



## Original Article

# Ten-year follow-up results of posterior instrumentation without fusion for traumatic thoracic and lumbar spine fractures



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## ABSTRACT

**Background:** This retrospective study aims to present and evaluate the long follow-up results of posterior instrumentation without fusion in patients with traumatic thoracic and lumbar fractures.

**Methods:** 45 patients were operated. The mean follow-up period was 147.6 months. Sagittal plane kyphosis (SPK) and anterior wedge angle (AWA) were evaluated in preoperative and follow-up.

**Results:** SPK and AWA improved significantly in the early postoperative. However, the correction was lost in the 10-year follow-up. The loss of correction was statistically significant in SPK and AWA.

**Conclusion:** Posterior instrumentation without fusion is still among the most useful in treatment of traumatic thoracolumbar fractures.

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## 1. Introduction

Conservative treatment is the method of choice for some patients who present with traumatic thoracic and lumbar fractures.<sup>1,2</sup> Although surgical treatment of thoracic and lumbar fractures still remains controversial, posterior decompression and stabilization of the spine is the preferred treatment method for those patients who need a surgical operation.<sup>3,4</sup> Several authors have reported the follow-up results of the posterior instrumentation of traumatic thoracic and lumbar fractures.<sup>5,6</sup> However, there is no series in the literature presenting long-term follow-up results. In addition, presently there is not enough data available for patients treated with fixation and decompression without fusion, although some good clinical outcomes have been reported for short-segment fixation without fusion.<sup>7</sup> The present study was designed to evaluate the outcome of thoracolumbar burst fractures managed with posterior fixation, without laminectomy and fusion.

## 2. Materials and methods

From November 1989 to December 1996, 118 patients with traumatic thoracic and lumbar spine fractures were operated using posterior instrumentation at the Orthopedics and Traumatology Department. Eventually, 45 patients were included in the study because some patients had died or moved to another city and communication was lost with them over the 10-year follow-up period. Thirty patients were male (66.7%), and 15 patients were female (33.3%). Their mean age at the time of surgery was 30.1 years (range, 15–65), and after the 10-year follow-up period, their mean age was 42.4 years (range, 29–79); the mean follow-up period was 147.6 months (range, 128–204). The cause of injury was falling from heights in 24 cases (53.3%), traffic accidents in 19 cases (42.2%), and trauma originating from industrial accidents in two cases (4.4%).

In the study, both Denis and Magerl classifications were used to classify the fractures. According to the Denis classification, 23 patients had burst fractures (type A: 7, type B: 11, type C: 1, type D: 4), 18 had flexion-distraction fractures, and four had fracture-dislocations. There were 19 patients (42.2%) with type A fractures, 18 (40%) with type B type fractures, and eight (17.8%) with type C fractures according to the Magerl classification.

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Complete spinal cord injury was seen in 36.8% of type A fracture patients, 44.4% of type B, and 75% of type C. Fractures between T4 and L5 were included. Regarding the levels of fractures, there were 25 thoracolumbar fractures (T1 and L1) (55.7%), eight thoracic fractures (17.8%), eight lumbar fractures (17.8%), and four segmental fractures (8.9%).

Complete spinal cord injury was seen in 75% of the thoracic fracture patients, 48% of the thoracolumbar fracture patients, and 25% of the lumbar fracture patients. The American Spinal Injury Association (ASIA) classification was used for functional evaluation, and there were 21 grade A, three grade B, seven grade C, five grade D, and nine grade E cases preoperatively.

All patients underwent posterior instrumentation without fusion. The Harrington distraction system was used as an instrumentation system in seven cases (15.6%) and transpedicular screw fixation was used in 37 cases (84.4%). Four patients were instrumented in two segments, 10 in three segments, 19 in four segments, nine in five segments, and three in six or more segments. Decompression was performed in 11 patients when the canal was severely obliterated by bone fragments. All patients were mobilized postoperatively with thermoplastic thoracolumbar orthosis or a thoracolumbar corset.

### 2.1. Imaging and function evaluation

In all cases, preoperative, early postoperative, and 10-year follow-up X-rays were taken and computed tomography (CT) scans were performed. Sagittal plane kyphosis (SPK) and anterior wedge angle (AWA) were evaluated in preoperative, early postoperative, and 10-year follow-up sagittal plane X-rays using Cobb's method (Fig. 1). The anterior wedge angle (AWA) was measured from the endplates of the injury level. Spinal canal diameter was measured on the axial cuts of CT scans at the injury level, preoperatively and postoperatively (X). The calculated vertebral spinal canal diameter (Y) was determined by averaging the spinal canal diameters of the adjacent vertebrae above and below the injury level (Y1 and Y2). The spinal canal narrowing percent (NR) was thus calculated as  $(Y - X)/Y \times 100\%$ . For functional evaluation, the Hannover spine score and the Oswestry disability score were used.

### 2.2. Statistical analysis

R 3.2.2. for Windows package program used for statistical analysis. Descriptive statistics are given with mean, standard deviation, median, minimum and maximum values for continuous variables. Shapiro–Wilk test used for test of normality. Wilcoxon

test used for comparisons of dependent variables values between two different times one way repeated measures ANOVA used for comparisons of dependent variables values among three different times. After ANOVA for significant variables LSD post hoc test used. For all statistical comparisons with a *p* value below 0.05 assumed as there is a statistically significance.

## 3. Results

After the 10-year follow-up period, the ASIA classification for 15 cases was grade A, no case was grade B, three were grade C, 15 were grade D, and 12 were grade E. In the 10-year follow-up period, 27 patients (60%) remained in the preoperative ASIA grade, eight patients (17.8%) improved one grade, seven patients (15.6%) improved two grades, and three patients (6.7%) improved three grades. Overall, a 0.7-grade improvement was seen for the patients.

### 3.1. Radiological results

All the changes of the SPK and AWA angles were found statistically significant ( $p < 0.001$ ). Early and late postoperative values were found significantly increased while significant correction lost was found in late postoperative SPK and AWA angles when compared with early postoperative period ( $p < 0.001$ ) (Fig. 2). The change in canal narrowing values was statistically significant in preoperative and late postoperative period ( $p < 0.001$ ). The mean percentage of preoperative narrowed canal diameter was  $48.64 \pm 14.05\%$  changed to  $8.2 \pm 4.61\%$  postoperative and the change was found statistically significant (Fig. 3; Table 1).

### 3.2. Clinical results

In functional evaluation, regarding all patients, the mean Hannover score was  $74.8 \pm 12.48$  (range, 35–97). In 30 non-wheelchair patients, the mean Oswestry score was  $21.69 \pm 13.79\%$  (10–60%). Fifteen patients were immobile or in a wheelchair. Shortcomings of this study are the diversity of instrumentation methods used and the small number of patients with 10-year follow-up.

The back pain of the patients who were operated on measured using visual analogue scale (VAS) score in the 10-year follow-up was zero in 30 patients (66.6%), and the mean VAS score was  $1.02 \pm 1.36$  (0–7). Of these 30 patients, 19 still have implants. There

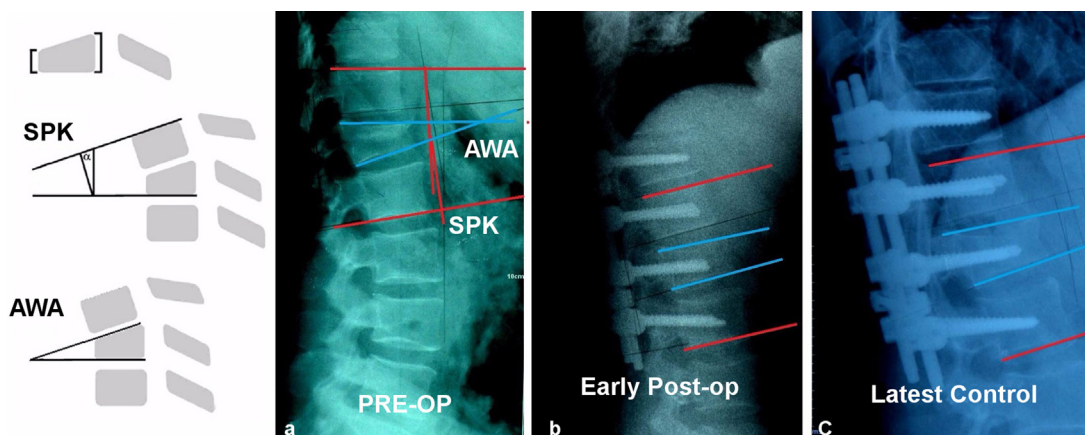


Fig. 1. L1 fracture ASIA E with anterior column compression treated with pedicle fixation without fusion, preoperatively (a), postoperatively (b), and 10 years after (SPK and AWA measurements).

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