EXCISION ARTHROPLASTY FOR INFECTED TOTAL HIP REPLACEMENTS

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A study of excision arthroplasty (Girdlestone's pseudarthrosis) for infected total hip replacements is presented. Twenty-two patients were reviewed with a minimum follow-up of one year. Reduction in pain was significant but the functional results were poor. Factors contributing to poor function were old age, poor medical condition and arthritis of the contralateral hip; these were in addition to the gross instability resulting from the pseudarthrosis. The patients were easily fatigued and dependent on external supports; calipers were found to be unacceptable. The symptoms after excision arthroplasty are compared with those before the original hip replacement.

The relief of pain and restoration of function which follow total hip replacement may be severely compromised if deep sepsis supervenes. The treatment of such infection presents a formidable challenge. Any method of treatment which leaves the infected hip in situ is only sometimes successful and Charnley (1970) suggested that if it caused sufficient symptoms, the implant should be removed. More recently one-stage exchange arthroplasty has been advocated (Buchholz et al. 1979, 1981), but although the early results have been extremely good, the later results are uncertain. We therefore felt it might be useful to review the results of a salvage procedure which had been used for many years, namely removal of the implant and the cement, leaving a pseudarthrosis. We here present the results of 22 such Girdlestone pseudarthroses.

Between 1969 and 1980 3339 Charnley total hip replacements were performed in our unit. Thirty-one patients with unilateral replacements had their implants removed by us, and two had theirs removed elsewhere, bringing the total to 33; this figure was confirmed by a nation-wide survey of orthopaedic surgeons. Of the 31 patients we treated, 22 returned for review. Four of the others had died, one a year after operation and one six years after, both from causes unrelated to their infection; the other two had died in the postoperative period, one from a cerebrovascular accident, the other from recurrent pulmonary embolism. The remaining five patients did not return, partly because they were too disabled to travel, but they are known to be still alive.

CLINICAL MATERIAL

Twenty-two patients were personally reviewed (by JMcE). There were 14 men and 8 women. One patient had previously had an osteotomy, 19 had had their hips replaced for osteoarthritis and three for rheumatoid arthritis. The average age at the time of replacement was 64 years (range 52 to 83 years) and at removal was 69.5 years. The interval before removal of the implant varied from 7 to 123 months with a mean of 32.6 months.

Although infection was suspected in one case as early as one week after operation, the implant was not removed for seven months, when the symptoms had become significant. The initial replacement had been performed through the standard Charnley approach in 21 hips and via the anterolateral approach in one. One patient presented with a dislocation after 10 years, seven presented with discharging sinuses and two with abscesses; two had definite wound infections in the early postoperative period. The follow-up ranged from 15 months to 9 years.

In every case the implant and the cement were first removed and balanced traction was then applied using a Steinmann's pin through the proximal tibia; traction was maintained for an average of six weeks. Appropriate systemic antibiotics were administered for two to three weeks after the operation. Closed suction irrigation was used but not for periods long enough to enable us to evaluate its effectiveness. Thereafter the patients were fitted with an ischial-bearing weight-relieving caliper and encouraged to walk.
RESULTS

We used the Wrightington classification which is based on that of Merle d'Aubigné and Postel (1954). Pain, function and mobility were assessed both before the original hip replacement and at review. After the excision arthroplasty other factors influencing the activities of daily living also were assessed.

Pain (Fig. 1). Considerable relief of pain was noted in all 22 patients; 13 had no pain at all (Grade 6), the other nine still had some pain on activity (Grade 5). All expressed considerable satisfaction at the relief of pain.

Function (Tables I and II). Only one patient could walk better than before the original hip replacement. Nine had maintained their previous levels of activity (Grade 3 or 4), the remainder were either bedridden or were restricted to walking a few yards indoors.

All patients depended on some form of external support for walking except for three who, at review, were just able to take a few steps unsupported. This necessity for support constituted a major handicap to 12 of the patients who, before their initial replacement, had needed only one stick while walking outdoors. Inability to rise unaided from a chair or get in or out of bed were considered a major functional disadvantage. All patients were soon fatigued after walking; this, together with instability of the hip, restricted their activities considerably.

In five patients passive flexion of the hip was 90°, in the remainder it varied from 45° to 80°. Three patients had more than 60° of straight-leg raising and more than 30° of abduction against gravity. Less than 40° straight-leg raising was associated with significant disability.

Patients' assessment (Table III). Fourteen patients were grossly disappointed with their functional result. The remaining eight were satisfied, partly because their previous symptoms had been severe, sometimes leading to prolonged hospitalisation. The satisfied patients were mostly those in the older age groups.

Table II. Dependence on supports

<table>
<thead>
<tr>
<th>Grades*</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before hip replacement</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>9</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>At review</td>
<td>1</td>
<td>0</td>
<td>7</td>
<td>4</td>
<td>7</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
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* Support grades
1—Bedridden
2—Wheelchair
3—Two crutches
4—Two sticks
5—One stick constantly
6—One stick outdoors
7—No support

Table III. Patients' assessment

<table>
<thead>
<tr>
<th>Number of patients</th>
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<tbody>
<tr>
<td>Enthusiastic</td>
</tr>
<tr>
<td>Satisfied</td>
</tr>
<tr>
<td>Non-committal</td>
</tr>
<tr>
<td>Disappointed</td>
</tr>
</tbody>
</table>

Shortening. The average true shortening was 3.7 cm and those with considerable loss of bone stock had up to 5.5 cm of shortening.

Employment. No pattern emerged as most patients were over retiring age or were self-employed; only one of the 22 patients worked for someone else and he has been relegated from an active to a sedentary job. Women found their household activities severely restricted, but this was difficult to quantify.

Radiological appearances. Observations before removal of the implants showed a variety of factors consistent with infection. Migration of the socket medially and superiorly occurred in 10 patients, in three of whom the cup had penetrated the medial wall of the acetabulum.

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and entered the pelvis. Significant loss of femoral bone stock after removal of the implant was noted in five patients, the greater trochanter being totally fragmented in three. In no patient was there bony contact between the cut end of the femur and the acetabulum; there was no sclerosis nor bony spikes between the femur and the pelvis, either of which might have suggested impingement.

**Wound healing.** In 19 patients the wounds had healed uneventfully; in the remaining three there had been considerable delay. Recurrent sinuses developed in four patients at intervals of 3 to 15 months after removal of the implant: the infecting organism in three was *Staphylococcus aureus*, the fourth had a combination of *Escherichia coli* and *Staphylococcus aureus*. Ten patients showed radiographic evidence of retained cement and three of these had developed wound problems; at review, however, only one patient with retained cement had a discharging sinus.

**Bacteriology.** The predominant infecting organisms were either *Staphylococcus aureus* or *Staphylococcus albus* (Table IV). Three patients with negative cultures had had prolonged courses of antibiotics before removal of the implant and this had probably rendered the pus sterile; at operation there was no doubt about infection because of the purulent nature of the material surrounding the site of the arthroplasty. Two of these three patients developed secondary infection. Although respiratory, urinary, vaginal and dental infections had occurred after the original replacement, there was no conclusive evidence to suggest an endogenous metastatic infection. The type of organism and the latent period of infection did not appear to influence the quality of the final result.

**Table IV. Bacteriology**

<table>
<thead>
<tr>
<th>Organisms</th>
<th>Number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Staph. aureus</em></td>
<td>10</td>
</tr>
<tr>
<td><em>Staph. albus</em></td>
<td>7</td>
</tr>
<tr>
<td><em>E. coli, Staph. aureus</em></td>
<td>1</td>
</tr>
<tr>
<td><em>Staph. aureus, Staph. albus</em></td>
<td>1</td>
</tr>
<tr>
<td>No growth</td>
<td>3</td>
</tr>
</tbody>
</table>

**Calipers.** All patients were advised to wear calipers for three months in order to provide support and to prevent further shortening. In fact the calipers gave no support and were regarded by the patients as both cumbersome and awkward; pain and irritation around the groin and perineum contributed to their problems. The vertical distance of the lesser trochanter from the lower border of the ischial tuberosity was measured on radiographs taken while the patient was on traction; this was repeated at review with the patient taking weight and showed an average of 1.7 cm further shortening. This finding casts doubt on the efficacy of calipers in preventing further shortening.

**DISCUSSION**

Although the limitations of total hip replacement are more realistically appreciated now that long-term results are being reported, comparatively few reports compare the subjective and objective results before replacement with those after excision arthroplasty. Reported infection rates after total hip replacement range from 11% (Wilson et al. 1972) to nil (Owen and Pal 1971; Collis and Steinhaus 1976). The diagnosis of infection is sometimes based on symptomatology and progress, and sometimes on radiological, bacteriological and haematological criteria, so making direct comparisons difficult. Another source of inaccuracy is that some patients with low-grade infection may have few symptoms and remain undiagnosed. The need to remove the prosthesis would be a more reliable index of failure; our figures in a community which tends to be geographically static amount to 1%.

Relief of pain after excision arthroplasty was recorded in all patients, most marked in those who had had severe pain before the initial replacement. The probable factors contributing to this reduction in pain were the absence of impingement and an abundance of tough fibrous tissue between the femur and acetabulum.

Since relief of pain is one of the primary objectives of surgery, excision arthroplasty cannot be considered a total failure.

Reduction of pain was, however, overshadowed by the markedly poor functional results, with only one patient showing any improvement and that being minimal. The remainder had either maintained only the same level of function as before hip replacement, or had deteriorated and were totally dependent on supports within the confines of their homes. Although early fatigue on activity and instability restricted function, poor results were also associated with poor general health in older patients, with weak muscles and with degenerative changes in the contralateral hip. The plight of patients with rheumatoid arthritis was considerably worse than that of osteoarthritic patients because of their polyarthropathy. Contrary to the observations made by Shepherd (1960) our results did not appear to improve with time.

As a result of absorption due to infection the loss of bone stock either in the acetabulum or the proximal femur was considerable in 22% of our patients and in these exchange arthroplasty would have been difficult. Moreover, if it had been done, it might again have become infected, leading to still further reduction in bone stock with possibly devastating consequences.

In relation to the wound problems, we agree with Hunter and Dandy (1977) and Petty and Goldsmith (1980) that small amounts of retained cement do not seem to influence wound healing after excision arthroplasty. Calipers did not prove to be effective; they were cumbersome, poorly tolerated, and did not seem to prevent further shortening. Often the caliper was soon abandoned.

In assessing the efficacy of excision arthroplasty,
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consideration must be given to the reasons for performing the operation. If alleviation of pain is the principal objective the operation would appear to be satisfactory. However, the resultant instability, fatigue, gait disturbance, alteration in lifestyle and need for supports constitute a serious disadvantage. Nevertheless, excision arthroplasty remains a useful salvage procedure for painful septic total hip replacements; delayed reimplantation is sometimes possible after eradication of the infection.

We acknowledge with thanks the assistance and co-operation of our colleagues in the preparation of this report.

REFERENCES