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The Effect of Vitamin D Deficiency on Vital Parameters in Myofascial Pain Syndrome

Miyofasiyal Ağrı Sendromunda D Vitamini Eksikliğinin Yaşamsal Parametreler Üzerindeki Etkisi

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Abstract

Objective: It is known that in vitamin D deficiency, people suffer extensive musculoskeletal pain. In this study, the relationship between vitamin D deficiency and myofascial pain syndrome (MPS) and the effect of vitamin D on pain, disability, quality of life, sleep and psychological condition were examined.

Method: In this study, 180 cases were examined. Of the cases, 120 were patients, and 60 were in the control group. The cases were compared in terms of 25(OH)D level and quality of life. The patients were also divided into two subgroups based on their 25(OH)D levels. Their scores on the visual pain scale, the neck pain and disability scale, the short form-36 (SF-36) quality of life index, Pittsburgh sleep quality index, Beck anxiety inventory and Beck depression inventory, which were tested for validity and reliability in Turkish, were recorded.

Results: The average 25(OH)D level of the patient group was 12.8±7.3 ng/mL, while that of the control group was 22.8±14.3 ng/mL, and there was a significant difference. Physical parameters of SF-36 quality of life index were higher in the control group than in the patient group. In the patient group with a deficiency in 25(OH)D levels, depression and anxiety levels were significantly higher and the mental parameters of the SF-36 quality of life index were significantly lower.

Conclusion: In our study, 25(OH)D levels were significantly lower in the patients diagnosed with MPS compared to the healthy people in the control group, and vitamin D deficiency was shown to have a negative effect on mental functions and mood.

Keywords: Mood, myofascial pain syndrome, quality of life, quality of sleep, 25(OH)D

Öz

Amaç: D vitamini eksikliğinde yaygın kas iskelet ağrısı olduğu bilinmektedir. Bu çalışmada D vitamini eksikliği ile myofasiyal ağrı sendromu (MAS) arasındaki ilişki ve D vitamininin ağrı, özürlülük, yaşam kalitesi, uyku ve psikolojik durum üzerindeki etkisi değerlendirilmiştir.

Yöntem: Çalışmada 120'si hasta ve 60'ı kontrol olmak üzere 180 olgu değerlendirildi. Olgular 25(OH)D düzeyi ve yaşam kalitesi yönünden karşılaştırıldı. Aynı zamanda hastalar 25(OH)D düzeyine göre iki alt gruba ayrılarak, vizuel ağrı skalası, Türkçe geçerlilik ve güvenilirlik çalışmaları yapılmış boyun ağrısı ve özür göstergesi, kısa form-36 (SF-36) yaşam kalitesi kısa formu, Pittsburgh uyku kalitesi indeksi, Beck anksiyete ölçeği ve Beck depresyon ölçeği skorları kaydedildi.

Bulgular: Hasta grubun 25(OH)D düzeyi 12,8±7,3 ng/mL iken kontrol grubunun 22,8±14,3 ng/mL olup, anlamlı farklılık vardı. Kontrollerde SF-36 yaşam kalitesi indeksinin fiziksel parametreleri hasta grubuna göre yüksek düzeyde idi. Hastaların 25(OH)D düzeyine göre eksikliği olan grupta depresyon ve anksiyete düzeyleri anlamlı daha yüksek ve SF-36 yaşam kalitesi indeksinin mental parametreleri anlamlı düşük idi.

Sonuç: Çalışmamızda MAS tanılı hastalarda sağlıklı kontrollere göre 25(OH)D düzeyi anlamlı düşük saptanmıştır ve D vitamini eksikliğinin mental fonksiyonlar ve duygu durumu üzerinde olumsuz etki oluşturduğu gösterilmiştir.

Anahtar kelimeler: Duygu durumu, miyofasiyal ağrı sendromu, uyku kalitesi, yaşam kalitesi, 25(OH)D

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Introduction

Myofascial pain syndrome (MPS) is a clinical picture characterized by pain, muscle spasms, stiffness, limitation of movement, weakness and sometimes autonomic disorder characterized by myofascial trigger points in taut bands formed in skeletal muscles and fascia (1,2). The frequency of the disease in the society is 12%, and its frequency in the patient population presenting to clinics due to pain is 30-31% (1,2). Because there is not any specific laboratory test or imaging method for MPS, the diagnosis is made through anamnesis and physical examination. The primary symptom in patients is pain. At the trigger point in the taut band in the affected muscle, the pain reflected in the particular area related to that muscle is felt. However, autonomic findings such as abnormal sweating, increase in body secretions and redness in the skin may also occur in addition to symptoms such as contraction, hypersensitivity, stiffness, limitation of movement, weakness, headache, dizziness, depression and sleep disorders (1-3).

Vitamin D is one of the most important physiological regulators of calcium (Ca), phosphorus (P) and bone metabolism (4). Its deficiency can have negative consequences on many organs and systems, especially on bone metabolism. It causes an increase in balance disorder and fall risk by creating myopathy, which is pronounced in the proximal muscles of the musculoskeletal system (5).

Our aim in this study was to examine the relationship between vitamin D deficiency and MPS and to examine the effect of vitamin D deficiency on clinical parameters such as pain, disability, quality of life, sleep and mood.

Materials and Methods

Our study began after the approval of the Local Ethics Committee. The study included 120 patients (95 females and 25 males) presenting to our Physical Therapy Outpatient Clinic between June 2015 and January 2017, who were diagnosed with MPS and whose 25(OH)D levels were checked, and 60 healthy cases (47 females and 13 males) as the control group. Healthy controls were selected from hospital staff.

Medical records of the patients were examined retrospectively. The group of people with MPS was examined separately in itself as 2 subgroups depending on their levels of 25(OH)D. The 2011 Endocrine Guideline Report identified 25(OH)D levels less than 20 ng/mL as deficiency, between 20 and 29 ng/mL as insufficiency and between 30 and 100 ng/mL as sufficiency (6). In our study, any value less than 20 ng/mL was accepted to be a deficiency.

Patients aged between 18 and 65 years, who were diagnosed with MPS based on the criteria defined by Travel and Simons, and who had at least one trigger point and/or a taut band in at least one of the neck and back muscles accompanying neck and/or back pain, were included in the study, and healthy subjects without any complaints of pain were included as the control group (2). Patients who had been diagnosed with fibromyalgia syndrome (FMS), who had any systemic disease (neurological disorders, chronic kidney, heart or liver diseases, or rheumatological diseases), who had distinct cervical disc lesions, cervical radiculopathy or myelopathy, who had undergone neck or shoulder surgery within the past year, who were pregnant, who would not cooperate, who had cognitive dysfunction, and those who used drugs or had any diseases affecting their 25(OH)D level were excluded from the study.

The patients' ages, genders, body mass indices (BMIs), sunbathing levels, clothing styles, pain durations, 25(OH) D, Ca and parathormone (PTH) levels, and their scores on the visual pain scale (VAS), neck pain and disability scale (NPDS), short form quality of life (SF-36), Pittsburgh sleep quality index (PSQI), Beck anxiety inventory (BAI) and Beck depression inventory (BDI), which were tested for validity and reliability in Turkish, were recorded (7-12). 25(OH)D, Ca, PTH and sunbathing levels and clothing styles of the healthy volunteers who did not have any complaints of pain and their scores on the short form-36 (SF-36) quality of life were recorded for the control group.

Visual Analog Scale (VAS)

Visual analog scale is used to evaluate the severity of pain. The severity of pain is scored between 0 and 10. 0 shows no pain, 1-3 mild, 4-7 moderate, 8-10 severe pain, and 10 points indicate intolerable pain (7).

Neck Pain and Disability Scale (NPDS)

Neck Pain and Disability scale is used to evaluate neck pain and disability. It consists of 20 items and each item is scored from 0 to 5. Summing of 20 item points gives the total score. The higher scores indicate elevated severity of pain and disability (8).

Short form-36 (SF-36)

SF-36 is used to appraise the quality of life. It contains 36 health-related items and assesses eight dimensions of physical and mental health. Eight dimensions are physical

functioning (PF), physical role (RP), vitality (VT), general health (GH), bodily pain (BP), emotional role (RE), social functioning (SF), mental health (MH), mental component summary (MCS), physical component summary (PCS). The score of each domain is 0 and 100 and high scores indicate greater health status. SF-36 was tested and proven to be a valid evaluation tool of health quality in Turkey (9).

Pittsburgh Sleep Quality Index (PSQI)

The PSQI is a 19-item, self-reported, questionnaire-based assessment of sleep patterns to measure subjective sleep quality. It has been widely used by various researchers to monitor and evaluate insomnia among patients. The contents of the PSQI include subjective sleep duration, sleep quality, sleep latency, habitual sleep efficiency, sleep disturbances, use of sleep medication and daytime dysfunction. Total score ranges from 0 to 21 and scores above 5 indicate poor sleep quality (10).

Beck Anxiety Inventory (BAI)

BAI is used to evaluate anxiety severity. It includes 21 questions that are scored from 0 to 3. The total score ranges from 0 to 63. High scores indicate a high severity of anxiety (11).

Beck Depression Inventory (BDI)

BDI consists of 21 questions, with each question scored between 0 and 3. Total score range between 0 and 63. High scores indicate a high severity of depression (12).

Statistical Analysis

The behavior of quantitative variables was expressed using centralization and variance measures: Mean ± standard deviation. To show the behavioral differences of group averages, the ANOVA t-test was used when normality and uniformity assumptions were met, and the Mann-Whitney U test (number of groups=2) non-parametric method was used when not. Statistical significance was determined as p=0.05 for all cases. Statistical analysis was provided by IBM SPSS (Statistics Package for Social Sciences for Windows, Version 21.0, Armonk, NY, IBM Corp.) package program.

Results

There was no significant difference between the groups in terms of sunbathing levels, clothing styles and demographic data in the study. The duration of pain was 8.53 months on average. The average 25(OH)D level of the patient group was 12.8±7.3 ng/mL, while that of the control group was 22.8±14.3 ng/mL, and a significant difference was found (p<0.001). Besides that, there was no significant difference between Ca and PTH levels.

Statistically significant differences were found between the patient group and the control group in the RP, BP and PCS parameters based on the SF-36 quality of life index parameters (p<0.05) (Table 1). Based on NPDS, 88.3% of the patients in the patient group had varying degrees of disability due to neck pain, and 14.2% of them had severe pain. Moreover, 57.5% of the patients had anxiety, 40.8% had depression, and 80.8% had sleep disorders.

In the analysis of subgroups conducted according to the 25(OH)D levels of the patient group, no statistically significant difference was found in terms of pain duration, VAS score, and NPDS and PSQI parameters (p<0.05). However, BAI and BDI scores were significantly higher in the group with vitamin D deficiency (p<0.05) (Table 2).

Significant differences were found in the parameters of GH, SF, MH and MCS in the comparison made according to SF-36 quality of life index parameters (p<0.05) (Table 3).

The correlation analysis showed that among the patients with MPS, 25(OH)D levels were negatively correlated with their scores on VAS (r=-0.155, p=0.091), NPDS (r=-0.026, p=0.780), BAI (r=-0.200, p=0.028), BDI (r=-0.219, p=0.016), PSQI (r=-0.139, p=0.129) and BMI (r=-0.047, p=0.528), and positively correlated with their scores on SF-36 quality of life index PCS (r=0.141, p=0.059) and MCS (r=0.088,

Table 1. Comparison of the MPS and control groups by SF-36 parameters

	MPS (n=120)	Control (n=60)	p
PF	69.5±22.0	74.5±22.8	0.089
RP	49.1±41.4*	67.5±36.0*	0.004*
BP	51.0±20.0**	65.9±22.1**	<0.001**
GH	59.2±18.6	59.8±17.0	0.933
VT	50.0±20.6	50.6±17.4	0.919
SF	64.9±24.2	68.7±25.7	0.272
MH	54.2±39.5	59.7±39.6	0.384
RE	65.7±16.4	68.3±13.3	0.423
PCS	60.4±19.0*	66.9±17.9*	0.002*
MCS	59.7±19.1	61.8±18.2	0.341

*Statistically significant at the p<0.05 level, **Statistically significant at the p<0.001 level.

MPS: Myofascial pain syndrome, SF-36: Short form-36, PF: Physical functioning, RP: Physical role, BP: Bodily pain, GH: General health, VT: Vitality, SF: Social functioning, MH: Mental health, RE: Emotional role, PCS: Physical component summary, MCS: Mental component summary

Table 2. Comparison of demographic and clinical parameters of MPS patients based on 25(OH)D levels

	25(OH)D <20ng/mL (98)	25(OH)D ≥20ng/mL (22)	p
25(OH)D	10.08±4.69**	24.93±4.06**	<0.001**
Duration	8.36±8.37	9.64±8.37	0.381
	Median (minimum-maximum)		**p**
BAI	11 (0-44)*	6.5 (0-22)*	0.019*
BDI	7.5 (0-41)*	3.5 (0-16)*	0.035*
NPDI	48 (6-91)*	48 (18-84)*	0.943
PSQI total	7 (0-17)	5.5 (2-15)	0.089
VAS	6 (1-10)	5 (3 10)	0.225
Age	36.5 (18-58)	43.5 (21-57)	0.158

*Statistically significant at the p<0.05 level, **Statistically significant at the p<0.001 level.

MPS: Myofascial pain syndrome, BAI: Beck anxiety inventory, BDI: Beck depression inventory, NPDI: Neck Pain and Disability index, PSQI: Pittsburgh sleep quality index, VAS: Visual pain scale

Table 3. Comparison of MPS1 and MPS2 groups by SF-36 parameters

	MPS1 (n=98)	MPS2 (n=22)	p
PF	69.4±22.0	70.0±22.5	0.935
RP	47.4±41.1	56.8±43.0	0.284
BP	49.9±19.9	55.9±20.0	0.253
GH	57.7±17.9*	66.2±20.4*	0.024*
VT	49.6±21.0	52.0±19.0	0.641
SF	62.9±24.3*	73.7±22.1*	0.044*
MH	50.4±38.9*	71.0±38.9*	0.026*
RE	65.4±17.4	66.9±11.0	0.911
PCS	56.1±18.6	62.2±19.1	0.086
MCS	57.1±19.8*	65.9±16.8*	0.033*

*Statistically significant at the p<0.05 level, **Statistically significant at the p<0.001 level.

MPS: Myofascial pain syndrome, SF-36: Short form-36, PF: Physical functioning, RP: Physical role, BP: Bodily pain, GH: General health, VT: Vitality, SF: Social functioning, MH: Mental health, RE: Emotional role, PCS: Physical component summary, MCS: Mental component summary

p=0.240). Based on the correlation analysis, 25(OH)D levels were found to have a significant correlation with BAI and BDI (p<0.05).

Discussion

In our study, we examined the relationship between MPS and vitamin D. The average 25(OH)D level of the patient group was 12.8±7.3 ng/mL, while that of the control group was 22.8±14.3 ng/mL. There was a statistically significant difference between the patient and control groups. In the analysis of subgroups conducted according to the 25(OH) D levels of the patient group, BAI and BDI scores were significantly higher in the group with vitamin D deficiency. Finally, significant differences were found in the parameters of GH, SF, MH and MCS in the comparison made according to SF-36 quality of life index parameters.

As with many tissues and cells, musculoskeletal tissues have vitamin D receptors (13). In vitamin D deficiency, a clinical picture called vitamin D myopathy is observed, which is mostly characterized by proximal muscle weakness and neuromuscular coordination disorder, and causes the risk of imbalance, frequent falls and increased fractures in the affected elderly, difficulty in standing up and walking in affected children (14,15). Moreover, non-specific musculoskeletal pain, chronic widespread pain, and lower back pain can also be seen in vitamin D deficiency (15,16). Gerwin (17) have reported that low levels of vitamin D cause persistent FMS and MPS and recommended that vitamin D levels be checked in chronic FMS and MPS patients. Plotnikkof and Quigley (5) found vitamin D deficiency in 93% of patients with chronic non-specific pain, severe hypovitaminosis D in 28% of patients (≤8 ng/mL) and vitamin D levels below the detectable level in 5 patients, and they reported that the widespread pain felt by these patients could be caused by low levels of vitamin D. A significant relationship was found also in our study between vitamin D deficiency and MPS development. The average 25(OH)D level of the patient group was 12.8±7.3 ng/mL, while that of the control group was found to be 22.8±14.3 ng/mL. A significant difference was found between the 25(OH)D levels of both groups according to the results of the statistical analyses (p<0.001).

There are studies showing the chronic pain and vitamin D relationship (18,19). Yener (20) examined the FMS and vitamin D relationship, and Canpolat Erkan (21) examined the soft tissue rheumatism and vitamin D relationship. In both studies, significant differences were found between the control group and patient groups in terms of VAS. However, there was no significant difference between VAS scores in subgroup analyses depending on low and high vitamin D levels. Similarly, our study showed no difference between VAS and the NPDS scores in subgroup analyses based on vitamin D levels in patients with MPS (p>0.005).

Evidence has been found in recent years that the central pain mechanism plays a role in MPS (22). Similarly, there is evidence that vitamin D affects the brain and nervous system (23-25). Armstrong et al. (26) reported

that patients with vitamin D deficiency and insufficiency had higher levels of anxiety and depression than those in control groups. A study in healthy volunteers found that vitamin D improved the positive effect and reduced the negative effect during the winter months (27). Berk et al. (28) reported vitamin D deficiency in patients with FMS as being associated with anxiety and depression. Our study also showed that in line with the literature, vitamin D statistically significantly correlated negatively with anxiety and depression in our patient group (BAI: r=-0.20, p=0.028 and BDI: r=-0.219, p=0.016). Additionally, in subgroup analyses based on vitamin D levels, depression and anxiety scores were significantly higher in the group with vitamin D deficiency (p=0.035, p=0.019, respectively). In light of these results, it should be borne in mind that deficiency of vitamin D may also be a significant factor in changes in mood that is seen in patients with MPS and has been linked mainly to chronic pain to date.

Soft tissue rheumatism in relation to chronic pain may bring about changes in quality of life. Sahin et al. (29) examined SF-36 parameters in patients with MPS and found that RP, BP and VT scores were significantly lower. Irnich et al. (30) found a decrease in RP and BP parameters in patients with chronic neck pain. In our study, the SF-36 quality index physical scores of the patient group with MPS (RP, p=0.004; BP, p=0.000; and PCS, p=0.002) were significantly lower than those of the control group. Besides that, vitamin D deficiency along with MPS can have negative consequences on quality of life (31,32). Feng et al. (31) conducted a study on 686 patients between the ages of 60 and 89 years. They showed that PF, RP, BP and GH scores decreased gradually with the decrease of vitamin D in their grouping according to vitamin D levels. In addition, they showed that the group with vitamin D deficiency scored worse on SF, VT and MH, which are some of the mental health-related parameters, compared to the group with sufficient vitamin D. Similarly, in subgroup analyses, we found that SF (p=0.044), MH (p=0.026) and MCS (p=0.033) scores, which are some of the mental parameters, and GH (p=0.024) scores, which are a physical parameter, were significantly lower in the group with low vitamin D (p<0.05). These results support that vitamin D deficiency impairs the quality of life by causing deterioration in MH in patients with chronic muscle pain, as well as aggravating anxiety and depression.

Conclusion

Vitamin D deficiency was found to be more common in MPS patients compared to the normal population. And this was found to have a significant effect on depression and anxiety and negatively alter the quality of life, especially by influencing cognitive functions.

Ethics

Ethics Committee Approval: This study was approved by the Ethical Committee Faculty of Medicine Namık Kemal University (date: 25.05.20I7, number: 2017154105/03).

Informed Consent: Consent was obtained from the volunteers.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: İ.C., A.B.S., Design: İ.C., A.B.S., Data Collection or Processing: İ.C., A.Y.G., Analysis or Interpretation: İ.C., A.Y.G., Literature Search: İ.C., A.B.S., Writing: İ.C., Manuscript review and revisation: A.B.S., A.Y.G.

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