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Temporary external fixation for low back pain: is it worth doing?

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Abstract Thirty-three patients with low back pain underwent spinal fusion following a positively predicting external fixation test. Thirty-two spinal fusions and one sacroiliac joint fusion were performed. The complications following the use of the external fixator were significant. The results following spinal fusion were not related to the positive response to the external fixator. Multi-

ple variables affect the results of spinal fusion. We feel that the external fixator test in low back pain management is very invasive, and its use cannot be justified.

Key words Low back pain · External fixation

Introduction

Olerud et al. [7], Esses et al. [1] and, finally, Jeanneret et al. [4] reported results of a trial of temporary external fixation to investigate its value in predicting the outcome of surgical fusion for low back pain [1, 4]. The impression given by the above papers is that temporary external fixation of the spine is superior to plain radiographs, discograms and facet blocks in predicting surgical results.

Olerud's paper [7], however, did not report the results of the fusion operations that were performed based on the results of the external spinal fixation test. In Esses's series, the subjective nature of the results, which were uniformly described "significant pain relief" in all patients, makes conclusions concerning the prognostic values of external fixation uncertain.

Only 41% of patients who underwent surgical fusion following a positively predicting external fixation test in Jeanneret's series had good results. Seven patients out of nine who underwent spinal fusion following a negative response to the external fixation test had poor results. We report the results of surgical fusion in 33 patients who responded positively to external fixation.

Materials and methods

More than 100 external fixation tests of the lumbar spine for identification of the source of low back pain were performed in the Harlowood Orthopaedic Hospital and the Centre for Spinal Study and Surgery between 1983 and 1994. In 33 patients (15 female, 18 male) enough data were obtained for the current study. The average age of these patients ($n = 54$) was 43.5 years. In 23 patients pre- and post-external fixation Oswestry disability scores were obtained from the medical records, and an update follow-up was conducted in 1996. In ten patients the study was carried out prospectively.

In 15 patients, the main complaint was chronic low back pain, the duration of which ranged from 5 to 7 years. In 17 patients the presenting symptoms were low back and unilateral leg pain with a back:leg pain ratio of 80:20. The sacroiliac joint was the source of pain in one patient (the 33rd). Degenerative disc disease was considered to be the source of pain in 15 patients, and 15 patients had undergone prior discectomy (this procedure had been carried out between 6 months and 3 years prior to presentation). The cause of back pain was mechanical in three patients (two had grade I spondylolisthesis of L5/S1 and in one the low back pain originated from the right sacroiliac joint following previous pelvic injury). Three patients were moderate cigarette smokers; otherwise, they were all fit.

All patients were assessed by the spinal surgeon, the physiotherapist and the occupational therapist. They had all been through at least a course of physiotherapy and some had received help from the occupational therapist. Several investigations were carried out prior to the external fixation of the spine. These investigations

were carried out in patients not coping with the pain in spite of pain killers and several other nonsurgical measures. These patients were keen beforehand to undergo any surgery that might help their back and leg pain.

The investigations performed were plain X-rays of the lumbar spine (in patients with mechanical low back pain, lateral views in dynamic extension and flexion together with static anteroposterior X-rays were performed). Myelography, early in the series, MRI later, discography, facet block and CT were carried out at one stage or another in most of these patients.

The external fixator was an AO type with a special Magerl frame mounted horizontally. The device allowed loosening and retightening of the frame pin junction. The choice of segments to be included in the fixation was based on the findings of the investigations. The procedure was carried out percutaneously; under X-ray monitoring a guide wire was inserted to locate the pedicle with the patient in a prone position. General anaesthesia was used in all cases. The procedure was carried out under strict aseptic conditions.

The aim of externally fixing a lumbar spinal motion segment was to prevent movement. If this improved the pain, fusion would be planned for 3 months after removal of the external fixator. All patients either claimed they experienced some level of pain relief or, in the case of continued pain, were unable to specify whether the source of pain was their original low back pain or pain caused by the fixator pins. Psychiatric patients with back pain and patients with disease at more than three levels were excluded from the study. Fixation was applied to L3/4 in three patients, L2/3 in two patients, L4/5 in five patients, L5/S1 in ten patients, L4/S1 in eight patients, L3/S1 in four patients, and in one patient S1 was fixed to the iliac bone.

A prophylactic postoperative antibiotic to prevent pin tract infection was used in all the cases until the removal of the external fixator. The pin tract site was cleaned every day with a saline solution or betadine. A special turtleshell cover on the frame was used postoperatively to avoid any injury. The patient was asked to sleep on their side with the external fixator on.

Pre- and post-external fixation and post-fusion abilities were compared using the Oswestry disability scoring system [2]. The patients included in this study had disability scores ranging from 60–80%. Pain was assessed by asking the patients to quantify the percentage of pain relief, categorized as follows [5]:

1. Greater than 75% pain relief
2. 25–75% pain relief
3. Less than 25% pain relief
4. Worse

The assessment was carried out in a double-blind study by the research fellow (K. A.) and the physiotherapist during hospital visits every few days. The frame pin junction was loosened without the knowledge of the patient, to avoid patient bias. In multisegmental external fixation, the assessment was made for each segment separately by loosening the pin frame junction of one segment while leaving the other segment tight. An electrical device was used to measure the movement of the spinal segment between the two pins during flexion and extension of the spine. The electrodes were attached to the end of the pins after disconnecting the frame. The frame was reattached to the screws later.

The external fixator was removed eventually under local anaesthesia on the ward.

Results

The follow-up period ranged from 2 to 11 years; the final follow-up was conducted by phone and by means of an

Oswestry questionnaire sent to the patients through the mail.

The mean period for which the external fixator was left in situ was 19.29 days (range 6–42 days). Early in the series, the external fixator was left in place for a longer period in the hope that this would encourage adhesion at the level of the diseased spinal segment. This concept was dropped later, because of the complications that developed, especially pin tract infection. In patients kept in an external fixator for a long period, the pain recurred, following its removal. The following complications were encountered during and after application of the external fixator:

1. Difficulty in introducing the Schanz screw (five cases)
2. Sterile oozing and discharge (seven cases)
3. Gram-negative pin tract infection (three cases), gram-positive pin tract infection (two cases)
4. Loosening of the pins (seven cases; in one case the pins and the frame fell down in one piece 2 days after application) and breakage of one of the Schanz pins (one case)

Generally, all the patients were stressed by the procedure. External fixation relieved the pain in every patient in the series, and all of them were accordingly operated upon (single-level fusion). Four methods of surgical fusion were used according to the preference of the surgeon and the pathology.

1. Combined anterior and posterior fusion (nine cases), using either a translamina [1] or pedicle screw system [8] posteriorly and femoral allograft anteriorly through a retroperitoneal approach.
2. Posterolateral instrumented fusion using a pedicle screw system (Steffie in six cases Dick's in four and a pedicle screw system in eight)
3. Non-instrumented fusion in five cases
4. Anterior sacroiliac fusion using bone graft and plating, carried out in the patient with sacroiliac joint pain

Assessment of the results was based on the percentage of pain relief and whether the patient believed that the operation had been worthwhile or not. The percentage change in Oswestry disability score following surgery was also considered, using the following categories [5]:

Good:

1. Greater than 75% pain relief
2. Operation was considered to be worthwhile by the patient
3. Oswestry disability score of 0–40%

Fair:

1. 25–75% pain relief
2. Operation was considered to be worthwhile by the patient
3. Oswestry disability score of 41–60%

Poor:

1. Less than 25% pain relief
2. Operation was considered not to be worthwhile by the patient
3. Oswestry disability score of 61–100%

In addition to the clinical assessment, these patients also underwent a radiological assessment of the fusion on the basis of anteroposterior and lateral X-rays of the spine at the region of the fusion taken 6 months, 1 year and again 2 years after fusion.

The results of the combined anterior and posterior spinal fusion ($n = 9$) were: good in six cases, fair in two and poor in one. The results of the posterolateral instrumented spinal fusions ($n = 18$) were: good in four cases, fair in nine and, poor in five. All the patients operated with non-instrumented spinal fusion ($n = 5$) had fair results. The patient who underwent a sacroiliac joint fusion also had a fair result.

The results of fusion correlated with the preoperative MRI findings and discograms. Unsatisfactory results after fusion surgery in our series were due to:

1. Pain from other segments in multiple segmental lumbar spine back pain (four cases).
2. Implant problems (five cases). In these cases, the implant was removed after fusion had resulted in a certain level of pain relief.
3. Delayed bone graft healing (two cases)
4. Problems not directly related to the procedure: pain from the scar of operation (two cases), neural and vascular injury sustained during the procedure (two cases).

Discussion

These results show that significant relief with an external fixation device does not predict a satisfactory outcome after spinal fusion. All groups who have used the technique have been impressed with the high level of relief obtained in a large number of patients when the fixator is applied. Although it is likely that a placebo effect occurs even when care is taken to exclude this possibility by rigidly fixing the fixator unknown to the patient at some stage after its application, the number of patients obtaining relief is high and not subsequently reflected in the clinical suc-

cess of fusion. It may be that the insertion of pins in the bone, or the muscles has some effect additional to immobilization, or that the presence of the fixator alters the loading pattern over the disc that a subsequent fusion does not achieve. Even patients who obtain a good clinical result commonly say that the effect of the fixator when it was applied was better.

There are, of course, many other variants that may affect the clinical success of a fusion, including of course the fact as to whether fusion was achieved. Certainly in the first series we reported [5] failure of fusion (instrumented posterolateral) may well have explained up to half of the failures.

There is a significant complication rate with the procedure. Olerud et al. reported one case with a cerebrospinal fluid leak and two with root irritation [7]. Esses, however, had only one complication in 35 patients, a serosanguinous leak from a sacral pin [1]. In series reported by Jeannert, 18 complications were reported in 17 patients out of 101 patients [4]; 12 had pin tract infections, and operative debridement and antibiotic therapy for 6 weeks were necessary in 3 patients. There were 5 patients with root pain; one screw had to be removed because of this. Two patients had emotional disturbances requiring early removal of the device.

Soini et al. reported 30 complications in 25 consecutive patients, most commonly pin tract infection, 12 required removal of the device and its reapplication, and there were three neurological complications [8]. Complications were higher in our series early on, indicating technique is important. It is important that the patient is treated with antibiotics prophylactically.

In the group of patients in whom this technique has its greatest value, that is patients with chronic disabling back pain, the source of which is unclear as to level, and the degree of disability indicates the likelihood of a significant non-organic element, it is particularly unfortunate if a complication occurs, as the added pain source is likely to prejudice the clinical success of a fusion.

These emotionally disturbed patients seeking a surgical solution to a problem that may be insoluble certainly will tend to report improvement of pain in the knowledge that such a report will make it likely that they will be rewarded by an operation. In evaluating the response to the fixator it is important to use an objective physical assessment of improvement insofar as the presence of the fixator allows. In making the decision as to whether to fuse the back in a patient with much illness behaviour, but with undoubted segmental dysfunction, the external fixator has been of less value than we had hoped. Not infrequently the dramatic cure the fixator has apparently produced is not reflected in a satisfactory clinical result after fusion.

It is, however, a valuable technique in the patient without illness behaviour who has two segmental potential pain sources in the spine, separated by one or two segment levels. Delay in actually fixing the segments is im-

portant, and a careful objective assessment of the response should be made. Technique is vital to ensure a minimum of complications. Its role in the patient with marked illness behaviour is questionable. In such patients all the other factors that may influence results, compensation claims, work status, domestic problems, etc. are still

probably more important determinants than a positive response to external fixation. The possibility that external fixation may have some other effect on pain generation or pain experience other than producing rigidity of the segment must be considered.

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