Original Research Article

Appraisal of Early Evaluation and Analysis of blunt chest trauma outcomes in patients

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Abstract

Background: Blunt chest trauma is related with a high risk of mortality. Respiratory complications may demand prolonged ventilation and result in death. **Objectives:** To investigate possible signs of trauma and the prognosis of trauma patients with thoracic injuries and recognize risk factors for mortality. **Methods:** A retrospective study was accomplished to investigate the clinical characteristics and treatment consequences of trauma patients with blunt chest injuries who undertook thoracic computed tomography on influx in the emergency department of King George Hospital Visakhapatnam (January 2019– August 2021). The prognostic values of age, sex, trauma type, injury severity score, revised trauma score (RTS),ventilator requirement, days in Intensive Care Unit (ICU) were evaluated. SPSS was used for analysis. **Results:** Fourteen of 30 analyzed patients died during their ICU stays; accordingly, we classified patients as survivors and non-survivors. These groups differed significantly regarding the RTS (P = 0.01), mechanical ventilation requirement (P = 0.03)and the presence of hemothorax (P = 0.03). However, no significant differences in the pneumothorax, rib fractures were observed between the groups. **Conclusion:** Between hospitalized trauma patients with blunt thoracic injuries, RTS, mechanical ventilation requirement,and hemothorax were recognized as risk factors for mortality. Patients should receive care andbe monitored closely to improve survival.

Keywords: Blunt trauma, chest injury, mortality, revised trauma score, hemothorax, mechanical ventilation.

Introduction

Trauma related mortality updates for 9% of deaths in all age groups and maximum cases include blunt injuries[1]. Multiple trauma is the foremost cause of emergency admission, accounting for roughly 16% of global medical expenses[2,3]. A previous study originate that 20% of deaths occurred within the first few weeks after injury, 30% occurred within hours of the injury, and 50% occurred instantly[4]. Therefore, management of this problematic condition frequently requires a multidisciplinary approach. Chest trauma is one of the most communal injuries suffered by polytrauma patients, with an incidence of 45%–65%[5]. This type of trauma, which is usually instigated by a high energy blunt force, is related with mortality rates as high as 60%[6]. Thoracic trauma is, thus, important in the overall management of multiple injury patients and may require a lengthier stay in the Intensive Care Unit (ICU) and use of mechanical ventilation. In addition, trained multidisciplinary teams and well equipped facilities play critical roles in dropping the rate of mortality inside a few hours of trauma injury[7]. The present study was conducted to determine the outcomes of blunt chest trauma and to identify possible risk factors for mortality.

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Materials and Methods

This retrospective study was conducted at King George Hospital Visakhapatnam where most trauma patients are transferred for treatment. Advanced Trauma Life Support guidelines were used for the early assessment.The medical records of all patients in our trauma registry were identified those who underwent chest radiography (CXR) and computed tomography (CT) scans of the thorax for thoracic injury diagnosis on arrival from January 2019 to August 2021. The patients were divided into two groups: survivors and non-survivors. Data were evaluated for variables such as age, sex, injury severity score (ISS), revised trauma score (RTS), injury mechanism,ventilator support requirement, associated injuries, ICU days,total length of stay (LOS), associated thoracic injuries,and laboratory examinations performed on arrival at our hospital. A total of 320 cases of multiple trauma within a 3 year period were available from the trauma registry in which 30 cases of blunt trauma were included in the study.All CXR and CT images were reviewed by investigators. All cases were assessed for the presence or absence of hemothorax, pneumothorax, fractured ribs, subcutaneous emphysema, pneumomediastinum, and mediastinal hematoma.

Patients were excluded from this study if they were younger than18 years, had an accompanying intracerebral hemorrhage or other brain injury, exhibited organ dysfunction or serious disease before injury, experienced an out-of-hospital cardiac arrest, or had incomplete data. The study was approved by theauthors' Institutional Review Board.

Statistical methods

Data analyses were performed using the Statistical Package for Social Sciences, version 22.0 (SPSS, Inc., Chicago, IL,USA). Student's t-test was used for continuous variables,and the Chi-square test or

Fischer's exact test was used forcategorical variables, respectively. The value of P < 0.05 wasconsidered statistically significant.

Results

Table 1- Demographic details and Injury details of participants

Variables	Survivors (n=15)	Non-survivors (n=15)	P
1. Age	40.10±20.15	37.87±19.28	0.74
2. Sex (%)			
Male	11 (80.00)	13 (86.67)	0.40
Female	4 (20.00)	2 (13.33)	
3. ISS	26.47±11.29	33.27±8.72	0.08
4. Revised trauma score	6.16±1.36	4.43±1.37	**0.02**
5. Initial reason (%)			
Multiple trauma	3 (20.00)	6 (40.00)	0.61
High falling	3 (20.00)	3 (20.00)	
GCS <13	6 (40.00)	5 (33.33)	
Arterial SBP	1 (6.67)	0 (0.00)	
Physicians decision	2 (13.33)	1 (6.67)	
6. Injury cause (%)			
Road accident	10 (66.67)	12 (80.00)	0.46
Falling injury	2 (13.33)	3 (20.00)	
Explosion	3 (20.00)	0	
7. Mechanical ventilator (%)			
Present	6 (46.67)	14 (93.33)	**0.01**
Absent 8. Abdominal injury (%)	9 (53.33)	1 (6.67)	
Present	3 (9.67)	0	0.50
Absent	12 (90.33)	15 (100.00)	
9 Pelvic injury (%)			
Present	2 (13.33)	3 (20.00)	0.50
Absent	13 (86.67)	12 (80.00)	
10.Admission (%)			
ICUs	12 (86.67)	15 (100.00)	0.13
Ward	3 (13.33)	0	
11. ICU stay	17.70±21.54	6.83±10.36	0.15
12. Total length of stay	50.70±59.82	6.43±10.36	**0.01**

As per table 1Thirty patients (24 men, 6 women) with blunt chest trauma were included in the study. The average age was 39.16 ± 19.42 years. Twenty-seven and three patients were admitted to the ICU and general ward, respectively. The main cause of multidisciplinary trauma team involvement was multiple trauma (nine patients, 30.0%), followed by fall from a height (six patients, 20.0%), Glasgow coma scale <13 (11 patients, 36.7%), physician's decision (three patients, 10%), and systolic blood pressure <90 mmHg (one patient, 3.3%). Three patient had a coexisting abdominal injury, and five patients had pelvic injuries. The survivors and non-survivors differed significantly in terms of the RTS (6.16 ± 1.36 vs. 4.43 ± 1.37; P = 0.02), number of total LOS (50.70 ± 59.82 vs. 6.43 ± 10.36; P = 0.01),and mechanical ventilator usage (P = 0.01). However, no significant inter-group differences were observed in age, sex.

Table 2- Associated Thoracic Injuries related to Blunt Chest Trauma

Variables	Survivors	Non- Survivors	P
1.Pneumothorax			
Present	4 (26.67)	7 (40.00)	0.350
Absent	11 (73.33)	8 (60.00)	
2.Hemothorax			
Present	9 (60.00)	3 (20.00)	**0.030**
Absent	6 (40.00)	12(80.00)	
3.Fractured ribs			
Present	10 (66.67)	9 (53.33)	0.355
Absent	5 (33.33)	6 (46.67)	
4.Flail chest			
Present	3 (26.67)	0	0.050
Absent	12 (73.33)	15 (100.00)	
5.Subcutaneous emphysema			
Present	4 (26.67)	2 (20.00)	0.257
Absent	11 (73.33)	13(80.00)	
6.Pneumomediastinum			
Present	2 (13.33)	2 (13.33)	0.999
Absent	13 (86.67)	13 (86)	

As per table 2 When patients were classified by thoracic injury type, rib fracture was the most common, followed by hemothorax, pneumothorax, subcutaneous emphysema, flail chest, pneumomediastinum, and mediastinal hematoma. A significant intergroup difference in hemothorax incidence was observed (P = 0.030).

Table 3-:Details of Laboratory Parameters in both groups

Variables	Survivors (n=15)	Non-survivors (n=15)	P
White cell count	14360±7750	16760±4395	0.15
Hemoglobin	12.35±2.10	12.95±2.84	0.52
Platelet counts	213.67±91.07	185.33±80.07	0.37
MCV	91.93±6.39	91.08±8.91	0.76
BUN	15.97±8.87	14.60±3.74	0.58
Creatinine	1.05±0.24	1.05±0.24	0.94
AST	92.93±78.01	73.13±70.89	0.47

As per table 3 Laboratory parameters were performed when the trauma patients arrived. No significant inter-group differences in white cell count, platelet count, mean corpuscular volume (MCV), or hemoglobin, blood urea nitrogen (BUN), creatinine, aspartate aminotransferase (AST).($p>0.05$).

Discussion

Blunt trauma injuries predominately affect male individuals aged 30–40 years. These injuries are mostly caused by traffic accidents, as well as falls from heights[8]. Alike to other studies, in our study, the mean age at the time of injury was 39.13 ± 19.42 years, and maximum patients were male (83.3%). Also, traffic accidents (73.3%) and falling from a height (20%) were the main causes of injury. Many studieshave stated associations of ISS and RTS with mortality. Precisely, the mortality risk increases with an ISS >40 and RTS <4.5[9,10,11]. In the present study, patients with multiple trauma and related blunt thoracic injuries had a mortality rate of 50%. In a previous study, 30%–75% of pulmonary contusions following to blunt thoracic trauma were caused by vehicular accidents[12].

Posttraumatic pulmonary contusion might injure the small airways and harm capillaries and epithelial cells. In addition, augmented mucus production, joined with a decreased ability to expectorate, may also persuade pulmonary alveolar edema[13]. Therefore, the patient may require a longer period of mechanical ventilator use and have a longer LOS. The thoracic injury is common among blunt trauma patients and may be isolated or concomitant. In general, such damage can be detected using CXR. Hemothorax/pneumothorax escorted by rib fractureis the most common type injury. Most patients are managed through tube thoracostomy[14] and mortality is straight related to the number of fractured ribs[15]. Pape et al.[16] revealed that in comparison with rib fractures, bilateral lung contusions accompanying with hemo/ pneumothoraces were a more vital factor regarding adverse outcomes. Contusion induced alveolar hemorrhage and pleural collection with hemothorax primes to a collapse of the lung parenchyma and extend the course of hospitalization; therefore, some studies revealed that the consequences of patients with blunt chest trauma might be affected by the interval between trauma and additional surgical intervention[17,18].

Conclusion

The RTS score, mechanical ventilator usage, and hemothorax were identified as risk factors for mortality. Most chest injuries could be treated through tube thoracostomy. However, it should be noted that early surgical intervention and multidisciplinary care would improve the outcomes of patients with initial radiographic evidence of hemothorax.

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