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THORACOLUMBAR FRACTURE SURGERIES: ANALYSIS WITH THORACOLUMBAR INJURY CLASSIFICATION AND SEVERITY SCORE (TLICS)

Cumhur Kaan YALTIRIK[1], Mustafa KAYA[2]

[1] *Yeditepe University School of Medicine, Department of Neurosurgery, İstanbul*
[2] *Ereğli State Hospital, Neurosurgery Clinic, Zonguldak*

ORCID numbers:
Cumhur Kaan Yaltırık: 0000-0002-4312-5685
Mustafa Kaya: 0000-0001-9401-0311

Address: Cumhur Kaan Yaltırık, Yeditepe Onkoloji Hastanesi Koşuyolu - İstanbul
E-mail: dr_cky@yahoo.com
Phone: 0 216 578 40 00
GSM: 0 533 333 18 00
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ABSTRACT

Aim: The purpose of our study is to compare our surgical decisions with TLICS considering our retrospective cases.

Materials and Method: We inspected 38 patients who were operated for thoracal, thoracolumbar and lumbar fractures between February 2016 - February 2018 at Ereğli State Hospital Neurosurgery Clinic and classify according to TLICS.

Results: We analyzed 38 patient with thoracolumbar trauma. Thirteen (34.3 %) female and 25 (65.7 %) male patients were evaluated. Mostly the cause of trauma was fall. The type of the fracture was frequently burst fractures. 16 (42.1 %) patients were operated for thoracal, 19 (50 %) patients were operated for lumbar fractures and three (7.9 %) patient were operated for thoracic-lumbar fractures. According to TLICS scores 20 patients (52.6 %) classified as surgical, 7 patients (18.5%) as surgeon's choice and 11 patients (28.9 %) as non-surgical.

Conclusion: The recommendation by TLICS score for a conservative treatment modality shows to have limitations in certain patients in need to be managed surgically due to their progressing symptoms especially pain.

Key words: Thoracolumbar fractures, TLICS, Spinal trauma

Level of Evidence: Retrospective clinical study, Level III.

INTRODUCTION

Thoracolumbar and lumbar burst fractures (TLBF) are commonly the result of major trauma and may be the reason of spinal cord damage resulting in neural deficits, and account approximately 15 % of all spinal injuries [10]. Several different classifications and treatment data have been devised to guide a proper treatment plan for these fractures. The constructed classification modules of vertebral fractures mainly rely on the mechanism of injury and depend on defining stability. Among the most influential were the ideas proposed by Denis [2], Magerl/AO [12] and Vaccaro [20].

TLBF are classified individually by Denis although these fracture patterns have recently been defined as a subtype of fracture occurring as a result of the compression mechanism in the Vaccaro systems [20]. Vaccaro et al. described the Thoracolumbar Injury Classification and Severity Score (TLICS) as an assistance modality for clinical decision-making in consideration of operative versus non-operative care and also surgical treatment approach in unstable injury patterns [20].

TLICS is based on three critical injury characteristics: (1) the morphology of the injury determined by the radiologic patterns, (2) the integrity of the posterior ligamentous complex, and (3) the neurologic status of the patient. The final calculated serves as a guide for a possible conservative (<4 points) or surgical treatment (>4 points) plan. The treatment plan for the outcome score of 4 points can be evaluated according to the surgeon's preference.

TLICS is a theoretical management proposal to aid when facing the decision making process for thoracolumbar traumas. The purpose of our study is to compare our surgical decisions with TLICS considering our retrospective cases.

Figure-1. Preoperative T5 fracture sagittal MRI image

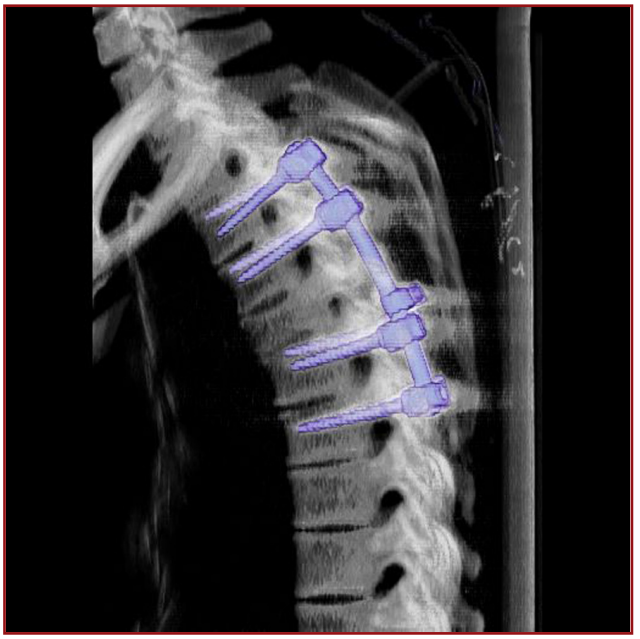

Figure-3. Postoperative T5 fracture stabilization sagittal 3D CT image

Figure-2. Preoperative T5 fracture sagittal CT image

MATERIALS AND METHODS

We inspected 38 patients operated for thoracal, thoracolumbar and lumbar fractures between February 2016 and February. The information's were collected from the patients file archives retrospectively. Radiological data were inspected from the PACS system. We calculated the TLICS scores of the operated patients and evaluated that surgery decision was correct or not according to TLICS (Table-1).

RESULTS

We analyzed 38 patient with thoracolumbar trauma. Thirteen (34.3 %) female and 25 (65.7 %) male patients were evaluated. Mostly the cause of trauma was fall. The type of the fracture was frequently burst fractures. 16 (42.1 %) patients were operated for thoracal, 19 (50 %) patients were operated for lumbar fractures and three (7.9 %) patient were operated for thoraco-lumbar fractures. According to TLICS scores 20 patients (52.6 %) classified as surgical, 7 patients (18.5 %) as surgeon's choice and 11 patients (28.9 %) as non-surgical (Table-2).

Table-1. Thoracolumbar Injury Classification and Severity Score

		TLICS 3 INDEPENDENT PREDICTORS		
1	Morphology Immediate stability	Compression Burst Translation / Rotation Distraction	1 2 3 4	Radiographs CT
2	Integrity of PLC Long term stability	Intact Suspected Injured	0 2 3	MRI
3	Neural Status	Intact Nerve root Complete cord Incomplete cord Cauda equina	0 2 2 3 3	Physical Examination
	Predicts	Need for surgery	0-3 4 ≥5	Non-surgical Surgeon choice Surgical

When we evaluate the table, we saw that we suggested surgery to the patients even that they are scored ≤ four by TLICS. This could be because of pain, which is limiting mobilization. Most of the patients had the diagnoses of burst fracture. Patients and surgeon mostly select surgical treatment for pain management and mobilize immediately. These factors pushes the surgeon to surgery in progression process. If the pain management could be done more affectively, the number of non-surgical treated patients could increase.

DISCUSSION

An ideal spine injury classification system should propose a clear treatment plan and facilitate direct communication between the surgeons, researchers, and trainees. Early manifestations such as the Denis classification and Magerl classification described the thoracolumbar spine and were later extended to describe cervical spine injuries [2,12].

The Spine Trauma Study Group developed an algorithm structured to aid in the clinical decision on following a surgical or conservative treatment plan. TLICS is using a numerical scoring system based on injury morphology, posterior ligamentous complex integrity and neurological status [20]. This manifests the first quantitative scoring system, used to orient the clinical decision-making between conservative and surgical management. Reports have shown this classification to be both valid and reproducible [3,14-15,17].

Whang et al evaluated the validity of the TLICS with 25 consecutive injuries treated conservatively, reassessing the score 3 months following the initial assessment [21]. They found TLICS to be matching with the chosen treatment options in 95.4 % of the cases, reporting substantial effectiveness. The same result was obtained from a study conducted by Patel et al, who also analyzed 25 patients and appraised the TLICS 7 months after the initial assessment [15].

Koch et al applied the TLICS score to 114 patients having been treated conservatively or surgically between 2004 and 2009 [10]. They reported the outcome of 5 or more points to have led to surgical treatment plan in 355 patients among 362 cases with a TLICS, whereas 176 cases out of 195 with a TLICS score lower than 3 were treated conservatively. In total, the authors reported 95 % accord between the performed treatment options and the TLICS proposal. The authors concluded the TLICS to prove an acceptable legitimacy in terms of the treatment recommendations within this historical series.

Joaquim et al assessed a series of 49 patients retrospectively, consecutively treated in two Brazilian centers [6]. A TLICS score of four or more points was calculated for 47 patients (95.9 %), while 2 patients had a TLICS of 2. The authors also reported an association between the AO type fractures, the TLICS score, and the neurologic status. In conclusion, they describe the historical indications for a surgical treatment in their institution to be similar to the indications proposed by the TLICS.

Machino et al reviewed 100 consecutive patients retrospectively with burst fractures, assessing the relation of the Load Sharing Classification and TLICS [11]. Both classifications were used to evaluate the patients; the PLC status was classified as injury with diastasis in the facet joints, facet perch, or subluxation, splaying the spinous process, as well as suggestive changes shown on MRI. Patients presenting with PLC injuries showed higher TLICS scores 1.3 points compared with 1.7 points; ($p<0.001$). However, though showing strong clinical correlation in patients with PLC injury and neurologic deficits, the LSC and the TLICS scores presented low association in cases with intact PLC without neurologic impairment.

Table-2. 38 patients data that operated form thoracolumbar fractures and comparison with TLICS. BF:Burst fracture, F:Fracture, D:Dislocation, PS:Posterior stabilization, M:Male, F:Female.

Gender	Age	Trauma	Diagnosis	TLICS	Operation	TLICS Decision
M	48	Fall	T12-L1 F	9	T10-L2 PS	Surgery
F	30	Fall	L1 BF	2	T12-L2 PS	Non Surgical
M	37	Fall	T12-L3 BF	5	L2-3 PS	Surgery
M	59	Fall	L1 BF	5	T11-L2 PS	Surgery
M	58	Fall	L2 BF	2	T12-L4 PS	Non Surgical
M	76	Fall	T6-7 F	6	T4-7 PS	Surgery
M	56	Fall	L1 BF	2	T11-L3 PS	Non Surgical
F	45	Fall	T7 F	9	T5-9 PS	Surgery
M	45	Fall	L1 BF	2	T11-L3 PS	Non Surgical
M	78	Fall	T12 BF	2	T10-L2 PS	Non Surgical
M	35	Traffic Acc.	T5 F	9	T3-7 PS	Surgery
F	62	Fall	L2-4-5 F	6	T12-S1 PS	Surgery
M	41	Traffic Acc.	T3-8 F	3	T7-9 PS	Non Surgical
M	59	Traffic Acc.	L1 BF	5	T11-L3 PS	Surgery
M	59	Fall	L1 F	2	T11-L3 PS	Non Surgical
F	32	Fall	L1 F	5	T11-L3 PS	Surgery
M	62	Fall	T6-7 D+T7 F	6	T4-10 PS	Surgery
M	55	Fall	T8-L1 F	4	T6-L2 PS	Sugeons' Choice
F	45	Fall	L4 F	4	L3-5 PS	Sugeons' Choice
M	47	Fall	T12 F	3	T11-L1 PS	Non Surgical
M	44	Fall	L1 BF	5	T11-L3 PS	Surgery
M	15	Fall	T12 BF	5	T11-L1 PS	Surgery
F	57	Fall	L2 F	4	T11-L3 PS	Sugeons' Choice
M	29	Fall	L1 BF	4	T11-L3 PS	Sugeons' Choice
F	67	Fall	T7 BF	6	T5-9 PS	Surgery
M	53	Fall	T8 BF	4	T6-10 PS	Sugeons' Choice
F	45	Fall	L3 F	4	L3-5 PS	Sugeons' Choice
F	39	Fall	T11 F	3	T10-L1 PS	Non Surgical
M	47	Fall	L1 BF	6	T11-L3 PS	Surgery
F	21	Fall	T11 BF	6	T10-L1 PS	Surgery
F	59	Fall	L1 F	3	T11-L3 PS	Non Surgical
M	30	Fall	L1 F	4	T11-L3 PS	Sugeons' Choice
M	58	Fall	T7 F	6	T4-10 PS	Surgery
M	55	Fall	T8 F	3	T6-10 PS	Non Surgical
F	45	Fall	L4 F	5	L3-5 PS	Surgery
M	53	Fall	T12 F	6	T11-L1 PS	Surgery
F	49	Fall	L1 BF	5	T11-L3 PS	Surgery
M	19	Fall	T12 BF	5	T11-L1 PS	Surgery

The authors concluded the TLICS used in isolation not to be helpful for patients with low TLICS scores (<4) and severe burst fractures. They proposed the inclusion of LSC to achieve a higher concurrence of the TLICS score and historical cohorts.

Winklhofer et al conducted a retrospective analysis of 100 patients with TLST classified according to the "*Arbeitsgemeinschaft für Osteosynthesefragen*" (AO) and the TLICS based on computed tomography (CT) findings by three radiologists [22]. Six weeks after initial evaluation of the patient data, their CT and MRI scans were reassessed. The two imaging modalities combined increased the number of detected fractures to 196 cases, while previously only 162 were identified when solely the results of CT scans were considered. The TLICS outcome changed in 33 % of patients when the results were compared to only their CT findings. The result of the evaluation of CT and MRI findings together lead to different decisions on conservative treatment plans (TLICS < 5) to surgical treatment (TLICS > 5) in 24 % of the cases. This outcome suggests the safety of the system to be clearly and significantly influenced by the radiologic modalities used for evaluation, adding the importance of MRI in the detection of injuries. Nevertheless, the low specificity of MRI in this setting may also lead to unnecessary surgeries.

From 2007 to 2010, initial conservative treatment with a TLICS score of 4 was performed in 100 % of the 162 patients. However, two patients required late surgery, none with neurologic deterioration, for pain and mild deformity. In the surgical group, 52.4 % matched the TLICS recommendations (4 points). Although suggesting TLICS to improve surgical decision-making, the study was limited by its retrospective application and short follow-up of the majority of patients [5].

A different study with the same patients conducted from 2000 to 2010 with a global analysis of all the 458 patients together, the same authors applied the TLICS retrospectively to the entire cohort [9]. From the 310 (67.6 %) patients treated conservatively, the TLICS matched recommendations in 307 of 310 (99 %), with 3 patients having TLICS of 7 points, requiring late surgery. Additionally, 4 other patients with TLICS < 5 points were managed surgically: 1 patient TLICS of 4 points (severe radiculopathy and burst fractures) and 3 with neurologically intact burst fractures with intractable pain and/or worsening of kyphosis. In the group of surgical patients, however, the TLICS scores matched with only 46.6% of the surgical indications. The main contention in patients was due to neurologically intact burst fractures without neurologic deficits (TLICS of 2 points). The authors suggested a lack of standardized criteria for treatment of burst fractures without neurologic deficits to be a potential cause for the mismatch found between the TLICS scores and surgical treatment. Potential limitations of this study include its retrospective nature, as well as the inconsistencies in defining posterior ligamentous complex injury based on magnetic resonance imaging.

Joaquim et al utilized the TLICS score to instruct treatment plans in a Brazilian population with spinal trauma. A total of 37 patients with TLICS of 3 or less points were first treated conservatively [7]. All patients were neurologically intact, and showed no new deficits with the conservative treatment. Two patients required late surgery with back pain and mild kyphosis, yet without neurologic worsening. The average TLICS score was 1.5 points, ranging from 1 to 2. In the group of 28 patients treated surgically, none showed neurological deterioration and those with incomplete deficits presented improvement during follow-up evaluation. The average TLICS score was 7 points (range 4 to 10 points).

Although the authors demonstrated the use of the TLICS in the decision-making process to be safe with regards to the neurologic status, the study was limited by its short follow-up, potential under reporting of failures, and lack of other outcome measures, such as pain status or functional disability.

In another study, Joaquim et al evaluated the TLICS scores in a series of 458 patients within the United States retrospectively. The patients were divided in two groups according to time of treatment, one being between 2000-2006, the other group representing patients evaluated and treated between 2007-2010 [8]. In the first period, the authors reported no utilization of TLICS in the studied institution, hence it carried no effect on the decision-making process in treatment plans. From 2007 to 2010, TLICS scoring system was used and influenced the planned treatment accordingly. In the report, in 2000-2006, the retrospective application of the TLICS matched the chosen treatment in 97.9 % of the patients managed conservatively and in 39.4 % of the surgically treated patients. The discordance in 60.6 % of patients was caused by the surgical treatment of burst fractures without neurologic deficits (TLICS 2). In 7 patients (4.7%): 3 patients with unrecognized PLC injuries, 1 with severe radiculopathy and a burst fracture (TLICS of 4 points), and 2 with severe back pain without deficits, surgical intervention was required following the previous conservative treatment. None of the patients presented neurologic deterioration.

Shen et al assessed 129 patients with T10-12 thoracolumbar burst fractures with a TLISC score 3 to be treated non-operatively. One hundred and four patients successfully completed the non-operative treatment, while the other 25 patients were later operated on as they presented persistent local back pain or progressive neurological deficits during follow-up appointments. The high score of VAS and the interpedicular distance may be considered as risk factors for the failure of conservative treatment [19].

Juaquim et al evaluated articles about TLICS as a systematic review, and suggested that the TLICS use was safe especially with regards to preservation or improvement of neurologic function [5]. The TLICS system demonstrates good reliability among physicians assessing thoracolumbar fracture treatment in pediatric patients as well [1,18].

Thoracolumbar fracture with score 4 of TLICS is a controversial part of the classification system. While Mohammadi et al suggested that the use of operative method in patients with thoracolumbar fracture with score 4 of TLICS [13], Pneumaticus et al recommends conservative treatment [16].

Hitchon et al reported that because of pain limiting mobilization, a quarter of neurologically intact patients with thoracolumbar burst fractures and a TLICS score of 2 failed nonsurgical management. Patients who has greater kyphosis, stenosis, and fragmentation of the fracture, maybe required surgery [4].

CONCLUSION

The TLICS focuses on three important aspects of thoracolumbar fractures and may offer guidance when choosing between conservative and surgical treatment modalities according to the final score. The recommendation by TLICS score for a conservative treatment modality shows to have limitations in certain patients in need to be managed surgically due to their progressing symptoms especially pain. If the pain management could be done more affectively, the number of non-surgical treated patients could increase.

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