

## Evaluation of TLICS for thoracolumbar fractures

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### Abstract

**Purpose** Thoracolumbar Injury Classification and Severity Score (TILCS), facilitates the communication between physicians, and guides to treatment decision with better outcome. A composite injury severity score is calculated from these characteristics stratifying patients into operative and non-operative treatment. Aim of this study is to identify the effectiveness of TLICS scoring for thoracolumbar vertebral fractures without neurological deficits and the efficacy of conservative treatment in patients with TILCS 4.

**Methods** 58 patients with thoracolumbar fracture were included. 38 patients with TLICS 1–3 (group A) and 20 patients with TLICS 4 (group B) treated conservatively, were evaluated with traditional two-plane radiographic examination, CT-scan and MRI. The pain and functional scales were used in the clinical evaluation. Local kyphosis angle, sagittal index and height loss percentage were measured in the radiologic evaluation. Mean follow-up period was 28 months. Post-fracture and follow-up values were compared. Functional scores and clinical outcomes of the groups were compared.

**Results** The mean pain (1 = worse pain, reverse-VAS) and functional scores at the final follow-up were 8.2 and 86 points, respectively (group A), 6.4 and 76 points (group B). The mean period for returning to work was 3.2 (group A) and 3.8 months (group B). Comparing the two groups did not demonstrate any statistical difference of their clinical and functional outcomes.

**Conclusion** The study's results demonstrate that conservative treatment for TLICS 4 thoracolumbar fractures can be safely applied. The conservative treatment of cases scoring TLICS 4 is equally effective to those scoring  $\leq 3$ .

**Keywords** Thoracolumbar injury · Thoracolumbar Injury Classification and Severity Score · Conservative treatment

### Introduction

Thoracolumbar spine trauma is the most common site of spinal cord injury with clinical and epidemiological importance. Classification systems for thoracolumbar injuries (TLI) can be simplified or complex in clinical use. The most appropriate classification system remained controversial until today. The posterior ligament integrity, the morphology of the injury and the neurological status were introduced together from Spine Trauma Group in Thoracolumbar Injury Classification and Severity Score (TILCS), facilitating the communication between physicians, education of residents and fellows, and guiding to treatment decision with better outcome. A composite injury severity score is calculated from these characteristics stratifying patients into operative and non-operative treatment. The reliability and validity of this system was studied favoring the application of the classification system [1–4].

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After the introduction of TILCS there is a tendency of successful conservative treatment of TLI [5, 6]. In a previous study of the TILCS system, the authors concluded that can be used with efficacy to conservative treatment. The TILCS recommendation matched in 99 % in conservative group. In surgical group 53.4 % did not match TILCS recommendation. No neurological complications were observed in both groups [7]. In general, patients with a total score of  $\leq 3$  can be treated non-operatively, depending on the type of injury. In contrast, patients with a total score of  $\geq 5$  usually require surgical treatment. Patient with a total score of 4 are in an intermediate zone where either operative or non-operative treatment might be equally appropriate. Controversies still exist regarding the management of unstable burst fractures without neurological status [8, 9]. The aim of the study is to research the effectiveness of TLICS scoring for thoracolumbar vertebral fractures without neurological deficits and the efficacy of conservative treatment in patients with TILCS 4.

## Materials and methods

In this study were included 58 patients with thoracolumbar fracture and TLICS  $\leq 4$  out of 74 TLI treated in our department between 2008 and 2012. 38 patients were scored with TLICS 1–3 (group A) and 20 patients with TLICS 4 (group B). All of the 58 cases with TILCS  $\leq 4$  were treated conservatively for thoracolumbar (T8–L5) vertebral fractures according to TLICS classification (Fig. 1).

37 of them were males and 21 females with a mean age of 46.03 years (range from 18 to 64 years). The etiologies of the injury were falls from various heights (49 %), motor vehicle accidents (25 %) and simple falls (26 %).

All the patients were evaluated with traditional two-plain radiographic examination, Ct-scan and MRI control (Fig. 2) for the posterior ligaments integrity. The ASIA was calculated for every patient. The Reverse-VAS pain (10 = no pain and 1 = worse pain) and functional scales (SF-36) were used in the clinical evaluation. Local kyphosis angle, sagittal index and height loss percentage were measured in the radiologic evaluation.

The patients were visited after their discharge from the hospital at 6 and 12 weeks, 8, 12, 24 and 32 months. They were dismissed with a spinal orthosis and free ambulation for 6–12 weeks (Fig. 3). Radiographs are obtained prior hospital discharge to verify fracture stability and spinal alignment, as well as occult ligamentous injury by patient's position. Mean follow-up period was 28 months (range 9–32 months). Post-fracture and follow-up values were compared. Functional scores and clinical outcomes of the groups were compared.

## Results

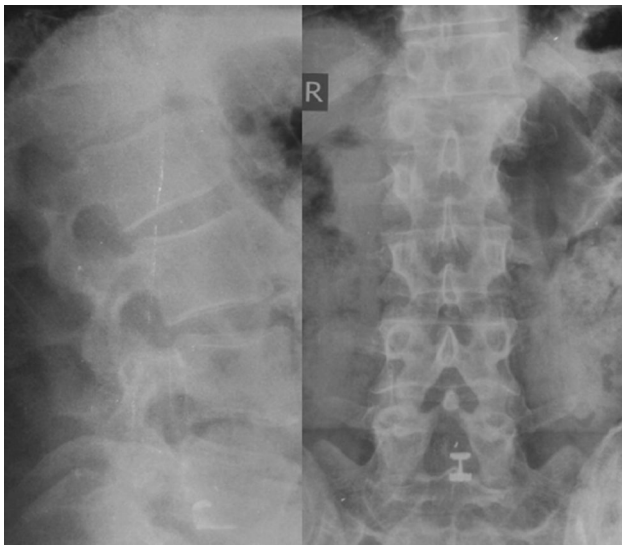
None of the patients investigated with TLICS  $\leq 4$  had neurologic deficit and no damage was observed in the posterior ligamentous complex in MRI evaluations. The mean pain and functional scores at the final follow-up were 8.2 and 86 points for the group A, 6.4 and 76 points,



**Fig. 1** Two-plain radiography and MRI of a thoracolumbar (T12) fracture at the emergency department with TLICS = 4



**Fig. 2** Two-plain radiographic control of TL–T12 fracture at discharge from the department treated conservatively



**Fig. 3** Follow-up control with two-plain radiographs

respectively for the group B (Tables 1, 2). Fifty-two patients returned completely to their pre-trauma working ability and daily activities and six patients with small limitations (4 group B and 2 group A). The mean period for returning to work was 3.2 (range 2.1–4.3) in group A and 3.8 (range 2.5–6) months in group B. Local kyphosis angle, sagittal index and height loss percentage values did not demonstrate any significant increase at follow-up ( $P \geq 0.05$ ) (Table 1). The two groups did not demonstrate any statistical difference of their clinical and functional outcomes ( $P \geq 0.05$ ).

**Table 1** Mean values of studied parameters according to the protocol of the study, at the injury time and after conservative treatment (TLICS 4)

	Admission	Follow-up	<i>P</i> value
SF-36	83.2, 4.1	76, 3.5	0.018
VAS pain	7.8, 0.8	6.4, 1.1	0.058
Kyphosis angle	35, 2.5	30.3, 6.4	0.218
Height loss (%)	74.3, 6.6	76.7, 5.1	0.573

Vales are expressed as MV (SD)

MV mean value, SD standard deviation

**Table 2** Mean values of studied parameters in two different groups according to the protocol of the study, at the last follow-up

	Group A	Group B	<i>P</i> value
SF36	86	76	0.003
VAS	8.2	6.2	0.071

## Discussion

Thoracolumbar junction (TLJ) spine fractures are common (54.9 %), associated to falls and can cause great disability. The rigidity of the thoracic spine and the more mobile lumbar spine favor the TLI (T10–L2) and fracture. The correct management (conservative or surgical) of TLI involves multiple steps such as precise diagnosis, appropriate classification and treatment. The patient must be controlled after a careful neurologic examination (motor and sensory systems) with standard two-plain radiographs, CT-scan (describing vertebral bone), while MRI is efficient at present soft tissues and neurological structures. The knowledge and understanding of biomechanics, natural history and treatment options favor the introduction of an important parameter, with key role in treatment decision and prognosis of the injury. The decision of conservative or surgical treatment of TLI depends on stability of the injury (posterior ligament complex injury) and the neurological status of the patients. Knowledge of PLC anatomy is essential in recognizing unstable injuries. Magnetic resonance imaging is important in evaluating PLC injury and patient's neurologic status, essential parameters in deciding the treatment of the TLI. Also at computed tomography signs of PLC injury include: interspinous distance widening, facet joint widening, spinous process fracture, and vertebral subluxation or dislocation. At the same way and more clear signs could be identified in MRI [2–4, 6, 10–15]. In our department a big series of different types of TLI were treated.

The Thoracolumbar Classification and Severity Score (TLICS) is a recent classification system of different fracture types including compression fractures, burst fractures (stable and unstable), flexion-distraction injuries and fracture dislocations. According to TLICS upon the degree of bony compromise, neurological involvement, and the integrity of the posterior ligamentous complex (PLC) depend the treatment, both operative and non-operative. Minor injury characteristics such as injury level, confounding variables (ankylosing spondylitis), multiple injuries and chest wall injuries are also identified. A final numerical score is calculated guiding the decision making about surgical versus nonsurgical management. The TLICS may predict spinal stability, future deformity and compromising neurologic progressive. Minimally invasive approaches and/or conservative treatment of thoracolumbar injuries become popular and easier to decide [2, 6, 9, 12, 16].

The ideal classification should be reproducible, precise (accurate) and comprehensive, including all types of injuries [10]. The classification of TLI continues to evolve and history has been written from Nicoll, Holdsworth, Louis, and Denis, who have contributed to the evolution of fracture classification [17–21]. Magerl [21] in 1994 propose the well-known AO classification system, according to the injury mechanism, considering prognostic aspects regarding healing. In 2005, the TLICS was proposed by the Spine Trauma Study Group [2]. The TLICS classification system has been proved to have good intra- and inter-observer reliability ( $\geq 92$  and  $92.9\%$ ) [3, 9, 16, 22, 23] in difference with the older classification systems [1, 11]. Although limitations of the classification system exist [4, 9, 10]. During a study controlling the relationships between TLICS and AO classification system of TLI, patients with a TLICS 1–3 points (AO type A injuries), generally neurologically intact, receiving conservative treatment. TLICS 4 group included AO type A fractures, neurologically ranging from intact to complete spinal cord injury. Controversies still exist regarding the management of unstable burst fractures without neurological status [7, 8]. As mentioned before, the TLICS may favor the conservative or surgical treatment of a TLI. Patients with total score of  $\leq 3$  are considered candidates for conservative treatment and  $\geq 5$  for surgical treatment. Patient with a total score of 4 are in an intermediate zone where either operative or non-operative treatment might be equally appropriate. Our cases were treated and classified according to the TLICS. Thoracolumbar injuries scoring 4 were treated conservatively. Out of our study it was possible to be evaluated the conservative treatment in patients scoring 4 and the results were satisfied.

## Conclusion

The study's results demonstrate that conservative treatment for TLICS 4 thoracolumbar fractures can be safely applied. The conservative treatment of cases scoring TLICS 4 is equally effective to those scoring  $\leq 3$ . Early mobilization with functional thoracolumbar brace produces effective functional results without significant loss of vertebral body height.

**Conflict of interest** The authors state that no conflict of interest exists. All authors have made an important contribution to the study. The study has been approved by IRB of our hospital as required.

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