

Relationship of serum vitamin D level with the clinical course of Adhesive Capsulitis

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Abstract

Aim: To investigate the relationship between adhesive capsulitis and serum vitamin D levels.

Materials and Methods: Patients who were diagnosed with primary adhesive capsulitis between 2015 and 2019 and had regular follow-up data were retrospectively evaluated. Age, gender, body mass index, affected side, disease duration, serum 25-OH vitamin D levels, range of shoulder motion, the Visual Analog Scale (VAS) score, the Constant-Murley score, and the Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire score were evaluated. Patients with a diagnosis of diabetes, history of rheumatic diseases, presence of cervical pathologies, history of fracture and/or shoulder surgery, history of infection, and full-thickness rotator cuff tear were excluded from the study. The serum 25 (OH) D levels below 20 ng/ml were accepted as deficiency. The patients were divided into two groups according to the serum vitamin D level (Group 1 if <20 ng/mL and Group 2 if ≥20 ng/mL). The VAS score, functional scores, range of motion (flexion, abduction, external and internal rotation) of the patients in the two groups were compared.

Results: Of the 74 patients included in the study, 59 (79.2%) were female and 15 (20.3%) were male, with a mean age of 50.6 ± 9.74 years. The mean duration of pain was 8.21 ± 2.3 months. The serum vitamin D level was below 20 ng/ml in 43 patients (58.1%) who were then allocated to Group 1, and Group 2 comprised 31 patients. The mean VAS score was 7.8 for Group 1 and 5.2 for Group 2. The mean Constant-Murley and DASH scores were 54.4 ± 15.9 and 21.6 ± 9.78, respectively in Group 1 and 52.04 ± 12.2 and 24.3 ± 6.4, respectively in Group 2. No significant difference was observed between the groups according to the range of joint motion, Constant scores, or DASH scores.

Conclusion: Vitamin D deficiency may be associated with shoulder pain in patients with adhesive capsulitis. However, the serum vitamin D level had no effect on the functional results.

Keywords: Adhesive capsulitis; frozen shoulder; vitamin D; function; shoulder pain

INTRODUCTION

Adhesive capsulitis, caused by the glenohumeral joint capsule inflammation and following progressive fibrosis and contracture of the joint capsule, is a disease characterized by the staggering loss of both active and passive glenohumeral movement. Although the etiology of adhesive capsulitis has not yet been fully elucidated, its clinical course and processes are known (1). The disease has two forms as primary (idiopathic) adhesive capsulitis, which is not associated with any trauma or systemic pathology, and secondary adhesive capsulitis that develops due to systemic (extrinsic or intrinsic) causes (2,3).

Vitamin D deficiency is very widespread, with a large number of people (approximately one billion) worldwide

experiencing this deficiency. Serum 25 (OH) D levels of less than 20 ng/mL (50 nmol/L) indicate vitamin D deficiency. The role of vitamin D in the musculoskeletal system is well known (4). However, the relationship of vitamin D with the development of some diseases is still unclear. There are new studies showing that vitamin D has various unknown physiological functions. These studies show that an acquired immune system in many inflammatory and autoimmune diseases could be regulated by vitamin d (5-7).

The causes arising from the musculoskeletal system and various inflammatory mechanisms are responsible for adhesive capsulitis, as mentioned above. Also, vitamin D has important roles in the musculoskeletal system and inflammatory processes. Therefore, it would be beneficial to investigate the clinical effects of vitamin D on adhesive

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capsulitis. The current study aimed to investigate the relationship between adhesive capsulitis and deficiency of vitamin D, which has been shown to have anti-inflammatory efficacy in recent studies.

MATERIALS and METHODS

Patients that presented to the Orthopedics and Traumatology, Internal Diseases and Physical Therapy and Rehabilitation outpatient clinics from January 2015 to April 2019 and were diagnosed with adhesive capsulitis and those who were measured serum vitamin D level were retrospectively reviewed. The diagnosis of adhesive capsulitis was made by predicated medical history, physical examination and radiological imaging findings, and the exclusion of other shoulder pathologies. Patients diagnosed with primary adhesive capsulitis, who had regular outpatient follow-up data, were included in this study, while those with a diagnosis of diabetes, history of rheumatic diseases, cervical pathologies, previous fracture and/or shoulder surgery history, history of infection or presence of current infection, and rotator cuff tear were excluded (Figure 1).

For all patients, the demographic data, shoulder joint range of motion (abduction, flexion, external rotation and internal rotation degrees), blood vitamin D level, Visual Analog Scale (VAS) scores for shoulder pain, and the Constant-Murley and Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire scores for the shoulder functions were recorded. The 25-OH vitamin D blood level was used to determine the level of vitamin D in patients. The serum 25 (OH) D levels below 20 ng/ml were considered to indicate deficiency (5,8). The patients with a serum vitamin D level of $20 < \text{ng/mL}$ were included in Group 1, and those with ≥ 20 in Group 2. The demographic features, range of shoulder joint motion, VAS scores for shoulder pain, and Constant and DASH scores for clinical results were compared between the groups.

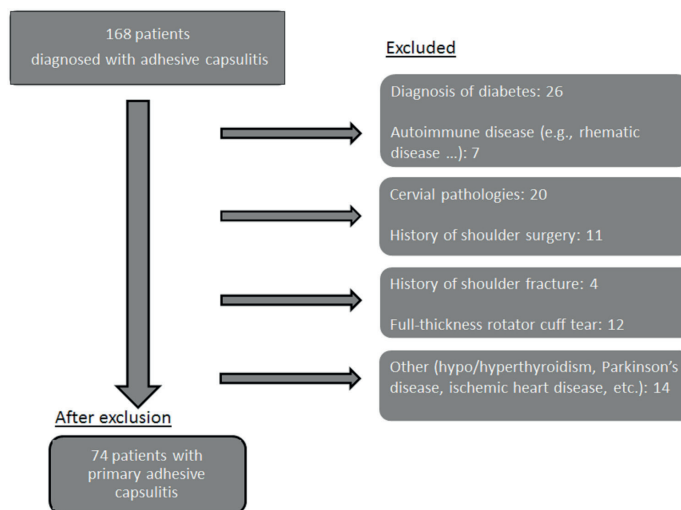


Figure 1. Flowchart showing exclusion steps and exact numbers of exclusions

Statistical Analysis

Statistical analysis was performed using SPSS v. 22.0 (SPSS Inc., IBM, NY, USA). Categorical variables (gender and affected site) were provided as percentages. The comparison of the mean values was undertaken by independent samples t test for two independent variables. Significance was evaluated at $p < 0.05$ level.

RESULTS

Table 1 shows the comparison of the demographic characteristics and pain duration of the two groups. Table 2 shows the comparison of the joint range of motion and VAS, Constant and DASH scores of the two groups. The VAS score of Group 1 was significantly higher than that of Group 2 (Table 2). No statistically significant difference was observed between the two groups according to the joint range of motion and the Constant and DASH scores (Table 2).

Table 1. Demographic data			
	<20 ng/mL Mean \pm SD / n (%) (n=43)	≥ 20 ng/mL Mean \pm SD / n (%) (n=31)	p value
Age (years)	51.0 \pm 5.2	49.2 \pm 6.7	0.640
Gender			
Female	33 (76.7%)	25 (80.7%)	
Male	10 (23.3%)	6 (19.3%)	0.793
Affected side			
Right	19 (44.2%)	14 (45.1%)	
Left	24 (55.8%)	17 (54.9%)	0.209
Height (cm)	158.9 \pm 3.9	160.3 \pm 3.5	0.314
Weight (kg)	73.2 \pm 9.8	77.31 \pm 7.4	0.944
Body mass index (kg/m ²)	26.0 \pm 3.8	28.0 \pm 4.6	0.422
Symptom duration (pain)	8.9 \pm 7.8	7.3 \pm 6.2	0.466

Table 2. Comparison of the joint range of motion and functional scores of the groups formed based on serum vitamin D levels

	<20 ng/mL Mean \pm SD / n (%) (n=43)	\geq 20 ng/mL Mean \pm SD / n (%) (n=31)	p value
CMS	46.7 \pm 16.9	54.4 \pm 15.9	0.531
DASH score	23.2 \pm 5.7	21.6 \pm 9.7	0.327
VAS	7.8 \pm 3.8	5.2 \pm 2.4	0.037
Flexion, degrees	81.6 \pm 15.7	91.6 \pm 17.1	0.138
Abduction, degrees	84.8 \pm 12.7	79.4 \pm 13.5	0.207
IR, degrees	40.0 \pm 9.7	35.1 \pm 10.5	0.114
ER, degrees	32.1 \pm 11.7	30.1 \pm 8.4	0.629

DISCUSSION

Patients with primary adhesive capsulitis have a process that progresses with global inflammation, fibrosis of the glenohumeral joint capsule and restriction of shoulder movement that could occur spontaneously without identifiable known pathology (4-7,14). However, the relationship between vitamin D deficiency and the development and treatment of inflammatory diseases is still an issue that needs to be investigated. The result of this study reveals no relationship between low serum vitamin D levels and limited shoulder joint range of motion and shoulder functions in adhesive capsulitis. However, a significant relationship has been reported between shoulder pain and vitamin D deficiency in this patient group. The importance of this study is that it is one of the first studies to investigate the clinical relationships between adhesive capsulitis and vitamin D.

Inflammatory cytokines (interleukin-1a, interleukin-1b, tumor necrosis factor- α , cyclooxygenase-1, and cyclooxygenase-2) have been shown to be increased in the glenohumeral joint capsule and bursal tissues in adhesive capsulitis (9). Oliveira et al. reported that blood 25 (OH) D levels were associated with two inflammatory markers examined. They reported a potential anti-inflammatory act for vitamin D in older patients in the British population (14). In another study, Zang et al. described vitamin D inhibition of cytokine production in monocytes/macrophages (4). Also, vitamin D deficiency has been found to be associated with autoimmune diseases (rheumatoid arthritis, systemic lupus erythematosus...), as well as inflammatory diseases (5-7,11,13-15). According to the results of this study, vitamin D deficiency shows relationship with shoulder pain in adhesive capsulitis. One of the possible mechanisms may be the suppressive effect of vitamin D on inflammatory cytokines and enzymes.

There are conflicting results of studies that have investigated the effects of vitamin D on shoulder pathologies in literature. Oh et al. found that the serum vitamin D level was significantly negatively correlated with fatty degeneration and positively correlated with isokinetic muscle performance in rotator cuff tears (9). In their rat model study, Angeline et al. determined that low vitamin D levels affected collagen remodeling and strength

in the tendon-bone junction (8). Harada et al. showed that vitamin D deficiency was associated with the risk of postoperative surgical complications in arthroscopic rotator cuff repair and may be a preventable risk factor (10). Vitamin D has been shown to support the proliferation of tendon-derived cells obtained from the supraspinatus muscle (15). It has been shown in another study (19) that vitamin D level was not related to the functional status in patients who had undergone an arthroscopic rotator cuff repair. According to our results, no significant relation was observed between ROMs and vitamin D levels or between disabilities of patients and vitamin D levels.

The relationship between vitamin D deficiency with nonspecific musculoskeletal pain has been demonstrated in previous studies (12,14). Also, vitamin D deficiency replacement therapy has been shown to improve pain and other musculoskeletal symptoms in patients with diffuse musculoskeletal pain (16-18). In this study, vitamin D levels were deficient in 58% of patients with adhesive capsulitis. Therefore, low vitamin D levels should be considered for patients who have severe shoulder pain in adhesive capsulitis. However, in this study clinical and functional results of patients were not compared with the clinical and functional results after replacement therapy.

This study has several limitations. First, it is a retrospective study with small sample size. Second, the vitamin D level of patients in this study was not evaluated according to the adhesive capsulitis stages. Third, vitamin D levels have not been compared between patients with adhesive capsulitis and the normal population. Future studies can provide more important information by comparing the clinical and functional results of adhesive capsulitis cases with vitamin D deficiency after replacement therapy. We consider that there is a need for prospective and multi-center studies with larger sample sizes.

CONCLUSION

Vitamin D deficiency may be associated with shoulder pain in patients with adhesive capsulitis; however, the serum vitamin D level had no effect on the functional results. Serum vitamin D deficiency is common in patients with primary adhesive capsulitis; therefore, it should be included in the evaluation of this patient group.

Conflict of interest : The authors declare that they have no competing interest.

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Ethical approval: Ethics committee approval was received for this study from the ethics committee of Gaziosmanpaşa Training and Research Hospital .

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