ABSTRACT

Acetabular revision in a total hip arthroplasty (THA) with pelvic discontinuity is uncommon and challenging. Optimal management remains controversial, particularly with graft and implant selection. Interpretation of outcomes is confounded by the heterogeneity of patterns of bone loss and the lack of long-term results in great numbers for any given choice of treatment. We report a revision THA using a press-fit bulk acetabular allograft and an uncemented porous-coated anatomic prosthesis for the management of pelvic discontinuity. After 20 years, the patient still had an excellent functional outcome with radiographic evidence of graft incorporation and no signs of loosening.

Key words: arthroplasty, replacement, hip; pelvis; reoperation

CASE REPORT

In September 1986, a 56-year-old woman presented with a painful right hip. She had undergone total hip arthroplasty (THA) 6 years earlier for primary osteoarthritis with protrusion, using a cemented Wagner resurfacing prosthesis (Aesculap-Werke, Tuttingen, Germany). Plain radiographs and computed tomographic scans revealed a type IIIb acetabular defect according to the Paprosky classification (Table) with a superomedial migration, a break in the Kohler line, and complete acetabular loosening at the bone cement interface (Figs. 1 and 2).

Revision surgery was undertaken through a conventional but extended transgluteal approach without trochanteric osteotomy. As the femoral component was entirely loose on the femoral neck, an in situ neck osteotomy was performed and bone retained for autografting. The acetabular component was loose and lying free. A thorough debridement revealed a 3-cm central defect in the false acetabulum and anterior column loss (summating to approximately
The residual host acetabular bed was prepared to provide a bleeding interface. The bulk acetabular allograft consisting of an irradiated (2.5 megarads) frozen hemi-pelvis was prepared by thawing in a warm solution of 50% povidone-iodine and 50% normal saline. Periosteum was stripped from the surface and sequential reaming carried out to 51 mm into subchondral bone, taking care to preserve the transverse acetabular ligament. A 52-mm trial cup was inserted and approximated with the host hemi-pelvis to plan cuts at appropriate levels. The host false acetabular floor was grafted with morcelised femoral neck and femoral head allografts. Following trials and minor adjustments to shape, a tight press-fit bulk acetabular allograft was the sole means to maintain cup position. The orientation and size of the bulk acetabular allograft precluded the use of supplementary screws as they may compromise the integrity of the allograft or the ability to use an uncemented cup. A 52-mm Series 1 (metal-backed polyethylene) uncemented porous-coated anatomic cup (Howmedica, Rutherford [NJ], US) was implanted with a secure press-fit. An uncemented porous-coated anatomic femoral component was implanted in a routine fashion. A stable reduction was achieved with a 32-mm diameter femoral head. A 5-cm leg length discrepancy was reduced to 0.5 cm.

Non–weight bearing for 6 weeks was followed by progressive increase in activity levels without complications. Early postoperative radiographs revealed no evidence of graft resorption. After 20 years, she remains satisfied, with a Harris Hip Score of 89 (compared to 40 prior to revision) and scores of 27 each in Short Form-12 and Western Ontario and McMaster Universities Osteoarthritis Index. Radiographs demonstrate union of the implant and

Table

Paprosky classification\* of acetabular defects

<table>
<thead>
<tr>
<th>Type</th>
<th>Relationship of component to the Kohler line</th>
<th>Vertical migration</th>
<th>Ischial lysis</th>
<th>Tear drop</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Lateral</td>
<td>Minimal</td>
<td>Minimal</td>
<td>Intact</td>
</tr>
<tr>
<td>IIA</td>
<td>Lateral</td>
<td>Minimal</td>
<td>Minimal</td>
<td>Intact</td>
</tr>
<tr>
<td>IIB</td>
<td>Lateral</td>
<td>Approaching 3 cm</td>
<td>Minimal</td>
<td>Intact</td>
</tr>
<tr>
<td>IIC</td>
<td>Medial</td>
<td>Minimal</td>
<td>Minimal</td>
<td>Violated</td>
</tr>
<tr>
<td>IIIA</td>
<td>Lateral</td>
<td>&gt;3 cm</td>
<td>Mild/moderate</td>
<td>Intact</td>
</tr>
<tr>
<td>IIIB</td>
<td>Line violated</td>
<td>&gt;3 cm</td>
<td>Severe</td>
<td>Violated</td>
</tr>
</tbody>
</table>

* Type I indicates an intact and supportive acetabular rim, with no migration of the component, no evidence of osteolysis in the ischium or tear drop, and no violation of the Kohler line (ilioischial line). The medial-most aspect of the component is lateral to the Kohler line. Type II indicates adequate host bone remaining to support a cementless acetabular component and >50% host bone support, with <3 cm of superior migration of the hip centre from superior obturator line and no major osteolysis of the ischium or tear drop (ischial osteolysis of <7 mm below the obturator line). Type IIIa indicates >3 cm of superior and lateral migration of the component above the obturator line with mild-to-moderate ischial lysis. The component is at or lateral to the Kohler line and the ilioischial and iliopubic lines are intact. The failed component migrates superior and laterally. Type IIIb indicates more extensive ischial osteolysis (>15 mm below the obturator line), complete destruction of the tear drop, migration medial to the Kohler line, and >3 cm of superior migration of the component cephalad to the obturator line. The failed component migrates superiorly and medially.

Figure 1 Preoperative radiographs showing grade IIIb acetabular deficiency with a superomedial migration of the acetabulum, a break in the Kohler line, and complete destruction of tear drop.

Figure 2 Preoperative computed tomographic scan showing acetabular deficiency.
host bone with no evidence of component loosening (Fig. 3).

**DISCUSSION**

Pelvic discontinuity in a revision THA is uncommon, with an incidence of 0.9% in 3505 consecutive cases of acetabular revision. Its aetiology is likely an ununited stress fracture in pathological bone. Given the heterogeneity of patients and pattern of bone loss, various management options are available including hemispherical sockets, custom acetabular reinforcement plates with impaction bone graft, and bulk acetabular allografts. The optimal option remains controversial because of the lack of long-term follow-up study in sufficient numbers of patients treated in a particular manner.

It is widely accepted that certain principles should be adhered to, in particular stable fixation and anatomic restoration. Although the use of a high hip centre is suggested, it fails to restore bone stock or correct leg length discrepancy and has greater potential for impingement and dislocation. The use of bulk acetabular allograft is anatomic and can provide stability, but has a failure rate of 47% (14 of 30 hips) at a mean period of 10 years. The evidence for incorporation of bulk acetabular allograft at a histological level is questionable; there are also concerns regarding graft resorption, collapse, and infection transmission. Nonetheless, its use in acetabular revision surgery to restore bone stock is advocated when expectations are low, with a failure rate of 19% (6 of 31 hips) after a mean period of 5.7 years, and a success rate of 88% (7 of 8 hips) after a mean period of 7.5 years when a reinforcement ring is used. When the host bone to cup contact was <50%, a cemented cup should be used, as uncemented cups had a failure rate of 43% (3 of 7 hips). The bulk acetabular allograft should be stabilised to the residual host bone with 2.6.5-mm cancellous bone screws.

Our patient was relatively young with high expectations of revision surgery. A press-fit bulk acetabular allograft and uncemented cup successfully reconstructed the acetabulum with pelvic discontinuity. Union was found between the allograft and host bone without evidence of collapse or resorption. Nonetheless, evidence of the whole allograft becoming living bone remains unavailable.

**REFERENCES**


**Figure 3** Postoperative radiographs after 20 years showing stress shielding and femoral remodelling and the well-fixed acetabular component.