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Primary total hip arthroplasty in patients with rheumatoid arthritis

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Abstract Twenty-eight (11 cemented and 17 noncemented) total hip arthroplasties (THA) were performed in 20 patients with rheumatoid arthritis (RA). The average age at operation was 42.1 years and the average follow-up was 10.8 years. There were two deep infections requiring removal of the prosthesis. Three cemented acetabular cups and one cemented femoral component were revised due to aseptic loosening. One cemented cup was loosened radiologically. One PCA polyethylene liner was revised because of significant wear. Both cemented and noncemented femoral components are capable of providing respectable results in RA patients. The relatively inferior results of THA among RA patients is due not only to the fixation method, but also to the poorer bone quality.

Résumé Vingt-huit arthroplasties totales de hanche (11 cimentées, 17 non-cimentées) ont été exécutées sur 20 malades atteints de polyarthrite rhumato. L'âge moyen à l'opération était de 42,1 ans et la durée moyenne de suivi de 10,8 années. Deux infections profondes ont nécessité l'ablation de la prothèse. Trois composants cotyloïdiens cimentés et un composant fémoral cimenté ont été révisés à cause d'un descellement aseptique. Un composant cotyloïdien montre un descellement radiographique. Un insert de polyéthylène a été remplacé à cause d'une usure notable. Les composants fémoraux cimentés et non-cimentés ont la capacité de fournir un résultat acceptable dans le cas d'une polyarthrite rhumato. Les résultats relativement inférieurs des prothèses totales chez ces mala-

des proviennent non seulement de la méthode de fixation mais aussi d'une mauvaise qualité osseuse.

Introduction

Total hip arthroplasty (THA) is perhaps one of the most successful operations for patients with rheumatoid arthritis (RA) in terms of pain relief, functional gain, and patient satisfaction. Despite the lower activity level and the lower body weight of these patients, the literature has documented the relatively inferior long-term results of cemented THA among patients with RA [3, 5, 15, 17, 18, 20, 21, 24]. Recently noncemented prostheses have also been used in RA patients, but there are only a few reports describing the short-term results [9, 13, 14, 16]. We reviewed the results of primary THAs performed on a group of RA patients. Both cemented and noncemented prostheses were used. The age at operation and the pre-operative hip score were comparable between the cemented and the noncemented groups.

Materials and methods

Between 1980 and 1995, we performed 28 THAs in 20 patients who fulfilled the diagnostic criteria for rheumatoid arthritis [1]. Eight patients had bilateral THA (Table 1). Three of them had bilateral cemented THA, one had bilateral noncemented THA and four patients had noncemented THA on one side and cemented THA on the other. Seventeen noncemented and 11 cemented prostheses were used. The noncemented prostheses included the porous coated anatomic (PCA) (Howmedica, Rutherford, New Jersey), Omnifit (Osteonics, Allendale, NJ), and the anatomic medullary locking (AML) (Depuy, Warsaw, Indiana) prostheses. All cemented prostheses were Charnley low-friction arthroplasty (Thackray, Leeds, UK) performed using first generation cementing technique. The posterior approach was adopted throughout. Only one dose of antibiotic was given prophylactically at the time of induction.

The average age at the time of operation for those who received cemented prostheses was 41.5 years (SD 16.5, range 17.4–68.0) and for those who received noncemented prostheses 42.5 years (SD 16.0, range 19.7–77.4). The bone quality of the proximal femur at operation was documented according to Dorr's

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Table 1 Patient data

Patient No.	Name	Sex	Date of Operation	Age at Operation (years)	Preoperative bone quality of proximal femur ^a	Prosthesis	Follow-up period (years)	Date of removal or revision	Survival period of THA (years)	Component(s) removed or revised; reason
1	CSY	F	3 Oct 1991	39	B	AML	8.1	27 Feb 1997	5.5	All; sepsis
2	CKS	M	15 Apr 1986	39	A	Charnley	13.6	—	13.6	—
			10 Feb 1987	40	A	PCA	12.8	—	12.8	—
3	CTS	F	1 Jan 1983	17	B	Charnley	16.9	14 Feb 1995	12.3	Cup; aseptic loosening
			29 Apr 1998	23	B	PCA	8.9	17 Jan 1997	8.9	Liner; wear
4	CYW	M	1 Jan 1980	22	B	Charnley	16.8	3 Jun 1996	16.4	All; aseptic loosening
			1 Jan 1985	27	C	Charnley	11.8	26 Sep 1996	11.8	All; sepsis
5	FHY	F	23 Apr 1981	24	B	Charnley	18.6	2 Nov 1990	9.7	Cup; aseptic loosening
			22 Sep 1995	39	C	Omnifit	4.2	—	4.2	—
6	KYPI	F	1 Jan 1991	25	A	PCA	8.9	—	8.9	—
7	LA	F	1 Jul 1995	20	B	Omnifit	4.4	—	4.4	—
8	LPC	F	19 May 1994	77	B	Omnifit	5.5	—	9.4	—
9	LSCJ	F	25 Jul 1995	38	A	Omnifit	4.3	—	4.3	—
10	LSW	F	10 Feb 1995	66	B	Omnifit	4.8	—	4.8	—
11	MHH	F	15 May 1994	64	B	PCA	5.5	—	15.5	—
12	MI	F	1 Dec 1992	68	B	Charnley	7.0	—	7.0	—
13	MSM	F	1 Jul 1990	46	B	PCA	9.4	—	9.4	—
14	TBY	M	13 Mar 1986	46	B	Charnley	13.7	—	13.7	—
			13 Mar 1990	50	B	AML	9.7	—	9.7	—
15	TWC	F	14 Apr 1987	29	B	PCA	12.6	—	12.69	—
16	WC	F	1 Jan 1983	53	B	Charnley	16.9	—	16.9	—
			1 Jan 1983	53	B	Charnley	16.9	—	16.9	—
17	WSY	F	1 Feb 1990	57	B	AML	9.8	—	9.8	—
18	WWY	F	1 Jan 1991	40	B	AML	8.9	—	8.9	—
19	YSC	M	20 Oct 1987	34	B	PCA	12.1	—	12.1	—
			30 Jan 1989	36	B	PCA	10.8	—	10.8	—
20	YYM	F	1 Jan 1987	53	B	Charnley	12.9	—	12.9	—
			26 Jan 1987	53	B	Charnley	12.8	—	12.8	—

^a Dorr's classification [7]

classification [7]. All patients were regularly followed up in our outpatient clinic with annual radiological examination of the hips. The average follow-up period was 14.3 years (SD 3.3, range 7.0–18.6) for the cemented group and 8.4 years (SD 3.1, range 4.2–12.8) for the noncemented group.

Clinical assessment in terms of pain, function, deformities, and range of movement was based on Harris's evaluation system [11]. Radiological assessment during each follow-up session included a standing anteroposterior radiograph of the pelvis with the X-ray beam centered at the pubic symphysis, and a lateral radiograph of the operated hip joint. Demarcation of the acetabular components was recorded using the zonal system described by DeLee and Charnley [6]. The zonal system described by Gruen et al. [10] was adopted to record the site of stem demarcation. Radiological loosening of the acetabular component was defined as Hodgkinson type 3 or 4 demarcation of the cup [12]. Femoral component loosening was defined as more than 5 mm of subsidence on plain radiograph, or a fracture of the cement or the stem, or a complete radiolucent line more than 2 mm in thickness [15].

Results

All patients had substantial clinical improvement in terms of pain, function, and range of motion. The average preoperative hip score was 25.3, improved to 88.9 postoperatively. Preoperatively twenty hips had severe pain, and 8 hips moderate pain. Postoperatively 19 hips were entirely pain-free and 9 hips had only occasional discomfort. No significant difference in the preoperative

hip score was found between the cemented and noncemented groups ($P>0.7$).

Four THAs in three patients were revised due to aseptic loosening (Table 1). Of the cemented THAs, two required revision for the acetabular component only and another one required revision of both the cup and the stem. One more cemented acetabular component has loosened radiologically in an asymptomatic patient. Two more femoral components had subsided 3 mm on the most recent radiographs. For the noncemented THAs, only one polyethylene liner was revised due to significant wear. On the same patient, osteolysis in zone I of the stem was evident on the radiograph at the time the liner was revised. The stem was, however, shown to be well fixed and therefore not revised during the operation. One more PCA stem displaced a nonprogressive subsidence of 4 mm. Another stem subsided 3 mm 3 years after the operation and has shown no further migration since then. Three cups had a 1 mm radiolucent line at zone 1.

We encountered two deep infections in two patients (Table 1), and both were late infection caused by methicillin-resistant *Staphylococcus aureus*. Other complications included two intraoperative fissures at the femoral calcar managed by cerclage wiring. No dislocation was recorded in any of our patients.

Table 2 Summary of reports on cemented THAs in RA patients

Authors (year)	No. of THA/no. of RA patients	Mean age at operation (years)	Mean follow- up (years)	Important findings			
				No. of cups revised for aseptic loosening (%)	No. of stems revised for aseptic loosening (%)	No. of loosened cups: revised+ radiological (%)	No. of loosened stems: revised+ radiological (%)
Poss (1984)	138/98	58.0	7.0	0 (0%)	5 (3.6%)	107 (77.5%)	5 (3.6%)
Unger (1987)	83/51	39.9	12.1	6 (7.2%)	11 (13.3%)	6 (7.2%)	11 (13.3%)
Severt (1991)	75/53	49.9	7.4	4 (5.3%)	1 (1.3%)	11 (14.6%)	5 (6.7%)
Chmell (1997)	66/39	19.9	15.1	23 (34.8%)	12 (18.1%)	29 (43.9%)	12 (18.1%)
Creighton (1998)	103/73	62.0	14.6	2 (1.9%)	2 (1.9%)	10 (9.7%)	4 (3.9%)
Lehtimäki (1999)	1553/1086	53.1	Up to 20 years	Survival probability of cups and stems at 15 years: 87.1% and 89.9%, respectively			
Tang (present series)	11/8	41.5	14.3	3 (27.3%)	1 (9.0%)	4 (36.3%)	1 (9.0%)

Table 3 Summary of reports on noncemented THAs in RA patients

Authors (year)	No. of THA/no. of RA patients	Mean age at operation (years)	Mean follow- up (years)	Important findings			
				No. of cups revised for aseptic loosening (%)	No. of stems revised for aseptic loosening (%)	No. of loosened cups: revised+ radiological (%)	No. of loosened stems: revised+ radiological (%)
Lachiewicz (1994)	35/25	41.0	4.5	0 (0%)	0 (0%)	1 (2.9%)	0 (0%)
Kumar (1998)	25/16	24.9	4.5	3 (11.1%)	1 (3.7%)	3 (11.1%)	1 (3.7%)
Araujo (1998)	33/32	51.4	5.0	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Loehr (1999)	21/15	53.0	3.3	0 (0%)	0 (0%)	0 (0%)	5 (23.8%)
Tang (present series)	17/16	42.5	8.4	1 (5.9%)	0 (0%)	1 (5.9%)	0 (0%)

Discussion

Choice of implant fixation in THA remains a controversial subject [3, 14, 20, 24], particularly in patients with RA. Although they are usually younger than those with osteoarthritis, the bone stock of RA patients are usually poorer because of the disease activity as well as the medical treatment, i.e., the use of nonsteroidal antiinflammatory drugs and steroids [3, 15, 18]. The results of cemented prostheses in RA patients are generally believed to be inferior when compared to those done for osteoarthritis [3, 5, 15, 17, 18, 20, 21, 24], despite the lower activity level and the lower body weight of the patients. Recently the use of noncemented hip prostheses has been extended to RA patients, and the early results reported so far are quite promising [9, 13, 14, 16]. However, the ability of bone in-growth onto the noncemented implants and thus the long-term results of these implants in RA patients has been severely questioned [13]. Therefore, the THA fixation method used in RA patients is an even more pertinent issue than in other situations. However, all the reported series are concentrated on one type of implant and there is no comparative study to address this controversy.

As in other inflammatory arthritic conditions involving young patients [21, 23], cemented prosthesis among

RA patients presented more failure due to aseptic loosening of the acetabular component than of the femoral (Table 2) [3, 5, 15, 18, 19, 20, 24]. The Charnley prosthesis in our series demonstrated a pattern similar to other series. At an average follow-up of 14.3 years, only one out of 11 Charnley stems was revised for aseptic loosening. On the acetabular side, we had, however, four cups with mechanical failure. Poss et al. [18] attributed the acetabular component loosening to the failure of restoring a normal acetabular position in hips with acetabular protrusion. Severt et al. suggested that a higher loosening rate of the cemented cups was related to a younger age at the time of implantation [20]. Creighton et al., however, concluded that radiographic loosening of the acetabular component was significantly associated with a younger age at operation, but not with the inability to restore the hip center in acetabular protrusion [5]. In our series, the patients who had their cemented prosthesis revised were 25 years younger at the time of the primary surgery.

Noncemented implants have only recently been used in RA patients. The short-term results of HA-coated prostheses [9] and porous-coated prostheses [14] are promising. However, none of the reports so far has documented more than 5 years' follow-up of noncemented prostheses (Table 3) [9, 13, 14, 16]. The noncemented

prostheses did well in our patients, both on the acetabular as well as on the femoral side. The porous-coated AML and PCA prostheses in our series have been followed up for an average of 9.1 and 10.5 years, respectively, and only one non-progressive subsidence of a PCA stem was observed. One further PCA polyethylene liner was revised because of significant wear.

Although the cemented and noncemented groups in our series were comparable in terms of age at operation and the preoperative hip score, we did not attempt to answer the question of whether one fixation method is better than the other in THA among RA patients. Obviously our series is small when compared to reports from tertiary referral centres. Unlike knee involvement, severe hip arthritis is generally less common among RA patients [4, 8, 22]. However, our study suggested that on the femoral side, both cemented and noncemented implants might give RA patients a reasonable length of longevity. One might favor the use of the noncemented femoral stem because it is generally less technically demanding and more flexible due to its modularity, although modularity is now also available in cemented femoral components. On the acetabular side, we favor the use of a noncemented cup because of the lower rate of aseptic loosening. Noncemented acetabular components also allow changing the polyethylene liner without revising the whole cup.

It helps to remember that all arthroplasties do fail with time [2, 15]. Nevertheless, a great deal of emphasis has been placed on the choice of implant fixation. The longevity of THA among RA patients also depends on the quality of bone supporting the prostheses. RA is a bone-loss disease, and the continuous bone remodeling may jeopardize the bonding at the bone-cement interface, even though the initial cement penetration into the bone was good. Drugs used for treatment also affect bone in-growth onto noncemented implants. Therefore, unless the bone-loss situation can be reversed, the results of THA among RA patients will probably remain inferior.

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