

The Early Results of Metal-on-Metal Hip Resurfacing

A Prospective Study at a Minimum Two-Year Follow-Up

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Abstract

Hip resurfacing has recently been offered as an attractive alternative to conventional total hip arthroplasty. This report evaluated the short-term functional outcome and longevity of a newer generation resurfacing device and includes the results of 228 consecutive hip resurfacings in 209 patients at a minimum of two-year follow-up. All resurfacings were performed by a single surgeon using a posterior approach. Excluding infections, there were only three failures (1.3%). The overall survival at 4.6 years was 96.9%. The survival of resurfacing in this study was comparable to that of other published studies of hip resurfacing. Surface hip arthroplasty appears to be an effective alternative to conventional total hip arthroplasty in patients suffering from osteoarthritis.

Conventional total hip arthroplasty in young and active patients remains a challenge for most orthopaedic surgeons given that this subgroup has high rates of failure requiring revision.¹⁻⁵ Hip resurfacing offers an attractive alternative to conventional total hip arthroplasty in young patients. The initial metal-on-polyethylene surface arthroplasties failed to provide a satisfactory solution because of excessive wear and loosening.⁶⁻⁸ However, modern metal-on-metal bearings have renewed an interest in surface arthroplasty, by yielding improved implant durability and

longer survivorship.⁹⁻¹³ The indications are currently expanding to include other causes of secondary arthritis, such as osteonecrosis, developmental hip dysplasia, and Perthes disease, although the results may be less predictable.¹⁴⁻¹⁶ Primary osteoarthritis (OA) remains the most common indication for hip resurfacing with the most reliable outcome.

There are only a few studies in the literature evaluating the functional outcome and longevity of the newer generation implant, the Articular Surface Replacement (ASR™, DePuy Orthopaedics, Inc., Warsaw, IN).^{17,18} We prospectively followed all patients undergoing surface arthroplasty with this implant, to assess the short-term clinical outcomes and identify the potential causes of early failures.

Materials and Methods

Patients undergoing resurfacing arthroplasty between March 2004 and May 2006 were prospectively evaluated to determine the short-term clinical outcomes and survival of the implants. A total of 228 consecutive hip resurfacings (209 patients) were performed, consisting of 168 males (80%) and 41 females (20%). The mean age at the time of surgery was 54 years (range, 25 to 73 years). Most patients were between 50 and 60 years of age, and only 6 patients were younger than 40 years. OA was the most common diagnosis in 222 hips (97.4%). The remaining patients developed secondary degenerative disease from ankylosing spondylitis (two hips, 0.9%), osteonecrosis (two hips, 0.9%), developmental hip dysplasia (one hip, 0.4%), and rheumatoid arthritis (one hip, 0.4%).

All the resurfacings were performed by a single surgeon (JA) using a posterior approach. The implants were inserted with the femoral component cemented according to the recommendations of the manufacturer. The mean size of the femoral component was 53 mm (range, 41 to 59 mm), and the mean of the acetabular component was 60 mm (range, 46 to 66 mm). The patients were followed

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for a minimum of 2 years and a mean of 35 months (range, 24 to 55 months). The clinical outcomes were measured using both the Harris hip score (HHS) and the University of California Los Angeles (UCLA) activity score.^{19,20} Patients were initially evaluated preoperatively using only the HHS, while the UCLA activity score was routinely added 1 year after enrollment into the study.

The changes in preoperative and postoperative hip scores were compared for statistical significance using the Mann-Whitney U test. The results were expressed as means plus or minus the standard deviation. A Kaplan-Meier curve was generated to assess the survivorship of the implants corresponding to 95% confidence limits. Revision surgery to total hip arthroplasty for all causes was considered the final end point. A second survival curve was also computed, excluding the revision cases due to infection.

Results

The follow-up rate for the entire cohort of 209 patients was 97%: six patients were lost to follow-up and one died. The mean preoperative Harris hip score and UCLA activity score were 46 ± 10 ($n = 218$) and 4.4 ± 2.3 ($n = 133$), respectively. At the most recent follow-up, the resurfacing group demonstrated significant improvement, with a mean HSS score of 91 ± 11 ($n = 217$) and UCLA activity score of 7.52 ± 1.9 ($n = 217$) ($p < 0.0001$). The largest increase in the HHS and UCLA scores were seen in the first year postoperatively, with marginal improvement observed in the following years.

A total of eight failures (3.6%) occurred in these patients. Five (2.2%) of the failures were due to an infection, one (0.4%) to a femoral neck fracture, one (0.4%) to aseptic femoral component loosening, and one (0.4%) to osteonecrosis that resulted in loosening and narrowing of the femoral neck. All eight patients required revision to a conventional total hip arthroplasty. There was also one additional deep infection that resolved following irrigation and debridement and the use of appropriate intravenous antibiotics. The overall survival was 94.8% at a follow-up of 4.6 years; however, the survival was 96.9% after excluding the infections as the cause of component loosening and failure.

Discussion

There are several advantages of hip resurfacing in the younger age group, including femoral bone preservation, lower rate of dislocation due to the large diameter of the femoral head, and comparable results following conversion of a failed femoral component to THA.²¹ However, several complications can arise, such as femoral neck fractures, aseptic loosening, infection, and metal hypersensitivity. We sought to evaluate our experience with hip resurfacing and assess the short-term clinical outcomes of these patients, along with the early modes of failure and survival of the implants.

Several studies have examined the results of newer

metal-on-metal hip resurfacings.^{9-13,22} Risk factors resulting in loosening of the femoral component have been identified, such as large femoral head cysts, female gender, and smaller component size in males.⁹ Other risk factors contributing to acetabular loosening after resurfacing also have recently been found to include a younger age and higher body mass index (BMI).²² These findings emphasize the need for proper patient selection to improve the outcomes and longevity of surface arthroplasty.

Our results demonstrate that the survival of 94.8% is comparable to that of other published studies. A review of 446 hips treated with a metal-on-metal hip resurfacing reported a survival rate of 99.7%.¹⁰ Only one patient required revision secondary to osteonecrosis and most patients returned to a high level of activity. Another study evaluated the Birmingham hip resurfacing in 144 hips at a 5-year follow-up and found a 98% survival rate.¹³ There were three failures: two infections and one femoral neck fracture. Steffen and colleagues had a 95% survivorship at 7 years in 610 hips treated with a Birmingham hip resurfacing.¹² A total of 23 hips underwent a revision (3.8%), and most of the failures were due to femoral neck fractures (12 cases). The majority of revisions in our series were secondary to an infection. It was realized in retrospect that the infections occurred as a result of a breach of sterility in the operating room over a limited period of time. This problem was quickly rectified and antibiotic cement is now used in all resurfacings. We have not observed any further problems with infections subsequent to implementing these measures.

Some investigators have postulated that a higher rate of complications occur at the beginning of a learning curve when first performing surface arthroplasty.²² In a clinical study involving 200 patients, 14 (7%) patients required revision surgery at a mean follow-up of 31.2 months.²² Among these failures, 10 were due to acetabular loosening, two to femoral neck fractures, one to aseptic femoral loosening, and one to a patient with ongoing pain. The study concluded that the acetabular failures were a result of a learning curve effect. Four of the five surgeons were inexperienced in performing hip resurfacings, and they all had failures. The only surgeon with more experience did not encounter a failure. Our cohort of 228 hip resurfacings was performed by the same surgeon and included the timeframe of the initial learning curve.

Surface arthroplasty appears to be an effective alternative to conventional total hip arthroplasty in patients suffering from OA. Resurfacing provides adequate pain relief and improved level of function and activity in younger patients who warrant a hip replacement. The patients in this series showed a marked improvement in both the HHS and UCLA activity scores, primarily in the first postoperative year. The implant survival and the functional outcomes score are comparable to those observed in other patients managed with metal-on-metal surface arthroplasty.^{11,12}

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Disclosure Statement

None of the authors have a financial or proprietary interest in the subject matter or materials discussed, including, but not limited to, employment, consultancies, stock ownership, honoraria, and paid expert testimony.

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