

Research Article

Plantar Fasciitis- Pain after Stretching: An Assessment Study

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Abstract: Plantar fasciitis pain is a commonly occurring foot complaint. Stretching is frequently utilized as a treatment. This study aimed to assess the effectiveness of stretching on pain in people with plantar fasciitis. Patients (n=36) diagnosed as having plantar fasciitis were included in our study at our out-patient department and they were advised to stretch the calf muscle for at least 5 minutes over a given wooden ridge. Their pain before and after calf stretching exercises was recorded on pain visual analog scale and analyzed. According to visual analog scale (VAS) which ranges from zero (NO PAIN) to 100 (WORST POSSIBLE PAIN), the average baseline pain score on VAS was 75.58 and all patients had significant reduction in pain score (average 42.46) which was statistically significant ($p < 0.05$). There is some evidence that plantar fascia stretching may be more effective in the treatment of plantar fasciitis in the short-term and thus improving foot functional activity on the long-term. Appropriately powered randomized controlled trials, utilizing validated outcome measures, blinded assessors and long-term follow up are needed to assess the efficacy of stretching.

Keywords: Stretching, Plantar fasciitis, Heel pain, Calf muscle, Calcaneal spur, Ankle..

INTRODUCTION

Plantar heel pain is one of the major complain presenting to foot and ankle specialists, may be seen in upwards of 11% to 15% of adults [1], thought to be multifactorial in origin. Different factors include increased age, decreased ankle and first metatarsophalangeal joint range of motion, obesity and excessive periods of weight-bearing activity [2, 3]. Various management strategies have been developed for the treatment. A systematic review [4] identified 26 different conservative treatments recommended for the treatment of plantar heel pain. During the review only heel pads, orthoses, steroid injections, night splints and extracorporeal shock wave therapy had been evaluated in randomized trials. It found that although there is limited evidence for the effectiveness of local corticosteroid therapy, the effectiveness of other frequently employed treatments in altering the clinical course of plantar heel pain had not been established.

One of the common conservative treatments for plantar heel pain is foot orthoses [5]. But due to the manufacturing process there is often a period of a few weeks gap between the initial consultation and issuing the devices. Short-term treatments such as muscle stretches are regularly used to alleviate symptoms during this interim period. A systematic review [6] of randomized trials examined the effect of calf muscle

stretching on ankle range of motion and reported that stretching produces a small but statistically significant increase in ankle range of motion, may reduce the symptoms of plantar heel pain by reducing the strain in plantar fascia that the calf muscle places on it during standing and ambulation [7, 8]. However, it is unclear whether a change in ankle range of motion translates to a clinically relevant outcome for patients.

Two previous randomized controlled trials had compared two active stretching interventions for plantar heel pain: calf stretching compared with plantar fascia stretching [9] and sustained calf stretching compared with intermittent stretching [10]. We conducted a study to assess whether calf muscle stretching is an effective in reducing pain severity immediately for plantar fasciitis pain.

METHODOLOGY

Patients coming to out-patient department with complaining of plantar heel pain were included if diagnosed with plantar fasciitis, defined as (i) localized pain at the plantar heel; (ii) that was worst when first standing or walking after rest; and (iii) that improved initially after first standing but worsened with increasing activity. As plantar heel pain is diagnosed clinically the majority of the time, we chose to not use expensive imaging procedures for diagnosis; thus

maximizing rationalizing of our findings to standard clinical practice. Participants also needed to be 18 years of age or older and have had symptoms for two weeks or longer. Patients were excluded from the study if patient history revealed any inflammatory, osseous, metabolic or neurological abnormalities. They were also excluded if they had received a corticosteroid injection within the past three months. Participants were not given any oral or injectable anti-inflammatory medications before assessment of pain.

Patient’s details like age, gender, occupation, body mass index (BMI), duration of symptoms, associated morbidities are recorded. A base-line severity score of pain according to visual analog scale (VAS) were recorded for later comparison and analysis. Visual analog scale (VAS) score which ranges from zero (NO PAIN) to 100 (WORST POSSIBLE PAIN), is easy to use for patients understanding and pain score recording. Patients were given a wooden stretching wedge (Fig. 1) on which to perform all stretches. This wedge was used to standardize the stretching technique across participants. The stretching technique was to be performed while standing. Participants were instructed to move their forefoot up the wedge until a stretch could be felt in the calf muscle while keeping their heel on the ground. They were advised to stretch the muscle for at least 5 minutes. After completing stretching exercises again patients were instructed to score their heel pain on VAS and scores were compared with base-line pain score and analyzed (Table 1).

Table 1: Analysis

Number of patients	36
Age	30.50±13.14
Male/ female ratio	2:1
BMI values	24.07±6.87
Duration after onset (weeks)	4.33±2.01



Fig. 1: Patients were given a wooden stretching wedge

RESULTS

The demographic details are given in Table 1. Among thirty-six patients males (n=24) predominate females (n=12), with an average age of 30.50 years and

an average BMI of 24.07±6.87. All patients stretched over the wooden stretching wedge for 5 minutes but few patients stretched with mild to moderate discomfort. The average baseline pain score on VAS was 75.58 and all patients had significant reduction in pain score (average 42.46) which was statistically significant (*p* < 0.05) (Table 2). The two- tailed *p* value was less than 0.0001 by conventional criteria; this difference was considered to be extremely statistically significant. The difference between mean of base-line pain score and after stretch pain score was 33.00.

Table 2: Baseline and after stretching pain score

Baseline pain score*	75.58
After stretching pain score*	42.46
<i>p</i> value	0.0001

*Measured using a Visual Analogue Scale (0 to 100 mm – 0 is no pain and 100 is the worst pain).

DISCUSSION

Plantar heel pain has been referred to in the published literature by many names including heel spur syndrome, which lends some importance to the radiographic presence of an inferior calcaneal spur to the clinical symptoms. The specific cause of plantar fasciitis is poorly understood and is multi-factorial. In a recent systematic review examining risk factors associated with chronic plantar heel pain, Irving *et al.* [3] reported a strong association between a body-mass index of 25 to 30 kg/m² and a calcaneal spur in a non-athletic population. They reported a weak association for the development of plantar fasciitis with increased body-mass index in an athletic population, increased age, decreased ankle dorsiflexion, decreased first metatarsophalangeal joint extension, and prolonged standing. Irving and colleagues³ noted that the relationship between static foot posture as well as dynamic foot motion and the development of plantar fasciitis was inconclusive.

The most common cause cited for plantar heel pain is biomechanical stress of the plantar fascia and its entheses of the calcaneal tuberosity [11-18]. Mechanical overload, whether the result of biomechanical faults, obesity, or work habits, may contribute to the symptoms of heel pain. Discussion of a biomechanical etiology usually involves the windlass mechanism and tension of the plantar fascia in stance and gait [3, 17, 19-27].

The symptoms of plantar heel pain are well known, and diagnosis is relatively straightforward. The diagnosis of plantar fasciitis is made with a reasonable level of certainty on the basis of a clinical assessment alone [28-31].

- Patients typically report an insidious onset of pain under the plantar surface of the heel upon weight bearing after a period of non-weight bearing.

- This pain in the plantar heel region is most noticeable in the morning with the first steps after waking or after a period of inactivity.
- In some cases, the pain is so severe that it results in an antalgic gait.
- The patient will usually report that the heel pain will lessen with increasing levels of activity (i.e., walking, running), but will tend to worsen toward the end of the day.
- The history usually indicates that there has been a recent change in activity level, such as increased distance with walking or running, or an employment change that requires more time standing or walking.
- In most cases the patient will initially complain of sharp, localized pain under the anteromedial aspect of the plantar surface of the heel, with paresthesias being uncommon (Fig. 2).

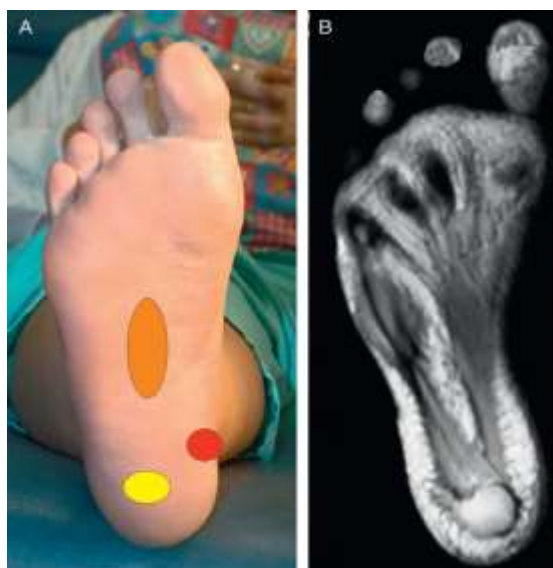


Fig. 2: (A) With plantar fasciitis, tenderness may be localized centrally along the plantar fascia (orange oval), along the plantar medial tuberosity (red circle), or directly plantar to the calcaneal tuberosity (yellow oval). (B) The anatomy of the plantar fascia as shown through MRI.

Stretching and strengthening programs play an important role in the treatment of plantar fasciitis and can correct functional risk factors such as tightness of the gastroc- soleus complex and weakness of the intrinsic foot muscles. Increasing flexibility of the calf muscles is particularly important. Frequently used stretching techniques include wall stretches and curb or stair stretches. Calf muscle and/or plantar fascia-specific stretching can be used to provide short-term (2 to 4 months) pain relief and improvement in calf muscle flexibility. The dosage for calf stretching can be 2-3 times a day utilizing either a sustained (3 minutes) or intermittent (20 seconds) stretching time, as neither dosage produced a better effect [35].

Other effective techniques include use of a slant board or placing a two-inch to four-inch piece of wood in areas where the patient stands for a prolonged time (e.g., workplaces, kitchen or stoves) to use in stretching the calf. Dynamic stretches such as rolling the foot arch over a 15-oz size can or a tennis ball are also useful. Cross-friction massage above the plantar fascia and towel stretching may be carried out before getting out of bed and serve to stretch the plantar fascia [35].

In our study patients noticed that the use of the wooden wedge placed increased pressure under the heel as the position of the foot on the wedge during the stretching procedure redistributed force away from the forefoot to the plantar heel region. This could have led to the four participants reporting discomfort while stretching. Care should be taken while instructing patients to stretch their calf muscles by raising their forefoot from the ground (e.g. on a book or wedge similar to the one used in this trial). We have chosen this form of stretching because it standardized the stretching technique across patients, alternative stretching methods that do not place increased pressure on the plantar heel (e.g. lowering the heel while the forefoot is on a step) may avoid such an adverse event.

One study reported successful treatment of 83 percent patients involved in stretching programs and remaining patients stated that stretching had helped when compared with use of orthotics, non-steroidal anti-inflammatory drugs (NSAIDs), ice, steroid injection, heat, heel cups, night splints, walking, plantar strapping and shoe changes [32].

The findings of this study need to be viewed in light of some limitations. Firstly, the evidence from this study is for one particular technique of stretching the calf muscle. The stretching technique we utilized – using a wooden wedge – ensured a suitable stretch applied in a relatively controlled manner. Secondly, the study specifically examined the effect of stretching on immediate pain relief as a short-term treatment for plantar heel pain; generally the period a patient waits for the fabrication of a longer-term treatment such as foot ortoses [33]. It would be of interest to evaluate the effectiveness of regular stretching over a longer period to investigate whether the intervention has a long-term effect. This may obviate the need to institute more expensive long-term treatments such as foot orthoses; although the risk of a higher incidence of adverse events may not make this worthwhile. This is the first qualitative study to examine the effect of calf stretching. Two previous studies examined two different stretching techniques for plantar heel pain without inclusion of a non-stretching control group [9, 34]. Di Giovanni *et al.* [9] had compared calf muscle stretching with plantar fascia tissue stretches over eight weeks. Both groups experienced reductions in pain. The plantar fascia stretches were found to provide a statistically significant greater reduction in pain in comparison to the calf

muscle stretches. Porter *et al.* [34] had compared sustained 3 minute calf stretches with intermittent 20 second calf stretches for plantar heel pain. He reported no significant differences in improvement between groups. However, without a sham or no stretching control group, it is not possible to attribute the observed improvements in either trial to the stretching. Our study represents a more precise estimate of the true effect of calf muscle stretches for plantar heel pain.

CONCLUSION

There is some evidence that plantar fascia stretching may be more effective in the treatment of plantar fasciitis in the short-term and thus improving foot functional activity on the long-term. It can be stated from the currently available evidence that stretching is effective in relieving plantar heel pain. The main pain-relieving benefits of stretching probably appear to occur immediately. There is no conclusive evidence regarding the most effective number of repetitions or frequency of stretching, or whether self or therapist applied stretches are most effective. Appropriately powered randomized controlled trials, utilizing validated outcome measures, blinded assessors and long-term follow up are needed to assess the efficacy of stretching.

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