Minimally Invasive Hip Resurfacing Compared to Minimally Invasive Total Hip Arthroplasty

Michael L. Swank, M.D., and Martha R. Alkire, C.N.P.

Abstract

Background: Since its March 2006 FDA approval in the United States, Birmingham hip resurfacing (BHR) has been a popular alternative to hip arthroplasty for the younger patient population. Data to date has shown a trend toward low incidence of dislocation and good survivorship.

Methods: 128 patients operated on by a single surgeon from July 2006 to December 2008 were reviewed for complications, pain, and function. A group of single incision, minimally invasive standard total hip replacements (106 cases) in 2008 was used for comparison of the same outcomes.

Conclusion: Pain, function, and total Harris Hip scores were all improved by the 2 year mark and better than the total hip group. Overall incision lengths decreased over the study time period. The average age of the BHR recipient was 51 years, approximately 14 years less than the total hip mean age. Pain in the Birmingham group improved by 32 points at the 3 month mark. By the end of 2 years, the Birmingham group Harris Hip score mean was nearly perfect at 98.5 points. Rare incidence of complications, marked decreased pain scores and marked elevation in function were results found in this sample of Birmingham resurfacing.

The Birmingham Hip Resurfacing (BHR) System (Smith & Nephew, Memphis, Tennessee) has been an alternative to conventional total hip arthroplasty (THA) for the younger patient population in United States, since its approval in March 2006 by the FDA (U.S. Food and Drug Administration). Follow-up results through 5 to 6 years show positive outcomes in pain and function, with low evidence of dislocation.1,2

Because of the need to translate the femoral head to allow for acetabular reaming, hip resurfacing has traditionally required an extensive and, most commonly, posterolateral approach. While there have been sporadic reports in the literature about less invasive approaches, little has been written describing these specific surgical techniques.

Based upon the senior investigator’s (MLS) interest in minimally invasive conventional total hip surgery and the desire to perform hip resurfacing with the least amount of soft tissue dissection, he has attempted to perform all resurfacings through a posterior approach, using the smallest possible incision that would allow adequate visualization and appropriate implant placement. The investigator’s ratio of resurfacing recipients to conventional THA has generally increased: the total percent of resurfacings performed, in 2006, was 10%; in 2007, the percent increased to 31%; and, in 2008, 43 resurfacings of 165 total hip procedures were performed, a total of 26%.

The same investigator’s first 128 minimally invasive Birmingham hip resurfacings were compared to an equivalent group of 105 minimally invasive conventional total hip replacements, performed over the same time period to determine if there was any difference in 1. wound complications, 2. functional results, 3. operative complications, or 4. transfusion rates between the two groups.

Materials and Methods

A prospectively collected database (Captureware, DePuy, Warsaw, Indiana) was retrospectively reviewed for the following variables: wound complications, functional outcome, operative complications, and transfusion rates.

The patient population consisted of 100 males and 28 females (128 hips), who underwent BHR procedures from July 2006 to December 2008. Resurfacing patient demo-
graphic data included a mean age of 51 years (range, 38 to 60 years) and an overall mean body mass index (BMI) of 29. Diagnoses were almost entirely that of osteoarthritis, with two patients either having a variant of hip dysplasia or posttraumatic arthritis.

The minimally invasive THA group data consisted of all procedures performed from 2007 and 2008 and included patients who were under 60 years of age, to provide an age-matched group to that of the resurfacing group. Patients ranged from 23 to 60 years of age.

Resurfacing Operative Technique

In the resurfacing group, a posterolateral incision extending from 6 cm below the tip of the greater trochanter and extending proximally 4 cm was made. The tendon of the gluteus maximus muscle was split to allow anterior translation of the femur and to prevent traction on the sciatic nerve. An anterior-superior capsulotomy was performed and elevation of the minimus muscle off the ilium was utilized to create an anterior-superior pocket for the femoral head. A large Hohmann retractor was placed on the anterior inferior iliac spine to retract the femoral neck and to translate the femur anteriorly for acetabular reaming and component placement. Femoral exposure was facilitated with a complete capsulotomy by placing a retractor under the femoral neck and utilizing an isolation drape; it was not necessary to require internal rotation beyond 90° or hip flexion greater than 90°, which allowed a more limited soft tissue dissection than the traditional exposure.

Minimally Invasive THA technique

The minimally-invasive group procedure was performed through a 6 to 8 cm posterior incision, starting at the posterior edge of the trochanter, approximately 2 cm from the top and extending proximally in the orientation of the gluteus maximus muscle. A Hohmann retractor was then placed under the tendons of the gluteus medius and quadratus along the neck of the femur, isolating the piriformis and gemelli and protecting the sciatic nerve, while eliminating the need for a self-retaining retractor. A posterior L-shaped capsulotomy was tagged and utilized to protect the sciatic nerve during acetabular and femoral preparation. The hip was dislocated, and femoral neck resection was performed subcutaneously with a sagittal saw, eliminating the need for delivering the femoral head out of the wound and allowing for minimal soft tissue dissection.

Resurfacing Incision Length and Components

Overall incision length decreased over time since the first resurfacing in July 2006. The mean incision length in 2006 was 18 cm, decreasing in 2007 to 16 cm, and in 2008 to 15 cm. The mean incision length for the entire sample was 16 cm (range, 10 to 25 cm). The range of acetabular sizes and femoral sizes for females was 48 to 60 mm for the acetabular component and 42 to 50 mm for the femoral components.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Pain, Function, Harris Hip Scores in Resurfacing Versus Conventional Total Hip Arthroplasty Groups Over Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip Resurfacing Scores</td>
<td>Conventional Total Hip Arthroplasty Scores</td>
</tr>
<tr>
<td>Preoperative pain</td>
<td>9</td>
</tr>
<tr>
<td>Preoperative function</td>
<td>22</td>
</tr>
<tr>
<td>Preoperative Harris hip</td>
<td>49</td>
</tr>
<tr>
<td>3-month pain</td>
<td>40</td>
</tr>
<tr>
<td>3-month function</td>
<td>31</td>
</tr>
<tr>
<td>3-month Harris hip</td>
<td>94</td>
</tr>
<tr>
<td>12-month pain</td>
<td>41</td>
</tr>
<tr>
<td>12-month function</td>
<td>32</td>
</tr>
<tr>
<td>12-month Harris hip</td>
<td>96</td>
</tr>
</tbody>
</table>

For males, the acetabular component size range was 46 to 60 mm and 46 to 58 mm for the femoral components.

Conventional Total Hip Arthroplasty Incision Length and Components

The overall average incision length was 8 cm (range, 5 to 22 cm). Acetabular components ranged from 48 to 60 mm and femoral head sizes from 32 to 48 mm.

Comparisons

Pain

The 3-month mean postoperative pain scores were equivalent in the resurfacing group versus THA, 41 versus 40 points, respectively. At 12 months postoperative, the resurfacing group’s pain scores were significantly better overall than the THA group, 41 points versus 38. Resurfacing pain scores at the two-year mark continued to improve, with the mean reaching 43 points.

Function

Overall function scores improved in both groups, with the mean resurfacing scores higher overall at the 3-, 12-, and 24-month marks (22, 32, and 33 points, respectively). Total mean Harris hip scores in the resurfacing group went from a mean preoperative of 49 points to an improved mean score at 3 months (94 points), 12 months (96 points), and 2 years (99 points). Total Harris hip scores for the conventional total hip group at 1 year were 90 points versus 96 points in the resurfacing group. At 3 months, the groups were equivalent. Overall function in the THA group was worse preoperatively than in the resurfacing group, but the groups were equivalent by 12 months. Total hip arthroplasty (THA) Harris hip scores were lower preoperatively, in addition to overall function, than the BHR group (Table 1).

Complications, Radiographic Radiolucencies, and Need for Transfusion

In the resurfacing group, one femoral neck fracture was converted to a THA 14 days after surgery that had subsequent
wound dehiscence. The subject was a 58-year-old female with a BMI of 49. No further revisions or dislocations have been found to date. Painless squeaking has been noted in two patients. There was no notable heterotopic ossification.

In the conventional total hip group, one patient had a dislocation, one a greater trochanteric fracture, and one a periprosthetic fracture. There were no transfusions reported in either the resurfacing or THA group.

**Discussion**

On the whole, resurfacings had slightly better function scores than the primary THAs at the 1-year mark, with excellent Harris hip scores at the 2-year mark. The total hip group had improved pain at 12 months to a greater degree than the resurfacing group. Considering the total hip group had lower function scores, preoperatively, there was little difference in overall total Harris hip scores postoperatively within groups at 1 year (resurfacing, 96 points; THA, 90 points). Minimally invasive resurfacing and THA had comparable improved pain, function, and overall Harris hip scores in the first 2 years following surgery. There was no difference in overall complications between the groups over the study period.

Both techniques provided excellent clinical outcomes with a very low complication rate. There were no statistically significant differences between the resurfacing and THA procedures, as performed through a minimally invasive posterior approach.

**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.

**References**