

EFFECT OF PROPERLY AND INPROPERLY INSERTED PEDICULAR SCREW ON THE RESULTS OF THE SPINE FRACTURES

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ABSTRACT :

The biomechanics of reduction and loss of correction of the burst fractures treated with transpedicular systems have not been adequately investigated. There are a wide range of conditions that can cause instability of the thoracolumbar spine after transpedicular fixation. One of the most important situation is proper insertion of the screw through the pedicle.

A total of 87 patients with unstable burst fractures of the thoracal, thoracolumbar and lumbar spine were treated with posterior spinal instrumentation (Alici; 45, Isola; 30, AO Spinal Internal Fixator; 12). All patients were evaluated pre and postoperatively with plain radiographs and computed tomography.

The average follow up was 2.4 years and patients had an average 11° loss of correction in local kyphotic angle.

In 20 of patients improper insertion of the pedicular screw was observed and we observed an average 13° of loss of correction in local kyphosis angle. In the cases that had proper pedicular screw insertion, there was an average 5° loss of correction, and this was statistically significant ($p < 0.05$).

This clinical study emphasized the importance of the proper insertion of pedicular screw during spinal trauma surgery. This influences the results both mechanically and neurologically.

Key Words: Spinal fracture, transpedicular fixation.

INTRODUCTION

Surgical treatment is an important alternative for the treatment of thoracolumbar fractures. There are many studies published about various operative methods. Since their first description, transpedicular screws have been used commonly. There are a lot of studies about the various systems developed (2, 3, 11).

The application technique of transpedicular screws were described in details. Although the technique is well known it is not performed correctly all the time. The aim of this study is to compare the results of proper and improper transpedicular screw application for the treatment of spine fractures (5, 6).

MATERIALS AND METHODS

Among the patients operated on because of vertebral fractures between 1991-1995 at the 3rd Department of Orthopedics and Traumatology Ankara Nu-

mune Hospital. Of the 87 patients meeting the criteria were included in the study. There were 51 male 36 female patients. The age of the patients ranged from 18 to 57 and average time of follow up was 2.4 years.

The most common cause of injury was traffic accidents. 59 patients were injured in traffic accidents, 26 were fall from height, 2 were working accidents. There were no vertebral fracture caused by gun shot wounds and no open fractures among our patients.

Only the patients having one level vertebral injury were included to our study. All the fractures were unstable burst fractures. All the patients were operated within 10 days from injury. Postoperative orthoses were used for all of the patients. All patients were evaluated by pre and postoperatif standart radiogram and CT. Transpedicular screw sites were controlled by lateral graphies intraoperatively. Although some of the screws were considered to be at correct position at intraoperative evaluation, they were found to be at incorrect sides on postop CT assessment.

45 Alici spinal system, 30 Isola and 12 AO internal fixator have been used. We studied the relationship

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between transpedicular screw sites and the loss of local kyphosis angle. We used Alici and AO systems in the treatment of thoracolumbar and lumbar fractures. Below the level T10, we performed Isola instrumentation 4 transpedicular screws for Alici and AO systems, 2 transpedicular screws (below fracture level) for Isola system were used. 20 patients in when transpedicular screw was applied improperly the average loss of correction in the kyphosis angle was 13° and 5° in patients that transpedicular screw were positioned properly.

The maximum loss of correction was founded in 4 patients when transpedicular screw were in intradiscal space (Average 18.5). There were no screws placed lateral to vertebral body. The maximum loss of correction was in a L1 burst type B patient treated by Alici instrumentation. Both of the cephalad transpedicular screw were at intradiscal space and the local kyphosis angle was 24°.

Although no screw failure took place in this study in 3 patients, bending of the rods were recorded. No rod breakage was found. The average loss of correction in local kyphosis angle that the transpedicular screw were placed properly was 5°. Patients used external support for 9 months because we believe that posterior spinal fusion becomes completely solid at 9 months postoperatively. Although Jewett's hyperextension orthosis have better biomechanical properties we have preferred full steel orthosis due to its easy usage by the patient.

All the patients were taken to a rehabilitation programme immediately. The patients having paraplegia were referred to rehabilitation centers and the other were rehabilitated by outpatient programme.

Although there were no pain complaint in the operation site, 38 of our patients (43.6%) suffered from pain at autograft donor site. Pain respond to rehabilitation programme in all but 6 patients.

Other complications are not considered during this study.

DISCUSSION

The goal in the treatment of thoracolumbar fractures is to provide fracture healing without the development of deformity or instability (7, 9). Posterior instrumentation systems consisting of transpedicular screw provides more rigid stabilisation than other kind of posterior instrumentation systems (1, 3, 11, 12).

Long segmented instrumentation, by increasing the lever arm provides better reduction and stabilisation but by causing loss of motion between vertebrae it distorts spinal biomechanics and cause degenerative changes in articulations cephalad and caudad to fusion mass (14, 15).

Kahanowitz et al. supports the above findings although Gardner et al reports they have not seen such changes.

It has been shown that in patients whom AO spinal fixator is used the linkages loosen in time causing loss of effectiveness of the implant (8). This effect increases in osteoporotic patients. Although drilling and measurement techniques are described in many reports we have preferred not to use any drills (1, 7, 8, 15).

Early failure has been shown to occur in AO spinal instrumentation in patients if the distraction is not performed symmetrically. Many biomechanical studies researching the place, angle and technique of transpedicular screw have been performed. Increment in the screw length and screw - vertebra interface provide improvement in performance of spinal instrumentation (7, 12).

In this study we have found significant relation between proper placement of transpedicular screw and preservation of local kyphosis angle. If the transpedicular screw are placed improperly then loss of local kyphosis angle takes place. Pain and initiation of activity cause no problem in patients with properly placed transpedicular screw. On the other hand improperly placed transpedicular screw leads to unsatisfactory clinical results.

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