Vitamin D Levels and Patients with Metatarsal Fractures

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Introduction/Purpose: Deficiency of vitamin D has been associated with a range of diseases, with hypovitaminosis D affect approximately 1 billion people worldwide. Among orthopaedic patients, insufficiency has been reported between 43% and 78%. Currently, the orthopaedic literature has conflicting evidence to associate vitamin D deficiency with acute fractures, stress fractures and nonunions. Furthermore, there is limited literature on vitamin D and its effects in foot and ankle patients. The purpose of this study is to determine the prevalence of vitamin D insufficiency in patients who have sustained low energy metatarsal fractures compared to non-osseous foot and ankle sprains.

Methods: Data collection occurred from May 2012 to August 2014. Patients with low-energy closed metatarsal fractures or non-osseous ankle sprains, between 18 and 85 years old, were enrolled. Patient demographics for fracture and sprain groups were collected through chart review and included age (subdivided into categories: 18-54, 55-65, and >65), gender, race, BMI, mechanism of injury, smoking status, history of fractures, osteoporosis or osteopenia and a previous diagnosis of vitamin D deficiency were also noted. Sufficient, insufficient and deficient levels of vitamin D were defined as ≥ 30ng/ml, 20-30ng/ml, and < 20ng/ml, respectively. Categorical data was summarized using counts and percents then analyzed using Fisher’s Exact test. Serum vitamin D levels were reported in categories and as continuous data (mean ± standard deviation). ANOVA was used to assess between-group differences in vitamin D levels. Subgroup analysis was done to determine patient characteristics associated with differing vitamin D levels.
Results: Of 71 fracture and 28 sprain patients, mean age was 51 and 41 years, respectively. Mean vitamin D level in the fracture group was 26.9±13.0ng/ml and in the sprain group was 27.1±12.8 (p=0.93). Between groups, the omnibus p-value for sufficient, insufficiency and deficiency was 0.81. Predictors of fracture risk were older age (p=0.001), white/non-Hispanic race (p=0.003), female gender (p=0.03), wintertime injury (p=0.02) and smoking (p=0.01). Variation in vitamin D levels, however, did not correlate to these differences. Subgroup analysis showed significantly higher vitamin D levels with calcium and/or vitamin D (p=0.001) supplementation, age >65 years old (p=0.01), non-Hispanic/white race (p=0.05) and a BMI < 30 (p=0.01). None of these characteristics independently predicted fracture risk, though the correlation with age may be explained by increased supplement use.

Conclusion: There was no difference in the mean vitamin D level or incidence of vitamin D insufficiency between patients with metatarsal fractures versus sprains. No causal relationship was established between serum vitamin D levels and fractures. There was, however, an association found between higher vitamin D levels and vitamin D supplementation, white race and lower BMI. This is one of the first studies in the foot and ankle literature to find no association between vitamin D levels and risk fractures, demonstrating need for further study of the relationship between vitamin D deficiency and different types of fractures.