

Missouri Kidney Program

Project Title: Vitamin D Deficiency in Patients on Hemodialysis

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Multiple studies have revealed a high prevalence for hypovitaminosis D in elderly patients, as well as in the hospitalized patients. More recent evidence indicates that there appears to be a relationship between hypovitaminosis D, physical performance and disability and falls in elderly patients. However, kidney disease has also been identified as a risk factor for vitamin D deficiency in hospitalized patients, and therefore, has the potential to also exist in patients maintained on outpatient dialysis. A pilot cross-sectional study of vitamin D status in the patients in our hemodialysis unit revealed that only 21% of the patients had values in the normal range; therefore, 80% of the patients on hemodialysis could be considered vitamin D deficient. Since vitamin D deficiency of this magnitude could represent a marker for chronic debilitating illness, decreased exposure to sunlight and poor dietary intake, it could also be a marker for increased frailty in this patient group, which has high morbidity. The observation that vitamin D deficiency of this magnitude is associated with muscle weakness and increased likelihood of falls, led us to the hypothesis that if such deficiency can be corrected, improvements in muscle strength would lead not only to increased well-being in the patients, but could also improve frailty and decrease falls, which have been associated with high morbidity and mortality. The goal of the proposed studies was to identify the incidence of vitamin D deficiency in patients on hemodialysis, correct the deficiency when present, and evaluate the physical and biochemical consequences of correction of this deficiency.

Study participants were recruited from our dialysis population at Saint Louis University. 25-hydroxyvitamin D levels were measured with a radio-immunoassay kit (Diasorin) that measures 25-hydroxyvitamin D₂ and 25-hydroxyvitamin D₃. We used the Short Form 36 Health Survey Questionnaire (SF-36) instrument to assess their well being, and quantitated measurements of muscle strength using dynamometry. When baseline information was obtained, we undertook correction of the vitamin D deficiency by the administration of ergocalciferol 50,000 units administered once weekly, designed to return levels of 25-hydroxyvitamin D into the normal range. Three months after initiating therapy, the serum biochemical parameters were remeasured, the SF-36 questionnaire was readministered, and quantitative measurement of muscle strength was re-evaluated. In order to assess whether longer therapy with vitamin would offer additional benefit in those patients who remained vitamin D deficient after three months of therapy, vitamin D supplementation was continued for an additional three months and at that time, the biochemical parameters and functional testing were repeated.

51 patients agreed to participate in the study, blood samples were obtained from the patients prior to the first hemodialysis session of the week for baseline determination of 25-hydroxyvitamin D levels and routine biochemistries. 4 patients were not enrolled because they did not meet the criteria for vitamin D deficiency. Thus, 90% of the patients were vitamin D deficient. A total of 28 patients completed the study. We found that vitamin D deficiency was corrected

in 86% of the patients after three months of therapy. The remaining 14% of the patients normalized their vitamin D levels after an additional three month course of therapy. Serum biochemistries including serum calcium, phosphorus, alkaline phosphatase and intact PTH remained unchanged throughout the duration of the study. Similarly, correction of vitamin D deficiency did not affect their well being or muscle strength as determined by the Short Form 36 Health Survey Questionnaire (SF-36) and dynamometry respectively.

In summary, we found that vitamin D deficiency is almost a universal finding in patients on hemodialysis and that ergocalciferol 50,000 units administered once weekly is an effective dose for the correction of vitamin D deficiency in this patient population. Correction of vitamin D deficiency did not result in changes in well being or muscle strength which may be attributed, at least in part, to the short term nature of the study.