COTREL–DUBOUSSET INSTRUMENTATION IN FRACTURES OF THE THORACAL AND LUMBAR SPINE

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ABSTRACT :

In recent yeârs improved radiological techniques and knowledge on spinal biomechanics have clearly shown that conservative treatment may give poor results in the treatment of the thoracolumbar traumatic injuries.

In this study, we are presenting 51 thoracolumbar spinal fractures treated with CDI and posterior fusion at Wolfgang Goethe University Offenbach City Hospital from January 1995 to January 1996.

CDI while providing more rigid fixation in three planes and early mobilization, has the low pseudoarthrosis and loosening rates. Today most of the systems have similar advantages in treating vertebral fractures. For this reason, the important factor in deciding which system will be used mostly depends on the familarity of the surgeon.

Key Words: *Thoracolumbar vertebral fractures, CDI.*

INTRODUCTION

It has been known that in spinal traumas, the surgery was first performed by Paul of Aeginia in 7th century. The systematic surgical procedures of open reduction and fusion was begun in 1940 by Albee. The importance of stability was first pointed out by E.A. Nicol in 1949 (26).

In 1958, Harrington was the first surgeon who used the instrumentation in vertebral fractures (8).

Fractures and fracture–dislocations of the thoracolumbar spine are important injuries as they may lead to neurological complications instability. For this reason, restoration of the vertebral column is required. Nowadays, a number of different instrumentation systems are being used in the surgical treatment of the thoracolumbar vertebral fractures.

The objectives of spinal trauma surgery are to obtain anatomical reduction, restoring the spinal canal, achieving early mobilization and preventing deformities (18).

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MATERIAL AND METHODS

In this study, we are presenting 51 thoracolumbar spinal fractures treated with CDI and posterior fusion at Wolfgang Goethe University Offenbach City Hospital from January 1995 to January 1996. The average follow up period was 12 months.

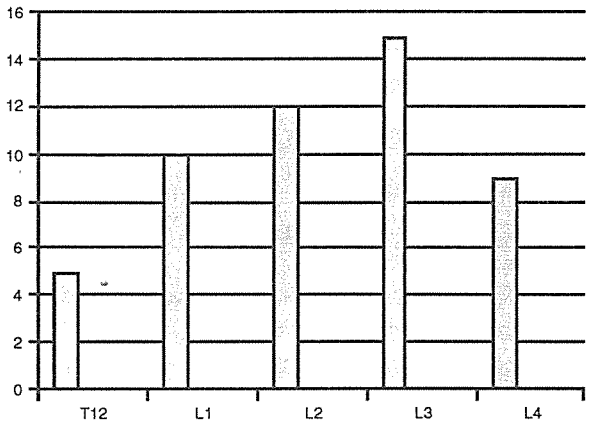
11 of the patients were female (21.6%) and 40 were male (79.4%). The average age of the patients was 33.6 (Range 13–64).

The radiological evaluation was performed according to Denis's thoracolumbar vertebra fracture classification (5). 32 patients had burst fractures (15 type A, 4 type B, 4 type C, 6 type D and 3 type E); 13 patients had compression fractures and 6 patients had fracture–dislocations (3 flexion–distraction and 3 flexion–rotation type) (Table 1).

Preoperative neurological evaluation was performed according to Frankel's classification for spinal cord injuries (12). It was determined to be Frankel A in one patient, Frankel B in one patient, Frankel C in one patient and Frankel D in six patients. The rest of the patients were Frankel E.

Upper, lower instrumentation and fusion level was to upper intact and lower intact vertebra.

Table 1. Number of fractures according to the involved vertebrae level.



RESULTS

Early postoperative results were determined both clinically and radiologically.

Average preoperative compression was 61.2% (42–79%), sagittal index (SI) was 26.2°±5.2° and thoracolumbar junction angle was 19.3°±11.2°.

Postoperatively, average SI was 12.3° (Range 0–24). Average thoracolumbar junction angle was 8.1°±7.9°.

At the postoperative twelfth month there was 3.9°±2.7° correction loss in sagittal index. There was no implant failure in any of the patients during the follow up period.

In three patients (5.8%) superficial infection was detected and all of them were treated with proper antibiotherapy without implant removal.

During the follow up period one patient with complete paraplegia remained unchanged. One Frankel B patient improved to Frankel C and one Frankel C patient improved to Frankel D. 4 of the Frankel D patients improved to Frankel E while 2 remained unchanged.

DISCUSSION

Management of unstable thoracolumbar spinal fractures includes adequate reduction in both the AP and saggital planes, decompression of the spinal canal (11).

Thoracolumbar region, especially the lumbar part of it is the most mobile segment of the vertebral column after the cervical region. The maintainance of this mobility is important for normal walking and sitting. In paraplegic patients, rehabilitation potential is strongly correlated with the mobility of lumbar region (24). The lumbar region had a lordosis and this lordosis maintained the gravity center at the ideal point. If it had lost after surgery the forces on the vertebra increased and degenerative changes occured more rapidly (31).

For a long time, the Harrington rods were accepted as a standart way to treat vertebral fractures (8). Because of the inadequacy in maintaining lumbar lordosis Harrington technique wasn't well suited to the fractures of this region. It also was not resistant to rotational or axial forces therefore could not prevent spinal deformity in the long follow up period (11, 17, 19, 20, 25, 29). 10–15% postoperative loosening and pseudoarthrosis rates were reported (8).

Luque's segmental spinal instrumentation provides better stabilization but the early mobilization of the patient causes loss of reduction (22, 30). Neurological complications such as cord contusion, root injuries and dural ruptures were seen in rates as high as 10–20% (3).

Pedicle screws and plates have been designed to overcome these problems. The pedicle connects the corpus and the posterior elements of the vertebra. It is the strongest element of vertebra. Using the pedicle, one can move the vertebra at three planes. Especially in lumbar region, the instrumentation had to be the transpedicular type (9). Difficulty in screw placement and providing only limited distraction seem to be the disadvantages of plate systems. New instrumentation with pedicle screws and rods seem to overcome these difficulties.

The ideal implant to be used in thoracolumbar spine surgery had to cover the following criteria:

- It must achieve three dimensional fixation
- It must be a simple system
- It must protect the physological curves
- It must allow early mobilization and rehabilitation after surgery.

Cotrel–Dubousset system was developed between 1978–1983. Biomechanical testing of the system has shown that its resistance to ventral flexion, posterior flexion, lateral bending and rotational forces was superior to other systems. Resistance to compression was equal to the Luque system (27).

CDI, using more hook attachment sites and pedicular screws had a lower pseudoarthrosis and loosening rate (2, 6, 7, 10, 13, 14, 21). In spine surgery, the most important factor for revision surgery was the implant failure and pseudoarthrosis. These led to correction loss. In Harrington or sublaminar wiring systems the correction loss has been reported up to 15% (23). In patients who had been operated with CDI there was only 1% of hook or screw pull–out (4, 16). Suk et al, reported 5 screw pull–out in 82 patients who had been operated with CDI (28).

Alıcı spinal system had also some advantages than the other systems like CDI had. It maintained the stabilization either by using pedicular screws and threaded rods at shorter segments or by using hooks with rods at longer segments (1). Gökçe et al reported 6.4% screw failure, 3.8% screw pull–out in 78 patients which had been used Alıcı spinal system (15).

We believe that CDI is a good option in the treatment of spinal fractures especially in the thoracolumbar region. It achieves satisfactory reduction and provides early mobilization without an external support. Although there are many systems for posterior fixation of the spinal fractures and all of them have similar properties, the most important factor in determining which system is adequate is the familarity of the surgeon to the system.

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