Bone grafting for acetabular protrusion in hip arthroplasty

27 cases of rheumatoid arthritis followed for 2–8 years

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An acetabular bone graft with spongious bone chips was performed in 27 primary total hip arthroplasties in 23 patients with rheumatic disease. There were no major complications. After 5 (2–8) years, the grafts were well incorporated; after 1 year, remodeling had produced a normal cancellous bone structure. Clinical assessment showed overall good results.

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Correction of protrusion to the anatomic position is crucial for good, long-term results after total hip replacement (Ranawat 1980, Poss 1984, Bayley 1987).

We studied the results of 27 primary total hip replacements combined with bone grafting for acetabular protrusion in rheumatoid arthritis.

Patients and methods

From 1979 to 1986, 27 primary total hip arthroplasties were performed in 23 (18 women, 5 men; mean age 47 [19–77] years) rheumatoid patients with an acetabular protrusion (Table 1). Four patients underwent a bilateral, two-stage procedure. There were 16 patients (18 hips) with seropositive rheumatoid arthritis, 4 patients (4 hips) were seronegative, and 3 patients (5 hips) had juvenile chronic arthritis.

A true acetabular protrusion existed in 22 hips. In the remaining five hips, a protrusion-like condition was created by unfortunately wide reaming of the acetabulum (Cases 13, 18) or by removal of large acetabular cysts (Cases 5, 7, 24), which left large bone defects in the acetabular wall.

The protrusion was determined on standard radiographs of the pelvis (related to the Köhler line) and/or proximal migration of the femoral head by comparison of the roof of the contralateral nonprotruded hip. In case of bilateral protrusion, the superior migration of the acetabulum was measured as described by Ranawat et al. (1980). Correction of the protrusion was determined in a similar way.

The operation and aftercare conformed to the procedure described by Slooff et al. (1984). However, in half of the cases, a vitallium mesh was used to keep the graft in place. No allografts were used in this series.

Remodeling and healing of the bone graft was followed with radiographs 6 weeks, 3, 6, and 12 months postoperatively, and at 1- or 2-year intervals thereafter. The radiographs were evaluated according to DeLee (1976). The mean observation time was 5 (2–8) years.

The Merle d'Aubigné and Postel (1954) hip-rating score was used to assess the clinical results. Unfortunately, the clinical data for a preoperative assessment were incomplete.

Results

There were no deep infections or other serious complications, and all the patients were satisfied with their operation(s) (Table 1).

On the sequential radiographs, we observed a radiolucency around the bone graft between the first and the third postoperative month; and after that, an increased density of the bone graft was seen. After a year, a normal cancellous bone structure was seen; dense bone structures, such as subchondral bone, had disappeared.

In three hips, we found evidence of migration and/or loosening. In Case 2, there was tilting of the cup and a 5-mm wide radiolucent line in zone III and a 2-mm radiolucent line in zones I and II after 5.5 years. In Case 14, we found a small (< 1 mm)

Table 1. Observations in 27 hips treated by bone graft and arthroplasty

A	B	C	D	E	F	G	H	I	J		K		L	M			N
1	67	M	L	P	CN	+	–	24	0	8	–15	–2	–	6	1	0	
2	51	F	L	P	ICN	–	–	70	10	11	10	6	I–II–III	5	6	5	
3*			R			–	–	59	8	2	6	1	III	5	6	5	
4	19	F	R	P	IN	+	–	36	6	14	0	7	–	5	6	6	
5	64	F	L	P	ICN	+	+	38	5	–2	1	0	–	6	5	6	*
6	59	F	L	N	N	+	+	39	0	6	–4	–4	–	6	5	6	*
7	53	F	L	P	IN	+	+	72	–4	1	–1	–5	–	6	3	6	*
8	23	F	L	C	ICN	+	+	40	5	12	0	1	–	6	6	6	*
9*			R			+	+	39	3	21	–7	25	II–III	6	6	6	*
10	62	F	L	N	IN	–	–	26	5	2	4	–4	–	6	6	6	
11	71	F	R	N	IN	–	+	39	5	3	–8	–12	–	5	5	6	
12	62	F	R	P	IN	–	–	82	3	1	–2	–1	–	6	4	6	
13	52	F	R	P	CN	+	–	24	1	0	–4	0	–	6	3	6	
14	41	F	L	P		+	–	41	2	–6	–11	–21	I–II–III	6	6	4	
15	56	F	R	P		–	–	86	6	1	–4	0	–	5	6	5	
16	38	M	L	P	I	+	–	24	0	2	–5	0	–	6	5	5	
17*			R			+	+	24	2	5	–7	–4	I	6	5	6	
18	26	M	R	N	N	+	–	24	–1	2	–2	–1	–	6	5	6	
19	63	F	L	P		+	–	25	5	3	3	–7	–	6	6	6	
20	19	F	R	C	ICN	–	–	96	3	0	–1	0	–	6	0	5	
21*			L			–	–	96	3	2	0	–1	–	6	0	5	
22	52	F	L	P	IN	–	+	91	6	0	–5	–1	–	6	1	6	
23	57	M	R	P	ICN	+	+	26	3	10	–7	–10	–	6	1	6	*
24	77	F	R	P	ICN	–	–	27	2	0	–5	–3	–	6	2	6	
25	34	F	R	P	CN	+	+	48	3	2	0	2	–	6	1	6	*
26	73	F	R	P	I	+	–	25	8	2	3	0	–	6	6	6	
27	23	M	L	C	CN	+	+	50	–2	–7	8	–1	tilt of cup	3	6	3	

A Case; *bilateral
B Age at time of operation
C Sex
D Side
E S seropositive; N seronegative; C chronic juvenile arthritis
F Medication: I immune suppression; C cortisone; N nonsteroidal analgetics
G + Vitallium mesh
H + Gentamycin loaded bone cement
I Follow-up in months
J Protrusion as assessed by Köhler's line/disruption of Shenton's line in millimeters (see text)
K Acetabular position postoperatively (see text)
L Radiolucent zone around cup at follow-up according to DeLee (1976)
M Hip score for pain, walking ability, and range of movement (Merle d' Aubigné)
N Cases included from study of Slooff et al. (1984). Two cases excluded because of use of a protrusion ring and allograft

radiolucency in zones I and II, more pronounced in zone III, without migration of the cup. In Case 27, tilting of the cup occurred after 4 years, caused by the enlargement of a cyst in the lateral acetabular roof. In the former 2 cases, the immediate postoperative position of the cup was not ideal (Table 1). Incomplete radiolucent lines of less than 2 mm were observed in 3 additional cases.

We found no evidence of loosening of the femoral components.

Discussion

If small approximately 3 × 5-mm cancellous bone chips are impacted and a vitallium mesh is used, the cement will not penetrate deeply into the newly formed acetabular wall. Strip grafts must therefore be condemned because of the likelihood of their being surrounded by cement and thus isolated from vascular ingrowth (Heywood 1980).

After consolidation of the graft, the cup with its cement is once again contained within a solid bony acetabulum. This provides a better solution than simply filling the gap with cement. In the case of successful acetabular grafting, the stress on the medial pelvic wall is lower (Crowninshield et al. 1983), and this procedure is thought to reduce the incidence of loosening of components (Stauffer 1982). Addition of the vitallium mesh, which provides a metal backing for the acetabulum, may reduce these stresses further (Slooff et al. 1984). The increased bone stock may also be of importance in

case of eventual revisional surgery (Johnsson et al. 1984). A solid bone graft (McCollum et al. 1980, Borja et al. 1985) carries the risk of mechanical weakening of the graft by creeping substitution just when a strong buttress is needed (Mendes 1984).

Our findings from radiologic assessments are similar to those of Gordon et al. (1985): most of the incorporation of the graft took place during the first year. The use of NSAID therapy did not seem to influence this process, nor did corticosteroids or immunosuppressive drugs. Some retardation of bone healing should, however, be expected during indomethacin therapy (Fyfe and Karademus 1982).

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