



The Relationship Between Plantar Fasciitis and Knee Osteoarthritis

Plantar Fasiit ve Diz Osteoartriti Arasındaki İlişki

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Abstract

Objective: In this study, we aimed to determine the prevalence and staging of gonarthrosis in patients diagnosed with plantar fasciitis. We also evaluated the coexistence of these two conditions, which may share common etiopathogenetic factors.

Method: A total of 171 participants, including 57 patients diagnosed with plantar fasciitis and 114 healthy controls, were included in the study. The diagnosis of plantar fasciitis in patients aged 30-70 was based on symptoms such as prominent heel pain during the first steps in the morning, tenderness upon palpation of the medial calcaneal tubercle, and a positive Windlass test, with radiological evaluation for the presence of calcaneal spurs. Individuals with lower extremity pathologies, previous surgical history, rheumatologic diseases, neurological or vascular causes of heel pain, and a body mass index ≥ 30 were excluded. The control group consisted of individuals without plantar fasciitis, with similar age and gender distribution. All participants underwent standing anteroposterior and lateral knee radiographs, and gonarthrosis staging was performed using the Kellgren-Lawrence classification.

Results: A total of 57 patients diagnosed with plantar fasciitis and 114 control individuals were included in the study. Upon examining the demographic data of the patients, no statistically significant differences were found between the groups. The frequency of radiological knee osteoarthritis was 77.2% in the patient group and 58.8% in the control group, with the patient group showing a significantly higher prevalence ($p=0.017$). Furthermore, when evaluating the stages of osteoarthritis, the proportion of advanced-stage osteoarthritis was significantly higher in the patient group compared to the control group ($p=0.020$).

Öz

Amaç: Bu çalışmada, plantar fasiit tanılı hastalarda gonartroz görülme oranını ve evrelemesini belirlemeyi amaçladık. Etiyopatogenezinde ortak faktörler bulunabilecek bu iki hastalığın birliktelik gösterme durumunu değerlendirdik.

Yöntem: Plantar fasiit tanısı olan 57 hasta ve 114 sağlıklı kontrol bireyi olmak üzere toplam 171 kişi çalışmaya dahil edildi. Otuz-70 yaş aralığındaki hastaların plantar fasiit tanısı, sabah ilk adımlarda belirginleşen topuk altı ağrısı, medial kalkaneal tübere palpasyonla hassasiyet ve Windlass testi pozitifliği gibi bulgulara dayanarak konulmuş, kalkaneal spur varlığı radyolojik olarak değerlendirilmiştir. Plantar fasiit dışında alt ekstremitte patolojisi, geçirilmiş cerrahi öyküsü, romatolojik hastalık, nörolojik veya vasküler nedenli topuk ağrısı olanlar ve vücut kitle indeksi ≥ 30 bireyler dışlanmıştır. Kontrol grubunda, plantar fasiit tanısı olmayan, yaş ve cinsiyet dağılımı benzer bireyler yer almıştır. Tüm hastalara ayakta yük vererek diz ön-yan grafileri çekilmiş ve Kellgren-Lawrence sınıflaması ile gonartroz evrelemesi yapılarak gruplar arasında karşılaştırılmıştır.

Bulgular: Plantar fasiit tanısı olan 57 hasta ve 114 kontrol bireyi çalışmaya dahil edildi. Hasta demografik verileri incelendiğinde, yaş, cinsiyet dağılımı ve vücut kitle indeksi açısından gruplar arasında istatistiksel olarak anlamlı bir fark bulunmadı. Radyolojik diz osteoartrit sıklığı olgu grubunda %77,2, kontrol grubunda ise %58,8 olup, olgu grubunda anlamlı olarak daha yüksek bulundu ($p=0,017$). Ayrıca, artroz evreleri değerlendirildiğinde, olgu grubunda ileri evre artroz oranı kontrol grubuna göre anlamlı olarak daha yüksekti ($p=0,020$).



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Abstract

Conclusion: This finding suggests that knee osteoarthritis is more frequently observed in individuals diagnosed with plantar fasciitis. This result carries an important message for clinical practice, indicating that the assessment of knee joint symptoms in patients with plantar fasciitis should be considered, and, when necessary, early intervention may help improve quality of life and prevent progressive joint damage.

Keywords: Heel pain, knee osteoarthritis, plantar fasciitis

Öz

Sonuç: Plantar fasiit tanısı alan bireylerde diz osteoartritinin daha sık görüldüğünü göstermektedir. Bu bulgu, klinik pratiğe önemli bir mesaj taşımakta olup, plantar fasiitli hastaların değerlendirilmesinde diz eklemi semptomlarının dikkate alınmasının ve gerektiğinde erken müdahalenin yaşam kalitesini artırabileceği ve ilerleyici eklem hasarını önlemeye katkı sağlayabileceği düşünülmektedir.

Anahtar kelimeler: Diz osteoartriti, plantar fasiit, topuk ağrısı

Introduction

Plantar fasciitis is one of the most common causes of heel pain. It is a condition that becomes more pronounced with the first steps in the morning and negatively impacts daily living activities (1). The etiology of the disease involves excessive loading of the plantar fascia, microtrauma, and biomechanical disorders (2,3). Similarly, gonarthrosis (knee osteoarthritis) is a frequently encountered degenerative joint disease in the weight-bearing joints of the lower extremities. Gonarthrosis leads to pain, restricted mobility, and loss of function, significantly affecting the quality of life of patients (4,5).

Lower extremity alignment disorders may play a common role in the pathogenesis of both plantar fasciitis and gonarthrosis. Specifically, changes in mechanical load distribution, such as varus or valgus alignment, may increase the stress on the plantar fascia and knee joint. This may increase the likelihood of co-occurrence of both diseases. However, studies on the coexistence of plantar fasciitis and gonarthrosis in the literature are limited, and there is insufficient information regarding the common mechanisms of these two conditions.

In this study, we aimed to determine the prevalence of gonarthrosis in patients diagnosed with plantar fasciitis, evaluate the potential effects of lower extremity alignment disorders on the coexistence of these two diseases, and investigate the impact of the presence of gonarthrosis on the success of plantar fasciitis treatment.

Materials and Methods

Study Design

This study is a single-center retrospective comparative observational study comparing the prevalence of gonarthrosis in patients diagnosed with plantar fasciitis and a healthy control group. The study was conducted in accordance with the World Medical Association's

Declaration of Helsinki. Patients were included from our medical practice between July 2024 and December 2024. After obtaining informed consent, patient data were extracted from our medical records and included in the study. The study approved by University of Health Sciences Turkey, İstanbul Bağcilar Training and Research Hospital Clinical Research Ethics Committee (approval number: 2024/03/11/035, date: 22.03.2024).

Patients who were definitively diagnosed with plantar fasciitis through clinical evaluation were included in the study. Individuals aged between 30 and 70 years were enrolled. The following typical examination findings were used to diagnose plantar fasciitis: Heel pain, particularly noticeable with the first steps in the morning or after standing up following prolonged sitting, tenderness and pain on palpation of the medial calcaneal tuberosity along the plantar fascia, and increased pain during dorsiflexion of the toes (positive Windlass test) (2,3). When necessary, radiological evaluation was used to support the diagnosis of plantar fasciitis, considering the presence of a calcaneal spur (heel spur) (Figure 1). Patients with additional foot or lower extremity pathologies other than plantar fasciitis were excluded from this study. Furthermore, individuals with congenital or acquired foot deformities, those with a history of lower extremity surgery, and those with a rheumatological disease were not included in the study. Additionally, patients with heel pain of neurological or vascular origin and individuals without typical examination findings supporting the diagnosis of plantar fasciitis were also excluded. Lastly, individuals with a body mass index above 30 were excluded from the study. These criteria were established to ensure the homogeneity of the study population, minimize the effects of confounding factors, and enhance the reliability of the results.

The control group consisted of individuals without a diagnosis of plantar fasciitis who were matched to the plantar fasciitis group in terms of age and sex distribution.



Figure 1. Calcaneal spur

In this study, patients diagnosed with plantar fasciitis in the outpatient clinic were evaluated for the presence of knee osteoarthritis using knee radiographs that were already available in their medical records. These knee radiographs were obtained concurrently during routine foot and ankle radiographic examinations performed to evaluate calcaneal spur, with the knee included within the cassette; therefore, no additional radiation exposure was required for the purposes of this study.

The control group was selected from patients who presented to the emergency department with minor knee trauma and underwent knee radiography for clinical indications. Individuals with acute fractures, dislocations, inflammatory joint disease, previous knee surgery, or chronic knee pain were excluded. The control group was not selected according to the presence or absence of radiographic knee osteoarthritis. All patients had provided informed consent for the use of their medical records for research purposes.

Radiographic Classification of Knee Osteoarthritis

Patients were evaluated through weight-bearing anteroposterior and lateral knee radiographs, and the presence of osteoarthritis was determined using the Kellgren-Lawrence classification. The Kellgren-Lawrence classification is a widely used method for grading knee osteoarthritis and consists of four stages. Stage 0 indicates

the absence of osteoarthritis findings, with no signs of joint disease observed. Stage 1 is characterized by minimal osteoarthritic changes, typically showing small osteophytes or mild cartilage thinning. Stage 2 is associated with moderate osteoarthritis, with prominent findings such as osteophytes, cartilage thinning, joint space narrowing, and subchondral sclerosis. Stage 3 indicates moderate osteoarthritis, characterized by multiple osteophytes, definite joint space narrowing, and subchondral sclerosis. Stage 4 represents severe osteoarthritis, with marked joint space narrowing, large osteophytes, severe subchondral sclerosis, and bony deformity. Due to the limited number of patients with Kellgren-Lawrence grade 4 osteoarthritis, stages 3 and 4 were combined for statistical analysis (Figure 2) (6). Based on the X-ray findings, the osteoarthritis stage for each patient's knee was determined, and these findings were compared between the plantar fasciitis group and the control group.

Sample Size and Matching

Power analysis was conducted based on an average effect size of 0.5 calculated across all measures. As a result of this analysis, a sample size of 80 participants was determined, consisting of 40 patients diagnosed with plantar fasciitis and 40 individuals without a diagnosis of plantar fasciitis, forming a matched control group. This sample size was chosen to provide sufficient statistical power to detect meaningful differences between the groups. Matching the patient and control groups based on fundamental demographic factors such as age and gender enhances the robustness of the study. By using this sample size, the goal is to obtain reliable and generalizable findings regarding the relationship between plantar fasciitis and knee osteoarthritis.

Statistical Analysis

Descriptive statistics for the data included mean, standard deviation, median, minimum, maximum, frequency, and percentage values. The distribution of variables was assessed using the Kolmogorov-Smirnov and Shapiro-Wilk tests. The Mann-Whitney U test was used for the analysis of independent quantitative data. The Wilcoxon test was used for the analysis of dependent quantitative data. The chi-square test was employed for the analysis of independent categorical data. All analyses were performed using SPSS 27.0 software.

Results

A total of 57 patients diagnosed with plantar fasciitis and 114 control patients were included in the study. The



Figure 2. Kellgren-Lawrence classification (a) Stage 0 (b) Stage 1 (c) Stage 2 (d) Stage 3

demographic information of the patients is reported in Table 1. The demographic data did not show any statistically significant differences and exhibited a normal distribution.

The presence and staging of osteoarthritis in the patient and control groups are presented in Table 2.

The osteoarthritis prevalence was significantly higher in the case group compared to the control group ($p=0.017$) (Table 2, Figure 3). Additionally, the osteoarthritis stage was significantly higher in the case group than in the control group ($p=0.020$) (Table 2, Figure 4).

Discussion

In this study, we investigated the prevalence of gonarthrosis in patients diagnosed with plantar fasciitis, and the results revealed that radiographic knee osteoarthritis was more frequently observed among individuals with plantar fasciitis compared with the control group. This finding suggests that there may be an association between plantar fasciitis and gonarthrosis.

Table 1. Characteristics of the study group (mean \pm standard deviation)

	Patient group (n=57)	Control group (n=114)
Mean age, y	46.7 \pm 10.6	43.2 \pm 12.3
Sex		
Female	46	81
Male	11	33
Mean BMI (kg)	24.1 \pm 3.3	24.9 \pm 2.4

BMI: Body mass index

Table 2. Presence and staging of osteoarthritis (mean, percentage)

	Patient group (n=57)	Control group (n=114)
Osteoarthritis		
(-)	13 22.8%	47 41.2%
(+)	44 77.2%	67 58.8%
Stage		
0	13 22.8%	47 41.2%
1	6 10.5%	20 17.5%
2	22 38.6%	32 28.1%
3 & 4	16 28.1%	15 13.2%

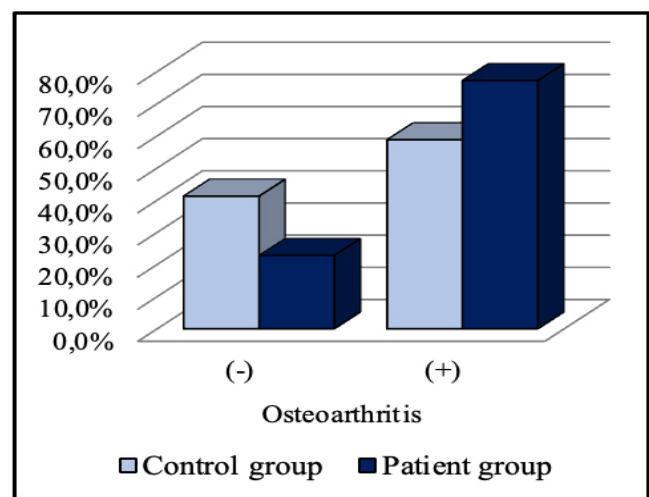


Figure 3. Osteoarthritis prevalence in the control and case groups

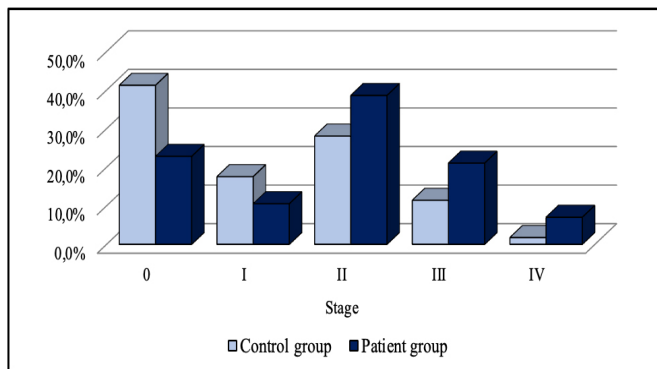


Figure 4. Osteoarthritis Stage distribution in the control and case groups

Similarly, the literature indicates that plantar fasciitis is frequently observed in patients with knee osteoarthritis, and that restricted ankle dorsiflexion is a significant risk factor for the development of plantar fasciitis (7). Our findings support this study. It is believed that restricted ankle dorsiflexion may increase biomechanical loading, creating excessive tension on the plantar fascia, which could play a role in the development of plantar fasciitis (7). In this context, rehabilitation programs aimed at increasing ankle range of motion may be important for preventing the development of plantar fasciitis or supporting the treatment process in patients with knee osteoarthritis. In a study where the plantar fascia was evaluated using ultrasonography in patients diagnosed with gonarthrosis, findings consistent with plantar fasciitis, such as thickening of the plantar fascia and increased echogenicity, were observed (8). Additionally, obesity is known to be a significant risk factor for both the development of plantar fasciitis and gonarthrosis (9). In our study, we excluded obese patients from the study groups, thereby preventing this risk factor from influencing the results of the study.

It has been shown that foot pathologies lead to symptoms that alter individuals' walking patterns, and these biomechanical changes increase the risk of developing knee osteoarthritis (10). Pronation or abnormal flatfoot gait is associated with many painful foot conditions, including plantar fasciitis (11-13). This condition has been suggested to increase rotational stress in the knee joint, according to several studies (14). The reason for this is the tight biomechanical connection between the movement of the rear foot and the tibia (15). As a result, abnormal movements in the foot can affect the knee joint. Over time, this abnormal stress may lead to the development of osteoarthritis in the knee joint. Specifically, a foot that is

pronated during walking has been shown to be associated with knee pain and medial gonarthrosis of the knee (14). In patients diagnosed with plantar fasciitis, a shortened stance phase has been shown to affect knee biomechanics (16). In individuals with gonarthrosis, foot symptoms have been noted to increase the risk of worsening knee pain over the following 4 years, although they were not associated with the progression of osteoarthritis. These results are thought to be due to the short follow-up period in the related study for osteoarthritis progression (17).

The possible mechanisms underlying the high prevalence observed in our study need to be addressed. In individuals with plantar fasciitis, pain and functional loss in the sole of the foot can lead to changes in walking patterns. Such compensatory mechanisms may increase the load on the knee joint and contribute to the development of gonarthrosis in the long term. Additionally, the sedentary lifestyle commonly observed in individuals with plantar fasciitis may also increase the risk of gonarthrosis. There are a limited number of studies in the literature regarding the relationship between plantar fasciitis and gonarthrosis. However, our findings contribute to the literature by suggesting a potential link between these two conditions. Our study emphasizes the need for further research to explore this relationship in greater detail. In particular, prospective cohort studies and biomechanical analyses are crucial for better understanding the causality of this relationship.

Study Limitations

This study has several limitations. Gonarthrosis was assessed radiologically, but symptomatic scoring of the patients was not performed. Plantar fasciitis can cause symptoms of varying severity in patients, and the intensity of these symptoms may affect their relationship with gonarthrosis. No classification of symptom severity was made in this study. Future prospective cohort studies with larger groups will be valuable in guiding further research in this regard.

Conclusion

In conclusion, this study demonstrated an association between plantar fasciitis and a higher prevalence of radiographic knee osteoarthritis. Because of the retrospective observational design, these findings should be interpreted as an association rather than a causal relationship. This finding carries an important message for clinical practice. Attention to knee joint symptoms during

the evaluation of patients with plantar fasciitis and, if necessary, taking appropriate early measures, can improve quality of life and prevent progressive joint damage.

Ethics

Ethics Committee Approval: The study approved by University of Health Sciences Turkey, İstanbul Bağcilar Training and Research Hospital Clinical Research Ethics Committee (approval number: 2024/03/11/035, date: 22.03.2024).

Informed Consent: Written informed consent was obtained from all participants who participated in this study.

Footnotes

Authorship Contributions

Surgical and Medical Practices: E.C.B., A.Ş., S.B., Concept: E.C.B., S.Ç., A.A., Design: E.C.B., S.Ç., A.A., Data Collection or Processing: E.C.B., A.Ş., S.B., Analysis or Interpretation: E.C.B., A.A., A.Ş., S.B., Literature Search: E.C.B., S.Ç., A.A., Writing: E.C.B.

Conflict of Interest: No conflict of interest was declared by the authors.

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