Surgical treatment of spondylolysis and spondylolisthesis with a hook screw

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Summary. Seventeen patients with spondylolysis and minimal spondylolisthesis were treated with a Morscher hook screw and bone grafting. At follow up, 82% had no symptoms and radiographs confirmed fusion of the isthmic defect. One patient had occasional pain, and two had an unsatisfactory result. They were both over 25 years of age and had a moderate displacement of 3–4 mm.

Résumé. Dix-sept malades, de 19 ans d’âge moyen, atteints de spondylolyse avec spondylolisthèse modéré ont été traités selon la méthode de fixation décrite par Morscher, au moyen d’une vis à crochet et par greffe iliaque. Les malades ont été revus avec un recul moyen de 3,6 ans. Chez 14 patients (82%) les résultats ont été excellents, avec consolidation radiologique de l’isthme. Chez un malade le résultat a été bon. Chez deux malades ayant dépassé l’âge de 25 ans et présentant une spondylolyse avec un glissement supérieur à 3–4 mm les résultats ont été mauvais. La technique est efficace chez les sujets jeunes, avant l’âge de 25 ans, atteints d’un spondylolisthèse avec déplacement modéré, ne dépassant pas 3 à 4 mm.

Introduction

The incidence of spondylolysis in the general population ranges from 2% to 5% [1, 12]. Most children and adults have no symptoms [10], and can be treated conservatively [13, 14, 15]. If this fails to relieve the symptoms, surgical treatment is indicated and several techniques have been described [3, 9].

This paper presents our experience with the treatment of symptomatic spondylolysis and grade I spondylolisthesis with the Morscher hook screw which we have used since 1987.

Material and method

Twelve patients with spondylolysis and 5 with grade I spondylolisthesis were treated with the Morscher hook screw from August 1987 to December 1990. There were 11 men and 6 women, aged from 14 to 31 years (average 19 years) at the time of operation. Nine were younger and 8 were older than 20 years. Seventeen were followed for a minimum of 2 years (average 3.6 years, range 24 to 64 months) (Fig. 1).

Every patient had low back pain which was associated with sciatica in 7. All had received conservative treatment previously with analgesia, rest and exercises; 6 patients wore a brace for from 2 to 6 weeks. These measures failed to relieve pain significantly.

Fifteen patients had spondylolysis at the L5 level on both sides, one at L3 on the left side only, and one, aged 25 years, had bilateral spondylolysis at the L2, L3 and L5 levels. Displacement was from 3 to 4 mm in 4 patients, and 6 mm in one; 12 had no displacement. The functional radiological instability of the affected segment was assessed in 5 patients, 4 older and one younger than 18 years.

Other radiographic abnormalities included a thoracic kyphosis in one and increased lumbar lordosis in 4, as measured by the Wiltse and Winter method [16]. Five patients had Schmorl’s nodes affecting 2 to 3 segments of the lumbar spine. Plain radiographs and CT scans showed that none of the patients had degenerative changes at the involved segment. Myelography showed no indication of root compression in the 7 patients with sciatica.

Electromyography revealed chronic nerve root irritation at the L5 level in 5 patients with sciatica. In 12, low back pain was not associated with sciatica.

Operative technique. In the technique described by Morscher et al. [11], the involved vertebral arch and the spondylolytic defect is exposed; connective tissue in the defect is removed together with the sclerotic margins of the adjacent bone ends. After exposing the superior articular process of the affected
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Age distribution at the time of surgery

![Age distribution at the time of surgery](image)

Clinical results according to Henderson.

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**Fig. 1.** Histogram showing the age distribution of the patients at the time of operation

**Fig. 2.** Histogram showing the clinical results in 17 patients (Henderson’s grading)

Table 1. Henderson categories of functional capacity [8]

<table>
<thead>
<tr>
<th>Category</th>
<th>Functional capacity</th>
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<tbody>
<tr>
<td>1 (Excellent)</td>
<td>No pain. Able to return to former occupation with no restrictions. Sports or recreational activities are unrestricted</td>
</tr>
<tr>
<td>2 (Good)</td>
<td>Occasional pain, no more than 12 h after very strenuous activity</td>
</tr>
<tr>
<td>3 (Fair)</td>
<td>Less pain than preoperatively, but still a problem. Must either wear an external support at work or be restricted to lighter work than before. Sports and recreation are restricted</td>
</tr>
<tr>
<td>4 (Poor)</td>
<td>No better than preoperatively. Unable to work. Continues to seek medical help for his pain</td>
</tr>
</tbody>
</table>

Table 2. Radiographic results

<table>
<thead>
<tr>
<th>Preoperative spondylolysis</th>
<th>No. of patients</th>
<th>Postoperative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Fusion</td>
</tr>
<tr>
<td>Without displacement</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>With displacement 3–5 mm</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>17</td>
<td>15</td>
</tr>
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</table>

Vertebra, the adjacent ligamentum flavum near the the spinous process is cleared from the inferior edge of the arch, and a small notch made in the inferior part. The hook is then placed on the arch and a 2.5 mm drill is driven into the superior articular process from below, outside the defect. Both cortices of the process must be penetrated. Cancellous bone obtained from the iliac crest is placed in the defect. The screw is then passed through the hook and the bone on both sides of the affected arches. Two nuts are placed on the screw in order to obtain better compression, and this may reduce a slight spondylolisthesis.

All the patients were operated on by the same surgeon.

After operation, the patients were confined to bed for 2 weeks, followed by immobilisation in a plaster corset, including one leg to mid-thigh. This corset was worn for 12 weeks, and replaced by a soft corset for the next 6 to 12 weeks. Radiographs were taken postoperatively and after 3 months. The patients were allowed to return to their normal activities 6 to 8 months after operation, but heavy work and bending was avoided for a further 6 months.

The clinical results were evaluated by Henderson’s criteria [8] (Table 1).

**Results**

At follow up, 14 of the 17 patients were free of pain and had full movement of the lumbar spine with no signs of root irritation (Table 2). They all returned to normal work and sporting activities. Radiographs confirmed that the isthmic defect was fused in all of them (Figs. 2 and 3). There were 3 patients with less than excellent results:

The first was a man, aged 21 years, who showed significant improvement in his symptoms but complained of low back pain during heavy work and slight pain on bending, which was relieved by movement. He was classified as a good result. Preoperative radiographs had shown a spondylolisthesis of 5 mm which was reduced by 4 mm after operation. He resumed light physical work after 10 months. At 2 1/2 years after operation, the defect was completely fused with no signs of instability at the involved level. Movement of the lumbar spine was not limited and there were no signs of nerve root irritation.

The second was a woman, aged 31 years, whose symptoms remained unchanged 3 years after operation. She complained of low back pain and sciatica, but had no limitation of lumbar movement and no neurological deficit. An EMG showed slight irritation of the L5 root which was present before operation. Radiographs showed that the defect, which was 5 mm across, had not fused; she