

**Vitamin D supplementation
increases tissue repair**

**Vitamin D deficiency
accelerates tissue degeneration**

Vitamin D level in patients is one of the factors that have been linked to bone and muscle proliferation and healing... In the tendon-to-bone healing process, vitamin D has been shown to successfully influence bone and muscle healing

-- Dougherty KA, Dilisio MF, Agrawal DK. Vitamin D and the immunomodulation of rotator cuff injury. J Inflamm Res. 2016 Jun 14;9:123-31. doi: 10.2147/JIR.S106206. eCollection 2016.

Vitamin D supplementation significantly accelerated wound healing

-- Yuan YF, Das SK, Li MQ. Vitamin D Ameliorates Impaired Wound Healing in Streptozotocin-Induced Diabetic Mice by Suppressing Endoplasmic Reticulum Stress. J Diabetes Res. 2018 Mar 7;2018:1757925. doi: 10.1155/2018/1757925. eCollection 2018.

CONCLUSIONS: Vitamin D increases circulating IGF1 in adults. As a result, a better vitamin D status may ease the achievement of normal IGF1 values in GHD.

-- Ameri P, Giusti A, Boschetti M, Bovio M, Teti C, Leoncini G, Ferone D, Murialdo G, Minuto F. Vitamin D increases circulating IGF1 in adults: potential implication for the treatment of GH deficiency. Eur J Endocrinol. 2013 Oct 21;169(6):767-72. doi: 10.1530/EJE-13-0510. Print 2013 Dec.

Recent studies show that vitamin D deficiency may be responsible for muscle atrophy.

Our results suggest that vitamin D deficiency is associated with elevated oxidative stress, muscle atrophy, and reduced mitochondrial function in the multifidus muscle. Therefore, vitamin D-deficient LBP patients might have reduced possibilities on early and effective rehabilitation

-- Dzik KP, Skrobot W, Kaczor KB, Flis DJ, Karnia MJ, Libionka W, Antosiewicz J, Kloc W, Kaczor JJ. Vitamin D Deficiency Is Associated with Muscle Atrophy and Reduced Mitochondrial Function in Patients with Chronic Low Back Pain. Oxid Med Cell Longev. 2019 Jun 2;2019:6835341. doi: 10.1155/2019/6835341. eCollection 2019.

CONCLUSION: Supplementation with vitamin D over four years was associated with significantly less progression of knee joint abnormalities

-- Joseph GB, McCulloch CE, Nevitt MC, Neumann J, Lynch JA, Lane NE, Link TM. Associations between Vitamin C and D Intake and Cartilage Composition and Knee Joint Morphology over 4 years: Data from the Osteoarthritis Initiative. Arthritis Care Res (Hoboken). 2019 Jul 8. doi: 10.1002/acr.24021. [Epub ahead of print].

CONCLUSION: 25 (OH) D levels were significantly decreased in knee OA patients. Significant deterioration of the medial menisci was observed in OA patients with 25 (OH)D levels <10 ng/ml suggesting that Vit D deficiency may play a role in the progression of medial femoro-tibial OA.

-- Bassiouni H, Aly H, Zaky K, Abaza N, Bardin T. Probing The Relation Between Vitamin D Deficiency and Progression of Medial Femoro-tibial Osteoarthritis of the Knee. Curr Rheumatol Rev. 2017;13(1):65-71. doi: 10.2174/1573397112666160404124532.

...low levels of 25-(OH)D were associated with increased progression of radiographic OA. Strong evidence for an association between 25-(OH)D and cartilage loss was apparent when joint space narrowing and changes in cartilage volume were considered collectively as cartilage loss.

-- Cao Y, Winzenberg T, Nguo K, Lin J, Jones G, Ding C. Association between serum levels of 25-hydroxyvitamin D and osteoarthritis: a systematic review. Rheumatology (Oxford). 2013 Jul;52(7):1323-34. doi: 10.1093/rheumatology/ket132. Epub 2013 Mar 29.

CONCLUSION: The biomechanical and histological data from this study suggest that low vitamin D levels may negatively affect early healing at the rotator cuff repair site.

CLINICAL RELEVANCE: It is estimated that 1 billion people worldwide are vitamin D deficient. In the deficient state, acutely injured rotator cuffs may have a reduced ability for tendon healing.

-- Cao Y, Winzenberg T, Nguo K, Lin J, Jones G, Ding C. Association between serum levels of 25-hydroxyvitamin D and osteoarthritis: a systematic review. *Rheumatology (Oxford)*. 2013 Jul;52(7):1323-34. doi: 10.1093/rheumatology/ket132. Epub 2013 Mar 29.

...joints treated with 24R,25(OH)2D3 had less articular cartilage damage and levels of inflammatory mediators. These results indicate that 24R,25(OH)2D3 protects against OA, and suggest that it may be a therapeutic approach for preventing traumainduced osteoarthritis.

-- Boyan BD, Hyzy SL, Pan Q, Scott KM, Coutts RD, Healey R, Schwartz Z. 24R,25Dihydroxyvitamin D3 Protects against Articular Cartilage Damage following Anterior Cruciate Ligament Transection in Male Rats. PLoS One. 2016 Aug 30;11(8):e0161782. doi: 10.1371/journal.pone.0161782. eCollection 2016.