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Is vitamin D and L-arginine deficiency associated with male erectile dysfunction?



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Vitamin D deficiency and male erectile dysfunction

Optimal blood concentrations of vitamin D are vital for a healthy sexual life in men [1]. Calcitriol (the active form of vitamin D) induced the production of nitric oxide (NO) in cultured endothelial cells, and NO is a potent vasodilator associated with penile erection [2]. The outcome of a meta-analysis conducted by Crafa et al. [3] suggests that hypovitaminosis D (serum concentrations of 25-hydroxyvitamin D < 20 ng/mL) is associated with male erectile dysfunction (ED). Men with 25-hydroxyvitamin D deficiency had a higher incidence of ED compared to those with serum levels at least 30 ng/mL [4]. Vitamin D deficiency may weaken erectile function by promoting endothelial dysfunction [5]. However, vitamin D supplementation improved erectile function which was complemented by an increase in serum testosterone levels in middle-aged men [6]. An optimal blood concentration of vitamin D may promote arterial blood supply to the cavernous bodies by improving endothelial vasodilation via mediating the bioavailability of NO, which is an effective endothelium vasodilator [7]. The intake of vitamin D supplement was significantly associated with increased chances of survival among patients with cardiovascular diseases and diabetes, most especially in patients who are vitamin D deficient [8]. The increase in the chances of survival among the patients was associated with improvements in endothelial function [8]. Normal levels of vitamin D [serum concentrations of 25-hydroxyvitamin D] range between 30 and 80 ng/mL [9]. Serum concentrations between 21 and 29 ng/mL are considered insufficient [9]. Serum concentrations of 25-hydroxyvitamin D < 20 ng/mL are considered deficient, and it increases the risk of ED; moreover, severe deficiency may be defined as serum concentrations < 10 ng/mL [9]. The incidence of ED declines when serum

concentrations of 25-hydroxyvitamin D are over 35 ng/mL [9]. Low serum concentrations of 25-hydroxyvitamin D are strong diagnostic criteria for ED in men with type 2 diabetes, because vitamin D deficiency affects endothelial function consequently increasing the risk of cardiovascular diseases [10]. A considerable percentage of men with ED had lower serum concentrations of 25-hydroxyvitamin D, and it is more prevalent among patients with arteriogenic etiology, which indicates that hypovitaminosis D may weaken erectile function by increasing endothelial dysfunction [10]. The recommended daily amount of vitamin D is 600 international units (IU) for adults aged 18–70 years and 800 IU for adults older than 70 years [7, 8]. Moreover, to sustain or improve endothelial and erectile function which is maintaining serum levels of 25-hydroxyvitamin D above 30 ng/mL, male adults need to take at least 1500–2000 IU/day of supplemental vitamin D [6–8].

L-arginine deficiency and male erectile dysfunction

NO is a soluble gas that is synthesized from L-arginine in the endothelial cells via the activity of calcium-calmodulin-dependent enzyme NO synthase [11]. Lower levels of plasma L-arginine may increase the risk of ED in men, because of the decrease in the concentration of NO [12]. The use of L-arginine supplements significantly improved the International Index of Erectile Function (IIEF) subdomain scores of sexual intercourse satisfaction, orgasmic function, and erectile function [13]. Erectile function improved in men after oral administration of high dose L-arginine [14, 15]. Moreover, the combination of L-arginine with a phosphodiesterase type 5 inhibitor (e.g., tadalafil) is more effective in improving erectile function in men [14, 15]. Daily intake of L-arginine with tadalafil significantly increased the IIEF 5-item questionnaire scores, and total testosterone levels compared to single dose of each medication in diabetic patients with ED [16]. The normal range of L-arginine plasma levels has been specified as 81.6

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± 7.3 mmol/L in young men and 113.7 ± 19.8 μ mol/L in elderly men [17]. The plasma levels of L-arginine are not substantially decreased in most disease conditions, except end-stage renal failure during hemodialysis treatment. Nevertheless, intravenous or dietary (oral) administration of reasonably high doses of L-arginine has been demonstrated to result in improved NO formation in individual with endothelial dysfunction [17]. Furthermore, L-arginine doses of 3–8 g/day seem to be safe and do not trigger acute pharmacologic reactions in humans [17].

Molinari et al. [18] found that the combination of Coenzyme Q10, L-arginine, and vitamin D3 was able to induce a NO production higher than the effects induced by the single doses in cardiac and endothelial cells. Increase in vasodilation was also confirmed in an in vivo model [18].

Conclusion

Vitamin D and L-arginine deficiency might be associated with male ED separately or equally, especially in individuals with underlying endothelial dysfunction. Moreover, the blood concentrations of vitamin D and L-arginine should be analyzed in men with symptoms of ED. However, further studies are needed to substantiate the role of hypovitaminosis D and L-arginine deficiency in male ED.

Abbreviations

ED: Erectile dysfunction; IIEF: International Index of Erectile Function; IU: International units; NO: Nitric oxide

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CEO did the literature search, wrote the manuscript, drafted the manuscript, and revised the manuscript critically. The author read and approved the final manuscript.

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Competing interests

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