Comparison of the RTS and ISS Scores on Prediction of Survival Chances in Multiple Trauma Patients

Porovnání RTS a ISS skórovacích systémů v predikci naděje na přežití u pacientů s mnohočetným poraněním

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ABSTRACT

PURPOSE OF THE STUDY

Trauma represents the third cause of death after cardio vascular disease and tumors. Also in Iran, road accidents are one of the leading causes of death. Rapid evaluation of trauma severity and prediction of prognosis and mortality rate and probability of survival and rapid treatment of patients is necessary. One of the useful instruments for this is ISS and RTS scoring systems. This study evaluated 70 multi trauma patients in Fatemi trauma center affiliated to Ardabil University of medical science.

MATERIALS AND METHODS

This study was prospective study populations were 70 trauma patients admitted in Fatemi trauma center. During the II month, and patients data was collected by clinical evaluating of patients and follow up them and arranged as a questionnaire then related findings were evaluated by SPSS software.

RESULTS

The average age of patients was 37.6?23.5 years and minimum and maximum age was 1 and 85 years. The most common involved group was 10-19 years (13 men and 1 woman). 81.4% of patients (57 cases were male) and 18.6% were female (13 cases). The most common causes of trauma was car accident with 64.2% frequency (43 cases) and then motorcycle accident with 16.4% frequency (11 cases) and all injured patient due to motorcycle accident compose the age group less than 40 years old. Also car accident had the highest frequency in both gender.

Other causes of trauma were fall down with 13.5% frequency (9 cases) and under debris 5.9% (4 cases). Also from 70 studied patients, 67 cases (95.7%) had blunt trauma and 3 cases (4.3%) had penetrating trauma. The most penetrating trauma occurs in ages less than 50 years and was in the range of 30-50 years. The average RTS and ISS was 10.67?1.45 and 18.11 ?8.64, high and low scores of ISS existed in

all age groups but a low score of RTS was highest in the children age group. The average length of ICU stay was 12.14?11.11 days. Overall mortality was 15.7 (11 cases). In this study, by the ISS increasing, the mortality rate also increased. But there is no relation between the mortality rate and RTS ratio.

CONCLUSION

The ISS scoring system performed better than the RTS in predicting of mortality and probability of survival and the length of ICU stay and had high accuracy and can predict patients' outcome better by ISS measuring.

Key words: multiple trauma, RTS, ISS

INTRODUCTION

After cardiovascular and tumor diseases, trauma is the third leading cause of death among in developed countries. Rapid assessment of the patient is a gold standard in emergency, in which "Golden Hour" for appropriated management for each emergency situation is now commonly used (5). In the United States, trauma is annually associated with billions of dollars of financial losses. In Iran, road accidents is one of the main causes of deaths and 25 to 30 thousand people are killed in Iran annually (15). Determining the severity of the trauma as a quantitative approach to show the severity of injury in different pathologies has begun since 1950 (11). Trauma Score was used in 1981 as a tool for triage of patients. Accurate scores such as Glasgow Coma Scale (GCS) and Trauma Score (TS) that could be calculated quickly bedside, would be useful for the initial evaluation of patients with acute injuries.

The Revised Trauma Score (RTS) (Table 1), which is derived from the TS, has been designed to be used in clinical assessment and follow-up of trauma patients. It has been proven to be better than TS in predicting mortality and in-patient outcomes (11). The Revised Trauma Score is made up of a combination of results from three categories: Glasgow Coma Scale, Systolic Blood Pressure, and Respiratory Rate (1, 6, 11).

The injury severity score (ISS) is based upon the Abbreviated Injury Scale (AIS). To calculate an ISS for an injured person, the body is divided into six ISS body regions. Then take the highest AIS severity code in each of the three most severely injured ISS body regions and then with this formula:

$ISS = A2 + B2 + C2$ where A, B, C are the AIS scores of the three most injured ISS body regions, score will be calculated.

The ISS scores ranges from 1 to 75 (i.e. AIS scores of 5 for each category). If any of the three scores is a 6, the score is automatically set at 75. Since a score of 6 ("unsurvivable") indicates the futility of further medical care in preserving life, this may mean a cessation of further care intriage for a patient with a score of 6 in any category.

It has been shown that ISS can better predict the likelihood of mortality, but there are still some restrictions that cannot calculate serious multiple injuries in an area of the body.

Therefore, it faces some difficulties especially in the evaluation of penetrating trauma, such as a patient with multiple injuries in an area (1). The purpose of trauma system is to prevent unnecessary death (8, 9, 11). Triage in the accident, is a search to identify patients at high risk of mortality due to the severity of injuries. Until the patient is taken to a trauma-treating center, there are some guidelines for the triage of those exposed to trauma (9). Due to the severity of accidents, the majority of patients are afflicted with multiple traumas and this makes it necessary to evaluate and predict the severity of trauma and determine the prognosis and mortality rates, possible survival, and rapid intervention in its treatment. From among the useful and effective methods for predicting and diagnosing the severity of trauma and prognosis of the patient in terms of survival and mortality rates, we could mention ISS and RTS rating systems. Given the importance of examining the prognosis of trauma patients, the present study was conducted to improve treatment and care approaches related to these patients. The purpose of this study was to assess RTS and ISS rating systems in terms of prognosis in patients with multiple traumas in Fatemi Hospital Trauma Center and compare these two systems together. Thus, 70 trauma patients admitted and treated at Trauma Centers of Fatemi Hospital from October 2006 until July 2007 were examined.

MATERIALS AND METHODS

Tab. 1: *The Revised Trauma Score (RTS)*

Glasgow Coma Scale (GCS)	Systolic Blood Pressure (SBP)	Respiratory Rate (RR)	Coded value
13–15	>89	10–29	4
9–12	76–89	>29	3
6–8	50–75	6–9	2
4–5	1–49	1–5	1
3	0	0	0

Tab. 2. *Frequency distribution of patients according to ISS and mortality rate*

Rates ISS	Frequency of patients	Mortality
1–5	4	–
6–10	5	–
11–15	27	4
16–20	15	1
21–25	2	–
26–30	9	3
31–35	6	3
36–40	2	–
Total	70	11

Tab. 3. *Frequency distribution of patients according to RTS and mortality rate*

Rates ISS	Frequency of patients	Mortality
12	26	3
11	17	2
10	17	1
9	2	1
8	5	2
7	2	2
6	1	–
5	–	–
4	–	–
3	–	–
2	–	–
1	–	–
0	–	–
Total	70	11

Tab. 4. *Correlation between RTS and ISS*

	RTS	ISS
Spearman Correlation	1	-0.557
Significant level		0.000
Samples	70	70
Spearman Correlation	-0.557	1
Significant level	0.000	
Samples	70	70

This analytic prospective study was done on the patients with multiple trauma (trauma of more than an area of the body caused by road accidents, falling from height and other factors) admitted to Fatemi Hospital Emergency Ward in Ardebil from October 2006 till July 2007. information like age, sex, cause of trauma, location, and type of trauma were noted, also two rating systems of RTS and ISS was performed in a period of 11 months for each patient.

Patients with non-trauma disorder or trauma to only one part of the body or organs' trauma were excluded from study. A questionnaire was designed to gather information for the selection of individuals based on inclusion and exclusion criteria from the project. The information related to the patients was extracted through interviews, clinical assessment and follow-up, and then was collected and adjusted. In this scheme, the patients are ensured that their medical secrets and questionnaire content will be kept completely confidential.

Based on the results of the questionnaire, 70 patients were entered into the study. The data related to previous records was obtained and registered through interviews with patients and their relatives. The proprietary information was gathered through assessing the patients themselves accurately. All patients were followed until

hospital discharge and their mortality was recorded referring to their files in the hospital. After data collection, it was coded and analyzed using SPSS-15 software.

FINDINGS

Mean age of patients was 37.6?23.5 years (between 1 and 85 years). The largest age group, afflicted with trauma was the group aged between 10 and 19 years old (13 men and 1 woman) and the smallest was between 70 and 79 years of age (1 man and 1 woman). The men included 81.4% of the patients (57 people), and the women 18.6% (13 people). 95.7% of trauma types comprised of blunt types (67 people) and 4.3% included penetrating ones (3 people). Most trauma causes in the studied patients included car accidents (64.2%), and the least causes were tangling under the collapse (5.9%).

RESULTS

Results showed that the main cause of traumas was car accidents in both sexes and revealed the frequency of accidents compared with other blunt traumas in this study. 96.5% of men were afflicted with blunt trauma (55 cases of 57 patients), and 3.5% were afflicted with penetrating trauma (2 cases of 57 patients). In contrast, 92.3% of women suffered from blunt trauma (12 of 13 people) and 7.7% suffered from penetrating trauma (1 of 13 people). Most penetrating trauma has occurred under 50 years of age and within the range of 30-50 years. In the meantime, most blunt trauma has occurred in the age range of 10-19 years.

The findings of this study also showed that the age group of 60-69 years old had the highest rate of car accident, and the age group under 40 years old included all injuries caused by motorcycle accidents. From among these, people between 10-19 years had the highest frequency. Due to aging, the age group of 80-89 years had the most causes for falling from a height.

Results showed that at two age groups of (80-89) and (20-29) the frequency of deaths was at its highest rate. However, due to the frequency of the patients the results indicated as the age increased, the mortality rate also increased. In the meantime, as ISS increased, the cases admitted in the ICU (intensive care) increased, too. Moreover, as RTS cases decreased, the cases admitted in ICU (intensive care) increased. Table 2 and Table 3 show the distribution of patients based on ISS and RTS and their related mortalities. To obtain the relationship between RTS and ISS, the Spearman Correlation Coefficient has been used (Table 4).

DISCUSSION

The results showed that the minimum and maximum age distribution was 1 and 85 years, respectively. The mean age was 23.5?37.6 and it was conformed to the study done in the department of cardiac and lung surgery by Zhao and colleagues (2007) that the mean age of patients was 38.2% and the age range included 5-59 years (16). Among age groups, the age group of 10-19 was the most prevalent age of trauma and in terms of gender distribution, male to female ratio was 4.3 to 1. This case study was conformed to the research performed in India in 2004 by Mulidhar

and colleagues. It included 84% of men and 16% of women (12). Also, a study in Tehran by Hatem Abadi (2004) called trauma "an illness for young men" (7). The rate of blunt trauma in our study was 97.7% and that of penetrating trauma was 4.3%. This result was in conformity with the studies conducted in Italy in 2004 and 2006. In 2004, 94%, and in 2006, 95% of the cases has been reported as blunt trauma (2). According to a study in Tehran in the year 2003-2004 (7) like our study motorcycle accidents have been mentioned as the most common mechanism of trauma. Padalino and colleagues in 2006 in Italy have reported road accidents with motor vehicles as the most common cause of trauma with approximate rate of 55.5% (13). The mortality in this study included 11 patients equal to 15.7%. The survival included 83.3% equal to 59 patients, and the mortality rate included a large number compared to the research conducted by Chinese University Chongqing with 6.8% mortality and 93.2% survival rate as well as 2006 study in Italy with 4.08% mortality (13, 16).

We could mention the main cause as severe trauma and injuries to patients in our study or poor performance in delivering pre-hospital care regarding the patients' taking to trauma centers in the minimum possible time. In addition, in this study older age, and previous records of a disease (e.g. ischemic heart disease) may explain the high mortality in some trauma patients (about 24.5% of the studied patients are over 60).

As for the average ISS and RTS in the studied patients, which respectively are 18.11?8.64, 10.67?1.45, the average ratio of ISS and RTS in an Italian study in 2006, are respectively as 13?9,7.5?1. According to these studies, equals to 15.7% in this study and 4.08% in the study conducted in Italy showed that ISS compared to RTS was the reliable prediction of mortality rate in trauma patients transmitted to the emergency ward. However, the average RTS rate in this study is more than that of the study conducted in Italy. Whereas the mortality in this study is about 3 times more than the mortality of the research performed in Italy. Thus, increasing ISS is associated with increased mortality and with the high levels of ISS we will have a higher rate of mortality. But RTS is not associated with mortality rate.

The results of this study indicate ISS higher efficiency in predicting mortality and outcome of trauma patients compared with RTS (13). The duration of staying in the ICU in this study was 12.08?11.11 days. In a study conducted in Italy by Padalino and colleagues, this period has been 11.7?10.3 days. Taking into account the average ISS and RTS in these two studies (ISS average in this study = 18.11?8.64, and RTS average in this study 10.67?1.45) and considering average ISS in Italy as 13?9, and average RTS 7.5?1, indicates that there is a direct relationship between ISS rate and duration of staying in ICU (intensive care needs). So that as ISS increases the duration of staying also increases. But there is no relationship between the rate of RTS and duration of staying at ICU (13). In this study, RTS is 7.5+1 and average RTS of our study is 10.67?1.45, while the duration of staying in ICU in our study is more than the conducted study in Italy, RTS of our study is more than RTS of Italian study, and meanwhile the duration of staying should be shorter (13). In

a study performed in Ardebil Fatemi Center, 34 patients (48.5%) had their ISS higher than 15 (ISS>15). From these patients, 30 subjects were admitted and hospitalized at ICU (88.2%). Only four people of these patients had no ICU hospitalization (11.8%), and all the patients with RTS<9, were admitted in ICU. This study demonstrates the point that increasing severity of trauma and injuries and thereby increasing the degree of ISS and reduction of RTS will increase ICU admission rate. The results of this study confirm the proposition presented in a study conducted by Du et al in 2000 in China. This study has suggested RTS=11 and ISS=9 to be transferred to an equipped trauma center (3). The results show that ISS acts better than RTS in predicting the probability of survival and mortality and duration of staying in ICU, and its accuracy is higher.

In a study in turkey after comparison of Injury Severity Score (ISS), Glasgow Coma Scale (GCS), Revised Trauma Score (RTS), and TRISS in patients with thorax trauma, conclusions showed that TRISS model would further reveal the mistakes and may improve patient care (4).

Based on a study in United States, in injuries are concomitant with blunt chest trauma, thoracic trauma severity is better than AIS(chest), Pulmonary Contusion Score (PCS), Wagner-score and Thoracic Trauma Severity Score (TTS) (10).

In a systematic review in 2012, authors after including 64 relevant articles tried to compare different injury severity scorings, results showed that the new ISS (NISS) might perform better in the mortality prediction of blunt injuries than the ISS. Additional studies are required to standardize the derivation of the International Classification of Diseases (ICD)-based Injury Severity Score (ICISS) and determine the relative performance of the ICISS against the AIS-based tools (14).

CONCLUSIONS

According to this study, in addition to RTS and ISS in predicting mortality and morbidity of patients other factors such as the age of trauma-stricken patients and other previous diseases (such as cardiac ischemia, etc.) are involved in, whereas these cases do not exist in RTS and ISS trauma scoring systems. Generally, in patients with multiple traumas we can predict the outcome measuring ISS. It is recommended to conduct a study in future using age+ (TRISS+ISS) in order to compare multiple trauma patients admitted to the trauma centers with existing systems.

Conflict of Interests

Authors have no conflict of interests.

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