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Orjinal Araştırma / Original Article

Determining the Relationship between Disease Stage, Duration of Admission Time, and Vitamin D Levels in Patients with Idiopathic Facial Paralysis

İdiyopatik Fasiyal Paralizi Hastalarında Hastalık Evresi, Başvuru Süresi ve D Vitamini Düzeyleri Arasındaki İlişkinin Belirlenmesi

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Abstract

Objective: To determine the relationship between disease stage, hospital admission time, and vitamin D levels in patients with Idiopathic Facial Paralysis (Bell's palsy).

Material and Method: The hospital registry system was scanned retrospectively and 52 patients diagnosed with idiopathic facial paralysis were included in the study. A control group was formed with 50 participants matched in terms of age and gender. Disease stage was determined according to the House-Brackmann Scale. Clinical and demographic data, vitamin D levels, and disease stages of the patients were recorded. Disease stage, duration of admission, and vitamin D levels were compared among patients. The patients and the control group were compared in terms of vitamin D levels.

Results: There was no statistically significant difference between the groups in terms of age and gender. The mean Vitamin D level of the idiopathic facial paralysis group was found to be lower than the control group. There was a statistically significant difference between the duration of admission and the disease stage. The duration of admission for patients with stage 2 was found to be higher than those with stage 5-6. When analyzed in terms of Vitamin D, it was observed that the average Vitamin D level of Grade 2 was statistically significantly higher than Grade 4 and 5-6, also, it was observed that the mean Vitamin D level of Grade 3 was statistically significantly higher than Grade 5-6.

Conclusion: According to our study results, we determined that vitamin D levels may be associated with development of the disease and disease prognosis. Also, we found that increased disease severity significantly shortened the duration of admission.

Keywords: Idiopathic facial paralysis, vitamin D, admission time

Öz

Amaç: İdiyopatik fasial paralizi (Bell felci) olan hastalarda;hastalık evresi, hastaneye başvuru süresi ve D vitamini düzeyleri arasındaki ilişkiyi belirlemek.

Gereç ve Yöntem: Hastane kayıt sistemi geriye dönük olarak taranarak idiyopatik fasial paralizi tanısı alan 52 hasta çalışmaya dahil edildi. Yaş ve cinsiyet açısından eşleştirilmiş 50 katılımcıdan oluşan kontrol grubu oluşturuldu. Hastalık evresi House-Brackmann Ölçeğine göre belirlendi. Hastaların klinik ve demografik verileri, D vitamini düzeyleri ve hastalık evreleri kaydedildi. Hasta grubu kendi içerisinde;hastalık evresi, başvuru süresi ve D vitamini düzeyleri açısından karşılaştırıldı. Hasta ve kontrol grubu D vitamini düzeyleri açısından karşılaştırıldı.

Bulgular: Her iki grup arasında yaş ve cinsiyet açısından istatistiksel olarak anlamlı bir fark yoktu. İdiyopatik fasiyal paralizi grubunun ortalama D vitamini düzeyi, kontrol grubuna göre daha düşük olarak saptandı. Başvuru süresi ile hastalık evresi arasında istatistiksel olarak anlamlı bir fark saptandı. Evre 2'deki hastaların başvuru süresi, evre 5-6'da olanlara göre daha uzundu. D vitamini seviyeleri açısından incelediğimizde, ortalama D vitamini seviyesinin Evre 2'deki hastaların Evre 4 ve Evre 5-6'daki hastalara göre istatistiksel olarak anlamlı derecede yüksek olduğu, ayrıca Evre 3'teki hastaların ortalama D Vitamini düzeyinin Evre 5-6'daki hastalara göre istatistiksel olarak anlamlı derecede yüksek olduğu saptandı.

Sonuç: D vitamini düzeylerinin idiopatik fasiyal paralizi gelişimi ve hastalığın prognozu ile ilişkili olabileceğini, hastalık şiddetinin artışı ile beraber hastaneye başvuru süresinin önemli ölçüde kısaldığını belirledik.

Anahtar Kelimeler: İdiyopatik fasiyal paralizi, D vitamini, başvuru süresi

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INTRODUCTION

Facial paralysis can occur due to congenital, traumatic, infectious, neoplastic, and metabolic reasons. It is divided into two as central and peripheral facial paralysis.[1] Its incidence is reported as 20-25/10000, and its frequency increases with age.[2] Acute idiopathic facial palsy (Bell's palsy), which has a relatively better prognosis, constitutes the majority of facial palsy cases. Bell's palsy (BP) is an acute partial or complete paralysis of the facial nerve, usually characterized by unilateral involvement of the face and it accounts for 60-70% of all facial paralysis.[3]

Bell's palsy diagnostic criteria were defined by Taverner and are still valid today: [4] 1) All muscle groups on one side of the face should have paralysis. 2) Must have a sudden onset. 3) There should be no central nervous system findings. 4) There should be no symptoms of cerebellopontine angle or ear diseases. In addition to these, disturbances in the sense of taste, pain spreading to the postauricular region, and numbness in the face are other symptoms that may accompany.[5]

Although BP which is mostly seen in adults, is not life-threatening, it can have devastating effects on the mood and quality of life of the patient.[6] Therefore, BP treatment, which includes conventional pharmacological treatment, physical therapy, and surgical options, may require a complicated multidisciplinary approach.[7]

Previous studies have focused on many prognostic factors such as age, accompanying pain, diabetes, initial grade of the palsy, or electrophysiological test results.[8] Vitamin D is a key hormone that regulates calcium and phosphorus metabolism. Recent studies show that vitamin D deficiency is associated with a wide variety of disorders such as multiple sclerosis, hypertension, cardiometabolic diseases, and diabetes.[9] The relationship between vitamin D and peripheral nerve health is also started to gain more attention.[10]

Also, the duration of facial paralysis, together with the age of the patient, can play a predictive role in prognosis. Therefore, the time of admission to the hospital is very important, especially in terms of treatment approach and prognosis.[1]

For these reasons, in this study, we aimed to determine the relationship between disease stage, hospital admission time, and vitamin D levels in patients with Bell's palsy.

MATERIAL AND METHOD

52 patients over the age of 18 who applied to Hatay Mustafa Kemal University Neurology Outpatient Clinic in 2018-2020 and were diagnosed with Bell's Palsy were recorded by scanning retrospectively through Hospital information management system and included to the study. Neurological examinations of the patients were normal except for facial paralysis. The patients had no otological findings such as hearing loss or parotid pathology. Cranial imagings of the patients were normal. Clinical and demographic characteristics, vitamin D levels, and disease stages of the patients were recorded. House Brackmann (HB) grading system was used for staging patients with facial paralysis.[11] According to the HB grading system, patients were classified as:

- Grade 1: Normal,
- Grade 2: Mild dysfunction,
- Grade 3: Moderate dysfunction,
- Grade 4: Moderately-Severe dysfunction,
- Grade 5: Severe dysfunction,
- Grade 6: Total paralysis

A control group was formed with 50 sex and age-matched participants who applied with headache in 2018-2020. The demographic data and vitamin D levels of the control group were scanned retrospectively and recorded.

Disease stage, duration of admission, and vitamin D levels were compared among patients. The patients and the control group were compared in terms of vitamin D levels.

We determined the following as the exclusion criteria of the study: Any disease that can impair vitamin D metabolism, use of drugs that can alter the level of vitamin D, central and peripheral nervous system diseases, liver, kidney, and heart diseases, pregnancy, malignancies and patients who received vitamin D treatment before. Patients with conditions that could cause facial paralysis, such as head and neck tumors or head trauma, were also excluded.

This study was approved by the Clinical Study Ethics Committee of Mustafa Kemal University Tayfur Ata Sökmen Medical Faculty (Approval no: 22, Date: 11/03/2021).

Statistical analysis

Descriptive statistics were presented as arithmetic mean±standard deviation for continuous variables, and as frequency and percentage for categorical variables. The compliance of continuous variables to normal distribution was checked with the Shapiro Wilk test. If the data conformed to a normal distribution, in terms of continuous variables, Bell's Palsy and the control group averages were compared using the Independent Samples t-Test, if not, the Mann Whitney-U Test was used. In terms of categorical variables, the Chi-Square Test was used to compare Bell's Palsy and control group percentages. One-way analysis of variance was used to compare grade group averages in terms of continuous variables if the data conformed to a normal distribution, and Kruskal Wallis Test was used if they did not. If it was found that at least one of the grade group averages was different from the others, post hoc analyzes were performed by applying Bonferroni corrected Mann Whitney-U Tests to determine which groups caused the difference. Statistical significance was accepted as $p < 0.05$. SPSS 21 statistical package program was used for all statistical analyzes.

RESULTS

52 BP patients were enrolled in this study. 25 of the 52 patients were male. The control group consisted of 50 participants and 25 were men. While the mean age was 42.25±16.09 in the BP group, it was 40.76±14.52 in the control group. There was no statistically significant difference between the two groups in terms of age and gender (**Table 1**).

Table 1. Demographic Features

		Group		p
		Bell's Palsy	Control	
Gender	Male	25 (48.1%)	25 (50.0%)	0.846*
	Female	27 (51.9%)	25 (50.0%)	
Age		42.25±16.09	40.76±14.52	0.705**

*: Pearson's chi-squared test, **: Mann–Whitney U test

There is a statistically significant difference between the BP and control groups in terms of Vitamin D level. The average Vitamin D level of the BP group was observed to be lower than the control group (p: 0.007) (**Table 2**).

Table 2. Vitamin D Levels

	Group		p
	Bell's Palsy	Control	
Vitamin D	14.37±7.60	18.84±9.38	0.007*

*: Mann–Whitney U test

The distribution of the number of patients in each group according to the HB grading system were shown in **Table 3**. Since there was only one patient in stage 6, stage 5 and stage 6 were combined and shown as a single group in Table 3. When the patient group was evaluated within itself, a statistically significant difference was found between vitamin D levels, hospital admission time, and disease stages. According to the post hoc analysis made to determine which groups this difference originates from;It was observed that the mean admission time in Grade 2 was statistically significantly higher than Grade 5-6, and the other grades were similar. When analyzed in terms of Vitamin D, it was observed that the mean vitamin D level of Grade 2 was statistically significantly higher than Grade 4 and 5-6, and also the mean vitamin D level of Grade 3 was statistically significantly higher than Grade 5-6's (**Table 3**).

Table 3. Admission Time and Vitamin D levels of Bell's Palsy Group

	Grade				
	Grade 2 n=9 (17.3%)	Grade 3 n=21 (40.4%)	Grade 4 n=14 (26.9%)	Grade 5-6 n=8 (15.4%)	p
Admission time (days)	3.22±1.72^{a}	2.76±1.61^{ab}	2.07±0.73^{ab}	1.38±0.52^{b}	0.016*
Vitamin D (ng/ml)	19.33±9.32^{a}	16.43±6.92^{ab}	11.43±6.11^{bc}	8.53±3.82^{c}	0.002*

n: Number of patients, *: Kruskal Wallis Test

DISCUSSION

More than half of peripheral facial paralysis is Bell's palsy. There is a sudden onset of unilateral paresis/paralysis in all mimic muscles. There are no other central nervous system symptoms. Lesion onset varies from a few hours to a few days. Although it has a benign course, it may cause concerns about sequelae in patients. Although its pathophysiology is not known precisely, it can be caused by vascular or viral causes (Herpes simplex virus, Varicella zoster virus, Cytomegalovirus, Epstein Barr virus).[12]

Female predominance in the BP patient group is mentioned in the literature. Kang et al.[13] reported that 54.8% of 250 BP patients were female and 45.2 were male. On the other hand, Garanhani et al. drew attention to the superiority of female gender with a rate of 60.9% in BP patients diagnosed between 1999 and 2003.[14] However, Rowlands et al.[15] showed that there was no significant difference in terms of gender in 2473 Bell's palsy patients. In our study, we found no statistically significant difference in gender in the BP patient group.

Prognostic determinants for Bell's palsy have been investigated in many previous studies. Age, diabetes mellitus, neutrophil-lymphocyte ratio, hyperacusis, decreased sense of taste, severe paralysis, severe degeneration in electrophysiological findings, and severe axonal damage are the features that are investigated as prognostic factors.[11,12]

The relationship between vitamin D level, admission time to the hospital, and BP has been little studied in the literature. It is now well known that vitamin D plays a role in regulating neurotrophin levels. Studies have shown electrophysiologically that ergocalciferol (vitamin D2) and cholecalciferol (vitamin D3) are important in the protection and regeneration of axons and also induce nerve recovery.[16-18] Vitamin D is also known to be involved in the regulation of genes in the myelinization process.[19] In an animal model of traumatic facial nerve injury, Montava et al. demonstrated the positive effect of vitamin D3 on myelinization and recovery.[20] Considering all these studies, we can say that vitamin D plays a key role in the nerve myelinization process and regeneration.

In the study of Ocak et al.[8] although the average vitamin D levels were found to be lower in the BP group compared to the control group, no statistically significant difference was found. Therefore, they concluded that vitamin D levels had no effect on the onset of the disease.In our study, when compared with the control group, average vitamin D levels were found to be statistically significantly lower in the BP group. This result indicates that there may be regional differences in vitamin D levels and vitamin D level may be a facilitating factor in the development of BP.

When the patient group was evaluated within itself, a statistically significant difference was found between vitamin D levels and disease grade. It was observed that the mean vitamin D level of Grade 2 was statistically significantly higher than Grade 4 and 5-6, and also the mean vitamin D level of Grade 3 was statistically significantly higher than Grade 5-6's. These results suggested that vitamin D may have a role on the severity of BP.

Paralysis duration and disease severity are effective on prognosis in BP patients. Therefore, the period from the onset of the symptoms to the patient's application to the health institution is vital. Savettieri et al. showed that BP patients with mild symptoms or degree of paralysis do not admit to the hospital.[21] Lee et al.[22] Stated that the early admission of BP patients to the health institution is physically and psychologically beneficial. Also, Hong et al.[23] showed that early treatment was quite effective in 40 patients with Bell palsy. Kang et al.[13] reported an average of 12.5 days in

female patients and 9.9 days in male patients in their study. In pediatric patients with Bell's paralysis symptoms, this period decreased to an average of 2 days in the study conducted by Chen et al.[24] In our study, the admission time according to grades was determined as follows: Grade 2: 3.22±1.72 days, Grade 3: 2.76±1.61 days, Grade 4: 2.07±0.73 days, Grade 5-6: 1.38±0.52 days (p: 0.016), and it was observed that the mean admission time in Grade 2 was statistically significantly higher than Grade 5-6, and the other grades were similar. In conclusion, it is noteworthy that as the grade increases, the average duration of admission decreases gradually and this result is consistent with the study of Özdemir et al.[1]

The limitations of the study can be stated as: The study is designed retrospectively and the number of participants is low. The relationship between vitamin D levels and the prognosis after BP treatment has not been evaluated. Not including electrophysiological examinations in the evaluation. To our knowledge, this is the first study directly evaluating both the relationship of vitamin D levels and admission time to the hospital with the severity of BP.

CONCLUSION

According to our results, we think that there may be a relationship between vitamin D levels and the development of BP. Also, considering the relationship between low vitamin D levels and disease severity, we can suggest that BP patients should definitely be checked about their vitamin D levels and be treated if their deficiency is detected. Also, we found that increased disease severity significantly shortened the duration of admission. Considering the major effect of early treatment on improvement in BP patients, we would like to say that it is important to increase awareness in order to accelerate the admission of low-grade patients to health institutions.
Future studies are needed to focus on this issue, to be designed prospectively, and to include more participants.

ETHICAL DECLARATIONS

Ethics Committee Approval: This study was approved by the Clinical Study Ethics Committee of Mustafa Kemal University Tayfur Ata Sökmen Medical Faculty (Approval no: 22, Date: 11/03/2021).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

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