



**ORIGINAL RESEARCH PAPER**

**Radiology**

**DIAGNOSIS OF PLANTAR FASCIITIS BY ULTRASOUND IMAGING IN SYMPTOMATIC SUBJECTS**

**KEY WORDS:** Plantar fasciitis, Ultrasound, symptomatic subjects, thickness of the plantar fascia, hypoechogenicity.

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**ABSTRACT**

Our aim of the study to diagnose plantar fasciitis by ultrasound imaging in symptomatic subjects. Plantar fasciitis is a disease of 10 % of the population mostly affect the young generation. In this study we have mainly focused on the thickness and echogenicity of the plantar fascia in the patients with plantar fasciitis. The subjects having symptoms & sign of plantar fasciitis were taken for the study from January 2016 to January 2018. These subjects were examined by orthopaedic specialists & provisionally diagnosed as plantar fasciitis. These subjects were examined by ultrasound machine LOGIQ-P5 with a linear probe 11 MHz. The thickness of the plantar fascia of the above subjects were having 5mm to 8mm (mean 6.5 mm) which is more than the normal thickness of the plantar fascia (4 mm). All the thickened plantar fascia were associated with hypo echoic echogenicity. Ultrasound imaging is a valuable modality which plays an important role in the diagnosis of plantar fasciitis. Ultrasound is also a non invasive and cost effective modality available today.

**INTRODUCTION:**

Plantar fascia is a thickened fibrous sheet of connective tissue which originates from the medial tubercle of the calcaneus bone & attached to the metatarsophalangeal joints of the foot. This supports to the arch of the foot which acts as a static dynamic stabilizer of the longitudinal arch of the foot.

Besides this action it acts as a shock absorber of the pressure exerted on the foot. Plantar fascia is made up of predominantly longitudinally oriented collagen fibres. Plantar fascia has mainly three components, like medial, central & lateral. Out of these the central component of the plantar fascia is the largest & most prominent one.

Plantar fasciitis is a disorder of the fibres sheet of the connective tissue that occurs in plantar fascia. It is a degenerative process of the plantar fascia (though exact cause is not clear).

The aggravating factors of the plantar fasciitis are repetitive walking & running which can make micro injuries to the plantar fascia.

The other risk factors include biomechanical factors (excessive pronation, reduced ankle dorsiflexion), improper foot wearing, excessive standing & obesity (Gordon et al 2012, Thompson et al 2001). As per the many literatures in many patients with plantar fasciitis obesity is one of the major contributing factor. Many studies have indicated a strong relation between the body mass index & plantar fasciitis.

Most common presentation by the patients with plantar fasciitis are (a) Heelpain (b) pain in the bottom of the foot (c) increased pain in the passive dorsiflexion of the foot (d) Tightness of the calf muscle (e) restriction during the extension of the toes (Thomas et al 2010, young et al 2001).

Diagnosis of plantar fasciitis can be made by physical examination & imaging methods. In physical examination the patients will have (i) tenderness on palpation at the heel (ii) foot may have limited dorsiflexion due to tightness of the calf muscle at the Achilles tendon.

The imaging methods for diagnosis of plantar fasciitis are plain x-ray of the foot., ultrasonography, MRI. Out of these

imaging methods available till today, ultrasonography (US) is the best choice of investigation in diagnosis of plantar fasciitis. It is because the accurate diagnosis of plantar fasciitis can be done. Also it can detect the characteristic changes in the plantar fasciitis. The other advantage of this modality are (i) It is cost effective, (ii) free from radiation, (iii) convenient in all age group, (iv) much preparation of the patient is not required for this examination, (v) it also helps in diagnosis of plantar fasciitis by providing objective evidences.

The purpose of our study is to diagnose plantar fasciitis by ultrasound imaging in symptomatic subjects.

**MATERIAL & METHODS:**

It is a retrospective study at J.J. Diagnostic centre, Bhubaneswar, Odisha from January 2016 to January 2018. We selected eighty eight subjects (patients) for our study who were diagnosed clinically plantar fasciitis by orthopaedic surgeon based at J.J. Diagnostic centre.

We referred many articles for guidance of our study. Out of 88 subjects selected for study 54 were males & 34 were females. The age of the subjects (patients) were from 20 years to 50 years.

Ultrasound LOGIQ-P5 with a linear probe of 11 MHz was used for the evaluation of plantar fascia.

**The inclusion criteria for our study were**

1. Patients typically complain of heel pain.
2. Heel pain persists for months together.
3. Pain is acute in morning or after a period of inactivity.
4. Referred by orthopaedic surgeon for ultrasonography examinations.

**The exclusion criteria for our study were**

1. History of foot surgery
2. Having history of foot & ankle trauma.
3. Patients having arthritis.
4. Patients with neuropathic foot disability.
5. Patients who were diabetic.

**The findings of the plantar fasciitis from different research papers were collected. The following three**

**features of plantar fasciitis were taken for the marker of our study.**

1. Thickening of the plantar fascia a more than 4 mm.
2. Hypoechoogenicity of the plantar fascia.
3. Peripheral collection (near the margin of the plantar fascia).

**The research papers of the following authors were referred for our study.**

1. Wall J.R. et.al 1993
2. Cardinal E et.al 1996
3. Gibbon WW et.al 1999.
4. Kamel M et.al 2000
5. Kane D et.al 2001
6. Akfirat M et.al 2003.
7. Ozdemir H et.al 2005.

Besides the above authors we also referred many more articles on this subject of plantar fasciitis which were published in different articles.

Before examination the patients were asked to sleep in prone position on the examination table with both the feet hanging at the edge of the table. However many patients could not adopt to the prone position due to obesity & over weight. So they were asked to take the supine position during examination.

The ultrasonography examination was done by two Radiologists attached to the J.J. Diagnostic centre & the results of the thickness of the plantar fascii were analysed by same two Radiologists for final report.

**RESULTS:**

It is observed in our study that the age group having symptoms of plantar fasciitis is 26 years to 40 years. The measurement of the plantar fascia in all the symptomatic subjects are more than 4 mm of the symptomatic subjects and having the measurement of plantar fascia 5 mm to 8 mm (mean 6.5 mm). Also it is observed in our study there is no difference of increased thickness in comparison of the left foot & right foot.

There is also no difference found between the male and female in the measurement of plantar fascia in our studies. The majority of the subject are found to be in the age group of 26 years to 40 years age (male-38 (70 %) out of 54 & female 26 (76 %) out of 34).

46 male out of 54 (85 %) & 31 female out of 34 (91 %) are having thickness of plantar fasciia 4 mm to 9 mm (mean 6.5 mm).

Many authors also have observed no different in male & female in the measurement of plantar fascia.

Mild fluid collection noted near the plantar fascia in 12 males (22 %) & 9 females (26 %) of the symptomatic subjects (patients).

However in all the symptomatic subjects the echogenicity found to be hypoechoic plantar fascia.

Spur was found in 6 males (11 %) & 4 females (11.7 %) of the symptomatic subjects (patients).

In some studies hypermia of the plantar fascia in symptomatic subject was a findings, but we could not found it during our examination due to heel pain & swelling at the heel pad. We therefore could not exert more pressure on the heel due to tenderness.

**Table-1 Male & female in age group (in years)**

	20 to 25	26 to 30	31 to 35	36 to 40	41 to 45	46 to 50	Total
Male	6	12	18	8	7	3	54
Female	3	9	7	10	3	2	34

**Table-2 Findings of measurement of plantar fascia in symptomatic male**

Foot	4 to 5 mm	6 mm to 7 mm	8 mm to 9 mm	10 mm & above	Total
Right foot	8	9	7	2	26
Left foot	4	10	9	3	28
Total	12	19	15	8	54

**Table-3 Findings of measurement of plantar fascia in symptomatic female**

Foot	4 to 5 mm	6 mm to 7 mm	8 mm to 9 mm	10 mm & above	Total
Right foot	8	7	2	1	18
Left foot	6	5	3	2	16
Total	14	12	5	3	34

**DISCUSSION:**

Plantar fasciitis is the most common type of injury to the plantar fascia & affect about 10 % of the population (Gordon et.al 2012).

Diagnosis of plantar fasciitis mainly based on the history of the patient & physical examination. Patients typically complain of heel pain at the inferior part, especially in the morning or after a period of rest. This type of pain persist for months & years together.

Though plain x-ray of the foot is advised by many orthopaedic surgeon & clinicians but the x-ray can only diagnose bony spur/calcaneal spur, bony fracture, arthritis. The diagnosis of plantar fasciitis cannot be done by plain x-ray of the foot.

Our study is to demonstrate the value of the ultrasound findings of the plantar fascia in plantar fasciitis. From our results it is understood that our findings are also correlate with the clinical findings of the orthopaedic surgeon and findings of many research papers those we have referred.

Though MRI in the one of the best modality available for the diagnosis of the plantar fasciitis, but it is time consuming more expensive. A common man cannot afford to the cost of MRI unless it is acute need for the diagnosis & to know other complications.

This is the research work we have taken in support of previous other research studies.

In our study we have found ultrasound imaging is an useful modality for the diagnosis of plantar fasciitis.

Many studies noted below have given measurement of the thickness of the plantar fascia by ultrasonography in plantar fasciitis.

4.79 mm in the study of Nurikarabay et. al (2007), 6mm for women & 5.2 mm for men in a study from wall et. al (1993). 3.9 to 9.1 mm (mean 4.75 mm) in the study of Akfirat et.al (2003). 3.2 to 6.8 mm (mean 5.2 mm) in the study of cardinal et. al (1996). 4.3 to 8.1 mm (mean 5.9 mm) in the study of Gibon et. al (1999).

Also in our study the mean measurement of the plantar fascia in symptomatic subjects is 6.5 mm. Therefore it is observed that thickness of the plantar fascia in plantar fasciitis is more than 4 mm.

Hypoechoic echogenicity of the plantar fascia in plantar fasciitis is an associated findings of plantar fasciitis. So,

diagnosis of plantar fasciitis by ultrasonography is done easily if two main findings are observed during ultrasound imaging examination.

- a) Thickness of the plantar fascia more than 4 mm.
- b) Hypoechoic echogenecity of the plantar fascia.

#### CONCLUSION:

No doubt ultrasonography imaging is one of the ideal modality which plays a vital role in the diagnosis of plantar fasciitis. Ultrasonography imaging is also a better facility by which diagnosis can be done quickly than any other modality. This facility now available widely in all cities & towns of India.

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