

CLINICAL APPLICATION OF FIXATEUR INTERNE 'DICK' IN THORACOLUMBAR AND LUMBAR SPINE FRACTURES

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The Fixateur interne developed originally for the treatment of thoracolumbar and lumbar spine fractures. Also it can be used for a variety of spinal disorders. A prospective study has been carried out and the first 10 patients have been reviewed. The early results of those patients with thoracolumbar and lumbar spine fractures are excellent. The fixator has provided rigid stabilization for rehabilitation of paraplegic patients.

The common implants for internal fixation of thoracolumbar and lumbar spine fractures like Harrington rods (1,3,7,10,12,14,23,24), Jacobs rods (17,18), Luque rods (9,20,21), dorsal Roy Camille plates (25,26) have several disadvantages. Stability is often not good enough to permit early mobilization of the patient. Slipped hooks, broken rods and loss of correction are reported complications (4,7,13,19,22,24,27).

The complications mentioned above are unavoidable because they are based on a four-point fixation (28,29). They have a mobile link to one vertebra and need a second bony support on the lamina of the next vertebra. This means that at least five vertebrae, two above and two below the fracture, are included in the fixation (10,23). Jacobs recommends even a three vertebrae above, three vertebrae below technique for better stability (17,18).

Reduction of bony fragments can be achieved only by indirect means. Direct adjustment of the position of one particular vertebra is not possible with these methods.

Such a long period of immobilization of healthy joints should not be the final solution in spinal surgery. Similar techniques on the upper and lower extremities would never be accepted. It is well known that paraplegic patients with a stiff thoracolumbar or lumbar spine and with an iatrogenic loss of lumbar lordosis have rehabilitation problems (2,15). Even the later removal of the implant after fracture healing has occurred, does not solve the problem often (16). Because the mobility of the temporarily instrumented part of the spine is not restored regardless if long fu-

sion or short fusion was intended. To overcome these disadvantages, Dick has developed a spinal fixation device which is based on a different mechanical principle. It is called as "Fixateur interne" (5).

The purpose of this paper is to present the results of the first 10 patients that we operated on, with the "Fixateur interne".

MATERIALS AND METHOD

System Design : Fixateur interne consists of Schanz screws, a coupling clamp and fully threaded rods. The Schanz screws are 5.0 mm in diameter. They are self tapping and the standard size has a 35 mm threaded length. They are engraved at the 50 and 60 mm mark to determine depth of insertion. The threaded rods are 7 mm in diameter and flattened on two sides. They come in a variety of lengths, ranging from 70 to 300 mm. The coupling device is freely mobile in the sagittal plane and thus allows for angulation of the Schanz screws before securing them to the rod.

The system allows axial, angular and rotational adjustability. This permits the instrumented segments of the spine to be held in a variety of biomechanical modes, including distraction, compression and distraction.

Surgical Technique: Using the usual dorsal approach, long Schanz screws are driven through the pedicles into the vertebral bodies until their tip lies close to the anterior aspect of the vertebral bodies. With some experience the correct points of entry dorsally can be easily found. The Schanz screws are inserted parallel to the end plate and convergent 10 to 15 degrees towards midline. They are self tapping. The screws are lying within the closed cortical bone of the pedicles and do no harm to the neural structures. They obtain a very firm hold in the bone.

The Schanz screws are connected together with threaded rods, at first the connective clamps and jaws are able to move in any direction. They permit kyphosis, lordosis, distraction, compression or rotation and can

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be finally fixed by nuts in any desired position. Thus the Schanz screws are held in a stable angle towards each other. As long as the hinges remain secure, no re-dislocation will occur.

Patient Data: 10 patients have been prospectively followed with a minimum follow-up time from surgery of 4 months. The mean follow-up is 6 months (range, 4-9 months). There were 5 male and 5 female patients. They ranged in age from 14 to 50 years (mean 34 years).

Our indication for surgery was spine fracture in all cases.

Of the 10 fracture cases, three were burst-type injuries, three were fracture-dislocations and four were flexion-distraction injuries.

Fracture levels of 10 patients seen as; one at D11, two at D12, five at L1, one at L2, and one at L3 (Table 1).

Table 1 : The fracture levels that involved.

Level of fracture	Number of Patient
D 11.....	1
D 12.....	2
L 1.....	5
L 2.....	1
L 3.....	1

Table 2: Frankel's classification of spinal cord injury

Frankel A- No motor or sensory function.
Frankel B- Incomplete sensory; no motor function.
Frankel C- Incomplete sensory; no useful motor function.
Frankel D- Incomplete sensory; useful motor function.
Frankel E- Normal function; may have spasticity.

Table 3: Patient distribution according to the Frankel classification before operation.

Group	Number of patient
Frankel A.....	5
Frankel B.....	0
Frankel C.....	1
Frankel D.....	2
Frankel E.....	2

The Frankel Classification (Table 2) (11) of this patient group included five cases graded A, one case C, two cases D, and two cases who were classified as Frankel Grade E (Table 3).

Canal compromise was quantified in all patients with burst fractures using axial plane and sagittal reconstruction CT scans.

In this group of 3 patients, the mean canal com-

promise measured (53%) of the anteroposterior diameter of the canal. Kyphosis was also quantified in these patients using lateral radiographs. The mean kyphosis at the injured segment measured 21.6o (range, 6o-28o).

In two patients, the fracture had been treated with laminectomy in another neurosurgery clinic just after injury. One patient's laminectomy level consists of 3 segments, other two segments. And these patients both were classified as Frankel grade A classification.

We applied laminectomy for two segments in two patients because of vertebral canal obstruction in burst type fractures, identified by CT scan. The posterior spinal fusion was done in all cases as a complementary process.

RESULTS

The follow-up of neurologic examination showed that four patients had improved one Frankel grade, one patient had two grades improvement. Three patients had no improvement that included in grade A classification. After removal of hospital six of patients graded in A and C classifications, sent to the rehabilitation centre to be treated in a standard program.

The mean postoperative canal compromise for three patients who had burst type fractures, is 18% (range 0-33%). Mean kyphosis of these patients quantified after surgery was 10.4o (range 2o-17o).

After the operations no full plaster or plastic jacket was applied. The mobilization was permitted at the end of the postoperative week.

In this short period of control we were not able to detect any complication in our patients that we applied Fixateur interne.

DISCUSSION

Spinal instrumentation systems incorporating pedicular fixation were developed by the aid of biomechanical advantages of transpedicular screws (30). The external spinal skeletal fixation devices developed by Magerl had advantages as adjusting the position of the instrumented segments by the help of long lever arms of the screws. This device provided a great stability, only the vertebrae above and below the index level required immobilization, Fixateur interne combines these advantages together with the benefit of being completely implantable.

We do not want to discuss neurological recovery in the Fixateur interne cases here. We feel that there is

agreement that neurological recovery depends on the primary lesion itself, on the quality and time of reduction which also means decompression by reduction, and on the absence of secondary neural involvement, and on further re-dislocation. But it does not depend on conservative or operative treatment. Also it is not influenced by the kind of implant. We agree with the work published by Frankel et al (11).

Dick and Esses suited that correction of kyphotic deformity was obtainable by the help of Fixateur interne (6,8). The kyphotic deformity correction in our patient's group maintained successfully too.

Esses also obtained the restoration of lordosis using the internal fixator and decompressing the spinal canal in all instances of burst fractures (8). In our study mean postoperative canal compromise for 3 patients who had burst type fractures, reduced from 53% to 18%.

Although we did not have a long term follow-up as a conclusion Fixateur interne is an effective device in the treatment of thoracolumbar and lumbar spine fractures. It can effectively decompress the spinal canal in cases of burst fractures and can effectively restore lordosis while immobilizing only two spinal motion units.

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