group of 16-30 years followed by the age group of 31-45 years and male preponderance (65%) was reported. In another study by Khursheed et al. showed similar findings with prevalence of age group from 21-30 (26.25%) followed by the age group of 31-40 (25.62%) and the study consisted of male participants (82.5%).^{3,8} Involvement of young male participants in external environmental forces in their daily activities might be one of the major contributing factors behind this observation. They are also attributed to the

active lifestyle with highest exposure to the use of machinery, assault, and sports.⁸

This study revealed that majority of the patients was industrial workers (24%), farmers (23%), and laborers (19.5%). These findings were comparable with the study conducted by Khursheed et al. (drivers: 17.5%, farmers: 16.25%, and industrial workers: 15.62%) and Bashah et al. (farmers: 29.7% and students: 19.8%).^{8,9} On the other hand, Negussie et al. and Onyemaechi et al. reported that majority of the patients were students (28% and 28.6%, respectively) with regard to the occupational status.^{10,11}

The prevalence of blunt chest trauma (83%) was reported in this study, which was concurrent to the study conducted by Ogunrombi et al. with 86.8%.¹² In contrast, Ali et al. reported that penetrating chest trauma was more common among the patients (61.5%).¹³ This difference in observation can be attributed to the injuries caused by frequent attack from the bandits and other communal conflicts in that particular region.¹² RTA was the commonest cause of injury (51.5%) and this was found in accordance with studies conducted by Atri et al. (81.7%), Onyemaechi et al. (53.3%), and Iyer et al. (35.2%).^{5,11,14} It was observed that this occurred due to the excess of use of automobiles in daily life.⁸

This study showed that rib fracture (66.5%), subdural hemorrhage (23%), and chest pain (93.5%) occurred most frequently. Khursheed et al. in his study reported that rib fracture was the most widespread type of chest injuries (78.12%) and pain/tenderness in the chest wall (95%) was experienced oftenly.⁸ Symptomatology of chest injuries varies with the magnitude of chest injury as well as the associated injuries with chest trauma such as head injury.⁸

In this study, 112 patients (56%) experienced conservative management followed by tube thoracotomy (39%) and thoracotomy (5%). This result was in accordance with Sharma et al. (conservative management: 93.6%).⁶ But the study conducted by Khan et al. and Massaga et al. reported 62% and 56.3% of tube thoracotomy management, respectively.^{15,16} This discrepancy may be due



to the type and severity of trauma included in their study cohort. The unstable patient may require thoracotomy at the emergency room to drain cardiac tamponade, provide cardiac massage, and control bleeding.¹⁶ Mortality of the current study was 4% and similar results were noted by Lema et al. (4.4% rate of mortality).¹⁷ In contrast, Massaga et al. reported high mortality rate (24.4%). This could be due to the severe injuries, other associated injuries, and it also depends on the management of the patients.¹⁵

In the current study, there was significant association of mechanism of injury with the type of chest trauma ($p=0.0299$). It was found that similar results were reported by Mathangasinghe et al. ($p=0.041$).¹⁸

The main limitation of this study is the small sample size and that the patients were followed-up only during the hospital stay. Hence, the current results lack generalizability to cover large regions. Further studies can be assessed by using an indicator to assess the global severity of trauma, such as Injury Severity Score in the predictive model. Better results with trauma patients can be expected with the progress in communication and emergency services.

Conclusion

This study concludes that young male persons were more prone to chest injury with prevalence of blunt chest trauma. RTA was the main cause and maximum patients suffered from rib fracture. Conservative management was most commonly performed. Preventive measures aimed at educating the common masses about the traffic rules and regulations and strictly implementing them is indispensable to reduce the incidence of chest injuries.

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