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Is There a Role for Resurfacing Hip Arthroplasty for Patients Who Have Arthritis of the Hip?

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Question: Is there a role for resurfacing hip arthroplasty for patients who have arthritis of the hip?

Response/Recommendation: Currently, there is a minimal role for the routine use of metal-on-metal (MoM) resurfacing arthroplasty for patients who have arthritis of the hip. Resurfacing using MoM bearing surfaces may be considered for skeletally mature young (< 65 years) men who have hip arthritis and no major deformity. Given the technical challenge of this surgical procedure, resurfacing should be performed by surgeons who have great experience with this procedure.

Level of Evidence: Level II.

Vote: Agree 86.4%, Disagree 11.7%, and Abstain 2.0%.

Rationale

In recent years, there has been a rapid decline in the utilization of MoM resurfacing arthroplasty in patients who have arthritis of the hip. The main reason for this decline in utilization relates to the issues of adverse local tissue reaction that have been seen with some designs more than others [1–3]. The initial reports of resurfacing hip arthroplasty (RHA) showed favorable outcomes, and many advantages of RHA were posited, particularly in young patients [4]. This included bone conservation, as the femoral neck is mostly conserved; a greater range of motion; better wear properties; and a lower risk of dislocation [4–6].

In the late 1990s and early 2000s, RHA attracted much attention from the orthopaedic community and was performed commonly. However, initial results were not as satisfactory as hoped due to significant differences in the performance of the implants and the steep learning curve, resulting in failures. A revision rate of up to 45% was reported in some series [7,8]. However, the outcome of RHA appears to be design-dependent, with one design continuing to show a favorable outcome in comparison to other designs [9]. In fact, one particular design had to be pulled out of the market due to its dismal performance [9,10].

The design philosophy of RHA is such that it aims to provide an anatomical restoration of the hip joint. It has been argued that this

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approach could potentially result in better clinical function and quality of life than conventional total hip arthroplasty (THA).

A gait analysis study revealed that RHA patients, when compared to THA, achieved a higher walking speed and maintained a more normal weight acceptance and a wider range of hip flexion [11]. While this may not be true in all cases, a meta-analysis showed that RHA can provide functional outcomes, at least equivalent to THA, in selected cohorts of young and active men [12]. Similarly, a randomized controlled trial comparing RHA and THA showed that both cohorts had similar functional outcomes after 5 years [13]. Several articles have indicated that active patients undergoing RHA can remain active after surgery [4,9,14,15]. A large meta-analysis suggests that patients who have RHA can return to sports in the first year after surgery [16].

Recent studies demonstrate that even younger and active patients can do well with THA and the use of a newer bearing surface, namely highly cross-linked polyethylene or ceramic on ceramic [17–19]. With the known issue related to the release of metal ions, even with the optimal designs, the use of RHA has been restricted to very active, muscular young men, and women of childbearing age are thought to be poor candidates for RHA [20–22]. In addition, early complications may be more likely when the head diameter is smaller than 50 mm.

In contrast to the early results, it seems that RHA survival rates in the current literature are comparable to THA. The most recent survival studies generally include follow-up of the Birmingham RHA and report 10-year rates of 83 to 100%, which is encouraging [9]. A meta-analysis of large studies produced a 10-year survival rate of 95.5% (95% confidence interval (CI), 93.4 to 97.1) with all-cause revision as an end point [23]. In a study of more than 300 cases from an experienced center, the Kaplan-Meier survival rate for all-cause revision was estimated to be 97.2% at 5 years (95% CI, 94.7 to 98.5) and 93.8% at 10 years (95% CI, 88.8 to 96.7), respectively [4]. However, it is worth noting that the survival results differed significantly by sex. In one study where the 10-year survival rate of all cases was reported to be 93.7%, the survival rate of prostheses in men was 95.4%, while this rate was only 89.9% in women [22]. Another study indicated that the results were less favorable, particularly in women and in cases with acetabular component inclination > 55 degrees [24].

A study from the Australian registry suggests that there may be an increased risk of revision in the RHA cohort compared to THA [10]. This risk may be due to less experienced surgeons performing the procedure and/or using suboptimal implants. This increased risk of revision is not as pronounced in single-center studies. The French Hip Resurfacing Registry study revealed a mere 0.04% (7 out of 1,650 hips) revision rate at a mean follow-up of 3.8 years [25]. However, this data must be viewed with caution, as only 18 surgeons accredited for RHA surgery are permitted to enter data into this registry. On the other hand, after adjusting for potential confounding factors with a mean follow-up of 73.2 months, multivariate analyses indicated that there were significantly higher rates of revision surgery ($P < 0.001$), overall complications ($P < 0.001$), all-cause reoperations ($P = 0.014$), and mortality ($P < 0.001$) in the THA cohort compared with RHA. It is also worth noting that patients who have THA were less likely to be satisfied ($P = 0.046$) [26]. A similar study showed no statistically significant difference between RHA and THA in terms of complications (12.1 and 16.2%, respectively) and revisions (6.3 and 6.1%, respectively) [5]. Furthermore, one study reported significantly lower dislocation rates with RHA [15].

It is worth noting that several published meta-analyses have yielded conflicting results regarding the frequency of revision. In one meta-analysis, overall complication rates were found to be significantly lower in the RHA compared to the THA group, with an odds ratio of 2.17 (95% CI 1.21 to 3.88; $P = 0.009$). There was no difference in revision rate between the two groups (odds ratio 1.06, 95% CI 0.57 to 1.99; $P = 0.85$). Functional outcomes were satisfactory in both groups, but the Harris hip score was significantly better in the resurfacing group (mean difference of 2.99, 95% CI −4.01 to −1.96, $P < 0.00001$) [27]. On the other hand, another meta-analysis of 27 studies indicated that there may be a higher incidence of revision in the RHA group than in the THA group (relative risk, 1.65; 95% CI, 1.28 to 2.31; $P < 0.0001$) and total revisions reached 142 in the RHA group and 86 in the THA group in 2,520 and 2,556 cases, respectively [28]. Similarly, in a meta-analysis by Smith et al., RHA had a higher risk of revision compared to THA [29].

There are further studies reporting higher revision rates with RHA due to component malpositioning, metal ion release, osteolysis, and component loosening [30]. Another important difference seems to be time for revision. A systemic review by Deborah et al. showed that revision rates are more frequent and early in RHA when compared to THA [31]. It was observed that revision rates were significantly higher in cases performed after inflammatory arthritis and after femoral neck fractures compared to those performed based on idiopathic osteoarthritis [32]. The most prevalent factor leading to revision was aseptic loosening, followed by problems related to MoM bearings [22]. In addition, it has been observed that metal ions are excreted in the urine at a significantly higher rate in patients who have RHA than in cases with metal-on-polyethylene THA [33].

Metal-on-metal RHA, using an implant system with a good track record, could provide favorable longevity and postoperative outcomes to carefully selected patients. Factors that are determinants of a favorable outcome include the selection of men under 65 years of age who have good bone stock, a diagnosis of osteoarthritis, no major deformity of the hip, and the use of a femoral head greater than 50 mm. Surgeons should continue to remain cautious of the leading causes for revisions and their potential risk factors to accurately identify optimal candidates for RHA.

CRediT authorship contribution statement

Hakan Kocaoğlu: Writing – review & editing, Writing – original draft, Investigation, Data curation, Conceptualization. **Ross Crawford:** Writing – review & editing, Writing – original draft, Investigation, Data curation, Conceptualization. **Javad Parvizi:** Writing – review & editing, Writing – original draft, Investigation, Data curation, Conceptualization. **James N. Powell:** Writing – review & editing, Writing – original draft, Investigation, Conceptualization. **Alfredas Smailys:** Writing – review & editing, Writing – original draft, Investigation, Data curation, Conceptualization. **Saheed Yakub:** Writing – review & editing, Writing – original draft, Investigation, Data curation, Conceptualization.

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