INSERTION OF A PROSTHETIC HIP INTO A TOTAL HIP ALLOGRAFT

CASE REPORT

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We describe a patient in whom a total hip replacement had failed and who subsequently fractured her proximal femur. The prosthetic hip and the surrounding bone were excised and replaced by a matched pair of allograft components. She obtained seven years of pain free hip function before the graft showed radiographic signs of failure; it was then replaced by a new prosthetic hip.

CASE REPORT

A 52-year-old woman with multiple joint involvement from rheumatoid arthritis had undergone a cup arthroplasty of the right hip in 1971. This was revised in 1974, but she still had symptoms and in 1976 she had a total hip replacement, with osteotomy of the greater trochanter. The trochanter did not unite and was rewired in 1977; this also failed to heal. In 1980 a radiograph showed that the femoral component was loose. In March 1981 she fell, sustaining a severely comminuted fracture of the proximal femur from the calcar to the tip of the prosthesis (Fig. 1). Despite being treated initially in skeletal traction and later in a spica cast, she continued to complain of severe pain and, in June 1981, her Harris hip score was 29.

When we first saw her, in September 1981, she had widespread rheumatoid involvement of both upper and lower limbs. The right leg was 7 cm shorter than the left and she was unable to bear much weight on it. She had had a left knee replacement and also had severe arthritis of the right knee. Radiographs showed extensive lysis of the cortex of the proximal right femur, radiolucency of the entire cement-bone interface and non-union of the fracture; the lateral view showed 30° anterior angulation of the femur at the tip of the prosthesis (Fig. 1b). The anteroposterior film showed continuous radiolucency, at

Fig. 1a

Fig. 1b

Anteroposterior and lateral views of the right hip in September 1981 showing a failed cemented hip arthroplasty with loose components, a comminuted ununited fracture of the proximal femur and deficiency of the medial wall of the acetabulum.

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least 2 mm wide, surrounding the acetabular cement. Fluid aspirated from the right hip yielded negative cultures. An arthrogram confirmed loosening of both components.

In September 1981 both components were removed. The medial wall of the acetabulum was severely deficient

and there was no evidence of healing of the femoral fracture or union of the greater trochanter. The entire hip joint was resected, from just above the acetabulum to the mid-femur; the cut extended through the superior and inferior pubic rami and the sacrospinous ligament was divided. A matched, whole osteo-articular hip allograft was used to reconstruct the hip. The femoral portion was fixed with two AO compression plates placed anteriorly and laterally, and the hemipelvic allograft was fixed with three compression devices to the host ilium. Fixation at the pubis and ischium was obtained with two large cancellous screws. The host greater trochanter was wired to the allograft femur. Autogenous graft was placed at the femoral allograft-host junction (Fig. 2). The allograft capsule was repaired.

cane satisfactorily). In May 1983 she had a left total hip replacement.

Seven years after the insertion of the allografts her only complaint was slight pain in the right buttock after prolonged sitting; otherwise she denied having any pain in the right hip, though she had recently noticed squeaking in that joint when rising from a chair. She routinely walked three to four blocks using one crutch. She was on non-steroidal anti-inflammatory drugs for her generalised rheumatoid disease. Stiffness of her right knee prevented her from climbing stairs and from sitting in low chairs, but she was able to put on her socks and shoes, and to cut her toenails.

At the seven-year follow-up she weighed 50 kg (110 lb). Her legs were equal in length and the incisions

Fig. 2

After resection of the old prosthetic hip arthroplasty with its surrounding acetabular and femoral bone, and reconstruction with matched proximal femoral and acetabular allografts.

After the operation the patient was kept in balanced suspension in wide abduction for six weeks. She was given intravenous cephazolin for three weeks, followed by oral cephalexin for six months. For the first year she walked with two crutches, after which radiographs showed union at the femoral and the iliac anastomoses. She then used only one crutch (she was unable to grip a

Fig. 3

Seven-and-a-half years later there is increased density of the allograft femoral head. Note union of the allograft to ilium and non-union of the ischial and pubic anastomoses.

were well healed. The right hip had no flexion contracture and flexed to 90°; abduction was 20°, external rotation 5° and internal rotation 15°. Lying on her side the hip could abduct well. Both knees had a flexion contracture of 10° with further flexion of only 10°. She walked with a stiff leg gait. Radiographs confirmed bony union at the femoral and iliac host-graft junction, but there was non-union at the greater trochanter, pubis and ischium.

She had not developed the early failure others have reported with this type of reconstruction, nor any evidence of a neuropathic arthropathy (Thompson and Manivel 1988). However, annual films had revealed gradual loss of joint space and there was now complete loss of the space together with erosion of the superior portion of the femoral head. At seven-and-a-half-years her function had not changed and she continued to be nearly pain free, but radiographs revealed further increased density of the femoral head to the level of the former epiphyseal line (Fig. 3). It was decided to convert her allograft hip to a prosthetic hip (Fig. 4).

Fig. 4

Anteroposterior radiograph after a total hip arthroplasty had been cemented into the allografts.

At operation there was no evidence of sepsis and intra-operative cultures were negative. Non-unions at the greater trochanter, the pubis and the ischium were confirmed, but there was bony union at the femoral and iliac anastomoses. No cartilage was present on either the femoral head or the acetabulum. The femoral head was smooth, dense, symmetrical and flattened; histology showed complete avascular necrosis with no viable bone. Biopsy of the acetabular allograft showed fragments of cortical and trabecular bone with osteonecrosis and focal fibrosis but some viable bone buttressing dead trabeculae.

The acetabular allograft was reamed and the socket reconstructed with a cemented, metal-backed component. Only minimal bleeding was seen, and only at the periphery of the acetabulum. On the femoral side, the plates and screws were removed and a long-stemmed cobalt chrome femoral component was inserted using modern cementing techniques (Harris and Davies 1988). The trochanter was rewired to the lateral cortex of the femur. She tolerated the procedure well and postoperative films showed the components to be in excellent position. She was discharged using two crutches.

Five months later her knee stiffness made it difficult for her to use stairs, put on shoes and socks or cut her toenails; but she was free of pain and could walk three blocks using one cane. Only her generalised arthritis prevented her from walking further.

DISCUSSION

The severe comminution of the proximal femur, coupled with the extensive bone lysis secondary to loosening, meant that reconstruction of her hip after the fracture would require a proximal femoral allograft; this we prefer to prosthetic replacement in patients who do not have a known limitation of their life span. But our patient also had severe bone loss of the socket for which, at that time (1981), our standard management was to insert an intra-acetabular femoral head allograft (Harris 1982) into which a socket could be cemented. When we contemplated using both a proximal femoral allograft and an intra-acetabular femoral head allograft, it seemed appropriate to extend the idea by using a matching pair. The resulting reconstruction was a true total hip replacement. For this to succeed, union to the ilium and at the mid-femur were essential; union at the ischium, pubis and greater trochanter, though desirable, were not crucial.

The progressive loss of joint space which followed is a reflection of deterioration of the transplanted cartilage; the loss of femoral head was due to erosion of the avascular femoral graft. She subsequently had to have a prosthetic hip cemented into her allografts, but three advantages were obtained by reconstructing the hip in two stages. First, she had an excellent hip for seven years; secondly, she gained from the improvements in total hip technology during those seven years; and thirdly, not only was the bone stock more extensive at the time of her last operation, but it was also free of any prior total hip implants and cement.

Developments subsequent to 1981 have altered our approach to this type of problem. Our favourable results with large, porous-surfaced, hemispherical sockets trans-fixed with screws (Jasty et al 1988), have led us to use this method for the management of failed cemented sockets with major bone loss. Nevertheless, for certain extreme problems with failed hip replacements and in some tumour situations, the solution we adopted with our

patient may be useful (McGann, Mankin and Harris 1986; Mankin, Gebhardt and Tomford 1987; Waber et al 1988; Capito et al 1989). The high risks involved add to the caution that is necessary in planning and executing such massive surgery.

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