

Vitamin D Deficiency is Associated with Increased Need for Operative Treatment of Forearm Fractures in Children

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INTRODUCTION:

The association between vitamin D status and fracture risk and severity in children remains ambiguous. Forearm fractures are the most common fractures seen in children. We hypothesized that vitamin D insufficient/deficient children would have a greater likelihood of having more severe forearm fractures requiring operative management.

METHODS:

We prospectively enrolled 100 children aged 3 -17 years with low-impact radius or ulna fractures presenting at one clinic treated by one surgeon. Each participant filled out a questionnaire focusing on risk factors for vitamin D deficiency. Fractures were categorized as requiring nonoperative or operative management. All fractures were treated by one pediatric orthopaedic surgeon using a strict criteria for operative intervention. All closed fractures were treated initially by immobilization alone or closed manipulation and casting. Operative intervention was exclusively used in patients with open fractures and in patients with closed fracture that acceptable alignment was not either achieved by closed manipulation or could not be maintained due to loss of reduction in follow-up visits. Vitamin D status was recorded based on measurement of 25-hydroxyvitamin D (25-OHD) concentration obtained during the clinic visit. Vitamin D status was compared between the children presenting with fractures requiring nonoperative and operative treatments.

RESULTS:

The mean age of the cohort was 9.8 + 3.2 years (3 to 15 years); 65% were male. Mean 25OHD was 27.5 + 8.3 ng/ml. 21% of patients were vitamin D deficient (using American Academy of Pediatrics criteria of 25OHD < 20 ng/ml) and 49% had vitamin D insufficiency (using the Endocrine Society criteria on 20 ng/ml < 25OHD < 30 ng/ml). Mean 25-OHD was 23.3 + 8.8 ng/ml in the operative group (n=12) and 28.1 + 8.1 in the nonoperative group (n = 88) (P = 0.057). Fifty percent of the operative group were vitamin D deficient compared to 17% of the nonoperative group (P = 0.017). The relative risk of surgery with 25OHD < 20 was 3.7. 25OHD level negatively correlated with BMI (r = -0.21, P = 0.44). 25OHD level was significantly lower in nonwhites 26.0 + 7.2 compared to whites 32.5 + 9.9 ng/ml (P = 0.0008). Patients requiring surgical management were significantly older, and had greater BMI. Nine of the 12 patients needing surgical management were either overweight or obese after adjusting BMI for growth curves.

DISCUSSION AND CONCLUSION:

This is the first prospective study to report that vitamin D deficiency may be a contributing risk factor for severe forearm fractures requiring operative management in children. After a low energy trauma causing a forearm fracture, a vitamin D deficient child is 3.7 times more likely to need surgical treatment compared to a child with normal vitamin D level.