Journal of Advances in Medical and Biomedical Research | ISSN:2676-6264

Patellar tendon thickness in patients with psoriasis: A Case-Control Study

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Article Info

Received: 2026/03/09;

Accepted: 2026/06/22;

Published Online: 2026/06/29;

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How to Cite This Article:

Davoodi N, Kianmehr N, Haghighi A, Goodarzi A, Gholamlou A, Sepyani A. Patellar tendon thickness in patients with psoriasis: A Case-Control Study. J Adv Med Biomed Res 2026; 34(3):269-273.

ABSTRACT

Background & Objective: Early detection of joint involvement, often presenting as enthesitis, is vital in psoriasis to prevent irreversible damage. This study aimed to assess patellar tendon changes using ultrasonography in patients with psoriasis and compare these findings with those of healthy controls.

Materials & Methods: In this case-control study, 30 patients with cutaneous psoriasis were enrolled as the case group, and 30 healthy controls who met the inclusion and exclusion criteria were included. Ultrasound examination of the patellar tendon thickness was performed in the distal and proximal areas of both knees. Statistical analysis was performed using SPSS version 26, with a significance level set at $P < 0.05$.

Results: There was no significant difference in the mean thickness of the proximal patellar tendon in the dominant knee (p=0.911) and the non-dominant knee (p=0.337) when comparing the psoriasis and the control groups. Similarly, there was no statistically significant difference between the two groups in the measurement of the distal area of the tendon in the dominant limb (p=0.154) and non-dominant limb (p=0.073).

Conclusion: The findings indicate that the thickness of the proximal and distal patellar tendons in the both dominant limb and non-dominant limbs does not differ significantly between patients with cutaneous psoriasis and healthy controls.

Keywords: Patellar ligament, Psoriasis, Psoriatic arthritis, Ultrasonography

1. Introduction

Psoriasis is a common chronic inflammatory disease that affects the skin. In general, its prevalence in the world population is close to 2% (1, 2). Psoriasis has a complex etiology including genetics and extrinsic factors. The most prevalent form of this disease is psoriasis vulgaris, which presents as erythematous, scaly plaques with clear borders and typically affects the scalp, elbows, knees, sacral area, hands, and feet. Psoriatic arthritis is a type of chronic inflammatory arthritis that affects 5-42% of individuals with psoriasis. The onset of psoriasis is generally preceded by arthritis, but in about 15% of cases, arthritis occurs prior to the skin disease (3). Psoriasis is primarily a skin condition, but it can also lead to systemic complications including articular, cardiac and renal disorders, neoplasms, and psychological conditions such as depression (4). Entheses are the primary source of inflammation in these patients, with a higher prevalence of involvement in the lower limb structures, including the calcaneal tendon, plantar aponeurosis, and the patellar tendon (which originates from the inferior pole of the patella and inserts into the tibial tuberosity) (4-5).Tendinitis is another common feature of psoriatic arthritis, usually due to involvement of the synovial tissue around the tendon (6). High-resolution ultrasound has revolutionized the diagnosis of tendon issues and enthesopathies, even in the absence of clinical signs of involvement, thereby aiding in the prevention of long-term injuries (7).

Ultrasound offers advantages such as cost-effectiveness, quicker examinations, and the ability to capture dynamic

images. It provides a noninvasive, real-time method to assess tendon characteristics, functions and abnormalities (8,9).

Musculoskeletal ultrasound is widely available and effectively detects inflammation, fluid accumulation, soft tissue lesions, tendon and enthesis disorders, as well as bone surface lesions with a sensitivity comparable to MRI (7).

A study showed that 25% of patients with cutaneous psoriasis had an increased risk of tendon or enthesic involvement compared with the general population (8). In another study by Vyas et al., the prevalence of subclinical enthesitis in people with chronic psoriasis vulgaris was significantly higher than in the control population (9). However, in another study, there was no significant difference in entheseal thickness between patients with cutaneous psoriasis and the control group (10). It seems that cutaneous psoriasis can lead to the involvement of tendons and entheses. However, studies in this case are relatively limited and contradictory results have been reported.

Therefore, the present study aimed to determine the sonographic characteristics of the patellar tendon in patients with cutaneous psoriasis without articular involvement compared with the control group.

2. Materials and Methods

Following approval from the ethics committee at Iran University of Medical Sciences (IR.IUMS.FMD.REC.1400.039), this case-control study was carried out in accordance with the ethical standards outlined in the World Medical Association (WMA) Declaration of Helsinki - Ethical Principles for Medical Research Involving Human Subjects.

All participants provided informed consent prior to their inclusion in the study. Patients diagnosed with cutaneous psoriasis who were older than 15 years of age and referred to Hazrat Rasool Akram Hospital from September 2020 to September 2021 were included in the study. Exclusion criteria included clinical manifestations of articular or enthesopathic involvement: history of musculoskeletal trauma: and receiving systemic treatment for psoriasis within the last 6 weeks, NSAIDs or glucocorticoids the last 2 weeks, and biological medication at any time. Ultrasonography of the patellar tendon was performed in all participants, including the case and control groups, by an experienced rheumatology fellow under the supervision of a rheumatologist.

Echotexture of patellar tendon including fibrillar pattern, presence of hypoechoic regions and focal thickening as well as presence of calcification or enthesophyte was evaluated between cases and controls with dynamic and linear array scanners (14 MHz). Patellar tendon thickness was measured in two areas: 6 mm distal to the patella junction and 6 mm proximal to the tibial tuberosity junction. Finally, ultrasound results were evaluated between patients and controls. After completing the checklists, their information was entered into SPSS v26. The data was analyzed using an independent t-test with a significance level of $P < 0.05$.

3. Result

The study included 60 participants (30 patients with cutaneous psoriasis as the case group and 30 healthy controls) who fulfilled both the inclusion and exclusion criteria. The average age of the participants was 41.42±15.00 years. The majority of the subjects studied (90%) had the right side as their dominant side. Other demographic characteristics including height, weight and BMI are shown in Table 1.

There was no significant difference in age, height, weight, and BMI between the two groups based on independent t-test results (P>0.05). The mean disease duration among patients with psoriasis was 14.92 ± 12.91 years, ranging from 1 to 50 years**.** Ultrasonographic examination revealed no abnormalities in tendon echotexture, with no evidence of enthesophytes or inflammatory changes. PASI scores ranged from 4 to 20**,** with a mean score of 9.03.

The comparison between different measurements in both the case and control groups revealed that the average thickness of the proximal part of the patellar tendon was 3.29 ± 0.44 mm in the case group and 3.27 ± 0.60 mm in the control group.

The thickness of the proximal patellar tendon in the dominant limb did not differ significantly between the two studied groups (p=0.911). Also, the average thickness of the distal part of the patellar tendon in the dominant limb in the case group (3.59 ± 0.63 mm) did not show a statistically significant difference compared to the control group (3.39 ± 0.44 mm) (p=0.154). Similarly, the thickness of the patellar tendon in the proximal (p=0.337) and distal (p=0.073) parts of the non-dominant limbs was not significantly different between the two groups (Table 2).

Table 1. Demographic characteristics of the participants.

	Total (n=60)	Control (n=30)	Case (n=30)	P value
Age (year)	41.42±15.00	38.87±12.71	43.97±16.82	0.190
Weight (kg)	79.15±17.25	76.50±14.54	81.80±19.92	0.237
Height (cm)	169.8±9.85	170.43±10.35	169.17±9.45	0.623
BMI (kg/m^2)	27.46±5.53	26.36±4.66	28.55±6.17	0.126

Note: BMI: Body mass index

Table 2. Comparison of patellar tendon thickness measurements in two groups.

The thickness of the patellar tendon (mm)		Control (n=30)	Case (n=30)	p
Dominant limb	Proximal part	3.27±0.60	3.29±0.44	0.911
	Distal part	3.39±0.44	3.59±0.63	0.154
Non-dominant limb	Proximal part	3.44±0.38	3.58±0.68	0.337
	Distal part	3.32±0.51	3.10±0.42	0.073

4. Discussion

In this study, the findings indicated that there was no significant difference between patients with psoriasis and healthy controls in terms of the thickness of the distal or proximal parts of the patellar tendon or any signs of echotexture abnormalities or presence of enthesophyte. The dominance of limbs also had no effect on the results. From an ultrasonographic point of view, tendon thickening in the early stages of the disease on ultrasound is attributed to disruption of the normal fibrillar structure (11). It has been demonstrated that patellar tendon thickening is one of the most common musculoskeletal manifestations in patients with psoriasis, with approximately 66% of these patients exhibiting an increased patellar tendon thickness (≥4 mm) (12). In a study by Graceffa et al. (10), patellar tendon thickness was increased in psoriatic arthritis, but no significant difference was observed between cutaneous psoriasis and healthy subjects, consistent with the findings of the present study.

In particular, in patients with psoriasis, especially those with psoriatic arthritis, the maximum increase in tendon thickness is observed in areas of bone erosion. This feature along with the degree of calcification can indicate the relationship between tissue damage and tendon thickness (13-14). The thickening of the tendon may be caused by either edema or fibrosis. However, for determining the outcome of the tendon, follow-up examinations are necessary (15). In some studies, with long-term ultrasound follow-up, the findings showed improvement of Achilles tendinitis and retrocalcaneal bursitis after treatment, in contrast, some other studies, did not observe the tendon thickness reduction. (16, 17).

The reason we use gray scale instead of a Doppler study is that tendon thickness measurement is the most reliable method to evaluate tendon inflammation. Power Doppler has been widely used in the assessment of structures for evidence of inflammation; however, it may have some limitations in identifying inflammation in early stages of disease. Furthermore, findings such as calcification or erosion indicate chronic inflammation and irreversible damage visible in gray scale (18, 19). In Graceffa et al. study (10), the main difference between psoriasis cases with and without psoriatic arthritis was in the tuberosity of the olecranon and the proximal area of the patellar tendon, therefore, in the present study, the examination of the proximal and distal parts of the patellar tendon was considered.

The two groups did not differ significantly in age, weight, or BMI in the present study. Therefore, it can be stated that the possible confounding effect of age, weight and BMI on the obtained results was eliminated. There was no significant difference between the patient and control groups in the thickness of the proximal and distal patellar tendon. Although it was consistent with the findings of some similar studies (10), these results were different from other studies including Lewinson et al. (20), Erdem et al. (21), Gisondi et al. (22). In Erdem et al. study, MRI was used to determine the thickness of the tendon, which may be the reason for the difference of the results (21). In addition, the inconsistency may be due to the difference in the evaluation area and examination technique, as many areas including the Achilles tendon, plantar aponeurosis etc. have been investigated in previous studies. In addition to examining tendon thickness, qualitative characteristics such as power and color Doppler signal were examined in past studies, which can lead to different results. For example, recent studies by Karamanlioglu et al. and Dascălu et al. have found significantly higher MASEI scores at the patellar tendon in psoriatic patients compared to healthy controls (23, 24). It is crucial to interpret this finding with caution, as the MASEI is a composite index. Its score encompasses not only tendon thickness but also other pathological alterations, including structural abnormalities, bone erosions, and calcifications. Consequently, a high score is not a specific indicator of patellar tendon thickening as assessed in the present study. One of the strengths of the present study was the evaluation of differences in tendon thickness the dominant and non-dominant limbs, which has been less discussed in previous studies. The small sample size and the absence of power Doppler evaluation were limitations of this study. Future research with a larger sample size and comprehensive Doppler assessment is recommended.

5. Conclusion

Finally, it was found that there was no difference in the thickness of the proximal or distal patellar tendon, its echotexture, or the presence of calcification or enthesophytes in the dominant or non-dominant limb of individuals with cutaneous psoriasis compared with healthy controls.

6. Declarations

6.1 Acknowledgments

The authors would like to acknowledge the support of Hazrat Rasool Akram Hospital for providing the resources and environment necessary to complete this study. No external funding or assistance was provided for this research.

6.2 Ethical Considerations

The present study was approved by the Ethics Committee of the Faculty of Medicine, Iran University of Medical Sciences (IR.IUMS.FMD.REC.1400.039).

6.3 Authors' Contributions

Conceptualization, N.D. and N.K.; methodology, N.D., A. H. and Ah.G.; validation, A.S., A.H. and A.S.; formal analysis, Ah.G.; investigation, N.D., N. K., A.S. and Ah. G.; writing—original draft preparation, Ah.G.; writing—review and editing, N.D., A.G. and A. H.; supervision, A.S.

6.4 Conflict of Interest

The author has no conflicts of interest.

6.5 Fund or Financial Support

This study received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors

6.6 Using Artificial Intelligence Tools (AI Tools)

No artificial intelligence tools were used in the preparation of this manuscript.

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