ORIGINAL PAPER

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Uncemented total hip arthroplasty in the elderly

Accepted: 9 September 1999

Abstract Between January 1991 and December 1994, 132 uncemented total hip arthroplasties (THA) were performed on 125 patients over 65 years of age; of which 102 arthroplasties, performed in 90 patients, were followed for at least 4 years. One revision was necessary following fracture of an acetabular component secondary to trauma. The post-operative Harris hip score (HHS) ranged from 87 to 99. Radiologically there were no signs of subsidence of more than 3 mm, nor of osteolysis. Five patients experienced thigh pain. Based on the clinical and radiological results, uncemented total hip arthroplasties can give satisfactory function in elderly patients.

Résumé Entre Janvier 1991 et Décembre 1994, 132 arthroplasties primaires totales de hanche sans ciment ont été faites chez 125 patients, avec comme critère d'inclusion l'âge au dessus de 65 ans. Nous avons révisé les résultats de 102 de ces arthroplasties chez 90 patients. La durée minimum de surveillance médicale était de 4 ans (moyenne: 64 mois, extrêmes: 48–96 mois). Aucune révision n'a été faite jusqu'à maintenant à cause d'une implantation déficitaire. Une révision (1%) a été nécessaire suite à une rupture traumatique du constituant acétabulaire. Tenant compte de la dernière consultation, le score-hanche Harris allait de 87 à 99. L'évaluation radiologique n'a révélé aucune signe de subsidence majeure (plus de 3 mm) ni d'ostéolyse. Toutes les implantations demeurent stable. Il reste une incidence de 5.3% de douleur sciatique. Se fondant sur ces résultats excellents cliniques et radiographiques on peut confirmer l'évolution satisfaisante des arthroplasties totales de hanche sans ciment dans le contexte d'ostéoporose.

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

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Introduction

Uncemented Total Hip Arthroplasty (THA) is often reserved for younger patients, whilst cemented THA is usually recommended for patients over 65 years of age [6]. Since 1991 we have been using uncemented hip arthroplasties for patients over 65 years of age. The purpose of this study is to present the clinical and radiological results of uncemented THA in this particular age group.

Materials – methods

Between January 1991 and December 1994, 132 primary THA's were performed on 119 patients aged 65 years or more. Twenty-nine of these patients were deceased or lost to follow-up, leaving 90 patients with 102 THA's for evaluation. 12 of the patients suffered from rheumatoid arthritis (RA), 71 had osteoarthritis (OA) and 7 a hip fracture. The average age was 74 years (range 65–83 years).

Two types of uncemented components have been used. At the start of the study we used the anatomic medullary locking prosthesis (AML, De Puy, Warsaw, IN) with $\frac{5}{8}$ of the femoral stem being plasma sprayed. From 1993 the Perfecta implant (Orthomet, Wright Medical, Memphis, TN), was used, with only the proximal $\frac{1}{3}$ of the stem being sprayed. 52 implants of the AML type were used and 50 of the Perfecta type. The acetabular components were those that were compatible with the stems and all were fully plasma sprayed. The cup used with the AML femoral stem was the Duraloc 1200 cup; 16 of which were introduced as a press fit. In all cases the head diameter was 28 mm. In all cases a modified Hardinge lateral approach was used. Patients were mobilised on the third post-operative day with touch weight bearing for six weeks and progressive weight bearing thereafter for the next month. All patients were advised to use walking aids for at least three months.

Standard AP and lateral X-rays were taken and the Harris hip score was recorded pre-and post-operatively,

Fig. 1A, B Evident osteointegration. Medial and lateral bone stria in direct apposition to the femoral stem. **A** A postoperative radiograph of a 75 year old woman, at 3 years follow-up. **B** A postoperative radiograph of a 78 year old woman, at 5 years follow-up

and at six months, twelve months and annually thereafter. Cortical bone quality and Singh index [13] were reported preoperatively. The cortical index was measured as the ratio of the cortical to the medullary diameters 10 cm distal to the lesser trochanter as described by Engh et al. and Mulliken et al. [3,12]. The femoral interface was delineated into 14 zones, 7 in the coronal plane and 7 in the sagittal plane as described by Gruen et al. [5]. The acetabular bone was delineated into three equal zones as described by DeLee and Charnley [2], and were combined and reported in the AP zones only [12]. We assessed femoral bony ingrowth by the presence of horizontal, feathery cancellous striations as described by Engh et al. [3] (Fig. 1). Radiolucencies associated with the porous coated areas were considered a sign of failure of ingrowth [3]. The femoral landmarks used to measure subsidence were described by Malchau et al. [9], and subsidence was considered to have occurred if the component settled by 3 mm or more. The teardrop and midpoint of the cup diameter used as prosthetic and bony landmarks, respectively. Migration of the acetabular component by more than 2 mm was noted, as well as angular change of more than 5 degrees, which was considered as a sign of loosening as recorded by McAuley et al. [11]. Stem orientation was neutral if the central axis of the component and femur were within 3°, otherwise the component was designated as either varus or valgus. The filling of the femoral medullary canal was evaluated on the post-operative X-rays in both planes. We used the stem to canal ratio at the level of the lesser trochanter and 10 cm distally, as described by Kim et al. [7] and Mulliken et al. [12]. The ratio at the level of the lesser trochanter is the “metaphyseal fill” of the stem and the ratio 10 cm distally is the “fit of the stem”.

Results

The preoperative HHS for the Rheumatoid and the Osteoarthritis patients ranged from 10 to 61 (average 38).

The average follow-up time was 64 months (range 48–96 months). The average hip score at the last evaluation was 95 (range 87–99) (Fig. 2). In 85/102 hips the HHS grades were excellent, in 17 good, and no hips were graded fair or poor. 5 patients experienced thigh pain. 87 patients were satisfied with the outcome.

The preoperative cortical indices were poor in 43% of the hips, fair in 37%, good in 15% and excellent in 5%. 4% of the patients were allocated in Singh group 1, 42% in group 2, 35% in group 3, 15% in group 4 and 4% in group 5. None was in groups 6 or 7. Radiolucent lines, less than 2 mm, were recorded in association with 11 out of 102 femoral components, of which 4 were in zone I, 5 in zone III and 2 in zone VII. A pedestal was noted in 16 hips and it was complete in 9 and partial in 7. In 22 hips calcar moulding was noted without subsidence. Cortical hypertrophy was seen in 23 hips. This was confined to zone III in 6 hips, to zone IV in 17 hips and zone V in a further 17 hips. Stress shielding (Fig. 3) was seen in 15 hips and was confined to zones VI and VII, with one case having cortical bone remodelling also in zone I. In 5 hips subsidence of 1–2 mm was noted without signs of loosening. Radiolucent lines were associated with seven acetabular components; measuring 1–2 mm in zones I, II and III in 3 hips, in zone II in 2 hips and in zone I in 2 hips. Polyethylene wear was measured using concentric circle templates [8], and wear of 1–2 mm was noted in two acetabular components. On the postoperative X-rays 95 of the femoral stems were in a neutral position, 7 were in valgus and no stem in varus. The adequacy of the intramedullary fill was recorded as satisfactory, when the stem filled the proximal canal by more than 80% of the coronal plane and more than 70% in the sagittal plane [7]. The stems filling and fitting was judged as satisfactory in all cases; the average filling of the Intramedullary canal by the stem in the coronal plane was 92% for the proximal fit and 89% for the distal fill. In the sagittal plane these percentages were 85% and 80% respectively.

Fig. 2A–C A 77-year-old woman with HHS 99 at 5 years follow-up. **A** Preoperative radiograph. **B** Anteroposterior radiograph

Fig. 3A–C An 80-year-old man at six years postoperatively. **A**: Preoperative radiograph. **B** Anteroposterior radiograph shows stress shielding on zones 1 and 7

One intraoperative crack fracture of the calcar occurred and was treated by cerclage wiring. Healing was evident both clinically and radiologically by the third month.

Discussion

Reports of cementless THA in patients with an average age range above 65 years have previously been published (Mallory et al. [10], age 17–73 years; Mulliken et al. [12], age 18–75 years; Kim et al. [7], age 19–88 years; Barrack et al. [1], age 31–72 years). McAuley et al. recently reported the results of cementless THA in patients over 65 years, followed for at least 5 years [11].

In view of the theoretical shorter operating time and the absence of cement-related complication, cementless THA may be of particular benefit in elderly patients. Mechanical stability is imperative at the time of femoral stem insertion [6]. Poor bone quality was not regarded as a contra-indication, and stable fixation of the porous coated components is achievable in osteoporotic bones, as was also reported by McAuley et al. [11] and Cracchiolo et al. [4].

We found no significant polyethylene wear. We noted wear of 1–2 mm in two liners. This may be due to short follow-up and reduced activity in this age group. We believe that the satisfactory results of uncemented THA in this group of patients can be attributed to optimal preparation of the femoral medullary cavity, a decreased load transfer to the implant due to reduced daily activities, the potential for osteointegration of bone even in this age group and the improved quality of polyethylene. These factors combine to reduce wear debris and osteolysis.

We conclude that uncemented THA can give a very satisfactory result in the elderly. These results may be comparable to the results after cemented THA. Longer follow-up is required.

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