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Prediction of Outcomes in Chest Trauma Patients Using Chest Trauma Scoring System

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ABSTRACT
AIM
Our aim is to predict outcomes in chest trauma patients using chest trauma scoring system (CTS) in tertiary care hospital
METHODS
- *Sample size -50*
- *study centre- GDMCH,Dharmapuri*
- *Type of study- Retrospective study*
- *study period- 1 year (DEC2020 to DEC2021)*

OBJECTIVES
To study the outcomes in chest trauma patients using chest trauma scoring system (CTS) in tertiary care hospital
Inclusion criteria:
Patient presenting to trauma ward with chest trauma
Exclusion criteria *Flail chest ,Polytrauma (with head injury and abdominal injury)*
CONCLUSION
This study concludes that a CTS ≥5 is associated with poor outcomes.
This scoring system may be used to identify patients at risk of complications and institute early intensive focussed care.

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I. Introduction

Trauma is the leading cause of death in India. Thoracic trauma is the third most common traumatic death, after head and spinal cord injury. The incidence of chest trauma is reported 10% of trauma admissions and mortality rate is variable ranging from about 10% to 60%.Trauma to thoracic region has a wide spectrum from chest wall injury to vital organs within the thoracic cavity. Thoracic injuries may be penetrating or blunt and management varies from conservative to invasive. Though multiple studies have been done to evaluate factors that predict morbidity and mortality in thoracic trauma, few have developed into scoring systems.. There are global poly-trauma scales, like Injury Severity Score (ISS) or the Trauma Injury Severity Score (TRISS) which predict outcome in case of poly-trauma but in case of isolated thoracic trauma the score may not predict the outcome correctly. The available thoracic trauma scores are Wagner score, Abbreviated Injury Scale chest (AIS), Lung Injury Scale, Pulmonary Contusion score (PCS),or RibScore, Thoracic Trauma Severity Score (TTSS) and modified early warning signs (MEWS) scoring system. Due to difficult applicability of some scores, lack of significance for predicting outcome or resource limitation, there is no universal scoring system. Studies done on scoring systems for thoracic trauma recognise age, rib fractures, pulmonary contusions and bilateral injury as the most important factors affecting prognosis of chest trauma patients. These factors individually or combined may help in predicting outcome. The Chest Trauma Score (CTS) was derived from number of above factors, devised by Pressley et al. and validated by Chen. Chen et al. found that this simple score can predict the possibility of poor outcome like complications and mortality in thoracic trauma patients if CTS ≥5. We evaluated CTS to predict mortality as primary objective and development of complications like pneumonia and need for ventilator support as secondary objective.

II. Material And Methods

- Sample size -50
- study centre- GDMCH,Dharmapuri
- Type of study- Retrospective study
- study period- 1 year (DEC2020 to DEC2021)

III. Objectives

To study the outcomes in chest trauma patients using chest trauma scoring system (CTS) in tertiary care hospital

Inclusion criteria:

Patient presenting to trauma ward with chest trauma

Exclusion criteria

Flail chest **,**Polytrauma (with head injury and abdominal injury)

The CTS is composed of four different components with a point system assigned: age (65 = 3); pulmonary contusion (none = 0, unilateral minor = 1, bilateral minor = 2, unilateral major = 3, bilateral major = 4); number of rib fracture (5 = 3); and the presence of bilateral rib fracture = 2. Number of rib fractures and pulmonary contusion were noted from chest X-ray and Computed Tomography (CT). Each parameter has been assigned specific score and final score was calculated by adding scores of each parameter. Final CTS was then calculated which ranges from 2 to 12. On the basis of final CTS, patients were divided into 2 groups with CTS <5 and >5.

CHEST TRAUMA SCORING SYSTEM

Age score	Score	Rib score	Score
<45 y	1	<3 RIBFX	1
45-65 y	2	3-5 RIBFX	2
>65 y	3	>5 RIBFX	3
Pulmonary contusion score		Bilateral RIBFX	
None	0	No	0
Unilateral minor	1	Yes	2
Bilateral minor	2		
Unilateral major	3		
Bilateral major	4		

(Final score 2-12, Patients grouped as <5 and ≥5). RIBFX – Rib fractures

IV. Results

AGE	MALE	FEMALE	%
<45 years	33	5	76.7%
45 to 65 years	6	2	14.7%
>65 years	3	1	6.7%

Out of 50 patients 38 (76.7%) patients were younger than 45 years, 8 (14.7%) were between 45 and 65 years and remaining 4(6.7%) patients were older than 65 years. The mean ± SD age of the patients admitted with isolated chest trauma was 34.50 ± 15.861 years. Out of 50 patients 42 patients (86.7%) were males and 8 (13.3%) were females. Total CTS was calculated by adding scores of each parameter . The final CTS noted in this study were in the range of from 2 to 12 with mean score of 5 ± 1.250. On the basis of total CTS, patients were divided into Total chest trauma score <5 (25 patients) and ≥5 (25 patients).

Association between high CTS ≥5 and development of pneumonia was found to be statistically significant . Association between high CTS ≥5 and requirement of mechanical ventilation was found to be statistically significant with a chi square coefficient of 5.000 and P value of 0.025. Total CTS ≥5 was significantly associated with mortality with a chi square coefficient of 6.136 and P value of 0.035, thus the association between high CTS and mortality was found to be statistically significant .

We also analysed each score component separately with respect to association with outcome. All the patients ≥65 years in the study group required mechanical ventilation(chi square coefficient of 13.696 and a P value = 0.000). Patients ≥65 years had 71.4% mortality as compared to 13% in <45 years. With a chi square coefficient of 9.355 and a P value of 0.007, the association between increasing age and mortality was found to be statistically significant.

Development of pneumonia, requirement of mechanical ventilation and mortality were associated with increasing number of Rib fractures (>3), high pulmonary contusion and bilateral injury individually.

V. Discussion

The CTS was evaluated with respect to outcome in 50 patients admitted with chest trauma over the specified study period, at a trauma care unit of a tertiary care hospital. Immediate and precise assessment of the severity level in thoracic trauma is essential for prompt and correct management, for predicting outcome, complications and requirement of intensive care and also explain prognosis to patients and relatives. If the assessment of the chest trauma severity is consistent and uniform based on standard scoring system, classification and triage can be done quickly and implementation of treatment protocols will be prompt in the emergency room. Joshipura et al. mentioned the lack of organised trauma care and gross disparity between trauma services available in various parts of India. A simple universal scoring system like CTS to assess both the severity of the trauma and for prognostication may help to standardise trauma care in India.

In the present study CTS the final CTS noted was in the range from 2 to 12 with mean score of 5 ± 1.250. Severe chest injury with high CTS hinders with deep breathing and coughing out of secretions, leading to secondary respiratory complications, development of pneumonia and requirement of mechanical ventilation. This was proved in our study as high CTS ≥5 was significantly associated with high incidence of pneumonia (P = 0.046) and increased requirement of mechanical ventilation (P = 0.025) in chest trauma. In a study by Pressley et al. high CTS scores were associated with pulmonary complications and are more likely to require intubation. Chen et al. showed that patients with CTS ≥5 had a greater prevalence of pneumonia and mechanical ventilation.

In the current study high total CTS was also significantly associated with mortality (P = 0.035). Early mortality was seen in bilateral multiple internal injuries with major vessel and refractory respiratory failure was the commonest cause for late mortality. Studies by both Pressley et al. and Chen et al. show that high CTS scores have a greater prevalence of mortality. Chen further stresses that CTS ≥5 is an important independent predictor for all three outcomes separately that is mortality, pneumonia, and Acute Respiratory Failure. Chen et al. also compared CTS with ISS and AIS chest and they were found to be insignificant for predicting all three outcomes in the same patients.[6] This scoring system may assist in the triage, resource utilisation like ICU bed and ventilator. Also in patients with high CTS on admission, earlier implementation of treatment strategies such as but not limited to epidural analgesia, supportive ventilation, and intercostal drainage (ICD) can be applied to reduce morbidity and mortality.

The association of increasing age with requirement of mechanical ventilation (P = 0.640) and mortality (P = 0.007) was significant but with pneumonia was not statistically significant. Battle et al. also showed increased odds of mechanical ventilation with increase in age.Bulger et al. also showed increased number of ventilator days with elderly suffering with blunt chest trauma.

Development of pneumonia, requirement of mechanical ventilation and mortality were associated with increasing number of rib fractures (RIBFX >3), high pulmonary contusion and bilateral injury individually but they were statistically not significant. This suggests that these components as an individual parameter may not be suitable to predict outcomes but when used together as a total score may help to predict outcome. Thus, this CTS system may give better predictive value of outcome than individual parameter.

Failure to treat blunt chest injuries in a timely manner with adequate analgesia, physiotherapy and respiratory support, often results in complications leading to pneumonia, respiratory failure and death.

VI. Conclusion

Thus, from the present study we conclude that CTS is a good predictor of outcome in chest trauma patients. This study concludes that a CTS ≥5 is associated with poor outcomes. This scoring system may be used to identify patients at risk of complications and institute early intensive focussed care.

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