The external fixation test of the lumbar spine

30 complications in 25 of 100 consecutive patients

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We retrospectively analyzed the rate and character of complications in a series of 100 consecutive external fixation tests during 1985–1991. There were 30 complications in 25 patients. The most common was pin tract infection, which was definite in 12 cases and probable in 6. Altogether 12 patients developed complications that resulted in removal or reapplication of the device. 8 cases had an incorrect position of a Schanz screw; 3 of these had neurological complications. The only variable having a significant association with complications was the duration of the test. Because of this complication rate, the indications for the test should be carefully considered.

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We have studied the rate and character of complications in a series of 100 consecutive patients, who underwent the external fixation test of the lumbar spine.

Patients and methods

100 patients with intractable low back pain and suspected instability of the lumbar spine underwent an external fixation test between January 1985 and May 1991 at our hospital. 61 of the patients were women, and the mean age was 43 (27–61) years. Two thirds had undergone previous surgery for herniated discs, spinal stenosis, or fusions for segmental instability, often 2 or more spinal operations (Table 1). The tested spinal segments were chosen on the basis of clinical, radiological (myelogram, CT, extension-flexion pictures), and neurophysiological findings. Suspected underlying conditions were in multi-operated patients (n 46), disc degeneration with low back pain (n 33), lytic spondylolisthesis (n 15), and degenerative spondylolisthesis (n 6). The most often tested segments were L4–S1 and L4–L5.

The Schanz screws were inserted through small skin incisions; an imaging intensifier was used to control the position of the screws in the AP and lateral views. The procedure was performed under general anesthesia in 91 cases and under local anesthesia in 9 cases. The AO external fixator (Schläpfer and Wörsdörfer 1980, Magerl 1981, 1982, 1984, Schläpfer et al. 1982) was applied for the fixation test. The distraction of the involved segment or segments was introduced already on the operation table. The patients were mobilized on the first postoperative day after radiographic control. During the test the patients usually were hospitalized. They were encouraged to perform activities that usually caused them pain. According to the pain response more distraction or compression was produced with the frame. The mean duration of the test was 20 (7–46) days. Prophylactic antibiotics were not given.

The postoperative radiographs were reviewed in order to register possible incorrect positions of the screws. Additionally, all neurological and vascular complications or fixator problems were recorded. Probable associations of the complications to variables like age, sex, previous operations, duration of the test, and experience of the surgeon in performing the test were analyzed.

For statistical analysis the Chi square and Student's *t*-test were used. A stepwise logistic analysis was used when explaining the occurrence of complications with more than one variable.

Table 1. Previous spinal operations in 69 patients

Number of operations	Number of patients
1	22
2	23
3	18
4	4
5	1
7	1

Table 2. Complications of the test

	n
Pin tract infection	18
definite 12	
probable 6	
Incorrect radiological position of the screw	7
Incorrect segment tested	1
Neurological deficits	3
Loosening of a screw	1
Total	30

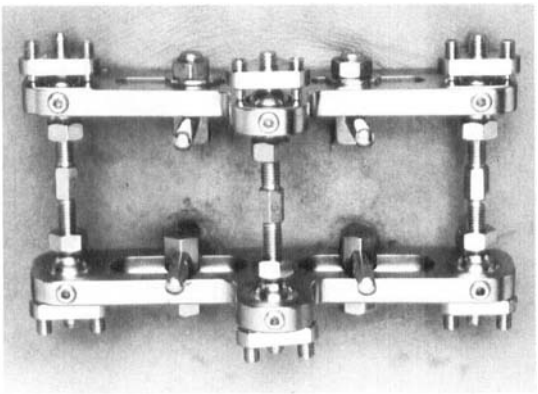

Figure 1. The AO external fixator (Magerl-Schläpfer).

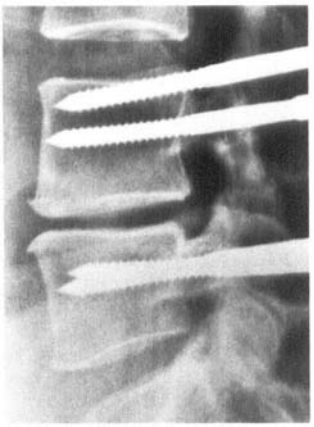

Figure 2. The lateral radiograph reveals a Schanz screw lying cranial to the pedicle. The patient had no neurological deficit and was painfree during the test.

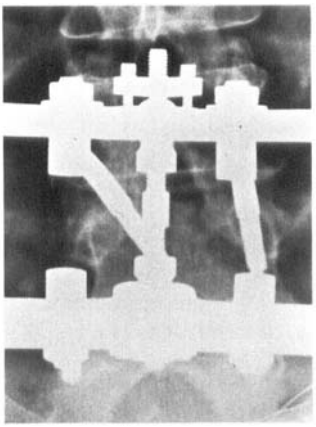

Figure 3. In the AP radiograph, the left L4 Schanz screw lies medially to the pedicle. This patient had a transient L5 root lesion.

Results

30 complications were recorded in 25 patients (Table 2). The most common complication was pin tract infection, which was overcome with antibiotics in 10 cases, and the subsequent interbody fusion could be carried out. In 8 cases the pin tract infection resulted in the removal of the external device. Cultured bacteria were *Staphylococcus aureus, Staphylococcus epidermidis,* and beta-hemolytic streptococcus.

In the retrospective radiographic analysis, the position of 1 or more Schanz screws was assessed to be incorrect in 7 patients. 3 of these patients had neurologic damage, all affecting L5-root level, and resulting in removal of the frame. 1 of these lesions was permanent, 2 were transient. In 1 additional case the device was erroneously applied to a wrong segment, and was subsequently reapplied. There were no cases with vascular damage or leakage of CSF in this material. So 12 of the 30 recorded complications resulted in removal or reapplication of the external frame. Out of the 100 test patients, 74 underwent subsequent anterior interbody fusions.

There was no association of complications with the age, sex, number of previous operations or indications for the test in this material. The only variable which was associated with the occurrence of complications was the duration of the test. In 75 patients without any complications, the mean duration of the test was 18 (7–36) days, whereas in 25 patients with complications it was 23 (12–46) days ($P < 0.05$). The surgeon with the most experience with the external fixation test had less complications (13/65) than the other surgeons (12/35) but the difference was not significant.

A stepwise logistic regressive analysis was used when explaining the occurrence of complications with more than one variable. There was no combination of variables with significant influence on the occurence of complications.

Discussion

The external fixation test of the lumbar spine appears to be a procedure associated with numerous complications. According to our results, the rate of complications is higher than reported in the literature. Only few complications of the external fixation test of the lumbar spine have been reported. Olerud et al. (1986) reported 1 case with leakage of cerebrospinal fluid and 2 cases of irritation of neural elements in their series of 18 patients; minor wound irritation was noted in several patients. Esses et al. (1989) reported a case of serosanguinous drainage from a sacral pin as the only complication in a series of 35 patients. Jeanneret and Magerl (1991) recorded 4 cases with superficial infection and 1 case with partial, transient lesion of the fourth lumbar root in their series consisting of 56 patients tested with external fixation of the lumbar spine. In our series, all possible complications were recorded, also those without clinical importance. In 10 of the 18 cases, the pin tract infection did not interfere with the subsequent interbody fusion. 3 of the 7 patients with an apparent incorrect position of a Schanz screw had neurological deficits.

The external fixation test is a disaster for a patient who suffers permanent neurological damage. The indication for an external fixation test of the lumbar spine must therefore be very thoroughly considered. In cases with intractable low back pain and suspected instability, however, our diagnostic arsenal is very limited; the test offers one of the few possibilities to evaluate these patients for subsequent spinal fusion.

References

Esses S I, Botsford D J, Kostuik J P. The role of external spinal skeletal fixation in the assessment of low back disorders. Spine 1989; 14 (6): 594–601.

Jeanneret B, Magerl F P. Diagnostische Stabilization der Lendenwirbelsäule und des Iliosakralgelenkes mit dem Wirbel Fixateur externe. In: Die degenerative Instabilität der Lendenwirbelsäule (Eds. Benini, A, Magerl, F. P.) Hans Huber, Bern 1991: 118–26.

Magerl F P. Clinical applications on the thoracolumbar junction and the lumbar spine with a fixateur externe. In: External Skeletal Fixation (Ed. Mears, D. C.) Williams & Wilkins, Baltimore 1981.

Magerl F P. External skeletal fixation of the lower thoracic and the lumbar spine. In: Current Concepts of External Fixation of Fractures (Ed. Uhthoff, H. K.) Springer Verlag, Berlin 1982: 353–66.

Magerl F P. Stabilization of the lower thoracic and lumbar spine with external skeletal fixation. Clin Orthop 1984; 189: 125–41.

Olerud S, Sjöström L, Karlström G, Hamberg M. Spontaneous effect of increased stability of the lower lumbar spine in cases of severe chronic back pain. The answer of an external transpeduncular fixation test. Clin Orthop 1986; 203: 67–74.

Schläpfer F, Wörsdörfer O. Methode zur Bestimmung von Kräften und Momenten im Fixateur externe, verwendet bei Instabilitäten der lumbalen Wirbelsäule. Z Orthop 1980; 118: 679.

Schläpfer F, Wörsdörfer O, Magerl F P, Perren S M. Stabilization of the lower thoracic and lumbar spine: comparative in vitro investigation of an external skeletal and various internal fixation devices. In: Current Concepts of External Fixation of Fractures (Ed. Uhthoff, H. K.) Springer Verlag, Berlin 1982: 367.