OSTEOSYNTHESIS WITHOUT INSTRUMENTATION FOR VERTEBRAL PSEUDARTHROSIS IN THE OSTEOPOROTIC SPINE

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We have performed simple bone grafting in four elderly patients with pain due to unstable pseudarthroses in the osteoporotic spine after compression fracture.

At operation, we observed abnormal movement of the affected vertebral body which was covered with a hypertrophic membrane; this seemed to inhibit the blood supply to the lesion. The thick membrane and avascular granulation in the false joint were excised and bone grafting carried out. Symptoms were dramatically improved immediately after operation and bony union was confirmed in the three surviving patients.

Chronic back pain due to vertebral collapse or spinal deformity is distressing for osteoporotic patients, causing interruption of sleep and difficulty with the activities of daily living.1,2 Many of these vertebral fractures may be asymptomatic, but in the remainder the morbidity is considerable, particularly when several vertebrae are involved.3 The pathomechanism of post-traumatic vertebral collapse is uncertain, but it has been described in association with bone necrosis.4 Since publication by Kempinsky in 19585 of the first description of neurological deficit in these fractures there have been a number of other reports.6-14 The nature of some of these fractures in the osteoporotic spine is uncertain, and the reliability of surgical management has not been established.

Attempts have been made to stabilise these injuries using instrumentation through both the anterior and posterior approaches, but there have been problems with failure of the implants. Kaneda et al9 used an anterior stabilising device with an AW-glass ceramic implant, but encountered sinking of the prosthesis in some patients. Baba et al7 recommended posterior instrumentation but had a similar rate of failure. Sequential compression of adjacent vertebral fractures may occur after the use of rigid fixation in osteoporotic spines.

We performed simple bone grafting for vertebral pseudarthrosis after fractures in four osteoporotic patients and report the results.

PATIENTS AND METHODS

Four elderly patients complained of back pain with no history of injury. They were unable to walk more than 50 metres because of the onset of back pain and had pain when lying supine (Table I). They had all been treated conservatively for at least six months without success.

Operative technique. The patient is placed in the right semisupine position and the affected vertebra exposed through a left retroperitoneal or transpleural approach, sparing the diaphragm. A hypertrophic membrane is found to cover the lateral aspect of the involved vertebra. This is reflected to reveal the pseudarthrosis lined with a layer of avascular granulation tissue (Fig. 1). The membrane is excised and the avascular granulation is minimally curetted to induce bleeding. The kyphosis is reduced manually by local pressure over the spine, and a tricortical iliac bone graft and cancellous bone chips are packed into the open cavity, stabilising the vertebra (Fig. 2).

Table I. Details of the four patients

<table>
<thead>
<tr>
<th>Case</th>
<th>Age (yr)</th>
<th>Gender</th>
<th>Causative factor</th>
<th>Level</th>
<th>Symptom</th>
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<tbody>
<tr>
<td>1</td>
<td>68</td>
<td>F</td>
<td>Lifting</td>
<td>L2</td>
<td>Prolonged back pain</td>
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<tr>
<td>2</td>
<td>74</td>
<td>F</td>
<td>Stooping</td>
<td>L2</td>
<td>Prolonged back pain</td>
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<tr>
<td>3</td>
<td>80</td>
<td>F</td>
<td>Getting up</td>
<td>T12</td>
<td>Prolonged back pain</td>
</tr>
<tr>
<td>4</td>
<td>86</td>
<td>M</td>
<td>None</td>
<td>L4</td>
<td>Left leg pain</td>
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</table>
Illustrated case report. A 68-year-old woman experienced acute back pain after lifting. Radiographs showed a compression fracture of the body of L2 with osteoporosis. Conservative treatment was unsuccessful, and after six months she had a tender kyphosis with pain on lying supine, on movement and on walking. Further radiographs showed multiple compression fractures with abnormal movement at L2 shown on the lateral films (Fig. 3). MRI showed an intravertebral lesion with low intensity on the T1-weighted (Fig. 4a) and high intensity on the T2-weighted scans (Fig. 4b).
Three-dimensional reconstruction of the CT scan revealed a horizontal cleft in the body open anteriorly, giving the appearance of ‘an alligator’s mouth’ (Fig. 5).

At operation the L2 vertebra was approached as outlined above. The serous fluid beneath the hypertrophic membrane shown by MRI was aspirated before the excision of soft tissue. The cavity in the body of the vertebra was lined with avascular granulation tissue (Fig. 1) resembling a pseudarthrosis. The granulation tissue was curetted, the kyphosis reduced and the defect packed with a tricortical iliac bone graft and cancellous chips (Figs 2 and 6a). The pain which she had suffered in the supine position had disappeared when she recovered from anaesthesia.

A body cast was applied two weeks after operation and worn for two months thereafter. Union was achieved at nine months and at 22 months there had been no collapse of the graft (Fig. 6b). There was complete relief of pain.

RESULTS

In all four cases, we saw abnormal movement in the affected vertebral body, and excision of the membrane allowed clear serous fluid to escape from the pseudarthrosis. In two patients, we examined the circulation of the affected vertebra using MRI with and without gadolinium. There was enhancement around the false joint before operation. After operation there was progressive spread into the graft site (Fig. 7), suggesting revascularisation.

All patients had dramatic relief of their pain. There was collapse of the graft in one patient, but bony union was still
Figure 6a – Tomogram immediately after operation. A tricortical iliac bone graft and cancellous bone chips have been packed into the opened cavity. Figure 6b – Solid union is seen at 15 months. The graft has not collapsed 22 months after operation.

Fig. 7a

Postoperative enhanced T1-weighted MRI of a 74-year-old woman with pseudarthrosis of L2. Compared with that at three months (a) (arrow), the enhanced area has spread into the grafted bone at 15 months (b) (arrows).
achieved with relief of symptoms. No notable complications were encountered although one patient died five months later from heart failure. The average length of follow-up was 13 months.

DISCUSSION

Microfractures occur near the endplate of osteoporotic vertebral bodies at a lower loading stress than in normal vertebrae, producing the ‘cod-fish deformity’. More of these fractures are seen in association with degenerate discs. Such microfractures are repaired in patients with normal bone, but this is diminished in elderly patients with osteoporosis. The presence of fibrous granulation tissue and necrotic bone within collapsed vertebral bodies suggests impairment of healing. The presence of a radiolucent area within the vertebral body, the vacuum phenomenon, has been described, but our findings at operation suggest that it is probably related to the serous fluid within a pseudarthrosis. The rapid improvement of the back pain after stabilisation of the spine confirms that the pain was due to instability at the pseudarthrosis, and differs from the uncontrolled movement after injury by high-energy trauma. The posterior elements of the vertebrae are not involved, which makes an anterior surgical approach more logical and allows stabilisation by bone graft with no need for additional instrumentation.

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REFERENCES