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Correlations among the RTS, ISS and TRISS trauma indices in different types of chest injury

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ABSTRACT

Aim: The aim of the present study was to evaluate correlations among the RTS, ISS and TRISS indices in different types of chest injury.

Method: A quantitative, retrospective, cohort study was conducted involving all patients with chest injuries at the Regional Trauma Center of the Base Hospital of the São José do Rio Preto School of Medicine in a one-year period. The sample was composed of 367 patients (293 males and 74 females) aged 13 to 89 years (mean: 37.9 ± 17.3 years).

Results: Significant differences in median values of the RTS, ISS and TRISS were found among the different types of injury ($p = 0.000$).

Conclusion: The injury assessment indices varied with the cause of trauma and are useful for the definition of the severity of chest injuries.

Keywords: *Trauma indices; RTS; ISS; TRISS; Types of trauma; Chest*

INTRODUCTION

The Abbreviated Injury Scale (AIS) and Injury Severity Score (ISS) were introduced in 1969. These are precise methods for quantifying the severity of trauma and injuries with numerous potential applications [1,2]. A variety of anatomic and physiological trauma indices can be used either alone or in combination to identify the severity of injuries [3]. Each injury is given a seven-digit number, the last digit of which represents severity of the injury for the tabulation of the ISS [3,4] which is an anatomic scoring system that offers a global score for patients with multiple injuries. Each injury is given an AIS and

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the score is attributed to one of the six regions of the body [head, face, thorax, abdomen, extremities (including pelvis), external]. Only the highest AIS in each region of the body is used. For the three most seriously injured regions of the body, the scores are squared and summed to produce the ISS, which ranges from 0 to 75. If an injury is attributed an AIS of 6 (lethal), the ISS is automatically 75 [3-6].

The AIS is a simple method for numerical classification and the comparison of injuries based on severity. Although originally designed for vehicle-related injuries, its use has been expanded to include other types of trauma. With this method, injuries are classified using an ordinal scale ranging from 1 (minor) to 6 (lethal) [7].

The Revised Trauma Score (RTS) is one of the most common physiological scoring systems. Revised trauma score (RTS) ranged from 2.746 to 7.8408. There was a graded increase in mortality with decreasing RTS score [8]. The RTS uses three specific physiological parameters: the Glasgow Coma Scale (GCS), systolic blood pressure and respiratory frequency [9].

The prediction capacity of any model is generally improved with the inclusion of additional relevant information. Champion and colleagues exemplified this concept with the development of the TRISS, which is a scoring system that combines anatomic and physiological measures of injury severity (ISS and RTS, respectively) and patient age to predict survival following trauma and was introduced in 1981 [9-12].

The aim of the present study was to evaluate correlations among the RTS, ISS and TRISS indices in different types of chest injury.

PATIENTS AND METHODS

Patients

All patients with chest injuries at the Regional trauma center of the base hospital of the São José do Rio Preto School of Medicine in a one-year period.

Type of study

A quantitative, retrospective, cohort study was conducted to correlate the RTS, ISS and TRISS in different types of trauma. Evaluated patients with chest trauma at the trauma service of a teaching hospital in a one-year period and correlated the RTS, ISS and TRISS for the following different types of trauma:

1) Automobile accident
2) Motorcycle accident
3) Runover
4) Fall
5) Bicycle accident
6) Gunshot wound
7) Knife wound
8) Aggression
9) Burn
10) Impaled

11) Electrical shock

12) Bite

13) Drowning

14) Suicide

Inclusion criteria

All individuals with chest trauma with an AIS of 2 or more were included.

Exclusion criteria

All patients who arrived dead at the service and for whom resuscitation was not performed were excluded from the study.

Ethical considerations

This study received approval from the Human Research Ethics Committee of the São José do Rio Preto School of Medicine (FAMERP) protocol n02665/04.

RESULTS

The sample was composed of 367 patients (293 males and 74 females) aged 13 to 89 years (mean: 37.9 ± 17.3 years). Mean age of the women was 43.2 ± 20.0 years and mean age of the men was 36.4 ± 16.3 years. The male sex was more frequent that the female sex ($p < 0.001$).

Trauma	N <	N >	Median	Q3-Q1
Automobile Accident	21	70	7.84	0
Motorcycle Accident	10	36	7.84	0
Runover	10	12	7.84	2.96
Fall	8	68	7.84	0
Bicycle Accident	4	18	7.84	0
Gunshot Wound	10	8	6.74	7.84*
Knife Wound	7	34	7.84	0
Aggression	1	23	7.84	0
Unintentional Injury	0	13	7.84	0
Impaled/Shock/Suicide	0	17	7.84	0

Table 1: Median RTS values for different types of trauma.

Note: *p = 0.000 - chi-squared test.

Significant differences in median values of the RTS were found among the different types of injury ($p = 0.000$, chi-squared test) (Table 1). This finding was confirmed by the results of the Kruskal-Wallis test with the Bonferroni correction for multiple comparisons ($p < 0.000$) (Figure 1).

Significant differences in median values of the TRISS were found among the different types of injury ($p = 0.000$, chi-squared test) (Table 2). This finding was confirmed by the results of the Kruskal-Wallis test with the Bonferroni correction for multiple comparisons ($p < 0.000$) (Figure 2).

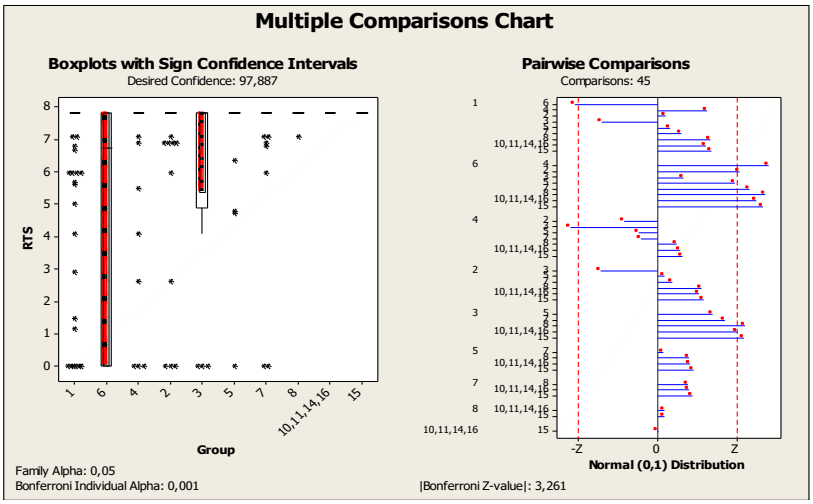

Figure 1: Boxplot and multiple comparisons of variation in RTS among different types of chest injury. Multiple comparisons tested using Bonferroni test 1) automobile accident; 2) motorcycle accident; 3) runover; 4) fall; 5) bicycle accident; 6) gunshot wound; 7) knife wound; 8) aggression; 10,11,14,16) impaled/electrical shock/suicide; 15) unintentional injury.

Trauma	N <	N >	Median	Q3-Q1
Automobile Accident	51	40	98.9	5.5
Motorcycle Accident	18	28	99.4	0.8
Runover	18	4	95.5	36.8
Fall	41	35	98.8	3.6
Bicycle Accident	11	11	99.2	3.3
Gunshot Wound	16	2	96.9	53.9
Knife Wound	25	16	99.1	1
Aggression	6	18	99.4	1.4
Unintentional Injury	3	14	99.6	0.2
Impaled/Shock/Suicide	4	9	99.3	0.8

Table 2: Median TRISS values for different types of trauma.
Note: *p = 0.000 - chi-squared test

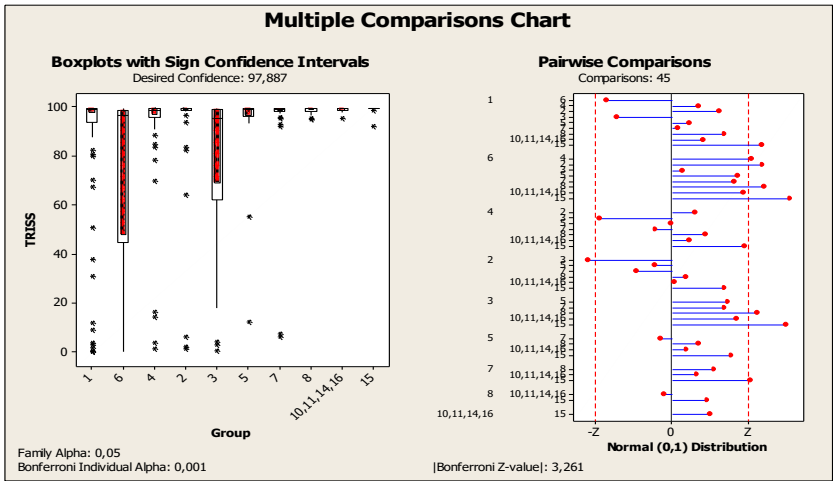

Figure 2: Boxplot and multiple comparisons of variation in TRISS among different types of chest injury. Multiple comparisons tested using Bonferroni test 1) automobile accident; 2) motorcycle accident; 3) runover; 4) fall; 5) bicycle accident; 6) gunshot wound; 7) knife wound; 8) aggression; 10,11,14,16) impaled/electrical shock/suicide; 15) unintentional injury.

Significant differences in median values of the ISS were found among the different types of injury (p = 0.000, chi-squared test) (Table 3). This finding was confirmed by the results of the Kruskal-Wallis test with the Bonferroni correction for multiple comparisons (p < 0.000) (Figure 3).

Trauma	N <	N >	Median	Q3-Q1
Automobile Accident	38	53	13	18
Motorcycle Accident	26	20	9	11
Runover	6	16	16	18.5
Fall	50	26	8	12
Bicycle Accident	11	11	10	9.5
Gunshot Wound	3	15	22.5	19.8
Knife Wound	20	21	13	9
Aggression	17	7	6	7.5
Unintentional Injury	14	3	5	4
Impaled/Shock/Suicide	7	6	10	9.5

Table 3: Median ISS values for different types of trauma.
Note: *p = 0.000 - chi-squared test.

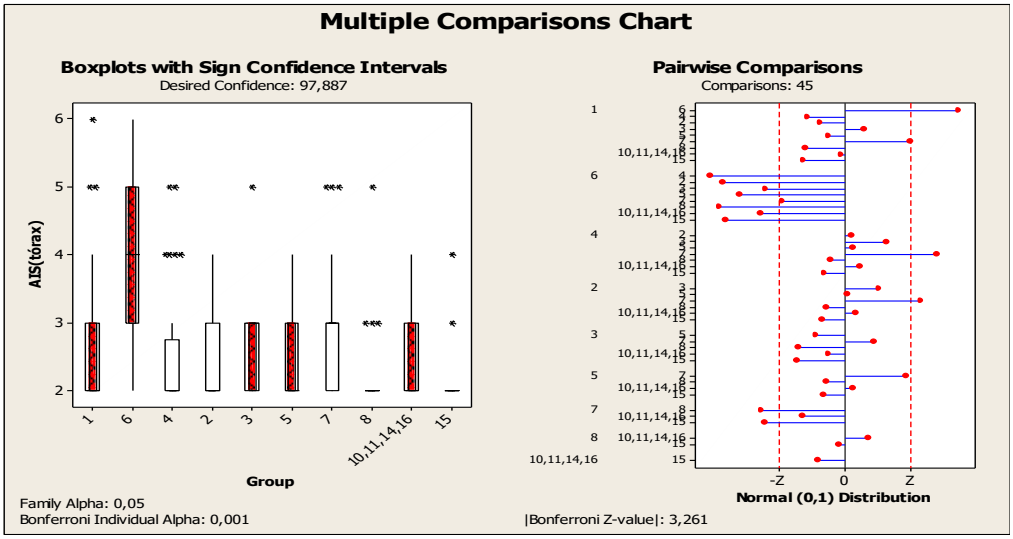

Figure 3: Boxplot and multiple comparisons of variation in ISS among different types of chest injury. Multiple comparisons tested using Bonferroni test. 1) automobile accident; 2) motorcycle accident; 3) runover; 4) fall; 5) bicycle accident; 6) gunshot wound; 7) knife wound; 8) aggression; 10,11,14,16) impaled/electrical shock/suicide; 15) unintentional injury.

DISCUSSION

The RTS, TRISS and ISS differed among the different types of trauma. Gunshot wounds and runovers had the highest alterations in relation to these indices, demonstrating a direct relation to the severity of trauma and offering important information regarding patient status. Weaknesses of study are a retrospective study and strong points are association with all types of trauma.

One of the few studies in the literature that have correlated chest injury indices with their severity found that, among the widely used trauma indices, the ISS has better discriminatory power regarding the development of acute respiratory distress

syndrome (ARDS) [6]. A cutoff point of ISS ≥ 16 has good sensitivity and specificity and constitutes a simple method for assessing ARDS in the epidemiology of trauma [1]. Chest injuries account for 25% of all deaths from traumatic injury [12].

The indices employed in the present study address general patient information beyond the focus of the chest injury, enabling the establishment of the severity of each case and the delineation of therapeutic strategies. As distinct types of injury differ in terms of severity, the use of these indices is fundamental in any situation of urgent care.

The ability to predict morbidity and mortality in cases of trauma using an injury severity score has obvious applications. However, decisions regarding individual patients should never be made exclusively based on a single statistic, such as the ISS. A variety of anatomic and physiological trauma indices can be used in combination to identify the severity of injuries [3]. Trying to summarize the severity of injuries in a patient with multiple traumas based on a single number is difficult in the best of hypotheses. Thus, diverse scoring systems have been proposed - each with its own problems and limitations [1].

Most patients with chest trauma can be treated clinically with or without pleural drainage. With the careful monitoring of vital signs, the adequate replacement of fluids and analgesia constitute adequate therapy in up to 90% of patients [13]. However, 10% to 15% of cases require urgent thoracotomy [14]. The surgical correction of severe thoracic wall injuries is associated with low morbidity in the long term and a health status nearly equivalent to that of the general population [15].

CONCLUSION

The injury assessment indices varied with the cause of trauma and are useful for the definition of the severity of chest injuries.

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