



Evaluation of the Inferior Calcaneal Spurs Influence on Plantar Fascia Thickness

Clint Jiroux, PMS-II ; Kyle Schwickerath, PMS-II; Frank Felix, PMS-II; Chad Smith, PMS-II; Matt Greenblatt, PMS-II
Arizona School of Podiatric Medicine – Midwestern University



STATEMENT OF PURPOSE

Plantar fasciitis is a common pathology associated with plantar heel pain. It is reported that in the United States, two million patients are treated for plantar fasciitis annually, and accounts for 15% of all foot disorders (1). A frequent association with plantar fasciitis is the presence of an inferior calcaneal heel spur. Often debated by medical professionals; Is the heel spur an incidental or causation of plantar fasciitis (2-4)? Using ultrasound imaging, the plantar fascia thickness can be quantifiably measured to determine plantar fasciitis. An ultrasound measuring a plantar fascia thickness greater than 4 mm is generally considered supportive of plantar fasciitis (5). At this time, no research has quantifiably measured the fascia band being influenced by the presence of a calcaneal spur. The goal of this research was to use ultrasound to measure the fascia band thickness with relation to the presence or absence of a calcaneal heel spur in patients with plantar fasciitis. Any influence by the heel spur on plantar fascia thickness may change the diagnosis and treatment of plantar fasciitis.

METHODOLOGY & HYPOTHESIS

A collection of ultrasounds and lateral foot radiographs of 57 patients who had been diagnosed with plantar fasciitis were evaluated and categorized based on the presence or absence of an inferior calcaneal spur. A classification of the spur (figure 1.) was based on its relationship to the plantar fascia insertion on the calcaneus (A, stretches from the insertion to superior of the fascia band; B, stretches from the insertion to within the fascia band). A measured plantar fascia thickness (mm) was recorded for each patient by measuring the hypoechoic band on ultrasound. Statistical analysis was performed with the results expressed as mean \pm standard deviation. One-way ANOVA was used to compare plantar fascia thickness between calcaneus with a spur (type A and B) and with the absence of a spur. The p value was set at $p < .05$.

Our original hypothesis is the presence and location of a calcaneal spur will have direct correlation to the increased thickness of the plantar fascia.

PROCEDURES

Location and presence of the spur was determined by ultrasound and lateral foot radiographs (figure 2.). The fascia band was measured with ultrasound in the longitudinal plane and with the probe placed at approximately 2cm distal from the fascia insertion on the calcaneus.

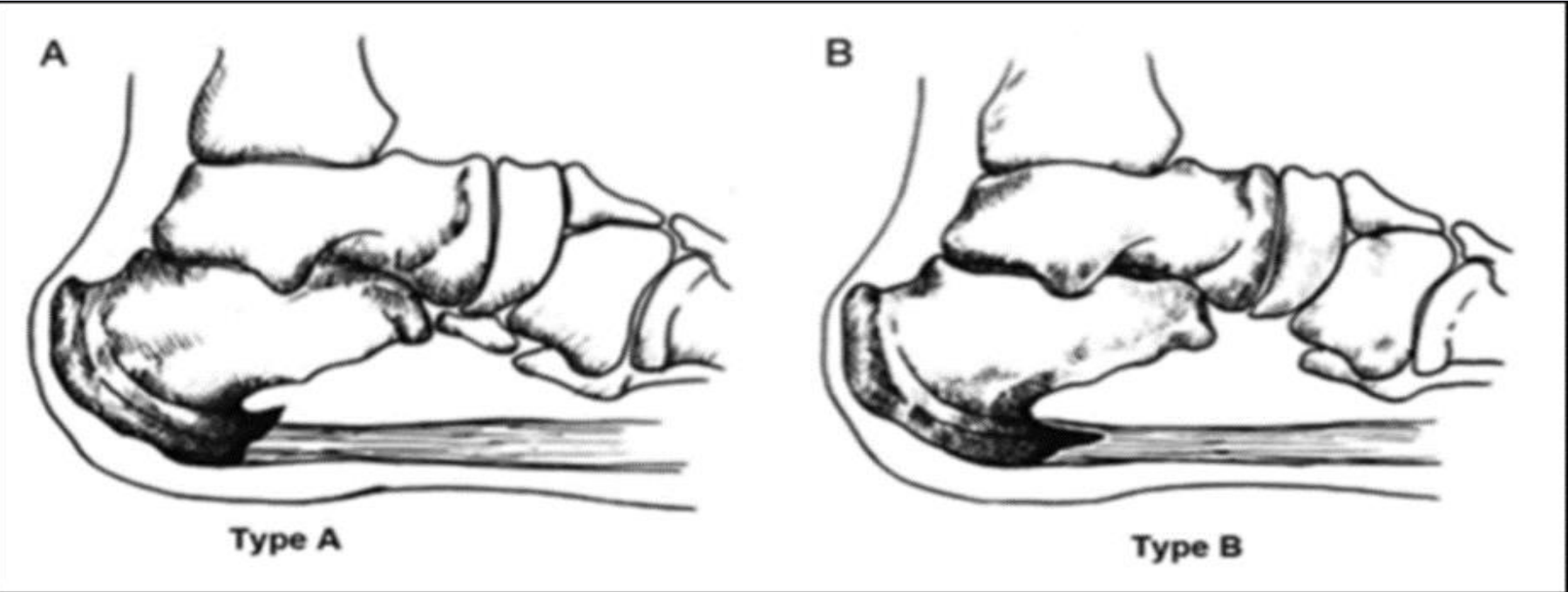


Figure 1. Type A inferior calcaneal spur that extends above the plantar fascia. (A) Type B inferior calcaneal spur that extends into the plantar fascia. (B) Source: B. Zhou, Y. Zhou, X. Tao, C. Yuan, K. Tang, Classification of Calcaneal Spurs and Their Relationship With Plantar Fasciitis. *J Foot Ankle Surg* 54, 594-600 (2015).

LITERATURE REVIEW

The podiatric medical community has been treating heel pain as one of the most common complaints given by patients suffering from a foot or ankle condition. Plantar fasciitis is one of the presentations for heel pain and involves the plantar fascia. The plantar fascia, which originates on the medial tubercle of the calcaneus, consists of three collagenous bands that run longitudinally on the plantar aspect of the foot and insert distally to the metatarsophalangeal joints. It helps to maintain the medial longitudinal arch and transmit forces from the hind foot to the forefoot (6).

When diagnosing a patient with plantar fasciitis, it is important to take a detailed history, physical exam, and be aware of other known risk factors such as: excessive running, tight Achilles tendon, and obesity (7). Physical findings typically reveal localized tenderness along the anteromedial side of the heel. This is a limitation because of its subjective nature. Fortunately, the role of imaging has allowed for a non-invasive, objective approach to its diagnosis. High-resolution ultrasonography is recognized as a superior model for diagnosing PF, because of its cost effectiveness, real-time imaging, and faster analysis (8-10). Supporting its validity, Kane et. Al (8) presented a sensitivity of 86% and specificity of 94% in diagnosing plantar fasciitis. Researchers who investigated plantar fascia thickness on plantar fasciitis patients found that clinical diagnosis represented a thickened hypoechoic plantar fascia on ultrasound (8). Quantification of plantar fascia thickness has reported 4 mm or greater as being consistent with plantar fasciitis (8-10).

A calcaneal spur is the osseous outgrowth that projects from either the posterior or inferior calcaneus. Common occurrence of the inferior spur is associated with plantar fasciitis. It is important to note however, that asymptomatic calcaneal heel spurs are present in 30% or less of the examined population (3).

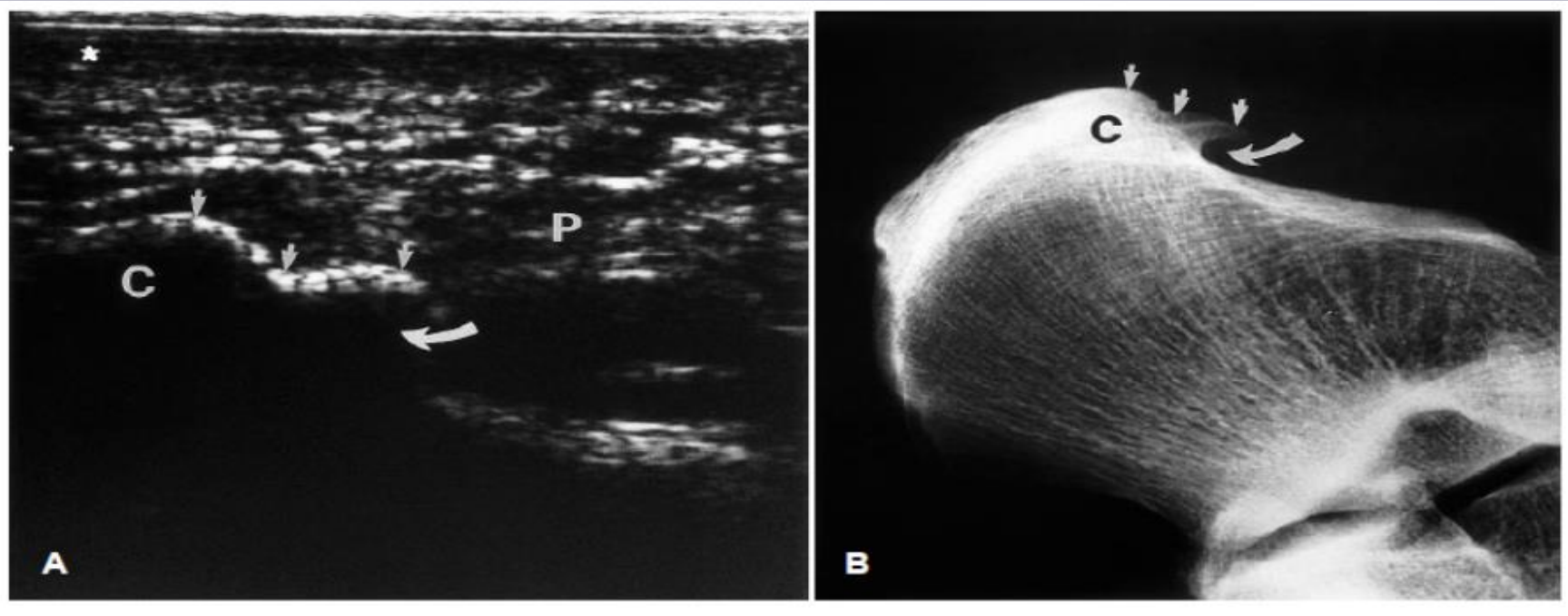


Figure 2. Longitudinal ultrasound of the plantar fascia with the presence of an inferior calcaneal spur. (A) A lateral view radiograph of the foot with the presence of an inferior calcaneal heel spur. (B). Source: W. W. Gibbon, G. Long, Ultrasound of the plantar aponeurosis (fascia). *Skeletal Radiol* 28, 21-26 (1999).

RESULTS

Table 1.
Ultrasound measured plantar fascia and Heel Spur Presence/Type
Mean(Standard Deviation) or n/N (%)

	Heel Spur A	Heel Spur B	No Spur	Overall
Mean Plantar Fascia Thickness (mm \pm SD)	4.69 (\pm 1.14)	5.02 (\pm 1.07)	5.04 (\pm 1.46)	4.92 (\pm 1.22)
Mean Age (Years \pm SD)	60.3 (\pm 10.07)	63.7 (\pm 15.67)	57.3 (\pm 7.99)	60.8 (\pm 12.14)
Total Male	6/19 (32%)	7/19 (37%)	7/19 (37%)	20/57 (35%)
Total Female	13/19 (68%)	12/19 (63%)	12/19 (63%)	37/57 (65%)

Of the 57 patients (table 1.), 20 were males (35%), and 37 were females (65%). Age of patients range from 42-83. Mean overall plantar fascia thickness was (4.92mm \pm 1.22), heel spur A (4.69 mm \pm 1.14), heel spur B (5.02 mm \pm 1.07), and no heel spur (5.04 mm \pm 1.46). ANOVA analysis (figure 3.) showed that the presence and location of the calcaneal spur did not show any significant influence on the plantar fascia thickness ($p > .05$, $p = 0.64$).

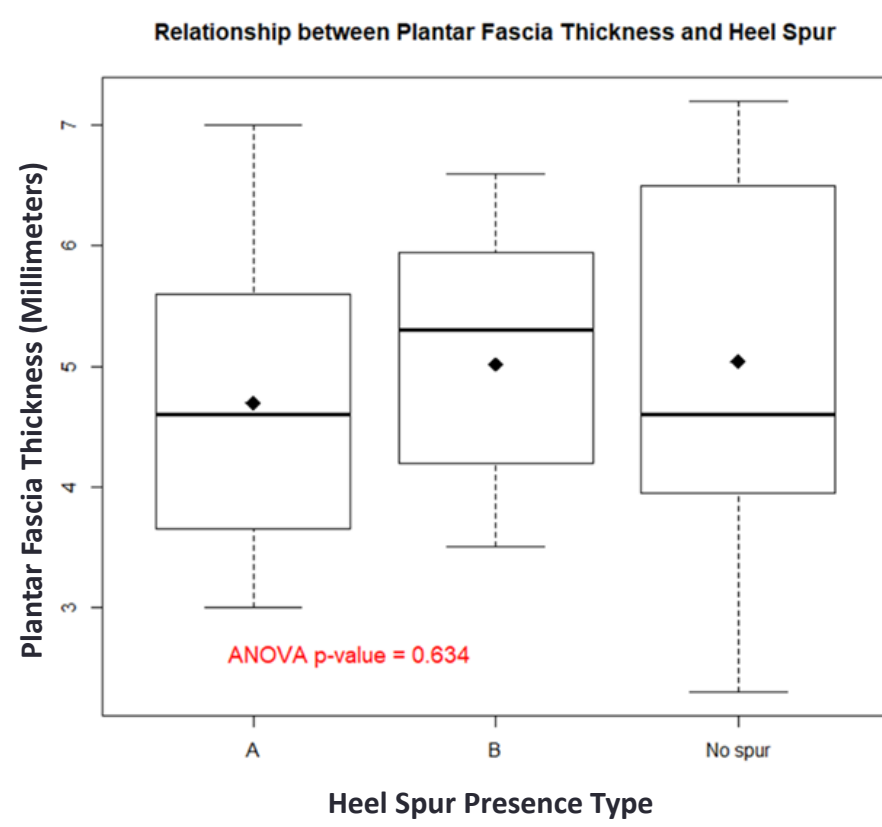


Figure 3. Box plot representing the range of plantar fascia thickness with type and presence of heel spur.

ANALYSIS & DISCUSSION

Through ultrasound, our research revealed the spur does not show a relationship to the thickness of the plantar fascia. Thus, based on our data, diagnostic measurements of the fascia band thickness should not take into consideration the presence of a heel spur. This data is supportive to the consensus of 4mm being the diagnostic value for plantar fasciitis. Additionally, this strengthens support of the heel spur being an incidental finding with plantar fasciitis.

Since the cause of plantar fasciitis is multifactorial, it has been debated whether there is a correlation between a calcaneal spur, and the pain it elicits. Studies on the subject matter have been inconclusive, with much variation in the reported results (2-4). As a result, orthopedic literature has deemed spurs more as incidental findings rather than causes of plantar fasciitis (11). While there has not been a direct correlation between calcaneal spurs and plantar fasciitis, calcaneal drilling and calcaneal spur removal are still considered to be viable surgery options in some plantar fasciitis cases (12).

Additional research in the underlying mechanism of plantar fasciitis would have clinical importance. This could lead to accurate diagnosis and treatment options specific for the patient and lead to faster relief of presenting symptoms. Even though the data did not support our original hypothesis of an increase in fascia thickness by a calcaneal spur, it has given quantifiable evidence that dictates the spur as being an incidental finding in plantar fasciitis. This also furthers the evidence of spur removal being an unnecessary and costly surgery when it comes to treating plantar fasciitis.

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