



Role of Vitamin D3 in Chronic Cases of Plantar Fasciitis

Maulik Langaliya*¹ and Dr Jaykumar Vadodariya²

¹Department of Orthopedic, Holy Spirit Hospital, Indiaa

²Casualty Medical Officer, The BD Petit Parsee General Hospital, Cumballa Hills - Mumbai

***Corresponding Author:** Maulik Langaliya, Department of Orthopedic, Holy Spirit Hospital, India.

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Langaliya and Dr Jaykumar Vadodariya.

Abstract

This study presents a comprehensive review of the existing literature regarding the role of vitamin D3 in chronic plantar fasciitis. The pleiotropic effects of vitamin D3 in modulating inflammation, promoting tissue repair, and maintaining the structural integrity of connective tissues are highlighted. Evidence suggests that vitamin D3 plays a crucial role in inhibiting proinflammatory cytokines and upregulating anti-inflammatory mediators, which may be particularly beneficial in the context of chronic plantar fasciitis. Additionally, vitamin D3 has been found to enhance the expression of genes involved in extracellular matrix remodeling and collagen synthesis, essential for the repair and regeneration of the plantar fascia. Intervention studies have demonstrated that individuals with chronic plantar fasciitis often exhibit lower serum vitamin D levels compared to healthy controls, and supplementation with vitamin D3 can lead to significant improvements in pain, physical function, and quality of life. The findings also suggest a potential association between vitamin D3 status and the development of chronic plantar fasciitis. However, it is important to acknowledge the limitations of the existing literature, as many of the studies to date have been observational in nature, and the causal relationship between vitamin D3 status and the development or progression of plantar fasciitis remains to be fully elucidated.

Keywords: Vitamin D3; Chronic Cases; Plantar Fasciitis

Introduction

Chronic plantar fasciitis is a persistent and often debilitating foot condition that can significantly impact an individual's quality of life and mobility. While the exact etiology of chronic plantar fasciitis remains obscure, recent studies have shed light on the potential role of vitamin D3 in its pathogenesis and treatment [4].

Vitamin D, a fat-soluble steroid hormone, has been shown to play a crucial role in regulating inflammation, promoting tissue repair, and maintaining the structural integrity of connective tissues, including the plantar fascia [2,5-7,13]. This paper aims to explore the current evidence on the relationship between vitamin D3 and chronic plantar fasciitis, and to discuss the potential therapeutic implications of this connection.

Vitamin D3, also known as cholecalciferol, is primarily obtained through the skin's exposure to ultraviolet B (UVB) radiation from sunlight, which triggers the conversion of 7-dehydrocholesterol, a cholesterol precursor found in the skin, into the active form of vitamin D3 [6,7,9]. Additionally, vitamin D3 can be obtained through dietary sources, such as fatty fish, egg yolks, and fortified dairy products, though the amount of vitamin D3 derived from these sources is generally limited.

The pleiotropic effects of vitamin D3 extend beyond its well-known role in regulating calcium and phosphorus homeostasis and maintaining bone health. Emerging evidence suggests that vitamin D3 plays a crucial role in modulating inflammation, promoting tissue repair, and maintaining the structural integrity

of connective tissues, all of which are relevant to the pathogenesis and progression of chronic plantar fasciitis [1,6,7,13,15].

Vitamin D3 has been shown to inhibit the production of proinflammatory cytokines, such as interleukin-6 and tumor necrosis factor-alpha, and to upregulate the expression of anti-inflammatory mediators, such as interleukin-10 [10]. These anti-inflammatory properties may be particularly beneficial in the context of chronic plantar fasciitis, where persistent inflammation is a key driver of the disease process.

Recent reports have also supported a role for the active metabolite of vitamin D3, 1,25-dihydroxyvitamin D3 (1,25D), in mediating normal function of the innate and adaptive immune systems [18,19]. This suggests that the ability of vitamin D3 to influence normal human immunity is highly dependent on the vitamin D status of individuals and may lead to aberrant immune responses or autoimmunity in those who are deficient in vitamin D3 [17,18].

Furthermore, vitamin D3 and its metabolites have been shown to participate actively in the regulation of innate and adaptive immune responses, and its deficiency is associated with a series of infections as well as autoimmune and allergic conditions. These data indicate that the vitamin D receptor (VDR)-metabolite system plays a central role in cellular and tissue defense through immune mechanisms and/or regulation of inflammatory processes.

Vitamin D3 has been found to enhance the expression of genes involved in extracellular matrix remodeling and collagen synthesis, which are essential for the repair and regeneration of the plantar fascia [8]. This suggests that adequate vitamin D3 levels may be necessary for the effective healing and recovery of the plantar fascia in individuals with chronic plantar fasciitis.

Recent studies have highlighted the potential therapeutic applications of vitamin D3 in diseases associated with auto aggressive immune responses and inflammation [17]. This paper aims to review the current understanding of the anti-inflammatory properties of vitamin D3 and its potential mechanisms of action in chronic cases of plantar fasciitis.

Materials and Method

To investigate the role of vitamin D3 in chronic plantar fasciitis, a comprehensive review of the existing literature was conducted.

Relevant studies were identified through searches of PubMed, Embase, and Cochrane databases using the keywords “vitamin D,” “cholecalciferol,” “plantar fasciitis,” and “connective tissue.” The search was limited to articles published in English and focused on studies that explored the relationship between vitamin D3 and chronic plantar fasciitis, including both observational and interventional studies.

Discussion and Conclusion

Several intervention studies have investigated the potential therapeutic benefits of vitamin D supplementation in patients with chronic plantar fasciitis. These studies have demonstrated that individuals with chronic plantar fasciitis often exhibit lower serum vitamin D levels compared to healthy controls, and that supplementation with vitamin D3 can lead to significant improvements in pain, physical function, and quality of life [13,15,16].

The available evidence suggests that vitamin D3 may play a crucial role in the pathogenesis and management of chronic plantar fasciitis. Several cross-sectional studies have reported a higher prevalence of vitamin D deficiency among individuals with chronic plantar fasciitis compared to healthy controls [12,13,15].

For example, a study by Celik, *et al.* found that 68% of patients with chronic plantar fasciitis had vitamin D insufficiency or deficiency, while only 27% of the control group exhibited suboptimal vitamin D status.

These findings highlight the potential association between vitamin D3 status and the development of this debilitating condition. Furthermore, a systematic review and meta-analysis by Genc, *et al.* pooled data from multiple studies and concluded that patients with plantar fasciitis had significantly lower serum 25-hydroxyvitamin D levels compare to healthy controls [14].

Interventional studies have also provided insights into the potential therapeutic benefits of vitamin D supplementation in chronic plantar fasciitis. A randomized, double-blind, placebo-controlled trial by Jansen, *et al.* demonstrated that supplementation with 50,000 IU of vitamin D3 per week for 8 weeks led to significant improvements in pain, function, and quality of life in patients with chronic plantar fasciitis, compared to the placebo group [16]. Similarly, a study by Genc, *et al.* reported that vitamin

D supplementation, combined with exercise therapy, resulted in greater reductions in pain and improvements in physical function compared to exercise therapy alone in individuals with chronic plantar fasciitis [3,12]. These findings suggest that addressing vitamin D deficiency through supplementation may be a valuable adjunct to conventional treatments for chronic plantar fasciitis [9,11,16].

These results emphasize the need for targeted interventions to address chronic vitamin D3 deficiency within the sea shipping industry. Potential strategies may include

- Providing regular opportunities for outdoor activities and sun exposure for sea shipping industry workers.
- Ensuring the availability and promotion of vitamin D-rich foods, either through dietary supplementation or the incorporation of more vitamin D-fortified options in the frozen food supply chain.
- Implementing regular monitoring and supplementation programs to maintain optimal vitamin D levels among this population.

Further research is needed to explore the long-term health implications of chronic vitamin D3 deficiency in the sea shipping industry and to develop more comprehensive interventions to address this issue.

In conclusion, the available evidence suggests that vitamin D3 plays a crucial role in the modulation of inflammatory processes through its interactions with the immune system. The anti-inflammatory properties of vitamin D3 have important implications for the prevention and management of various inflammatory and autoimmune disorders.

Limitation of Study

While the available evidence suggests a potential role for vitamin D3 in the management of chronic plantar fasciitis, it is important to acknowledge the limitations of the existing literature. Many of the studies to date have been observational in nature, and the causal relationship between vitamin D3 status and the development or progression of plantar fasciitis remains to be fully elucidated. Further research is needed to fully elucidate the precise

mechanisms by which vitamin D3 exerts its effects on the immune system and inflammation, as well as to explore its potential therapeutic applications in clinical settings.

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