Vitamin D 25 Hydroxy

Background Information

Although vitamin D was originally described as a vitamin, it is now recognized as a prohormone that is biologically inactive until metabolized into a secosteroid, similar to the classic steroid hormones. Vitamin D in the circulation is derived from the conversion of 7-dehydrocholestrol in the skin via exposure to ultraviolet rays. It is then metabolized by hepatic 25-hydroxylase into biologically inactive 25 hydroxy vitamin D [25(OH)D; calcidiol] which by renal 1α-hydroxylase is converted into 1-25dihydroxyvitamin D [1-25(OH)2 D; calcitriol] the active vitamin D metabolite. Renal production of 1-25(OH)2 D is tightly controlled by the parathyroid hormone and is important in the regulation of serum calcium homeostasis.[1] Furthermore, the discovery that most tissues and cells have vitamin D receptor and several possess the enzymatic machinery to convert primary circulating form [25(OH) D] to active form [1-25(OH)2 D] has suggested to its expanded role in decreasing the risk of many chronic diseases including infectious diseases, cancers and autoimmune diseases.[2]

The 25(OH)D, the principle-circulating reservoir in plasma, is the most reliable measure of overall Vitamin D status even though it is biologically inactive. It is useful in ruling out Vitamin D deficiency as a cause of hypocalcemia or osteomalacia, as well as in securing a differential diagnosis of hypercalcemia that could be indicative of excess parathyroid hormone, sarcoidois, some forms of lymphoma or other disorders.

Clinical Indications

Vitamin D is crucial to the bone health and overall well being of humans. Although sunlight exposure to skin may provide adequate levels of vitamin D; hypovitaminosis D is common due to minimal or no sun exposure coupled with low dietary Vitamin D intake. Recently, Vitamin D deficiency or insufficiency is recognized as the common cause of hyperparathyroidism with consequent bone loss and osteoporosis. Lack of 25-hydroxy vitamin D [25(OH)D] results in hypocalcemia, osteomalacia and related disorders. This test is also useful in diagnosing intestinal malabsorption and vitamin D deficiency or intoxication, including differentiating primary hyperparathyroidism for hypercalcemia of cancer, distinguishing between vitamin D-dependent and vitamin D-resistant rickets, monitoring the vitamin D status of patients with chronic renal failure, and monitoring therapeutic response in patients being treated for Vitamin D-related disorders.

Decreased or undetectable 25-hydroxy vitamin D levels indicate a deficiency due to poor diet, decreased exposure to the sun, or malabsorption of vitamin D, or liver and kidney diseases. Increased levels (over 150 ng/mL) may indicate excessive self medication or prolonged therapy. When associated with hypercalcemia there may be hypersensitivity to vitamin D, as in sarcoidosis.

Interpretation

Vitamin D levels are inversely associated with PTH levels and are directly related to intestinal calcium absorption. Therefore, the optimal level of vitamin D is defined as 30 ng/mL, as at this level the PTH begin to level off and intestinal Ca absorption is maximal. Vitamin D levels between 15-29 ng/mL are considered as insufficient and levels < 15 ng/mL are considered as deficient.[2,3] Based on these definitions, optimal levels Vitamin D deficiency or insufficiency is highly prevalent worldwide.

In contrast, Vitamin D intoxication is rare and levels greater than 150 ng/mL can be considered as toxic. Vitamin D toxicity can occur by inadvertent ingestion of very high doses [$>$ 50,000 U] raising serum Vitamin D levels to more than 150 ng/mL. It has been shown that doses up to 10,000 U/day for many months do not cause toxicity.

Limitations of the Assay

Values of 25-hydroxy vitamin D can vary with exposure to sunlight and the season of the year and geographic location. There are also variations depending on race, age and during menstrual cycles, particularly at the time of ovulation. Because of the complex nature of calcium balance, it may also be useful to measure parathyroid hormone in conjunction with vitamin D.

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Test Information

Fasting specimen is preferred. (No eating for four hours before blood test.)

Methodology

Vitamin D 25 Hydroxy is measured using chemiluminescence immunoassay (CLIA). The antibody used in this assay reacts equally and measures both D_2 and D_3.

References

1. Hollis BW. Circulating 25 Hydroxyvitamin D levels Indicative of Vitamin D sufficiency; Implications for establishing a new effective Dietary Intake Recommendation for Vitamin D. *J Nutr*. 2005;135(2):317-22.
2. Holick MF. Vitamin D Deficiency. *N Engl J Med.* 2007;357:266-81.
3. Malabanan A, Veronikis IE, Holick MF. Redefining Vitamin D insufficiency. *Lancet.* 1998;351:805-6.

Test Overview

Test Name	Vitamin D 25 Hydroxy
Methodology	Chemiluminescence Immunoassay (CLIA)
Specimen Requirements	Volume/Size: 1 mL; Type: Serum; Tube/Container: No additive SST (Gold); Transport temperature: Refrigerated.
Minimum Specimen Requirements	Volume/Size: 0.5 mL
Alternate Specimen Requirements	Volume/Size: 1 mL; Type: Plasma; Tube/Container: EDTA (Lavender); Transport Temperature: Refrigerated. Volume/Size: 1 mL; Type: Plasma; Tube/Container: Lithium heparin (Green); Transport Temperature: Refrigerated.
Ordering Mnemonic	VITD
Billing Code	82307
CPT Code	82306

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