Primary Ceramic-Ceramic THR vs Metal-Metal Hip Resurfacing in Active Young Patients

Abstract

The purpose of this study was to compare clinical outcomes between ceramic-on-ceramic total hip replacement and metal-on-metal hip resurfacing arthroplasty in comparable groups of young active patients at a 3- to 6-year follow-up. The first 250 patients (mean age, 49.54 years) of a series of 930 resurfacing arthroplasties were compared clinically and functionally with a series of 190 patients (mean age, 46.76 years) with ceramic-on-ceramic uncemented total hip prostheses. The total Harris hip score was 97.9 in the resurfacing group vs 92.1 in the ceramic group. In the resurfacing group, 60.71% had a strenuous activity level vs 30.43% in the ceramic group.

The association between high volumetric wear, polyethylene particulate debris, osteolysis, and loosening in total hip replacement (THR) in young patients is well recognized and understood.1-4 This has prompted an interest in alternative bearings, such as ceramic-on-ceramic and metal-on-metal.5-11

Metal-on-metal hip resurfacing has become increasingly popular, particularly in younger patients with more active lifestyles. Theoretical advantages are as follows: less bone resection, more physiological femoral loading, less stress shielding, maximum proprioceptive feedback, and restoration of normal anatomy. The lower risk of dislocation, less leg-length discrepancy, and easier (femoral) revision are added benefits in this patient population.12-15 These theoretical advantages have also raised high patient expectations. This technique was introduced in the author’s hospital in 1998.16

The purpose of this study was to establish whether the resurfacing technique is clinically and functionally superior to the conventional ceramic-on-ceramic primary THR in comparable groups of patients.

Materials and Methods

Between September 1998 and September 2003, 930 consecutive metal-on-metal Birmingham hip resurfacing (Smith & Nephew, Memphis, Tennessee; MMT, Birmingham, United Kingdom; Figure 1) arthroplasties were performed at Ghent University Hospital by the authors through a posterolateral approach. The first 250 cases of this series were included in the resurfacing group. Mean patient age in this group was 49.54 years. The group consisted of 66.15% men and 33.85% women. Follow-up ranged between 3 and 6 years. The main indications were osteoarthritis (80.54%), avascular necrosis (8.95%), and rheumatoid arthritis (3.11%). According to the Charnley classification, 92.65% of this group were classified as A, 2.94% as B, and 4.41% as C.17
Between July 1996 and September 2003, 190 Ancafit 28-mm ceramic-on-ceramic modular uncemented total hip prostheses (Wright Medical, Arlington, Tennessee; Figure 2) were implanted at the same hospital. All procedures were performed by the authors—73.7% through a Harding lateral approach and 26.3% through a posterolateral approach. Mean follow-up in this group was 3 years. The group consisted of 58.9% men and 41.1% women with a mean age of 44.95 years. The main indications were osteoarthritis (56.25%), avascular necrosis (27.5%), rheumatoid arthritis (6.25%), and trauma (4.38%). According to the Charnley classification, 73.77% of this group were classified as A, 10.66% as B, and 15.57% as C.

Demographics of both groups were comparable regarding age and body mass index (Table 1).

The Harris hip score and functional activity score were collected prospectively. Data storage and processing was performed using the Orthowave and Statwave software (CRDA, Epinet, France).

Only patients with a preoperative Harris hip score <50 were included in the study.

Intraoperative and postoperative problems and complications were carefully recorded, as were reoperations and revisions. Radiographs were evaluated.

Results
Two patients were lost to follow-up; they died of causes unrelated to the procedure. Average hospital stay was 2 to 5 days for the resurfacing group and 5 to 7 days for the THR group.

At latest follow-up, differences were observed in Harris hip scores (global and total) and activity level between the 2 groups that were to the advantage of the resurfacing group (Tables 2-5).

In the resurfacing group, the activity level did not seem to be influenced by the Charnley classification of the patients (Table 6). Furthermore, avascular necrosis apparently did not affect the clinical results, whereas in the THR group, a significant difference in activity level was found between the Charnley A group (avascular necrosis included) and the Charnley A group with only osteoarthritis as primary diagnosis. The results were better in the subgroup with avascular necrosis included. None of the scores showed a difference between the lateral and posterolateral approach in the THR group.

The latest radiographic follow-up showed no osteolysis due to wear in either group.

Complications encountered in the resurfacing group were 1 postoperative femoral neck fracture at 3 weeks, 1 traumatic dislocation, 1 low-grade infection, 1 avascular necrosis, 1 case with the femoral guide pin left in situ, and 1 acetabular component that was not bottomed out. The resurfacing patients did not present with significant leg-length discrepancy.

In the THR group, the dislocation rate was 4% with 1 recurrent dislocation requiring revision. Leg-length discrepancy due to lengthening varied from 0 to 2 cm. In 2 cases, shortening of the leg due to subsidence of the stem was found. One periprosthetic fracture and 1 low-grade infection required revision. No fractures of the ceramic components were observed.
Discussion

Between 1995 and 2002, mean patient age for THR declined from 67 years to 56.5 years at the author's (C.P.) hospital, and the number of THRs increased from 120 to 415 a year. Dealing with younger, active patients implies a need for alternative bearings, as the use of polyethylene in this population may be disastrous. For this reason, the metal-on-metal and ceramic-on-ceramic bearings have gained popularity at the author's (C.P.) hospital.

The concept of resurfacing is not new, but the history of failures with the Charnley Teflon-on-Teflon (DuPont, Wilmington, Delaware) and the Wagner metal-on-polyethylene resurfacing prostheses creates controversy.20-23

With the introduction of the metal-on-metal Birmingham hip resurfacing prosthesis and refined instrumentation, it should be possible to avoid the problems of the earlier designs. The early clinical and radiologic results are satisfactory with high Harris hip scores.16 The high percentage of strenuous activity level in this group of young, active patients meets the authors' expectations of the resurfacing technique (ie, anatomical restoration of leg length and offset).

In the THR group, there seems to be an important difference in functional outcome depending on the initial diagnosis. The Charnley A subgroup with avascular necrosis included seems to have higher activity levels compared with the subgroup with only osteoarthritis included (Table 6). However, this does not apply to the resurfacing group.

The controversy on the superiority of either resurfacing arthroplasty or conventional ceramic-on-ceramic THR remains unsolved. Although Chirodan et al24 reported that there is no difference at 12 months postoperatively between the 2 procedures in terms of pain and function, we observed some significant differences, reflected in a higher Harris hip score and a higher activity level in the resurfacing group, even in the Charnley A subgroup with inclusion of avascular necrosis as the primary diagnosis.24
A quicker recovery and shorter hospital stay seem to be advantages of the resurfacing procedure. The lower incidence of dislocation in our resurfacing series is consistent with previously reported results regarding the relationship between head diameter and dislocation rate, as we had a dislocation rate of 4% in the THR group with the 28-mm ceramic-on-ceramic friction couple.25

Conclusion

When alternative bearings are used in patients younger than 65 years, metal-on-metal hip resurfacing appears to produce good results. The early results are promising, with markedly positive differences in clinical and functional outcome compared to primary ceramic-on-ceramic THR.

Meticulous surgical technique combined with proper preoperative templating and reproducible placement of the prosthetic components is essential to a good postoperative result without any restrictions in activities. The metal-on-metal, just like the ceramic-on-ceramic bearing, should guarantee a low-wear result with no osteolysis. At this stage, resurfacing is the authors' preferred arthroplasty technique to treat young, active patients, but long-term follow-up is mandatory.

References


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