

The Short Term Treatment of Plantar Fasciitis Using Simple “off the shelf “ Foot Orthoses.

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Abstract.

Objective. To determine the effect of off the self foot orthoses in the treatment of idiopathic plantar fasciitis.

Methods. Thirty-four subjects with a clinical diagnosis of plantar fasciitis were evaluated using isotopic bone scan, ultrasound and physical examination as a baseline measure. A Foot Function Index (FFI), standardized orthopedic foot and ankle joint measures plus a navicular drop test were used to evaluate each patient's physical baseline parameters at the being of the study. FFI and ultrasound were then repeated at 12 weeks post treatment. Plantar fascia thickness of less than 3mm was used as a definition of normal. Body mass index was also calculated for all subjects. **After diagnosis of plantar fasciitis with the above techniques the subjects were issued with a pair of "off the shelf" arch supports (VASYLI devices). The subjects were asked to wear the orthoses for a three-month period (12 week period) and were then re-evaluated.**

***Results.* A significant ($p < 0.05$) reduction in all FFI scores was observed with over 90% of patients showing significant or total relief of plantar fasciitis symptoms.** A direct correlation ($p < 0.001$) was found between increased thickness of the plantar fasciae in the right foot only with increased BMI and body weight. However, no correlation was seen between increased foot flattening and plantar fascia thickness or level of pain, disability or disability as defined by the FFI.

This paper represents one part of a larger study entitled: "**Local corticosteroid injection therapy in plantar fasciitis: a randomized controlled trial**"

Key Words: Ultrasonography, Plantar Fasciitis, Orthoses.

Introduction.

Plantar fasciitis is a common condition, which presents clinically as pain in the arch or more commonly as pain within the heel. Brodelon (1983 PP 49)¹ states that “*Plantar Fasciitis is a clinical syndrome characterized by unilateral or bilateral heel pain in the medial tubercle of the calcaneous*”. However, other sites of pain have been described within the plantar fasciitis syndrome,²

Though plantar fasciitis is a well-described condition, Singh et.al. (1996 pp 172)³ suggest that “*little is known about its underlying disease process or its natural evolution*”. Taunton et al, (1983 pp 42)² suggests that “*a calcaneal spur can also be present, and this is thought to be the result of periosteal detachment, haemorrhage and osteoblastic activity*”. Recent use of ultrasound technique in the diagnosis of plantar fasciitis⁴ have clearly shown the swelling that occurs in the soft tissue confirming that this condition a multi-tissue disease process.

A number of treatments have been used for plantar fasciitis from night splints⁵, surgery ⁶, custom and prefabricated orthoses ⁷ and steroid injections ⁸ all with varying success.

Prefabricated orthoses appear to be the most commonly used treatment option as these are readily available from pharmacies, shoe shops and any number of health professionals.

D’Maio et al (1993)⁹ estimate that plantar fasciitis affects 10% of the general population and presents with heel pain. The pain experienced by the patient is often extreme with sufferers complaining of life changing effects, loss of work time, disability and reduced activity. Assessment of the effect that plantar fasciitis has on patients general health and function have until recently ⁷ been poorly researched, with pain being seen as the major factor in the disease presentation. The importance of general foot health in terms of disability, activity and pain need to be considered as a significant indicator of treatment success.

Foot function indices such as that developed by Budiman-Mak, Conrad and Roach (1991)¹⁰ have proved an effective method of evaluating foot function. The FFI has been shown to have good reliability with Inter Class Correlation’s (ICCs) of 0.69 to 0.84 indicating good to excellent reliability. These foot index scales are divided up into three main areas, pain, activity and disability. Essentially they are based on the measurement of a line with defined parameters.

Eg.1. Pain Sub-scale.(how severe is the foot pain ?)

No Pain -----Worst Pain

Eg.2. Activity Sub-scale. How much difficulty did you have?

No Difficulty ----- So difficult unable

Eg.3. Activity limitation Sub-scale. (how much of the time do you?)

1. Stay indoors most of the day because of foot problems.

None of the time -----All of the time.

A total of 9 pain scores, 9 disability scores and 5 activity scores are used in the FFI.

The aim of the study was to determine the effect of “off the shelf” style orthoses in the short term treatment of plantar fasciitis as measured by the FFI . Other factors considered important in the analysis of the cause of plantar fasciitis were the subjects weight, body mass index (BMI), age, sex and physical characteristics of the lower limb.

Methodology of study.

The method was divided into six main areas.

- Clinical diagnosis.
- Imaging diagnosis.
- Bio-data.
- Foot Function Index.
- Range of motion studies.
- Issue of orthoses.

Clinical Diagnosis

This aspect of the study comprised of patients presenting with the clinical symptoms of plantar fasciitis. The patients were examined for the presence of unilateral or bilateral palpable heel pain. The medial and lateral plantar tubercle of both feet were palpated for the presence or absence of pain. The patients were evaluated for the presence of other possible heel pain conditions, with rheumatic conditions being excluded by blood test. Subjects with a history of foot injury were excluded from the study.

Imaging Diagnosis.

Isotopic Bone Scan: All patients underwent an isotopic bone scan to confirm the presence of a bone “hot spot” in the region of the plantar fascia insertion. This diagnostic technique was used to confirm the presence of an osteitis in the medial plantar heel insertion point of the plantar fascia. The scan was used to observe, flow, tissue uptake and delayed phases.

Ultrasound: All patients underwent ultrasonography using a standard liner transducer applied to the affected heels at the time of initial presentation and before orthotic therapy was commenced. The ultrasonography was repeated at 12 weeks. All ultrasonography measurements were carried out by the same experienced examiner.

Patients Bio-data.

Table one: Shows a summary of the patients Bio-data.

Parameter.	Male Patients	Female Patients	Total Patients
Height.	1.74 \pm 0.07 m	1.64 \pm 0.05 m	1.68 \pm 0.08 m
Weight	83.3 \pm 14.2 Kg	79.3 \pm 18.2 Kg	80.93 \pm 16.87 Kg
BMI.	27.3 \pm 3.1	29.3 \pm 7.1	28.5 \pm 5.8
Age.	57.64 \pm 12.3 Years	54.7 \pm 13 Years	55.9 \pm 12.66 Years

Duration of disease 21.5 \pm 22.94 months

n = 34 (13 males and 21 females).

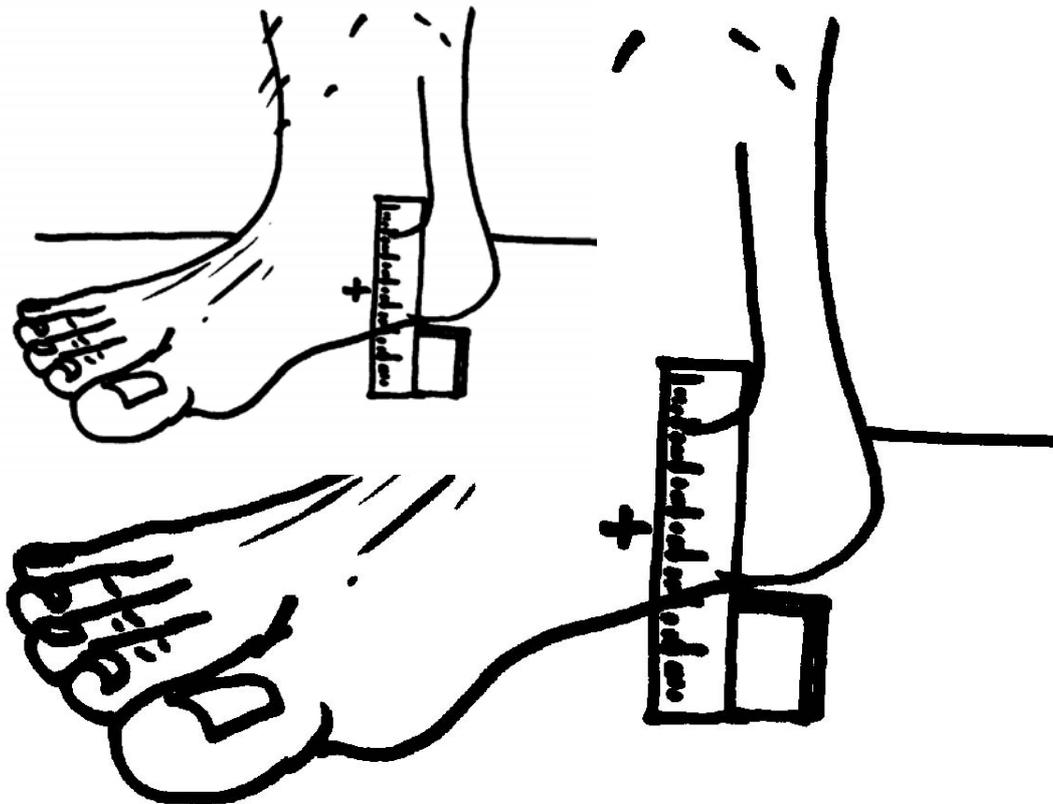
Females had a statistically ($p < 0.05$) significant different BMI than the males with a higher average value. Age groups were not significantly different.

Clinical/Orthopedic Measurements.

Standardized orthopedic measurements ¹¹. were taken with an average of three repeated measures being used to determine ankle joint neutral position, maximum dorsiflexion and maximum plantar flexion. Plus the non-weight bearing neutral, maximum inversion, maximum eversion positions of the subtalar joint.

Navicular Drop: Final Orthopedic measurement was the Navicular Drop. This was again repeated three times and an average calculated for each subject.

Figure One: Shows the Navicular Drop technique.



The patient moves from a sitting neutral position, semi-weight bearing to rise into their fully compensated weight bearing position. A skin marker positioned over the navicular prominence was used to determine vertical displacement between the semi-weight bearing and weight bearing positions 12

Standardized Orthoses.

A standard “off the shelf” orthoses (Regular VASYLI™ green, medium density). All patients received one pair adjusted to fit their footwear. All patients were advised to wear these devices at all times when weight bearing. All patients given footwear advice.

Figure Two: Shows the standardized “off the shelf” orthoses.



All patients were followed up with a FFI at 12 weeks and were also given a repeated ultrasound

Statistical analysis

Statistical analysis was performed with the use of SPSS™ statistical analysis software. Values are given in the text as mean \pm Standard error of the mean with 95% confidence intervals (CI) A paired sample t’test and analysis of variance was used for the analysis. A p value of < 0.05 was considered significant.

RESULTS

Details of ultra sound of plantar fascia.

Normal thickness defined as less than 3mm.

Male 4.25 ± 1.4 mm

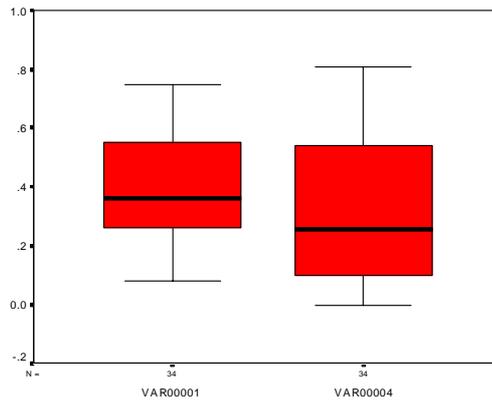
Female 4.39 ± 1.51 mm

Bone Scans.

Positive in all clinical cases, soft-tissue scans shows increased flow to the sole of all patients in study.

Graph 1. Shows the comparison between the pain scores between the pre and post issue of orthoses.

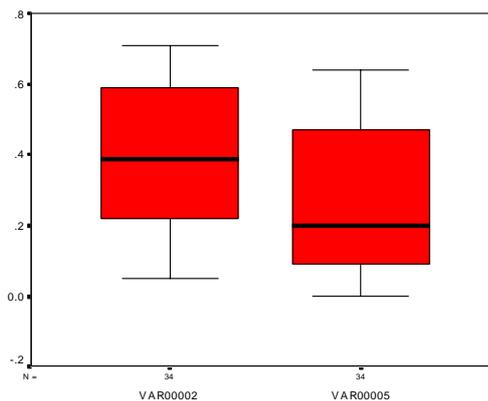
Pain score



The Null Hypothesis H1 is rejected at the $p < 0.05$ level showing significant improvement of pain levels after the use of orthoses.

Graph 2. Shows the comparison between the activity scores between the pre and post issue of orthoses.

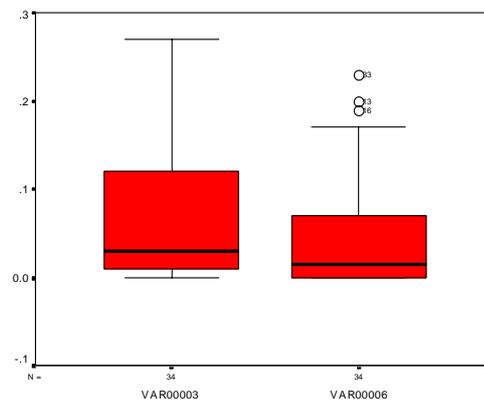
Activity score



The Null Hypothesis H2 is rejected at the $p < 0.001$ level showing significant improvement in the disability index after the use of orthoses.

Graph 3. Shows the comparison between the disability scores between the pre and post issue of orthoses.

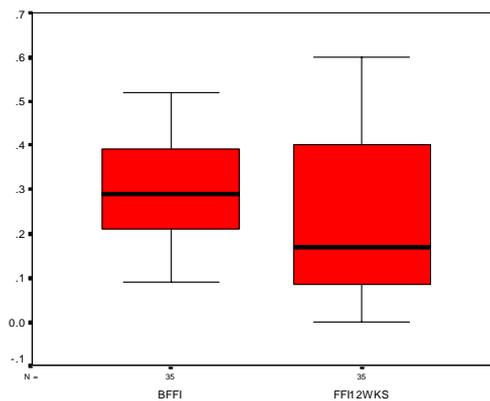
Disability score



The Null Hypothesis H3 is rejected at the $p < 0.05$ level showing significant improvement in the activity index after the use of orthoses.

Graph 4. Shows the comparison between the total scores between the pre and post issue of orthoses.

Total score



The Null Hypothesis H4 is rejected at the $p < 0.05$ level showing significant improvement in the total/combined pain/disability/activity index after the use of orthoses.

Results of the t-tests show clearly that patients' pain, activity and disability scores were all reduced. It is important to note that the reduction in the activity score indicates that the patients' activity levels had improved after the introduction of the orthoses. **After orthoses 90% of subjects reported a significant decrease in the level of pain experienced. However, not all had complete resolution of symptoms. 67% of subjects reported a significant improvement in their activity levels. Similar results were seen in the disability indicator.**

Patient Bio-data Analysis

All independent data points were tested statistically for correlation using Analysis of Variance (ANOVA) with the following results. Only significant results are presented in this paper. Clarification of any of the insignificant correlation's can be obtained directly from the authors.

The right foot plantar fascia thickness data showed significant ($r < 0.05$) correlation with BMI and weight. An increase in both of these parameters would appear to be directly related to an increase in plantar fascia thickness. However, the left foot plantar fascia thickness showed no relationship between any of the bio-data, plantar fascia thickness or orthopedic/physical measures. No correlation existed between any of the ankle or subtalar joint measurements compared to plantar fascia thickness, FFI's, BMI etc.

Navicular drop was not predictive of any of the variables in either foot. Flatter feet do not appear to get greater levels of pain and disability.

Discussion.

The study has been presented as an independent paper but represents part of a much larger study, entitled: "**Local corticosteroid injection therapy in plantar fasciitis: a randomized controlled trial**". The reason that this paper was worthy of independent presentation was the significant results obtained from the standardized podiatric therapy. The idea of the larger study was to provide a standard pre treatment before the subjects went on to receive the double blind corticosteroid injection or Lignocaine injection therapy. However, seventy percent of the patients had significant resolution of their symptoms and thus did not progress to the second stage of the study. A limitation of the presented study is that no controls were used. This was because the initial aim of the research was directed towards the action of corticosteroids with the double blind feature of the study occurring in the second stage.

In support of the methodology used in the presented research is the fact that patients had their plantar fasciitis symptoms on average for 21 months prior to joining the study. They had not shown any improvement during this period.

The use of the FFI at presentation and follow up at twelve weeks allows comparison of before and after intervention ensuring that the patient acted as their own control subject.

It could be argued that some of these patients could have got better due to the twelve weeks time factor. However, considering the length of time they had had their pain and disability this would seem unlikely. However it can be seen as a limitation of the study.

All patients within the study presented with thickness greater (4.3mm) than the normal plantar fascia (3mm) as supported by literature 14, 15. All these patients clearly showed significant increase in plantar fascia thickness average of 4.3 mm. Along with the bone scan all patients in the study were diagnosed as having plantar fasciitis. It is for this reason that the study was deemed worthy of presentation at this time. The research is ongoing and consideration is being made for the use of randomized controls.

Anecdotal clinical evidence would suggest that a foot which has more pronation/eversion accompanied by flattening of the arch on weight bearing, would be more prone to plantar fasciitis. However none of the foot motion variables showed correlation with pain, disability, activity levels or plantar fascia thickness. This finding would not support this clinical finding.

Dorsiflexion at the ankle joint motion has also been linked with lowering of the arch, as pronation is linked as a compensation for the limited dorsiflexion. In this population there was no correlation within these factors. Limited dorsiflexion did not equate to a higher navicular drop values.

The types of feet seen in this population varied greatly with inverted, normal and everted subtalar joint position. Again no correlation was seen between these factors and pain, disability, activity levels or navicular drop values. This would confirm the limited value of clinical measurement of these foot measurement techniques in predicting foot problems.

Of no surprise is the significant correlation between plantar fascia thickness with the apparent increase in BMI or patients increased weight. This finding supports the literature 16 however, in this study this is only correlated in the right foot not the left. Why this should be is a mystery, but maybe it is due to environment factors such as driving a car (increased foot function on the accelerator) or increased right “handedness” in the population corresponding to right “footedness”. The subjects use their right foot more than their left?

Conclusions.

Simple “off the shelf” orthoses (VASYLI™) do have a significant effect on plantar fascia symptoms in this patient group. This finding supports the current literature 7, 13. However the effect maybe short term and requires further research.

The results suggest that clinical measures of the foot have little or no value as predictors of the level of plantar fasciitis thickness, level of pain, disability or reduced activity seen in the patient. The navicular drop technique is a reliable foot posture evaluation 11. However, it would appear to have no correlation with any of the variables measured.

Flatter feet do not seem to produce thicker plantar fascia, have more pain, cause greater disability or reduce activity. The only factor that seems to be correlated to plantar fascia thickness is the increase in BMI and patients weight. The latter being supported in the literature 16. However in the group this factor was only correlated in the right foot. Why this is the case remains a mystery and deserves further research.

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