Low Vitamin D is Associated with Worse Pre-operative Function but Greater Improvement after Total Joint Arthroplasty

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INTRODUCTION:

25-OH-vitamin-D (25(OH)D) deficiency is a common and underdiagnosed threat to bone health and has been associated with worse outcomes after total joint arthroplasty (TJA). This study investigated whether low pre-operative 25(OH)D is associated with lower patient-reported outcomes (PROs) and higher odds of post-operative complications following TJA in a diverse population with high prevalence of low 25(OH)D. METHODS:

This was a retrospective study of patients undergoing total hip (THA) or knee arthroplasty (TKA) at an urban tertiary care center between 2020-2023. A total of 488 patients met inclusion criteria, representing 538 surgeries. Chart review was conducted to collect pre-operative, day-of-surgery, 6-week post-operative, 90-day post-operative, and 25(OH)D treatment data. Patients identified as 25(OH)D deficient (< 12 nmol/L) or insufficient (12–30 nmol/L) were prescribed supplementation prior to or at the time of surgery per institution protocol. We analyzed the association between 25(OH)D level and Hip dysfunction and Osteoarthritis Outcome Score for Joint Replacement (HOOS, JR) or Knee injury and Osteoarthritis Outcome Score for Joint Replacement (KOOS, JR) pre-operatively and at 6 weeks and 90 days post-operatively, as well as the relationship between 25(OH)D and 90-day complications. RESULTS:

Pre-operative 25(OH)D deficiency or insufficiency was observed in 46.51% of surgeries and disproportionately impacted Black patients. Lower 25(OH)D was also associated with younger age, higher body mass index, and lower pre-operative HOOS, JR score. Improvement in HOOS, JR score at 90 days post-operatively was found to be significantly greater in the 25(OH)D deficient group (P = .043). A similar trend was observed among KOOS, JR scores but did not achieve significance (Figures 1 & 2). Furthermore, analysis of linear mixed models found HOOS, JR scores to be significantly higher overall in patients who had pre-operative 25(OH)D > 30 nmol/L compared to those who had 25(OH)D deficiency when controlling for time measured (P = .023); no such association was found between overall KOOS, JR scores and 25(OH)D status. Low pre-operative 25(OH)D did not increase odds of re-operation (P = .484), readmission (P = .385), wound complications (P = .595), or overall complications (P = .656).

DISCUSSION AND CONCLUSION:

This is one of the largest studies investigating the impact of 25(OH)D levels on TJA outcomes. Our results suggest that low 25(OH)D is associated with lower pre-operative function and greater improvement as measured by HOOS, JR score following THA; a similar trend was observed in TKA but was not significant. Nonetheless, TJA coupled with 25(OH)D supplementation in patients with low 25(OH)D may result in similar post-operative outcomes as those with normal preoperative 25(OH)D levels, both in terms of improvement in function and low odds of complications. Surgeons performing TJA in diverse populations should be aware of high rates of 25(OH)D deficiency and its association with PROs, and they should test and treat 25(OH)D deficiency accordingly as part of comprehensive pre-operative patient optimization. Future studies should continue to investigate the impact of 25(OH)D on surgical outcomes in large and diverse patient arthritis populations, well explore and overall musculoskeletal as as its role in health.



A significant relationship was demonstrated between 25(OH)D group and HOOS, JR score improvement 90 days post-operatively. Abbreviations: PROM, patient-reported outcome measure; HOOS, JR, Hip disability and Osteoarthritis Outcome Score for Joint Arthroplasty; KOOS, JR, Knee disability and Osteoarthritis Outcome Score for Joint Arthroplasty.



HOOS, JR scores were found to be significantly different pre-operatively. The patient-reported outcomes were not significantly different at any other timepoint. Abbreviations: HOOS, JR, Hip disability and Osteoarthritis Outcome Score for Joint Arthroplasty; KOOS, JR, Knee disability and Osteoarthritis Outcome Score for Joint Arthroplasty.