

The New Injury Severity Score: Availability in Evaluation of Severity of Polytrauma Patients with Orthopaedic Injuries

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Summary

Significant number of patients with multiple injuries are registered every year in Latvia. In 2009 during seven months 298 patients with multiple trauma are registered. In the most of the cases cause of multiple injuries are road accidents (Health Statistics and Medical Technologies State Agency, Latvia).

Using of the simple modification of the Injury Severity Score (ISS) – the New Injury Severity Score (NISS) - makes possibility to better assess the patients with multiple injuries, particularly patients with orthopaedic injuries, predict resources for treatment, the outcome and functional results.

Key words: injury severity score; new injury severity score; polytrauma; damage control orthopaedics.

INTRODUCTION

Injury classification by type and severity is fundamental to the study of its magnitude, distribution and determinants. Since the late 1960s a number of scales assessing injury severity have been proposed. In 1971 by a joint committee comprising members of the American Medical Association, the Society of Automotive Engineers, the American Association for Automotive Medicine (now named Association for the Advancement of Automotive Medicine) the Abbreviated Injury Scale (AIS) was introduced. Now it is the most widely reported severity scale, used throughout in North America, Europe, Japan, Australia and New Zealand as a consensus derived anatomically based scale for rating the severity of injuries. The AIS was first published in 1976. Three revisions of the AIS have been published since then (1980, 1985, 1990) (19). The AIS is foundation for the ISS. Recently researchers proposed a simple modification of ISS – the NISS.

The overview provides insight in polytrauma definition based on Injury Severity Score and new concept of assessment of injury severity of polytrauma patients with orthopaedic injuries.

Definition of polytrauma

Severe trauma is one of the most frequent cause of death in people below 40. The successful management of polytrauma patients remains challenging despite of modern diagnostic and therapeutic approaches. Application of polytrauma concept to the multiply injured patient determines the treatment strategies and resources. The term „polytrauma” originates in the Greek words „poly” (multiple) and „trauma” (wounds)

indicating a complex injury pattern of different anatomical regions. Many definitions of polytrauma have been described in literature. The modern definition of polytrauma as a syndrome of multiple injuries of defined severity (Injury Severity Score ≥ 16) with consecutive systemic reactions, which may lead to disfunction of remote organs (definition according to Otmar Trentz), also comprises the complex host response to the injury (7).

The Injury Severity Score

The ISS was originally developed to predict survival after major trauma and has served as a standard summary measure of anatomic injury for more than 20 years. It is defined as the sum of the squares of the highest AIS code in each of the three most severely injured ISS body regions. The AIS was developed to be used by crash investigators to standardize data on the frequency and severity of motor vehicle related injuries. According to AIS each injury description has been assigned a seven digit numerical injury identifier. The single digit to the right of the decimal point is the AIS number according to the severity code ranging from 1 (minor injury) to 6 (maximum injury, possibly lethal). The six body regions of injuries used for ISS determination are: head or neck, face, chest, abdominal or pelvic contents, extremities or pelvic girdle, external injuries or burns. ISS scores range from 1-75. A score of 75 results in one of two ways: with three AIS 5 injuries or with at least one AIS 6 injury (2).

Table. Example of the ISS calculation of polytrauma patient with multiple orthopaedic injuries.

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ISS body region	Injury	AIS code	Highest AIS	AIS ²
Head/neck	No injury	0		
Face	Skin abrasion	210202.1	1	1
Chest	Rib fractures 3-4, right side	450220.2	2	4
Abdomen/pelvic contents	No injury	0		
Extremities/pelvic girdle	Bilateral open fracture of femur	851801.3	3	9
	Displaced fracture of left tibial shaft	853405.3		
External injuries/burns	No injury	0		
ISS =14				

The ISS is a standard for trauma scoring and is based on patient mortality and outcome. The ISS is used for assessment of trauma patients, prediction survival probability, patient outcome evaluation, health care system research and to assess costs of trauma patients treatment.

The ISS makes possible a valid numerical description of the overall severity of injury in persons who have sustained injury to more than one area of body (3). Siegel JH et al. described using ISS for predicting of injury severity and death in blunt multiple trauma (18), Kluger Y et al. wrote about using ISS in assessment of injury severity in terrorist bombings (10).

Nevertheless ISS does not give very objective information of the amount of work and resources that the patient requires, if patient has serious multiple injuries in one of ISS anatomic regions. For example, ISS allows only one extremity injury to be considered. It means that patient with one long bone fracture could score the same as another with several such fractures and this underestimates the potential for functional difficulties in recovery. The example in table shows that patient who has many serious orthopaedic injuries has ISS only 14 points. If the NISS is calculated the mentioned patient has 27 points (polytrauma). Thus the NISS avoids this shortcoming by including the most severe injuries, regardless of body region, and may allow more accurate prediction of functional outcome.

The New Injury Severity Score

The ISS has an idiosyncrasy that impairs its predictive power and complicates its calculation. Because of the

mentioned problem a simple modification of the ISS called the NISS was presented. The NISS is defined as the sum of squares of the AIS severity scores of a casualty's three most severe injuries, regardless of body region in which they occur (13). Studies have reported that the NISS is more predictive of survival and performs better statistically than the ISS (5).

The NISS is a minor modification to the scoring of ISS and using both in parallel in monitoring trauma care can provide extra useful information for minimal extra effort. Lavoie et al. (2004, 2005) have found that the NISS is better choice in trauma research than ISS for predicting ICU admission, hospital length stay and of in-hospital mortality (11,12), Balogh Z et al. declared that NISS better predicted postinjury organ failure than ISS (4). Husum H et al. described that both the ISS and the NISS predicted short term mortality with accuracy for victims with penetrating trauma. According to their studies, the NISS predicted post injury complications significantly better than the ISS, but the accuracy of both tests was moderate and further studies are needed before the NISS should be adopted as a „golden standard“ for severity scoring (9).

This enhanced trauma scoring may be useful in the assessment of trauma care delivery with the aim optimizing treatment of polytrauma patients with musculoskeletal trauma. The objective assessment of injury severity helps to choose the more appropriate method for management of polytrauma patients with long bone and unstable pelvic fractures. In recent time damage control orthopaedics (DCO) method has been accepted as a more appropriate tactic in the management of polytrauma patients with life threatening injuries and orthopaedic injuries. The approach of DCO takes the influence of posttraumatic systemic inflammatory and metabolic reactions of the organism and is aimed at reducing both the primary and the secondary mortality in severely injured patients. DCO appears to be an adequate alternative to early total care for patients at high risk of developing posttraumatic systemic complications such as acute respiratory distress syndrome, multiple organ failure (14,17) and systemic inflammatory response syndrome (SIRS). It provides the external fixation, which is effective, time saving and safe in patients with multiple injuries (8,15, 22).

Poole GV et al. studies show that although AIS and ISS appropriately reflect the impact of extraskelatal injuries, in patients with femur fractures they do not adequately reflect the increased morbidity associated with multiple lower extremity fractures. They suggest that AIS score counting for multiple long bone fractures of lower extremities may need to be upgraded (16).

A recent study by Sutherland et al. at the University of Aberdeen, Scotland, examined functional outcomes in a cohort of 200 patients with musculoskeletal trauma. This study showed that, while the differences were not large, the NISS provided better prediction of functional outcome than did ISS. Both scores are created from the same baseline information and use of both the traditional ISS and its modification, NISS, are recommended in studies assessing musculoskeletal trauma outcomes (20, 21).

Functional recovery after polytrauma is a long term process. Clinicians working in hospitals usually receive limited follow-up information about outcome such as functional results of musculoskeletal system, disability and quality of life (1, 6, 23).

The studies of the NISS using in predicting of functional results of polytrauma patients with orthopaedic injuries are supposed to help develop and improve the management of those patients.

CONCLUSIONS

Most of the studies show the usefulness of the NISS in assessment of injury severity, predicting resources and outcome of patients with multiple injuries. Particularly it refers to polytrauma patients with orthopaedic injuries. Use of both the ISS and its modification - NISS are recommended in studies for predicting and evaluation of functional results of those patients. Additional randomized studies are required in order to prove it convincingly.

Conflict of interest: None

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