A Comparison between Monoblock and Modular Dual Mobility components: Mid-term analysis of Serum Metal Ion Levels

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INTRODUCTION:

Dislocation is among the most prevalent of complications associated with total hip arthroplasty (THA). One of the leading solutions to this challenge is the use of dual mobility (DM) constructs. The traditional 'anatomic' (ADM) or monoblock design is characterized by a one-piece stainless steel or cobalt chromium shell with a mobile polyethylene liner. A newer alternative is the modular (MDM) design that instead uses a standard titanium cup, fixated through screws with a fixed liner. This design has several advantages, however, the additional bearing surface between the cup and metal liner has raised concerns about fretting and corresponding release of metal ions.

Our previous study found that the frequency of detectable serum metal ions was greater in MDM constructs than ADM constructs at 1 year after surgery (39% vs 20%). We also found that cobalt ions were more commonly detected in MDM constructs. As increases in metal ions can be indicative of adverse events in this cohort, we continued monitoring of serum metal ions five years after the use of either the MDM/ADM construct.

METHODS:

Patients identified to have an ADM/MDM construct implanted between 2015-2019 were asked to return to complete metal ion testing as a part of a comprehensive evaluation of their five-year outcomes. Metal ion testing was completed and results were interpreted based on standardized ranges for each metal ion. The Mann-Whitney U test was used to determine differences between ADM/MDM constructs and metal ion levels at five years. RESULTS:

Overall, 98 patients were contacted from our previous study. Two patients had already died, six were lost to follow-up, leaving 90 patients eligible for continued monitoring. 52 (57%) patients returned (ADM, N=22; MDM, N=30). Mean metal ion values at five years were the following: cobalt (0.83+/-0.412), chromium (0.91 +/-1.3), and titanium (5.4 +/-4.3). ADM constructs presented with higher chromium levels compared to MDM constructs (1.2 vs. 0.69). However, overall, we found that there was no significant difference in mean cobalt (p=0.94), chromium (p=0.30), or titanium (p=0.98) levels between ADM and MDM constructs at five years.

DISCUSSION AND CONCLUSION:

We found no differences in metal ion levels between ADM/MDM constructs at five years. Larger future studies are needed to determine if normal metal ion results between constructs equates to similar clinical outcomes.