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ROLE OF INJURY SEVERITY SCORE IN POLYTRAUMA CASES

Orthopaedics

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ABSTRACT

Polytrauma patients represent the ultimate challenge to trauma care and the optimization of their care is a major focus of clinical and basic science research.Scores are very important to the scientific study of the epidemiology and treatment of trauma. Trauma systems are vital components of trauma care chain.

The present study was conducted to identify the role of injury severity score in polytrauma patients.The study was conducted at MIOT Hospitals, Chennai, India from 1-Oct-2014 to 1-Dec-2015 for a period of 14months.One hundred and forty nine cases of polytrauma with musculoskeletal injuries were selected and classified as stable, borderline, unstable and in extremis and received either ETC or DCO on the basis of different parameters including AIS and ISS score. There is definitely a role for ISS scoring in the classification of polytrauma patients and which will definitely affect the future management protocol of the patient. This will helps identify patients with polytrauma with low chances of survival, and to allow a fair comparison between different trauma patient .Although ISS is the most widely accepted anatomical score, there are major limitations with this approach.

KEYWORDS

Polytrauma,Trauma scoring systems,ETC,DCO,ISS.

INTRODUCTION

Trauma continues to be a leading cause of death and disability in all age groups, especially the young. The initial assessment and management of seriously injured patients is a challenging task and requires a rapid and systematic approach [1]. Injuries causing this mortality occur in predictable patterns and recognition of these patterns led to the development of advanced trauma life support (ATLS) by the American College of Surgeons, and standardized protocol for trauma patient evaluation has been developed. Different systems of trauma scoring have been developed. [2] Characterization of injury severity is crucial to the scientific study of trauma, yet the actual measurement of injury severity began only 50 years ago.Abbreviated Injury Scale (AIS) was introduced by the Association for the Advancement of Automotive Medicine (AAAM) International Injury Scaling Committee (IISC) and later modified in 2005. The AIS is the basis for the Injury Severity Score (ISS), which is the most widely accepted measure of injury severity in patients with polytrauma.The ISS score is virtually the only anatomic scoring system in widespread use. A single scoring system is inefficient to address the severity of multiple injuries in polytrauma patients; so there were multiple scoring systems as well as combined scoring systems were introduced, each with its own problems and limitations. [3]

AIS and ISS scoring systems

AIS was initially introduced in 1971[4]. All different anatomic injuries are matched with a different seven-digit number code. They are classified according to the affected *body region* (first digit, with body region 1 = head, 2 = face, 3 = neck, 4 = thorax, 5 = abdomen, 6 = spine, 7 = upper extremities, 8 = pelvis and lower extremities, and 9 = external and thermal injuries), *type of anatomic structure* (second digit, range 1 to 6), *specific anatomic structure* (third and fourth digits, range from 02 to 90), and *level of the injury* (fifth and sixth digits, range from 00 to 99). The last digit of each seven-digit AIS code follows a dot and represents the injury severity of the specific injury on a scale of 1 to 6 (1 = minor, 2 = moderate, 3 = serious, 4 = severe, 5 = critical, and 6 = maximal-currently untreatable injury). This last severity digit has been developed by a consensus of many experts and is continuously monitored by the committee.Main limitation of the AIS scale is it does not provide a comprehensive measure of severity.The AIS scale does not represent a linear scale, ie the difference between AIS1 and AIS2 is not the same as the difference between AIS4 and AIS5.When used alone, the current AIS version is not useful for predicting patient outcomes or mortality; instead, it forms the basis of the Injury Severity Score (ISS) and the Trauma and Injury Severity Score (TRISS).

Table 1 AIS CALCULATION

Injury	AIS Score
1.	Minor
2.	Moderate
3.	Serious
4.	Severe
5.	Critical
6.	Unsurvivable

The ISS was introduced by Baker et al. in 1974[5]. Each injury in the patient is allocated an AIS code and the codes are grouped in six ISS body regions: head and neck, face, chest, abdomen, extremities and pelvis and external. Only the highest AIS severity score (post dot digit-seventh digit of the AIS code) in each ISS body region is used. The ISS is the sum of the squared AIS scores for the three most severely injured ISS body regions[5]. It can take values from 1 to 75. A value of 75 can be assigned either by the sum of three AIS severities of 5 in three different ISS body regions, or by the presence of at least one AIS severity of 6. Any AIS severity 6 is an automatic ISS 75 independent of any other injuries.

Table 2 ISS CALCULATION

Region	Injury Description	AIS	Square top three
Head & Neck	Cerebral contusion	3	9
Face	No injury	0	
Chest	Flail chest	4	16
Abdomen	Minor contusion of liver Complex Rupture spleen	2 5	25
Extremity	Fractured femur	3	
External	No injury	0	
Injury severity score			50

The definition by Osterwalder could prove an effective alternative approach to an overall ISS score as it specifically requires a score of AIS $\geq$ 2 in at least two of the ISS regions[6]. Breaking down the scoring system in this way avoids obscuring the actual severity of injury in each body region. However, like others, this definition has not been validated. The cut-off of AIS $\geq$ 2 would enable defining a patient with a fairly low ISS such as 8, 12 and 13 as polytrauma, which would not make the score specific enough. The anatomical score (ISS) could be improved by adding a physiological, criterion-based definition, as found in Schweiberer et al [7] and Heberer et al[8].

The definition published in 2000 by Trentz in the AO Principles of Fracture Management considers ISS in addition to systemic inflammatory response[9]. While the criteria for the severity of injury (ISS > 17) echoed the value proposed by the German Trauma Society, this definition was unique in both defining polytrauma as a "syndrome" and also in its explicit inclusion of the systemic inflammatory response of polytrauma. In 2005, Keel and Trentz further refined the original Trentz definition with the phrase "sequential systemic traumatic reactions", replaced by the more objective criteria of "systemic inflammatory response syndrome (SIRS) for at least one day[10]."

AIM OF THE STUDY

To identify the role of injury severity score in polytrauma cases

MATERIALS AND METHODS

This was a prospective study. The study was conducted on polytrauma patients with musculoskeletal injuries who were admitted to MIOT International hospitals from the period 1-10-2014 to 1-6-2015.The present study was conducted to identify the role of injury severity score in polytrauma patients. Initially 230 patients who fit the inclusion criteria were included for the study. Of these 81 were lost to follow up and thus excluded. Children, pregnant women, patients who were treated at other centers, patients with concomitant psychiatric or terminal illness and those with GCS 3 were excluded from the study.I have calculated AIS and ISS score of all patients included in this study and considering the other factors,they were classified in to stable,borderline,unstable and in extremis groups.Then they underwent treatment in the form of ETC or DCO.

RESULTS

A total of 230 polytrauma patients with musculoskeletal injuries were seen in the emergency department in the period from 1-10-2014 to 1-12-2015 for a period of 14 months. Eighty one patients were rejected because of the exclusion criteria or lost to follow up from the trial subsequently. One hundred and forty nine patients (n=149) with polytrauma and musculoskeletal injuries who fit the selection criteria were chosen from them to be the test subjects and they were then followed over a period of 4 to 12 months.

Table 3 Classification Of Patients With Percentages

Class	Number of Patients	Percent
Stable	55	36.91
Borderline	48	32.22
Unstable	26	17.45
In extremis	20	13.42
Total	149	100

The patients were triaged into the stable, borderline, unstable and in extremis depending upon the condition at admission. Factors like shock, coagulation profile, hypothermia,status of SIRS and soft tissue injuries were taken into consideration. Data shows that 36.91% (n=55) of the patients were in stable condition, 32.20%(n=48) of the patients were in borderline condition, 17.45%(n=26) of the patients were classified as unstable and 13.42%(n=20) of the patients were classified to be in extremis condition.

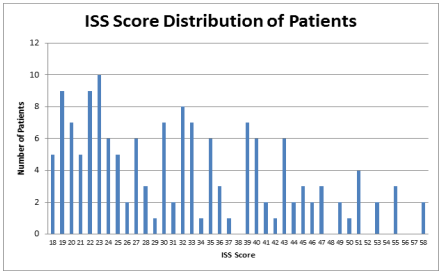

Figure 1 ISS SCORE DISTRIBUTION OF PATIENTS

In the present study ISS scores ranged from a minimum of 18 to a maximum of 58. The mean ISS score was 32 with a standard deviation of 10.60.

Table 4 ISS SCORES OF PATIENTS

Class	ISS Range	Mean ISS	Percent
Stable	18-27	21.49 ±2.27	36.91
Borderline	24-37	31.17±3.31	32.20
Unstable	39-46	41.46±2.37	17.45
In extremis	43-58	50.60±4.33	13.42
Total	18-58	32±10.60	100

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ISS	149	18	58	32.00	10.605
Valid N (listwise)	149				

Descriptives

ISS

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
ST	55	21.49	2.268	.306	20.88	22.10	18	27
BL	48	31.17	3.309	.478	30.21	32.13	24	37
US	26	41.46	2.370	.465	40.50	42.42	39	46
EX	20	50.60	4.333	.969	48.57	52.63	43	58
Total	149	32.00	10.605	.869	30.28	33.72	18	58

ANOVA

ISS

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	15354.326	3	5118.109	575.437	.000
Within Groups	1289.674	145	8.894		
Total	16644.000	148			

Multiple Comparisons With Iss Taken As A Dependent Variable

Multiple Comparisons

Dependent Variable: ISS
Tukey HSD

(I) Category	(J) Category	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
ST	BL	-9.676*	.589	.000	-11.21	-8.14
	US	-19.971*	.710	.000	-21.82	-18.13
	EX	-29.109*	.779	.000	-31.13	-27.09
BL	ST	9.676*	.589	.000	8.14	11.21
	US	-10.295*	.726	.000	-12.18	-8.41
	EX	-19.433*	.794	.000	-21.50	-17.37
US	ST	19.971*	.710	.000	18.13	21.82
	BL	10.295*	.726	.000	8.41	12.18
	EX	-9.138*	.887	.000	-11.44	-6.83
EX	ST	29.109*	.779	.000	27.09	31.13
	BL	19.433*	.794	.000	17.37	21.50
	US	9.138*	.887	.000	6.83	11.44

*. The mean difference is significant at the .05 level.

ANOVA study shows greater difference in mean value (around 10) of ISS score in each group with high significance and for further confirmation post hoc test has been done. This compared the ISS of one category with others and which shows high significance.

In stable patients the ISS scores ranged from 18-27 with a mean of 21.49 and standard deviation of 2.27. In borderline patients the ISS scores ranged from 24-37 with a mean of 31.17 and standard deviation of 3.31. In unstable patient the ISS scores ranged from 39-46 with a mean of 41.46 and standard deviation of 2.37.In patients in extremis the ISS scores ranged from 43-58 with a mean of 50.60 and standard deviation of 4.33.

T-Test

Group Statistics

	ETC/DCO	N	Mean	Std. Deviation	Std. Error Mean
ISS	ETC	80	24.60	5.283	.591
	DCO	69	40.58	8.557	1.030

In ETC group, ISS score mean is 24.6 with a SD of 5.3 and in DCO group it was 40.6 with a SD of 8.6 and which shows high significance.

DISCUSSION

The ISS was introduced in 1974 as a method for describing patients with multiple injuries and evaluating emergency care. It has since been classed as the 'gold standard' of severity scoring.Each injury is initially assigned an AIS score and one of six body regions (head, face, chest, abdomen, extremities, external).The highest three AIS scores (only one from each body region may be included) are squared and the ISS is the sum of these scores.

This study was conducted out of the need to assess the ISS scoring in polytrauma patients from the moment patient are admitted in emergency and to evaluate its role in management of musculoskeletal injuries ie, ETC or DCO. When comparing the ISS scores with classes of polytrauma, they were found to be comparable.ANOVA analysis compared the ISS of one category with others and which shows high significance.Patients who were in worse conditions had higher ISS scores. But ISS scores by themselves were not helpful in making any predictions about their classification. For instance, a patient with ISS score of 40 can be included in stable or borderline categories.

CONCLUSION

There is definitely a role for ISS scoring in the classification of polytrauma patients and which will definitely affect the future management protocol of the patient.

This will helps identify patients with polytrauma with low chances of survival, and to allow a fair comparison between different trauma patient, also to organize and improve the quality of trauma care systems, and to assess resource allocation.

Further prospective studies should be performed to verify this scoring system.

LIMITATIONS

Inaccurate AIS scores are carried forward. Many different injury patterns can yield similar ISS scores. It is not useful as a triage tool. It only considers one injury per body region and therefore may underestimate the severity in trauma victims with multiple injuries affecting one body part. Any definition should clearly separate multiple trauma from polytrauma. Another limitation to the use of ISS to define polytrauma is the great range of scores used to define it. The exclusive use of ISS (an anatomical score) ignores the important physiological aspects of polytrauma. Finally, ISS is hardly ever calculated on admission, which makes it difficult to use as a prospective tool especially for clinical trials

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