QUESTION 27: Does vitamin D deficiency (VDD) increase the risk of subsequent surgical site infections/periprosthetic joint infections (SSIs/PJIs) in patients undergoing orthopaedic procedures?

RECOMMENDATION: Unknown. VDD may increase the risk of subsequent SSIs and/or PJIs in patients undergoing orthopaedic procedures by diminishing vitamin D-mediated innate and adaptive immune responses.

LEVEL OF EVIDENCE: Limited

DELEGATE VOTE: Agree: 82%, Disagree: 5%, Abstain: 13% (Super Majority, Strong Consensus)

RATIONALE

The exact mechanism of how vitamin D affects immune function is unknown. Numerous studies have demonstrated its regulation of both the innate and adaptive immune responses [1–6]. Vitamin D has been shown to activate the innate immune system to kill bacteria through intracellular regulation of monocytes, as well as by modulating production of anti-microbial peptides (AMPs) and cytokines [1,2]. Vitamin D activates the adaptive immune response through paracrine regulation in dendritic cells, T cells and B cells [1].

Clinical evidence of VDD and risk of SSI/PJI in the orthopaedic literature is limited. In a prospective study, measuring serum 25-hydroxyvitamin D levels, VDD was found in 64% of patients presenting for primary total joint arthroplasty (TJA), 52% of patients presenting with aseptic loosening, and 86% of patients presenting with PJI — a statistically significant difference for PJI compared to the other groups [7]. A retrospective case-control study of revision TJAs had similar findings, with PJI patients being more likely to have VDD than patients being revised for aseptic indications (72.7 vs.48.4%, respectively) [8]. Additionally, prevalence of VDD was 55% in the revision TJA population compared with 39% in the primary TJA population. Importantly, when controlling for other nutritional parameters such as albumin and transferrin, VDD remained predictive of PJI as the reason for revision surgery [8].

To date, there are no clinical studies on the effect of vitamin D supplementation and the risk for SSI/PJI. In a PJI mouse model, VDD mice were shown to have an increased bacterial burden when compared to VDD mice that received “rescue” vitamin D supplementation [9]. Bacterial burden was similarly decreased between normal mice and the VDD “rescue” mice receiving supplementation.

VDD is common, with rates reported to be 42% in adults in the United States, and 24 to 65% in TJA patients [10–14]. As a potential modifiable risk factor for SSI and PJI, VDD is an important area for future study.

REFERENCES