



Treatment of Unstable Thoracolumbar Fractures: Does Fracture-Level Fixation Accelerate the Bone Healing?

Zühtü Özbek¹, Emre Özkar¹, Hasan Öner², Gültekin BAŞ¹, İpek Canan Erman¹, Hülya Özen³, Emre Entok², Ali Arslantaş¹

■ **OBJECTIVE:** To investigate the effect of fusion on short segment including fractured level (SSIFL) and long segment (LS) transpedicular fixation after acute thoracolumbar junction burst fractures. The 2-year clinical and radiologic follow-up results of the 2 groups also were compared.

■ **METHODS:** Seventy-four patients were randomized into one of 2 groups: SSIFL ($n = 39$) or LS ($n = 35$). The SSIFL group included one level above and one level below, including the fracture level, whereas the LS group included 2 levels above and 2 levels below, excluding the fracture level, for the transpedicular fixation. Fusion was assessed by technetium 99m-methylendiphosphonate, bone scintigraphy, and single-photon emission computed tomography. The 2-year follow-up results were compared clinically (Oswestry Disability Index and visual analog scale) and radiologically (kyphosis angle, sagittal index, anterior vertebral body height loss) at regular intervals. The clinical scores and radiologic parameters of patients with and without fusion also were compared.

■ **RESULTS:** The number of patients with fusion was significantly greater in the SSIFL group compared with the LS group. There was a significant reduction of the clinical scores of patients who had fusion compared with the fusion-free group; however, there was no radiologically significant difference. Furthermore, there was no significant difference between the SSIFL and LS groups in terms of the 2-year radiologic and clinical follow-up results.

■ **CONCLUSIONS:** Fusion occurred sooner and patients experienced earlier clinical recovery in the SSIFL group compared with the LS group.

INTRODUCTION

The thoracolumbar junction (TLJ) is important because it is a transitional zone between thoracic kyphosis and lumbar lordosis; spine fractures often occur in this region.¹ The surgical treatment of TLJ fractures can include anterior, posterior, or combined procedures. The most common method is a posterior procedure.²⁻⁴ Posterior intervention can be performed through a transpedicular or nonpedicular approach. There are several variations of the transpedicular method²⁻⁸; choosing the most appropriate surgical treatment of TLJ fractures remains a topic of debate.

Previous studies compared surgically treated TLJ fractures in terms of symptoms (such as pain, neurologic status, functional status, quality of life), radiology (such as Cobb angle, sagittal index [SI], anterior vertebral body height loss [AVBHL], canal compromise ratio), and surgery (such as method applied, duration of operation, blood loss, duration of hospital stay).²⁻⁸

The aim of this study was to evaluate the effects of 2 different surgical methods (short segment including fractured level [SSIFL] and long segment [LS]) on fusion in the treatment of TLJ fractures and to determine the association between fusion and clinical status. Clinical and radiologic results at 2-year follow up also were assessed.

Key words

- Fracture
- Fusion
- Long segment
- Short segment
- Thoracolumbar

Abbreviations and Acronyms

AVBHL: Anterior vertebral body height loss

KA: Kyphosis angle

LS: Long segment

ODI: Oswestry Disability Index

SI: Sagittal index

SPECT: Single-photon emission computed tomography

SSIFL: Short segment including fractured level

Tc-99m MDP: Technetium 99m-methylendiphosphonate

TLJ: Thoracolumbar junction

VAS: Visual analog scale

From the Departments of ¹Neurosurgery, ²Nuclear Medicine, and ³Biostatistics, Eskisehir Osmangazi University, School of Medicine, Eskisehir, Turkey

To whom correspondence should be addressed: Zühtü Özbek, M.D.

[E-mail: zuhtuozbek@gmail.com]

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Table 1. Inclusion and Exclusion Criteria for the Study

Inclusion Criteria	Exclusion Criteria, Number of Patients Excluded (n)
Fractures after acute trauma	Osteoporosis (T-score [BMD] < -2.5 SD), n = 7
Type A3 and A4 fractures (according to AO classification)	Pathologic fracture; History of malignancy, n = 2
	Neurological damage, n = 7
	Decompression with laminectomy, n = 3
	Multiple level fractures, n = 9
	Other trauma in addition to spinal trauma, n = 11
	Younger than 20 years and older than 60 years old, n = 13
	Nonintact bilateral pedicle, n = 2
	Comorbidity (diabetes, chronic kidney failure, steroid use), n = 14
If the patient had more than one of the exclusion criteria, only one of them was considered. AO, Association for the Study of Internal Fixation; BMD, bone mineral density; SD, standard deviation.	

MATERIALS AND METHODS

Ethics Committee

Ethical approval for the study was granted by the Eskisehir Osmangazi University Human Research Ethics Committee (approval number 80558721/G-190).

Patient Selection and Surgical Procedure

In this prospective study, 152 patients with A3 or A4 fractures of the T11, T12, L1, and L2 vertebrae according to the Association for the Study of Internal Fixation classification after acute trauma between 2007 and 2013 were included in the initial evaluation.⁹ Factors that may have negatively affected the radiology, clinical features, and fusion formation in the postoperative period were assessed during the preoperative evaluation; 68 patients with these factors were excluded from the study (Table 1). The indications for surgery were SI greater than 15° or AVBHK exceeding 50%.⁴

Patients who met all of the inclusion and none of the exclusion criteria were randomized into 1 of 2 groups via a computer-generated random allocation sequence with a statistical package program (NCSS LLC., Kaysville, Utah, USA). The patients' demographic characteristics are listed in Table 2. Transpedicular fixation was performed one level above and one level below, including the fracture level, in the SSIFL group and 2 levels above and 2 levels below, excluding the fracture level, in the LS group. The same posterior fixation system was used in all patients (Xia Spinal System, Stryker, Kalamazoo, Michigan, USA). Fusion was performed in all patients with the use of autologous bone harvested from the iliac crest. The patients were mobilized early in the postoperative period and used corsets for 1 month.

After the patients were discharged, they were checked regularly at 3-month intervals. During the follow-up period, a total of 10 patients were excluded from the study (Figure 1). Three of these 10 patients had postoperative infection, another 3 required repeat surgery for various reasons, and 4 patients were followed for less than 2 years or were not followed regularly and were therefore excluded. The study ultimately included a total of 74

Table 2. Demographic Characteristics of the Patients Included in the Study

SSIFL, n = 39						LS, n = 35					P Value
Age, years	40.3 ± 11.59 41 (30–51)					37.5 ± 10.88 35 (30–47)					0.371
Sex, male, female	28, 11					25, 10					1.00
Fracture level	T11	T12	L1	L2		T11	T12	L1	L2		0.95
	3	10	22	4		2	8	22	3		
AO classification	A3		A4			A3		A4			1.00
	27		12			25		10			
Denis classification	A	B	C	D	E	A	B	C	D	E	0.988
	9	24	3	0	3	8	22	3	0	2	
LSC	6.8 ± 0.82 7 (6–7)					6.9 ± 0.78 7 (6–7)					0.575
Follow-up period, months	33.26 ± 8 32 (26–38)					34.34 ± 9.6 31 (26–43)					0.736
BMI, kg/m ²	26.67 ± 3.51 26 (24.11–29.03)					27.10 ± 3.25 27 (24.86–28.67)					0.492
SSIFL, short segment including fractured level; LS, long segment; LSC, load sharing classification; BMI, body mass index; AO, Association for the Study of Internal Fixation.											

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