Treating Vitamin D Deficiency and Insufficiency in Chronic Neck and Back Pain and Muscle Spasm: A Case Series

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ABSTRACT

Introduction: The association between vitamin D deficiency or insufficiency and pain in the musculoskeletal system, especially in the neck and/or back regions, and/or muscle spasm is not well studied. The results of the limited studies have been mixed.

Case Presentation: The goal of this report is to examine the association between vitamin D deficiency and insufficiency and chronic neck and back pain and muscle spasm and the role of correction of vitamin D deficiency and insufficiency in the treatment of chronic pain and muscle spasm, especially in the neck and back regions. This case series reviewed medical records to identify patients with chronic pain (lasting from 6 months to 1 year) in the neck and back regions that improved significantly through the correction of the vitamin D deficiency or insufficiency. Patients were referred to the spine clinic of a tertiary hospital in a major metropolitan area in the Northwest by their primary care physicians after physical therapy and after first-tier pain medications, including nonsteroidal anti-inflammatory drugs, had failed. Some of the patients had epidural steroid injections without significant relief. The blood vitamin D level was tested at the clinical laboratory, and patients were given 50,000 IU of oral vitamin D once a week for 12 weeks. The main outcome measures were patient self-reported visual analog scale score and degree of muscle spasm**.** The 4 patients included in this series all had more than 70% improvement in their symptoms after taking 50,000 IU of vitamin D once a week for 12 weeks.

Discussion: Vitamin D deficiency and insufficiency can cause or worsen neck and back pain and muscle spasm. The correction of vitamin D deficiency and insufficiency plays an important role in the treatment of chronic neck and back pain and muscle spasm among patients having concurrent vitamin D deficiency and insufficiency because it can be prevented and treated easily.

Given the high health care expenditure on the treatment of chronic neck and back pain, prompt and accurate diagnosis and treatment of vitamin D deficiency and insufficiency not only increase the quality of care but also reduce the cost.

INTRODUCTION

Historically, vitamin D deficiency (serum level < 20 ng/mL) and insufficiency (serum level < 30 ng/mL) have been linked with skeletal health and disorders, such as osteoporosis, osteomalacia, or rickets. During the past decades, several reports have been published on the role of vitamin D deficiency or insufficiency in nonskeletal disorders, especially many chronic diseases.[1] The most-recognized conditions include various cancers, autoimmune diseases, hypertension, cardiovascular disease, and diabetes.[2,3]

However, the association between vitamin D deficiency or insufficiency and pain in the musculoskeletal system, especially in the neck and/or back regions, and/or muscle spasm is not well studied. The results of the limited studies have been mixed. A few case reports and a small cohort study[4-6] for certain musculoskeletal conditions have been published in the past few years, reporting a positive effect of vitamin D in treating chronic pain in palliative medicine and chronic low back pain. Recently, Sikora-Klak et al[7] recommended prompt treatment of vitamin D insufficiency and deficiency in athletes because of the high prevalence of vitamin D deficiency among the athletes, which imposes the risks of stress fracture, illness, and delayed muscle recovery. A quantitative meta-analysis[8] of 19 randomized controlled trials with 3436 participants (1780 receiving vitamin D supplementation and 1656 receiving placebo) reported a significantly greater mean decrease in pain score (primary outcome) with vitamin D supplementation compared with placebo in people with various chronic pain conditions. However, another study[9] conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) included 8 clinical trials and reported that vitamin D supplementation was not more effective than placebo, no intervention, or other conservative or pharmacologic interventions for low back pain. However, that study was limited because the overall quality of evidence was "very low" because of the poor methodologic quality and small sample sizes of the included studies. A retrospective study[10] reported that the severity of pain increased in patients with low back pain as the deficiency of vitamin D increased among 98 patients. However, the study defined the vitamin D deficiency group as those whose vitamin D serum level was lower than 20 ng/mL (84 patients) vs 20 ng/mL and higher in the healthy group (only 14 patients), which did not reflect the vitamin D-insufficient population as those with serum levels of 20 to 30 ng/mL. One study[11] reported that vitamin D and ferritin correlate with chronic neck pain but did not address the role of vitamin D deficiency in neck pain; notably, the studied population was skewed on sex, with 90% of patients being women. This article reports 4 cases of chronic pain (from 6 months to 1 year) in the neck and back regions in patients in whom pain and muscle spasm improved significantly through the correction of the vitamin D deficiency or insufficiency.[11] An effort has been made to anonymize patient information so as to not cause harm to the patients.

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CASE PRESENTATIONS

Presenting Concerns

Case 1

A 46-year-old man with a medical history of AIDS and hepatitis B who had a 6-month history of back pain radiating into the frontal, lateral, and posterior aspects of both thighs with cramps and numbness was referred to the spine clinic. His visual analog scale (VAS) score was 6 to 8 out of 10. He was not anemic. The patient had tried physical therapy and pain medications, including nonsteroidal anti-inflammatory drugs (NSAIDs). The physical examination did not reveal any significant findings except for a limited range of motion in the lumbar spine attributable to the pain. Results of magnetic resonance imaging revealed mild degenerative changes throughout the lumbar spine with L5-S1 grade I anterolisthesis. Radiograph results revealed anterolisthesis of 4- to 4.5-mm slippage at L5 on S1 without evidence of instability on flexion or extension views.

The blood vitamin D level was 23 ng/mL (reference range, 30-100 ng/mL). The patient was prescribed 50,000 IU of oral vitamin D once a week for 12 weeks. After taking vitamin D for 8 weeks, the patient reported 80% improvement in pain. Retesting of vitamin D revealed a level of 31 ng/mL (reference range, 30-100 ng/mL).

Case 2

A 62-year-old man with a greater than 40-year history of T9 complete paraplegia had pain from worsening muscle spasm in the lower body and legs for 1 year, which severely interfered with his sleep. Daily stretching no longer provided relief. He reported a VAS score of 8 to 9 out of 10. He was not anemic. He could not tolerate tizanidine, which was prescribed as a muscle relaxant and pain medication. He had been given baclofen with progressive increasing of the dosage to the point where a baclofen pump was considered. Physical examination findings were consistent with T9 paraplegia. He also had increased muscle tone, suggesting mild spasticity in both the legs and ankles. The muscles in the calves were very tight on deep palpation.

His blood vitamin D level was 15 ng/mL (reference range, 30-100 ng/mL). He was prescribed 50,000 IU of oral vitamin D once a week for 12 weeks. After finishing the regimen, he reported 90% improvement. Retesting of vitamin D revealed a level of 51 ng/mL (reference range, 30-100 ng/mL).

Case 3

A 42-year-old woman with scoliosis had an 8-month history of pain and muscle tightness in the midback and low back. The VAS score was 9 out of 10. She was not anemic. Physical examination revealed no significant findings besides the scoliosis. The patient had tried physical therapy and pain medications, including NSAIDs. Radiograph results of the thoracolumbar spine revealed stable mild degenerative changes and moderate scoliotic curvature.

Her blood vitamin D level was 22 ng/mL (reference range, 30-100 ng/mL). She was prescribed 50,000 IU of oral vitamin D once a week for 12 weeks. After taking the vitamin D for 6 weeks, she reported 80% improvement in her pain level. Retesting of vitamin D revealed a level of 32 ng/mL (reference range, 30-100 ng/mL).

She returned to the clinic 1 year later for a 3-month history of gradual onset of recurrent midback pain and muscle spasm again. She did not continue to take vitamin D at the lower dosage daily as recommended because she was concerned about potential toxic effects. Retesting of vitamin D revealed a level of 14 ng/mL (reference range, 30-100 ng/mL). After taking 50,000 IU of vitamin D twice a week for 3 weeks, she reported 70% improvement of her symptoms. Retesting of vitamin D revealed a level of 29 ng/mL (reference range, 30-100 ng/mL).

Case 4

A 41-year-old man had a 1-year history of neck pain radiating into the shoulders, with muscle tightness in the upper arms and wrists. His VAS score was 8 to 9 out of 10. He was not anemic. The patient had tried physical therapy and pain medications, including NSAIDs. In addition, the patient also occasionally felt weak in the right arm. On physical examination, other than limited range of motion in the cervical spine and tenderness in the neck and upper back region, there was no other significant finding. Cervical spine magnetic resonance imaging results revealed mild spondylotic changes.

His vitamin D level was 27 ng/mL (reference range, 30-100 ng/mL). After taking the 3200 IU of vitamin D daily for 1 week, he reported 70% improvement in his symptoms and 90% improvement at 10 weeks. Retesting of vitamin D revealed a level of 36 ng/mL (reference range, 30-100 ng/mL).

DISCUSSION

All 4 patients in this case series had preexisting spinal conditions. Although the preexisting spinal conditions could be the cause of the pain symptoms, the results observed in this case series provide evidence of the association between the vitamin D deficiency or insufficiency and the concurrent episodes of pain and muscle spasm. Although Gokcek et al[11] proposed an inversed linear association between vitamin D level and the VAS scores from low back pain, this association only reflected the individuals with vitamin D serum level below 20 ng/mL because the control group contained patients with vitamin D insufficiency (vitamin D level of 20-30 ng/mL). This study indicates that vitamin D supplementation also plays an important role in the patients with vitamin D serum levels between 20 and 30 ng/mL. It is evident that treating vitamin D deficiency or insufficiency is important in the management of chronic neck and back pain and muscle spasm. The mechanism for this association is not yet clear, which calls for more in-depth research. However, in part, it could be related to the deficiency and/or imbalanced homeostasis of intracellular and/or extracellular electrolytes, including calcium, magnesium, and phosphorus, resulting from the vitamin D deficiency, as reported through the historical research data.[12] Recent research has indicated that the vitamin D receptors play important roles in cellular signal transduction and mediation of immune responses.[13,14] Vitamin D deficiency is becoming pandemic for various reasons in the modern era and has drawn vast attention from the public.[15,16] Recent interventional studies have found promising effects of vitamin D supplementation on cancer pain and muscular pain but only in patients with insufficient levels of vitamin D when

starting intervention.[17] Possible mechanisms for vitamin D in pain management are the anti-inflammatory effects mediated by reduced cytokine and prostaglandin release and effects on T-cell responses.[17] It is important for practitioners to be aware of and recognize the coexistence of vitamin D deficiency and insufficiency among the population with chronic pain because it can be prevented and treated easily. Turner et al[18] reported the mean duration of opioid use for the inadequate vitamin D and adequate vitamin D groups were 71.1 and 43.8 months, respectively (p = 0.02). Given the high health care expenditure on the treatment of chronic neck and back pain, prompt and accurate diagnosis and treatment of vitamin D deficiency and insufficiency not only increase the quality of care but also reduce the cost, considering that the cost of the serum vitamin D test is approximately $25 vs the cost for the second or third tier of pain medications; narcotics especially are much more expensive, yet they have severe potential adverse effects and an adverse social impact.

CONCLUSION

On the basis of this small case pool, vitamin D deficiency and insufficiency play an important role in chronic pain and muscle spasm in the musculoskeletal system. However, treatment of vitamin D deficiency and insufficiency improves symptoms in those individuals. Although this series calls for in-depth, large cohort studies to further research this association, a vitamin D test should be performed in individuals with chronic pain and muscle spasm who have the risk factors for vitamin D deficiency or insufficiency, such as lack of sun exposure because of their lifestyle or certain medical conditions, especially among those who do not respond to the first tier of treatment, including NSAIDs and/or physical therapy. ❖

Disclosure Statement

The author(s) have no conflicts of interest to disclose.

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Supplementation

Low levels of vitamin D in the population as a whole suggest that most people need to take a vitamin D supplement. This may be especially true for seniors, as the ability to synthesize vitamin D in the skin declines with age.

— Andrew Weil, MD, b 1942, American physician, author, spokesperson