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Metal on Metal Hip Resurfacing in Patients 45 Years of Age and Younger at Minimum 5-Year Follow-Up

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ABSTRACT

Background: Metal on metal hip resurfacing (MoM-HR) is an alternative to total hip arthroplasty in young and active patients. The purpose was to determine the survivorship of MoM-HR procedures performed in patients aged 45 years and younger assessing patient-reported outcome measures (PROMs) at minimum 5-year follow-up.

Methods: All 217 patients equal to or younger than 45 years of age at the time of surgical intervention presenting to our center with MoM-HR between May 2002 and May 2011 were prospectively followed. Baseline demographic data, preoperative and postoperative radiographic measurements, and validated PROMs were obtained (Hip Disability and Osteoarthritis Outcome Score, Western Ontario and McMaster Universities Osteoarthritis Index, and University of California, Los Angeles Activity Score). Survivorship was calculated using Kaplan-Meier analysis, and risk factors for failure were identified using multivariate regression analysis.

Results: The overall survivorship excluding septic failures was 94.6% and 93.8% at 5 and 10 years, respectively. Aseptic loosening of the acetabular component was the most common mode of failure (11/20 cases). Gender, head size, and acetabular abduction angle had no significant effect on survivorship. Significant improvements in PROMs were seen for Hip Disability and Osteoarthritis Outcome Score, Western Ontario and McMaster Universities Osteoarthritis Index, and University of California, Los Angeles Activity Scale ($P < .001$).

Conclusion: This study indicates that MoM-HR is a suitable option for young individuals, as demonstrated through improved functional scores and low revision rates. The survivorship of HR in the younger than 45 age-group was similar to that of total hip arthroplasty, as well as HR in older patients. Given the proposed benefits of HR, this procedure may be viewed as a viable option in patients aged younger than 45 years.

The primary goals of a total hip arthroplasty (THA) procedure should be to alleviate the patient's symptoms and provide them with a functional hip construct for as long as possible. Young and active patients present a treatment dilemma however, as they demand a more durable and long-lasting prosthesis [1]. An alternative to THA in young and active patients is hip resurfacing (HR) arthroplasty as it spares much of the proximal femoral anatomy, leaving the patient with more bone stock should revision surgery become necessary [2,3]. Other proposed advantages include optimal restoration of hip biomechanics [4], lower dislocation rates,

This study was reviewed and approved by the institutional ethics committee and the authors have no conflicts of interest to disclose.

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lack of stress shielding [5], and the return to sporting activity [2,3]. Given these benefits, HR must still have comparable longevity and functional outcomes to THA in order to be considered a valid alternative.

HR arthroplasty rose to prominence in the 1990s; however, the prevalence of this procedure declined after several prosthetic designs were found to have unfavorable short-term results [2,6]. Further analysis unveiled specific risk factors for early failure, including small femoral head size, diagnoses of avascular necrosis or dysplasia, female sex, and surgeon inexperience [6–9]. Registry data suggest that the ideal patient for this procedure is a male aged younger than 55 with a diagnosis of osteoarthritis [7]. In Australia, while the number of HR procedures has fallen every year since 2005, the number of procedures performed in patients aged younger than 55 with osteoarthritis rose in 2016 [7]. Direct comparisons to THA in this same demographic show similar implant survivorship, clinical results, and complication rates [3].

Now that certain prostheses and patient factors have been identified as risk factors for failure [2,6,7,9], there is a lack of data in the literature regarding medium-term to long-term outcomes when this procedure is applied to the proper demographic. The purpose of the present study was to determine whether this procedure can be performed safely and effectively in a young demographic. This was done by examining the survivorship of metal on metal (MoM) HR procedures performed in patients aged 45 years and younger assessing patient-reported outcomes measures (PROMs) at minimum 5-year follow-up.

Methods

This is a retrospective study that involved drawing data from a prospectively maintained single-center institutional registry. The setting of this study was the practice of 2 high-volume surgeons who routinely treat young and active patients for hip arthritis.

Between May 2002 and May 2011, the 2 surgeons treated 217 patients (258 hips) 45 years of age and younger at the time of surgical intervention with HR for hip arthritis using the Conserve Plus prosthesis (MicroPort, Memphis, TN). Baseline demographic data as well as preoperative and postoperative radiographic and functional measurements were prospectively collected. Mean age at the time of surgery was 40 years (range, 18-45 years). Mean body mass index was 26 kg/m^2 (range, 17-75 kg/m^2). Fifty-five patients were female and 162 patients (63%) were male. The preoperative diagnoses were degenerative arthritis in 219 hips, avascular necrosis of the femoral head in 20 hips, and dysplasia in 7 hips (Fig. 1).

During that time, patients underwent HR if they had severe hip arthritis on radiographs, hip pain for at least 1 year, and failure of nonsurgical management (medications and trial of physiotherapy). Patients who were aged 45 years or younger on May 31, 2011, were included. Relative exclusion criteria for HR were (1) severe acetabular or femoral dysplasia; (2) renal dysfunction; (3) metal allergy; and (4) pregnancy. All patients were treated with HR at a single center by 2 surgeons using either the posterolateral, lateral, or anterior approach (Fig. 2). Twenty-nine patients had a trochanteric slide osteotomy as part of their lateral exposure, as this was the preferred technique by the senior author before transitioning to anterior approach. All patients received thromboprophylaxis for 3 weeks using low-molecular-weight heparin. Outpatient physiotherapy was initiated at 2 weeks.

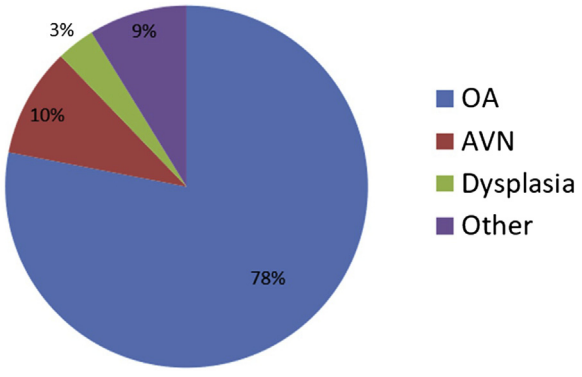

Fig. 1. Primary pathology within the study cohort. OA, osteoarthritis; AVN, avascular necrosis.

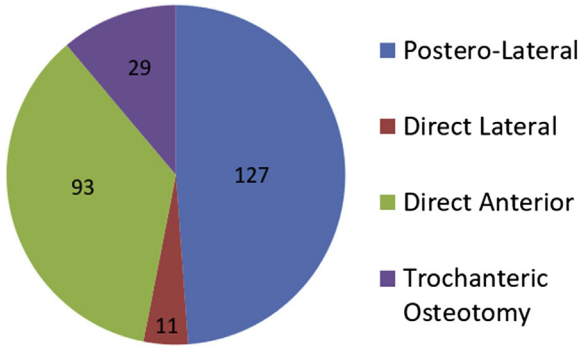

Fig. 2. Distribution of surgical approach within the study cohort.

Patients were seen at 2 weeks, 6 weeks, 3 months, 1 year, and 2 years as part of their standard postoperative protocol. Anteroposterior and lateral radiographs were taken at the 2-week follow-up appointment and then at 5 and 10 years. All patients were contacted to enquire about the status of their prostheses and to identify any failures that may have been treated at a different center. Four patients did not respond to our attempts to contact them and were therefore lost to follow-up. All patients were mailed functional questionnaires.

The primary outcome of interest was aseptic failure of the HR implant, for any reason. In order to identify risk factors for failure, both implant size and demographic and radiologic criteria were tracked (the initial follow-up radiographs for 11 patients were not available because they were taken outside of our facility). Points of interest were sex, body mass index, age, surgical approach, and pathology. Radiographic measurements were made by center-trochanteric distance based upon anteroposterior and lateral hip radiographs. Points of interest included presence of acetabular and femoral lucencies, femoral notching, abduction angle of the shell, and neck shaft angle.

Table 1
Cumulative Survivorship for Patients With Aseptic Revision as End Point.

Group	5-y Survival (95% Confidence Interval)	Hips at Risk	10-y Survival (95% Confidence Interval)	Hips at Risk
All patients	94.6 (94.3-94.9)	242	93.8 (93.5-94.1)	102
Gender				
Female	90.0 (89.2-90.8)	54	88.3 (87.5-89.1)	24
Male	95.9 (95.6-96.2)	188	95.4 (95.1-95.7)	78
Head size				
≤48 (mm)	94.1 (93.7-94.5)	112	92.4 (91.9-92.9)	48
>48 (mm)	94.8 (94.4-95.2)	128	94.8 (94.4-95.2)	52
Acetabular abduction angle				
≤50	94.5 (94.2-94.8)	206	93.6 (93.3-93.9)	206
>50	92.6 (91.6-93.6)	25	92.6 (91.6-93.6)	20