

Elevated Titanium Levels in Revision Total Hip and Knee Arthroplasty: What Do They Mean?

Mikaela H Sullivan, Cory Gene Couch, Matthew Philip Abdel¹, Robert T Trousdale

¹Mayo Clinic

INTRODUCTION: Total hip arthroplasty (THA) and total knee arthroplasty (TKA) implants include metal alloys, which can generate ions. Contrary to cobalt (Co) and chromium (Cr), titanium (Ti) biomarkers and toxicity are poorly studied. We aimed to study Ti levels in revision THAs and TKAs by 1) calculating incidence of low, moderate, and high serum levels, 2) evaluating effects on clinical decision-making, and 3) assessing for systemic symptoms in patients with elevated levels.

METHODS: We retrospectively reviewed all revision THAs and TKAs with serum Ti levels drawn 2018-2022 through our institutional total joint registry. Of 873 revision THAs and 1024 revision TKAs, 110 (13%) and 33 (3%), respectively, had Ti levels obtained. Patients were stratified to low (<10 ng/mL; mean 3 ng/mL), moderate (10-99 ng/mL; mean 35 ng/mL), and high (>100 ng/mL; mean 430 ng/mL) Ti levels. Mean age was 66 years with 52% female.

RESULTS: Incidences of low, moderate, and high titanium levels were 75%, 17%, and 8%, respectively, in revision THAs and 76%, 18%, and 6%, respectively, in revision TKAs. Main indications for revision THA were adverse local tissue response to CoCr (25%), aseptic loosening (19%), and conventional polyethylene (PE) wear (14%). For revision TKAs, the leading reasons for revision were conventional PE wear (35%), aseptic loosening (31%), and infection (21%). No patient underwent revision due to elevated Ti levels, and there were no new onset systemic symptoms attributed to elevated Ti.

DISCUSSION AND CONCLUSION: Titanium levels were obtained in 13% of revision THAs and 3% of revision TKAs. Incidences of elevated serum Ti levels were 8% and 6% in THAs and TKAs, respectively. Low, moderate, and high titanium levels did not influence decision to revise. Despite a wide range of serum levels, no patient was diagnosed with systemic symptoms related to elevated Ti, and local tissues were not compromised due to Ti.