



## Prospective study of plantar fascia thickness correlated to efficacy of conservative treatment for plantar fasciitis using ultrasonography

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The thickness of the plantar fascia is measured using ultrasonography and has been correlated to either success or failure of conservative treatment depending on how thick the fascia is. The research hypothesis is that the thicker the plantar fascia in a patient diagnosed with plantar fasciitis, the higher the incidence of treatment failure. One hundred thirty six patients from our 4 clinics and 7 podiatric physicians made the clinical diagnosis of plantar fasciitis. The patients were divided into 2 groups for this study. Group 1 included all the patients that had a successful outcome with conservative treatment. Group 2 included all the patients who failed to improve after extensive conservative treatment. The mean for Group 1 plantar fascia thickness was .522 mm. Group 2 included 11.7% of feet and the mean plantar fascia thickness was 1.006mm. The range of plantar fascia thickness was .3mm to .97mm for Group 1. The range of plantar fascia thickness for Group 2 was .67mm to 1.22mm. Based on this study, 1.006 mm was measured to be the mean for Group 2 and may be a useful predictor of treatment outcomes.

**Keywords:** plantar fascia thickness, plantar fasciitis, ultrasonography, conservative treatment

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The thickness of the plantar fascia is measured using ultrasonography and has been correlated to either success or failure of conservative treatment depending on how thick the fascia is [1-13]. The research hypothesis is that the thicker the plantar fascia in a patient diagnosed with plantar fasciitis, the higher the incidence of treatment failure. Conservative treatment in this study includes injection therapy, physical therapy modalities like icing, stretching, prefabricated arch supports, massaging, over the counter anti-inflammatory medications, and orthotics. The null hypothesis states that no matter what the thickness of the plantar fascia it has no effect on success or failure of conservative treatment.

What are some of the etiologies of plantar fascia thickness? It has been suspected that inflammation of the fascia occurs. Other etiologies include degenerative changes to the fascia, micro-tearing and scarification of the fascia [14]. Since using ultrasonography, this has been a recent concept in treating plantar fasciitis. In the past, we had no idea there was a thickness issue. According to more recent studies, there is a possible correlation between the thickness of the plantar fascia and the success of conservative treatment [15]. A study published by this author in 1980 found a 90% success rate with conservative treatment and a 10% failure rate. Most of the patient's in the 10% group elected to proceed with open fascial release to get complete pain relief [16]. Yet, several authors found that a plantar fascia thickness of greater than 4mm was considered thick [15].

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## Methods

One hundred thirty six patients from our 4 clinics and 7 podiatric physicians made the clinical diagnosis of plantar fasciitis. Each patient had their plantar fascia measured using ultrasonography and the thicknesses were recorded. There were a total of 197 feet with the diagnosis of plantar fasciitis. The success or failure of conservative treatment was recorded for all 136 patients. The feet were divided into 2 groups for this study. Group 1 included all the patients that had a successful outcome with conservative treatment. Group 2 included all the patients who failed to improve after extensive conservative treatment. There was no time limit regarding conservative treatment time. Thus, some patients took several months to complete their conservative treatment, whereas others took much longer. A majority of these patients in Group 2 eventually had endoscopic plantar fasciotomy or open fascial releases performed to eliminate their heel pain. The mean thickness of the plantar fascia was calculated for both groups. Using a T test 2 tailed type with a p value of .001 and 95% confidence intervals was calculated.

## Results

The statistical analysis demonstrated that the two groups were significantly different at a p-value of .0001. Group 1 included 88.3% of feet (174/197). The mean for Group 1 plantar fascia thickness was .522 mm. Group 2 included 11.7% of feet and the mean plantar fascia thickness was 1.006mm. The range of plantar fascia thickness was .3mm to .97mm for Group 1. The range of plantar fascia thickness for Group 2 was .67mm to 1.22mm. Thus, the null hypothesis is rejected and our research hypothesis was accepted.

## Discussion

This study corroborates the conclusion of several other studies supporting the concept that the plantar fascia thickness is important and may predict patient conservative treatment outcomes [1-13]. However, the 4mm thickness or greater was not considered significantly thick in this study. Many of the patients in Group 2 had EPF or open fascial release performed. All the patients had no residual heel pain after their surgical sites healed.

Others have reported that the plantar fascia in some patients will be thinner after corticosteroid injections [15]. The author plans on doing a study on this topic to determine if this is true or not. Will the thickness also play a role in determining whether the plantar fascia will thin after corticosteroid injections? Will the BMI also be a predictor of outcomes based on thickness of the plantar fascia?

One of the concerns of this study was the inability to control the accuracy of the various podiatric physician measurements of the plantar fascia. There is a steep learning curve in accurately measuring the plantar fascia thickness. This was not tested by having each physician measure the same plantar fascia of a dozen patients and determine accuracy of each podiatric physician.

It has been suggested that diabetes mellitus has a high correlation with increased plantar fascial thickening [15]. This study did not examine this relationship.

Lastly, despite the thickness of the plantar fascia, the patient diagnosed with plantar fasciitis needs to undergo conservative treatment to fulfill the standard of care. How extensive the care is will be determined by the podiatric physician and the patient. Furthermore, there will be exceptions to the findings and conclusions of this study. A patient may be within range of Group 1 yet fail improving after receiving conservative treatment. Contrarily, a patient within Group 2 range completely becomes asymptomatic after completing conservative treatment. This is plausible even though it did not occur in this study. Based on this study, 1.006 mm was measured to be the mean for Group 2 and may be a useful predictor of treatment outcomes.

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