

# Physiotherapeutic treatment of plantar fasciitis

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## ABSTRACT

Plantar fasciitis or heel pain syndrome is a common cause of heel and foot pain in adults that affects about 2 million Americans a year and it is estimated that about 10% of the world's population have presented or will present foot pain at some time in their life. **Objective:** To review the literature in order to verify the effectiveness of the modalities of physical therapy in patients with plantar fasciitis. **Method:** An electronic search was conducted in the databases of the Cochrane Library, Medline (via Pubmed), PEDro, and LILACS, with no date or language restrictions. In the present study, articles about the physical therapy for plantar fasciitis and those that have focused on the surgical treatment were included. **Results:** In total, 23 studies met the inclusion criteria. The procedures were: Stretching sural triceps, manual therapy, bandaging, orthotics/ insoles and electrotherapy. **Conclusions:** There is moderate evidence that stretching exercises for the triceps surae provide benefits to patients with plantar fasciitis. The evidence of the application of bandages is still weak, but some studies have reported improvement in pain and function in the short term. There is good quality evidence supporting the use of custom insoles that can provide short-term improvement in pain and function in patients with plantar fasciitis. The use of night splints presents controversial results, although some studies have shown good results.

**Keywords:** Fasciitis, Plantar, Physical Therapy Modalities, Rehabilitation

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## INTRODUCTION

Plantar fasciitis, or calcaneus pain syndrome, is a frequent cause of pain in the heel and in the foot that afflicts some two million American adults each year.<sup>1,2</sup> It is estimated that some 10% of the population worldwide have presented or will complain of foot pain at some time in their lives<sup>1,3,4</sup> and that 7% of those over 65 years of age report hypersensitivity in the heel area.<sup>3,5</sup>

The clinical sign of this disease is localized pain in the heel or along the entire plantar fascia to its insertion, especially in the first steps of the day or after long periods of not having the feet on the floor. Long walks or long periods on their feet can also be uncomfortable for these patients.<sup>6-9</sup>

The etiology of PF is multifactorial-it can develop from inflammatory or degenerative factors. The most frequently cited risk factors are the loss of range of ankle dorsiflexion motion and high body mass index. PF can also be triggered by other factors such as an overload of the plantar fascia linked to intrinsic weakness in the foot, anatomical and biomechanical alterations in the plantar arch, discrepancy between the lower limbs, inappropriate footwear, and alterations in the static and dynamic positioning of the feet.<sup>3,4,8-11</sup>

Different interventions are used during PF rehabilitation, however there is no consensus as to the best treatment option, for the evidence varies widely with the effectiveness of each technique.

## OBJECTIVE

The objective of this study was to review the literature in order to verify the effectiveness of the different physiotherapeutic treatment modalities on patients with plantar fasciitis.

## METHOD

An electronic search was conducted in the databases of the Cochrane Library, Medline (via Pubmed), PEDro, and LILACS, with no date or language restrictions. The search was carried out between November and December of 2012 using the following terms: "plantar fasciitis", "heel pain", "physical therapy", "exercise", and "conservative treatment". The present study included articles that dealt with the physiotherapeutic treatment of plantar fasciitis

and excluded those that focused on surgical treatment. The titles and abstracts of the articles found were analyzed by two independent authors. Articles considered potentially eligible were obtained and the complete texts were analyzed. The data collected by the two authors was later compared and, in case of conflict, a third author decided whether to include it in the study. The outcomes from the physiotherapeutic treatments for plantar fasciitis were extracted from the included studies.

## RESULTS

The data extracted from the 23 studies that fulfilled the inclusion criteria was analyzed according to their treatment modality:

### 1 - Stretching of the sural triceps

One study conducted by Kibler et al.<sup>12</sup> compared the range of movement in dorsiflexion of the feet with and without plantar fasciitis and found a statistically significant difference between the healthy and afflicted sides, wherein the afflicted side had more limited range of motion, suggesting that limited dorsiflexion amplitude is one of the risk factors for developing PF. Snow et al.,<sup>13</sup> working with cadavers, verified that the presence of connective tissue of the tendon fibers of the heel are also present in plantar fasciitis. Porter et al.,<sup>14</sup> through a randomized clinical trial, verified that the patients' pain in PF diminished to the degree that the range of motion (ROM) of dorsiflexion was recovered. No ECR was found that evaluated the isolated effect of stretching compared with a control group that did no other intervention, and the evidence around this modality is moderate.

### 2 - Manual Therapy

Manual therapy is widely used in rehabilitation centers and there is evidence of improvement in pain and gains in ROM under various musculoskeletal conditions such as knee osteoarthritis, ankle sprains, and rotator cuff injuries.<sup>15</sup>

Di Giovanni et al.<sup>16</sup> verified through clinical trials that specific stretching of the fascia yielded better results than global stretching of the ankle musculature, however both groups (stretching of fascia *versus* global stretching of the ankle) showed improvements.

Other studies of lesser index of evidence (group/series of cases and case studies) reported good results from manual therapy

composed of mobilization exercises of the tibial nerve, passive stretching of the posterior tibial muscle, strengthening, and the use of bandages.<sup>17,18</sup>

One randomized multicenter clinical trial on 60 patients divided them into two groups: one group did manual therapy and active exercises while the other group did therapy with electro-physical agents and active exercises-the results favored the group that received manual therapy.<sup>19</sup> Another clinical trial conducted by Renan-Ordine et al.<sup>20</sup> verified that the manual release of the trigger points combined with active stretching yielded a short-term improvement in pain and function when compared to the isolated performance of stretching.

No ECR were encountered in evaluating the isolated effects of manual therapy and of each type of exercise analyzed separately, and the overall evidence of this modality is still moderate.

### 3 - Taping (Bandages)

Pronation, which is caused by excessive plantar flexion and adduction of the talus during the discharge of weight caused by the eversion of the heel, results in increased tension on the structures of the plantar surface of the foot and generates excessive stress on the plantar fascia.<sup>4,9</sup> The use of anti-pronation taping was studied by Hyland et al.<sup>21</sup> in a clinical trial, with one week of follow-up, which was composed of four groups: heel taping, placebo taping, isolated alignment, and a control group. The group that received heel taping showed improvement in pain in comparison to the other groups.

The elastic bandage was studied by Radford et al.<sup>22</sup> The clinical trial was composed of two groups of 46 patients each. One group received an elastic bandage with ultrasound placebo and the other group received only the ultrasound placebo. There was no statistically significant difference between the groups, however, the group that received the bandage obtained a slight improvement in pain.

One systematic review from 2010 included five clinical trials that used taping in the treatment of PF and concluded that there was a high level of evidence that taping yields short-term benefits, but the results as to the long term were inconclusive.<sup>23</sup> In spite of little evidence on the effectiveness of elastic bandages, the use of this technique in the conservative treatment of PF has shown benefits as a supplementary resource.

#### 4 - Foot Orthoses/Insoles

Orthoses for the feet are frequently used as a component of conservative treatment for PF with the objective of correcting biomechanical alterations of the feet that cause excessive stress on the fascia.

The studies include different types of orthoses such as felt insoles, cushions, and other things. Different studies were found, among them two stood out.

The first study, conducted by Peffer et al.<sup>24</sup> involved 236 patients in a multicenter clinical trial to evaluate five different treatments: ankle stretching, silicone insoles, plantar arch support with ankle stretching, rubber insoles with hindfoot support and stretching, and the use of a functional orthosis along with stretching exercises. After eight weeks, the prefabricated orthoses proved to be effective and the use of orthoses with stretching was more effective than stretching alone.

Another study, conducted by Landorf et al.<sup>25</sup> involving 136 patients, was a randomized clinical trial composed of three groups: placebo orthoses, prefabricated orthoses of rigid foam, and semi-rigid customized plastic orthoses. The group that received the customized prefabricated orthoses showed short-term improvements in pain and function. The follow-up after 12 months showed similar results for the three groups.

In a systematic review carried out by Jawke et al.,<sup>26</sup> collaborators reported that there was significant evidence that the customized orthoses yielded positive results as to function, but not in reducing pain after three and twelve months.

#### 5 - Night Splints

Night splints are used to maintain dorsiflexion and extension of the toes while the patient is sleeping; this way the fascia is also stretched and keeps its ideal length.<sup>7</sup>

One clinical trial<sup>27</sup> involving 116 patients was divided into two groups: one group was treated with anti-inflammatories and given night splints, and the other group only anti-inflammatories. At the three-month follow-up there was no difference between the two groups.

One crossover study carried out in 1998 was composed of 37 patients with chronic PF.<sup>28</sup> The study was composed of two groups wherein group A made use of splints for the first month and group B used splints during the second month. In the four final months

neither group used splints and 88% of the patients experienced an improvement of symptoms.

A systematic review made by Crawford & Thompson<sup>29</sup> found limited evidence for the use of night splints by PF patients being treated for at least six months. Those patients who received customized splints showed an improvement in pain, while those treated with prefabricated splints did not achieve the same results.

#### 6 - Electrotherapy

##### 6.1 - Extracorporeal Shockwave Therapy (ESWT)

The use of ESWT has increased in recent years and has been a treatment option in various musculoskeletal conditions, including PF.<sup>30</sup>

In one systematic review, Cochrane<sup>29</sup> included five randomized clinical trials using different doses. The evidence is still inconclusive in spite of some studies reporting favorable results with ESWT.

The systematic review conducted by Landorf & Menz<sup>6</sup> was composed of six clinical trials that compared the use of ESWT with other modalities (placebo or low dosage). The review concluded that ESWT yielded a reduction in pain in a period of less than twelve weeks as compared with the placebo or low dosage treatment, however the clinical significance of the study is questionable due to the low evidence of the studies included. For this reason one can conclude that the evidence on the use of ESWT is very low.

##### 6.2 - Ultrasound

One clinical study containing 19 patients with bilateral PF reported the results of eight weeks of ultrasound treatment in comparison with a placebo (apparatus turned off) and found no difference between the two groups.

There is no evidence to support the use of therapeutic ultrasound in the treatment of PF patients.

##### 6.3 - Laser

Only one study was found, which was a randomized clinical trial that evaluated the application of low-intensity laser *versus* placebo (treatment with the laser turned off) and there was no difference between the two treatment groups.

There is no evidence to support the use of therapeutic laser in the treatment of PF patients.

## DISCUSSION

During the search no clinical studies were found that dealt with any type of strengthening exercises to treat patients with plantar fasciitis.

There was, however, moderate evidence to support the implementation of stretching exercises of the sural triceps. In a clinical trial conducted by Porter et al.<sup>14</sup> they verified that after four months of a stretching program for the sural triceps the patients with plantar fasciitis presented diminished pain closely linked to an improved range of motion in dorsiflexion. DiGiovanni et al.<sup>16</sup> also conducted a randomized clinical trial comparing ankle stretching with specific stretching of the fascia and concluded that the group that did the specific fascii stretching showed more satisfactory results in the diminution of pain than the group that did the traditional and global stretching. However, the study conducted was not blind and had a high sample dropout rate, which could directly affect the results.

Hyland et al.<sup>21</sup> published a randomized clinical trial in 2006 comparing heel taping with placebo taping and stretching and obtained favorable results in pain reduction in the group that received heel taping. The results had to be analyzed carefully since the study was not evaluator-blind. Radford et al.<sup>22</sup> made a controlled blind clinical study in which one group of patients received taping in conjunction with ultrasound placebo and the other group received only the ultrasound placebo. The results slightly favored the group that received the taping, however the lack of a control group and the short follow-up period (one week) were important limitations in the study.

Among the modalities of electrotherapy, shockwave therapy stands out with increasing research regarding its effectiveness. The results found in the clinical trials are contradictory, since some studies find favorable results and others find no satisfactory results with this modality. Another important factor is the lack of methodological rigor among these studies, which does not allow any precise statement on the technique's effectiveness.<sup>29,30-33</sup>

Orthoses and insoles are frequently used to treat patients with plantar fasciitis. A study conducted by Landorf et al.<sup>25</sup> showed that, after three months of using customized insoles, the patients presented better functional results than the placebo

group. This data corroborates with a study by Roos et al.<sup>34</sup> in which they obtained favorable results for the group that used customized orthoses as compared to the group that used prefabricated orthoses for a period of three to twelve months. Both studies presented a moderate level of evidence, with some methodological biases. Other studies suggested that this type of orthosis diminishes the pain of patients with plantar fasciitis, but all of them are of low methodological quality, therefore this data must be viewed with caution. In a randomized clinical trial composed of 60 patients, Turlik et al.<sup>35</sup> compared the use of customized orthoses with generic orthoses and found results favorable to the group using customized orthoses, however there was no masking of the sample, there was a significant dropout of participants, and the data was not clearly presented.

The effectiveness of night splints proved inconclusive. Generally the splints are prescribed when symptoms last for more than six months, however, some adverse effects such as discomfort and cost-benefit are frequently reported. Batt et al.<sup>36</sup> reported that favorable results can be obtained by chronic patients after nine to twelve weeks using the splints. Powel et al.<sup>28</sup> demonstrated after one month's use, that 37 patients obtained an 88% improvement in symptoms. In a clinical study carried out by Roos et al.,<sup>34</sup> 43 patients were divided into three groups (use of orthoses, use of orthoses in conjunction with splints, and use of only splints) and all the groups showed satisfactory results after six weeks and one year of follow-up, however the group that received the orthoses and the splints presented the best results. In contrast, Probe et al.<sup>37</sup> did not find satisfactory results for the use of night splints in comparison to anti-inflammatories, footwear modifications, or stretching exercises, however that study is also of dubious quality. Some studies report that plantar fasciitis presents a spontaneous cure in a portion of the population; for this reason, the data from studies with long-term follow-ups must be viewed with caution.

Until now the evidence on physiotherapeutic treatment for plantar fasciitis is limited. The limited number of randomized clinical trials that involve different therapeutic modalities such as stretching exercises, strengthening exercises, and taping present low quality methodology. There are few studies that compare isolated techniques with a placebo group, which hampers the interpretation of the results. Most of the studies found present

important methodological failings such as lack of masking, no standardization of data, sample loss, and lack of randomization, all of which make reaching a decision based on a consensus of the literature impossible.

## CONCLUSION

There is moderate evidence that stretching exercises for the sural triceps yield benefits for patients with plantar fasciitis. The evidence on taping is weak, however, some studies report improvement in pain and function over the short term.

There is quality evidence to support claims that the use of customized insoles yield improvements in pain and function in the short term for patients with plantar fasciitis.

The use of night splints that maintain continuous stretching of the sural triceps shows conflicting results, and some studies have obtained good results from their use. Pain and discomfort are factors that are frequently reported from their use, aside from their cost.

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