SURGICAL TREATMENT OF THORACOLUMBAR VERTEBRAE FRACTURES WITH ALICI SPINAL INSTRUMENTATION*

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ABSTRACT

This report presents the results of 28 patients treated with Alıcı Spinal Instrumentation between 1993 and 1995 at the Department of Orthopaedic Surgery of the Faculty of Medicine, Erciyes University. Average age of the patients was 46.8 years. There were seventeen male and eleven female patients. Two patients had complete and eight had various degrees of neurological deficit preoperatively. Clinical and radiological follow-up average was 15.6 months, followed-up for minimum one year.

Surgical treatment and spinal fusion were performed in all cases. Neurological function, sagittal index and percentage of anterior vertebral body compression were recorded on preoperative and postoperative examinations and in the last follow-up control. Twenty-four patients were treated with transpedicular screw-rod and hook-rod combination posterior fixation, and four patients were treated with screw-plate anterolateral fixation. Neurologic deficit was resolved after treatment in eight cases. The preoperative average anterior vertebral body compression percentage was 46.5%, postoperatively it was 13%. The preoperative average sagittal index was 20°, postoperatively it was 6.4°. The preoperative average of spinal canal compromise was 33%, postoperatively it was 8°. The fractures healed in 25 out of 28 patients. Two patients completely lost functional walking ability. Another two patients did not return to work, but were able to start their daily activities. 24 patients had normal functional ability and returned to work. Transpedicular screw-rod system may be advised in the treatment of fractures of unstable thoracolumbar vertebrae, because there is no need of external support and absence of late deformities.

Key words : *Thoracolumbar burst fractures, neurological deficit, functional ability.*

INTRODUCTION

Today some of the trauma injuries resulting from motor vehicle accidents and industrial accidents are on the increase causing thoracolumbar vertebrae fractures (23). It is seen that some of the patients with these kinds of fractures have neurologic function loss as well as fractures. It is important that these people are treated and restored to their daily activities. In 1960s Harrington (21) distraction rod system, in 1970s the segmenter fixation system consisting of Luque's (18) sublaminar wire and distraction rods and after 1980s transpedicular screwing system (4, 6, 7, 12, 15) started to be used in treatment of these patients.

With the introduction of segmenter spinal system, it is now possible for the patient not to need external assistance and to provide earlier mobilization for him. Concerning these advantages, a variety of systems have been designed and put into practice recently. With the inroduction of these systems:

- Stronger structures may be provided in the fracture area,
- Direct or indirect decompression of the spinal canal may be performed,
- Physiological curvatures of the vertebral column may be overcome,
- Patients may be mobilized and rehabilitated earlier (13, 23).

PATIENTS and METHODS

The results of the 28 patients after sufficient follow-up period (minimum 1 year) out of the 36 patients treated in the Orthopaedics and Traumatology Department of Erciyes University between 1993 and

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1995 were evaluated. The remaining eight patients' follow-up period was insufficient. The unstable fractures were treated with open reduction, internal fixation and fusion. The criteria in the surgical treatment procedure were:

a) Fractures associated with at least two columns as well as the middle column,

b) Fractures accompanied with neurological deficit,

c) Fractures with sagittal index of over 15°,

d) Fractures with vertebrae corpus height loss of over 50%,

e) Fracture-dislocations.

Of the 28 patients, 17 were male and 11 female. Their ages ranged from 16 to 69, the average age being 46.8 (Table 1). The fractures were due to motor vehicle accidents in 9 patients, industrial accidents, falling from height and miscellaneous in the remaining 19. There were 6 compression fractures, 20 burst fractures, one seat-belt fracture injury and one fracture-dislocation (Table 1). The fractures were mostly seen between T12-L2 (Table 1). The patients were assessed neurologically, according to Frankel and it was determined that two of them were A, one B, three C, four D, and eighteen of them Frankel E. 24 of the patients were treated using posterior instrumentation plus fusion, and 4 treated with anterolateral instrumentation plus fusion method. Discectomy or laminectomy was applied to the patients with disc injury or spinal canal encroachment. 14 patients had fractures apart from vertebrae. All patients were examined physically, neurologically and radiologically (CT). In the examinations of the patients before and after the operation and in their last follow-up sagittal index, frontal Cobb's angle, height loss of vertebral body and the percentage of canal encroachment were assessed. In addition, their pain and functional capacities were determined after the operation by the Denis' pain and work scala (8).

Table 1. Patients' demographic data

- **Age**

Average	46.8
Range	16-69
0-10	3 cases
21-30	8 cases
41-50	4 cases
51-60	6 cases
60-over	7 cases

- **Fracture distribution**

Compression	6 cases
Burst	20 cases
Seat-belt	1 case
Fracture-dislocation	1 case

- **Distribution of the fractures acc. to the vertebrae levels**

T7	1	case
T8	1	case
T9	2	cases
T10	0	case
T11	1	case
T12	5	cases
L1	11	cases
L2	3	cases
L3	2	cases
L4	2	cases

RESULTS

The patients reviewed in this study were assessed clinically and radiologically before and after the operation and in the last follow-up (Fig 1A, 1B, 1C, 2A, 2B, 2C). The follow-up period ranged from 12 to 32 months, with an average of 15.6 months. The mean operation period was 3.2 hours and the hospitaization period after the operation was 15.8 days. The sagittal index was 20.1° before the operation and 6.4° after the operation. The correction loss was 2.4° in the last follow-up. The height loss of vertebral body was 46.4% on average before the operation, whereas it was 9.3% after the operation and 13.3% in the last follow-up.

The deformity in the frontal plain was 4.2° on average but it was seen to be 1.4° in the last follow-up.

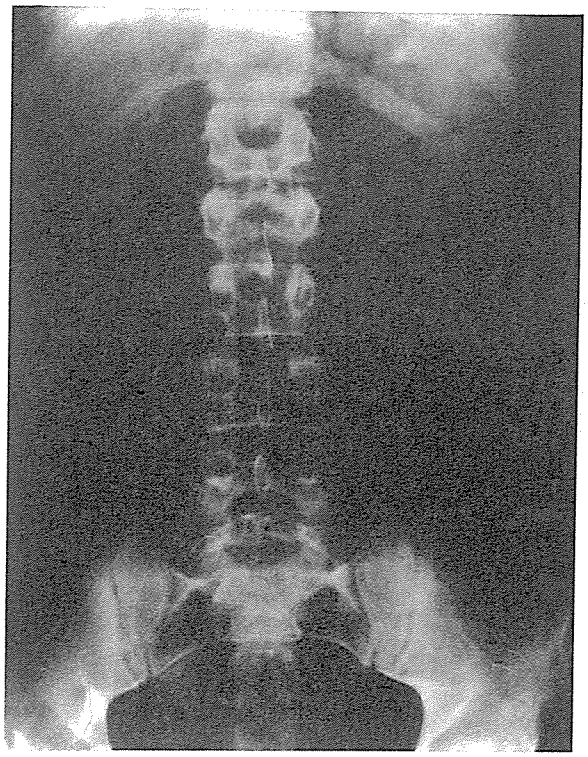

Figure 1A.

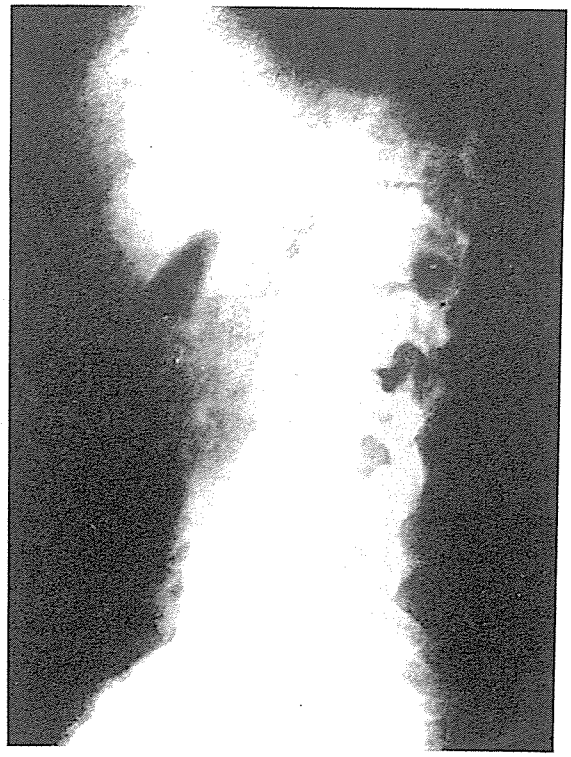

Figure 1B.

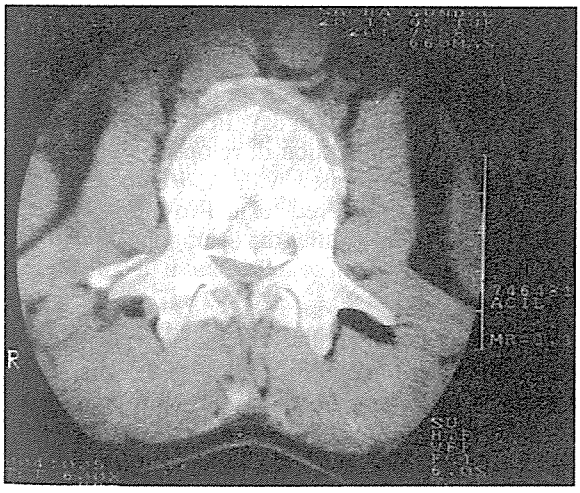

Figure 1C.

While the canal encroachment measured through CT was 33% on average, it was found to be 7.6% postoperatively. Mean postoperative mobilization period of the patients was 13 days. Patients were permitted to do limited activities and to lift something light six months postoperatively. 24 patients returned to their daily activities without presenting pain or functional loss but 2 patients having Frankel A showed no improvement. Although one patient having Frankel B and one patient having Frankel C carried on with their daily activities, they did not improve well enough to return to their previous work. In terms of pain and functional capacity determined by Denis' pain and work scala (8), the results were assessed as excellent (P1, W1) in 12 (42.85%) patients, good (P2W2) in 11 (39.3%) patients, fair (P3W3) in 3 (10.7%) patients and poor (P4-P5, W4-W5) in 2 (7.15%) patients. Infection (Staphylococcus aureus) was seen in one patient on the fourth day postoperatively an the patient was treated with antibiotic (Vancomycine®) according to the result of the culture. In another patient it was seen that (thoracal burst fracture) pedicular hook had dislocated. In

associated with them (16, 18), the spinal column should be strengthened and cord should be protected in order to allow patients to rehabilitate and to return the traumatic patients to their daily activities.

Initially, Harrington spinal instrumentation was used in surgery, but due to the fact that this system was unable to prevent rotational forces and to allow immediate rehabilitation, researchers began to develop stronger systems with better protection function (2, 3, 17, 18). Luque, developed spinal instrument and used it in the treatment of fractures (18). It was observed that this system provided the reduction and stabilisation of the fractures, allowed early mobilisation and caused no correction loss, but it was unsatisfactory in canal reconstruction (3). Later, internal fixators were developed and used in the treatment of fractures. But it was noticed that Schanz screws were not in accommodation with pedicular diameter (3, 16). It was reported that the instrument developed by Dubousset (CD) was successfully used in fractures and in the correction of vertebral deformities and that the results were satisfactory (17, 23). Later, Alıcı spinal instrument developed in Turkey (ASI) begun to be used and it became increasingly more preferable in the treatment of vertebral fractures because of the fact that it had the types which could be applied both posteriorly and anteriorly. With this system, not only can distraction be carried out but the canal can also be restored more efficiently. The results are also satisfactory in the short segment fixations (2, 3, 11). In this study it was discovered that while the sagittal index was 20.1° preoperatively, it was 6.4° postoperatively, and 8.7° in the last follow-up. Our total correction loss was 2.4°. In the literature, this value is shown to reduce from the mean 15° to 5.8° (2, 3, 10, 11, 17, 22).

It was observed that while vertebral body height loss was initially 46.4% on average, it was 9.3% postoperatively and 13.3% in the last follow-up. A correction of 33.1% was obtained. The data about this study in the literature are also in confirmation with our study (3, 22). The Cobb angle in the coronal plane was 4.2° preoperatively, whereas it was 1.4° in the last follow-up. The amount of correction in this plain was found to be 2.8°. Although the preoperative canal encroachment was 33% on average in the evaluation of CT scan, it reduced to 8% postoperatively. The average attained in the spinal canal reconstruction was 25%.

Although our cases were rehabilitated in the early period, their correction loss was 2.4°. In the literature these values were determined as 0° (2, 11, 16, 22). The reason for the correction loss in our study was that some of our patients began to do heavy work in the early period, contrary to what was said to them.

In the neurologic assessment, no improvement was seen in the two Frankel A patients. One of these patients had femur and the other one had sternum fractures. Therefore, surgical treatment was applied to femur fracture in order to provide the opportunity for early mobilization. One patient with Frankel B and another patient with Frankel C improved after the treatment. However, they were unable to return to their previous work. 24 of our patients recovered fully after the treatment and returned to their previous work. In the literature, similar findings were reported in the studies carried out by Denis, Aebi and Howard (1, 8, 14).

The results obtained in the pain and the functional capacity assessment were excellent 42.85%, good 39.3%, fair 10.7% and poor 7.15%, and these results are consistent with those in the literature (8, 20). In addition in our study it was seen that in one patient there was serious infection, in one patient a hook dislocated and in another patient pedicular screw was broken. There were no other complications apart from the above.

As a result of what has been mentioned and discussed above, we conclude that Alıcı spinal instrument can be used in a reliable way in the treatment of vertebrae fractures and fracture dislocations and that the patients will be able to return to their daily activities with no problems caused by rapid rehabilitation.

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