

HARRI-LUQUE METHOD IN SURGICAL TREATMENT OF THE THORACOLUMBAR SPINE FRACTURES

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ABSTRACT :

26 patients who had thoracolumbar spine fractures were treated with Harrington rods and segmental sublaminar wires between 1992-1995, in department of orthopaedics and traumatology, in Haydarpaşa Numune Hospital, Istanbul. Because of the neurologic findings, anterior decompression and grafting in addition to the posterior instrumentation were done in two patients.

Average follow-up time was 14 months (7-25). There were 23 fractures in 20 patients, who had enough follow-up. 16 of them were burst fractures, 6 of them were fracture-dislocations, and one of them was compression fracture.

Preoperatively average local kyphosis angle was 23.3 degrees, postoperatively it was 10.7 degrees, in the last follow-up it was 17.8 degrees.

Preoperatively average anterior vertebral body compression was 44.7%, postoperatively it was 24.7%, in the last follow-up it was 30.6%.

Postoperatively average time that patients used TLSO corset was 4 months (1 week-1 year).

Patients treated with this method had following complications; one patient had superficial infection, one rod was broken in another one, lower hooks were dislodged from lamina in two patients. In the last follow-up, average loss of correction was 7.1 degrees.

In the last 8 patients, we used DTT for making the system rectangular for providing the rotational stability.

Complications related with Harrington system were discussed in the literature. Patients who had poor economic status, this method could be used effectively if fusion was done, TLSO corset was used and follow-up was made routinely.

Key words: Harri-Luque, segmental spinal instrumentation, surgical treatment, thoracolumbar spine fractures.

INTRODUCTION

Segmental sublaminar spinal instrumentation system "SSI" developed by Eduardo R. Luque from Mexico (30, 31). SSI produces rigid internal fixation and alignment of the spine by each vertebra in a three-point system (sagittal plane), with rods and wire at the laminar level, using the disc as the third point of fixation (31). It is stated that; this method mobilizes the patient without any external support in the early

postoperative period (30, 31, 40). Some authors who declare that the Luque system can not stand against axial loading forces, have made use of Harrington distraction rods combined with wires which had been passed under the laminae at the segmental level. Following the experimental studies (12, 18, 33, 35, 36), Harri-Luque technique was popularized (1, 4, 7, 9, 11, 15, 17, 20, 21, 24, 27, 29, 41, 43). Some authors advised using contoured, square ended Harrington rods to achieve distraction and lordoization of the lumbar spine (1, 11, 29).

We have applied Harri-Luque system to 26 patients in our department because of the patients' financial status besides other spinal fixation system. We have evaluated the results of our 20 cases who had been followed-up adequately.

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PATIENTS and METHOD

In Haydarpaşa Numune Hospital, orthopaedics and traumatology department, we have treated 26 patients with thoracolumbar vertebral fractures and fracture-dislocations by posterior reduction, stabilization, grafting, and fusion by Harri-Luque system in between 1992-1995. In addition, anterior decompression and grafting were done in two cases and posterolateral decompression was done in four cases. 20 of the 26 patients could be followed-up adequately.

The average age of the patients was 28 (13-57) years old at the time of the operation. There were 13 men and 7 women. The mechanism of injury included 13 cases (65%) of falls or jumps from heights, 3 cases (15%) motor vehicle accidents, 3 cases (15%) crush injuries, and one case (5%) resulting pedestrian accident.

The fracture classification was done according to Denis' three column concept (10). There were 23 fractures at 20 patients. 16 of them were burst fractures, 6 of them were fracture-dislocations, and one of them was compression fracture. The lesion was at T9-10 in one case, at T11-12 in two cases, at T12 in four cases, at T12-L1 in one case, at L1 in eight cases, L1-L2 in one case, at L2 in five cases, and at L3 in one case. Additional types of injuries were 10 calcaneal fractures in 7 of the cases, 3 pylon fractures in 3 of the cases, talonavicular fracture dislocations in one of the cases, and rib fractures in one of the cases.

The average time was 14.3 days (2-31) between the trauma and the operation. In the cases which we have applied Harri-Luque, we have inserted sublaminar wire to the intact two vertebra proximal and distal to the fractured vertebra, usually. We also used the square ended Harrington rods, and "L" cross-sectioned lower hooks. In the last eight patients DTT rotational stabilization system were used additionally (Figure 1). In lumbar fractures, in order to leave more mobile segments distal to the fracture level sublaminar wire was used only at one level. In 12 patients the graft was obtained from the iliac crest and in 8 patients it was obtained from the spinous processes and this graft was applied along the instrumentation for fusion. All the patients used the TLSO type corset for the mean time of 4 months (1 week-1 year).

RESULTS

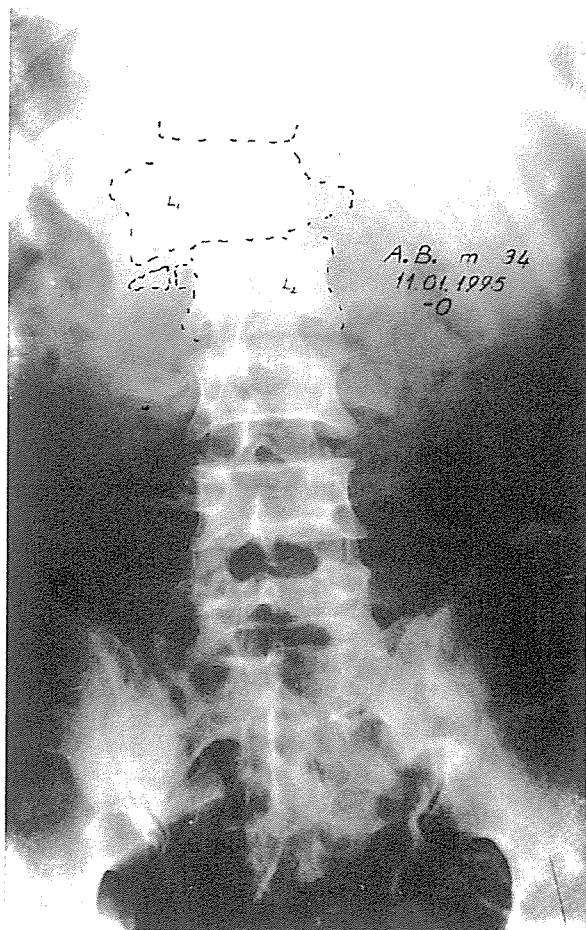
The mean follow-up time was 14 months (7-25). In the radiologic criteria done before and after the

operation and in the follow-up the local kyphosis angle, local fracture angle, anterior vertebral body compression rate and medullar canal widening percentage in the CAT scans were evaluated.

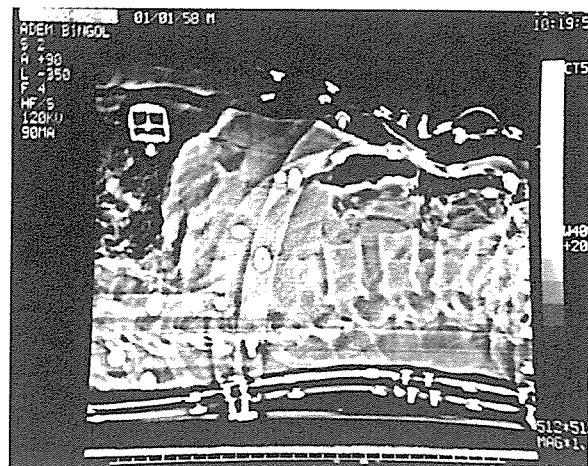
The local kyphosis angle was 23.3 degrees (2-54) before the operation, 10.7 degrees (0-22) after the operation and 17.8 degrees (0-30) in the last follow-up. The local fracture angle was 18.2 degrees (6-35) before the operation, 9.4 degrees (0-16) after the operation and 13.1 degrees (3-36) in the last follow-up. Because of the economic status of the patients, three of the patients couldn't have CAT scans before and after the operations and six of the patients couldn't have their CAT scan taken after the operation. The medullar canal widening percentage which was 38.1% (0%-66%) before the operation changed to 68.9% (59%-100%) after the operation.

The neurologic status of our patients were classified according to Frankel et al. classification system (16). In this series, 6 patients were classified as Frankel grade A prior to surgery: one progressed to grade B, another one progressed to grade C and 4 were unchanged postoperatively. One patient was classified as Frankel grade B progressed to grade E. There were 3 patients in Frankel grade C; one improved to grade D and two to grade E. 4 patients who were in grade D prior to surgery: one was unchanged and 3 improved to grade E. 6 patients who were in Frankel grade E prior to surgery didn't have any deteriorate in their neurologic status.

When the cases were evaluated according to the complications: in one case which we applied anterior decompression before the posterior stabilization procedure local infection was seen as a complication and was dealt with local wound debridement and medication. However in the patients' follow-up who has psychiatric problems and homosexual trends, the proximal hooks were dislodged and the instruments were removed. In his last follow-up the local kyphosis angle was 46 degrees and a new operation was being planned. Our other patient in whom complication related to the instrumentation was seen a drug addict. One rod was broken and out of the skin and one of the proximal hooks was dislodged. In the operation done for this complication it was seen that the fusion was complete and the instruments were removed. This patient has no problem. Lower hooks were dislodged from the lamina in another two patients. There were no any broken wires and we determined all the wires holding the rods. One of the patients had transient radiculopathy postoperatively, which completely



A. Preop AP radiography



B. Preop LAT radiography

Figure 1. A patient who is 34 year-old man with a fracture-dislocation at L1-L2 level. His neurologic status was Frankel B before the operation and progressed to Frankel E after the operation.

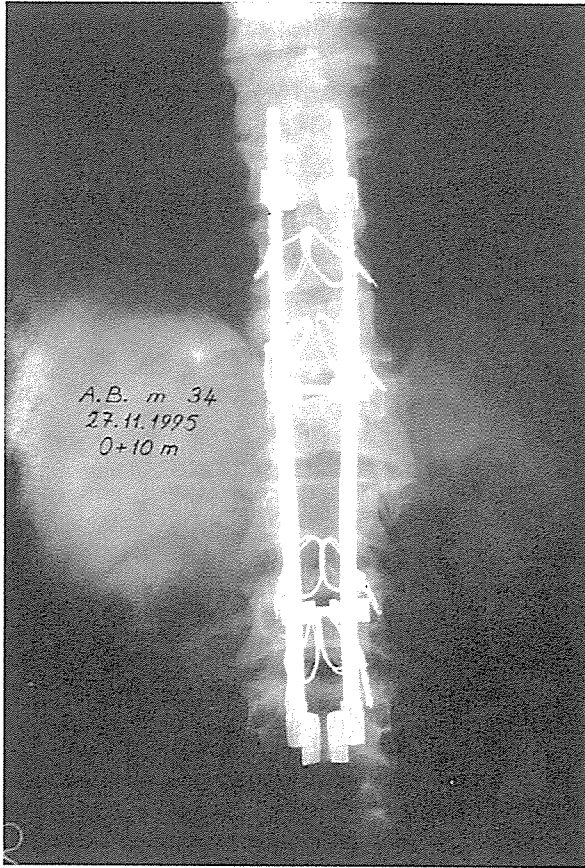
cleared during the hospitalization. In the last follow-up, we determined 7.1 degrees loss of correction at the local kyphosis angle.

DISCUSSION

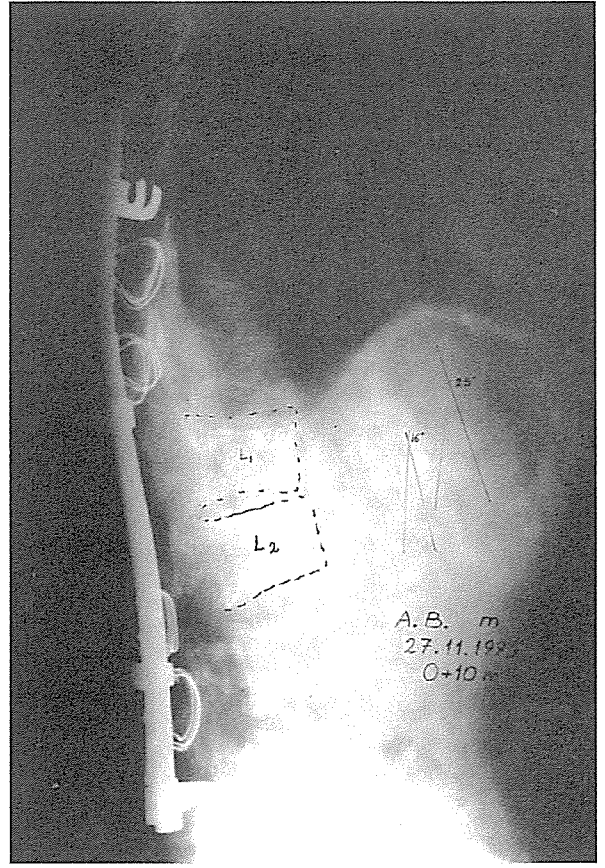
It is widely accepted that the stable wedge compression fractures, osseus Chance fractures, and neurologically intact stable burst fractures are treated conservatively (2, 28, 41). However in order to prevent the chronic instability risk developing from mechanical causes some authors advise posterior stabilization when the compression is more than 50% at the anterior height of the vertebral body or when more than one fracture is present nearby vertebral bodies (2, 10, 13). In fractures causing neurologic deficit or causing anterior compression on the spinal cord, anterior decompression and fusion is necessary (6, 26, 32). Some authors advocate posterior fusion in addition to this procedure (6).

After Harrington developed a system known by his name (22) according to this principle many system have been developed which all share reduction medullar canal decompression, rigid fixation and stabilization which allows early mobilizations as the main principles in common (7, 13, 18, 31, 34). When the results have declared that rod-hook systems yield high complication rates and are inadequate, in order to obtain rigid fixation transpedicular screw systems have been widely used in thoracolumbar and lumbar vertebral fractures (3, 8, 38). We have also used many system in our department especially considering the patients' economic status. Especially in the 26 patients, who had difficulty in buying expensive apparatus, we have applied Harri-Luque system developed by Akbarnia et al. (1), DeWald (11), Gaines et al. (17, 18), Louw (29), and Sullivan (41).

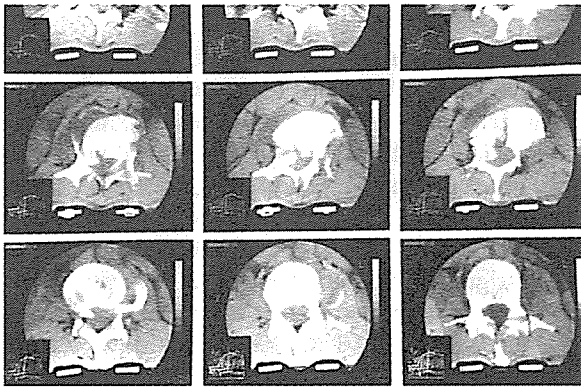
Two of our patients who had neurologic deficit first we have done anterior decompression and fusion



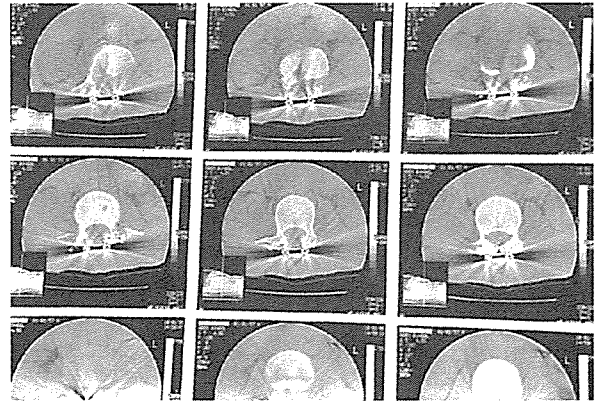
C. Post-op AP radiography



D. Post-op LAT radiography



E. Preop CAT scan



F. Post-op CAT scan

Figure 1. A patient who is 34 year-old man with a fracture-dislocation at L1-L2 level. His neurologic status was Frankel B before the operation and progressed to Frankel E after the operation.

in the first stage and then in the second stage we have applied Harri-Luque. In four patients, Harri-Luque system was applied with the posterolateral decompression advised by Erickson et al. (14), Garfin et al. (19), and McAfee et al. (34) in the same stage.

When Harrington distraction rod system is supported with segmental sublaminar wires both distraction and desired correction in the transverse plane can be obtained and the patients can be mobilized early in the postoperative period (1, 7, 11, 15, 17, 18, 29). The efficiency of the technique was proved by experimental studies (12, 33, 35, 36). In addition, we have used in our last 8 cases, the device of fixation in the transvers plane (DTT) which adapts to Harrington rods, by thinking that these devices will increase rotational stability. The most serious critic against Harri-Luque system and sublaminar wire applications is the neurologic deficit that might develop during the passage of sublaminar fixation wire (4, 5, 23, 25, 29, 37, 39, 42, 43). We have applied Harrington distraction rods supplemented with segmental wiring in our 26 patients and only one of them had transient radiculopathy postoperatively which completely cleared during the hospitalization period. Two of our patients, who had complications with the instrumentation system were the one who ignored our advices, didn't come for the regular follow-up and who had psychiatric problems. The other one had psychiatric problems and homosexual trends.

It isn't wise to speak about Harri-Luque system in our modern world in which everyday a new system is being developed. However we think that in combination with posterolateral decompression and by using square ended Harrington rods with "L" cross-sectioned lower hooks, which are adapted to these rods in combination with DTT, but making the fusion all the time and TLSO corset till the fusion forms solidly, Harri-Luque system can be used especially in the patients whose economic status is very low.

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