Narrowed Indications Improve Outcomes for Hip Resurfacing Arthroplasty

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Abstract

Hip resurfacing arthroplasty has had excellent clinical outcomes from multiple centers. However, controversy exists regarding the most appropriate patient selection criteria. Many proponents of hip resurfacing believe that narrowing the patient indications with strict inclusion and exclusion criteria may lead to improved outcomes and decreased complication rates. The purpose of this study was to review the results of resurfacing performed by an experienced surgeon to determine if implant survival and complication rates were different between subgroups of patients with different demographic factors.

Materials and Methods: We evaluated 311 patients who had a hip resurfacing arthroplasty performed after the initial learning curve and who had a minimum follow-up of 5 years (mean, 93 months). These patients were compared to a group of 93 patients (96 hips) who underwent resurfacings, with newer selection criteria based on the findings of the first cohort.

Results: Overall, there were 10 failures in the first patient cohort (97% survivorship), compared to no failures in the second cohort. Higher revision rates were associated with patients who had osteonecrosis or rheumatoid arthritis. Patients who had femoral component sizes larger than 50 millimeters had lower revision rates. There were no revisions in patients who were under 50 years of age, had head sizes greater than 50 millimeters, and who had a primary diagnosis of osteoarthritis.

Discussion: After evaluating our initial experience after the learning curve, the ideal patient selection criteria was determined to be young males who have femoral head sizes greater than 50 millimeters. The early results are encouraging in that, although resurfacing may not be appropriate for all patients, it can provide predictable, excellent survivorship in these patients.

Recent studies have reported clinical success rates of greater than 90% for metal-on-metal hip resurfacing arthroplasty. However, these results typically reflect the experience of high-volume surgeons who have extensive experience with this procedure. Recent studies have elucidated many patient-related as well as surgical and implant-related factors that may increase the risk for complications and resurfacing failures. Patient-specific factors include neuromuscular or neurosensory deficiencies that might adversely affect the patient’s gait, females who are of child-bearing age, and a documented allergy to cobalt, chromium, or molybdenum. These are generally accepted as contraindications to the procedure. Other patient-specific characteristics that are considered relative risks include the presence of multiple cysts or osteopenia present on hip radiographs. Surgical technical factors such as femoral neck notching have been identified as increasing the risk for failure. Recently, complications associated with metal ion production in metal-on-metal articulations and have been discussed extensively in both the scientific literature and news media may also be technique-related.

In addition to these patient and surgical risk factors, hip resurfacing is a technically challenging procedure that has a corresponding learning curve. Early in this curve, there may be increased risk for complications that require revision surgery, such as femoral neck fracture, femoral component failure, and component loosening. After going through this learning curve, the senior investigator (MAM) made
adjustments to his selection criteria that encompassed many of the above criteria, with a resultant decreased failure rate.

The purpose of this study was to assess a prospective cohort of patients at a single institution to evaluate the role of surgeon experience on selection criteria and the subsequent association with implant survival. This was performed by evaluating a series of patients who were operated on after the initial learning curve in order to determine which patients were at higher risk for component failure. These risk factors were then incorporated into the patient selection criteria when the senior investigator switched to a new prosthesis, and the results of these patients were reviewed to determine if this updated selection criteria provided improved survivorship. We specifically asked the following questions: 1. After the initial learning curve and technique changes, what were the ideal patient characteristics? 2. What has the later survivorship been for the patients who had this new selection criteria applied?

Materials and Methods

There were 311 patients who underwent hip resurfacing arthroplasty after the initial learning curve and who had a minimal follow-up of 5 years (mean follow-up, 93 months). Patients had a mean age of 50 years (range, 18 to 79 years) and a mean body mass index of 27 kg/m² (range, 18 to 44 kg/m²). There were 225 males, encompassing 72% of the cohort. The diagnoses included 233 patients who had osteoarthritis, 46 with osteonecrosis, 13 with posttraumatic osteoarthritis, 10 with hip dysplasia, eight with rheumatoid arthritis, and one with a seronegative inflammatory arthritis. The mean femoral component size used was 46 millimeters (range, 36 to 56 millimeters).

The second patient cohort was a group who underwent hip resurfacing arthroplasty after the senior investigator transitioned to a new implant system. Earlier reports have suggested that technique changes can improve clinical results following resurfacing arthroplasty. All of these technique changes were included in all patients in this cohort. The operative technique and selection criteria for the second patient cohort included avoiding resurfacing in patients with large femoral head or neck cysts, ensuring proper seating of the femoral component and ensuring an optimal thickness of the cement mantle. In this group, there were 93 patients (96 hips) who had a minimum follow-up of 2 years (mean follow-up, 30 months). There were 87 males (94%), and 6 females who were no longer of child-bearing age. The mean age of the cohort was 52 years (range, 21 to 85 years), and their mean body mass index was 28 kg/m² (range, 20 to 47 kg/m²).

All procedures were performed by the senior investigator (MAM), using an anterolateral approach. All patients in the first cohort received a Conserve™ Plus implant (Wright Medical Technology, Arlington, Tennessee), while all patients in the second cohort received a Cormet prosthesis (Corin, Stryker Orthopaedics, Mahwah, New Jersey). All acetabular components were placed without screws, using cementless press fit fixation, and the femoral component was cemented in all cases using the cement techniques as recommended by the manufacturer.

A standard rehabilitation protocol was utilized, with patients recommended to increase weightbearing over a 10-week period and then were started with 50% weightbearing restrictions. A crutch or cane was used for the first 6 weeks, and then patients were advanced to full weightbearing as tolerated thereafter.

Data was prospectively collected in a database for the overall cohort of resurfacing patients. The data were subjected to analysis using SigmaStat software, version 3.0 (Systat, Inc., San Jose, California). A multivariate analysis was performed to evaluate the effect of gender, age, femoral head size, pre-operative diagnosis, and body mass index.

Results

Overall, there were 10 failures in the first cohort (97% survivorship) and no failures in the second cohort (100% survivorship). Of the 10 patients who required revision in the first cohort, there was one patient revised for osteolysis, four patients revised for a femoral neck fracture, three patients revised for a loose femoral component, one patient each revised for intractable pain, and acetabular protrusio. Of the four femoral neck fractures that occurred, two occurred within 2 months, the third was a basivertebral fracture that occurred at 24 months postoperatively after a fall, and the fourth occurred 41 months postoperatively after trauma. All patients were revised to a standard total hip arthroplasty.

The results of the multivariate analysis revealed that a diagnoses of rheumatoid arthritis or osteonecrosis is associated with higher revision rates. Femoral components larger than 50 millimeters were associated with lower revision rates. Two of eight patients diagnosed with rheumatoid arthritis required revision (25%), while four of 48 patients who had osteonecrosis required revision (8%). The revision rate was lowered to 2.5% (1/39) in patients who had a minimum femoral component size of 52 mm. There were no revisions in the first cohort in the group of patients who were males under 50 years of age and who had a minimum femoral head size of 50 millimeters.

Discussion

Resurfacing has had successful results in the hands of experienced surgeons with recent mid- to long-term studies (5- to 12-year mean follow-up) reporting comparable survivorship and clinical outcomes to conventional total hip arthroplasty in selected patients. Proponents of resurfacing have cited advantages that may include bone conservation, lower dislocation rates, the potential for a more normal gait, an appeal to higher activity patients, a possibly technically easier revision than a standard total hip arthroplasty, and the ability to handle deformities and previously implanted hardware. Opponents of resurfacing have argued that many of these advantages can be obtained with the use of large head metal-on-metal standard total hip arthroplasty. However, recent concerns with metal hypersensitivity and adverse local tissue reactions have been found with metal-on-metal devices, with more problems typically encountered with standard total hip arthroplasty.
than with resurfacing. This may make resurfacing a more attractive option for the appropriate patient. Because of these issues, we wanted to identify which patients were the ideal candidates for resurfacing and whether newer selection criteria have improved survivorship in these patients.

There were several limitations to this study, including that it was a retrospective review of a prospectively collected database of patients. Although the sample sizes were relatively small, in order to provide sufficient numbers for an adequately powered study, greater than 1000 resurfacing procedures would have been required in each cohort for statistical significance. We await further follow-up and increased numbers to assess these newer selection criteria to determine if the differences found in survivorship are maintained at longer-term evaluation. Additionally, two different prostheses were used in the respective cohorts, so that although differences in survivorship could be attributable to improved surgical technique and patient selection criteria, it cannot be ruled out that prosthetic design may account for the improved implant survival in the second cohort.

Numerous reports in the literature have shown excellent survivorship of resurfacing at mid- to long-term follow-up, ranging from 96 to 100% at up to 12 years. In a recent study of 12,093 hip resurfacings recorded in the Australian registry between 1999 and 2008, Prosser and colleagues noted comparable survivorship to total hip arthroplasty in patients who were younger than 65 years of age, had femoral head sizes greater than 50 millimeters, and who had a primary diagnosis of osteoarthritis. The survival rate in their patient population was 97%, which is similar to the rate seen in the first patient cohort in our study. The patient population which had the highest survival rate from the Australian registry was a similar population to the one with best results in the present study: younger males who have larger femoral head sizes. This supports the concept that they may be the ideal candidate in which to perform resurfacing.

The subset of patients who had the worst survivorship in the present study was found in patients who had rheumatoid arthritis, though this included only eight patients. This differs from some reports in the literature that have shown excellent survivorship for this group. Aulakh and coworkers published on a cohort of 41 patients who were diagnosed with rheumatoid arthritis and underwent resurfacing arthroplasty and found an 11-year Kaplan-Meier survivorship of 96%. Further studies are needed to evaluate this patient subgroup.

Conclusion
Hip resurfacing arthroplasty can be an extremely successful procedure in selected patients: young males with head sizes greater than 50 millimeters. Short-term results with no failures at a minimum 2-year follow-up with new selection criteria are encouraging. Resurfacing may not be appropriate for all patients, but when used in these ideal patients, it can provide predictable, excellent survivorship.

Disclosure Statement
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