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In-Hospital Study of Combined Trauma Score and Outcome in Poly Trauma

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Abstract

Background: Several Trauma scores are utilized to evaluate the injured victim. Physiologic, anatomic, combined (anatomic and physiologic) scoring systems are commonly used. There is no consensus on the best predictor of mortality and morbidity.

Aim and Objective: To report in-hospital mortality and disability of polytrauma cases in our trauma center. We studied and compare the clinical and radiological parameters to trauma scores (RTS and NISS) and their outcome.

Methods: The study included all injured polytrauma cases aged 14-65 years, between June 2015 to July 2017 at Trauma Centre and Super specialty Hospital, Department of General-Surgery, Institute of Medical Sciences, Varanasi. Pregnant women or patients having preexisting co-morbid conditions were excluded. Demographics profile, vital, MOI, NISS, RTS, blood transfusion, length of stay, and mortality recorded. Cases were divided into two groups: survived and expired.

Results: Out of 61 polytrauma cases, 88.5% of cases were survived and 11.5% were expired. The mean age at presentation was 38.74 ± 13.22 years (range 18-65 years). Majority 77% of cases had RTI followed by FFH 21.3% and structural collapse 1.6%. FAST positive in 47.5%. Out of 61 cases, 12 (19.7%) had ICU requirement, 40 (65.5%) had blood transfusion and shock in 58 (95.1%).

The mean NISS was significantly low in the survived group (p=0.001) and RTS was significantly high in the survived group as compared to the expired group (p=0.001). The hospital stay was also significantly high in the survived group (p=0.049). On comparing the mean change in GCS, SBP, RR, RTS, and NISS at presentation and discharge which showed statistically significant change (p=0.003, p<0.001, p<0.001, p<0.001, p=0.037). In our study, the cutoff point of NISS for predicting mortality was 20 (sensitivity, 100%; specificity, 73%). The cutoff point of RTS for predicting mortality was 4.5 (sensitivity, 85%; specificity, 100%).

Conclusion: Based on observation, the NISS is a better predictor compared to RTS in terms of their outcome in polytrauma cases.

Keywords

Polytrauma; Injury severity score; New injury severity score

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Introduction

Trauma leads to demise and disability globally. Global burden of disease study, injuries are accountable for 5.1 million deaths, and 15.2% of disability-adjusted life years lost [1,2]. According to the WHO more than 1.2 million people die just in road accidents every year and as many as 50 million people are injured or disabled [2].

To compare the severity and clinical outcome of trauma patients, injury severity scoring systems are widely accepted tools, trauma-related mortality depends on factors as injury severity, age, sex, mode of injury, quality of provided health care, and associated co-morbidities [3].

Several trauma scores are used to evaluate injured patients, classified as physiologic, anatomic, and combined anatomic and physiologic scoring systems [4]. The majority of anatomic injury severity scores are based on the Abbreviated Injury Scale (AIS), the most widely used severity scores are the Injury Severity Score (ISS) and the New Injury Severity Score (NISS) [5-7].

Osler et al. states the NISS is the sum of the squares of the three highest injury scores regardless of the body region, the ISS is the sum of the squares of the injury scores in the three most severely injured body regions [5,6]. Various studies comparing the ISS and the NISS, the majority of the study on blunt trauma reveals the NISS to be superior to ISS [8-11].

The Revised Trauma Score (RTS) is assessed from the physiological responses of injured cases. The physiological parameters that make up the Revised Trauma Score are the respiratory rate, systolic blood pressure, and the Glasgow Coma Score. Values for the Revised Trauma Score range from 0 to 7.84, with 0 representing the deceased patient and 7.84 representing a patient with normal physiological parameters [12].

RTS is the best and globally used physiological trauma scoring system, use of the RTS coded values in the field can allow rapid characterization of neurologic, circulatory, and respiratory distress and assessment of the severity of serious head injuries [13].

Although the existence of several scoring systems there is no consensus which one is the better for predicting mortality, to report in-hospital morbidity and disability of polytrauma cases in our trauma center, we studied and compared in-hospital clinical and radiological parameters in relations to trauma scores (RTS and NISS) and their outcome.

Methods

Our study is in hospital Prospective study, included all injured polytrauma cases reported between June 2015 to July 2017 at our Trauma Centre, Department of General Surgery, Institute of Medical Sciences, Banaras Hindu University Varanasi.

All polytrauma victims aged 14-65 years were included in the study, pregnant women or preexisting co-morbidity cases were excluded. The written informed consent was taken from all the patients or his/her relatives. The study was approved by the

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Institutional Ethical Committee of the Institute of Medical Sciences, Banaras Hindu University, Varanasi.

Data included patient demographics, Heart Rate (HR), Systolic Blood Pressures (SBP), Diastolic Blood Pressures (DBP), Respiratory Rate (RR), mechanism of injury, Glasgow Coma Scale (GCS), Revised Trauma Score (RTS), new injury severity score (NISS), need for blood transfusion, need for exploratory laparotomy, hospital length of stay, and mortality and disability.

The ISS was calculated by giving the AIS score of each injury. The highest AIS score in body region was used, the AIS scores of the three most severely injured body regions were then squared and added together to produce the ISS score 1-75.

The NISS was defined as the sum of the squares of the AIS of the patient's three most severe AIS injuries, regardless of the body region in which they occurred.

Revised Trauma Score (RTS) aimed at identifying severity based on systolic arterial pressure, Glasgow Coma Scale, and respiratory rate. RTS score (0-12) was calculated (GCS value × 0.9368+SBP value × 0.7326+RR value × 0.2908).

All data analyzed by using the Statistical Package for the Social Sciences version 23 (SPSS, Inc, Chicago, IL), data presented as proportions, medians, or mean ± standard deviation, as appropriate. Patients were classified into survived and expired. Comparisons were performed by using Chi-Square, Student t-test, and paired Student t-test whenever applicable. Receiver operating characteristic curves were plotted to identify the NISS, RTS, and GCS cut off points for predicting the mortality. The Area Under the Curve (AUC) was used to compare the discriminatory power of the scoring system, with an AUC of 1.0 considered as perfect discrimination and 0.5 considered as equal to chance. A two-tailed p-value of <0.05 was considered to be statistically significant.

Results

A total of 61 cases were admitted to the trauma center during the study period. Fifty-two were males (85.2%) and 9 were females (14.8%). The mean age of patients was 38.74 ± 13.224 years (ranging from 18-65 years), 37 (60.7%) patients had <40 years age and 24 (39.3%) patients had >40 years age group.

The majority, 47 (77%) cases had motor vehicle injury followed by fall from height 13 (21.3%) and 1 (1.6%) structural collapse. FAST was positive in 29 (47.5%) and negative in 32 (52.5%).

According to NCCT Head, 15 (24.6%) patients had a contusion and 1 (1.6%) cases have a diffuse axonal injury.

Table 1: Comparison of various study variables between survived and expired.

	Outcome				p-value
	Survived (n=54)		Expired (n=7)		
	No.	%	No.	%	
Age					
< 40	33	61.1	4	57.1	0.840
≤ 40	21	38.9	3	42.9	
Mean ± SD	38.22 ± 13.026		42.71 ± 15.130		0.402
Gender					
Male	45	83.3	7	100	0.242
Female	9	16.7	0	0.0	
Mechanism injury					
RTA	41	75.9	6	85.7	
Falls	12	22.2	1	14.3	0.823
Structure collapse	1	1.9	0	0.0	
Definitive airway	4	7.4	2	28.6	0.077
Hemothorax	23	42.6	2	28.6	0.689
Pneumothorax	20	37.0	2	28.6	0.710
Tension pneumothorax	1	1.9	1	14.3	0.218
Flail chest	2	3.7	1	14.3	0.311
Contusion	9	16.7	0	0.0	0.580
RR	29.33 ± 7.919		30.29 ± 12.175		0.780
Pulse	107.93 ± 16.271		108.57 ± 26.063		0.927
SBP	96.15 ± 13.861		82.57 ± 15.131		0.019
DBP	59.70 ± 11.409		52.57 ± 13.100		0.131
GCS presentation	14.19 ± 2.075		13.43 ± 2.820		0.387
Blood transfusion	34	63.0	6	85.7	0.40
FAST	26	48.1	6	85.7	0.106
Hypothermia	7	13.0	4	57.1	0.016
Shock	52	96.3	6	85.7	0.311
Spine protection	4	7.4	1	14.3	0.532
ICU requirement	6	11.1	6	85.7	<0.001
RTS presentation	7.2504 ± 0.73178		6.0990 ± 1.23611		0.001
NISS presentation	17.39 ± 6.614		26.29 ± 4.990		0.001
Hospital stay	9.50 ± 3.284		6.57 ± 5.884		0.049

RR: Respiratory Rate; SBP: Systolic Blood Pressures; DBP: Diastolic Blood Pressures; RTS: Revised Trauma Score; NISS: New Injury Severity Score

Table 2: Area under the curve for different severity scores

Test Result Variable (s)	Area	Sensitivity	Specificity	p-value
GCS	0.43	60%	75%	0.549
RTS	0.68	85%	100%	0.014
NISS	0.89	100%	73%	0.001

GCS: Glasgow Coma Scale; RTS: Revised Trauma Score; NISS: New Injury Severity Score

On CECT thorax, hemothorax was the commonest observation in 11 (18.03%) cases followed by pneumothorax in 11 (18.03%), hemopneumothorax in 8 (13.11%), flail chest in 6 (9.84%) and lung contusion in 4 (6.56%) cases.

According to CECT abdomen, 17 (27.86%) cases had solid organ injury followed by hollow organ injury in 12 (19.67%) cases, both solid and hollow viscus injury in 3 (4.91%) cases.

Other associated injuries like fracture of clavicle and scapula were present in 8 (13.1%) and fracture of radius and ulna in 7 (11.5%) cases.

Out of 61 patients, 12 (19.7%) had ICU requirement, while blood transfused in 40 (65.6%) cases and shock responded in 58 (95.1%) cases.

At the end of the study, 54 (88.5%) cases were survived and discharged, 7 (11.5%) had expired.

On comparing various data between survived and expired cases, the statistically significant difference was observed in systolic blood pressure (p=0.019), hypothermia (p=0.016), ICU requirement (p<0.001), revised trauma score (p=0.001), new injury severity score (p=0.001) and duration of hospital stay (0.049) (Table 1).

GCS, NISS, and RTS were assessed to predict the sensitivity of these tools among the polytrauma cases. The receiver operating characteristic curve was used to compare the sensitivity and specificity of three different scores. Among three trauma scores, GCS, NISS, and RTS were having 0.43 (sensitivity 60% specificity 75%), 0.68 (sensitivity 85% specificity 100%), and 0.89 (sensitivity 100% specificity 73%), of area under the curve (Table 2).

Discussion

In our study most of the polytrauma cases were male. Previous studies had shown alike observation [14,15]. The mean age of our cases was 38.74 ± 13.22 years.

The present study revealed the commonest mechanism of polytrauma were road traffic accidents, fall from height was another, the study by Aydin et al. also revealed most common mechanism leading to trauma was road traffic accident [16].

In our study, NCCT head revealed Traumatic Brain Injury (TBI), fifteen (24.6%) cases had a contusion and diffuse axonal injury in one (1.6%) case.

On CECT thorax, hemothorax was the most common finding present in 11 (18.03%) cases followed by pneumothorax in 11 (18.03%), hemopneumothorax in 8 (13.11%), flail chest in 6 (9.84%) and lung contusion in 4 (6.56%) cases.

According to CECT abdomen, 17 (27.86%) cases had solid organ injury followed by hollow viscus injury in 12 (19.67%) cases and combined injury in 3 (4.91%) cases.

Other associated injuries as a fracture of clavicle and scapula were present in 8 (13.1%) and fracture of radius and ulna in 7 (11.5%) cases.

In this study, 11.5% of polytrauma cases succumbed, a nearly similar results in a study by Yousefzadeh-Chabok et al. reported mortality rate was 13.9% [17].

According to the international consensus, both anatomical and physiological parameters should be included in the definition of poly, trauma. We compared the two standard trauma scores, RTS and NISS in the polytrauma patients. In our study mean NISS were significantly higher in expired (26.29 ± 4.990) cases compared to survived (17.39 ± 6.614) cases (p=0.001) and RTS was significantly lower in expired (6.0990 ± 1.23611) cases compared to survived (7.2504 ± 0.73178) cases (p=0.001). A similar finding was reported by Javali et al. [18].

In the present study, best cutoff points for predicting mortality in polytrauma victim NISS and RTS were 20 and 4.5 with a sensitivity of 100%, 85%, and specificity of 73%, 100%, respectively.

The area under the ROC curve using NISS and RTS for predicting death was 0.89 and 0.68 respectively; all these scores were statistically significant in terms of mortality prediction. In a study by Javali et al. found the best cutoff points for predicting mortality in elderly trauma patients in NISS and RTS were 17, 7.108 with a sensitivity of 91%, 97% and specificity of 93%, 80% respectively [18]. They also found statistically significant results in terms of mortality prediction.

In our study, we found that NISS was most sensitive to predict in-hospital mortality. Previous studies had shown that vital signs like heart rate, respiratory rate, and GCS may be more accurate predictors for in-hospital mortality than RTS and NISS and may depend on age [19,20].

Multicentric study in India concluded that RTS is a better predictor of inpatient mortality than ISS and NISS [21], but in our study, we found RTS has less sensitive predictor compared to NISS.

In a study by Jamulitrat et al., enunciated that NISS is better than ISS in the prediction of mortality in their prospective study in 2044 trauma patients [22]. In another study conducted by Husum et al., NISS and ISS were compared for prediction of short-term mortality and postoperative complications in adult penetrating trauma patients [23]. Our study revealed the performances of ISS and NISS for short term mortality prediction were similar, but NISS was superior for the prediction of postoperative complications.

In polytrauma cases, Hemothorax and pneumothorax have equal share followed by hemo-pneumothorax, flail chest and pulmonary contusion among thoracic trauma, Solid organ injury is the commonest finding followed by hollow viscous injury and combined injury among associated abdominal injury and Contusion is the commonly observed findings compared to diffuse axonal injury among traumatic brain injury. The limitation of the study is the small sample size and single-center study.

Conclusion

To conclude, anatomical based trauma score systems (NISS) are much better predictors of in hospital mortality in comparison to physiologically based scoring systems (RTS) for polytrauma cases. Identification of more precise tools and consensus guidelines may help trauma physicians to better identify the patients at risk of the worse outcome at an early stage and could lead to institutional prophylactic measures and as outcome predictor.

Conflict of Interest

The authors declare no conflict of interest.

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