

# The long-term efficacy of pedicular screw fixation at patients suffering from thoracolumbar burst fractures without neurological deficit

Seyed Amirhossein Javadi, Fereshteh Naderi<sup>1</sup>

Department of Neurosurgery, Neuroscience Institute, Tehran University of Medical Sciences, Tehran, Iran, <sup>1</sup>Department of Neurology, Hannover Medical School (MHH), Hannover, Germany

## ABSTRACT

**Objectives:** Treatment of choice at stable burst fracture is still a matter of debate. The aim of this study is assessment of health-related quality of life (HRQOL) regarding short form-36 (SF-36) and its correlation with kyphosis in patients affected by thoracolumbar burst fracture without neurological deficit undergoing posterior short segment pedicular screw fixation.

**Materials and Methods:** Twenty patients with thoracolumbar burst fractures without neurological deficits, meeting our criteria were enrolled in this study. The patients underwent short segment pedicular screw fixation. After 2 years of follow-up, the outcome assessment was performed with evaluating HRQOL; SF-36. The mean  $\pm$  standard deviation was measured at each eight category of SF-36 and compared with normative values of Iran. The correlation of Cobb angle and body pain was analyzed by linear regression.

**Results:** The study detected reduced quality of life (QOL), with total mean of  $49.7 \pm 14$  and physical function grade of  $61.2 \pm 22$  which was significantly lower than Iran normative reported as  $85.9 \pm 19$ . Fifty percent still suffered from moderate to severe pain and Cobb angle had no statistically significant correlation with body pain.

**Conclusions:** It seems that surgical treatment could not improve pain related disability of patients with stable thoracolumbar burst fracture at long term follow up.

**Key words:** Burst, fracture, kyphosis, quality of life, thoracolumbar

## Introduction

Thoracolumbar junction is the most common area of the spine involved in burst fractures.<sup>[1-3]</sup> Burst fractures are divided into several subtypes regarding neurological status and morphology.<sup>[2-4]</sup> Treatment of choice at stable burst fracture without neurological deficit is still a matter of debate and there is a lack of evidence on the superiority of operative treatment at long-term follow-up.<sup>[1,5,6]</sup>

Considering the outcome, besides pain relief, patient's subjective perception increasingly became aim in medicine.<sup>[3,7,8]</sup> Therefore, the postoperative quality of life (QOL) occupies an important position in trauma surgery. Short form-36 (SF-36) is one of the tools for assessment of health-related quality of life (HRQOL).

The aim of this study is assessment of HRQOL in patients affected by thoracolumbar burst fracture without neurological deficit undergoing posterior short segment pedicular screw fixation. This is the first norm-based analysis to compare pathologic and normal values of HRQOL in Iran, which could evaluate the patients at the same population of their origin. Besides, long-term follow-up is considered.

## Materials and Methods

Twenty patients with thoracolumbar burst fractures without neurological deficits, meeting our criteria were enrolled in this study. X-ray, computed tomography scan, and magnetic resonance imaging study of the whole spine were performed. The inclusion criteria were as follows: burst fracture at anterior and middle column, intact posterior ligamentous complex (PLC), intact facet and decreased height <50%. The

Access this article online	
Quick Response Code:	Website: www.asianjns.org
	DOI: 10.4103/1793-5482.162704

### Address for correspondence:

Dr. Seyed Amirhossein Javadi, Department of Neurosurgery, Neuroscience Institute, Tehran University of Medical Sciences, Keshavarz Blvd., 14197-33141, Tehran, Iran.  
E-mail: javadi1978@yahoo.com

patients underwent posterior short segment pedicular screw fixation. After 2 years of follow-up, the outcome assessment was performed with evaluating HRQOL; SF-36. The mean  $\pm$  standard deviation (SD) was measured at each eight category of SF-36 and compared with normative values of Iran. Analysis was performed with Chi-square test. Statistical significance was considered as  $P < 0.05$ .

Kyphosis was measured as Cobb angle. The correlation of Cobb angle and body pain was analyzed by linear regression. IBM SPSS software version 17.0 was used for data analysis. The whole study was approved by the local ethics committee and informed consents were signed by all of the patients before surgery.

## Results

Male to female ratio was 2/1 with a mean age of  $44.5 \pm 7.6$  (mean  $\pm$  SD). The level of fracture was equally divided between L1 and T12.

The assessment showed reduced QOL, with total mean of  $49.7 \pm 14$  and physical function grade of  $61.2 \pm 22$  which was significantly lower than Iran normative reported as  $85.9 \pm 19$  ( $P < 0.05$ ). Bodily pain (BP) was  $34 \pm 29$  comparing to the normal value of  $78.9 \pm 26$  ( $P < 0.05$ ). The detail result of each category is reported at Table 1. Fifty percent of patients still suffered from moderate to severe pain, 2 years after surgical intervention [Figure 1]. Cobb angle had no statistically significant correlation with body pain score ( $P > 0.05$ ) as indicated at [Figure 2]. Low scores of BP (more disabilities) were found at some cases with minimal kyphosis.

## Discussion

Burst fractures constitute 30–60% of thoracolumbar fractures and about 50% or more have no neurologic deficit.<sup>[8-10]</sup> Burst fractures were first reported by Holdsworth and different classifications exist based on morphology, stability, and mechanism of injury since that time.<sup>[8]</sup> Thoracolumbar injury classification and severity score (TLICS) considers neurological status, morphology and integrity of PLC.<sup>[5]</sup> According to this classification, burst fracture with intact PLC and neurological status is categorized as one subgroup. In these cases, operative treatment is not necessary.<sup>[8,11-13]</sup>

This is the first norm-based evaluation of HRQOL with long-term follow-up in Iran. The current study revealed significant decreased QOL and BP score, which did not correlate with the degree of progressive kyphosis, at stable burst fractures. This would be partly due to the nature of primary trauma insult. Other studies have reported similar values for SF-36 [Table 2]. Several reasons exist for poor grades of HRQOL and pain scale, including the injury to the motion segment, method of treatment (nonoperative versus operative), and surgical technique.<sup>[3,6-8]</sup>

**Table 1: Mean values of different aspects of SF-36 in comparison to Iran normative**

Variable	Mean	Iran normative
Physical function	61.2	85.9
Role physical	12.5	72.1
Body pain	34	78.9
General health	60	57.1
Energy/fatigue	53.7	65.1
Social function	69	76.4
Role emotional	50	69.1
Emotional	59	66.6
Physical health	44.5	
Mental health	58.2	
Total	49.7	

SF-36 – Short form-36

**Table 2: Values of SF-36 categories reported at other studies**

	Briem <i>et al.</i>	Wood <i>et al.</i>	Kraemer <i>et al.</i>	Current study
Physical function	68.98	63	65	61.2
Role physical	57.22	51	45	12.5
Body pain	68.5	59	62	34
General health	71.8	69	64	60
Energy/fatigue	60.8	84	56	53.7
Social function	82.95	84	79	69
Role emotional	80.44	80	68	50
Emotional	75.20	81	78	50

SF-36 – Short form-36

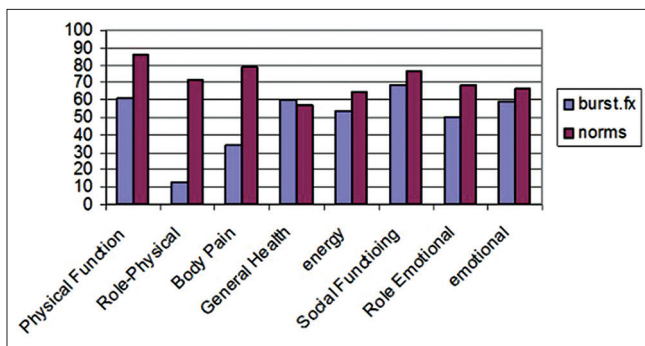
Bone deformity is corrected with surgery. However, it is unclear if this correction is clinically important since patients with residual kyphosis improve neurologically<sup>[6,14-16]</sup> and some of the operated cases may be stable before surgery. Surgery causes earlier mobilization and discharge, less initial pain and faster return to work.<sup>[6-8]</sup> However, HRQOL is not superior in surgical treatment [Table 3]. According to the systematic review done by Thomas *et al.*, there is no evidence for the superiority of surgical treatment; and kyphosis will progress at both surgical and conservative modalities.<sup>[10]</sup> Besides, the correlation of kyphosis and outcome is not clear.<sup>[6,8,10]</sup> Verlaan *et al.* concluded that the final degree of kyphosis was similar regardless of surgical approach.<sup>[6]</sup>

There is an increasing emphasis on self-reported measures of health status and HRQOL. Considering the patients' point of view and the multidimensional nature of health, subjective measures of health status are included in epidemiological and community-based survey research. SF-36 is one of the most widely used subjective measures of health status.<sup>[3,7,8]</sup> It is a generic measure developed to meet psychometric standards for group comparisons, to enable profiling of functional health and well-being, and

**Table 3: Results of comparative studies and systematic reviews of burst fractures at thoracolumbar junction**

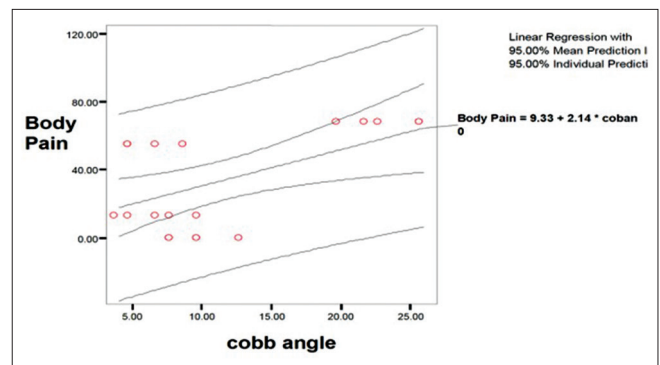
Author	Year	Type of study	Comparison	Number of cases	Results
Wang <i>et al.</i> <sup>[16]</sup>	2006	RCT	Fusion versus nonfusion at posterior short segment pedicular fixation	58	Loss of kyphosis was not significant, nonfusion is satisfactory ; more motion segment is saved, less blood loss, and time
Tezeren and Kuru <sup>[15]</sup>	2005	RCT	Short posterior versus long segment posterior approach	18	Radiologically long segment was more effective, clinical outcome was the same
Wood <i>et al.</i> <sup>[7]</sup>	2005	RCT	Anterior versus posterior approach	43	Similar outcomes, Anterior fusion has fewer complications or surgeries
Jindal <i>et al.</i> <sup>[4]</sup>	2012	RCT	Fusion versus nonfusion at posterior approach	50	No clinical or radiological difference
Wood <i>et al.</i> <sup>[8]</sup>	2003	RCT	Operative versus nonoperative treatment	47	No difference at outcome, operative treatment has no long-term advantage, better physical function at nonoperative group
Shen <i>et al.</i> <sup>[11]</sup>	2001	RCT	Operative versus nonoperative treatment	80 (47 vs. 33)	Surgical group had less pain after 3 months, Surgical group; partial kyphosis correction and earlier pain relief, but after 2 years they were similar
Siebenga <i>et al.</i> <sup>[12]</sup>	2006	Comparative	Surgical versus nonsurgical	34 (16 vs. 18)	Surgical group had better outcome than nonsurgical group at type A3 fracture
Yi <i>et al.</i> <sup>[13]</sup>	2006	Systematic review	Operative versus nonoperative	53 (one study)	Kyphosis and correction lost, but did not correlate with clinical outcome
Abudou <i>et al.</i> <sup>[1]</sup>	2013	Systematic review	Operative versus nonoperative	87 (two studies)	Less pain and better functional RMD scale in operative; more pain and worse function in operative
Thomas <i>et al.</i> <sup>[10]</sup>	2006	Systematic review	Operative versus nonoperative		Lack of superiority of one method, no statistical linking kyphosis to clinical
Tian <i>et al.</i> <sup>[14]</sup>	2013	Meta-analysis	Fusion versus nonfusion	220 (four studies)	No difference, fusion is not necessary
Ghobrial <i>et al.</i> <sup>[5]</sup>	2013	Review	TL junction fractures	48 studies	Level 1; nonoperative treatment for TL burst fracture without deficit
Alpantaki <i>et al.</i> <sup>[12]</sup>	2010	Systematic review			
Verlaan <i>et al.</i> <sup>[6]</sup>	2004	Systematic review	Surgical treatment of lumbar and thoracic fracture		At follow-up kyphosis was similar, however more severe kyphotic cases underwent combined anterior and posterior approach

RCT – Randomized controlled trials; TL – Thoracolumbar; RMD – Roland-Morris disability



**Figure 1:** Comparison of short form-36 results between patients and normal persons

to quantify disease burden. The SF-36 includes 36 questions grouped into eight categories: Physical functioning , role limitations due to physical health (role physical), body pain, general health perceptions, energy/fatigue, social functioning, role limitations due to emotional problems (role emotional), and emotional. The higher scores indicate less disability. SF-36 estimates disease burden for more than 200 diseases and conditions including arthritis, back pain, spinal injuries, stroke, surgical procedures, trauma, cancer, cardiovascular disease, chronic obstructive pulmonary



**Figure 2:** Correlation of body pain and Cobb angle

disease, depression, diabetes.<sup>[17]</sup> Norm-based comparison is a type of criterion-based interpretation, in which scores are evaluated in relation to typical scores (norms). This method could evaluate the patients at the same population of their origin.<sup>[17]</sup> Since the reliable Persian translation and norm-based scores of SF-36 for Iran population are available and their reliability and validity have been reported well in literature,<sup>[9]</sup> the aforementioned method was selected for analysis. However, the major limitation of our study is lack of control group as nonoperated cases.

## Conclusions

Patients in this study showed a reduced QOL, esp. pain scale, without significant correlation with kyphosis. No evidence exists on linking kyphosis to clinical outcome. Other etiologies of poor pain scale such as weight, occupation, education, and treatment approach should be assessed as well. It seems that surgical treatment could not improve pain related disability of patients with stable thoracolumbar burst fracture at long term follow up.

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**How to cite this article:** Javadi SA, Naderi F. The long-term efficacy of pedicular screw fixation at patients suffice! ring from thoracolumbar burst fractures without neurological deficit. *Asian J Neurosurg* 2015;10:286-8.

**Source of Support:** Nil, **Conflict of Interest:** None declared.