THE MANAGEMENT OF UNSTABLE FRACTURES OF THE THORACOLUMBAR SPINE WITH THE "AO INTERNAL FIXATOR"

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The AO Internal Fixator is the most popular device, nowadays, in the surgical treatment of thoracolumbar spine fractures. The device consists of long Schanz screws inserted into the vertebral bodies, from a posterior approach, through the pedicles and of connecting threaded longitudinal rods carrying mobile clamps that can be fixed in every position by nuts. The long lever arms of the Schanz screws provide manual reduction during the operation. since the device is stable against flexion anmd rotation by itself, the fixation can be restricted to the most immediate adjacent vertebrae which leaves the rest of the spine mobile. In our clinic the AO Internal Fixator intrumentations have been starkted in May 1989. The early results of these instrumentations have shown that the implant is one of the most reliable methods in the surgical treatment of lower thoracic and lumbar vertebrae fractures. This report presents and discusses 59 instrumentations in fresh fractures. The main advantage of the application is the short fixation area and the ease of postoperative treatment.

INTRODUCTION:

In the surgical management of thoracolumbar spine fractures; there have been great advances especially since 1982. With the improvement of diagnostic procedures; the classification became more valuable. This has led to better evaluation of pre and postoperative status. The aim in the surgical treatment of thoracolumbar vertebral fractures is: restoration of the spinal physiology with early decompression and stabilization, early mobilization and rehabilitation and with these, avoidance of late posttraumatic deformity (11). All instable fractures according to the Denis classification; mechanically, neurologically and neuromechanically; that is the fractures those affect the middle column must be surgically managed (2,3).

The pedicle-rod system as a posterior instrument, have been designed by Magerl (12). "External Spinal Skeletal Fixator" was used in the treatment of thoracolumbar spine fractures, applied through the pedicles of the adjacent vertebrae to the affected one. Magerl and Walter Dick modified this instrument and created the "AO INTERNAL FIXATOR" which became totolly implantable (4, 5, 6). Despite many reports that favour the reliability of pedicular fixation; there is still some arguement about it (7). The aim of this report is to present the results of 59 patients who were treated by AO INTERNAL FIXATOR in our clinic.

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MATERIALS and METHOD

***Instrument Design:** The Schanz screws which are applied transpedicularly to the vertebral bodies of one level above and below the affected vertebra, with a posterior approach, are connected with mobile clamps to the longitudinal threaded rods and make the AO INTERNAL FIXATOR system. The long lever arms of Schanz screws facilitating manual reduction are cut at the en of the operation. The rods are connected with a transverse piece called "Cross Linking Device" to sitrengthen lateral stability.

***Technique:** The anatomic lanmarks have the prime importance in application of the pedicles. Before inserting the screws, the walls and depth of the predrilled hole must be examined. Reduction must be planned specifically and after the instrumentation, the two segments must be fused posterolaterally by autogenous bone graft.

***Clinical Material:** Between May 89 and August 92; 59 thoracolumbar vertebral fractures were instrumented in our clinic. The follow-up time is between 1 month and 24 months (Mean 8.5 months). Among them 20 were women and 39were men. THe average age is 40.7 ranging between 16 and 75. In our series, one level fractures were found as 94.9 %; two level 5.1% and the most affected vertebra as L1 in 29 patients (38.9%). Motor vehicle accidents is the prime causative factor by 32 cases (54.2%), followed by falls from a height in 23 cases (38.9%). According to the Denis classification, 56 of the fractures (94.9%) were burst; 2 were compression (3.3%) and 1 was fracture-dislocation (%1.7). We have not exmperienced a seatbelt injury.

***Results:** In the clinical evaluation of the patients, we used the Frankel scale and found that 52 patients were Frankel E; 3 patients Frankel D; 2 patients C; 1 patient B and 1 patient Frankel A. In the postoperative follow-up period we found that the numbers were respectively 53, 3, 1, 1, 1.

We searched for the canal compromise with the CT scan in burst fractures and found as mean 42.5% (0-45%) preoperatively and 26.9% (0-35%) postoperatively.

The local kyphosis was found as 11.9 degrees preop; and 4.2 postoperatively. In the follow-up there was 8.6 degrees of loss of correction.

The implants were removed in 18 patients. In 3 of them, there were approximately 4 degrees of loss of correction after removal.

***Complications:** Two cases became infected; one had deef venous trombosis; 1 had urolithiasis and in 3 of them bed sores were opened. There was no exitus.

We experienced loss of correction in 24 patients, 2 Schanz screw malpositions, in 3 cases the screws have been broken, in 2 cases loosening of the implant has occured. One painful root lesion and 5 painful paravertebral bursitis have observed. The paravertebral bursitis disappeared after the implant removal.

DISCUSSION

There are many biomechanical advantages of treating thoracolumbar vertebral fractures with transpedicular screwrod system (1, 4, 5, 6, 7, 8). The arms of the Schanz screws enable the sagittal reduction. With the application of distraction to the screws on the longitudinal rods; reconstruction of the fractured vertebra and decompression of the spinal canal was achieved (4, 5, 6, 8).

AO INTERNAL FIXATOR immobilizes two segments and this is a great advantage in the rehabilitation of the patients. This system provides thrre dimesional reduction and correction in every type of lower thoracic and lumbar fractures. Depending on the requirements; the fixator can be used for distraction; compresson or neutralisation (6).

It was reporteod that FIXATEUR INTERNE is as succesful as the anterior systems in the reduction of the kyphotic deformity, and decompression of the neural canal. The fixator must be applied in 72 hours for fractures with minor neurologic deficit omr significant canal compromise and in 7 days for major kyphotic deformities.

On the ofther hand Kostuik supports anterior instrumentation in burst fractures which came after 10 days with major neurologic deficit and significant canal compromise (10).

We believe that anterior decompression and stabilisation must be combined if; after posterior instrumentation; oecompression does not occur and the neurologic deficit stand still or increase.

In our instrumentations; due to the increasing experience in aplying transpedicular screws; malposition is a minor problem. Positioning through the anatomic landmarks and controlling the hole, decrease the complications.

Loss of correction is due to; screw malposition failure of postoperative brace usage and particularly not making posteralateral fusion as it is not recommended at the begining by Walter Dick. But now it is clear that posterolateral fusion is essential (8, 9, 11). We routinely use external brace for 8-12 weeks in our patients.

We have little experience in transpedicular grafting which was used only in 3 patients. But with the thought of possible bone retropulsion from the middle column to the spinal canal; we prefer posterolateral fusion over transpedicular grafting.

RESULTS

Our experiences and results in the treatment of fresh, (first 5 days), thoracolumbar fractures with the AO FIXATEUR INTERNE; are pointing out that is a very safe and adequate posterior surgical instrument. After 10 days the results are not as good as the fresh fractures. The instrumentation can be done safely between Th 10 vertebra and sacrum. THe device is not recomended to the fractures which need more than 2 segment fixation. All the instrumentations must be combined with posterolateral fusion.

REFERENCES

1. Aebi, M; Etter, C.; Kehl, T.; and Thalgot, J. Stabilization of the Thoracolumbar Spine With The Spine Vol. 12, No: 6:544, 1987.
2. Denis, F. Spinal instability as defined by the three column spine concept in acute spinal trauma clin. Orthop. and related research, 189: 65, 1984.
3. Denis, F.; Armstrog, G.W.D; Searls, K.; and Matta, L. Acute thoracolumbar burst fractures in the absence of neurologic deficit Clin. Orthop. and related research, 189; 142, 1984.
4. Dick, W. The fixateur interne as a versatile implant for sipinal surgery spine, vol. 12, no. 9: 882, 1987.
5. Dick, W.; Kluger, M.P.; Magerl, F.; Woersdorfer, O.;

and Zack, G. A new device for internal fixation of thoracolumbar and lumbar spine fractures: the fixateur interne paraplegia, 23: 225, 1985.

6. Dick, W. Internal fixation of thoracic and lumbar spine fractures hans huber fublishers, NewYork, 1989.
7. Esses, S.I. The AO Spinal internal fixator spine, vol. 14 No. 4: 373, 1989
8. Esses, S.I.;Botsford, D.J.; and Kostuik, J.P. Evaluation of surgical treatment of burst fractures spine, Vol. 15 No. 7: 667, 1990.
9. Kahanovitz, N.; Bullargh, P.; and Jacobs, R.R. The effect of internal fixation without arthrodesis on human facet joint cartilage clin. orthop. and related research, 189: 204, 1984.
10. Kostuik, J.P. Anterior fixation for features of the thoracic and lumbar spine with or without neurological involvement clin. orthop. and related research, 189: 103, 1984.
11. Lindsey, R.W.; Dick, W. The Fixateur interne in the reduction and stabilization of thoracolumbar spine fractures in patients with neurologic deficit spine, vol. 16 No. 3-5; 140, 1991.
12. Magerl, F.P. Stabilization of the lower thoracic and lumbar spine with external skeletal fixation clin. orthop. and related research, 189; 125, 1984.