THE "FIXATEUR INTERNE" IN THE SPINE SURGERY

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The "Fixateur Interne" is a new device for posterior spine surgery. It consists of long Schanz screws which are inserted from a posterior approach through the pedicle into the vertebral bodies and of connecting threaded longitidunal rods carrying mobile clamps which can be fixed in every position by nuts. The long lever arms of the Schanz screws facilitate manual reduction. The fixation can be done to the adjacent vertebrae of a lesion leaving the rest of the spine mobile. This report presents and discusses 24 instrumentations. The maen advantage is short fixation area and to maintain the desired correction.

***Key Words** : Fixateur interne, Thoracic and lumbar spine fractures, tumors, spondylolisthesis.*

The goal of treating any injury is to restore anatomy and function of the injured part as completely as possible. The aim of spinal injury treatment is the restoration of spinal physiology, with relief of pain and restoration of stability without neurological damage. Experience in recent years has clearly shown that the best method of decompression of neural structures is rapid and perfect reduction of the fracture or dislocation (2).

The surgical systems which arc currently used for reduction and stabilization of the stabil and unstable fractures of the spine can be summarized as:

a. Pure osteosynthescs : Pure ostcosynlhcscs arc only applicable in a few types of spinal fractures.

b . Harrington distraction instrumentation.

c. Locking hook spinal rod system which was de veloped by Jacobs ct al. in 1974 (5).

d. Tension banding techniques.

e. Harrington compression instrumentation.

f. Modified spine plate described by Roy-Camille (7,8).

g . Luque segmental sublaminar instrumentation.

h. Combined techniques like Harri-Luque (1,4).

i. External fixator which was introduced by Magerl in 1977 (6).

The indication of instrumentation anterior is quite restricted in the vertebral fractures because of the following disadvantages:

a. Anterior thoracolumbar approaches require greater surgical skill than posteriors.

b . Most dural injuries arc situated posteriorly and cannot be dealt with surgically from the anterior approach.

c. Routine removal of metal after healing is thus not advisable.

d. The stability of anterior instrumentation without additional posterior stabilization is not adequate for immediate mobilization without a plaster jacket.

e . Where there is a combined anterior and posterior injury, adequate correction of the kyphosis without late recurrence is rarely succesful using anterior instrumentation only because the dorsal tension banding structures are severed and tend to separate under flexion forces. Thus usually additional compression instrumentation would be necessary posteriorly to improve the reduction and stability.

f. Large anterior implants may lead to secondary vascular injury.

Following Magerl's ideas and suggestions a fully implantable and stable spine fixation device was developed at Basle University orthopaedics department, which is called Fixalcur Interne (FI) instrumentation. Dr. Walter Dick performed the first operation in 23th Dec of 1982 (3).

MATERIAL AND METHODS

From May 1989 until March 1990 24 FI instrumentations were performed at the Orthopaedics Department of Ankara University Medical Faculty Ibn'i Sina Hospital. The cases have a follow up of 1 to 10 months (Mean value 4.5 months). Indications for instrumentation arc listed in Table 1.

Table 1 : Indications for Surgery

	Case
Fracture	18
Posttraumatic instability & Deformity	4
Spondylolisthesis	1
Pathologic Fracture	1
Total	24

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There were 14 male and 10 female patients with a mean age of 42,2 years (range 16-63). Mean kyphotic deformity in the 24 cases before operation was 14.9° mean residual kyphosis after instrumentation was 3.6°.

The operative technique is as follows. The patient is positioned in prone position, after general anaesthesia. By the usual midline posterior approach, the lamina and facet joints are prepared open and the transverse processes localized. In lumbar spine, the point of entry is found level to the midline of the transverse process as for laterally as the lateral border of the upper articular process. In the thoracic spine, the entry point is located immediately below the upper facet joint approximately 3 mm lateral to the middle of the joint near to the base of the transverse process. After localization of the entry point, 2 mm K-wires are inserted parallel to the end plates and convergent 10°-15° towards the midline through the pedicles into the vertebral bodies for a depth of 3 cm. after roentgenogram control, the K-wires are replaced by the self-driven manually into the vertebral bodies until their lip lies close to the anterior wall. Forces in every direction can be brought upon the Schanz screws as needed for individual case. The kyphosis is corrected by compressing forcefully the free dorsal ends of the Schanz screws arc spread apart and thus the desired lordosis is achieved. Then the angle between the Schanz screws is fixed by lateral nuts and reduction is completed by distraction with the nuts on the threaded rod until the anatomic height of the vertebral body is restored. After tightening the counternuts, the dorsally protruding parts of the Schanz screws are removed with a special bolt cutter, and the wound is closed.

RESULTS

From May 1989 until March 1990 24 FI instrumentations were performed. The cases followed-up of (1-10) months (Mean value 4.5 months). We performed orthosis post opcrativcly in 2 cases for a period of 3 months. The shortest period of observation is 1 month and the longest 10 months.

Indications for surgery as follows :

	Case
Fracture	18
Post traumatic instability and deformity	4
Spondylolisthesis	1
Pathologic fracture	1

Fractures : The levels of the 18 instrumented fractures were as follows :

T 12	2
L 1	9
L 2	6
L 3	1
L 4	1
	19

In one of them both L 2 and L3 were affected. The average kyphotic angle of the cases were 11.5° posteopcrativcly and the average kyphotic angle were reduced to -0.75° after the operation.

According to the Frankel classification they had the following distrubition :

	Preoperative	Postoperative
Frankel A	1	-
Frankel B	-	-
Frankel C	-	1
Frankel D	-	-
Frankel E	17	17

Posttraumatic instabilities and deformities

There were 4 patients in this group, of whom 2 were male and 2 were female. The original trauma had occurred four to twenty four months previously (mean value : 9.5 months). Three of them had undergone prior conservative treatment, one of them had failed posterior surgery (Harrington). The fracture involved were as follows:

Case	
L 1	2
L2	2

The average kyphotic deformity angle in these four patients before operation 25° and postopcralively was 10.5°.

Spondylolisthesis : In a painful L 5 - S 1 spondylolisthesis case (a female, 53 years old) the instrumentation has been performed. In this case the anterior displacement of L 5 on S 1 was 44%. Reduction was carried out leaving a residual displacement of 38°. The kyphosis angle was -42° preoperatively and -34° postoperatively. The patient is completely painfree.

Pathologic fractures : The fixator Intern has also been performed in a pathologic fracture of L 2 vertebra, due to Multiple Myclom (a female, 43 years old). In this case, instrumentation was applied for posteior stabilization, less pain and early mobilization.

Complications : In one of the patients wound infection observed 21 days after the operation and in another patient after 1 month. Both of them were treated with drainage and antibiotics.

In one of the patients, deep vein thrombosis has developed at the fifth postoperative day. Medical treatment has been applied for recovery.

Technical complications : Almost in all patients Computerised Tomography has been performed both preoperatively and postoperatively. It has seen that in two of the patients, one of the Schanz screws was out of the vertebral body i.e., they were not in the right position.

There were no vascular injuries among the 24 instrumentations. No neurological injury detected in any patient.

DISCUSSION

The functional results of an instrumentation with short fixation area regarding spine mobility and shape arc superior to those obminable with long range fixation systems. We can summarize the advantages of the system comparing to the others used.

Fixation of the segments only, FI can be used in various fracture forms. The mobility of lomber region is very important in rehabilitation. The long lever arms of the Schanz screws arc more suitable for reduction than all other implants.

The fixator intern allows three dimensional movement due to the form anchorage in the bone, so that lordosis and kyphosis can be corrected. It can be used after laminectomy. Patients docs not need external support after operation.

Also the system can be used in stabilization of the spine, spondylolysis, spondylolisthcsis in the correction of kypholie deformities and in the primer or seconder tumors of the spine.

The important point is the restoration of the medullar canal and reduction of the bone can be achieved between 5-10 days after the fracture. After 10 days it is quite difficult to achieve it.

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