ALICI SPINAL INSTRUMENTATION IN THE SURGICAL TREATMENT OF THORACOLUMBAR FRACTURES OF THE SPINE

ALICI E., M.D.* PINAR H., M.D.** AKÇALI Ö., M.D.***

43 patients with thoracolumbar fractures of the spine were treated between 1989 and 1991. The number of fractured vertebrae were 52. The levels of fractures were between T6 and L3. There were 4 burst fractures, 43 compression fractures and 5 fracture-dislocations. 28 patients had preoperative CT scans. The patients were operated within three hours to one month of the injury. Indications for surgery were neurological findings and instability. The surgical treatment consisted of distraction and reduction by means of Alıcı hooks, transpedicular screws and rods. The follow up was average 16.2 months. (Range 6 to 28 months). At follow-up examination 5 patients in Frankel A remained unchanged. 2 Frankel B patients improved to Grade C and 2 remained unchanged. 3 Grade C patients improved to D and 1 remained unchanged. 3 of 5 Grade D patients improved to E and 2 remained unchanged. 25 patients did not have neurological deficits pre and postoperatively. There were three complications: 1 superficial infection, 2 implant failures.

There are proponents for both operative (8, 11) and nonoperative (2, 16) management of thoracolumbar fractures of the spine. Recently, results of operative treatment have demonstrated improved short and long-term function. This has led to a more agressive surgical approach to these fractures (4). Decreased hospitalization time, decreased cost, and an improved rehabilitation of patients treated by such an approach have been documented in the literature (7).

This progressive increase in interest in the surgical management of unstable fractures of the thoracolumbar spine has been prompted by Holdsworth's two-column classification system which pointed out to the potential for clinical instability following thoracolumbar fractures (11). The major advantages of surgery have only recently become well accepted and recognised. In addition to the above-mentioned ones, the other advantages include improved reduction, effective stabilization and the prevention of late deformity (8, 13, 18). Moreover, there has been unconfirmed suggestion that neurologic recovery can be facilitated by surgical stabilization (17).

Harrington instrumentation and similar methods have been the most commonly used fixations for thoracolumbar fractures (4, 8). A major criticism of these posterior surgical stabilization methods is that they necessitate the immobilization and possible fusion of multip levels above and below the injured vertebrae (5, 8). Recently, implant systems with pedicle screws have been used in an attempt to overcome this problem.

This article reports the authors' early experiences with Alıcı Spinal Instrumentation in the surgical treatment of thoracolumbar fractures of the spine.

MATERIALS and METHODS

This retrospective study was conducted on 43 patients with fractures of the thoracic and lumbar spine. The patients were treated with Alıcı Spinal Instrumentation between 1989 and 1991. There were 30 males and 13 females with an average age of 37,4 years (range, 15 to 73 years). The number of fractured vertebrae was 52. There were 4 burst fractures, 43 compression fractures and 5 fracture-dislocations.

The commonest level of bony injury was at the thoracolumbar level. The levels were 3 between T6 and T8, 36 between T9 and L1 and 13 at L2 and L3. 25 patients were without neurological involvement and the rest had varying degrees of neurological deficits according to Frankel's scale (9). On lateral roentgenograms, decrease in vertebral height was less than 30 % in 6, 30-50 % in 12, 51-70 % in 28, and more than 70 % in 6 cases. 28 patients had preoperative CT scans which revealed narrowing of the medullary canal of less than 30 % in 8, 30-50 % in 14, and more than 50 % in 6 cases.

Indications for surgery were: 1. neurological findings, 2. instability (according to Denis) (4). The patients were operated within three hours to one month

Department of Orthopaedics and Traumatology, Dokuz Eylül University, School of Medicine, İzmir - Türkiye

* Professor

** Orthopaedic Surgeon

*** Resident

(average two days) of the injury. The patients underwent distraction and reduction, and posterior stabilization with Alıcı hooks, transpedicular screws and rods. Fusion was not performed. The operating time was one to two hours (average 90 minutes) and average blood transfusion was one unit.

RESULTS

Follow up was 6 to 28 months, average 16.2 months.

During the follow up period, 5 patients with complete paraplegia (Frankel A) remained unchanged. Two Frankel B patients improved to grade C, and another two remained unchanged. Three grade C patients improved to grade D, and one remained unchanged. Three of five grade D patients improved to grade E, and two remained same. 25 patients did not have neurological deficits both preoperatively and postoperatively.

Detailed preoperative and postoperative roentgenographic analysis is given in Table 1.

One patient had early infection which resolved with appropriate antibiotic treatment. There were two implant failures: In one patient one of the transpedicular screws broke and this necessitated revision. After several months one of the rods failed and second revision was done with two stage anterior and posterior fusion. In another patient, again one of the screws failed and revision was done. Both of these cases were fracture-dislocations, in other words very unstable injuries. In retrospect we think that posterior fusion should have been done at the initial operation.

DISCUSSION

The treatment of vertebral fractures, especially the burst fractures has been a matter of debate for many years until Denis introduced the "three column concept". This classification led to the recognition of the importance of distinguishing between major wedge compression injuries and burst fractures. The vital difference between the two is that the middle column is intact in a compression fracture but is disrupted in a burst fracture. It has generally been thought that compression fractures which do not result in greater than a 50 % decrease in vertebral body height do not cause long-term problems. However, this has very little substantiation in the literature. Operative intervention should be considered for the young active patient in whom there has been significant compression and/or angular deformity. One way to deal with this type of fracture is to perform anterior surgery. Our experience demonstrated than the Alıcı system and similar systems consisting of pedicular fixation provide a reliable technique for treating these injuries through a posterior approach. If successful results can be obtained by posterior surgery, than anterior surgery should not be performed due to its potential risks.

Fracture-dislocations involve a complete disruption of all three columns. The injuries are extremely unstable, and are often associated with marked neurological deficits. Surgical fusion with instrumentation provides a reliable means of obtaining stability and preventing progression of deformity (8, 12). Although anterior surgery has been reported for these injuries, we recommend posterior surgery. If the canal is not restored, than an anterior surgery should be added. Our experience showed that, if posterior fusion is not done, implant failure is very likely.

In a burst fracture, anterior and middle column are disrupted. It was Denis who stressed the importance of middle column in vertebral stability (4). We recommend surgical treatment in all burst fractures even in the absence of significant canal compromise because they are unstable and carry the risk of early neurological deficit. The significance of burst fractures is due to the associated canal compromise. When there is marked canal compromise but no neurological deficit, evidence suggests that decompression will prevent late neurological signs due to spinal stenosis (3). It has also been shown that surgical stabilization prevents the development of symptomatic kyphosis which may be a cause of late neurological deficit in some burst fractures (4, 15).

Recently, major problems with the use of Harrinton instrumentation have been identified (10). Pedicle screws and plates have been designed to overcome these problems. Difficulty in screw placement and providing only limited distraction seem to be the disadvantages of plate systems. New instrumentation systems with pedicle screws and rods seem to overcome these difficulties. Alıcı spinal system is one of the instrumentations designed for this purpose. Our preferred technique is the posterior approach to reduce the fragment by indirect reduction maneuvers. The principle of canal reduction is distraction which provides soft tissue ligamentotaxis. This is facilitated by restoration of vertebral alignement and the application of tensile forces to the posterior longitudinal ligament and posterior annulus. We think, the advantage of this type of reduction is that it is safer because the canal is

Table I: Radiographic Results

	Preop		Postop	
	Range	Mean	Range	Mean
Angle of local kyphosis (0)	4-38	15	0-26	5.8
Angle of anterior compression (0)	6-30	14.6	0-16	5.8
Angle of scoliosis (0)	0-12	2	0	0
Antero-posterior dislocation (%)	0-33	12.5	0-8	0.5
Mediolateral dislocation (%)	0-9	0.6	0-1	0.1
Loss of vertebral height (%7	15-80	44.6	0-30	7
Narrowing of the vertebral canal (%)	26-75	58	85-100	91

not entered. In addition, the posterior approach is more familiar to many surgeons. It may also be better tolerated by older patients and those with associated thoracic trauma.

At the present time, all of our patients have a postoperative CT scan performed as soon as possible. This is very important, as in some instances we saw that posterior distraction did not clear the canal sufficiently. If this is the case, then we perform anterior decompression, stabilization with Alıcı anterior spinal system, and fusion. Rupture of the posterior longitudinal ligament and posterior annulus is responsible for the failure to clear the canal by posterior distraction Inability to achieve full restoration of vertebral shape and demonstration of bony deficit on postop X-rays (after posterior surgery) should be alarming and an anterior surgery should be performed.

There is an important point that should be stressed for burst fractures. A make-up test is of utmost importance. We had some patients with large retropulsed fragments in the canal and with minor neurological deficit who developed complete paraplegia as posterior distraction was applied. This means that the posterior longitudinal ligament was not intact. In such a case, we think that the best indication is an immediate posterolateral decompression at the same session. Anterior stabilization and fusion should be added at another session. MRI is the best way to demonstrate the rupture of posterior longitudinal ligament. If this is known preoperatively, then anterior decompression should be done at the first session. We would also like to stress that in cases where the posterior longitudinal ligament is ruptured, the nucleus pulposus herniates through the fragments, and this may prevent union. So, this is another reason to perform anterior surgery in those cases.

For patients with complete paraplegia we perform posterior instrumentation. Postoperatively, these patients undergo a CT scan to evaluate the canal. If canal clearance is not adequate, then anterior decompression and fusion is added in an attempt to permit maximal neurological recovery.

Advocates of anterior approach note that a more adequate decompression can be performed. Some instrumentation system should be used to enhance stabilization. Kaneda (14), Dunn (6), and Kostuik (15) have all developed anterior instrumentation systems. Alıcı anterior instrumentation is also available and has been used when indicated (1).

Our indication for anterior surgery is not wide. Adequate clearance of the canal occurs in most of the cases with posterior distraction. The condition of the posterior longitudinal ligament may be an important factor in deciding between posterior and anterior surgery. Unfortunately, emergency MRI at any time is not possible at the present time. We have been considering to expand our indications for direct decompression, either anterior or posterolateral. Most of the thoracolumbar fractures are still suitable for posterior surgery in our practise.

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