

Vitamin D Deficiency Effect on Rearfoot and Ankle Arthrodesis: A Retrospective Analysis

Rebecca Bari DPM¹, David Sadoskas, DPM, FACFAS²
1. Resident, 2. Associate Residency Director

Statement of Purpose

Vitamin D (VitD) is a vital component to fracture healing – specifically in the feedback loop that is involved with controlling osseous callus formation. Having a normal VitD level in spinal fusions has been shown to be beneficial¹; however, there is a lack of literature whether VitD affects fusion rates in arthrodesis procedures for the foot and ankle. We hypothesized that the patients with low VitD levels would have a higher prevalence of nonunion.

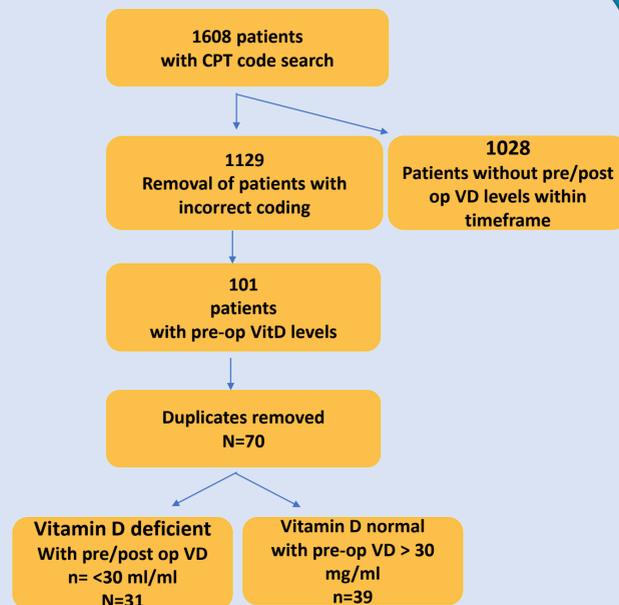
Level of Study

Format: Retrospective Comparative Review
Length of follow up : minimum 6 months
Level of evidence: 3
Classification: Rearfoot and Ankle Reconstruction

Literature

Greater than 41% of the population has a VitD deficiency². Currently, it is not recommended to screen individuals who are not at risk for deficiency or to prescribe VitD according to the Endocrine Society Clinical Practice Guideline³. There is no consensus on whether physicians should assess VitD levels of patients prior to undergoing rearfoot/ankle arthrodesis⁴. In one study that looked at VitD status for elective foot and ankle arthrodesis, 67% of the patients were deficient. This study looked at the prevalence of hypovitaminosis, but did not look at non-union rate⁵. Another study looked at various arthrodesis procedures throughout the foot, however the patient population included those with an active endocrine disease, not specifically VitD deficiency³. We specifically looked at higher risk arthrodesis procedures in order to attempt to influence fusion rates.

Methods



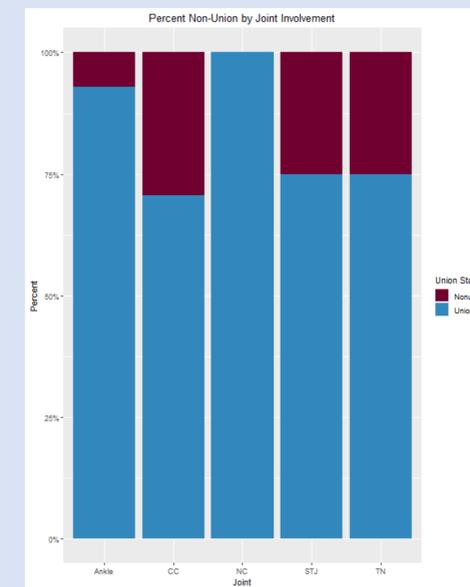
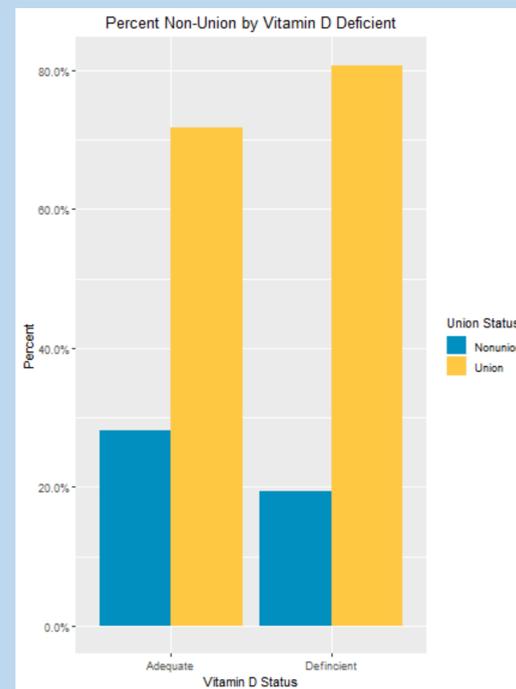
A chart review was performed in patients who underwent any of the following arthrodesis procedures with an open technique: ankle, STJ, TNJ, CCJ, and NCJ between January 1, 2004 and January 1, 2019 in the Baylor Scott and White Health system. Exclusion criteria included uncontrolled diabetes mellitus (HbA1C >8.0), deformity caused by charcot neuroarthropathy. Deficiency was defined as a VitD serum level of <30 ng/dL². We identified patients with recorded VitD lab values within 6 months prior to surgery and 18 months post operative. Patients who received supplementation of VitD were still considered. Radiographs were typically taken postoperative period of: 3 weeks, 6 weeks, 3 months, 6 months, 12 months. Union was defined as signs of osseous trabeculation across the entirety of the fusion site. Nonunion was defined as failure of union across any of the joints involved in the procedure, and the patient was placed in the nonunion category.

Results

Of the 70 patients, 31 had VitD deficiency with a union rate of 80.7%. 39 patients with a normal VitD had a union rate of 71.8%. Using a univariate logistic regression, VitD deficiency was not found to be a statistically significant predictor of nonunion (p-value =0.3910).

27 out of the total 131 joints went to non-union (STJ n=9, TNJ n=7, Ankle joint n=4, NCJ n=5, CCJ n=2).

No statistically significant association was detected between union and the following: tobacco use (p-value=0.3467), diabetes (p-value =0.3039), VitD supplement use (p-value=0.3473).



Discussion

Multiple variables can contribute to a non-union, including surgical technique such as joint preparation, malposition, inappropriate hardware use, as well as patient factors including smoking, obesity, infection. Given these confounding variables, it is difficult to identify VitD as a single causative factor.

This study is limited by a small cohort size. Our initial chart review included 1129 patients but the majority of these patients (91%) did not have VitD levels on file. Additionally, many of the patients who had adequate VitD were on supplementation. Our study did not look at the effect comparing the use of VitD supplementation on fusion rate.

We did not compare arthrodesis rates in patients with adequate VitD in conjunction with an allograft/autograft in the union site.

Financial Disclosure: The authors have no financial disclosures.



Figure 4: Example radiographs of a patient who underwent a CCJ arthrodesis with adequate vitamin D (36 ng/dL) who underwent a non-union (radiograph taken at 14 months).

Conclusion

We were unable to correlate a difference in fusion rates between patients with low and normal VitD. If VitD is checked and found to be deficient, supplementation is recommended but may not affect union rates. The prevalence of nonunions were also higher than typically described in the literature; however, this study involved multiple physicians in the health system that could have vastly different postoperative protocols. As this was a chart review, we were unable to determine how many nonunions were asymptomatic and this outcome was outside the scope of this article. This study revealed a lack of evidence in the literature, and additional studies are needed to determine the importance of VitD deficiency in rearfoot and ankle arthrodesis.

References

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