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Bone grafting in total hip replacement for acetabular protrusion

A review of 11 operations

In 11 total hip replacement operations performed on nine patients with acetabular protrusion, the deficient acetabulum was reinforced with a bone graft from the femoral head in ten operations and in one from the greater trochanter and the femoral medullary canal. Acetabular meshes were used in two operations and a fine wire mesh in one.
At follow-up, averaging 18 (8–28) months postoperatively, a solid bone socket for the acetabular component had formed in all hips without evidence of loosening or infection.

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Central protrusion of the acetabular wall is not infrequently encountered during total hip replacement. Acetabular protrusion may be idiopathic or secondary, mainly due to rheumatoid arthritis, central fracture dislocations of the hip, accidental intraoperative perforations, and bone loss as a result of failed prosthetic replacement.

Various techniques reinforcing the acetabulum for protrusion encountered in total hip replacement have been described; mechanical devices (Eichler 1973, Harris & Jones 1975), extra amounts of cement (Sotello-Garza & Charnley 1978), and the use of solid bone grafts have been advocated (McCullum et al. 1980, Augereau & Postel 1980, and Heywood 1980).

In this report we describe the results of acetabular bone grafting and reinforcement methods employed in 11 cases of total hip replacement.

Patients and methods

Between 1979 and 1981, acetabular reinforcement by bone grafting was performed in 11 total hip replacement operations in nine patients, eight females and one male whose average age was 55 (31–76) years. Acetabular protrusion was primary in three patients, and secondary to rheumatoid arthritis in four patients (six hips). In one patient it was caused by a protruding Thompson prosthesis, and in one it occurred accidentally during an operation.

Total hip replacement was performed with the patient lying on his side, usually through a posterolateral incision. Trochanterotomy was performed in the case with a protruding Thompson prosthesis.

Minimal acetabular reaming was carried out using Müller's acetabular reamers. Care was taken to leave as much subchrondral bone as possible, especially in patients with rheumatoid arthritis. All the prostheses were the Müller type (10 dual lock and one C.A.D.).

In seven hips a solid bone cap was fashioned out of the femoral head. In three others the femoral head was chopped into small chips or larger pieces, which were then used as cancellous bone grafts. Bone from the greater trochanter and femoral medullary canal was used in one case. Acetabular meshes were inserted in two hips and a fine wire mesh in one.

Patients were followed up regularly in the outpatient department. Full weight bearing was usually permitted 3 months after operation. Results were assessed using a modified Merle d'Aubigne hip score, and pelvic radiographs were taken. Follow-up was done at an average of 18 (8–28) months.

One patient suffered a pulmonary embolus after the operation of her second hip; she was successfully treated with heparin and oral anticoagulants.

Case report

A 69-year-old woman was admitted because of severe pain in her right hip. The pain had begun

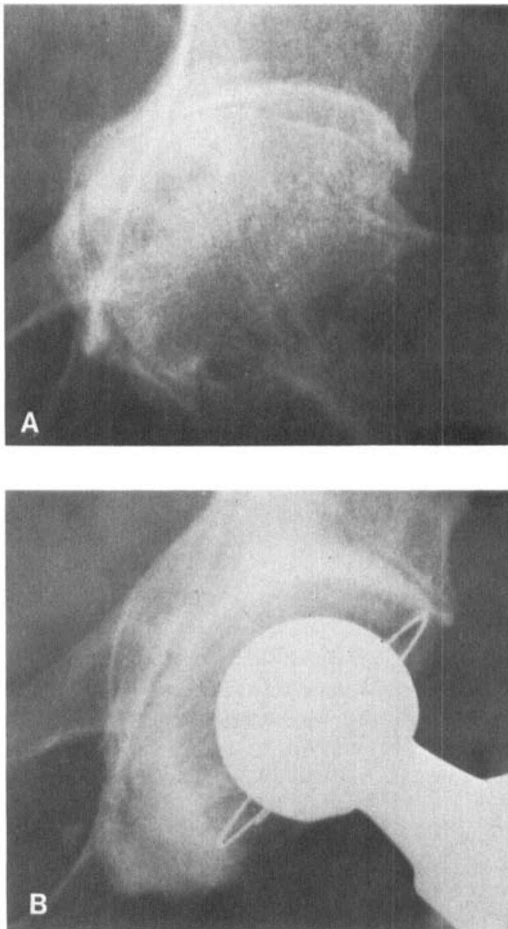

Figure 1. A. Before the operation. Idiopathic acetabular protrusion. – B. 19 months after acetabular reinforcement with a solid bone block and total hip arthroplasty.

intermittently 5 years earlier, but had now intensified and become permanent. The radiograph showed arthrosis with acetabular protrusion (Figure 1). At operation, a cap-shaped bone graft was fashioned from the femoral head and introduced into the acetabulum, and a Müller dual lock prosthesis was inserted. Nineteen months later the patient was free of pain and walked without a cane. The radiograph showed solid incorporation of the graft.

Results

Operative results could be rated as good or excellent in all 11 hips. Radiographic follow-up examinations showed that in all cases the grafts formed solid bone sockets for the acetabular component without evidence of loosening or further protrusion.

Discussion

The object of reinforcing the acetabulum in this series was to prevent a possible loosening and further migration of the acetabular cup into the pelvis. Salvati et al. (1975) reported five such cases of intrapelvic protrusion of the acetabular component of McKee Farrar prostheses. Four of these patients had rheumatoid arthritis. In a recent review by Salvati et al. (1981) postoperative protrusions occurred after Charnley hip replacements in two patients with coxarthrosis. Hopkins et al. (1983) reported two cases of acetabular cup protrusion after total hip arthroplasty combined with sepsis in patients with rheumatoid arthritis, causing aneurysms of the external iliac artery. Ranawat et al. (1980) concluded that in protrusio acetabuli due to rheumatoid arthritis, improved fixation and better positioning of the acetabular component is achieved by the use of bone grafts or a special titanium mesh, or both.

A recent stress analysis of acetabular reconstruction in acetabular protrusion by Crowninshield et al. (1983) showed that in the protruded acetabulum, cortical bone stresses on the medial part of the pelvic wall increase with medial placement of the acetabular component, while normal, more lateral placement of the component reduces these stresses.

Bone grafting of the medial acetabular wall, mainly by a solid bone cap, lateralizes the acetabular component, causing the desired stress reduction. According to the same authors, the efficiency of a medial metal shell is limited in reducing the stress levels in the bone or cement. Yet in combination with a bone graft, its main effect is an even cement distribution in the acetabulum.

The question whether methylmethacrylate has any detrimental effect on the viability of autogenous bone grafts has been studied by Roffman et al. (1983) who showed that the bone grafts remain viable and unite with the acetabular wall in an experimental dog model.

These were also our own clinical and radio-

graphic observations, confirming previous studies by Augereau & Postel (1980), Heywood (1980), and McCullum et al. (1980). These three groups described various techniques of total hip replacement in conjunction with bone grafting for acetabular protrusion. Augereau & Postel (1980) and Heywood (1980) recommended the use of solid grafts fashioned from the femoral head. This recently became our preferred technique because of its simplicity and because the solidity of the corticocancellous grafts eliminates the need for metallic meshes or shells.

The use of bone chips packed into the acetabulum, a technique we have used with quite satisfactory results, is now reserved for those cases in which the femoral head is not available for bone grafting, as in revision operations. According to Harris & Jones (1975), iliac bone in combination with acetabular meshes provides an adequate medial wall for the acetabular cup. Our experience to date has led us to the conclusion that if a deficient acetabular wall is encountered during total hip replacement, especially in patients with rheumatoid arthritis, bone should be grafted in order to provide a solid socket for the acetabular component. We believe that such a measure may reduce the risks of loosening and cup migration.

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