

TSRH INSTRUMENTATION IN THE TREATMENT OF UNSTABLE THORACOLUMBAR FRACTURES

M. TÜZÜNER * İ. T. BENLİ * M. KIŞ * S. AKALIN * M. ÇITAK *

ABSTRACT:

The results of 40 patients with unstable thoracolumbar vertebral fractures instrumented surgically by Texas Scottish Rite Hospital (TSRH) System in the 1st Department of Orthopaedics and Traumatology, Ankara Social Security Hospital were evaluated. Sixteen (40 %) of the patients were female and 24 (60 %) were male. Mean follow up was 13.2 (6-30) months. Mean preoperative sagittal index was 14.2° and was corrected 62.8 % postoperatively. In the 76.4 % of the patients TLJ angles came into physiologic limits. Spinal canal compromise regressed 66.7 % in the postoperative period. In the light of these findings, we concluded that TSRH Instrumentation was an effective way of treating thoracolumbar unstable vertebral fractures.

INTRODUCTION

The most important causes of vertebral instability are traumatic pathologies. According to Denis' three column theory, at least two column must be affected for an instable fracture (10). Instability is a great risk for deterioration of neurologic status and improvement of deformities. Treatment of the vertebral instability is surgical correction and stabilization (6).

For over 25 years Harrington rods and hooks are used for surgical correction and stabilization (3, 6). CD system, which became popular after mid 1980s, brought new perspectives to surgical correction and stabilization of the unstable fractures with its rectangular rigid frame and possibility of segmental spinal fixation (6, 9, 17).

Aim of the surgical stabilization is reducing the fracture, gaining the vertebral stability and neural canal volume (22).

TSRH system is a modification of CD system which applies similar principles as CD system. Main advantages of TSRH system are more rigid construction with cross-link plates and technical ease of application (3, 21).

In this study we evaluated the 40 patients who had thoracolumbar unstable vertebral fractures that was treated with TSRH system.

MATERIAL AND METHOD

40 patients with thoracolumbar unstable vertebral fracture were operated in the Social Security Hospital 1st Orthopaedics and Traumatology Clinic between December 1991 and December 1993. 16 (40 %) of

them were female and 24 (60 %) were male. Youngest patient was 15 and oldest patient was 63 years old, average age was 34.3. 3 patients (7.5 %) had two level and 37 (92.5 %) patients had one level lesion. Patients with two level lesions were one T6-T7 dislocation, T12 burst fracture, one T8 compression, T11 burst fracture and one L2 compression and L4 burst fracture. When all 43 lesions were taken into consideration there were 33 (76.7 %) burst fractures, 7 (16.3 %) compression fractures, and 3 (7.0 %) dislocations. One dislocation was between T4-T5, one was between T6-T7, and one was between T8-T9. Distribution of the fracture levels are shown in the table.

All patients were evaluated physically and neurologically on their admittance. In the neurological examination, motor and sensory examination, bulbocavernosus reflex and sphincter control examination were performed. If a neurological deficit was observed the level was established and classified according to Frankel's classification (14). Plain radiography and CT was performed. Anterior compression percentage was established according to the criteria of Atlas et al (5). The angle between lines drawn from the lower end plate of upper vertebra and upper end plate of lower vertebra gave us the "local kyphosis angle" (Sagittal \neq LKA Index - SI) (13).

All the patient had CT evaluation preoperatively. The types of the fracture was established and classified according to Dennis (11). Spinal canal compromise was also evaluated with CT and percentage of compromise was recorded (5).

Except 3 patients taken from rehabilitation clinics for the aim of stabilization all the patients were considered emergency and were operated in 8 hours after

* 1st Departments of Orthopaedics and Traumatology, Ankara Social Security Hospital, Ankara, TÜRKİYE

they admitted to hospital. All the patients with neurologic deficit had decompressive laminectomy.

In the postoperative period on the first day patients were rolled in the bed. On the second day they set down and on the third day they were encouraged to walk. Their controls were performed on the first, third, sixth, twelfth postoperative month. After the first year they were called for control yearly.

RESULTS

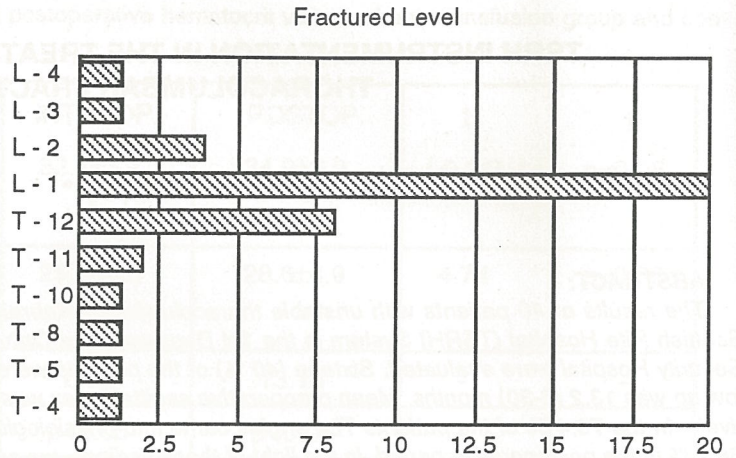
In the radiologic examination mean sagittal index was 14.2° (0°-25°) and in the last controls mean correction was % 62.8 (70-100 %). Hook dislodgement was observed in two patients 2 (5 %) on the third and fifth postoperative months.

One of them was revised with transpedicular screw placed in the fractured and above vertebra. The other patient was revised with extantion of the instrumentation on level above by hooks and screw.

Preoperative and postoperative CTs showed that spinal canal decompression was 66.7 %. In the last x-ray control except 2 (5 %) patients, all the patients had evidence of consolidation or fusion. These 2 patients were on their 6th and 12th postoperative months. They had no problem to require revision.

Table 1. Distrubation of the patients according to fractured levels.

Fractured Level	TSRH
T - 4	1
T - 5	1
T - 8	1
T - 10	1
T - 11	2
T - 12	8
L - 1	20
L - 2	4
L - 3	1
L - 4	1



Neurologic status of the patients were graded according to the Frankel score it's shown in Table-2. Numbers of the immobilized segments changed between 2-7 with an average of 3.8.

Two (5 %) patients had deep infection and four (10 %) had superficial infection. Two patients with deep infection were paraplegic patients taken from rehabilitation clinic. Long term antibiotherapy and debridment resulted with healing and removal of the construct was not needed. The other 4 patients with superficial infection healed with antibiotherapy. During the follow-up we didn't have any hook or screw loosening, screw or rod breakage and failure of construct. Except the 2 (5 %) patients with hook pull out there was no loss of correction that is statistically significant.

DISCUSSION

Today's surgical treatment of thoracolumbar fractures accomplished a very good stability to the fractured spine (6).

The area of internal fixation of thoracolumbar unstabil fractures first began in 1958 when dual Harrington rods were used. Main problems with this instrumentation were flat back syndrom, low back pain, inadequacy of reduction and need for a cast or brace for at least 3 - 6 months. After this, contoured Harrington rods with sublaminar wiring was a great step in fracture treatments by posterior approach (6, 15, 19, 20, 22). With this instrumentation distraction and wires helped the instrumentation to be segmentally stabil. Adequate reduction was also possible. By counturing the rods the kyphosis or lordosis as needed, flat back syndrome and low back pain was not as

Table 5. Pre and postoperative neurologic status of the patients according to Frankel Classification

TSRH

A (5)	—————	A (4)
B (4)	—————	B (1)
C (4)	—————	C (4)
D (2)	—————	D (4)
E (25)	—————	E (27)

usually as before. But the mechanical weakness of Harrington rods neurological risks of sublaminar wiring and need of a brace in almost all cases were the disadvantages of the system (6, 21).

In mid 80's a new idea of instrumentation of spine was developed with Cotrel-Duboussed (CD) system (9). System had contoured rods to align with lordosis or kyphosis, various hooks or pedicular screws for firm attachment and DDTs for a more rigid construct. The system was so stable that a brace was not needed for most of the patients in the postoperative period (7).

On the other hand pedicle screw fixation is an efficient way of manipulating spine because it crosses all three columns of the spine (1-3, 18). Survivorship of a pedicle screw is reported to be 80 % after 10 year follow up (18). This is as good as a total hip or knee prosthesis survivorship.

Especially combination of pedicle screws with hooks on the same rod was attractive for the surgeons dealing with unstable vertebral fractures (7, 13).

Use of such systems causes an early rehabilitation in neurologically compromised patients, and reduce the morbidity in neurologically intact patients (6).

TSRH system also uses the principles of CD system. Main advantages of this system are ease of application, ease of removal, rigidity of cross-links and especially for fracture, variable angled pedicle screws. This variable angled attachment causes a great sim-

ilarity in contouring the rod or positioning the screw. Ease of the technique reduces the operative time (3, 21).

In our series there are 2 hook dislodgements needed a revision, both of the hooks were transvers process hooks. Because of this in our constructs were not transvers process hooks any more we prefer mainly screws and off-set hooks if possible. When using screws is not possible our second choice is pedicular or laminar hooks.

Grady Mc Bride reported a 63.2 % of correction in the sagittal index at the fractured level with CD rods (17). Benli et al. established that the mean sagittal index angle was corrected by 67.1 ± 23.7 % and the thoracolumbar junction angle was brought within physiological limits in 65 % of the cases with thoracolumbar fractures treated with Cotrel - Duboussed Instrumentation (7). Altun et al. reported 77.7 % of correction in the SI with TSRH system (3). We had 62.8 % of correction in sagittal index with the same system.

Benli et al. reported a 38.9 % correction was achieved in spinal canal compromise (7). Altun et al. reported 53.7 % decompression (3). Our spinal canal decompression was 66.7 %. According to us severe canal compromise needs anterior decompression. Especially when posterior longitudinal ligament is torn, posterior ligamentotaxis decompression is insufficient.

We didn't use any cast or brace in the postoperative period. We think with this kind of rigid fixation systems postoperative brace is not needed especially if the construct is rigid or fusion of at least 3 mobile segments is performed.

We didn't see any implant insufficiency like breaking of the rod or screw, bending of screw and loosening of the connections.

Our follow-up period is short (Average 13.2 months) but by looking at the results the system seems to be a good alternative in treating the vertebral fractures.

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