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Clinical Results of the Conserve Plus Metal on Metal Hip Resurfacing: An Independent Series

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ABSTRACT

The purpose of the present study was to report the clinical and radiographic results of an independent series of the Conserve Plus hip resurfacing. Five hundred forty-eight consecutive hip resurfacings were performed using the Conserve Plus prosthesis in 458 patients (350 males) with a mean age of 48.3 years (range 19 to 66). No patients were lost to follow-up. At a mean follow-up of 6.6 years (3.9 to 11.9) thirty (5.4%) hips required conversion to a total hip arthroplasty (THA) (20 males, 10 females, mean age = 48.3 ± 7.3 years). Five-year survival with as revision endpoint was 94.5% (95% CI: 93.5% to 95.5%). This study confirms the good clinical results previously reported with the Conserve Plus hip resurfacing device.

Metal on metal hybrid hip resurfacing arthroplasty is a treatment option for osteoarthritis in the young and active adult population [1]. Two implant designs now have 10-year results with the Conserve Plus [2] (Wright Medical Technology; Memphis, TN) having 88.5% and the Birmingham Hip Resurfacing [3] (Smith and Nephew; Warwick, United Kingdom) a 93.5% survivorship at 10 years, respectively. However, the withdrawal of certain implant designs from the marketplace has dampened the enthusiasm for hip resurfacing despite the initially encouraging results [4]. Additionally, some groups have reported significantly higher rates of failure in certain patient subgroups: patients with small femoral components [5] and female [6] patients which can be been associated with severe soft tissue reactions [7]. Consequently, a complete understanding of potential factors (patient selection, implant design and surgical technique) influencing the clinical outcome after metal on metal hip resurfacing is critical. And although registry data are being used to define implant success, they still have limitations in regards to implant positioning/surgical technique as well as precise modes of failure.

Independent clinical series from centers that were not involved in the initial implant design and development have an important role in confirming the reproducibility and safety of new implant designs and surgical techniques. Often the results of independent series are slightly inferior to designer series and attributed to technical errors as well as poor patient selection [8]. On the other hand, they may reveal a design deficiency and/or unknown bias in patient selection, which was not evident in the designing surgeon's series or for that matter in registry data. The purpose of the present study was to report the clinical and radiographic results of an independent series of the Conserve Plus hip resurfacing with a minimum of four years of clinical follow-up.

Methods

From November 2001 to October 2009, 548 consecutive hip resurfacings were performed using the Conserve Plus prosthesis in 460 patients (351 males and 109 females) with a mean age of 48.3 years (range 18 to 66) and a mean body mass index (BMI) of 27.5 (range 17.9 to 46). There were 88 patients who had bilateral procedures, of which 20 were performed simultaneously. The preoperative diagnoses were degenerative osteoarthritis in 505 hips (92.1%), avascular necrosis of the femoral head in 27 hips (4.9%) and inflammatory arthritis in 16 hips (3%). Prior to commencing the study, ethics approval was obtained from our institutional research ethics board.

All operations were performed by two surgeons (P.B. and P.K.) who are fellowship-trained joint arthroplasty surgeons. The Conserve Plus implant was used in all cases. It is a high-carbon content cast cobalt-chromium alloy conforming to ASTM F75 and containing 27% to 30% chromium, 50% to 60% cobalt, and 5% to 7% molybdenum. The castings undergo two heat treatment regimens prior to final machining and polishing. The acetabular component has a cobalt chrome porous beaded surface and is less than a hemisphere at 167 degrees with a contact patch to rim distance that decreases as the acetabular component gets smaller [9]. The femoral side has a chamfered design that is cemented with a cement mantle of approximately 1 mm and with a short tapered stem to maintain alignment. A standard posterior approach was performed in 286 (52.2%) cases (P.K.). Direct anterior approach [10] was used in 178 (32.5%) hips (P.B.), 66 (12.0%) hips were

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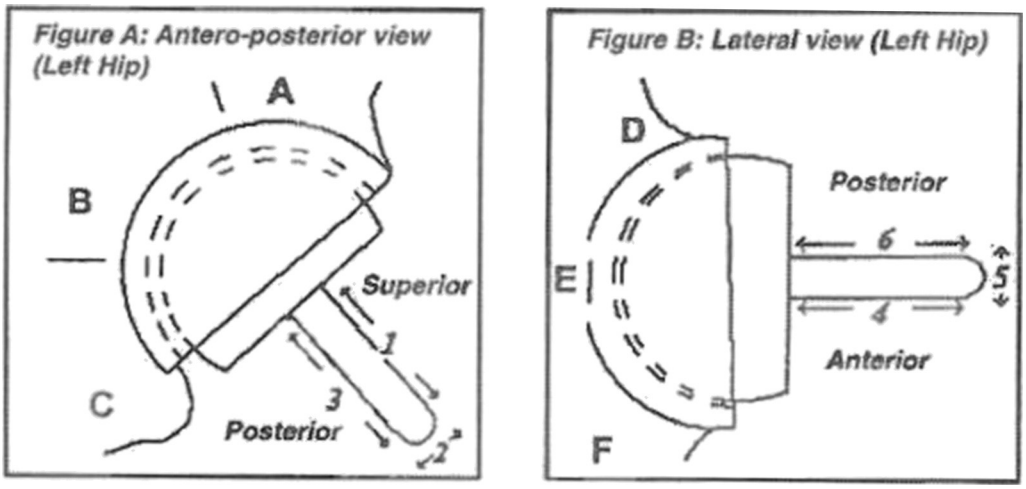

Fig. 1. Femoral and acetabular zones definition on anteroposterior (A) and lateral (B) radiographs.

performed through a surgical dislocation/trochanteric slide [11] (P.B.), and a direct lateral approach (Hardinge) was used in 18 (3.3%) hips (P.B and P.K.). The patients were allowed to weight bear as tolerated for all posterior approaches and had restricted weight-bearing for 4–6 weeks for the anterior and surgical dislocation approaches. All patients were managed with prophylactic antibiotics for 24 hours and low-molecular weight heparin for three weeks.

As part of our standard practice at our facility, patients were seen at 4–6 weeks, 6 months, and yearly. Follow-up included a physical examination, standard radiographs of the pelvis (standing antero-posterior view) and hip (cross-table lateral view), and the completion of validated patient-reported outcome questionnaires: Hip Disability and Osteoarthritis Outcome Score (HOOS) [12], SF-12 health survey scores [13] and Harris Hip Scores [14].

At the 6-week follow-up visit, radiographic data regarding implant positioning (acetabular component abduction angle and stem–femoral shaft angle) and the presence of neck notching were evaluated by an independent reviewer (T.N.). At each follow-up visit, a radiographic determination of the presence of femoral neck narrowing (defined as a reduction of greater than 10% of the femoral neck diameter estimated in the antero-posterior and cross-table lateral views), acetabular or femoral component migration, and any radiolucencies was made. If radiolucencies were present, the size of the finding was quantified (0 to 1 mm; 1 to 2 mm; >2 mm), and the zone(s) of its presence was recorded (Fig. 1).

Statistical Analysis

Descriptive statistics were calculated for all demographic and surgical variables, as well as the patient-reported outcomes. All group-related analyses were performed using Student's t-test, ANOVA, and multivariate regression, as appropriate. All non-parametric tests (i.e. binary variables) were assessed using a chi-square analysis. Kaplan–Meier analyses were performed in order to determine 1) implant survivorship (i.e. any revisions requiring component change), and 2) time to conversion to THA due to aseptic loosening. Any patient lost to follow-up or death (unrelated to study) was classified as censored observations. All statistical analyses were performed using PASW Statistics GradPack, version 17.0 (SPSS Inc.; Chicago, IL). In all cases, statistical significance was set at $\alpha = 0.05$.

Results

The mean follow-up for this cohort was 6.6 years (range 3.9 to 11.9 years). No patients were lost to follow-up. Two patients died from causes unrelated to surgery at 15 and 44 months of follow-up, leaving 546 hips for analysis. All the clinical outcome scores showed significant improvements from baseline to latest follow-up (Table 1). No differences in follow-up HOOS scores were observed based upon gender, BMI classification or surgical approach. The most common size of femoral component used was 50 mm (28.1%; 153 cases; range, 38 to 62 mm) with the median size for males being 50 mm (range 44–62) and females being 46 mm (range 38–52) ($P = .001$).

Table 1
Summary of Quality of Life Scores (Mean (SD)).

Variable	Baseline	Follow-up	*P*
HOOS (0 = poor, 100 = excellent)			
Pain	42.59 (17.39)	85.59 (18.23)	<.001
Symptoms	40.00 (17.80)	80.55 (18.80)	<.001
Function—daily living	46.40 (19.80)	86.64 (17.58)	<.001
Function—sports	24.31 (18.00)	76.00 (22.66)	<.001
Quality of life	21.05 (17.24)	69.59 (24.92)	<.001
SF-12 (0 = poor, 100 = excellent)			
Physical component	34.39 (9.65)	48.71 (9.64)	<.001
Mental	49.73 (12.10)	53.54 (9.10)	<.001
Harris Hip Score (0 = poor, 100 = excellent)	53.62 (18.94)	86.65 (14.52)	<.001

Table 2
Relationship Between Surgical Approach and Implant Positioning at 6 Weeks Post-Operative [*n*, (%)].

Surgical Approach	Femoral Component Positioning[a]	
	Neutral-Valgus	Varus
Anterior	163 (95.3)	8 (4.7)
Posterior	238 (91.2)	23 (8.8)
Surgical dislocation	65 (100)	0 (0.0)
`Lateral	7 (77.5)	1 (12.5)
$\chi^2 = 25.73$, $P < .001$		

Surgical Approach	Vertical Acetabular Component[b]	
	Yes	No
Anterior	20 (11.7)	151 (88.3)
Posterior	63 (23.5)	205 (76.5)
Surgical dislocation	2 (3.1)	62 (96.9)
Lateral	2 (22.2)	7 (77.8)
$\chi^2 = 20.37$, $P < .001$		

[a] Neutral-valgus positioning: difference between stem–femoral shaft angle and femoral neck–femoral shaft angle >5°. Varus positioning: difference between stem–femoral shaft angle and femoral neck–femoral shaft angle <5°.
[b] Vertical acetabular component: acetabular component abduction angle >50°.