

Association of Plantar Fasciopathy with Plantar Fascia Thickness: An Observational Study

¹Anil K Gupta, ²Satyasheel S Asthana, ³Virinder S Gogia

ABSTRACT

Introduction: Plantar fasciopathy is the most common cause of heel pain. It may result in physical inactivity and impact quality of life. Ultrasound can aid to rule out other heel pathology as well as to see various finding in plantar fasciopathy.

Material and methods: This observational study was carried out in the outpatient department of physical medicine and rehabilitation of King George's Medical University, Lucknow, Uttar Pradesh, India. The time duration of the study was three months. The ethical clearance was taken. The aim of this study was to find out the association between plantar fasciitis and plantar fascia thickness. The objective of this study was to compare plantar fascia thickness of patients suffering from plantar fasciopathy and normal healthy subjects using ultrasound. Two groups were created, group A had a patient diagnosed with plantar fasciopathy while group B was a control group and had normal healthy subjects. A *p* value <0.05 was taken as statistically significant. Data analysis was done using statistical package for social sciences (SPSS) software version 21.

Results: Both groups were age and sex matched. The plantar fascia thickness of group A and B was 5.38 ± 0.70 mm and 2.71 ± 0.60 mm, respectively. The intergroup comparisons showed that there was a significant difference between the plantar fascia thickness of two groups with *p*-value < 0.001.

Conclusion: The present study showed that plantar fascia thickness has a direct association with plantar fasciopathy.

Keywords: Plantar fascia thickness, Plantar fasciopathy, Ultrasound.

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¹Associate Professor, ²Junior Resident, ³Associate Professor and Head

^{1,2}Department of Physical Medicine and Rehabilitation, King George's Medical University, Lucknow, Uttar Pradesh, India

³Department of Physical Medicine and Rehabilitation, Dr Ram Manohar Lohia Institute of Medical Sciences, Lucknow, Uttar Pradesh, India

Corresponding author: Virinder S Gogia, Associate Professor and Head, Department of Physical Medicine and Rehabilitation, Dr Ram Manohar Lohia Institute of Medical Sciences, Lucknow, Uttar Pradesh, India, Phone: +919926846442, e-mail: physiatry@drvsgogia.com

INTRODUCTION

Plantar fasciopathy (PF) is one of the most common causes of heel pain in the general population. Although self-limiting, PF may result in physical inactivity and impact quality of life adversely.¹

The plantar fascia is a strong connective tissue that helps maintain the longitudinal arch of the foot. It consists of three bundles and originates from medial tubercle of calcaneum and extends distally where it divides into five digitations that insert into the metatarsophalangeal joints. The mean maximal thickness of plantar fascia is 4 mm in a central bundle, 2.3 mm in a lateral bundle and 0.6 mm in medial bundle.¹

Term plantar fasciitis is a misnomer as the disease is a degenerative process rather than the inflammatory disease. It is related to overuse trauma that leads to microtears and degeneration of plantar fascia, especially at its insertion. Therefore the term "plantar fasciopathy" should be preferred.

The etiology of PF is multifactorial. Biomechanical risk factors are a more common cause of PF which mainly include improper footwears, increased body mass index and condition like pes cavus and pes planus. Seronegative spondyloarthropathies and rheumatoid arthritis are commonly associated with medical conditions.

The diagnosis of plantar fasciopathy usually relies on clinical history and physical examination. The main symptoms include pain and stiffness on walking after prolong rest, especially in the morning. The physical examination reveals tenderness at the origin of the plantar fascia and sometimes impaired ankle dorsiflexion and toes extension.

In recalcitrant cases, imaging like ultrasound (USG) can aid to rule out other heel pathologies like plantar fibromatosis and tear of the plantar fascia. On ultrasound, normal plantar fascia shows a fibrillar pattern owing to the hyperechoic appearance of type 1 collagen fiber bundle embedded in a background of hypoechoic matrix.^{2,3} In PF, USG shows loss of fibrillar pattern, increased plantar fascia thickness, perifascial collection, and calcification within plantar fascia.⁴

This study is done to assess the relationship between plantar fascia thickness and plantar fasciopathy.

MATERIALS AND METHODS

This observational study was carried out in the outpatient department of Physical Medicine and Rehabilitation of King George's Medical University, Lucknow, Uttar Pradesh, India. The time duration of the study was three months. The ethical clearance was taken. The aim of this study was to find out the association between plantar fasciopathy and plantar fascia thickness. The objective of this study was to compare plantar fascia thickness of patients suffering from plantar fasciopathy and normal healthy subjects using ultrasonography. The inclusion criteria were age >19–57 years and clinical symptoms and signs of plantar fasciopathy (only in plantar fasciopathy group). The exclusion criteria are enumerated in Table 1.

A detailed history was taken, and a detailed clinical examination was done. Complete blood cell count, erythrocyte sedimentation rate, serum uric acid, HLA B27 and skiagram of heel were done only in suspected cases. After fulfilling the criteria, patients were explained in detail about the study and modality and written informed consent was taken. Two groups were created, group A had a patient diagnosed with plantar fasciopathy while group B was a control group and had normal healthy subjects. A sample size of the study was 84. Sonography was done in a lateral position with the affected limb independent position, with slight flexion at the knee and the patient was told to keep the foot in a relaxed manner. The transducer was placed in the sagittal plane on the medial band of the plantar fascia at its insertion into the medial calcaneal tuberosity. We looked for the calcaneum, plantar fascia, changes in echogenicity of the fascia and perifascial edema.

A p value <0.05 was taken as statistically significant. Data analysis was done using SPSS software version 21.

RESULTS

Group A and B both had 42 patients each. The mean age of group A and B was 39.48 ± 7.91 years and 37.38 ± 8.16 years respectively. The mean weight of group A and B was 70.81 ± 11.68 kilogram (kg) and 58.52 ± 6.31 kg respectively. The mean height of group A and B was 158.38 ± 10.48 cm and

Table 1: Exclusion criteria

Patient refusal to take part in study
Acute trauma
Fracture of calcaneum
Acute infection (cellulitis, local abscess, septic arthritis)
Open wound over heel
Osteomyelitis of calcaneum
Entrapment neuropathy or any neurological deficit
Previous surgery of plantar fascia
History of any injection in plantar fascia
Malignancy

161.48 ± 9.27 cm, respectively. The body mass index (BMI) of groups A and B was 28.23 ± 3.51 kg/m² and 22.43 ± 1.41 kg/m² respectively. Intergroup comparisons showed that there was a significant difference between the body mass index (BMI) of both groups. There were 57.14% females and 42.86% males in the study population. Both groups were age and sex matched as shown in Table 2. The plantar fascia thickness of groups A and B was 5.38 ± 0.70 mm and 2.71 ± 0.60 mm, respectively. The intergroup comparisons showed that there was a significant difference between the plantar fascia thickness of two groups with p value <0.001 as shown in Table 3.

DISCUSSION

In this study, plantar fascia thickness in symptomatic patients was found to be significantly more as compared to normal healthy subjects.

The mean plantar fascia thickness in healthy asymptomatic subjects was 2.71 ± 0.60 mm in this study. A study conducted by Cardinal et al.⁵ and Vohra et al.⁶ showed 2.9 mm and 2.7 mm plantar fascia thickness which is similar to our study. However, most studies showed plantar fascia thickness in asymptomatic foot slightly higher than our study. A study conducted by Wall et al.,⁷ Kane et al.,⁸ Tsai et al.,⁹ Gene et al.,¹⁰ Akfirat et al.,¹¹ and Sabid et al.¹² had plantar fascia thickness of 3.6 mm, 3.8 mm, 4 mm, 3.6 mm, 3.4 mm and 3.2 mm, respectively.

The mean plantar fascia thickness in symptomatic patients was 5.38 ± 0.70 mm in this study. The results of this study were almost consistent with studies conducted by Wall et al.,⁷ Cardinal et al.,⁵ Vohra et al.,⁶ and Kane et al.⁸ which showed plantar fascia thickness in symptomatic foot as 5.6 mm, 5.2 mm, 5.4 mm and 5.7 mm while number of patients were 19, 17, 109 and 23 respectively. While in this study mean plantar fascia thickness was 5.38 mm and numbers of symptomatic patients were 42.

A study conducted by Tsai et al.,⁹ Gene et al.,¹⁰ and Walther et al.¹³ showed plantar fascia thickness in the symptomatic foot as 6.5, 6.3 and 6.1 mm while numbers

Table 2: Characteristic of study population

Parameters	Group A (Mean \pm SD)	Group B (Mean \pm SD)	p value
Age (years)	39.48 ± 7.91	37.38 ± 8.16	0.40
Sex (male)	18	18	1.00
Sex (female)	24	24	
Weight (Kg)	70.81 ± 11.68	58.52 ± 6.31	$p < 0.05$
Height (Cm)	158.38 ± 10.48	161.48 ± 9.27	$p = 0.317$
BMI (Kg/m ²)	28.23 ± 3.51	22.43 ± 1.41	$p < 0.001$

Table 3: Plantar fascia thickness

Group A (PF) (Mean \pm SD)	Group B (Control) (Mean \pm SD)	p value
5.38 ± 0.70 mm	2.71 ± 0.60 mm	$p < 0.001$

of patients were 14, 30 and 20, respectively. The plantar fascia thicknesses in these studies were slightly more than our study. A study conducted by Akfirat et al.¹¹ and Sabid et al.¹² had a mean thickness of 4.8 mm and 4.9 mm in 23 and 77 symptomatic patients respectively.

The results of this study are consistent with meta-analysis conducted by McMillan et al.¹⁴ in 2009.

CONCLUSION

We conclude that plantar fascia thickness has a direct association with plantar fasciopathy. Review literature suggests that plantar fascia thickness >4 mm usually presents with symptoms of plantar.

Ultrasound is a noninvasive and cost-effective technique. It is a more useful tool in directing the practitioner to consider differential or concomitant diagnoses or effectiveness of treatment modality used owing to noninvasive procedure and cost-effectiveness.

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