Is there a role for resurfacing hip arthroplasty for patients with arthritis of the hip?

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Response/Recommendation:

Currently, there is minimal role for the routine use of metal-on-metal resurfacing arthroplasty for patients with arthritis of the hip.
Resurfacing using metal-on-metal bearing surfaces may be considered for skeletally mature young patients (<65 years) male patients with hip arthritis and no significant deformity. Given the technical challenge of this surgical procedure, resurfacing should be performed in high volume centers by surgeons with experience with this procedure.

Level of Evidence: Level II

Rationale:

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

In the late 1990s and early 2000s, RHA attracted much attention from the orthopedic community and was performed fairly commonly. However, initial results were not as satisfactory as hoped due to significant differences in the performance of the implants and the high learning curve, resulting in failures. 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 (Birmingham Hip Resurfacing) continuing to show favorable outcome in comparison to other designs. In fact , one particular design (ASR) had to pulled out of 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 approach could potentially result in better clinical function and quality of life than conventional 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 male patients [12]. Similarly, an RCT comparing RHA and THA showed that both cohorts had similar functional outcomes after five 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 with RHA are able to 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 newer bearing surface, namely highly cross-linked polyethylene or ceramic on ceramic [17–19]. With the known issue related to release of metal ions, even with the optimal designs, the use of RHA has been restricted to very active, muscular young males and women of childbearing age are thought to be poor candidates for RHA [20–22]. Additionally, 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%-100%, which is encouraging [9]. A meta-analysis of large studies produced a 10-year survival rate of 95.5% (95% CI, 93.4% to 97.1%) with all-cause revision as an end point [23]. In a study of more than three hundred cases from an experienced center, the Kaplan-Meier survival rate for all-cause revision was estimated to be 97.2% at 5 years (95% confidence interval [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 gender. In one study where the 10-year survival rate of all cases was reported to be 93.7%, the survival rate of prostheses in male patients was 95.43%, while this rate was only 89.86% in women [22]. Another study indicated that the results were less favorable, particularly in women and in cases with acetabular inclination greater than 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 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 1650 hips) revision rate at 3.8 years of mean follow-up [25]. However, this data must be viewed with caution as only 18 surgeons accredited for RHA surgery are permitted to enter data to 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 with 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 (12.08% and 16.24%, respectively) and revisions (6.32% and 6.14%, 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 (OR) of 2.17 (95% CI 1.21, 3.88; $p = 0.009$). There was no difference in revision rate between the two groups (OR 1.06, 95% CI 0.57, 1.99; $p = 0.85$). Functional outcomes were satisfactory in both groups, but the Harris Hip Score was significantly better in the resurfacing group (MD 2.99, 95% CI - 4.01, - 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 (RR, 1.65; 95% CI, 1.28e2.31; $p < 0.0001$) and total revisions reached 142 in the RHA group and 86 in the THA group in 2520 and 2556 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 to 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 collum femoris fractures compared to those performed on the basis of idiopathic osteoarthritis [32]. The most prevalent factor leading to revision was aseptic loosening, followed by problems related to metal-on-metal (MoM) bearings [22]. In addition, it has been observed that metal ions are excreted in the urine at a significantly higher rate in patients with RHA than in cases with metal-on-polyethylene THA [33].

Metal on Metal RHA using a resurfacing system with a good long term track record could provide favorable longevity and postoperative outcomes to carefully selected patients. Factors that are determinants of a favorable outcome include selection of male patients under 65 years of age with good bone stock, a diagnosis of osteoarthritis, no significant deformity and femoral head size greater than 50. Surgeons should continue to remain cautious of the leading causes for revisions and their potential risk factors to accurately identify optimal candidates for RHA.

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