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Original article

Excellent short-term results of hip resurfacing in a selected population of young patients



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ARTICLE INFO

Article history:

Received 16 March 2015

Accepted 17 July 2015

Keywords:

Femoral head diameter

Hip resurfacing

Ion levels

Survival

ABSTRACT

Background: Hip resurfacing (HR) is an alternative option to total hip arthroplasty (THA) in a population of selected patients (young and/or active).

Hypothesis: The short-term survivorship rate is as least as good as that for THA with no abnormal increase in serum metal ion levels.

Materials and methods: A continuous prospective series of 502 hip resurfacings in 481 patients mean age 48.7 years old (± 10.3 ; 18–68) (Conserve Plus, Wright Medical Technology) was analyzed clinically, radiologically and biologically (total blood chrome, cobalt and titanium metal ion levels). Mean follow up was 4.1 years (1.9–4.9).

Results: There were no dislocations. There were 5 cases of revision surgery with component replacement (including 2 infections). Implant survivorship using implant removal as the criteria (excluding infection) was 99.4% at 4 years (CI 95%: 98.1–99.8). The evaluation of metal ion levels showed a significant increase in cobalt from a preoperative level of 0.24 $\mu\text{g/L}$ (0.01–3.6) to 0.86 $\mu\text{g/L}$ (0.01–5.7) at the final follow-up ($P < 0.001$). Chrome and titanium levels went from 0.68 $\mu\text{g/L}$ (0.01–4.4) and 2.36 $\mu\text{g/L}$ (0.39–7) to 1.28 $\mu\text{g/L}$ (0.1–5.5) and 4.49 $\mu\text{g/L}$ (1.29–8.21) respectively ($P < 0.001$). All clinical scores had significantly improved at the final follow-up. Mean frontal plane cup inclination was 42.7° (35–62).

Discussion: In a selected population of young and/or active patients, the short-term results of hip resurfacing are excellent. At the postoperative 4-year follow-up the rate of complications (in particular the absence of dislocations) was less than that for THA in young and/or active patients. Certain conditions must be respected to obtain these results; frontal plane cup inclination of between 40 and 45°, a femoral head diameter of at least 48 mm and good quality femoral bone.

Level of evidence: IV.

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1. Introduction

Hip resurfacing with second generation metal on metal bearings was developed 15 years ago to provide an alternative option to total hip arthroplasties (THA) in a population of young and/or active patients. This option has numerous theoretical advantages: return to high level impact sports [1], preservation of femoral and acetabular bone stock [2], lack of instability [3], preservation of

articular proprioception [4], maintenance of coxofemoral biomechanics [5,6], maintenance of lower limb length and facilitation of future revision surgery.

However in 2015, although the general notion of HR is accepted there are still numerous controversies; about the type of bearings (large diameter metal on metal bearings) with a risk of adverse reactions to metal debris (ARMD), about the indications and the technical difficulties of implantation [7]. The goal of this study was to analyze the short-term clinical, radiological and biological results of HR in a prospective series of patients.

The main hypothesis was that the short-term survival of HR is equivalent to THA with no abnormal increase in serum metal ion concentrations.

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2. Materials and methods

This was a continuous prospective study was performed in patients who underwent HR over a period of 2 years (January 1, 2009 to December 31, 2010) by a single surgical approach (postero-lateral) and one experienced surgeon responding to Haute Autorité de santé (HAS) criteria (more than 50 HR/year) (JG). The contraindications to HR were: a preoperative leg length discrepancy of more than 1 cm, renal insufficiency, age over 70 years old for men and 60 for women, the presence of a bone cyst of the femoral head of more than 1 cm in diameter and a native femoral head diameter of less than 48 mm [3].

The implant used was HR Conserve Plus (Wright Medical Technology, Arlington, TN, USA). The femoral component was cemented in all cases (coat of cement 0.5 mm thick) with size increments of 2 mm. Cup thickness was 3.5 mm (open angle 170°) implanted by 1 mm press fit. Cementless acetabular component fixation was obtained by a porous bead coating. Articular clearance was 150 µm.

A posterolateral approach was used by performing a “T” capsulotomy [8]. The diameter of the patient’s native femoral head was measured and served as a reference for the component diameters. The femoral procedure was performed first followed by the acetabular procedure. The femoral head was translated in front of the acetabulum. Reaming was performed until bleeding subchondral bone was obtained. Cup inclination was 40° and anteversion was obtained by placing the cup parallel to the transverse ligament. The femoral component was sealed with low viscosity cement. A redon drain was left in place for 24 hours. Full weight bearing was allowed immediately after surgery. Four weeks of postoperative rehabilitation was systematically prescribed. Patients were seen 2 months after surgery then yearly thereafter.

The clinical evaluation was based on the Postel Merle d’Aubigné score [9], the Harris Hip Score [10], the Oxford hip score [11] the Devane activity classification [12] and UCLA [13]. Standard X-rays (lower limbs, 15° internal rotation) were obtained at each visit. AP X-rays were considered to be valid if the end of the coccyx was centered and located between 2 and 4 cm from the pubic symphysis [14]. A Dunn view was obtained for sagittal assessment. The X-ray evaluation was based on an assessment of frontal plane acetabular cup inclination in relation to the radiographic U-figure (tear drop), the preoperative cervico-diaphyseal angle and the SSA (Stem Shaft Angle) at follow up as well as calculation of anterior offset on the Dunn view. The presence of heterotopic ossifications was evaluated according to Brooker et al. [15]. The appearance of radiolucencies (of more than 2 mm) or acetabular osteolysis was identified.

A biological analysis of the chrome, cobalt and titanium metal concentrations was performed on whole blood by mass spectrometry (High Resolution Sector Field Inductively Coupled Plasma Mass Spectrometer (HR-SF-ICPMS)). Analysis was based on preoperative doses and another at the final follow-up. The limits of detection were 0.1 µg/L for 3 ions.

The series included 481 patients (502 HR, 21 bilateral cases) including 70% men (335 patients) and 30% women (146 patients). The mean age was 48.7 (±10.3; 18–68). The mean BMI was 26.1 (±488; 15.1–47.3). Surgery lasted a mean 63.5 minutes (±14.6; 30–140). The mean size of the femoral and acetabular components was 50.4 mm (48–60) and 56.4 mm (54–66) respectively. The etiologies were mainly primary osteoarthritis of the hip (72.8%), dysplasia (13.1%), aseptic osteonecrosis of the femoral head (8%), post-traumatic causes (3.7%) and sequella from osteochondritis (2.4%).

At the final follow up, one lost to follow-up patient (0.2%) and 6 patients who were living overseas who were evaluated by a self-administered questionnaire and email were noted. There were therefore 474 patients who underwent all evaluations (radiological, biological and clinical). The mean follow-up was 4.1 years (1.9–4.9).



Fig. 1. Pelvic AP X-ray in a 41 year old man with primary osteoarthritis of the hip centered on the right hip.

3. Statistical method

The Student *t* test and the Chi-square test were used for continuous and categorical variables respectively and the Wilcoxon test for non parametric data. The correlation between the progression of metal ion concentrations and a numerical parameter was studied with the Spearman correlation coefficient and the Mann-Whitney test for binary qualitative variables. Confidence intervals (CI) were determined at 95% and $P < 0.05$ was considered to be statistically significant. Kaplan-Meier type survival curves were obtained based on component replacement for whatever reason, including septic revision, as criteria for failure (CI 95%).

4. Results

There were no dislocations. A postoperative hematoma had to be evacuated with no other clinical consequences. Three cases of Brooker class III heterotopic ossifications (0.6%) were noted.

Survivorship based on revision surgery for any cause as the criteria for failure was 99% at 4 years (CI 95%: 97.6–99.6) and 99.4% at 4 years (CI 95%: 98.1–99.8) (Figs. 1 and 2) when component removal

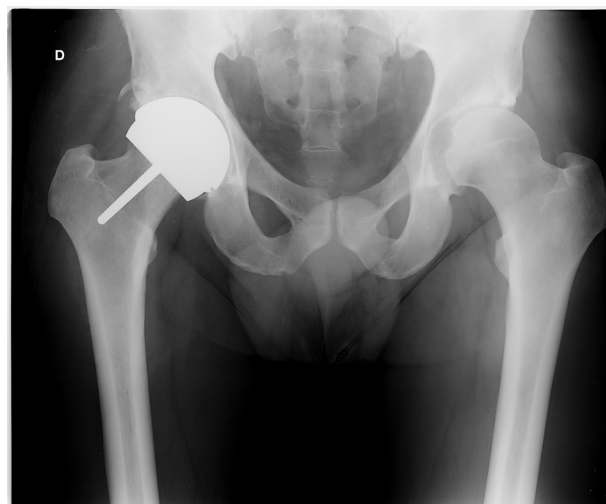


Fig. 2. Postoperative 4 year AP X-ray of the pelvis. Frontal plane cup inclination is 43°, the cervico-diaphyseal angle is 130° and the SSA angle is 132°. There are no radiolucencies.

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