

Musculoskeletal Ultrasonography Findings of the Plantar Fasciitis Patients

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ABSTRACT

Background with Objective: Plantar fasciitis is a common condition causing heel and arch pain and has been related with degenerative changes in the plantar fascia resulting in tissue thickening. Musculoskeletal ultrasound imaging (MSK US) is an emerging diagnostic tool which allows for dynamic visualization of tissues in real time. There are very few available studies regarding musculoskeletal ultrasonography findings in patient with plantar fasciitis. The aim of this study was to observe the musculoskeletal ultrasonographic findings of the plantar fasciitis patients.

Methods: This cross-sectional study was conducted in the Department of Physical Medicine & Rehabilitation, Dhaka Medical college hospital, Dhaka during February 2023 to March 2024. A total of 51 patients with plantar fasciitis were included in the study. Ethical clearance was obtained from the Ethical Review Committee of Dhaka Medical College Hospital. Statistical analyses of the results were obtained by using window based computer software devised with Statistical Packages for Social Sciences (SPSS-20.1).

Results: The mean age of the patients was 46.6 ± 4.3 years where majority of the patients (51.0%) were in 41-45 years age group and 27 (52.9%) patients were male. The mean VAS of the patients was 4.7 ± 0.9 , 27 (52.9%) had pain score 4 in VAS scale, 14 (27.5%) had scored 5 and 6 (11.8%) patients scored 6. The mean duration of pain of the patients was 5.1 ± 3.2 months where 19 (37.3%) had pain for 1-3 months and 17 (33.3%) patients had pain for 4-6 months. According to USG, 25 (49.0%) patients had decreased echogenicity and 6 (11.8%) had hypervascularity. Few had perifascial effusion (5.9%) and one had partial tear. The mean plantar fascia thickness of the patients was 4.7 ± 0.5 mm. The thickness was significantly more in male patients (5.1 ± 0.4 mm) than female patients (4.4 ± 0.4 mm) ($p < 0.001$).

Conclusion: Increased thickness of the plantar fascia with reduced echogenicity and hypervascularity are common ultrasonographic findings of plantar fasciitis.

KEYWORDS: plantar fasciitis, Visual Analogue Scale (VAS), musculoskeletal ultrasonography.

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INTRODUCTION

Plantar fasciitis (PFs), the most prevalent cause of inferior heel pain in adults, is thought to afflict approximately 10% of the general population. It has a self-limiting course that can be effectively treated with conservative methods in up to 90% of patients. The remaining patients, however, experience excruciating heel condition that is difficult to cure¹. Plantar

fasciitis affects all genders, although are more common in women. Heel pain is a typical complaint which worsens with weight-bearing. The most common physical finding is localized tenderness at the inferomedial portion of the calcaneal tuberosity². Plantar fasciitis has an unclear and most likely complex etiology. Many risk factors have been proposed, such as small injuries, excessive foot pronation,

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obesity, jobs involving prolonged standing and running, Achilles tendon and intrinsic foot muscle tension, and improper footwear. An extensive clinical examination is typically necessary to make the diagnosis of plantar fasciitis. Due to the chronic nature of this illness, an ultrasound examination may reveal a thickening of the fascia³. Histologically, the plantar fascia is composed of a common tendon aponeurosis for a superficial layer of intrinsic plantar foot muscles rather than a true fascial layer. As an aponeurosis, the plantar fascia, like superficial tendons, is easily visible with ultrasonic imaging. Musculoskeletal ultrasound is regarded a useful diagnostic technique for plantar fasciitis, as it provides real-time and dynamic imagery while being non-invasive, affordable, and radiation-free^{4,5}. Imaging is crucial for diagnosing, treating, and evaluating therapy outcomes. Some studies indicate that people with plantar fasciitis have thicker plantar fascia. Plain radiography, ultrasonography, and magnetic resonance imaging (MRI) are the modalities commonly used. Plain radiography has been unreliable for soft tissue diseases. MRI is costly, time-consuming, and not appropriate for claustrophobic people. For people with plantar fasciitis, ultrasonography is frequently used to assess the PF

MATERIALS & METHOD

This cross-sectional study was conducted in the Department of Physical Medicine & Rehabilitation, Dhaka Medical college hospital, Dhaka during February 2023 to March 2024.

A total of 51 patients with plantar fasciitis were included in the study. Ethical clearance was obtained from the Ethical Review Committee of Dhaka Medical College Hospital. Purposive sampling technique was applied for this study. Plantar fasciitis was confirmed by ultrasound assessment and considered present when the plantar fascia was 4.0 mm or greater at the calcaneal origin. Plantar fascia thickness was measured at a standard location, where the fascia crosses the anterior aspect of the inferior calcaneal border. Ultrasonography findings decreased echogenicity means loss of normal fibrillar pattern. Partial tear means Focal anechoic areas with loss of the normal fibrillar pattern and Perifascial effusion means Collection of fluid surrounding the fascia. Visual analogue scale is a measurement instrument for subjective characteristics or attitudes that cannot be directly measured. This scale was scored on a 10 points scale. Respondents use a 10-cm line to indicate their level of pain on the VAS, with the left end denoting no discomfort and the right end denoting the highest level of pain. Statistical analyses of the results were obtained by using window based computer software devised with Statistical Packages for Social Sciences (SPSS-20.1).

RESULTS

The majority of patients (51.0%) were in 41-45 years age group. The mean age of the patients was 46.6 ± 4.3 years. (Table I)

Table I: Distribution of patients by age (n=51)

Age group (in years)	Frequency (percentage)
41-45	26 (51.0%)
46-50	12 (23.5%)
51-55	13 (25.5%)
Mean \pm SD	46.6 \pm 4.3

Among the 51 patients, 24 (47.1%) patients were female and 27(52.9%) patients were male. (Figure I)

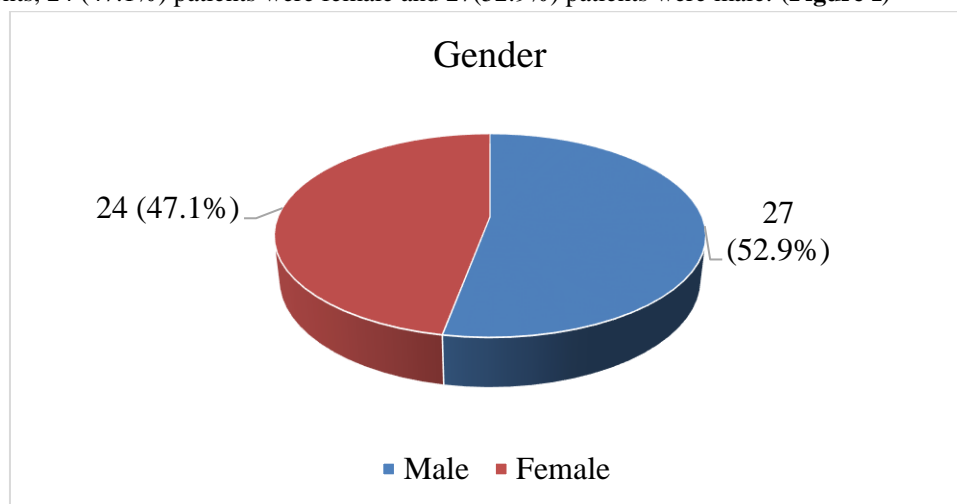


Figure I: Distribution of patients by gender (n=51)

Majority of the patients (52.9%) had pain score 4 in VAS scale while 14 (27.5%) had scored 5 and 6 (11.8%) patients scored 6 in VAS scale. The mean VAS of the patient's was 4.7 ± 0.9 . (Table II)

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Table II: Distribution of Plantar Fasciitis patients by pain score assessed by Visual Analogue Scale (VAS) (n=51)

VAS	Frequency (percentage)
4	27 (52.9%)
5	14 (27.5%)
6	6 (11.8%)
7	4 (7.8%)
Mean \pm SD	4.7 \pm 0.9

Out of the 51 patients, 19 (37.3%) had pain for 1-3 months and one third (33.3%) patients had pain for 4-6 months. The mean duration of pain of the patient's was 5.1 \pm 3.2 months. (Table III)

Table III: Distribution of patients by duration of pain (n=51)

Duration (in months)	Frequency (percentage)
1-3	19 (37.3%)
4-6	17 (33.3%)
7-9	9 (17.6%)
10-12	6 (11.8%)
Mean \pm SD	5.1 \pm 3.2

According to USG, 25 (49.0%) patients had decreased echogenicity and 6 (11.8%) had hypervascularity. Few patients had perifascial effusion (5.9%) and one had partial tear. The mean plantar fascia thickness of the patient's was 4.7 \pm 0.5 mm. (Table IV)

Table IV: Distribution of patients by musculoskeletal ultrasonography findings (n=51)

Musculoskeletal ultrasonography findings	Frequency (percentage)
Decreased echogenicity	25 (49.0%)
Perifascial effusion	3 (5.9%)
Partial tear	1 (2.0%)
Hypervascularity	6 (11.8%)
Plantar fascia thickness (Mean \pm SD)	4.7 \pm 0.5

The mean plantar fascia thickness of male and female patients were 5.1 \pm 0.4 mm and 4.4 \pm 0.4 mm respectively. Independent sample t test showed that, the thickness was significantly more in male patients than female patients. (Table V)

Table V: Comparison of patients by plantar fascia thickness (n=51)

USG findings	Male (n=27)	Female (n=24)	P value
Thickness (mean \pm SD)	5.1 \pm 0.4	4.4 \pm 0.4	<0.001

DISCUSSION

Pain is the most frequent symptom and the primary reason for patients with plantar fasciitis contact pain specialist. Visual Analogue Scale (VAS) is the most popular scale which was also used by other researchers dealing with plantar fasciitis (McMillan et al., 2013; Ahn et al., 2016) ^{6,7}. In this study, the mean VAS of the patients was 4.7 \pm 0.9. Majority of the patients (52.9%) had pain score 4 in VAS scale while 27.5% had scored 5 and 11.8% patients scored 6 in VAS scale. McMillan and his colleague (2013) included patients with mean VAS score of 5.5 \pm 2.3. Patients of the study of Ahn et al. (2016) had mean VAS of 6.1 \pm 1.7 which was higher than the present study ^{6,7}. The range of VAS was 4 to 7 in the present study while the range was 3 to 9 in the study of Ahn et al. (2016) ⁷. The mean duration of pain of the patients was 5.1 \pm 3.2 months where 37.3% had pain for 1-3 months and 33.3% patients had pain for 4-6 months. Patients of the study

of Ahn et al. (2016) had mean duration of 8.4 \pm 9.1 which was higher than the present study ⁷. This difference might be due to the range of duration of plantar fasciitis between the studies. In the present study, the range of duration was 1- 12 months while in the stud of Ahn et al. (2016), it was 2-48 months ⁷. Ultrasound (US) can detect thickening of the plantar fascia, including hypoechoic alterations and fluid collections in the proximal fascia due to injury or inflammation. In the present study, decreased echogenicity, hypervascularity, perifascial effusion and partial tear were revealed ultrasonographically. In the present study, almost half of the patients (49.0%) had decreased echogenicity which matched the findings of Ozdemir et al. (2005) where 41.0% cases had decreased echogenicity ². However, few studies observed all patients with plantar fasciitis showed hypoechoic of plantar fascia (Tsai et al., 2006; Aggarwal et al., 2020) ^{8,9}. In this study, 5.9% patients had

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perifascial effusion. Ozdemir et al. (2005) found 2.5% patients had perifascial effusion². Hypervascularity was observed in 11.8% patients. In the study of McMillan et al. (2013), 27.0% patients had hypervascularity while the study of Walther et al. (2004) found 40% of patients had either moderate or marked hypervascularity^{6,10}. One patient of the current study had partial tear. The Turkish study of Akfirat et al. (2003) also found only one patient with partial tear¹¹. The mean plantar fascia thickness of male (5.1 ± 0.4 mm) was greater than female patients (4.4 ± 0.4 mm) ($p < 0.001$). This finding was well supported by Wu et al. (2019) who also found noteworthy difference in plantar fascia thickness between males and females¹².

CONCLUSION

Increased thickness of the plantar fascia with reduced echogenicity and hypervascularity are common ultrasonographic findings of plantar fasciitis. Ultrasound should be used as the initial imaging modality for the investigation of patients with plantar fasciitis. Ultrasonography offers advantages in that it is widely available, reasonably priced, and rapid.

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CONFLICT OF INTEREST

Authors declare no conflict of interest.

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