TOTAL HIP REPLACEMENT USING FEMORAL NECK BONE TO GRAFT THE DYSPLASTIC ACETABULUM

FOLLOW-UP STUDY OF 18 PATIENTS WITH OLD CONGENITAL DISLOCATION OF THE HIP

SHIGENORI INAO, EIJI GOTOH, MIFUMI ANDO

From Asahikawa Medical College, Nishikagura, Japan

We performed total hip replacement on 25 congenitally dislocated hips using corticocancellous bone from the femoral neck as a bone graft to reconstruct the deficient acetabulum. Two patients (two hips) died less than five years after surgery and three hips developed deep infection. We reviewed the remaining 20 hips at an average interval of 8.4 years (5.2 to 12.9). Their functional scores (modified Merle d'Aubigné and Postel) averaged 5.7 for pain, 5.1 for walking ability, and 4.2 for range of motion. Radiographs showed union and remodelling of the grafted bone in every case. There were radiological signs of aseptic loosening in three sockets (15%) without collapse of the grafted bone. None of the femoral stems was loose. No revision operation has been performed. Our results confirm the usefulness in the long term of femoral autografts for severe acetabular deficiency.

J Bone Joint Surg [Br] 1994; 76-B:735-9.

Received 21 January 1994; Accepted 31 March 1994

Charnley himself pointed out the hazards of hip replacement in patients with congenital dislocation; these included acetabular dysplasia, femoral dysplasia, limb-length inequality, soft-tissue contractures and muscle atrophy (Charnley and Feagin 1973). Patients in severe pain need treatment, however, and in many cases only total hip replacement is appropriate.

The main problem is how to achieve stable fixation of the socket in the shallow acetabulum. Harris, Crothers and Oh (1977) used large bone grafts from the excised femoral head to reconstruct the acetabulum. We have used a different technique of acetabular augmentation by

autograft and now report our clinical and radiological results after a mean follow-up of 8.4 years.

PATIENTS AND METHODS

Between June 1976 and November 1987, 25 total hip replacements were performed using autogenous acetabular grafting on 21 patients with old congenital dislocation of the hip. There were 20 women (23 hips) and one man (2 hips); 16 hips were left and 9 right. All the patients have been followed up. According to the classification of Eftekhari (1978), the degree of dislocation was stage C in 21 hips and stage D in four.

The mean age at operation was 50 years (48 years for stage-C hips and 62 years for stage-D; range 20 to 73). The mean age at the onset of hip pain was 38 years (35 years for stage-C and 55 years for stage-D). Total hip replacement was therefore undertaken about ten years after the onset of symptoms.

The mean height of the patients was 148 cm (132 to 164) and mean weight 52 kg (30 to 72).

Thirteen hips had had no previous treatment, three had been conservatively treated by plaster casts and other conservative methods in childhood, and nine had been treated surgically (one open reduction, one muscle release, one pelvic osteotomy and six femoral osteotomies).

Of the 17 patients who had a unilateral replacement, seven had a normal hip on the opposite side. In five it was subluxed and osteoarthritic and in five it was dislocated (stage C). In the four patients who had bilateral replacements, three had bilateral stage-C dislocations and one had a stage-C dislocation on one side and a stage-D dislocation on the other. Two-thirds of the patients therefore had abnormalities of both hips. Below the hips, the bone lengths were not sufficiently different to cause significant leg-length discrepancy in any patient.

Operative technique. Preoperative traction was not used. We used Charnley's transtrochanteric approach in 21 hips and Hardinge's lateral approach in two. Dall's (1986) approach was used in two recent cases of stage-C dislocation. The purpose of the operation is to place the socket at the level of the true acetabulum. To augment the lateral acetabular margin we use corticocancellous bone

S. Inao, MD, Senior Registrar
E. Gotoh, MD, Senior Registrar
M. Ando, MD, Assistant Professor
Department of Orthopaedic Surgery, Asahikawa Medical College, Nishikagura 4-5, 3-11, Asahikawa 078, Japan.

Correspondence should be sent to Dr S. Inao.

©1994 British Editorial Society of Bone and Joint Surgery
0301-620X/94/5859 \$2.00

The technique of acetabular bone grafting. Figure 1a – Lateral view. A 5 mm wide strip of solid subchondral or cortical bone is preserved anteroposteriorly in a belt-like shape (*) between the graft site on the ilium (I) and the true acetabulum (T). A circumferential anchoring groove (A) is made in the ilium, ischium and pubis. Figure 1b – Coronal view. The grafted bone (G) is fixed by two cancellous screws with its cancellous surface in contact with the scraped ilium (I). C = cement; A = anchoring groove; * = preserved solid bone.

The average increase in leg length was 20.8 mm (8 to 39). There was no correlation between the postoperative range of motion and the amount of limb lengthening.

Radiologically, the sockets were graded as follows: grade I in 12 hips; grade II in 5; grade III in 1; and grade IV in 2 (Charnley 1979). Definite aseptic loosening was therefore observed in three sockets (15%); it developed at 2, 4.5 and 5.5 years postoperatively. There was no case of definite or probable radiological loosening of the femoral stem (Harris, McCarthy and O'Neill 1982). The clinical and radiological results were independent of the postoperative difference in limb length.

At the time of the review, no case had been revised for aseptic loosening.

DISCUSSION

Operative technique. Regardless of the state of the other hip, the socket was always placed as nearly as possible at the level of the true acetabulum. The advantages of this are many: 1) it is the site of most bone stock; 2) there are mechanical benefits from medial placement of the socket; 3) the position maximises abductor function; and 4) the limb is lengthened. Furthermore, non-anatomical positioning of the socket at the level of the false acetabulum has been reported to result in a high rate of loosening (Linde, Jensen and Pilgaard 1988). Sometimes, however, when resection of the proximal femur was limited because of the very narrow intramedullary canal at the site of stem insertion, the socket had to be placed at a site between the levels of the true and false acetabula.

Our bone-grafting technique differs from that of Harris et al (1977) in that we use corticocancellous bone taken from the femoral neck instead of the sclerotic and cystic bone of the head. We also preserve the sclerotic subchondral bone at the inferior margin of the false acetabulum (stage-C dislocation) or the cortical outer wall

2% or more of total height is expected, we now monitor the sciatic nerve during the operation, a method which has proved quite successful in preventing nerve palsy (Ariyama et al 1989). McQueary and Johnston (1988) suggested that a severe preoperative flexion contracture of the hip predisposed to femoral nerve palsy; there were no severe flexion contractures in our patients preoperatively.

The incidence of trochanteric nonunion in our series was slightly higher than in some previous reports (Dunn and Hess 1976; Crowe, Mani and Ranawat 1979; Linde et al 1988; McQueary and Johnston 1988; Mulroy and Harris 1990; Fredin et al 1991), but two of our three patients had no symptoms from the pseudarthrosis. The nonunions all occurred in patients whose limbs had been lengthened more than 3 cm. In such cases, we now preserve as much of the lateral side of the femur as possible to allow reattachment of the trochanter without tension. We also prohibit active abduction of the hip until weight-bearing is started at three months.

Long-term clinical and radiological results. The operations achieved marked improvement in pain and walking ability which has been maintained in the long term. The range of movement, however, did not improve much although it was sufficient for most daily activities.

Radiological loosening of the socket was seen in three of the 20 hips (15%). Gerber and Harris (1986) reported loosening of the socket in about 20% of their cases at an average follow-up of 7.1 years with their method of acetabular reconstruction. At subsequent follow-up, however, at an average 11.8 years, the loosening rate had risen to 46% mainly due to collapse of the bone grafts. From this experience, Mulroy and Harris (1990) were pessimistic about the long-term effectiveness of their method of reconstruction. Fredin et al (1991) and Garvin et al (1991), however, reported good results from the use of the femoral head as a graft after average follow-

proportion of bilateral involvement of the hip. Weight-bearing was started later in our patients, and we used a smaller head diameter.

We had no case of aseptic loosening of the femoral stem. This may be because the narrow intramedullary cavity of the underdeveloped femur results in tight fixation of the stem.

McQueary and Johnston (1988) used a thick layer of cement to reconstitute the deficient acetabulum and Russotti and Harris (1991) placed the socket proximally

in the false acetabulum. Their long-term reviews showed aseptic loosening rates for the socket of 10% and 16%, after 8.5 and 11 years respectively, results which are similar to ours. We consider, however, that the reconstruction of the acetabular bone stock has a definite advantage in case a revision operation is required.

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

REFERENCES

- Ariyama H, Ando M, Gotoh E, Atsuta Y, Imai M. Sciatic nerve monitoring system during hip arthroplasty. *Rinsho Seikei Geka* 1989; 24:833-6. [In Japanese].
- Brooker AF, Bowerman JW, Robinson RA, Riley LH Jr. Ectopic ossification following total hip replacement: incidence and a method of classification. *J Bone Joint Surg [Am]* 1973; 55-A:1629-32.
- Charnley J. *Low friction arthroplasty of the hip: theory and practice*. Berlin, etc: Springer-Verlag, 1979:20-90.
- Charnley J, Feagin JA. Low-friction arthroplasty in congenital subluxation of the hip. *Clin Orthop* 1973; 91:98-113.
- Crowe JF, Mani VJ, Ranawat CS. Total hip replacement in congenital dislocation and dysplasia of the hip. *J Bone Joint Surg [Am]* 1979; 61-A:15-23.
- Dall D. Exposure of the hip by anterior osteotomy of the greater trochanter: a modified anterolateral approach. *J Bone Joint Surg [Br]* 1986; 68-B:382-6.
- Dunn HK, Hess WE. Total hip reconstruction in chronically dislocated hips. *J Bone Joint Surg [Am]* 1976; 58-A:838-45.
- Eftekhari NS. *Principles of total hip arthroplasty*. St Louis: CV Mosby Co, 1978:437-55.
- Fredin H, Sanzén L, Sigurdsson B, Unander-Scharin L. Total hip arthroplasty in high congenital dislocation: 21 hips with a minimum five-year follow-up. *J Bone Joint Surg [Br]* 1991; 73-B:430-3.
- Garvin KL, Bowen MK, Salvati EA, Ranawat CS. Long-term results of total hip arthroplasty in congenital dislocation and dysplasia of the hip: a follow-up note. *J Bone Joint Surg [Am]* 1991; 73-A:1348-54.
- Gerber SD, Harris WH. Femoral head autografting to augment acetabular deficiency in patients requiring total hip replacement: a minimum five-year and an average seven-year follow-up study. *J Bone Joint Surg [Am]* 1986; 68-A:1241-8.
- Harris WH, Crothers O, Oh I. Total hip replacement and femoral-head bone-grafting for severe acetabular deficiency in adults. *J Bone Joint Surg [Am]* 1977; 59-A:752-9.
- Harris WH, McCarthy JC Jr, O'Neill DA. Femoral component loosening using contemporary techniques of femoral cement fixation. *J Bone Joint Surg [Am]* 1982; 64-A:1063-7.
- Linde F, Jensen J, Pilgaard S. Charnley arthroplasty in osteoarthritis secondary to congenital dislocation or subluxation of the hip. *Clin Orthop* 1988; 227:164-71.
- McQueary FG, Johnston RC. Coxarthrosis after congenital dysplasia: treatment by total hip arthroplasty without acetabular bone-grafting. *J Bone Joint Surg [Am]* 1988; 70-A:1140-4.
- Mulroy RD Jr, Harris WH. Failure of acetabular autogenous grafts in total hip arthroplasty: increasing incidence: a follow-up note. *J Bone Joint Surg [Am]* 1990; 72-A:1536-40.
- Russotti GM, Harris WH. Proximal placement of the acetabular component in total hip arthroplasty: a long-term follow-up study. *J Bone Joint Surg [Am]* 1991; 73-A:587-92.