

Surgical outcomes and correlation ODI and ASIA scores in patients with thoracolumbar and lumbar burst fractures

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ABSTRACT

Background and Purpose: Decision-making process in Thoracolumbar and Lumbar Burst Fracture (TLBF) patients with Thoracolumbar Injury Severity and Classification Score (TLICS) > 4 is remained controversial. On the other hand, the question is whether that the Oswestry Disability Index (ODI) can be use to assess to clinical outcomes in these patients. We aimed to study the correlation between the ODI and American Spinal Injury Association (ASIA) impairment scale in these patients and evaluation of surgical outcome.

Methods: This was a prospective study. The TLICS were determined and TLICS > 4 was included. The nerve injury was assessed according to sensory scores and motors scores of the using ASIA Scale at pre- and postoperative. It was also ODI calculated at last follow-up. In addition, correlation between ASIA and ODI was evaluated at last follow-up.

Results: Fifty eight patients (20.7% female) who underwent spinal surgery for TLBF with a minimum follow up of 2 years were studied. The mean age was 30.7 ± 8.7 (24 to 65) years. Automobile accident was the predominant mode of injury. Patients were followed for 25 months on average (24 – 43 months). ASIA sensory scores and motor scores were improved significantly at last follow-up ($P < 0.001$). No patient experienced neurological worsening during the follow-up period. The mean ODI were 29.7 (SD= 4.9) at last follow-up. Correlation test showed significant correlations among the ODI and the ASIA sensory scores ($r = 0.74$, $P < 0.02$) and motor scores ($r = 0.78$, $P < 0.01$) at last follow-up assessment.

Conclusion: The findings confirm that for TLICS > 4 surgical outcome is acceptable. It also shows that the ODI and the ASIA scores have a strong correlation in measuring disability in patients with TLBF after at least 2 year follow-up.

Keywords: Thoracolumbar Injury Severity and Classification Score; Thoracolumbar and lumbar burst fractures; Outcome; Oswestry Disability Index

INTRODUCTION

Thoracolumbar And Lumbar Burst Fractures (TLBF) is a common type of spinal injuries and frequently causes spinal cord injury. It account for approximately 15% of all spinal injuries¹⁻². Various tools as Thoracolumbar Injury Severity and Classification Score (TLICS) have been developed to assess clinical outcome in patients with

TLBF³⁻⁵. The TLICS system proposed based on 3 major descriptive categories: injury morphology, integrity of the Posterior Ligamentous Complex (PLC), and neurologic status. It identifies 3 critical injury categories and assigns an injury severity score based on these categories in which injury severity score is calculated by summation of the individual scores (Table 1)⁴.

Table 1. The TLICS system*.

Variable	Points
injury morphology	
Compression	1
Burst	+1
translation/rotation	3
Distraction	4
neurological status	
Intact	0
nerve injury	2
cord, conus medullaris	
incomplete	3
complete	2
cauda equina	3
PLC integrity	
intact	0
indeterminate†	2
injured	3

* As reported by Vaccaro *et al*³

† For patients with suggested ligamentous injury on STIR imaging or T2-weighted MRI.

However, not all of these measurements are easy to apply which can be a barrier to use in clinical practice. In addition, each tool has advantages and disadvantages. This paper explores the use of two tools that have been validated for specific conditions. The American Spinal Injury Association (ASIA) impairment scale is a standard method of assessing the neurological status of a person who has sustained a spinal cord injury⁵. The Oswestry Disability Index (ODI) is among well known tool for measuring functionality in patients with low back pain and has been used to measure functionality in these patients⁶. It is unclear whether the ODI questionnaire can be used to assess of clinical outcomes compared to the ASIA score and assess whether there was an association between ODI and ASIA scores for patients with TLBF. Thus, the aims of this study are first, to study the correlation between the ODI score and ASIA sensory and motor scores at postoperative in patients with TLBF and second, to assess of surgical outcome based on ASIA score.

MATERIAL AND METHODS

Patients and data collection

This is a prospective, consecutive case series. Between March 2007 and May 2012 a sample of newly diagnosed TLBF patients seen at two large teaching hospital in Tehran, Iran, was investigated. The diagnosis of TLBF was performed using clinical symptoms, neurological examinations, and imaging studies including plain radiography, CT and MRI of the lumbar spine. The nerve injury was evaluated based on sensory scores and motor

scores of ASIA standards for neurological classification of spinal cord injury⁵, and the TLICS⁴. Only patients who had TLICS more than 4 and who were alert and cooperative with neurologic testing were included in the study. Patients who were treated conservatively (n=6), were treated with an only anterior spinal fusion (n=9), were not completed clinical outcomes at last follow-up (n=11) were excluded. The remaining 58 patients who underwent a posterior spinal fusion by two surgeons were selected. Injuries were also classified as thoracic (T1–10), thoracolumbar (T11–L2), or lumbar (L3–5) spinal trauma. The characteristics including age, gender and body weight were recorded.

Additional measurement was done by the Iranian version of ODI (Version 2). It is a measure of functionality and contains 10 items. The possible score on the ODI ranges from 0 to 50, with higher scores indicating worst conditions. The psychometric properties of Iranian version of questionnaire are well documented⁷.

Statistical analysis

All statistical analyses were performed using the PASW Statistics Version 18 (SPSS, Inc., 2009, Chicago, IL, USA). The ASIA score were measured at preoperative and at last follow-up. In addition, the ODI was calculated at last follow-up. Continuous variables are reported as mean and standard deviation. The correlation was calculated by Pearson correlation test. The probability level was set at $P < 0.05$.

Ethics

The Ethics Committee of Shahid Beheshti University of Medical Sciences, Tehran, Iran, approved the study.

RESULTS

Fifty eight TLBF patients with a mean age of 30.7 ± 8.7 (24 to 65) years were studied. 20.7% were female. Automobile accident was the predominant cause of trauma (30 patients, 51.7%), followed by falling from height (16 patients, 27.5%). Regarding injury level, 10 patients (17.2%) had thoracic fractures (T1–10), 40 (68.9%) had thoracolumbar fractures (T11–L2), and 8 (13.8%) had lumbar fractures (L3–5). All of patients had a TLICS > 4 and were primarily treated surgically. The TLICS ranged from 5 to 10 points (mean 7.3 points). All distractive and rotational injuries had a concomitant PLC injury. The last follow-up was 25 months ranging from 24 to 43 months.

The ASIA sensory score improved from 163.7 (SD = 21.3) at preoperative to 210.4 (SD = 19.7). The

ASIA motor score improved from 53.3 (SD = 6.3) at preoperative to 84.1 (SD = 11.1). ASIA sensory scores and motor scores were improved significantly at last follow-up ($P < 0.001$). None of these patients had neurological worsening during follow-up. Complications directly related to surgery included 4 patients with pedicle screw revision for asymptomatic misplacement and 5 patients with wound infections, 2 of whom required revision surgery for debridement without instrumentation removal or revision.

The mean ODI were 24.9 (SD= 3.4) at last follow-up. There were statistical significant correlation between ODI and the ASIA sensory scores ($r = 0.74$, $P < 0.02$) and motor scores ($r = 0.78$, $P < 0.01$) at last follow-up assessment.

DISCUSSION

This is the first report to measure disability in patients with thoracolumbar and lumbar burst fractures according to ODI and ASIA score with at least 2 year follow-up. The findings confirm for TLICS > 4 surgical outcome is acceptable. It also shows that the ODI and the ASIA scores have a strong correlation in measuring disability in patients with thoracolumbar and lumbar burst fractures at least 2 year follow-up.

Literature has reported a range of recovery of neurological deficit of about 50-85%⁸. It has been reported that most of the neurological improvement occurs in the first 6 months after trauma⁹⁻¹⁰. In our series no patient worsened after treatment and all 9 patients (15.5%) with incomplete deficits had some improvement⁹. In addition, there are functionality and neurologically improved based on ODI score and ASIA score, respectively, at last follow-up.

The TLICS injured severity score is a promising system that could help surgeons in decision-making process^{4,9,11}. For TLICS > 4, surgery for stabilization of these injuries is accepted based on the fact that they can develop severe post-traumatic deformities^{4,9,11}, which is in line with our findings.

Relations between the ODI score and the ASIA score have not been studied before. Several authors reported clinical outcomes of patients based on ASIA score with a diverse range of follow-up with successful outcome¹²⁻¹⁴, which is in line with our findings. However, this study showed that the ODI may be able to use in clinical outcome in patients with TLBF.

The ASIA score is a standard method of assessing the neurological status of a person who has a sustained spinal cord injury⁵. Meanwhile, the ODI is currently

considered by many as the gold standard for measuring degree of disability and estimating quality of life in a person with low back pain⁶. Accordingly, to identify ways to improve care, we need more specific tools for patients' assessment. However, additional research is required to assess the discriminant power of the measures for specific diagnostic entities.

Our study is limited by its short time of follow-up. The sample size of 58 was not large enough to provide a sufficient statistical power. Thus, a study with a sufficient number of patients is necessary. Finally, due to limited number of patients with thoracic, thoracolumbar and lumbar fractures we could not compare these ODI with ASIA scale.

CONCLUSION

Our findings demonstrate that a TLICS > 4 is both accurate and safe in that it predicted good outcomes with surgery. It is also confirm that the ODI and the ASIA scores have a strong correlation in measuring disability in patients with thoracolumbar and lumbar burst fractures at least 2 year follow-up.

COMPETING INTERESTS

The authors declare that they have no competing interests.

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