

Incidence of Joint Arthroplasty Complications in Vitamin D Deficient Patients

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INTRODUCTION: More than one million patients undergo a total joint arthroplasty (TJA) procedure annually in the United States (U.S.), and utilization rates are projected to increase due to the aging population.⁸ Given the projected increase in utilization and knowledge of bone health for improved TJA outcomes, the role of vitamin D levels has been a focus of recent literature.^{5,6,12} Vitamin D has many important roles, including bone mineralization, remodeling, immunity, and muscle health among other physical health benefits.^{1,9} A 2018 study found national rates of vitamin D deficiency and insufficiency of 28.9% and 41.4%, respectively, between 2001-2010.⁴ Approximately 40-82% of patients undergoing TJA have been recognized to have low vitamin D levels.⁷ Vitamin D insufficiency has been associated with worse clinical outcomes for TJA patients, notably prolonged hospital length of stay, increased perioperative complication rates and worse postoperative functional outcomes.¹ Despite knowledge of vitamin D in bone health and prevalence of deficiency in the U.S. population, current literature lacks consensus regarding guidelines surrounding nutritional care for individuals undergoing joint replacement.^{2,9-11,13} The objective of this study was to determine if complications of total joint arthroplasties are associated with low vitamin D levels. We hypothesized that vitamin D deficiency will lead to increased complication rates within ninety days of surgery. This study intends to expand current knowledge of the role of vitamin D in post-arthroplasty outcomes and guide future research on vitamin D supplementation and pre-operative nutritional optimization.

METHODS: This is a retrospective chart review performed after obtaining Institutional Review Board (IRB) approval. Patients were excluded if they were less than 50 years old or if they had a diagnosis of avascular necrosis, post-traumatic arthritis, or post-infectious arthritis. Patients who underwent a total knee arthroplasty (TKA) or total hip arthroplasty (THA) from 2018-2019 were identified (CPT 27447 and 27130). Patient charts were examined to identify vitamin D status, demographics, medications, and post-operative complications. Primary outcome measures were implant-related complications such as loosening, periprosthetic fracture, periprosthetic joint infection, and revision, and medical complications within 90 days of surgery. Vitamin D deficiency was defined as 25-hydroxyvitamin D (25 (OH)D) levels less than 20ng/mL.⁷ Univariate and multivariate logistic regression analysis was used to identify significant differences between vitamin D-deficient patients and those with vitamin D levels within normal limits.

RESULTS SECTION: A total of 316 patients were included in the study. 183 patients underwent TKA and 133 underwent THA. The number of patients with low and normal vitamin D levels was 38 and 278, respectively. There was no association between vitamin D levels and implant loosening, periprosthetic fracture, postoperative infection, or revision on univariate or multivariate analysis. Vitamin D deficiency was significantly associated with increased odds of hospital readmission on univariate analysis (OR 2.41, 95% CI 1.05-5.57), however this relationship lost significance on multivariate analysis (OR 2.29, 95% CI 0.97-5.41).

DISCUSSION: Contrary to our initial hypothesis, vitamin D deficiency was not a risk factor for post-operative orthopaedic-related complications. Low vitamin D levels were associated with hospital readmissions echoing findings by Ingstad et al.³ As there is currently no consensus regarding vitamin D deficiency quantification, it may be beneficial to standardize laboratory definitions. Patients with vitamin D levels less than 20ng/mL may benefit from vitamin D supplementation to optimize health and post-surgical recovery, leading to improved outcomes.

SIGNIFICANCE/CLINICAL RELEVANCE: Vitamin D deficiency is highly prevalent in patients undergoing joint replacements; however, studies to date have not definitively established the impact of hypovitaminosis D on the post-operative course.¹⁰ Standardization of the laboratory definitions for vitamin D deficiency warrants further investigation. Identifying modifiable patient-specific risk factors related to nutritional status may decrease complication rates in total joint arthroplasty.¹

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