Uncemented surface replacement for osteonecrosis of the femoral head

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From 1973 to 1982, we performed 40 uncemented surface arthroplasties using 27 Thomine and 13 Gerard cups in 32 patients with osteonecrosis of the femoral head (Ficat Stages 3 and 4). The median follow-up was 8 (3–12) years, with a median age at operation of 35 (19–60) years. Walking ability and mobility were improved, but relief from pain was the most significant improvement. In 28 of the 40 hips the result was excellent or good according to the scoring system of Merle d'Aubigné. The clinical outcome was not influenced by varus angulation, axial resorption, or acetabular protrusion of the cup. As compared with other methods of treatment for osteonecrosis with loss of sphericity of the femoral head, we conclude that the cup arthroplasty is a good choice of treatment in the young patient.

We report the results of 40 hip arthroplasties with uncemented Thomine (1973) and Gerard (1978) cups for osteonecrosis.

Patients and methods

From 1973 to 1982, we performed 40 cup arthroplasties in 31 patients, 13 women and 18 men. Osteonecrosis was due to the use of corticosteroids following renal transplantation (22 hips) and in Hodgkin's disease (one hip). In these cases immunosuppression was continued postoperatively. Posttraumatic osteonecrosis was present in nine hips. In four hips the cause was alcohol abuse and in four hips a predisposing factor could not be demonstrated. Preoperatively, the radiographs were classified in four stages according to Ficat and Arlet (1980); 29 cases were Stage 3 and 11 cases Stage 4.

The median age at operation was 32 (19–60) years with no difference between the two cup types. The median follow-up was 8 (3–12) years.

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Twenty-seven Thomine (1973) cups and 13 Gerard (1978) cups were used. Two patients had a bilateral Gerard cup, 6 patients a bilateral Thomine cup, and 1 patient a Thomine cup on the left side and a Gerard cup on the right side (Cases 13 and 14). The Thomine cup is spheric and fits snugly on the femoral head. The Gerard cup is a combination of a Luck (1970) femoral cup and Aufranc (1957) acetabular cup. The Luck cup is supported by the cylindrically fashioned femoral head. The acetabular cup slides in the acetabulum after this has been enlarged by reaming. In 32 operations an anterolateral approach, in 6 operations an anterior approach, and in the remaining two operations a lateral transgluteal approach was used. Prophylactic antibiotics and anticoagulants were used in all the patients. The hips were evaluated preoperatively and postoperatively for pain, walking ability, and mobility (Merle d'Aubigné and Postel 1954). At the radiographic examination during follow-up, we looked for axial resorption of the femoral head, varus angulation of the cup, acetabular protrusion, and for heterotopic ossification. The final clinical examination was performed by one of the authors (FdM).

Complications

Systemic complications included one deep venous thrombosis and one manifest pulmonary embolus.

Table 1. Uncemented cup arthroplasty in 40 hips with osteonecrosis

Case	Cup	Age	Sex	Side	Etiology	Stage	Approach	Score		Radiography		Compli-cation
								Preop P W M	Postop P W M	Year		
1	G	22	m	l	T	4	1	2 2 3	2 2 4	6	V P	8
2	G	22	m	r	T	3	2	3 5 6	4 4 6	3		
3	G	28	f	l	C	4	1	6 5 6	6 5 6	7	V P	
4	G	29	f	r	C	4	3	6 5 6	5 5 6	6	P	
5	G	31	f	l	C	4	3	3 5 5	6 6 6	6		
6	G	43	f	r	C	3	3	1 3 4	5 5 6	6	V	1 5
7	G	42	m	r	A	3	3	4 3 5	5 4 6	4		
8	G	42	m	l	A	3	3	3 3 5	5 5 6	4		
9	G	35	m	l	C	3	2	4 3 5	5 5 6	3	H	1
10	G	38	f	l	C	3	3	4 3 5	5 6 6	4		
11	G	59	m	l	C	4	3	3 4 4	4 3 6	4	H	
12	G	57	f	r	T	4	3	2 2 2	4 4 5	4		3
13	G	30	f	r	C	4	3	4 4 6	4 4 6	6		4 7
14	T	29	f	l	C	3	1	3 3 5	5 3 6	7	V H	
15	T	21	m	r	C	3	3	3 4 6	6 6 6	10	V P	
16	T	32	m	r	C	3	3	1 3 5	5 3 4	9		
17	T	32	m	l	C	3	3	1 3 5	5 3 3	8	V	
18	T	46	m	l	U	3	3	3 1 6	5 5 5	9	H	
19	T	46	m	l	U	3	3	3 4 6	4 5 6	11		
20	T	44	m	r	U	3	3	3 4 6	4 5 6	13		
21	T	43	m	r	C	3	3	2 1 5	6 4 6	9	V	
22	T	43	m	l	C	3	3	2 1 5	6 4 6	9		
23	T	48	f	l	T	3	3	3 4 5	5 5 5	10		
24	T	19	m	l	T	4	3	3 2 6	2 2 3	3	V P	6
25	T	29	f	l	T	4	3	3 4 6	5 5 5	9		
26	T	30	m	l	A	3	3	1 2 5	5 4 5	10	V	
27	T	23	m	l	C	3	3	3 5 5	5 6 6	11		
28	T	23	m	r	C	3	3	3 5 6	6 5 6	11	V	
29	T	28	f	r	U	3	3	4 5 6	6 6 5	8		2
30	T	27	m	r	A	3	1	2 2 5	3 2 4	8	V R	
31	T	60	m	r	T	3	1	1 1 5	5 5 5	10	V H	
32	T	19	f	l	C	3	3	4 4 5	5 5 6	11		1
33	T	19	f	r	C	3	3	5 5 6	6 6 6	11	R	
34	T	57	f	r	T	3	3	4 5 5	5 6 5	11	V	
35	T	36	m	r	C	3	3	2 3 5	2 2 6	7	H	
36	T	36	m	l	C	4	1	2 3 5	2 2 5	6		
37	T	24	f	l	C	3	3	0 3 5	4 5 5	10	H P	
38	T	36	m	l	T	3	3	5 5 6	5 5 6	3	V P H	7
39	T	37	f	r	C	4	3	2 1 4	6 5 6	10		
40	T	37	f	l	C	3	3	2 1 4	6 4 6	10	V H	

| Vertical bar represents bilateral cases

Cup
- G Gerard's
- T Thomine's

Etiology
- T trauma
- C corticosteroid use
- A alcohol abuse
- U unknown

Approach
- 1 anterior
- 2 lateral
- 3 anterolateral

Score (Merle d'Aubigné-Postel)
- P pain
- W walking ability
- M mobility

Radiography
- P protrusion
- R resorption of femoral head
- V varus angulation
- H heterotropic ossification

Complication
- 1 urinary tract infection
- 2 venous thrombosis
- 3 pulmonary embolus
- 4 dislocation
- 5 change of Gerard's cup
- 6 conversion to Gerard's cup
- 7 total hip arthroplasty
- 8 arthrodesis

Three urinary tract infections were resolved with antibiotic therapy. In five hips revision surgery was necessary.

In 1 patient an arthrodesis was made, after the cup arthroplasty had failed twice (Cases 1 and 24). In Case 6 a revision to a smaller size Gerard cup was performed because of restriction of movement 8 months after the first operation. After the reintervention the mobility was improved. Now with a follow-up of 6 years, there is only a slight limitation of mobility. Six years after the arthroplasty (Case 13) a dislocation occurred between the inner and outer Gerard cup and closed reduction failed. Mainly because of the poor condition of the acetabulum and the short life expectancy of this patient after a failed renal transplantation, a cemented total hip arthroplasty was performed. In Case 38 of posttraumatic necrosis a cemented total hip arthroplasty was performed 3 years after a Thomine-cup arthroplasty primarily because of persisting symptoms and progressive acetabular protrusion.

Results

Pain

The most striking improvement was the relief from pain (Table 1), with a score of 6 in 10 hips and 5 in 18 hips. Preoperatively only two hips scored 5 and two hips scored 6. In 32 hips a clinical improvement was present. The result remained unchanged in six hips. In two hips the outcome was worse (Cases 4 and 24). The first patient with a slightly worse result at follow-up had a score of 6 preoperatively and 5, 6 years after a Gerard arthroplasty. The cup was placed in slight retroflexion, and a minimal acetabular protrusion was present as a possible cause of the pain. The second patient was Case 24 presented above. Another 2 patients with three operated on hips had persisting pain. The first of these 2 patients, a Stage 3 osteonecrosis due to alcohol abuse, received a Thomine cup at aged 27 years (Case 30). After 8 years the score for pain, walking ability, and the mobility was 3, 2, and 4. A varus angulation and femoral resorption was a possible cause of this outcome. In the second patient, a 36-year-old man with a bilateral osteonecrosis due to corticosteroids a bilateral Thomine-cup arthroplasty was performed (Cases 35 and 36). Both hips, 6 and 7 years later, scored only 2 for pain. Except for the heterotopic ossification on the right side, this poor result could not be explained.

Walking ability

Seven hips scored 6 and 16 hips scored 5 at follow-up. Preoperatively a score of 5 was present only in 10 hips. In 11 hips the result remained unchanged; and in 3 patients with four operated on hips, the outcome was worse (Cases 2, 11, 35, and 36). Nine hips scored 3 or less.

Mobility

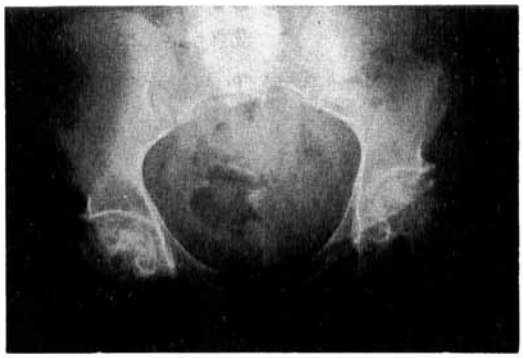
There was only a slight improvement between the score preoperatively and postoperatively. Overall, 34 hips scored 5 or 6 at follow-up. An improvement was present in 17 hips, whereas in seven hips the result was worse, and in 16 hips the result remained the same.

Radiographic examination

At follow-up a varus angulation was seen in 15 hips (Thomine 11, Gerard 3). Axial migration of the cup on the femoral neck caused by resorption of the femoral head was present in two hips. Acetabular protrusion was obvious in three Gerard cups (Figure 1) and in four Thomine cups (Figure 2). Neither the varus angulation, axial resorption, nor acetabular protrusion influenced the clinical outcome at follow-up. Heterotopic bone formation was evident in nine hips, twice after an anterior approach, six times after an anterolateral approach, and once after a lateral approach. The presence of heterotopic bone formation did not seem to influence the results.

Discussion

The treatment of osteonecrosis depends on the stage of the disease. In the early Stages 1 and 2 when the sphericity of the femoral head is not lost, treatment is directed towards preventing collapse of the femoral head (Arlet and Ficat 1965, Bonfiglio and Voke 1968, Hungerford and Zizic 1978). However, once collapse has occurred and the sphericity is lost, especially when secondary arthrotic changes are present, an arthroplasty or arthrodesis may be indicated (Kenzora and Glimcher 1985, Hungerford and Lennox 1985). Arthrodesis for osteonecrosis is relatively contraindicated because the disease can be bilateral in up to 80 per cent; hemiarthroplasty is associated with progressive femoral subsidence and loosening or acetabular protrusion (Amstutz et al. 1975, Dutton 1982). Total hip arthroplasty is less than ideal in younger patients (Stauffer



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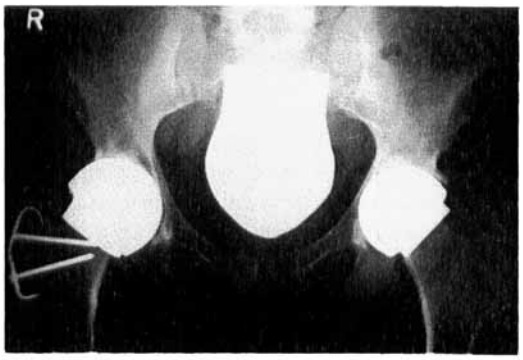

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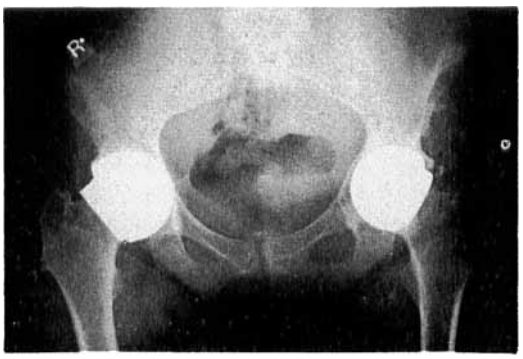

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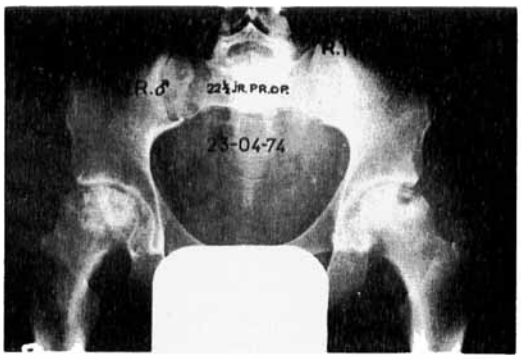
Figure 1. A 28-year-old woman with bilateral osteonecrosis, Stage 4, due to corticosteroid use after renal transplantation (Cases 3 and 4).

A. Before the first operation.

B. One year after a Gerard arthroplasty on the left side and 3 months postoperatively on the right side.

C. At follow-up after 6 years. Protrusion on both sides with varus angulation on the left side.



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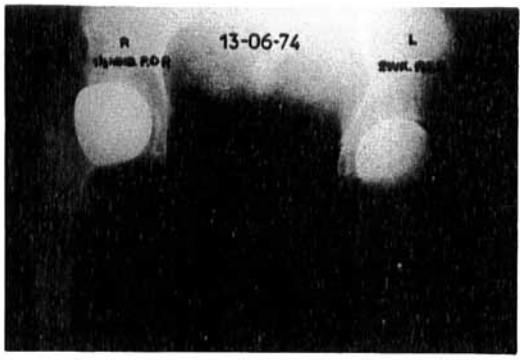

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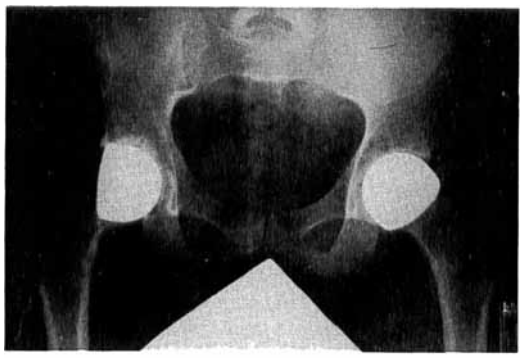

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Figure 2. A 23-year-old man, bilateral osteonecrosis Stage 3, corticosteroid use after renal transplantation (Cases 27 and 28).

A. Before the first operation.

B. One month after bilateral Thomine cup arthroplasty. The cup on the right side was placed in varus, on the left side in slight valgus as recommended.

C. Eleven-year follow-up. Progression of the varus angulation on the right side. Clinically, both hips scored excellent.

1982, Bradford et al. 1983, Hedley and Kim 1983, Cornell et al. 1985).

In our series with a median follow-up of 8 years, two thirds had substantial relief from pain, and walking ability was slightly improved. The mobility remained practically unchanged; the majority had a good range of motion preoperatively. Jolley (1982) found an overall failure rate of 0.1 in a 3-year follow-up study of 55 Tharies and Freeman I.C.L.H. cup arthroplasties. In this study, one out of the 10 cases operated on for osteonecrosis was a failure. Dutton et al. (1982) reported a 2-year failure rate of 0.2 in 42 Tharies cup arthroplasties for osteonecrosis. Their experience with hemiarthroplasty in osteonecrosis with a 6-year follow-up was poor, with 12 out of 16 converted to a total hip. Cornell et al. (1985) had a 7-year failure rate of 0.4 in 28 total hip arthroplasties for osteonecrosis.

In our series a reintervention for hip complications was necessary in 5/40 hips. We believe that an uncemented cup arthroplasty should be considered in Stages 3 and 4 osteonecrosis of the femoral head, especially in young patients. Relief from pain can be accomplished in the majority. A total hip arthroplasty or arthrodesis will still be possible if the cup arthroplasty fails.

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