



The Role of Vitamin D for Periodontal Diseases and Osteoporosis

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Opinion, advocating important role of vitamin D and its deficiency in significant number of individuals, prevails within the society, mass of information is available regarding its use, doses, sources, etc. One billion people on the planet were diagnosed with vitamin D deficiency during the last decade [1]. There are four forms of vitamin D (calciferol) - lamisterol (vitamin D₁), ergocalciferol (vitamin D₂), cholecalciferol (vitamin D₃) and dihydrotachysterol (vitamin D₄), two of which being the most important - D₂ and D₃. There are many reasons of vitamin D deficiency, which is finally diagnosed if serum level of 25OHD₃ is less than 20 ng/mL [2,3]. This determines pathogenesis of many diseases, including ones of periodontal, resulting in loss of masticatory function.

Periodontium consist of four structures: gingiva, periodontal ligament, cementum and alveolar bone. This is functional unit, maintaining homeostasis - the connection between tooth and gingiva makes up a unified whole, preventing penetration of pathogenic microorganisms or chemical substances, capable to induce inflammation of periodontal tissue (PTs). PTs keep tooth inside the alveolar socket, distribute mechanical load of mastication, and have their own blood supply, neural regulation and defensive mechanisms. Formation of bacterial biofilm and its adhesion to tooth surface induces diseases and response of PTs. Soft and mineralized tooth plaque is initiative risk factor of these diseases, but in general, diseases are caused by many predisposing factors. Periodontal diseases initially manifest as gingivitis, inflammation of the gingiva, which, if untreated, spreads deeper within periodontal tissue: causing destruction of periodontal ligament, formation of pathological periodontal pocket and resorption of the alveolar bone, causing tooth loss over time [4].

For some time already, clinical studies strive to link vitamin D with periodontal diseases and prove its therapeutic and preventive role in Periodontology. Vitamin D is secosteroidal hormone, playing important role in the treatment of periodontal diseases because of its anti-inflammatory and antibacterial effect on PTs as well as its immunomodulatory, differentiating, anti-proliferative and regulative effect on autoimmune processes and cellular apoptosis and participation in bone metabolism [2,5,6,7,8]. One of the main functions of vitamin D is maintaining the proper blood levels of calcium and phosphorus by regulating absorption of these substances inside the bowels and reabsorption in kidneys and by enhancing processes of resorption and regeneration, which are generally called remodeling [9]. Bony tissue is like a living and continuously changing organ and due to this process, the old bony tissue is not accumulating and bone adaptation to changing mechanical forces develops. Disintegration and renewal processes of bony tissue depend on metabolism, as constant interchange of mineral substances between bone and blood plasma, where an

active form of vitamin D is circulating, takes place [10]. Besides, bone performs supportive function (e.g. keeps teeth in alveolar sockets), skeletal bones protect internal organs, acts as depot of mineral substances (especially calcium), which is necessary for normal muscle function [11]. Osteoporotic changes of skeletal bones occur because of impaired mineralization of the bones due to long term decreased uptake of vitamin D and calcium, increasing risk of bone fractures, what concerns jaws - accelerated resorption of bone tissue causes adentia [12].

Osteoporosis (OP) is common metabolic disease, characterized by loss of bone's organic and non-organic structure. Gender, age, early menopause, petty physique, race and heredity are uncontrollable risk factors, whereas calcium and vitamin D levels are controllable ones. OP and periodontal diseases are closely related, having many common risk factors. In OP, bone mineral density (BMD) loss takes place in whole skeleton, including jaws. From dental point of view, the whole chain of processes starts developing with this disease: radiographic picture of jaw bone is changing, the height of alveolar process diminishes due to resorption, loss of bone tissue of alveolar process influences prosthetics and denture retention, tooth mobility increases, individuals lose teeth faster, reduced number of teeth changes functional load on jaws, leading to reduced BMD, mastication load is distributed unevenly - remaining teeth carry an extra load, changes take place in periodontal ligament, gingival soft tissue support is lost, lower facial third reduces in height, thus causing esthetic problems, also lacunar resorption takes place in cortical bone of mandibular base, changing its dimensions and reducing success rate of implantation procedures [13,14,15]. But tendency of developing moderate-severe chronic periodontitis and the extent of bone resorption (height of alveolar ridge) might be reduced up to 46% with of 800 IU vitamin D supplements per day [16]. It is worth noting that BMD in healthy individuals is not associated with chronic periodontitis and 25-hydroxyvitamin blood levels, it is more common for young and middle-aged individuals [17]. Individuals with low systemic BMD exhibited increased systemic cytokine levels, enhancing bone resorption throughout the body. Jaws are part of bony skeletal system, with the same processes taking place there. Bacterial infection of PTs also enhances local increase of cytokine levels, osteoclast activity and resorption. Hence, systemic factors act together with local ones in PTs [18].

Chronic periodontitis is one of the causes, responsible for tooth loss. Periodontal ligament degrades, periodontal pocket forms and deepens and tooth becomes mobile as disease progresses and inflammation spreads deeper. Several factors, including poor life quality and low socioeconomic status and various systemic diseases may play role in etiopathogenesis of periodontitis, influencing the number of teeth inside the oral cavity [19,20]. Tooth loss may be reduced by optimal serum

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25(OH)D level, which is inversely proportional to risk of tooth loss: increase of 25(OH)D level by 10 µg/L reduces tooth loss risk from 13% to 23% [21,22].

In conclusion it should be noted, that vitamin D is very unique substance due to its abilities, functions and participation in various processes. Its optimal serum levels could prevent occurrence of numerous diseases, including such common diseases throughout the world as chronic periodontal diseases and osteoporosis, which are social problems, compromising individual's quality of life.

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