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# Cementless Acetabular Fixation in Patients 50 Years and Younger at 10 to 18 Years of Follow-Up

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**Abstract:** The purpose of the study was to evaluate the 10- to 18-year follow-up of cementless acetabular fixation in patients 50 years and younger. We retrospectively reviewed a consecutive group of 118 patients (144 hips) in whom primary total hip arthroplasty had been performed by 2 surgeons using a cementless acetabular component. Two (1.4%) cementless acetabular components were revised because of aseptic loosening. Twenty-four hips (16.7%) were revised for any mechanical failure of the acetabular component mostly related to acetabular liner wear and osteolysis. The average linear wear rate was 0.19 mm per year, which was higher than our previous reports with cemented acetabular fixation. The fiber mesh ingrowth surface of the cementless acetabular component in this study was superior to cemented acetabular components in terms of fixation. However, the high rates of wear and osteolysis have led to poor overall acetabular component construct survivorship. **Keywords:** cementless acetabular fixation, young, 50 years and younger, primary total hip arthroplasty, bearing surface.


The greatest challenge facing orthopedic surgeons who perform total hip arthroplasty (THA) is providing long-term function of the hip in young patients. Especially in the young patient, cemented acetabular fixation in the THA construct has had limited long-term durability. Loosening of the acetabular component has been recognized as the major long-term problem associated with cemented THA [1,2]. In the early 1980s, cementless porous-coated acetabular components were developed in the hope of improving the durability of acetabular fixation. For this reason, the 2 senior authors (JJC and RCJ) began using cementless acetabular components in 1986. The purposes of the present study were to evaluate, after 10 to 18 years of follow-up, the senior authors' results with use of these devices for primary THA in patients 50 years and younger and to compare them with the results of a previous cohort of patients 50 years and younger who had been managed by one of the senior authors (RCJ) with cemented acetabular components.

## Materials and Methods

Between January 1986 and April 1995, the senior authors performed 144 consecutive, nonselected primary THAs in 118 patients 50 years and younger. It is to be noted that the initial 18 hips (16 patients) of the present cohort have been reported as part of another study [3]. The average age of the patients at the time of surgery was 40.5 years (range, 22.4-50.6 years). The male-female ratio was 61:57. The average weight was 81.9 kg (range, 43-151.5 kg), and the average height was 163.5 cm (range, 119-193 cm). Most of the diagnoses (66%) were accounted for by avascular necrosis (38 hips, or 26%), primary osteoarthritis (30 hips, or 21%), developmental dysplasia (18 hips, or 12%), and slipped capital femoral epiphysis (9 hips, or 6%). Inflammatory arthritis only accounted for 10% (15 hips), skeletal dysplasias accounted for 6% (9 hips), and metabolic disease accounted for 3% (4 hips). All preoperative diagnoses are summarized in Table 1.

The Harris-Galante I (Zimmer, Warsaw, Ind) acetabular component was used in 99 hips, and the Harris-Galante II (Zimmer) acetabular component was used in 45 hips. The shells of all of these acetabular components were made from titanium alloy and had a sintered titanium fiber-metal porous coating with multiple screw

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**Table 1.** Diagnoses

| Diagnosis | Patients | Hips |
|---|---|---|
| Avascular necrosis | 31 | 38 |
| Osteoarthritis | 25 | 30 |
| Developmental dysplasia | 14 | 18 |
| Slipped capital femoral epiphysis | 9 | 9 |
| Rheumatoid arthritis | 7 | 8 |
| Posttraumatic arthritis | 7 | 7 |
| Legg-Calve-Perthes | 7 | 7 |
| Epiphyseal dysplasia | 3 | 5 |
| Ankylosing spondylitis | 3 | 5 |
| Achondroplasia | 2 | 4 |
| Morquio disease | 1 | 2 |
| Down syndrome | 1 | 2 |
| Felty syndrome | 1 | 2 |
| Turner syndrome | 1 | 1 |
| Hip dysplasia secondary to spastic hemiparesis | 1 | 1 |
| Osteoarthritis with multiple exostoses | 1 | 1 |
| Septic arthritis | 1 | 1 |
| Osteoarthritis with history of Rickets | 1 | 1 |
| Osteoarthritis secondary to protrusio and growth hormone deficiency | 1 | 1 |
| Metastatic thyroid cancer | 1 | 1 |
| Total | 118 | 144 |

holes for dome screw fixation. Both cemented and cementless femoral components were used. Cemented femoral components were used in 85 hips and included the Iowa grit-blasted (Zimmer) femoral component in 56 hips, the polished Iowa (Zimmer) femoral component in 20 hips, the Harris (Zimmer) precoat femoral component in 7 hips, the Endurance (DePuy, Warsaw, Indiana) in 1 hip, and a modified Charnley (Zimmer) in 1 hip. Cementless femoral components were used in 59 patients and included the AML (DePuy) in 20 hips, the Prodigy (DePuy) in 14 hips, the Anatomic (Zimmer) in 13 hips, the Omniflex (Osteonics, Allendale, NJ) in 6 hips, the hydroxylapatite (HA) (Osteonics) in 4 hips, and the VIP. (DePuy) in 2 hips.

On-line reaming or 1-mm underreaming of the acetabulum was performed in all cases. Two or three 5.1-mm titanium-alloy dome screws were used to augment fixation. A posterolateral (JJC) or transtrochanteric (RCJ) approach was used for cemented femoral components. The technique also included the use of a distal femoral cement plug as well as the use of a cement gun to deliver Simplex P cement (Howmedica, Rutherford, NJ), which had been centrifuged for porosity reduction. A posterolateral approach was used for all cementless femoral components, and the femoral canal was underreamed by 0.5 mm for the extensively coated implants. A 28-mm femoral head was used in 75 hips, a 26-mm femoral head was used in 39 hips, and a 22-mm femoral head was used in 30 hips.

Patients were evaluated 10 to 18 years after THA, both clinically (with use of a standard terminology questionnaire [4] and activity level as assessed by the University of California, Los Angeles (UCLA) score [5]) and radiographically (with use of the most recent low anteroposterior pelvic radiograph, which included the tip of the femoral component). The most recent radiograph was compared with the immediate postoperative radiograph as well as with any interim serial radiographs. Radiographs were evaluated by 2 of us (MJT and JJC) for evidence of acetabular migration according to the criteria of Massin et al [6] as well as for any radiolucent lines or osteolytic lesions measuring 1 $cm^2$ in the zones described by DeLee and Charnley [7]. The acetabular component was considered to be radiographically loose if it had migrated more than 5 mm or if the radiographs demonstrated circumferential radiolucent lines, including in the area around the screws. Linear wear was determined by measuring femoral head penetration into the polyethylene measured with the use of the digital edge-detection technique reported by Shaver et al [8]. Volumetric wear was calculated with the use of the equation derived by Kabo et al [9].

The femoral components were evaluated in the same manner as the acetabular components. For cemented femoral components, stems were evaluated for osteolytic lesions more than 5 $mm^2$ according to the 7 zones of Gruen et al [10], and loosening of the cemented femoral components was classified according to the criteria of Harris and McGann [11].

We evaluated cementless femoral component fixation for bone ingrowth, stable fibrous fixation, or unstable fibrous fixation according to the criteria of Engh et al [12]. We determined femoral component subsidence and osteolysis by the same criteria as described for the cemented femoral components. Radiolucencies were also recorded according to the 7 femoral zones [10].

The results for this cohort with regard to revision for aseptic loosening and radiographic evidence of loosening (as indicated by a loose component at the time of revision or by the detection of component migration or circumferential radiolucent lines on radiographs) were compared with the results for the previous cohort of consecutive series of hips that had been treated by one of the senior surgeons (RCJ) [13,14]. These patients were all 50 years and younger at the time of their primary THA in which the acetabular component had been inserted with cement. They were followed up for a minimum of 25 years and evaluated with use of the same 2 criteria (revision and loosening) as end points for Kaplan-Meier analysis [15]. The comparative group included 93 primary THAs performed between 1970 and 1976 by one of the senior surgeons (RCJ). The Charnley total hip prosthesis was used in all 93 hips. A stainless-steel polished flatback or narrow femoral stem (modified to a thinner diameter in 4 hips) with a 22-mm-diameter head and an ultrahigh-molecular-weight polyethylene acetabular component were inserted with Simplex P cement (Howmedica, Rutherford, NJ). All 93 acetabular components were of the all-polyethylene Charnley type