Electronic Appendix

Risk Factors Associated with the Appearance of Acetabular Osteolysis

According to Cox multivariate regression analysis, the risk of appearance of acetabular osteolysis increased with acetabular wear (hazard risk = 1.92; 95% confidence interval, 1.23 to 2.99; p = 0.004), a weight of >80 kg (hazard risk = 4.1; 95% confidence interval, 1.5 to 11.5; p = 0.007), and the presence of a 32-mm femoral head (hazard risk = 3.14; 95% confidence interval, 0.96 to 10.23; p = 0.05).

Electronic Appendix

Risk Factors Associated with the Appearance of Cortical Thickening

Femoral cortical thickening was related to greater acetabular wear (p = 0.001, Mann-Whitney test), greater canal filling at level A (p = 0.009, Student t test), a 32-mm femoral head (p = 0.011), and proximal femoral osteopenia (p = 0.026, chi-square test). According to Cox multivariate regression analysis, the risk of appearance of cortical thickening increased with canal filling at level A (hazard risk = 1.065; 95% confidence interval, 1.024 to 1.108; p = 0.0018), acetabular wear (hazard risk = 1.52; 95% confidence interval, 1.04 to 2.29; p = 0.0325), and the presence of a 32-mm femoral head (hazard risk = 2.33; 95% confidence interval, 1.07 to 5.0; p = 0.0334).

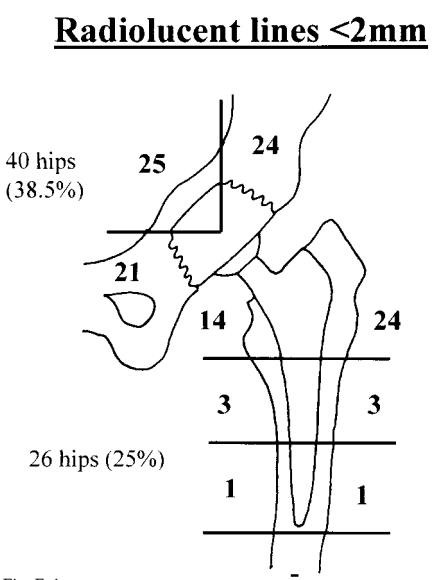

Fig. E-1
Distribution of radiolucent lines around the acetabular component (in the zones of DeLee and Charnley) and around the femoral component (in the zones of Gruen et al.) at the most recent follow-up evaluation.

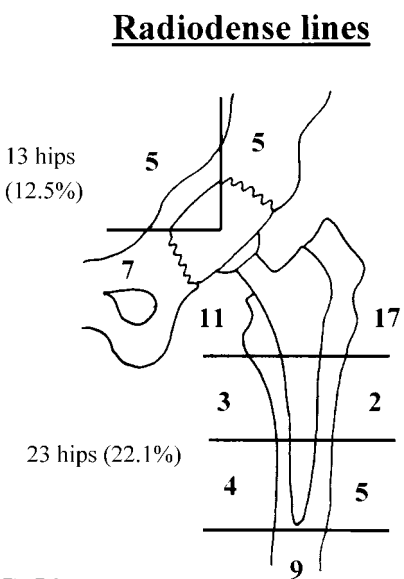

Fig. E-2
Distribution of radiodense lines around the acetabular component (in the zones of DeLee and Charnley) and around the femoral component (in the zones of Gruen et al.) at the most recent follow-up evaluation.

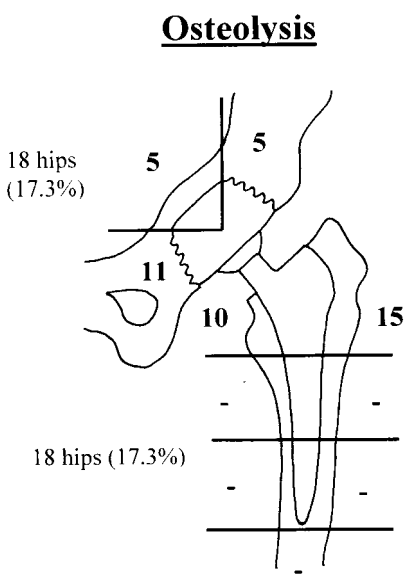

Fig. E-3
Distribution of osteolysis around the acetabular component (in the zones of DeLee and Charnley) and around the femoral component (in the zones of Gruen et al.) at the most recent follow-up evaluation.

TABLE E-1 Acetabular Cup Diameter and Femoral Head Size

Cup Diameter *(mm)*	No. of Hips		
	Total (N = 104)	32-mm Femoral Head (N = 44)	28-mm Femoral Head (N = 60)
48	1 (1%)	0	1
50	3 (3%)	1	2
52	8 (8%)	1	7
53	4 (4%)	0	4
54	1 (1%)	0	1
55	21 (20%)	3	18
56	6 (6%)	2	4
58	20 (19%)	14	6
60	5 (5%)	0	5
61	15 (14%)	10	5
63	2 (2%)	0	2
64	17 (16%)	12	5
68	1 (1%)	1	0

TABLE E-2 Stem Width

Stem Width	No. of Hips (N = 104)
0	5 (5%)
1	26 (25%)
2	23 (22%)
3	23 (22%)
4	14 (13%)
5	10 (10%)
6	2 (2%)
10	1 (1%)

TABLE E-3 Mean Values for Pain, Function, and Range of Motion at Each Follow-up Interval According to Merle D'Aubigné and Postel Score[17]

	No. of Hips	Pain Score	Function Score	Range of Motion Score
Preop.	104	2.2 ± 0.5	2.8 ± 0.6	3.0 ± 0.7
5 years postop.	104	5.8 ± 0.4	5.8 ± 0.3	5.6 ± 0.6
10 years postop.	104	5.7 ± 0.5	5.7 ± 0.4	5.5 ± 0.6
13 years postop.	12	5.8 ± 0.4	5.8 ± 0.4	5.5 ± 0.6

TABLE E-4 Level of Pain at Final Follow-up

Level	No. of Hips
Level <4	0
Level 4*	2
Level 5**	13
Level 6	89

*Thigh pain. **Thigh pain (three hips); groin and buttock pain (one hip); thigh, groin, and buttock pain (nine hips).

TABLE E-5 Risk Factors Associated with Thigh Pain*†

	Thigh Pain (N = 14)	No Thigh Pain (N = 90)
Gender (male:female)	6:8	37:53
Age		
<50 years	2	12
≥50 years	12	78
Femoral type[16]		
Type A	10	57
Type B	4	27
Type C	0	6
Canal filling *(%)*		
Level A	85.1 ± 11.4	88.3 ± 10.1
Level B	84.1 ± 11.8	85.9 ± 11.8
Osteolysis		
Yes	1	17
No	13	73
Stem width		
0-2	8	46
3-10	6	44
Stem position		
Neutral	6	55
Varus	7	33
Valgus	1	2
Osteopenia[26]		
None (n = 56)	7	49
Grade 1 (n = 24)	3	21
Grade 2 (n = 21)	3	18
Grade 3 (n = 3)	1	2
Grade 4 (n = 0)	0	0

*The values are given as the number of hips, except where indicated. †With the numbers available, no significant differences could be detected.

Table E-6 Risk Factors Associated with Acetabular Cup Loosening*

	Cup Loosening (N = 7)	No Cup Loosening (N = 97)	P Value
Gender (male:female)	4:3	39:58	NS
Age			
Mean age *(yr)*	56.9 ± 7.8	62.6 ± 11.0	NS
<50 years	2	13	NS
≥50 years	5	84	
Diagnosis			
Osteoarthritis	5	65	NS
Avascular necrosis	2	16	
Other	0	16	
Cup diameter			
48-55 mm	4	34	NS
>55 mm	3	63	
Femoral head			
32 mm	7	37	0.001
28 mm	0	60	
Acetabular angle			
Mean *(°)*	58.0 ± 7.6	48.0 ± 7.4	0.0008
Neutral (40°-50°)	2	60	0.023
Vertical (>50°)	5	29	
Horizontal (<40°)	0	8	
Uncontained threads			
No uncontained threads	5	75	NS
1 uncontained thread	2	14	
2 uncontained threads	0	8	
Acetabular wear			
<1 mm	1	77	0.001
1-2 mm	5	15	
>2 mm	1	5	

*The values are given as the number of hips, except where indicated.

Table E-7 Risk Factors Associated with Cups That Had >0.2 mm/year of Polyethylene Wear*

	Wear Rate		
	>0.2 mm/year (N = 10)	<0.2 mm/year (N = 94)	P Value
Gender (male:female)	4:6	39:55	NS
Age			
<50 years	2	13	NS
≥50 years	8	81	
Weight			
≥80 kg	4	23	NS
<80 kg	6	71	
Activity[15]			
Levels 3-4	7	47	NS
Levels 1-2	3	47	
Diagnosis			
Osteoarthritis	8	62	NS
Avascular necrosis	2	16	
Other	0	16	
Femoral head			
32 mm	8	36	0.002
28 mm	2	58	
Acetabular angle			
Neutral (40º-50º)	3	59	0.06
Vertical (>50º)	6	28	
Horizontal (<40º)	1	7	

*The values are given as the number of hips, except where indicated.

TABLE E-8 Factors associated with Postoperative Stem Position

	Neutral (N = 61)	Varus (N = 40)	Valgus (N = 3)	Total (N = 104)	P Value
Stem width					
Mean diameter	2.9 ± 1.7	2.1 ± 1.3	3.0 ± 1.0	2.6 ± 1.6	0.05*
Median diameter (range)	3 (0-10)	2 (0-6)	3 (2-4)	3 (0-10)	
Canal filling *(%)*					
Level A	89.4 ± 9.7	85.0 ± 11.4	92.3 ± 5.8	87.7 ± 10.5	NS
Level B	87.8 ± 11.5	83.1 ± 10.8	73.0 ± 7.2	85.6 ± 11.5	0.01**

*Kruskal-Wallis test

**ANOVA

TABLE E-9 Influence of Different Factors on Femoral Subsidence*

	Subsidence (N = 12)	No Subsidence (N = 92)	P Value
Gender (male:female)	6:6	37:55	NS
Age			
<50 years	2	13	NS
≥50 years	10	79	
Weight			
Mean (kg)	74.6 ± 10.2	68.3 ± 12.5	NS
≥80 kg	3	24	NS
<80 kg	9	68	
Femoral type[16]			
Type A	6	61	NS
Type B	4	27	
Type C	2	4	
Stem width			
0-2	7	47	NS
3-10	5	45	
Stem position			
Neutral	8	53	NS
Varus	4	36	
Valgus	0	3	
Canal filling *(%)*			
Level A	83.8 ± 9.2	88.3 ± 10.9	NS
Level B	80.2 ± 12.0	85.3 ± 12.2	
Pain level			
Level 4	0	2	
Level 5	1	12	NS
Level 6	11	78	
Diagnosis			
Osteoarthritis	8	62	NS
Avascular necrosis	4	14	
Other	0	16	

*The values are given as the number of hips, except where indicated.

TABLE E-10 Influence of Different Factors on Cortical Thickening*

	Thickening (N = 31)	No Thickening (N = 73)	P Value
Gender (male:female)	13:18	30:43	NS
Age			
Mean *(yr)*	60.2 ± 13.7	63.3 ± 10.5	
<50 years	6	9	NS
≥50 years	25	64	
Femoral type[16]			
Type A	24	43	NS
Type B	6	25	
Type C	1	5	
Canal filling *(%)*			
Level A	91.9 ± 10.0	86.0 ± 10.3	0.009†
Level B	85.9 ± 12.3	84.4 ± 11.0	NS
Femoral head			
28 mm	12	48	0.011
32 mm	19	25	
Median stem width (range)	3 (1-10)	2 (0-6)	NS
Stem position			
Neutral	17	44	NS
Varus	13	27	
Valgus	1	2	
Femoral osteopenia[26]			
Grade 0-1	20	60	0.026‡
Grade 2-3	11	13	
Acetabular wear			
Mean *(mm)*	0.87 ± 0.8	0.46 ± 0.7	0.001§
<1 mm (no. of hips)	25	53	NS
1-2 mm (no. of hips)	3	17	
>2 mm (no. of hips)	3	3	

*The values are given as the number of hips, except where indicated. †Student t test. ‡Chi-square test. §Mann-Whitney test.

TABLE E-11 Influence of Different Factors on Femoral Osteopenia (Grades 2-3)[26]*

	Osteopenia					
	Grade 2 (N = 21)	Grade 3 (N = 3)	Grade 4 (N = 0)	Grade 2-3 (N = 24)	Grades 0-1 (N = 80)	P Value
Gender (male:female)	6:15	1:2	0:0	7:17	36:44	NS
Age						
<50 years	4	2	0	6	9	0.08
≥50 years	17	1	0	18	71	
Activity level[15]						
Levels 1-2	5	0	0	5	45	0.0025
Levels 3-4	16	3	0	19	35	
Diagnosis						
Osteoarthritis	13	0	0	13	57	NS
Avascular necrosis	4	2	0	6	1	
Other	4	1	0	5	12	
Femoral type[16]						
Type A	16	3	0	19	48	0.09
Type B	5	-	0	5	26	
Type C	0	0	0	0	6	
Stem size						
0-2	11	2	0	13	41	NS
3-10	10	1	0	11	39	
Canal filling *(%)*						
Level A	90.2 ± 9.7	92.0 ± 12.7	0	90.1 ± 10.0	86.8 ± 10.6	NS
Level B	86.6 ± 12.6	87.0 ± 13.7	0	86.2 ± 12.8	84.2 ± 12.4	NS
Acetabular wear						
<1 mm	11	0	0	11	67	0.007
1-2 mm	7	2	0	9	11	
>2 mm	3	1	0	4	2	
Thigh Pain						
Yes	3	1	0	4	10	NS
No	18	2	0	20	70	

*The values are given as the number of hips, except where indicated.

TABLE E-12 Influence of Different Factors on Femoral Osteolysis*

	Osteolysis (N = 18)	No Osteolysis (N = 86)	P Value
Gender (male:female)	8:10	35:51	NS
Age			
<50 years	3	12	NS
≥50 years	15	74	
Activity level[15]			
Levels 1-2	8	42	NS
Levels 3-4	10	44	
Stem width			
0-2	11	43	NS
3-10	7	43	
Stem position			
Neutral	12	49	NS
Varus	5	35	
Valgus	1	2	
Canal filling *(%)*			
Level A	88.7 ± 12.5	88.3 ± 10.0	NS
Level B	88.7 ± 12.0	84.3 ± 11.8	NS
Polyethylene wear			
<1 mm	11	67	NS
1 mm	5	15	
2 mm	2	4	
Pain level			
Level 4	1†	1	NS
Level 5	0	13	
Level 6	17	72	

*The values are given as the number of hips, except where indicated.
†Revised cup.