

# TREATMENT OF THORACAL AND LUMBAR VERTEBRAE FRACTURES BY ALICI SPINAL SYSTEM

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## ABSTRACT :

16 Patients, with thoracal or lumbar spinal trauma, were operated on at Hospital of Yüzüncü Yıl University Medical School (Van) between Jan 1995 and Feb 1996. All of the patients were male and their mean age was 38.25 (14–75) years. 19 operations were performed to these 16 patients. Levels of the 21 fractured vertebrae varied between 5<sup>th</sup> thoracal and 4<sup>th</sup> lumbar. The average follow-up period was 9(3–16) months. These fractures/dislocations of spinal column were classified as burst fracture (in 12 levels), fracture–dislocation (in 2 segments), compression fracture (in 8 levels) and avulsion of anterior vertebral body (in 1 level). All of the fractures were treated via posterior approach by using "Posterior Instrument of Alici Spinal System" and performing of posterior spinal fusion. Because of late instability, only one patient operated on anteriorly first and then posteriorly. The instrument was removed in one patient due to deep infection at the 6th week after operation. One of the patient died due to MI at the 3rd week postoperatively.

Between Jan 1995 and Feb 1996, sixteen patients were operated on and applied "ALICI POSTERIOR INSTRUMENT", for treating of unstable thoracal and lumbar vertebrae fractures at the Hospital of Yüzüncü Yıl University, which has begun to serve since Sept. 1994.

**Key Words:** Thoraco–lumbar fracture, Alici spinal sistem.

## INTRODUCTION

Thoracolumbar vertebrae fractures are the fractures of vertebrae between T11–L2. Causes of these fractures are usually indirect traumas as falling, traffic accident, work accident, crush and direct traumas as gunshot. This fractures are usually serious traumas, often accompanied with multiple organ injuries (4, 6).

Treatment of thoracolumbar fractures may be planned either surgical or conservative. Different kinds of spinal system are used for stabilization in patient with thoracolumbar fractures and/or fracture–dislocations and surgical treatment is indicated (4, 9).

In our clinic, we perform Alici spinal system for purpose of stabilization in surgery indicated patient with thoracolumbar vertebral traumas.

## MATERIAL and METHOD

All of the patients were male (100%) and the mean age was 38.25 (range: 14–75).

The period between the accident and application time of the patients varied from 1 hour to 9 months (mean: 20.9 days) (Table 1).

Carrying out of the operations was fulfilled, as an average, 3.8 days (6 hours–7 days) after admittance. But 6 of the patients, who had neurological deficit or serious instability, were operated on, as a mean, after 14.6 hours (6–24) of admittance.

Motor vehicle accidents were observed as the most frequent cause of vertebral fractures by a ratio of 50%. Falls (44%) and blunt trauma (6%) were the other reasons of these injuries.

The levels of fractured vertebrae, which especially accumulated on the thoracolumbar junction, varied between thoracal–5 and lumbar–4. Totally these 16 patients had 21 various types of fractured vertebrae and 2 dislocated segments. The levels of dislocations were (T12–L1) in one of the patients and (L4–L5) in the other.

10 (62.5%) of the fractures were single level fractures, 1 (6.25%) two level fracture and dislocation

**Table 1.** Operation times after traumas.

Number of Patients	Duration Between accident and application
10 Patients .....	In 24 Hours
1 Patient .....	24-48 Hours
4 Patients .....	1-3 Weeks
1 Patient .....	9 Months

was observed. The levels and the numbers and percentages of fractured vertebrae and dislocated segments are given at Table 2.

**Table 2.** The levels, numbers and percentages of fractured vertebrae and dislocated segments.

LEVEL	FRACTURES	
	NUMBER	%
T-5	1	4.7
T-6	1	4.7
T-7	1	4.7
T-8	1	4.7
T-9	0	0.0
T-10	0	0.0
T-11	1	4.7
T-12	4	19.3
L-1	7	33.7
L-2	1	4.7
L-3	2	9.4
L-4	2	9.4
<b>TOTAL</b>	<b>21</b>	<b>%100.0</b>

  

DISLOCATIONS		
	NUMBER	%
T12-L1	1	50
L4-L5	1	50
<b>TOTAL</b>	<b>2</b>	<b>%100.0</b>

Fracture types of vertebrae could be classified as compression fracture in 8 (38%), burst type-A in 3 (14%), burst type B in 9 (43%) and avulsion fracture of anterior part of vertebral body in 1 (5%) of the levels (Table 3).

In 8 compression fractures, mean compression ratio was 35.4% (r: 25%-58%). Only in one case, it was

single level and the ratio of compression was 58% but the others were accompanied with at least another vertebral fracture.

The average point of instability of the cases according to "White-Penjabi Scale" was 5.88 (r: 4-8) (Table 4).

"Frankel's Functional Scheme" was applied to classify neurological injuries (25%) (Table 5).

**Table 3.** Types of vertebral fractures.

Type	Number	%
1. Compression	8	%38
2. Burst	12	%57
Type-A	3	%14
Type-B	9	%43
3. Avulsion	1	%5
<b>TOTAL</b>	<b>21</b>	<b>%100</b>

**Table 4.** The average point of the causes according to "White-Penjabi Scale"

Number of Patients	Points
3 .....	4
2 .....	5
7 .....	6
2 .....	7
2 .....	8
<b>16 .....</b>	<b>5.88</b>

**Table 5.** Preoperative Neurological status of patients.

PREOPERATIVE NEUROLOGICAL STATUS		
	Number	%
Frankel-A	2	% 12.5
Frankel-B	1	% 6.25
Frankel-C	0	% 0.0
Frankel-D	1	% 6.25
Frankel-E	12	% 75
<b>Total</b>	<b>16</b>	<b>%100.0</b>

Myelography was performed to 2 patients preoperatively and 4 patients postoperatively.

Instead of vertebral fracture, another single fracture which concerned with extremities was observed in 4 (25%) patients and accompanied fractures were more than one in another 2 (12.5%) patients' group. The list of other fractures which were accompanied with vertebral fractures of 6 (37.5%) patients is given at Table 6.

**Table 6.** List of fractures accompanied with vertebral fractures.

Radius/Ulna	3	%33.33
Coccygis	1	%11.11
Tibia/Fibula	3	%33.33
Talus	1	%11.11
Calcaneus	1	%11.11
Total	9	%99.99

## RESULTS

We applied all of the 16 patients "ALICI POSTERIOR SPINAL INSTRUMENT" with posterior fusion (4). In one patient, who was evaluated as late instability, we first performed anterior release and fusion and then, in the second stage, posterior fusion and instrumentation was applied. In an other patient, who had fracture-dislocation on T12-L1, a compressed site was observed on the posterior part of medulla spinalis by myelography after early postoperative period. We performed partial laminectomy (at the instrumentated site) to this case with a second operation and after the second myelographic control the canal was %100 open without any obstruction. Due to late and deep infection, the instrument was failed in one patient and it was removed in the 3<sup>rd</sup> month after operation.

Mean operation time was 2 hours 55 minutes. Mean bleeding volume was 2.5 units. Mean duration of hospitalization was 21 days.

8 (50%) patients were advised for using orthotic support for three months postoperatively. But noted that it could be worn by only 5 of them in the follow-up period.

Two patients were excluded from the study because of implant failure due to late and deep infection and death.

The average preoperative local kyphosis angle of 14 patients was 21.40 degrees. It was reduced to 11.14

degrees postoperatively (at lying position). The average local kyphosis angle of the patients at last follow-up (mean: 9 months) was 17.85 degrees (at standing X-rays). The average preoperative anterior compression rate of the patients was 48.6%. It was reduced to 16.6% postoperatively (at lying position). At final control (mean: 9 months) standing X-rays, it was found 29.9%.

Totally in 10 patients, spinal canal was compromised at an average of 41% (10%–100%). 3 of them had neurological deficit. In 5 patients compromise of spinal canal was 40% or more at an average of 65% (40%–100%) preoperatively. Postoperatively the compromise of spinal canal was reduced at a mean of 26.8% (0%–40%) and according to myelographic controls, none of the patients had any block in their spinal canals.

One of the 2 Frankel-A patients was remained at Frankel-A, the other was improved to Frankel-C. The other two patients who had neurological deficits as Frankel-B and Frankel-C were improved to Frankel-E after operations. None of the patients was worse than preoperative neurological status postoperatively and in the follow-up period (Table 7).

**Table 7.**

	Preoperative		Postoperative	
Frankel-A	2	% 12.5	1	% 6.25
Frankel-B	1	% 6.25	0	% 0.0
Frankel-C	0	% 0.0	1*	% 6.25
Frankel-D	1	% 6.25"	0	% 0.0
Frankel-E	12	% 75.0	14	% 87.50
Total	16	% 100.0	16	% 100.0

Mean sitting days of the patients was 2.1 days. Standing with help was 3.2 days, walking with crutches 4.7 days and walking without any help was 8.1 days after operation.

## Complications

In 4 (25%) patients, 5 various types of complications occurred (Table 8).

## DISCUSSION

Main causes of vertebral fractures, that especially interest relatively young population, are motor vehicle

**Table 8.** Type of complications.

Type of Complication	Number of Patients	%
Loosening of implant due to late and deep infection and excess loss of correction:	1	6.25
Paralytic Ileus	1	6.25
Excess loss of correction	1	6.25
Excitus due to MI	1	6.25
<b>Total</b>	<b>4</b>	<b>25.00</b>

accidents, industrial accidents, and falls (6, 13, 16). The mean age of our patients was 38.25 (17-75) and most of these vertebral fractures were due to motor vehicle accidents (50%). Falls (44%) and blunt trauma (6%) were among the other reasons.

In columna vertebralis, especially thoracolumbar junction, which is the level of transition from horacal kyphosis to lumbar lordosis, is the most exposed site to the vertebral fractures (5, 6, 7). In our cases, L1 vertebra was the most involved level by a ratio of 33.7%. The 2<sup>nd</sup> was the T12 level with a 19.3% rate.

Rapid rehabilitation, easy nursing care and diminution of complications due to long term bed rest may be mentioned as the advantages of surgical stabilization of unstable vertebral fractures (6). Surgical stabilization is also advised as a prophylactic enterprise, even in stable burst fractures, for preventing neurological instability (1, 2, 3, 8, 9, 10, 11). Surgical stabilization is preferred in serious compression fractures (which is more than 50% in one level or includes more than one vertebrae), and in all of burst fractures.

Instrumentation without fusion is the main cause of degenerative arthritis of facet articulations (12). It is accepted that carrying out a spinal fusion as a rule while performing instrumentation to the vertebral fractures.

Laminectomy increases the instability of fractured site (11, 14). We never perform laminectomy in vertebral fractures except presence of compression to medulla spinalis due to posterior elements. In one patient, who had a compressed site as it is defined in the latter, partial laminectomy was performed for providing decompression and the aim was achieved.

Loss of correction is a serious problem after achieved correction by operation and instrumentation.

Inspite of performing transpedicular spondylosaplasty with instrumentation, 4 degrees loss of correction was reported (15). The average preoperative local kyphosis angle was 21.4 degrees and reduced to 11.14 degrees postoperatively. 10.26 degrees of correction was provided by open reduction and posterior instrumentation. At last control, X-rays local kyphosis angle was measured as an average of 17.85 degrees. Loss of correction of mean local kyphosis angle seems to be 6.71 degrees but it must be noticed that the preoperative and early postoperative X-rays were taken as the patients were at lying position. However the control X-rays of all patients (except one, who was Frankel-A pre and postoperatively) were taken as they were standing without an external support. Average of anterior compression rate was 48.6% preoperatively. It reduced to 16.6% by open reduction and instrumentation but measured 29.9% at last control X-rays as the patients were standing. 3 (75%) of 4 patients with neurological deficit improved an average of 2 Frankel (1-3) grades. As an outcome, neither the number of series (16) nor the mean follow-up period of our cases (9 months) have permitted to make a more detailed interpretation yet. But there is no reason for changing our concept or instrument about the treatment of vertebral fractures.

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