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COMMENTARIES

Sato Shines a Light on Sunshine

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Commentary on: Sato Y, Iwamoto J, Kanoko T, Satoh K. Amelioration of osteoporosis and hypovitaminosis D by sunlight exposure in hospitalized, elderly women with Alzheimer's disease: a randomized controlled trial. *J Bone Miner Res*. 2005 Aug;20(8):1327-33.

Sato and colleagues (1) have demonstrated that improving vitamin D status can lower risk of fracture. A modest amount of sun exposure, averaging about 10 minutes per day to the face, arms, and hands, dramatically increased serum 25-hydroxyvitamin D [25(OH)D] levels. Results showed, at the end of one year, the mean serum 25(OH)D concentration was 52.2 ng/ml in the sun exposed group and 10 ng/ml in the control group. This rise in serum 25(OH)D also induced several changes along the metabolic bone pathway, including an increase in serum calcium, and a decrease in each of the following: serum parathyroid hormone, biochemical markers of bone turnover, and rates of metacarpal bone loss. Sun exposure also improved lower extremity muscle performance and lowered risk of falling (Fig. 1). These actions most likely resulted from the activation of vitamin D receptors in muscle tissue, along with the promotion of the size and number of the type 2 muscle fibers (2). The combination of the reduction in bone loss and fewer falls then led to significantly fewer fractures, in the sun-exposed group.

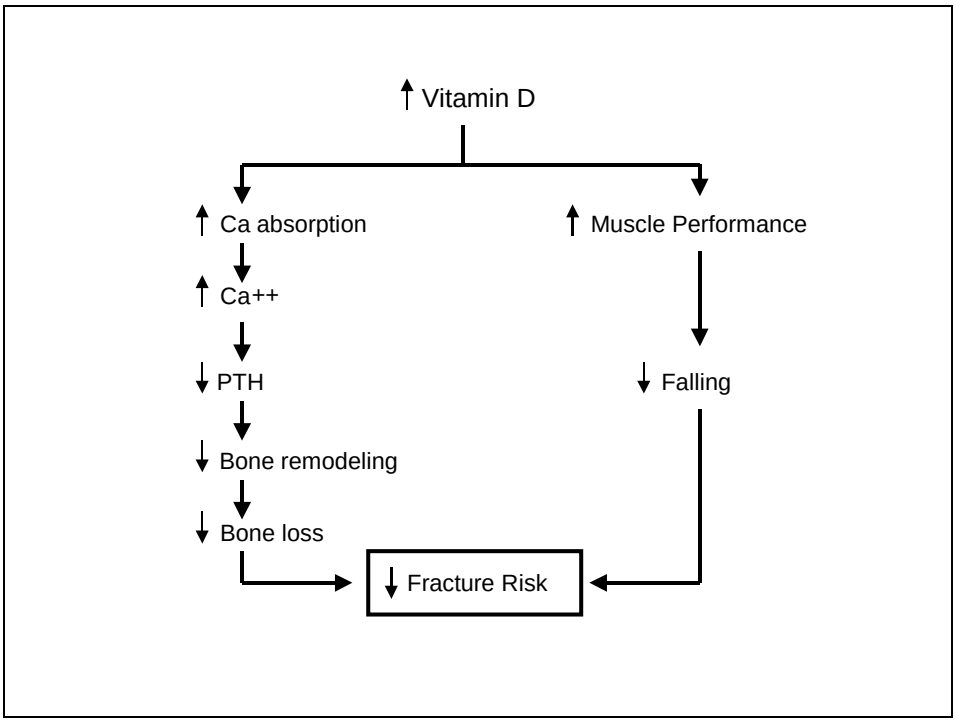

Figure 1. Vitamin D and Fracture Risk

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In the trial conducted, both the control and sun exposure groups were given 1,200 mg/d of calcium. Thus, the biochemical and clinical improvements in the sun exposed group can clearly be attributed to improved vitamin D status. While calcium is no antidote to vitamin D deficiency, the benefit from sun exposure in this study was realized in the calcium replete subjects. Therefore, one cannot conclude that the benefit observed with the increased serum 25(OH)D levels would have been the same in calcium deficient subjects.

The population studied by Sato and colleagues was at very high risk for vitamin D deficiency as determined by its combination of low dietary intake of the vitamin (<100 IU per day), and the minimal amount of time it habitually spent out of doors. Most of these patients were undoubtedly osteomalacic; as such, it would have been interesting to know their serum alkaline phosphatase levels.

Vitamin D supplementation has been evaluated in a series of different studies of older men and women (3-7). In one or more of these studies, supplementation with 700 to 800 IU per day of vitamin D_3, with and without added calcium, has raised serum 25(OH)D, and has lowered PTH, biochemical markers of bone turnover, and rates of bone loss (3;4). Vitamin D also improved muscle performance in the lower extremities (5), reduced risk of falling (6), and lowered risk of fracture (7). The study by Sato, however, is the only vitamin D intervention trial to document significant changes in *each* of the measures shown in Figure 1. This is likely because the Alzheimer's patients studied had a more profound degree of deficiency at the beginning of the trial than subjects in the other studies. It is generally accepted that the benefit of a given nutritional replacement is directly proportional to the degree of deficiency characteristic of the recipient.

This study underscores the point that a small amount of sun exposure on a regular basis will raise and maintain the serum 25(OH)D at the appropriate level. This is true in elderly subjects, despite the fact that they have a reduced capacity of vitamin D production in skin (8). The Sato study took place at 32 degrees latitude (similar to that of Sydney, Cape Town, Buenos Aires, Cairo, San Diego, and Jacksonville). From the previous work of Webb, it is known that sun exposure promotes vitamin D production year round, at this latitude (9). At higher latitudes, however, vitamin D synthesis in skin becomes more restricted during the wintertime. For example, at latitude of 42 degrees (Boston, Chicago, Rome, Beijing), little to no production takes place between mid-October and mid-March (9). At still higher latitude of 52 degrees (Edmonton, Liverpool, Moscow, Punta Arenas), vitamin D production takes place only for 4 or 5 months of the year (9). Thus, being out of doors for 10 minutes per day year round will not be as effective for those who live at higher latitudes. An alternative to natural sun exposure is the use of sun lamps for several minutes per day. We and others have successfully used this approach in patients who do not have normal vitamin D absorption. Perhaps this should, as previously proposed, be considered as an alternative to natural sun exposure for residents of nursing homes and other institutionalized individuals. Sato has reminded us of the consequences of ignored vitamin D deficiency and has also demonstrated an effective, low-cost and safe approach to correcting it.

Conflict of Interest: The author reports that no conflict of interest exists.

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