THE USE OF HARRINGTON DISTRACTION RODS IN THORACOLUMBAR VERTEBRA FRACTURES

Z. Korkusuz, S. Özbarlas, Y. Ateş

Fractures of the thoracic vertebra has caused problems in treatment for years and until recently they have been treated conservatively. In 1958, after the introduction of Harrington rods into vertebral surgery orthopaedists were able to treat fractures with operative techniques. This has been the most often used method in the treatment of unstable vertebral fractures and those with neurologic compromise.

In this report we present the results of 99 patients 48 of whom were treated with Harrington Distraction Rods between June 1985 and June 1989. 14 of our patients were female and 34 male, the average age of operation was 46 (Range 17-75), with a mean follow up of 2,5 years.

Key Words : Thoracolumbar Spine, Fractures, Harrington Instrumentation.

Surgical treatment of Vertebral fractures brought up the concept of vertebral stability. The first classification was developed by Nicholl (14). After him, Holsworth classified fractures according to the forces they were affected (9). After the development of Computerised Tomography the Three-column concept of Denis was developed and is widely used today (5)., According to this classification: in cases where the anterior column cannot withstand pressures compression fractures develop, when both the anterior and middle column is affected the Burst Fracture, and when the anterior column is intact but the middle and posterior columns arc affected by distractive forces Scat-Belt fractures develop. When all the columns arc affected by forces arising from different planes also dislocation of the fracture occurs. Ferguson and Allan have classified fractures into seven categories according to mechanistic forces but we did not use that classification (7).

MATERIALS AND METHODS

99 patients were admitted into Ankara University Medical Faculty, Department of Orthopaedic Surgery and Traumatology with the diagnosis of a vertebral fracture. Of these 48 were treated operativcly.

Etiologies of fractures in operated patients arc : 26 traffic accident, 17 fall from a height, 4 crush injuries! and 1 job related accident. Interval between the accident and surgery was in the first 12 hours in 6 patients, 12 to 24 hours in 16 patients, in 2 to 7 days in 18 patients, the second week in 6 patients, and 2 patients at a later date.

Neurologic symptoms were evaluated according to Frankel's criteria (8) as: 17 patients Frankel Grade A, 9 patients Frankel Grade B, 7 patients C, 3 patients D and 12 patients E (Table 1).

Table 1: Frankel's classification of neurologic status.

Stage A: Total motor and sensory loss
Stage B: No sensory loss, motor loss evident
Stage C: Motor innervation exists but not functionally
Stage D: Full motor action
Stage E: Normal motor and sensory function.

Fracture types consisted of 15 compression fractures, 24 Burst type fractures, 1 Seat-Belt and 8 fracture dislocations (Table 2).

Compression fracture	15 patients
Burst fracture	24 patients
Seat-Belt injury	1 patient
Fracture dislocation	8 patients

Table 2: Classification of fractures according to patients.

Operative treatment consisted of Harrington Distraction Rods with spinal fusion in all of the patients. In 6 patients sublaminar wiring and in 5 patients laminectomy was additionally performed.

The duration of hospitalisation was 3 weeks on average. After this period patients were discharged with external supports. The patients were admitted to a rehabilitation clinic and their first follow up examination was made 3 months after discharge. The average follow up time was of 2.5 years (range 6 months to 4,5 years).

Z. Korkusuz, S. Ozbarlas, Y. Atcş Ankara University, Medical faculty, İbni Sina Hospital, Department of Orthopaedic Surgery and Traumatology, Ankara, TURKEY

RESULTS

Early Post-operative complications were; one patient had deep venous trombosis, 5 patients had urinary tract infections, 3 patients had decubilis ulcers and one patient died because of pulmonary embolism.

The neurologic status at early follow up examination was: 17 patients who had complete neurologic deficiency (Frankel Grade A) no early recovery was seen, of the Grade B cases 5 remained in B but 2 recovered to become D while the other 5 remained in C, of the 3 grade D cases no early improvement was seen, of the Grade E patients no detoriation was seen.

At the last follow up examination the neurologic recovery continued and of the 17 Grade A patients 5 improved to B, of the 9 initially B cases 6 improved to grade C and 3 to grade D, of the 7 grade C patients 4 remained in C while 2 improved to grade D and 1 to E, of the 3 grade D cases one improved to E. No detoriation of neurologic status was seen in any of the cases.

1 Harrington Rod breakage, and one hook loosening was seen at the follow up, but since good fusion had established no neurologic deterioration was seen in these cases.

DISCUSSION

When a decision has to be made regarding the form of treatment in vertebral fractures every patient must be individually evaluated according to the neurologic deficiency, status of the spinal cord and slabilitiy of the spine. The concept of stability has been a controversial subject for many years. Nowadays the most widely accepted methods arc the evaluation criteria of White and Panjabi and the three column theory of Denis (3,5). In addition to the bony pathologies status of the ligaments are also important. Since we do not have sufficient technical expertise no quantitative criteria has yet been developed. The development in magnetic resonance imaging will hopefully correspond to our needs.

In grossly translated fractures a reliable healing of the spinal column is not always anticipated. Also there is extremely poor or absent apposition of fracture fragments. This kind of fracture is the only one with absolute indication of surgical internal fixation of the spine (2,4).

Experimental data have shown that compression fractures causing less than 50 % of height loss can return to normal contour. It was experimentally shown that restoration of the normal contour can be effectively established using Harrington distraction rods with the decrease in probable insult to the spinal canal (10,11). Rods must be of sufficient length and must have the same contour as the vertebrae for good restoration. When effectively used, spinal deformity can be corrected, spinal canal protected and good stability achieved (11).

Problems are caused by combined lesions of the anterior and posterior elements, since distraction rods must have intact anterior elements so that overdistraction can be prevented. This anterior elements have been shown to be the anterior longitudinal ligament (1). Sublaminar or segmental wiring of the spinous processes has been developed due to the ovcrdistraction problem but since the spinous processes are rather weak structures and problems of application arise they arc not widely used (13). Also Luque instrumentation with segmental wiring poses difficulty when subject to vertical compression forces (12).

In our cases we decided on operative treatment, mostly according to the neurologic status of the patient. Most of the patients that had undergone operative treatment had a neurologic compromise. Besides these patients, surgical treatment was the preferred method in patients that had undergone laminectomy with no improvement and those that had the criteria of instability. Surgical treatment consisted of double Harrington Distraction rods with fusion by the addition of sublaminar wiring in some cases and laminectomy in Frankcl Grade A to inspect the status of the Spinal Cord. Generally short rod and short fusion was the accepted technique. Long rods with sublaminar wires were applied only to patients that had undergone excessive laminectomy and in those which rotatory instability was not easily controlled. When short rods are applied no rod sleeves arc needed and rods can be bent according to sagittal curves when deemed necessary. There is an increase in the proponents of anterior decompression and fusion (6). Although we perform many anterior fusion operations this method is not used for vertebral fractures in our clinic.

As a result we conclude that patients who have neurologic compromise and/or the criteria of vertebral instability, surgical intervention is the treatment of choice. In our series we have seen that double Harrington Rods with the principle of short rod and short fusion with the addition of sublaminar wiring is an effective method of treatment. In order to see the status of the spinal cord prognostically laminectomy can also be employed. With its advantages of rotational stability and no requirement of external support fixatuer interne is also currently performed in our clinic.

REFERENCES

1 . Anden U., Lake A, Nordwall A.: The role of the anterior longitudinal ligament in Harrington rod fixation of unstable thoracolumbar spinal fractures. Spine 5: 23, 1980.

2 . Bedbrook G.: Treatment of Thoracolumbar dislocation and fractures with paraplegia. Clin. Orthop. Rel. Res. 112: 27, 1975.

3 . Bucholz R.W., Gill K.: Classification of injuries to the Thoracolumbar Spine. Orlhop. Clin. North Am. 17: 63-73, 1986.

4 . Davies W.E., Morris J.H., Hill V.: An analysis of conservative (nonsurgical) management of thoracolumbar fractures and fracture-dislocations with neurological damage. J.Bone Joint Surg. 62A: 1324,1980.

5 . Denis F.: Three column Spine concept in Acute Spinal Trauma. Clin.Orthop.Rcl.Rcs. 189: 65-76, 1984.

6 . Dunn H.K.: Anterior Stabilisation of Thoracolumbar injuries. Clin. Orthop.Rel.Res.189:116-124, 1984.

7 . Ferguson L.R., Allen B.L.: A mechanistic classification of Thoracolumbar Spine fractures. Clin.Orthop.Rel.Res.189:77-88, 1984.

8 . Frankcl H.L., Hancock D.O., Hysop G. et al: The value of postural reduction in the initial management of closed injuries of the spine with paraplegia and tetraplegia, Paraplegia 7: 179-192,1969.

9 . Holsworth F.W.: Fractures, dislocations and fracture-dislocations of the spine. J.Bone Joint Surg. 52A: 1534,1970.

10 . Jacops R.R., Casey M.P.: Surgical management of Thoracolumbar Spine Injuries. Clin. Orthop. Rel.Res. 189:22-35, 1984. 11 . Jacops R.R., Nordwall A., Nachemson A.: Reduction, stability and strcnght provided by internal fixation systems for thoracolumbar spinal injuries. Clin.Orthop.Rel.Res.171:300,1982.

12. Lugue E.R., Cassis N., Ramirez-Wiella G.: Segmental Spinal instrumentation i the treatment of fractures of the thoracolumbar spine. Spine 7: 312,1982.

13. Murphy M.J., Southwick W.O., Ogdcn J.A.: Treatment of the unstable thoracolumbar spine with combination Harrington distraction and compression rods. Orthop. Trans. 6:9,1982.

14 . Nicoll E.A.: Fractures of the dorsolumbar spine. J.Bone Joint Surg. 31B: 376,1949.