

Case Series.

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Statement of Purpose

Vitamin D is essential in maintaining musculoskeletal health and bone mineralization, as it has a vital role in the regulation of calcium and skeletal homeostasis. Vitamin D has also been shown to have a significant role in the healing process of fractures and elective fusion procedures. The endocrine system is responsible for the tightly regulated mechanisms for bone and mineral metabolism in the human body. Homeostasis of bone minerals is primarily controlled by parathyroid hormone, vitamin D 1,25OH, and calcitonin.¹

Sprague et al performed a meta-analysis showing Vitamin D deficiency led to patients having a higher risk of receiving a fracture of the foot and ankle. This study also revealed that patients supplemented with Vitamin D healed their fractures more efficiently.² Specifically in regards to ankle fractures, Warner et al. showed that in patients who suffered ankle fractures who were Vitamin D deficient (<20ng/ml) showed significantly lower FAOS scores one year post-op signifying vitamin D deficiency was a factor in inferior FAOS with regard to symptoms, activities of daily living, and quality of life.³

Catanzariti et al. revealed that patients with Vitamin D deficiency were statistically significant 8.1 times more likely to develop a non-union for elective fusion procedures. All other patient variables and risk factors, such as age, procedure selection, BMI, and tobacco use, between the 2 groups did not reach statistical significance.⁴

Our study focuses on the use of Vitamin D supplementation in the treatment of non-unions secondary to both trauma and elective fusion procedures.

Methodology and Hypothesis

Non-unions in both traumatic and elective procedures are very difficult to treat. Conservative measures include the use of bone stimulation devices, prolonged immobilization, or dynamization. Unfortunately, there is a large portion of these patients that require revisional surgery.⁵

Within the literature and in our practice, Vitamin D insufficiency is considered values less than 30ng/mL and Vitamin D deficiency is considered values less than 20ng/mL.³ Our practice has found success treating patients with non-unions with supplementation of Vitamin D to a minimum blood level of 50ng/mL. In general when a patient is below the optimal level for healing, patient's are supplemented with 5,000 – 6,000 IU's daily of Vitamin D3.

We present two cases of patients with non-unions after surgical intervention for both traumatic and elective surgery, in which vitamin D supplementation along with prolonged protected weight bearing healed their non-unions with no revisional surgery performed.

Case 1

WS is a 65 year old male with past medical history of coronary artery disease with last myocardial infarction within 5 months of initial injury, diabetes mellitus type 2, hypertension, and peripheral vascular disease, presented in April of 2017 with an isolated, minimally displaced, fibular fracture (Figure 1, A-C). Secondary to his extensive co-morbidities and high risk for surgery, he was treated conservatively with immobilization in a CAM walking boot. After 6 weeks of immobilization, clinical exam revealed pain out of proportion to length of time immobilized and new radiographs revealed continued fracture line with minimal osseous bridging (Figure 2, A-C). Positively, there was no increase in displacement as compared to original presentation. At that time, his Vitamin D levels were obtained for further evaluation. His Vitamin D level was 23ng/mL. We diagnosed him with Vitamin D insufficiency and he was placed on Vitamin D3 6,000IU's per day. Over the proceeding months radiographs were obtained evaluating his progress on a monthly basis. At approximately 2 months after starting Vitamin D supplementation his radiographs began to show partial osseous bridging and his clinical symptoms were improving dramatically. At 4 months, WS presented completely symptom free with complete consolidation of his fibular fracture (Figure 3 A-C). He has since returned to regular shoe gear and is able to return to all normal activities without restrictions. He continues to have minimal discomfort and is very happy with his final results.

Figure 1.



Figure 2.

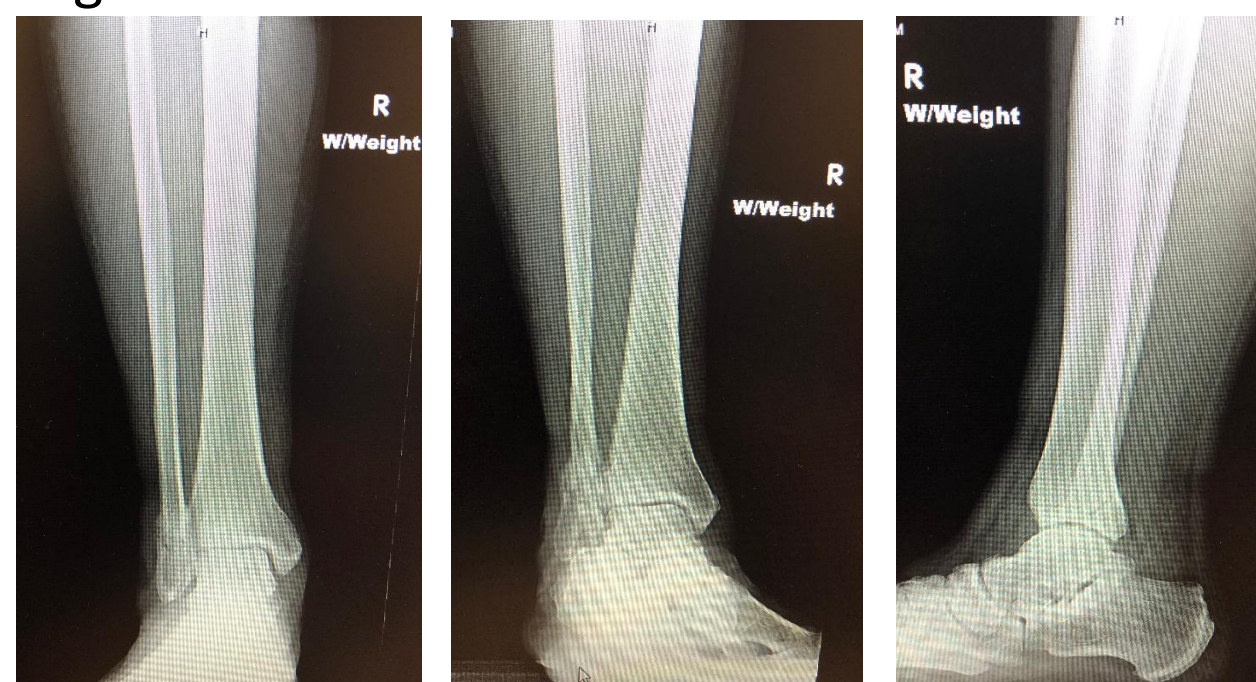


Figure 3.



Case 2

KS is a 66 year old female with benign past medical history who presented to our clinic approximately 1.5 years after undergoing a Lapiplasty type, Lapidus bunionectomy per outside physician. Upon initial presentation, clinically, she had warmth and edema to the local surgical sight with excessive pain. Radiographs revealed a non-union at the level of the 1st tarsometatarsal joint on multiple views (Figure 5, A-B). Her initial work up included inflammatory lab markers along with Vitamin D assessment. Fortunately, her lab inflammatory markers were not consistent with any type of chronic/acute infection. Unfortunately, her Vitamin D levels were significantly low as her initial Vitamin D levels were 21ng/mL. Immediately she was supplemented with 6,000IU's per day of Vitamin D3. Over the next three months she was seen and evaluated once a month. Upon each visit her clinical symptoms were improving. After three months of Vitamin D supplementation, her radiographs revealed complete osseous consolidation of her fusion site (Figure 6, A-B). She was able to return to work as a physical therapist at that point with no restrictions or restriction in shoe gear. She continues to do well today, as she only gives positive reviews when seen on the floors in the hospital.

Figure 5.



Figure 6.



Results/Discussion

Both patients were able to heal their surgical non-unions with Vitamin D supplementation to a minimum blood level of 50ng/mL. Though this remains a controversial topic within the literature, numerous studies have shown the effects Vitamin D levels play on healing surgical sights whether it be elective or traumatic.

Smith et al. revealed a 47% occurrence rate of hypovitaminosis D in patients with low energy fractures of the foot and ankle. They also related that predictors for low Vitamin D included patients who smoked, obese patients, and patients with endocrine disorders.⁶

Catanzariti et al. focused their evaluation on risk of non-union in association with hindfoot arthrodesis procedures. They showed that patients with hypovitaminosis D were 8.1 times more likely in developing a non-union than those with normal Vitamin D levels.⁴

However, what is interesting within the literature, is that not only are you at higher risk for having a fracture injury and developing a non-union with hypovitaminosis D, patients suffer long term effects from these poor outcomes. Warner et al. showed that at a minimum of 1 year follow up, patients who suffered a ankle fracture with hypovitaminosis D had significantly poorer FAOS scores compared to their counterparts in regards to symptoms and quality of life.³

Our study shows that Vitamin D supplementation to a baseline of 50ng/mL can be an effective means for treating non-unions for both traumatic and elective cases. It is our belief, Vitamin D levels should be obtained prior to surgical intervention on patients and supplementation should be performed as needed to normal values during the healing process.

References

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