ABSTRACT

Purpose. To report outcomes of 7 patients with bacterial spondylodiscitis treated through a posterior approach.

Methods. Five men and 2 women aged 40 to 80 years underwent one-stage posterior interbody debridement and instrumentation for single-segment bacterial spondylodiscitis of lumbar (n=5) or thoracic (n=2) vertebrae. The Oswestry Disability Score, the Frankel classification, the Cobb angle, and the visual analogue scale (VAS) for pain as well as bone union on radiographs were assessed.

Results. Patients were followed up for 19 to 36 months. None had relapses or complications. Postoperatively, 5 patients had no pain or used analgesics only occasionally; their VAS scores varied from 0 to 20. The remaining 2 patients had residual symptoms and received regular peripheral pain medication and opiates; their VAS scores ranged from 30 to 50. The mean Oswestry Disability Score improved to 21 (range, 12–38). The mean Cobb angle improved from 13.1° to 11.1°. The segments were probably fused in 5 patients and questionable in 2.

Conclusion. Posterior debridement and instrumentation was adequate for single-segment spondylodiscitis and achieved good outcomes.

Key words: discitis; spine

INTRODUCTION

Bacterial spondylodiscitis is rare; its incidence in Germany is approximately one in 250 000 persons per year.1 It can be fatal in up to 9% of patients,2,3 and results in permanent neurological deficits in up to 33% of them.3,4 Most patients can be treated with immobilisation (bed arrest, orthosis) combined with empirical antibiotics.3,5,6 Surgical intervention is indicated when there is (1) any interspinal space-occupying mass (e.g. epidural abscess), (2) bacteriological and/or histopathological diagnosis but negative percutaneous biopsies, (3) advanced destruction of vertebral bodies together with kyphosis, (4) rapid neurological deterioration, and (5)
septic progression. The optimal operating strategies and approaches remain controversial.7–9 Some recommend (anterior or posterior) debridement, bed rest, and immobilisation (with a brace or through posterior instrumentation).10,11 Anterior debridement combined with bone grafting using one- or 2-stage posterior instrumentation is the standard approach.3–5,12–16

In our clinic, posterior lumbar interbody fixation has been performed for patients with a small abscess in the anterior portion of the vertebral body connected to a disc, so that drainage can be accomplished through the posterior approach. It has also been performed for those with spinal stenosis and those with an abscess in the posterior portion of the dura. We report outcomes of 7 patients with bacterial spondylodiscitis treated through a posterior approach.

MATERIALS AND METHODS

From January 2006 to June 2007, 5 men and 2 women aged 40 to 80 years underwent one-stage posterior interbody debridement and instrumentation for single-segment bacterial spondylodiscitis of lumbar (n=5) or thoracic (n=2) vertebrae (Table 1). This approach enabled immediate ambulation/rehabilitation. Ideal candidates are those with limited vertebral body destruction, single-segment involvement, epidural abscesses in the posterior dura, and spinal stenosis.

Diagnosis was based on radiography, contrast magnetic resonance imaging, and elevated levels of infection markers. The interval from presentation to diagnosis was 7 to 10 weeks. All patients presented with increased white blood cell count (range, 12.5–14.8 g/dl), erythrocyte sedimentation rate (range, 40–100 mm/h), and C-reactive protein level (range, 56–204 mg/l). Only 2 patients were febrile. No patient had a history of operations or injections near the spine, and thus the spondylodiscitis was endogenous. Two of the patients had urogenital infection, and 3 had diabetes mellitus.

The posterior elements were exposed. The entire posterior complex up to the base of the pedicles (including the transverse processes, facet joints, and lamina) was excised. This exposed the dura, the exiting and the descending nerve roots on both sides. These neural structures were carefully dissected and lifted off the posterior longitudinal ligament using a bipolar cautery. The affected intervertebral disc was exposed and curetted out on one side, followed by the other.

All visible inflammatory tissues were debrided. The interbody was fused with 2 tricortical iliac crest grafts positioned between the vertebral bodies as posterior lumbar interbody fusion. Deformity was corrected by positioning the patient on the table. Posterior instrumentation was carried out with pedicle screws and rods.17 Two vertebral bodies above and below the affected segment were included.

Intra-operative smears and tissue samples were taken for histological and microbiological assessment. Antibiotics were administered intravenously for 12 to 20 days. When inflammatory marker levels declined to normal values, oral antibiotics were given for a further 12 weeks.

<table>
<thead>
<tr>
<th>Patient no.</th>
<th>Sex/age (years)</th>
<th>Segment involved</th>
<th>Neurological status (Frankel grade)</th>
<th>Cobb angle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Preop</td>
<td>Postop</td>
</tr>
<tr>
<td>1</td>
<td>M/62</td>
<td>T6/7</td>
<td>Incomplete paraparesis of both legs (C)</td>
<td>Complete resolution (E)</td>
</tr>
<tr>
<td>2</td>
<td>M/40</td>
<td>L4/5</td>
<td>Incomplete L5 lesion unilaterally (D)</td>
<td>Incomplete resolution, persistent L5 lesion, muscle strength of 3/5 (D)</td>
</tr>
<tr>
<td>3</td>
<td>F/73</td>
<td>L3/4</td>
<td>Incomplete L4 lesion unilaterally (D)</td>
<td>Complete resolution (E)</td>
</tr>
<tr>
<td>4</td>
<td>M/80</td>
<td>L2/3</td>
<td>Complete paraparesis of both legs and bladder-colon disturbances (B)</td>
<td>Incomplete resolution, recovery bladder-colon disturbances, both quadriceps strength of 4/5, dysesthesia of the genital area (D)</td>
</tr>
<tr>
<td>5</td>
<td>W/67</td>
<td>T12/L1</td>
<td>Incomplete paraparesis of both legs (C)</td>
<td>Complete resolution, recovery of walking ability, quadriceps and iliopsoas strength of 4/5, dysesthesia of the genital area and light bladder-colon disturbances (D)</td>
</tr>
<tr>
<td>6</td>
<td>M/63</td>
<td>L3/4</td>
<td>Complete L4 unilaterally (C)</td>
<td>Complete resolution (E)</td>
</tr>
<tr>
<td>7</td>
<td>M/48</td>
<td>T11/12</td>
<td>Incomplete paraplegia T12 (C)</td>
<td>Complete resolution (E)</td>
</tr>
</tbody>
</table>
Postoperatively, physiotherapy was given for 6 weeks with a semi-elastic lumbar bandage for 3 months. The Oswestry Disability Score, the Frankel classification, the Cobb angle, and visual analogue scale (VAS) for pain, as well as bone union on radiographs were assessed. Patients were followed up at weeks 6, 12, and months 6 and 24.

RESULTS

Patients were followed up for 19 to 36 months; none had relapses or complications (Table 1). Organisms were identified in 5 of the patients only. The most common was *Staphylococcus aureus* (n=3), followed by coagulase-negative *Staphylococcus* (n=1) and *Enterococcus* (n=1).

Postoperatively, 5 patients had no pain or used analgesics only occasionally; their VAS scores varied from 0 to 20. The remaining 2 patients had residual symptoms and received regular peripheral pain medication and opiates; their VAS scores ranged from 30 to 50. The mean Oswestry Disability Score improved to 21 (range, 12–38). The mean Cobb angle improved from 13.1º to 11.1º. The segments were probably fused in 5 patients and questionable in 2 (Fig.).

DISCUSSION

Intervertebral fusion and instrumentation for spondylodiscitis can be performed through the anterior-posterior approach (in one or 2 stages), anterior fusion and grafting only (with or without anterior instrumentation) or a posterior approach combined with interbody bone grafting, with or without posterior instrumentation (Table 2). It is important to debride inflammatory and necrotic tissue, correct or prevent deformity by fusion, and decompress neural structures. Anterior fusion and bone grafting combined with posterior instrumentation is considered the standard procedure. Patients with titanium cages or those with posterior instrumentation have greater improvement in sagittal alignment than those without.

Most patients can be treated by immobilisation and antibiotic treatment. Surgery should be performed when there are epidural abscesses and neurological symptoms, kyphosis, and persistent pain, or when conservative treatment is ineffective. Decompression by laminectomy only may result in instability and failure. It should be combined with posterior instrumentation and fusion using autologous bone grafts. This achieves a fusion rate.
**Table 2**

Review of the literature[^19-28,33,34]

<table>
<thead>
<tr>
<th>Study</th>
<th>No. of patients</th>
<th>Mean patient age (years)</th>
<th>Pathogen</th>
<th>Antibiotic treatment (months)</th>
<th>Treatment*</th>
<th>Follow-up (months)</th>
<th>Outcome</th>
<th>Radiographic outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fayazi et al., 2004</td>
<td>11</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Chronic suppressive therapy</td>
<td>17</td>
<td>No recurrence; one died, 7 pain-free</td>
<td>One pseudoarthrosis</td>
</tr>
<tr>
<td>Korovessis et al., 2006</td>
<td>14</td>
<td>54</td>
<td>Mostly S aureus</td>
<td>4.4±0.8</td>
<td>APF with titanium cage</td>
<td>45</td>
<td>No recurrence; a mean of 1.5 Frankel grade improvement</td>
<td>100% fusion</td>
</tr>
<tr>
<td>Lerner et al., 2005</td>
<td>46</td>
<td>66</td>
<td>Mostly S aureus</td>
<td>4</td>
<td>APF with titanium cage vs. iliac bone grafts</td>
<td>31</td>
<td>76% recovered from neurological impairment; a mean Roland Morris Score of 6.6</td>
<td>100% fusion for iliac bone grafts; 53% fusion for titanium cages</td>
</tr>
<tr>
<td>Ruf et al., 2007</td>
<td>70</td>
<td>62</td>
<td>Mostly S aureus</td>
<td>3–6</td>
<td>APF with titanium cage</td>
<td>41</td>
<td>No recurrence; neurologic status unchanged in 37 patients, 26 patients improved 1 Frankel grade, 7 patients improved 2 Frankel grades, one patient worsened 1 Frankel grade.</td>
<td>100% fusion</td>
</tr>
<tr>
<td>Krodel et al., 1991</td>
<td>24</td>
<td>50.2</td>
<td>Tuberculous spondylitis</td>
<td>-</td>
<td>AF with autologous bone grafts</td>
<td>36</td>
<td>No recurrence</td>
<td>100% fusion</td>
</tr>
<tr>
<td>Pee et al., 2008</td>
<td>60</td>
<td>58</td>
<td>Mostly S epidermidis</td>
<td>3</td>
<td>APF with titanium cage vs. iliac bone grafts</td>
<td>36</td>
<td>No recurrence; improved 5 visual analogue scores for pain; 50% improvement in Oswestry Disability Score; of 16 patients with neurological impairment, 11 improved and 5 unchanged</td>
<td>56 of 60 patients showed solid fusion</td>
</tr>
<tr>
<td>Hopf et al., 1998</td>
<td>34</td>
<td>53.2</td>
<td>Mostly M tuberculosis and S epidermidis</td>
<td>-</td>
<td>AF vs. APF with autologous and homologous bone grafts</td>
<td>48 vs. 29</td>
<td>No recurrence; group 1: 24 patients pain-free and 10 slight pain; group 2: 31 patients pain-free, 5 slight local pain, and 3 painful sensations</td>
<td>100% fusion in both groups</td>
</tr>
<tr>
<td>Lim et al., 2008</td>
<td>13</td>
<td>51</td>
<td>Mostly Staphylococcus species</td>
<td>-</td>
<td>AF with autologous bone grafts</td>
<td>11</td>
<td>No recurrence</td>
<td>96% fusion rate</td>
</tr>
<tr>
<td>Lee and Suh, 2006</td>
<td>18</td>
<td>57.7</td>
<td>Mostly S Aureus</td>
<td>3.8</td>
<td>PF with autologous bone grafts</td>
<td>32</td>
<td>2 patients improved by 2 Frankel grades (C to E), 11 improved by one grade, and 5 showed no change; Kirkaldy-Willis criteria was excellent in 5 patients, good in 10, and fair in 3</td>
<td>Bony union in 17 patients</td>
</tr>
<tr>
<td>Suess et al., 2007</td>
<td>21</td>
<td>65</td>
<td>Mostly S Aureus</td>
<td>3</td>
<td>AF for lumbar spine and APF with titanium cage for thoracic spine</td>
<td>18</td>
<td>No recurrence; median Denis Pain Scale improved from P4 to P2; 2 patients with neurological impairment improved</td>
<td>-</td>
</tr>
<tr>
<td>Liljenqvist et al., 2003</td>
<td>20</td>
<td>68</td>
<td>-</td>
<td>3</td>
<td>APF with titanium cage</td>
<td>23</td>
<td>No recurrence; a median Roland-Morris score of 6.5; all 5 patients with neurological deficits improved to Frankel grade D or E</td>
<td>100% incorporation</td>
</tr>
</tbody>
</table>

[^19-28,33,34]: AF denotes anterior fusion, PF posterior fusion, and APF anterior-posterior fusion.
REFERENCES

20. Korovessis P, Petsinis G, Kouragas G, Iliopoulos P, Zacharatos S. Anterior surgery with insertion of titanium mesh cage and posterior instrumented fusion performed sequentially on the same day under one anesthesia for septic spondylitis of