REDUCTION AND STABILIZATION OF THORACOLUMBAR FRACTURES WITH ALICI SYSTEM

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Numerous studies have been conducted on biomechanics, kinesiology, radiology and the principles of healing spinal fractures in the last fifty years (6). Along with the development of computerized axial tomography (CAT), the evaluation of the anatomical changes in the fractured area of the spine and the treatment of the fracture have been facilitated (10).

Only recently have the major advantages of surgery became well accepted and recognized to improve reductions, have more effective stabilization, earlier mobilization and rehabilization and to prevent late deformity (8). Operative management has resulted in a shorter hospital stay and neurologic recvory can be facilitated by surgical stabilization (2, 4).

The aim of the treatment of spinal injuries is the restoration of the normal pain-free, static, dynamic and protective functions of the spine.

Various devices have been developed in the last 30 years for the surgical treatment of spinal problems, dating back to Harrington, Roy-Camille, Steffee, etc. Another well known AO spinal internal fixator was developed by Dick based on ESSF designed by Magerl. The coupling mechanism with Schanz screws and rods is mobile in the sagittal plane and thus allows for restorations of kyphosis and lordosis. The system itself can be maintained in distraction compression or neutralization.

A new device has been developed by Alıcı, in the last 5 years. The system consists of threaded rods, hooks, screws and connecting pieces.

The purpose of this study is to evaluate the results of surgical treatment conducted with the Alıcı Spinal System.

MATERIALS and METHODS

Throughout the years of 1990 to 1992, the system was applied to ca. 30 patients with thoracolumbar fractures at the Department of Orthopaedics and Traumatological Surgery, Buca SSK Hospital, İzmir. Out of these patients, 23 were followed and consist the data of this study.

Pre operative Care:

After admission to the hospital routine examination and radiology, the patients were forwarded to outside institutions to have their CAT. All patients which went through surgery received prophylactic antibiotics before and during the operation. In most instances, antibiotics coverage continued for 3 to 5 days after surgery. All patients were treated with a simple corsete after surgery. Patients were instructed to wear their corsete when ambulating for a period ranging from 6 to 24 weeks after surgery. Peroperatively, no use of X-ray and image intensifier have been made.

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Patient Data:

These 23 patients were followed prospectively for a period of 6 to 24 months. The patients', 9 females and 14 males, mean age is 33, with a range of 22 to 44.

The time from the injury to the time of surgery wes less than 24 hours in 15 cases, 1 to 3 days in 5 cases, and more than 3 days in 3 cases. Six patients had Burst type A fractures, seven patients had Burst B, six patients had anterior compression and four patients flexion distraction injuries. Two of the patients were Frankel Grade A, two were grade C, six were Grade D and thirteen were Grade E (Table I).

Of 13 Burst fractures, one was at the injury level of 17, two at T11, two at T12, four at L1, three at L2 and one at L3 (Table 2). Mean preoperative kyphothic deformity in the patients with Burst fracture is 17.7 (range 7 to 39). According to Frankel scale, these Burst fractures were:

Two in Grade A,
two in Grade C,
five in Grade D and
four in Grade E.

The mean preoperative vertebral height was 1.7 cm (range 1,5 to 2,1).

Mean bony compromise spinal canal measured by A-P diameter on CT scan, was 55 % (range 10 to 95 %) in the patients with Burst fractures. In the group of six patients who sustained anterior compression fractures one was at level T12, two at L1, two at L2 and one at L3.

Mean preoperative kyphotic deformity was 18 (range 14 to 23). Mean preoperative vertebral height was 1.9 cm (range 1.7 to 2.6). All patients were neurologically at Frankel Grade E.

Of the four patients who sustanied flexion distraction injuries, two were at L1, one at L2 and one at L3. Mean operative kyphotic deformity was 19 (range 14 to 22).

All of the patients were neurologically intact on admission, except one who was at Grade D (Table 3).

Some patients had additional injuries such as; three with wrist fractures, one with a bimalleoler ankle fracture, one with a tibia plateau fracture and two with calcaneus fractures.

RESULTS

Of the a.m. cases, sixteen patients were operated with hooks and rods, whereas in the last seven cases a combination of pedicular screws and rods were chosen for the reduction and stabilization of the spinal fracture. The highest level at which the screws were used in this study was T11 and the lowest level L4. The highest hook was at level T4.

The mean operative compromise in the patients with Burt fractures was 20 % (range 0 to 100 %). The mean improvement in canal clearance was 35 % (range 0 to 85 %). The improvement in the kyphotic deformity was measured on lateral radiograms. This was done by erecting perpendiculars from the inferior end plate of the vertebra above and the superior ed plate of the vertebra below the injured levels. Mean improvement in kyphotic deformity in the patients totally was 11.3 (range 0 to 30). All but three of the patients with Burst fractures maintained the same Frankel grade. These three patients improved from Grade D to Grade E. One patient with anterior flexion and distraction type of fracture improved from Frankel Grade D to Grade E.

The mean postoperative kyphotic deformity of patients with flexion distraction injuries was 12.6 (range 9 to 21). All of these patients remained in the same Frankel Grade E.

The mean postoperative kyphoticdeformity of patients with anterior compression fractures was 12.3 (range 8 to 18).

Whe have not seen any breakage in neither screw nor rods and had no hook displacements. One patient postoperatively had atelecthasis which was treated conservatively. Four patients had urinary tract infection and recovered with antibiotherapy. One patient had superficial infection which healed with wound maintenance.

The postoperative evaluation of the patients according to Smiley-Webster scale is as follows:

Rating	Explanation	No. of patients
Excellent	Complete recovery, returned to previous activities	13
Good	Occasional back of leg pain, temporary use of brace, returned to previous activities	5
Fair	Partial recovery, full-time support modified activities	3
Poor	No relief of original complaints	2

DISCUSSION

In general, a surgical approach is chosen in cases where conservative treatment is unlikely to produce satisfactory late results. The main goal of surgery is to decompress the canal and restore it's width and to stabilize and maintain correction.

Posterior techniques are most commonly used for the stabilization of injuries of the thoracic and lumber spine. Since 1960's, Harrington device has been the most popular. However, some authors have pointed out that the Harrington device does not permit achievement of all treatment goals (1, 7). The first pedicle screw plates were developed by Roy-Camille in 1963 (11). In 1982, Dick designed the internal fixator system as a logical further development of Magerl's ESSF (3, 9).

Distraction plays the key role in the reduction of the intracanal fragment in Burst fractures. Although restoration of lordosis is important, kyphosis correction can lead to an increase in encroachment into the canal. Therefore, for the posterior device to be effective, a large distractive force is necessary. Although Harrington does provide distraction, the force is spread over multiple spinal motion units. With the pedicular system, however, it has become possible to have distraction at desired short levels.

Some authors state the possibility of stabilization with Harrington device without opening the canal (5).

The Alıcı system we have used allowed us to maintain stabilization either by using pedicular screws and threaded rods at shorter segments or by using hooks and threaded rods at longer segments. This system provides a multipurpose usage flexibility and is a reliable and cost effective method for thoracolumbar fractures.

Table 1: Frankel Grades

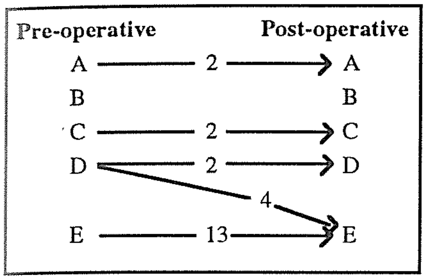

Table 2:
NUMBER OF PATIENTS

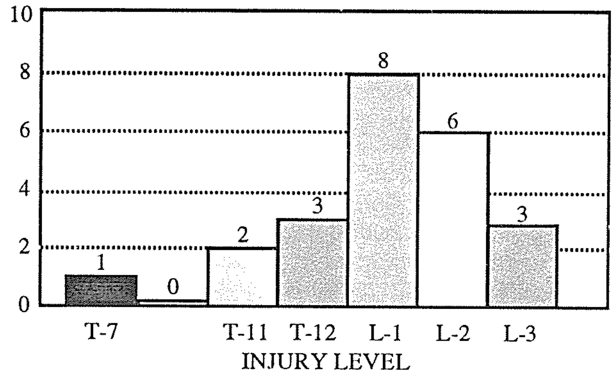

Table 3: General Patient Data

Case No.	Injury Level	Type of injury	Pre-op. Kyphosis Angle	Post-op. Kyphosis Angle	Pre-op. Vertebral Height	Pre-op. Vertebral Height
1	T7	Burst B	16	10	1.7 cm	2.2 cm
2	T11	Burst A	22	20	1.6 cm	2.3 cm
3	T11	Burst A	14	10	1.5 cm	2.0 cm
4	T12	Ant.comp.	17	10	2.0 cm	2.2 cm
5	T12	Burst B	14	6	2.1 cm	2.4 cm
6	T12	Burst B	12	10	1.5 cm	2.0 cm
7	L1	Ant.comp.	17	13	1.7 cm	2.2 cm
8	L1	Burst B	39	30	1.8 cm	2.6 cm
9	L1	Flex.dist.	22	13	2.7 cm	3.5 cm
10	L1	Burst A	16	0	1.7 cm	3.2 cm
11	L1	Flex.dist.	23	18	2.7 cm	3.5 cm
12	L1	Ant.comp.	23	21	2.6 cm	2.7 cm
13	L1	Burst B	13	6	2.1 cm	3.5 cm
14	L1	Burst B	14	10	1.7 cm	2.1 cm
15	L2	Burst A	4	0	1.8 cm	2.2 cm
16	L2	Burst A	16	9	2.0 cm	2.8 cm
17	L2	Flex.dist.	14	8	1.7 cm	2.1 cm
18	L2	Ant.comp.	14	9	2.0 cm	2.3 cm
19	L2	Burst A	20	14	2.1 cm	2.3 cm
20	L2	Ant.comp.	21	13	1.8 cm	2.2 cm
21	L3	Ant.comp.	17	10	1.7 cm	2.3 cm
22	L3	Flex.dist.	19	10	1.8 cm	2.2 cm
23	L3	Burst B	17	11	1.7 cm	2.0 cm

Table 4: Change in Vertebral Height

Vertebral height (mm) / Type of fracture	Pre-operative	Post-operative
Burst	17.9	24.3
Ant.,comp.	19.6	23.1
Flex.Dist.	22.2	28.2

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