THE HARRINGTON DISTRACTION RODS AND INTERSPINOUS WIRING IN THE SURGICAL TREATMENT OF UNSTABLE THORACOLUMBAR FRACTURES OF THE SPINE

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Between 1986-1993, we have treated 51 patients with fractures of the thoracolumbar spine at the Departement of Orthopaedics and Traumatology in Ege University with a combination of Harrington distraction rods and interspinous wiring.

We have combined the Harrington distraction rods and interspinous wiring in unstable fractures according to Dennis's "Three column theory" in order to prevent the over-distraction forces of the rods and to direct the distractive forces through the hooks to the middle and anterior columns. By doing this, we achieved a better reduction of the fragments, and a more stable internal fixation with balanced distraction.

Key Words: *Fractures of Vertebrae, Harrington, Thoracolumbar Spine.*

INTRODUCTION

Fractures of the thoracolumbar spine are injuries that occur as a result of high energy trauma (1). Surgical treatment of fractures of the thoracolumbar spine is becoming more popular (1, 3, 8, 11, 15, 17, 18, 19). The Rod-hook system developed by Paul Harrington which was named after himself in 1947, became more and more popular worlwide and its the most prefered implant in the surgical treatment of fractures of the spine.

The distraction-fixation systems used in the treatment of fractures of the spine are more effective when the anterior longitudinal ligament is intact and reduces the anterior fractures fragments by the distraction forces applied through the posterior vertebral elements. In burst fractures, where all the three columns described by Dennis are disturbed, the ligamentous structures are also injured. In such fractures, distraction forces alone are insufficent to obtain stability and may sometimes cause more damage to the neural structures by inbalanced distraction (8). Posterior compressive fixation applied together with distraction increases the axial stability and the rotational stability. Thus vertebral restoration would be better and complications should become decreased accordingly.

We performed this technique in 51 patients with unstable fractures of the thoracolumbar spine and the results are discussed in this paper.

MATERIAL AND METHOD

At the Department of Orthopaedics and Traumatology in Ege University, we treated 51 patients with unstable fractures of the thoracolumbar spine, with Harrington distraction rods and interspious wiring of the fracture fragments. Thirtysix of the patients were male and fifteen were female with an avarage of 32 years (minimum 12 - maximum 66). Motor vehicle accidents were the most common etiologic factor. The patients were radiologically examined with standard X-rays and computerized tomography when first admitted to the emergency unit. The pre-operative kyphosis index, the vertebral height and the compromise of the canal have been noted. The neurologic status of the patients were evaluated according to the Frankel's criteria (Table 3).

OPERATIVE TECHNIQUES

The patients were operated in the prone position through a longitudinal midline incision and we prepared the wire holes in the spinous processes of the vertebras, one cephalad and one caudad, to the fractured vertebra. We used a 0.8 mm cerclage wire and and compressed the vertabrae from the posterior. We placed the laminar hooks two vertebra above and two vertebra below the fractured vertebra and used two Harrington distraction rods without breaking the cerglage wires. We did not perform posterior fusion. Patients without any neurologic problems were mobilized at the third postoperative week with a thoracolumbar orthosis. Patients with neurologic compromise were rehabilitated and mobilized with a walking orthoses and walking crutches.

RESULTS

The average follow up was 33 months. The most common site of injury was L1 (Table 1), vertebrae and the most common type of fracture was the burst frac-

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tures including the middle column type of fracture was the burst fractures including the middle column (Table 2).

Table 1. Site of Injury

Site of injury	Incidence
T5	5
T8	2
T12	14
L1	20
L2	10

Table 2. Type of Fracture

Fracture Type	Incidence
Burst fracture	21
Compression Fract.	5
Burst + Dislocatio.	5
Comp. + Dislocatio.	17
Pure Dislocation	3

The neurologic status was evaluated according to Frankel's criteria (Table 3) and the follow up clinic results were evaluated according to the Smiley-Webster criteria (12). After the final evaluation %19.6 of the patients were catagorized as excellent and good, %19.6 as fair and %60.7 as bad (Table 4).

Table 3. Frankel's Scala

Scala	Pre-op.	Follow-up
A	40	31
B	2	7
C	1	3
D	1	1
E	7	9

Table 4. Smiley-Webster Criteria

Scala	Pre-op.	Follow-up
Excellent and Good	%13.7	%19.6
Fair	-	%19.6
Bad	%86.3	%60.7

DISCUSSION

If the patient is admitted to the hospital within the early hours of injury, it's known that canal restoration and decompression can be obtained by posterior distraction (9, 10, 19). For the restoration of the vertebral height, the anterior lonitudinal ligament should be intact (4). In burst fractures when the ALL is ruptured together with the PLL, posterior distraction results in the flexion of the anterior column and the restoration of the canal cannot be achived (4, 8). In such instable fractures rod-sleeves (6) or sublaminar wiring have been used together with the Harrington rods, but rod-sleeves are not suitable for fractures where the posterior elements are broken as well and neurologic damage is more common after subliminar wiring. Interspinous wiring on the other hand, does not cause any intramedullary damage or neurologic complication when applied but increases the axial and rotational stability.

This method also helps in the restoration of the canal and vertebral body height by the moment it creates against the distactive forces of the rods, and also prevents overdistraction; thus preventing further neurologic damage. Floman et al (8) also used posterior spinous wiring in 36 patients but the preferred to put the wire around the spinous processes, where, on the other hand, we preffer to pass the 0.6 mm wires through holes made in the spinous process. This did not result in any significant decrease in the strength of the spine.

Although there is great amount of publication about the surgical treatment of fractures of the thoracolumbar vertebra with Harrington rods (5, 7, 9, 13) there still is disagreement about the hook placement and bony fusion (2, 5, 16). In recent years, there is a great tendency towards short segment fusion after the increase in knowledge about vertebral stability (13, 16). On the other hand, Gardner et al did not perform any bony fusion in the 33 patients that they treated (9). It has been proved biomechanical experiments that the posterior ligaments and soft tissues are also very important in vertebral sability (14).

The capsula around the facet joints would prevent over distraction and add to vertebral stability. Keeping this factor in mind, we tried to protect the posterior soft tissues while placing the rods and avoided excising more than necessary. On the other hand, we would have to excise all the posterior capsular elements to perform bony fusion and this would result in further instability.

Gardner et al have obtained %85 percent good results on their patients whom they have trated without

bony fusion; although the kyphosis angle was 12 degrees and vertebral height loss was 4.9 (8). In our clinic follow up the average kyphosis angle was 11 degrees and the vertebral body height decrease was %17. In patients without neurologic compromise or in patients with incomplete neurologic compromise, we have achived %90 good results.

In conclusion, posterior interspinous wiring when used together with the Harrington rods increases stability and prevents overdistraction and kyphosis in the surgical treatment of thoracolumbar fractures of the spine.

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