Is The Thoracolumbar Injury Severity Score (TLISS) Still A Good Base For The Education Of Residents In Orthopaedics And Traumatology

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ABSTRACT

Introduction. Thoracolumbar spinal injuries indicated for surgical intervention specify the necessity of intervention within 24 hours. The traumatologists working in a structure without a Spinal Unit must be able to evaluate such injury and set indications for surgical treatment, that is, nonoperative treatment. The purpose of this study is to evaluate if Thoracolumbar Injury Severity Score (TLISS) is still a good base for the classification of thoracolumbar spinal injuries and to give a correct indication for nonoperative, that is, surgical treatment.

Patients and Methods. Six Orthopaedics and Traumatology residents from Siena (Italy), five Orthopaedics and Traumatology residents from the Clinical Centre of Banja Luka (Bosnia and Herzegovina) and five Orthopaedics and Traumatology residents from the Alta Val d'Elsa Hospital, Siena (Italy) were presented 24 clinical cases from professional literature where the following data were indicated: patient's age, neurological conditions, description of the injury, mechanism of the injury and radiological findings (RTG, MR). The abovementioned 24 patients were chosen from the literature based on the injuries mostly seen by an orthopaedist with a lack of experience in the problems of spinal column trauma (low energy trauma, with partial or without neurological impairments, with the TLISS score of 4). The residents from the three groups had to classify all patients according to the TLISS score and to define the most appropriate method of treatment-conservative or surgical, and after that, all classifications, as well as the therapeutic decisions, were compared. The statistical methods used in this study include: statistical significance, reliability ($P<0.05$), the validity of the decision, the percentage of accuracy and Cohen's kappa coefficient.
The best results in evaluation of the mechanism of the injury were demonstrated by the group of doctors from the Orthopaedic Hospital with an accuracy of 78.8% ($P<0.05$) and with an average correlation ($K = 0.598$). The best description of the injury was presented by the doctors from Siena with 87% accuracy ($P<0.05$) and with correlation ($K=0.749$). The doctors from Siena responded best at evaluating the neurological status with 97.6% accuracy ($P<0.05$) and with correlation ($K=0.936$). The assessment of the injury of the PCL residents from Siena was 64.7% accurate ($P<0.05$) with correlation ($K=0.426$). The total TLISS score was best calculated by the residents of Siena with 82% accuracy ($P<0.05$) and correlation ($K=0.718$). The most appropriate therapeutic decision was made by the residents from Siena with 80.3% accuracy ($P<0.05$) and with correlation ($K =0.707$).

Conclusion. Currently, the Denis classification and the AO classification are the most widely used classification algorithms for the fractures of thoracolumbar spine but some defects have also been identified in both of them. The value of TLISS evaluation is by the three groups of residents in presented 24 patients from the professional literature. Significant differences in accuracy were found in defining a real damage of the spinal cord at the level of the cauda equina. The evaluation of the integrity of the posterior longitudinal ligament by the radiography is of low accuracy.

Key Words: spine fractures, thoracolumbar spine, TLISS, education.

Introduction

One of the proven facts in medicine, based on the evidences (EBM), is that the patients with the thoracolumbar spine injury, if the injury is indicated for the surgical treatment, should be given a surgical intervention and the fracture must be stabilized within 24 hours after the injury. It is up to the orthopaedists and traumatologists working in the institutions without a spine surgeon or a surgeon dealing with the spinal column injuries to decide whether a patient should be directed for a nonoperative or operative treatment. For that reason, the orthopaedists must have a broad theoretical knowledge regarding the injuries of the spinal column. In an attempt to reduce the variability and improve the result in evaluation and indications for the treatment of such injuries, Vaccaro and his co-workers showed in their study that, even though there are other classifications in use, the TLISS (Thoracolumbar Injury Severity Score) still presents a good reference for the medicine and specialist education of the orthopaedists and traumatologists. The aim of this study is to evaluate if the TLISS classification is an adequate classification when it comes to the thoracolumbar spinal injuries, as well as to determine if it is still a good base for the education of orthopaedists and traumatologists.

Patients and Methods

Six residents in Orthopaedics and Traumatology from the Polyclinic "Santa Maria alle Scotte" were given the material with the following topics: anatomy and biomechanics of the spinal column, classification of the thoracolumbar fractures, classification of thoracolumbar spine fractures TLISS, neurological outcome of the operative and nonoperative treatment of spinal column injuries. The same material was also distributed to the 5 residents in Orthopaedics and Traumatology at the Clinical Centre Banja Luka, Bosnia and Herzegovina, while the 5 residents in Orthopaedics and Traumatology from the Orthopaedic Hospital Alta Val d'Elsa were only given the works explaining what TLISS is. This classification was chosen because, among other things, it considers the mechanism of the injury, otfen not included in an anamnesis taken by a surgeon. In our work we introduced residents with 24 clinical cases published in PubMed and professional journals specialized in spinal column, etc. Even though our Institution has the Center for Spinal Surgery within its own structures, we didn't have a sufficient number of patients for this study. The following were taken into consideration: patient's age, neurological status and the description of the mechanism of injury. All patients were shown on standard radiographies in two projections, as well as on CT and MR in the sagittal projection in T2 sequence. The abovementioned 24 patients were chosen from the literature based on the criteria of injuries mainly seen by an orthopaedist inexperienced in problems of spinal column trauma (low energy trauma, with partial or without neurological impairments, with the TLISS score

of 4). The residents from the three groups had to classify all patients according to the TLISS score and to define the most appropriate method of treatment-conservative or surgical, and after that, all classifications, as well as the therapeutic decisions, were compared among the groups of doctors mentioned .

Thoracolumbar spine injury classification TLISS objectifies the factors leading to the injuries and helps a spinal surgeon in choosing the most adequate treatment. The TLISS is based on three major factors of the thoracolumbar trauma: injury and the mechanism of injury, the integrity of the posterior longitudinal ligament (CLP) and patient's neurological status. The mechanism of injury and integrity of CLP are deduced from the observations of imaging studies including radiographies and / or MR of the thoracolumbar spine. Based on the scoring within these three factors, a total score is being calculated and it can be used to define an adequate therapy. Possible mechanisms of injury include compression, rotation and distraction. One to four points are awarded based on the mechanism of injury.

Patients with normal neurological status are given 0 points. Patients with an injury to the nerve root or a lesion of the spinal cord or cauda equina syndrome are awarded 1 to 3 points and these patients can benefit from surgical decompression.

The third major component of the TLISS algorithm also includes the assessment of the integrity of the posterior longitudinal ligament (CLP). The integrity of the CLP is determined by clinical examination and radiographies and / or by the CT and MR images (interspinal gap). Patient with an intact CLP is given 0 points. If a ligament is injured 3 points are awarded and if the status of the CLP is indeterminate 2 points are assigned.

The total score in the TLISS evaluation system evaluates the severity of the trauma and helps guide the decision between two choices: nonoperative or operative therapy.

Patients with a score less than or equal to 3 are indicated for the nonoperative treatment, while patients with a score greater than or equal to 5 are indicated for the surgical treatment, performed by the stabilization of fractures, with or without decompression. Patients with a total score of 4 fall in the category of the intermediates and the choice of therapy rests on the experience of the surgeon. The percentage of reliability of the evaluation system TLISS has been shown to be significant (the values of K are between 0.24 - 0.724). Recent studies prove a high reliability rate.

Table 1: TLISS algorithm

	Qualification	Points
I-Mechanism of injury		
Compressional	—	1
	Lateral angulation	1
	>15°	1
	Burst	1
Translational/rotational	—	3
Distractional	—	4
II-Neurological status		
Without impairments	—	0
Nerve root injury	—	2
Spinal cord injury (including the conus medullaris)	Incomplete	3
	Complete	2
Cauda equine syndrom	—	3
III- Integrity of the posterior longitudinal ligament (CLP)		
Intact	—	0
Suspected injury	—	2
Injured	—	3

The reliability and validity of the decisions on the method of treatment made by the TLISS system of the residents in Orthopaedics and Traumatology from Siena were compared with those made by the doctors from two control groups: a group of residents in Orthopaedics and Traumatology of the Orthopaedic Hospital from Siena and a group of residents in Orthopaedics and Traumatology of the Clinical Centre Banja Luka (BiH). The results were measured by Cohen's kappa coefficient. The Cohen's kappa coefficient is a measure accepted in the international studies and it quantifies the degree of agreement between observers in order to reduce the subjectivity.

This coefficient is between 0 and 1. 0 corresponds to an accidental correlation or a complete mismatch in tests, while 1 corresponds to a perfect correlation between the tests.

- from 0.00 to 0.20: minimal correlation
- from 0.21 to 0.40: slight correlation
- from 0.41 to 0.60: medium correlation
- from 0.61 to 0.80: significant correlation.
- from 0.81 to 1.00: perfect correlation

Results

Research results are presented in Table 2. The best results in evaluating the mechanism of injury were found in a group of doctors from the Orthopaedic Hospital with the accuracy of 78.8% ($P<0.05$) with an average correlation

coefficient K=0.598. The best description of injury was presented by the residents from Siena with the accuracy of 87% ($P<0.05$) and with the correlation coefficient K=0.749. The doctors from Siena gave the best assesment of the neurological status with the accuracy of 97.6% ($P<0.05$), with the correlation coefficient K=0.936. The assessment of the injury of PCL of the residents from Siena showed the accuracy of 64.7% ($P<0,05$), with the correlation coefficient K=0.426. The residents from Siena made the best calculation of the total TLISS score with the accuracy of 82% ($P<0,05$) and with the correlation coefficient K=0.718. The doctors from Siena also had the most adequate choice of therapy with the accuracy of 80.3% ($P<0,05$) and the correlation coefficient K=0.707.

Table 2. Results

	Percentage of accuracy	Cohen's Kappa
Mechanism of injury		
AOU Siena	76.1	0.580
Orthopaedic Hospital	78.8	0.598
Clinical Centre Banja Luka (BiH)	76.5	0.583
Classification of fractures	87.0*	0.749
AOU Siena	74.3	0.569
Orthopaedic Hospital	86.2	0.744
Clinical Centre Banja Luka (BiH)		
Neurological status		
AOU Siena	97.6*	0.936
Orthopaedic Hospital	94.6	0.907
Clinical Centre Banja Luka (BiH)	96.9	0.911
Integrity of the CLP		
AOU Siena	67.4*	0.426
Orthopaedic Hospital	63.4	0.400
Clinical Centre Banja Luka (BiH)	65.4	0.413
Total TLISS score		
AOU Siena	82.0*	0.718
Orthopaedic Hospital	77.8	0.581
Clinical Centre Banja Luka (BiH)	81.2	0.713
Choice of treatment		
AOU Siena	80.3*	0.707
Orthopaedic Hospital	73.7	0.562
Clinical Centre Banja Luka (BiH)	77.4	0.689

Discusion

The aim of the study was to establish whether a resident in Orthopaedics and Traumatology is able after his/her specialization to choose correctly the methods of treatment of thoracolumbar spine injuries. Empirically, we have discovered that this is a weak spot in their professional training.

Currently, both the Denis and the AO classifications are the most used classification algorithms for the fractures of thoracolumbar spine, but some defects have also been identified in both of them. The value of TLISS evaluation is by the three groups of residents in presented 24 patients from the professional literature.

By analyzing the data, we have received responses of the participants in the questionnaires, where the mechanism of the fracture occurrence was best described by the doctors who are able to understand it better due to their experience.

Conclusion

The previous study conducted by Vaccaro and his co-workers has already shown that the TLISS classification can be used for a correct diagnosis, as well as when it comes to choosing methods of treating thoracolumbar spine trauma. The most useful, but at the same time the most difficult for the decision, is TLISS = 4, where the decision on a method of treatment is based on the experience of a surgeon. This study offers encouraging results for the use of TLISS algorithm for the classification of thoracolumbar spine injuries, methods of treatment, as well as for the education of residents in Orthopaedics and Traumatology and surgeons who are not primarily involved in thoracolumbar spine injuries.

It is likely that the Thoracolumbar Injury Classification and Severity Score (TLICS) may be easier to use, but it is something that still needs to be investigated.

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Da li je Thoracolumbar Injury Severity Score (TLISS) još uvijek dobra osnova za edukaciju specijalizanata ortopedije i traumatologije

SAŽETAK

Uvod. Povrede torakolumbalne kičme koje su indikovane za hirurško liječenje potrebno je hirurški zbrinuti unutar 24 sata. Traumatolozi zaposleni u ustanovama koje nemaju spinalni odjel moraju biti u stanju da klasifikuju takvu povredu i da postave indikaciju za hirurško, odnosno neoperativno liječenje. Cilj ove studije je da utvrdi da li je Thoracolumbar Injury Severity Score (TLISS) još uvijek dobra osnova za klasifikaciju povreda torakolumbalne kičme i postavljanje pravilne indikacije za neoperativno, odnosno, hirurško liječenje.

Ispitanici i metode. Šest specijalizanata ortopedije i traumatologije iz Siene (Italija), pet specijalizanata ortopedije i traumatologije iz Kliničkog Centra Banja Luka (Bosna i Hercegovina) i pet specijalizanata ortopedije i traumatologije iz bolnice Alta Val d'Elsa, Siena (Italija) prezentovano je 24 klinička slučaja iz stručne literature gdje su prikazani sljedeći podaci: dob pacijenta, neurološki status pacijenta, opis povrede, mehanizam povrede i radiološki nalazi (RTG, MR). Navedena 24 pacijenta izabrani su iz literature po kriterijumu povreda koje najčešće viđa ortoped neiskusan sa problematikom traume kičmenog stuba (trauma niske energije, sa djelimičnim ili bez neuroloških ispada sa TLISS skorom 4). Specijalizanti iz tri navedene grupe trebali su da sve pacijente klasifikuju prema TLISS skoru i da odrede najprikladniji način liječenja - konzervativno ili hirurško, a zatim je vršeno poređenje klasifikacija i terapijskih odluka među navedenim grupama ljekara. Statistički metodi korišteni u ovoj studiji su: statistička značajnost, pouzdanost (P<0.05), validnost odluke, procenat tačnosti i Kappa-Cohenov koeficient.

Najbolji rezultati kod ocjenjivanja mehanizma povrede bili su u grupi ljekara Ortopedske bolnice sa tačnošću od 78,8% (P<0,05) i uz prosječnu korelaciju (K=0,598). Najbolji opis povrede predstavljen je od strane doktora iz Siene sa 87% tačnosti (P<0,05) i korelaciju (K=0,749). Doktori iz Siene dali su najbolju ocjenu neurološkog statusa sa 97,6% tačnosti (P<0,05) i korelacijom (K=0,936). Procjena povrede PCL specijalizanata iz Siene bila je sa 64,7% tačnosti (P<0,05) i sa korelacijom (K=0,426). Ukupan TLISS rezultat je najbolje izračunat od strane specijalizanata iz Siene sa 82% tačnosti (P<0,05) i korelacijom (K=0,718). Najadekvatniji izbor terapije imali su doktori iz Siene sa 80,3% tačnosti (P<0,05) i korelacijom (K=0,707).

Zaključak. Trenutno su Denisova i AO klasifikacija najčešće korišćeni klasifikacijski algoritmi za prelome torakolumbalne kičme, ali su uočeni i određeni nedostaci u obje ove klasifikacije. Vrijednost TLISS ocijenjivana je od strane tri grupe specijalizanata kod prezentovana 24 pacijenta iz stručne literature. Značajne razlike u tačnosti pronađene su u određivanju stvarnog oštećenja kičmene moždine u nivou caude equine. Procjena integriteta zadnjeg longitudinalnog ligamenta (CLP) pomoću radiografije je niske tačnosti.

Ključne riječi: prelom kičme, torakolumbalna kičma, TLISS, edukacija