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Hip replacement for congenital dislocation and dysplasia

Seventeen patients with arthrosis secondary to congenital dislocation or dysplasia of the hip were treated by total hip replacement. Nine hips were completely dislocated, while 12 were dysplastic and subluxated. The operation was performed as a modification of Charnley's standard technique, the acetabular prosthesis was always placed in the neoacetabulum, and no particular attempt was made to correct the shortening of the leg. In eight patients bone grafting to the upper lateral acetabular edge was done. Only a few complications occurred and no postoperative dislocations. On average 4 years after the operation, the clinical and radiographic results were satisfactory. The operation used here is less difficult than placing the cup in the original acetabulum.

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In total hip replacement (THR) for congenital dislocation or acetabular dysplasia, previous authors, notably Harris et al. (1977), have stressed the importance of placing the cup at the site of the normal acetabulum. In similar cases we have used the simpler operation of placing the acetabular component in the neoacetabulum.

Patients

During the 9-year period 1968 to 1977, 470 Charnley total hip replacements were performed in the department of Orthopaedic Surgery O at Odense University Hospital. Of this material 17 patients (21 hips) had congenital dislocation or dysplasia; all were women with a mean age of 50 (35–66) years. Seventeen hips were congenitally dislocated, and 4 were dysplastic or subluxated. Of the 17 hips with primary dislocation, 3 were untreated, 10 had been treated in plaster casts before the age of 2 years, and 4 had had previous operations: one patient had had bilateral pelvic osteotomies at ages 15 and 20 years; and another had had bilateral shelf operations at 9 and 36 years, and then intertrochanteric osteotomies. None of the hips with primary subluxation had previously been operated. At the time of THR there was dislocaction of 9 hips and subluxation of 12 (Table 1).

The degree of dysplasia was assessed by measurement of Sharp's (1961) angle, viz. the angle between a line through the distal points of the pelvic tear drop and a line joining these points and the lateral edge of the acetabulum of the same side (Figure 1). In hip dysplasia this angle is wider than the normal range of 33°–42°. All 12 subluxated hips had angles greater than 43°, and five more than 55°. In all hips the acetabulum was flattened, and all had femoral shortening, with a gap in Shenton's line of more than 3 cm in nine hips and of 7 cm in one hip. All hips had definite radiographic evidence of secondary arthrosis. All the patients had a limp and 18 hips had a positive Trendelenburg sign. Most patients had very limited walking distance (Table 1). The duration of pain ranged from 10 to 50 years.

Surgical technique

All the operations were carried out by the Charnley method, the last 10 being done in a "clean-house" operating room. In cases with complete dislocations the neoacetabulum was always chosen as the site for the acetabular prosthesis. We did not make any special attempts to correct shortening of the leg. The centre hole was carefully and accurately placed, so that the reaming could be done without perforating the anterior edge of the acetabulum. Reaming of the acetabulum was always done parallel to a plane through the anterior superior iliac spines to avoid further shortening and to obtain the best possible placement of the acetabular component with the least possible loss of bone. The thickness of

Table 1. Clinical data for 21 hips in 17 patients operated with THR for CDH or hip dysplasia.

	Primary dislocation	Previous treatment	Age at THR	Dislocation at THR	Angle of Sharp	Operation	Before THR PRW	4-yr follow-up PRW
1	+	C	56	–	65	S	343	645
2	+	C	57	–	45		342	645
3	–	–	44	–	50		342	665
4	–	–	55	–	58		343	654
5	+	C	55	–	55	E, Ti	342	643
6	+	–	51	+	–	E, Ti, S	343	556
7	+	–	53	+	–	E	332	646
8	+	C	39	–	55		342	645
9	+	C	40	–	55	F	342	645
10	+	Po	47	+	–		312	513
11	+	–	51	+	–	E, Ti	343	655
12	+	C	41	–	50		332	655
13	+	Po	66	–	50		232	633
14	+	C	53	–	48		322	642
15	–	–	38	–	45		342	652
16	+	C, S, Io	35	+	–	E, Ti, Ta	342	644
17	+	C, S, Io	36	+	–	E, Ti, Ta	342	554
18	+	–	62	+	–	E, Ti, Ta	333	546
19	–	–	59	–	50		423	545
20	+	–	59	+	–	E, Ec	313	645
21	+	C	46	+	–		322	645

Previous treatment: C: Plaster cast, Po: Pelvis osteotomy, S: Shelf operation, Io: Intertrochanteric osteotomy.
Operation: E: Bone graft to lateral acetabular edge, F: Bone graft to acetabular floor, S: 30-mm acetabular cup, Ec: Eccentric acetabular cup, Ta: Tenotomy of adductors, Ti: Tenotomy of iliopsoas.
Pain (P) and walking capacity (W) graded according to de'Aubigne & Postel (1954). Range of motion (R): 1 = 0–30°, 2 = 31–60°, 3 = 61–100°, 4 = 101–160°, 5 = 161–219°, 6 = 211–260°.

the acetabular floor was measured through the centre hole. A floor thickness of 3–5 mm was the aim. In one hip the acetabular floor was reinforced with a bone graft as it was estimated to be too thin to support the prosthesis. We did not use wire mesh for reinforcement. In two hips, one subluxation and one dislocation, we used a small 30-mm cup without a collar, and in one completely dislocated hip an eccentric acetabular cup. In the other 11 subluxations and 7 complete dislocations, we used the standard 40-mm cup. To improve the bony support of the acetabular component, bone grafting was done to the area above the lateral acetabular edge in eight hips. The grafts were usually cancellous bone blocks from the upper end of

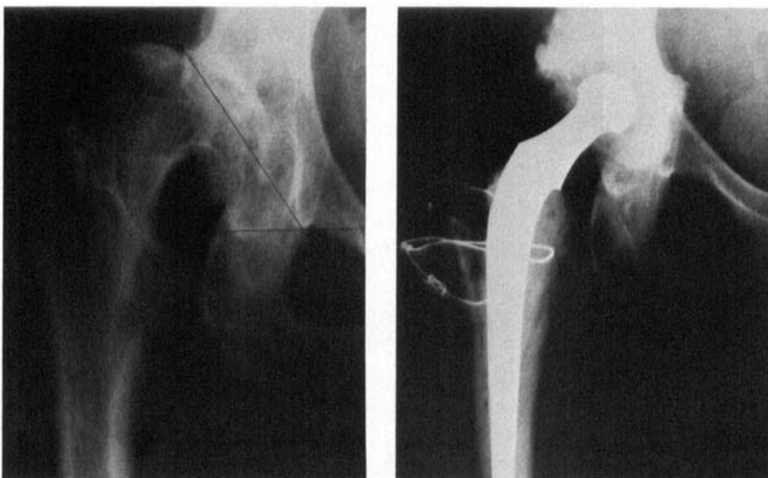

Figure 1. Case 4. Hip dysplasia with subluxation before and after THR. The lines illustrate the angle of Sharp.

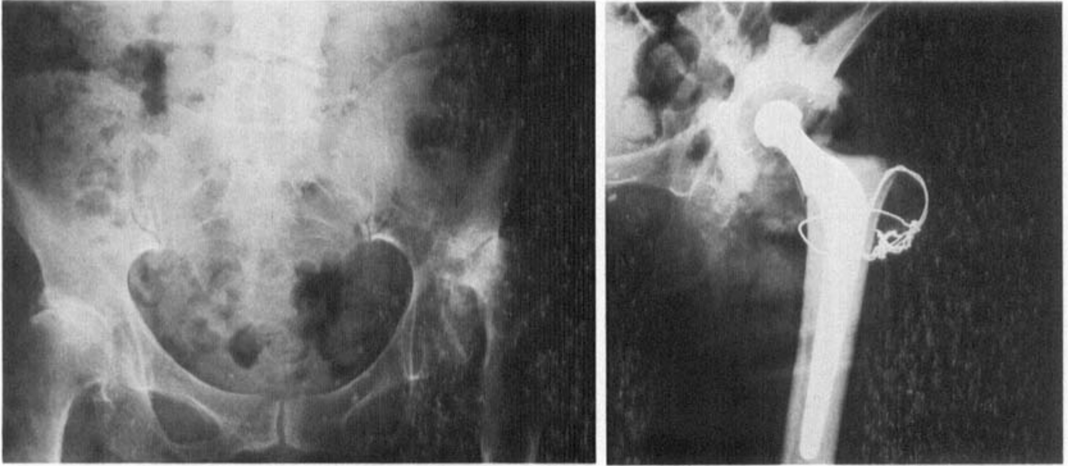

Figure 2. Case 11. Dysplastic bone in both femur and pelvis. Bone grafting to neoacetabular edge and straight stem prosthesis in femur.

the femur. They were placed subperiosteally, directly on the exposed bone with no other fixation than the soft tissues (Figure 2).

Because of anteversion of the femoral neck, it was necessary to insert the femoral component posteriorly into the femoral neck after resecting part of the posterior wall. The narrow medullary canal necessitated cautious, successive reaming, usually done with long drills of increasing diameter earlier used for arthrodesis of the hip by the McKee technique. In five hips Charnley's straight 8-mm narrow stem prosthesis had to be used. Two of these hips had previously undergone intertrochanteric osteotomy. The capsule of the hip joint was completely excised in all cases. Because of residual contracture, tenotomy of the external rotators was done in all hips, tenotomy of the iliopsoas muscle in six, and tenotomy of the adductors in three hips.

As correction of the shortening was not attempted, the fixation of the trochanter to the femoral shaft did not cause any problems. One patient was kept in bed for 4 weeks after the operation. All the others were mobilized within 1 week, as a rule on the 2nd postoperative day. As prophylaxis against thrombosis we used mechanical per- and postoperative procedures in 15 cases: intermittent compression of the lower leg by air bags (Sørensen & Jørgensen 1981).

Results

Except for one case of deep thrombophlebitis without late sequelae, no postoperative complications were observed; in particular, there were no dislocations. One hip developed large periarticular calcific deposits and rapidly became ankylotic, as it had been prior to the operation.

All patients were seen for clinical and radiographic follow-up after an average period of 51 (45–99) months. Sixteen patients had no pain at follow-up, and five had only mild, intermittent pain. The range of motion was improved in 12 hips and unchanged in nine. In no case had the mobility deteriorated after the operation. Walking function improved in 15 and was unchanged in two patients. Walking distance was unchanged in three patients, but had improved in all the others; ten could walk an unlimited distance (Table 1). However, in half the patients walking was still influenced by insufficiency of the gluteal muscle, and three hips had a positive Trendelenburg sign versus 18 preoperatively. As might be expected, the gluteal insufficiency persisted, especially in patients with complete dislocation. Shortening had been reduced in five hips, but in eight hips there was moderate residual shortening. The trochanter had healed in all cases at the 3-month follow-up. The bone

grafts seemed to have healed well: the intended build-up of the acetabulum had been achieved and the top of the convexity of the cup was covered. All occuptationally active patients were able to continue in their previous jobs. No patient required domestic help, although three had previously needed help for ordinary household duties.

Discussion

The difficulty of treating sequelae of congenital dislocation or dysplasia of the hip by THR increases with the severity of the dislocation. With hypoplastic pelvic and femoral bones it is difficult to obtain sufficient bony support of the acetabular component and to place the femoral component in the marrow cavity. The marked shortening reduces the possibilities for hip abductor function. Charnley & Feagin (1973) warned against operating on patients with dislocation merely for their limp, and they limited the indication for THR to cases with pain and secondary arthrosis. Since then, others have extended the operative indications. Hess & Umber (1978) considered disabling low-back pain combined with severe lumbar lordosis in patients with complete dislocation of the hip a sufficient indication for THR, even in the absence of hip pain. Charnley & Feagin (1973) did not place special emphasis on the positioning of the acetabular component in relation to the original acetabulum, but stressed the importance of sparing the anterior edge of the acetabulum during reaming.

In the opinion of several subsequent authors (Eftekhar & Stinchfield 1973, Dunn & Hess 1976, Harris et al. 1977, Hess & Umber 1978, Crowe et al. 1979, Fredin & Unander-Scharin 1980), the cup should nearly always be placed at the site where the acetabulum would normally have developed, because this is the site of the thickest bone and in this way the hip abductors are afforded the most effective resting length and the most advantageous leverage. This makes it possible to correct the shortening of the leg, albeit with the soft tissues as a limiting factor, with the risk of injuring the femoral nerve and especially the sciatic nerve by too forceful passive extension (Dunn & Hess 1976). Due to tension of the soft tissues, it is often necessary to resect part of the upper end of the femur. This increases the difficulties caused by the narrow femoral marrow cavity (Harris et al. 1977), as the stem of the femoral component reaches down into a narrower part. Furthermore, marked lengthening may render it difficult to bring the trochanter into contact with the femoral shaft without major loosening of the abductors, capsular excision, and positioning of the leg in abduction (Harris et al. 1977). Cases with a great lack of pelvic bony stock, especially in untreated complete congenital dislocations, have led to the development of special techniques to secure bony support of the acetabular component, e.g. the use of massive bone grafts from the resected femoral head (Harris et al. 1977, Crowe et al. 1979, Fredin & Unander-Scharin 1980) or controlled fracture of the acetabular floor combined with bone grafting and wire mesh (Dunn & Hess 1976, Hess & Umber 1978).

The main objects of our relatively simple operations, viz. relief of pain and improvement of function, seemed to be obtained to the same extent as in other materials with similar severity of congenital hip disease. Technical difficulties were not equal in all patients, but even in severe cases of subluxation and in cases of complete dislocating it proved possible to perform the THR. Positioning of the cup in the neoacetabulum was sufficiently secure, as there were no cases of prosthetic dislocations and no loosening of the cups, and the bone grafting technique was apparently sufficient to obtain the desired moderate build-up of the upper acetabular edge. By placing the cup in the neoacetabulum it is possible to avoid major exposure, shortening of the upper end of the femur, and the risk involved in stretching the soft tissues. At the same time, the fixation and healing of the trochanter is facilitated. Nevertheless, gluteal insufficiency was reduced in several patients, although in many – especially those with complete dislocation – it remained so marked as to affect walking. Shortening which is not corrected at the operation is a minor problem which can be solved by conservative means.

We used Charnley's standard prosthesis for the femoral component, usually with a straight

stem. Because of the small head and small cup size of this prosthesis we did not feel it was necessary to construct special, individual prostheses.

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