

Paper #41

Sensitivity and Specificity of Metal Ion Level in Predicting Head-Neck Taper Corrosion in Metal-on-Polyethylene Total Hip Arthroplasty

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Introduction: While metal ion levels are a useful diagnostic test for assessing metal-on-metal total hip arthroplasty (THA), the utility of metal ion levels in evaluating metal-on-polyethylene (MoP) patients with head-neck taper corrosion has not been previously reported. The aim of this study was to investigate the sensitivity and specificity of serum metal ions as a predictor of head-neck taper corrosion associated adverse local tissue reactions (ALTR) in MoP THA patients.

Methods: In this case-control study, a total of 68 MoP THA patients (28M:40F) were investigated. There were 2 patient groups: (1) Case group: ALTR detected on metal artifact reduction (MARS) MRI (n=41); and (2) Control group: without ALTR on MARS MRI (n=27). All patients had metal-on-polyethylene THA with highly cross-linked polyethylene liners with cobalt-chromium femoral heads on Ti alloy femoral stems. Serum cobalt and chromium levels were analyzed. Receiver operating characteristic curve was constructed to determine the sensitivity and specificity using different metal ion cut-off values.

Results: The presence of ALTR was significantly associated with higher cobalt (8.0 μ g/L vs. 2.1 μ g/L, p=0.001), higher chromium (2.1 μ g/L vs. 1.1 μ g/L) and higher Co/Cr ratio (5.5 vs. 2.7, p=0.05). The area under curve for cobalt, chromium and Co/Cr ratio were: 0.799, 0.758 and 0.727, respectively. The optimal cut-off diagnostic values were 0.95 μ g/L for cobalt (sensitivity: 90.0%, specificity: 59.3%), 0.55 μ g/L for chromium (sensitivity: 82.5%, specificity: 70.4%) and 3.1 for Co/Cr ratio (sensitivity: 67.5%, specificity: 85.2%).

Conclusions: Although metal ion levels alone should not be relied on as the sole parameter to determine revision surgery, cobalt level >1 μ g/L and the Co/Cr ratio >3 are useful clinical diagnostic adjuncts in the systematic clinical evaluation for head-neck taper corrosion related adverse tissue reactions in patients with MoP THA. The study provides evidenced-based practical information for surgeons when interpreting metal ion levels in MoP THA patients for clinically relevant head-neck taper corrosion.

Notes
