Editorial

Balancing Vitamin D

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A young female patient in her early 30s with a history of multiple atypical nevi presented to my office a few months ago for her annual skin examination. I encouraged her to practice sun protection, but she told me that her vitamin D level was low and her gynecologist recommended increased sun exposure. I had to wonder why her gynecologist was checking her vitamin D level and why he/she would recommend sun exposure over supplementation.

Over the next few months, I investigated how physicians in other fields address vitamin D. The spectrum was wide with some physicians not discussing the issue with patients and others routinely checking levels and making various recommendations in the event of insufficiency including, in some cases, increased sun exposure. Five to 15 minutes of exposure to midday sun on the arms, face, and hands several times per week was proposed by some physicians, but others failed to qualify their suggestion of sun exposure.

Vitamin D deficiency and insufficiency have been reported in patients with erythropoietic protoporphyria, cutaneous lupus erythematosus, vitiligo, and melanoma.[1-4] It has not been established if the deficiency increased the risk for the disease or if the deficiency was somehow a result of the disease. All of these diseases require sun protection, which would likely result in decreased vitamin D levels in the absence of increased dietary intake or supplementation. Dermatologists need to identify patients at risk for deficiency and provide guidance on how to effectively achieve and maintain vitamin D status without compromising commitment to sun protection.

Vitamin D is a fat-soluble vitamin obtained from food, supplements, and UVB radiation–induced conversion in the skin. There are few foods in nature (mostly saltwater fish) that contain vitamin D. Fortified milk, orange juice, and cereals are the main sources of vitamin D in the American diet. The Institute of Medicine minimum intake recommendations of vitamin D are 200 IU daily from birth to 50 years of age, 400 IU daily from 51 to 70 years of age, and 600 IU daily over the age of 71 years.[5] However, the American Academy of Pediatrics issued an updated guideline in 2008 that recommended 400 IU of vitamin D supplementation daily for all infants, children, and adolescents beginning the first few days of life for those without adequate dietary intake.[6] The American Academy of Pediatrics continues to advise avoidance of direct sunlight for infants.

Currently, there is no method to quantify stored vitamin D, but the circulating 25-hydroxyvitamin D (25[OH]D) level is the best available indicator of vitamin D status. The vitamin D level depends on multiple factors, including skin color, UV exposure, dietary and supplement intake, absorption, and metabolism. Although there is no established standard, vitamin D deficiency and insufficiency have been defined as less than 25 nmol/L (10 ng/mL) and 50 nmol/L (20 ng/mL), respectively.[7] Although further research is needed to determine the appropriate serum concentration for overall good health, many nutritional experts recommend levels of at least 75 nmol/L (30 ng/mL). There is an inevitable seasonal cycle of circulating levels in the middle to high latitudes with a level of 80 nmol/L (32 ng/mL) required by the end of summer to maintain a sufficient level throughout the year.[7]

Individuals at greatest risk for vitamin D deficiency are breastfed infants; those with darker skin types; elderly patients who cannot synthesize vitamin D in the skin as effectively and are less able to hydroxylate the active form in the kidney; those with photosensitive disorders or aggressive sun protection; those living above 35° latitude; those with fat malabsorption, which decreases vitamin D absorption; and obese patients who sequester the vitamin in the larger pools of body fat.

It is well-established that adequate levels of vitamin D are necessary to prevent rickets and osteomalacia. Prevention of osteoporosis with reduced fractures has been associated with higher vitamin D levels; however, most studies also include calcium, making it difficult to isolate the effect of vitamin D alone.[8,9] Numerous studies correlate the level of

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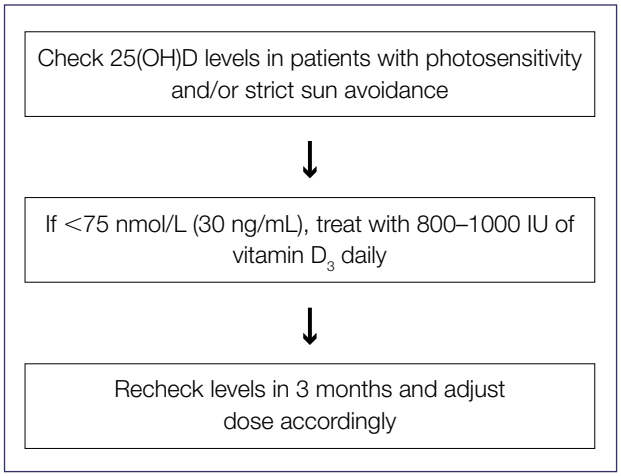

Suggested monitoring and treatment of vitamin D levels. Due to variable factors including unintentional sun exposure, absorption, skin color, metabolism, and dietary intake, the recommended dose must be determined on an individual basis. 25(OH)D indicates 25-hydroxyvitamin D.

25(OH)D with health benefits beyond skeletal health, mostly at levels much higher than the recommended adequate intake levels. It has been suggested that high-dose supplementation may have a protective effect against colon, breast, and prostate cancer. Other studies have reported an association between low vitamin D levels and inflammatory bowel disease, multiple sclerosis, systemic lupus erythematosus, type 1 diabetes mellitus, and rheumatoid arthritis.[8] However, the association with cancer and autoimmune diseases is based on epidemiologic data that identify an association but not causality. If increased vitamin D levels are associated with visceral cancer prevention, then it would be assumed that the current increase in skin cancer would be associated with increased sun exposure and resultant increased vitamin D levels, which therefore should result in a lower rate of internal cancer. However, in reality, the incidence of internal cancers also has increased. Other confounding factors, including genetics, diet, socioeconomic status, and environmental factors, play major roles that may mask the effect of vitamin D in these studies. Additional studies with similar limitations have suggested prevention of cardiovascular disease, cognitive decline and Parkinson disease in elderly patients, and enhanced immunity with supplementation.[10-12]

Although the precise role and optimal levels of vitamin D have not been fully elucidated, meta-analysis of randomized controlled trials shows an association between intake of vitamin D supplements and decrease in all-cause mortality rate.[13,14] In addition, increased 25(OH)D levels have been associated with lower melanoma stage and improved prognosis.[4] Thus attention to the vitamin D status of patients is prudent.

Physicians recommending UV radiation to support vitamin D levels argue that vitamin D toxicity cannot occur from UV exposure that maxes out before sunburn levels and is nearly impossible from the limited dietary sources but can occur from overly aggressive supplementation. Symptoms of toxicity include nausea, vomiting, poor appetite, constipation, weakness, weight loss, confusion, arrhythmia, and ectopic calcification. The Office of Dietary Supplements suggests an upper intake level of 2000 IU of vitamin D daily for patients aged 1 year and older to prevent toxicity.[15]

The tanning bed industry has touted the benefit of increased levels of vitamin D and has promoted use of tanning beds for this purpose. However, the UVB wavelengths of UV radiation that convert vitamin D in the skin are miniscule components of the radiation emitted by tanning beds.[16] The target audience of this promotion is young white women who are unlikely to tan for this purpose and are not at high risk for deficiency.

Sunscreen use has been blamed for vitamin D deficiency but, in reality, most individuals do not apply enough, cover all exposed skin, or reapply as needed. Also, sunscreen is primarily used during intentional sun exposure rather than the casual incidental exposure that is sufficient in many individuals to produce the maximum available vitamin D from the skin.

"And before you let the sun in, mind he wipes his shoes."[17] The UV action spectra for vitamin D synthesis and DNA damage associated with skin cancer are virtually identical and cannot be separated. Higher doses of radiation cause more damage but not more vitamin D.

Cutaneous synthesis is altered by season, latitude, time of day, cloud cover, smog, melanin content of the skin, and sunscreen use. Therefore, it is difficult, if not impossible, to titrate one's exposure for adequate vitamin D intake. It is very difficult for patients residing in the northern latitudes to get enough sun to generate vitamin D in the winter, so these patients will need to take a supplement (at least during the winter). It makes sense to continue the widely available, inexpensive, and noncarcinogenic supplementation throughout the year and avoid unnecessary sun exposure when it is available. In addition, vitamin D supplementation can be combined with calcium or other vitamins that are not available from the sun.

Dermatologists have increased responsibility for the potential long-term consequences of our recommendations. Although we cannot recommend unprotected exposure to UV radiation to increase vitamin D levels, we should screen for and treat vitamin D deficiency, particularly in patients with skin disorders resulting in the recommendation of strict sun avoidance, such as erythropoietic protoporphyria, cutaneous lupus erythematosus, xeroderma pigmentosum, and melanoma (Figure). We should be prepared to provide information on obtaining dietary or supplementary sources of vitamin D.

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