



RESEARCH ARTICLE

EFFECT OF DORSIFLEXION NIGHT SPLINTS IN TREATMENT OF PLANTAR FASCIITIS

Bhanwar Singh Takhar\* and Sanjeev Saxena

Singhania University, Pachheri Bari, Jhunjhunu, India

ARTICLE INFO

Article History:

Received 17<sup>th</sup> April, 2012  
Received in revised form  
24<sup>th</sup> May, 2012  
Accepted 25<sup>th</sup> June, 2012  
Published online 30<sup>th</sup> July, 2012

Key words:

Plantar Fasciitis,  
Ultra Sound Therapy,  
Dorsiflexion Night Splints.

ABSTRACT

**Background:** Plantar fasciitis (PF) is an overuse injury causing inflammation at the origin of the plantar fascia and surrounding perifascial structures, such as the calcaneal periosteum, which affects about 10% of the population at least in one moment in life. Successful treatment of plantar fasciitis usually requires a combination of treatment modalities, rather than administering only one treatment at a time. This study is aimed to examine the effect of dorsiflexion night splints with ultrasound therapy and exercises in the management of plantar fasciitis.

**Methodology:** 12 subjects of both genders, with mean  $\pm$  SD age of  $46.08 \pm 3.82$  years were selected on the basis of selection criteria. The subjects were under a structured 6 weeks exercise program, dorsi flexion night splint and ultra sound therapy for each day for 6-days a week.

**Result:** There is statistically significant reduction in foot functional score index measures and improvement in range of motion of ankle joint with p value less than 0.05 after 6 weeks of supervised exercise program.

**Conclusion:** The results of the present study, suggest that dorsiflexion night splints with ultrasound therapy and exercise are effective for plantar fasciitis.

Copy Right, IJCR, 2012, Academic Journals. All rights reserved.

INTRODUCTION

Plantar fasciitis (PF) is an overuse injury causing inflammation at the origin of the plantar fascia and surrounding perifascial structures, such as the calcaneal periosteum, which affects about 10% of the population at least in one moment in life (Cornwall & McPoil, 1999; Roxas, 2005). It is the most common clinical problem that causes infero-medial heel pain in adults.<sup>1-4</sup> Inflammation occurs by repeated micro traumas at the origin of plantar fascia over the calcaneal medial tuberosity. Traction forces during the support phase on gait lead to an inflammatory process, resulting in fibrosis and degeneration. Calcaneal spur, and medial calcaneal nerves, lateral plantar nerve and fifth toe abductor nerve trapping may be involved, usually, when an inflammation picture is already established on plantar fascia (Young *et al.*, 2001).

Treatment for plantar fasciitis can be divided into numerous categories as listed below:

1. Conservative care (chiropractic therapy, electric modalities, patient education, soft tissue therapy/massage, acupuncture, taping, night splints, stretching, ice, heat, strengthening, orthotics)
2. Injections and medication
3. Surgical intervention

Successful treatment of plantar fasciitis usually requires a combination of treatment modalities, rather than administering

only one treatment at a time (Tisdell *et al.*, 1999; Lynch *et al.*, 1998). Although many authors agree that mechanical treatment should be considered a cornerstone of any plan of treatment, some debate remains regarding the most effective form of mechanical intervention (Scherer, 1991). These modalities may include foot orthoses, foot taping, footwear, night splints, rest, and walking casts. Night splints have been proven to be effective in relieving the pain associated with the first step in the morning by preventing nocturnal contracture of the plantar fascia and Achilles tendon (Mizel *et al.*, 1996). The natural history of plantar fasciitis is often self-limited and generally resolves within one year (Caselli, 1997). Ultrasound is a high frequency sound wave with an affinity for tendons and ligaments (highly organized, without high water content). Ultrasound has been purported to increase chemical activity in tissues, increase cell membrane permeability, deform molecular structures, and alter diffusion and protein synthesis rates, all potentially affecting the speed of tissue repair. This study is aimed to examine the effect of dorsiflexion night splints with ultrasound therapy and exercises in the management of plantar fasciitis.

METHODOLOGY

Prior to participation in the study all patients were explained in detail about the research intervention procedures and associated risks and benefits specific to the intervention and they acknowledged their participation by signing an informed consent. Study was conducted in the outpatient department of a teaching hospital. Twelve patients were included in this pilot study who were referred by physicians with a clinical

\*Corresponding author: [bhanwar\\_physio@rediffmail.com](mailto:bhanwar_physio@rediffmail.com)

diagnosis of plantar fasciitis or directly recruited by the principal investigator based on the presence/absence of following inclusion/exclusion criteria.

### Inclusion Criteria

1. Plantar heel pain
2. Pain provoked by taking the first few steps in the morning, by standing after prolonged sitting, and/or by prolonged standing
3. Tenderness localized to the origin of the plantar fascia on the medial calcaneal tubercle.

### Exclusion Criteria

1. Previous foot surgery
2. Foot trauma within the previous three months
3. Tarsal tunnel syndrome
4. Loss of plantar foot sensation
5. Foot pathology other than plantar fasciitis including tendonitis, bursitis, or calcaneus fracture
6. Generalized inflammatory disorders associated with the diagnosis of plantar fasciitis including rheumatoid arthritis, ankylosing spondylitis, Reiter's disease, gout, or lupus
7. Previous treatment of plantar fasciitis with dorsiflexion night splints and/or medial arch supports
8. Inability or unwillingness to discontinue current treatment modalities that are used for the purpose of plantar fasciitis
9. Participation in a worker's compensation program
10. Age of less than eighteen years

Ultra sound therapy was given to the subjects on the affected side over the heel with ultra sound gel as coupling media, with 3 MHz frequency for 4 minutes in continuous mode. All subjects were advised with active free exercises for toes and stretching of plantar fascia. Subjects were also advised to wear dorsi flexion night splint made of polypropylene, which holds the ankle in about 5° of dorsiflexion for six weeks. Range of pain-free passive ankle joint dorsiflexion with straight knee was measured using goniometer and disability imposed by the heel pain/plantar fasciitis measured by Pain and Disability sub-scales of the Foot Function Index at base line and after six weeks of intervention.

### RESULTS

The data collected were analysed using IBM SPSS version 20 for windows. Demographic details like age, gender, side of involvement and duration of symptoms were also recorded at baseline and analysed. Significance with in group was analysed with p value set at 0.05 for statistical significance. The mean  $\pm$  SD of age is found to be  $46.08 \pm 3.82$  years for all the 12 participants. There were 4 females and 8 males in the study. Table-1 shows the details of comparison of pre and post intervention values within the group, ankle dorsi flexion range of motion was analysed with paired t-test and ankle pain and disability foot function index was analysed with Wilcoxon signed rank test. In both outcome measures there were

**Table 1: Analysis of pre and post intervention values**

Outcome measures	Pre	Post	p
Ankle dorsiflexion	8.42 $\pm$ 2.02	11.41 $\pm$ 2.10	0.000
Foot function Index	79.00 $\pm$ 6.94	51.16 $\pm$ 4.60	0.002

significant improvement after intervention compared to before intervention values.

### DISCUSSION

This study analysed the effects of dorsiflexion night splints with ultrasound therapy and exercises in the management of plantar fasciitis for increasing passive range of motion of ankle joint and improving functional independency of foot. Kogler and Cornwall (1995) reported that foot orthoses designed to provide total contact to the plantar surface of the foot in combination with proper footwear significantly decreased the strain on the plantar fascia during weight bearing. Wapner and Sharkey (1991) were one of the first to report that a molded ankle foot orthosis used at night to maintain the foot in either neutral or dorsiflexion was a useful adjunct in the treatment of prolonged cases of plantar fasciitis. They had a 79% cure rate after patients used the splint for an average of four months.

Mizel *et al* (1996) showed that use of night splints to prevent plantar fascia contracture and shoe modification consisting of a steel shank and anterior rocker bottom to limit plantar fascia tension from heel rise to toe off during ambulation resulted in improvement in approximately 80% of patients with acute plantar fasciitis. Porter *et al* (2002) conducted a study comparing sustained with intermittent Achilles tendon stretching on dorsiflexion, pain and function over a four month period. Increased Achilles tendon flexibility was found to correlate with decreased foot and ankle pain and increased foot and ankle function, an important point for consideration. This study was limited to less number of subjects and lack of control group to find out the more accurate effects. Leg dominance was also not given much importance.

### Conclusion

This study suggests that ultrasound therapy and Exercises along with dorsi flexion night splint are effective in reducing pain & disability and increasing range of motion in subjects with plantar fasciitis.

### REFERENCES

- Caselli MA, *et al*. Evaluation of magnetic foil and PPT Insoles® in the treatment of heel pain. J Am Pod Med Assoc. 1997; 87(1):11-16.
- Cornwall MW, McPoil TG. Plantar fasciitis: etiology and treatment. Journal of Orthopaedic & Sports Physical Therapy 1999;29:756-60.
- Kogler GF, Solomonidis SE, Paul JP. In-vivo method for quantifying the effectiveness of the longitudinal arch support mechanism of a foot orthosis. Clinical Biomechanics 1995;10:245-52.
- Lynch DM, Goforth WP, Martin JE, Odom RD, Preece CK, Kotter MW. Conservative treatment of plantar fasciitis. A prospective study. Journal of the American Podiatric Medical Association 1998;88:375-80.

- Mizel MS, Marymont JV, Trepman E. Treatment of plantar fasciitis with a night splint and shoe modification consisting of a steel shank and anterior rocker bottom. *Foot & Ankle International* 1996;17:732-5.
- Porter D, Barrill E, Oneacre K, May BD. The effects of duration and frequency of Achilles tendon stretching on dorsiflexion and outcome in painful heel syndrome: a randomized, blinded control study. *Foot Ankle Int.* 2002; 23(7):619–624.
- Roxas, M. Plantar fasciitis: diagnosis and therapeutic considerations. *Alt Med Rev.* 2005; 10:83-93.
- Scherer PR. Heel spur syndrome. Pathomechanics and nonsurgical treatment. Biomechanics Graduate Research Group for 1988. *Journal of the American Podiatric Medical Association* 1991;81:68-72.
- Tisdell CL, Donley BG, Sferra JJ. Diagnosing and treating plantar fasciitis: a conservative approach to plantar heel pain. *Cleveland Clinic Journal of Medicine* 1999;66:231-5.
- Wapner KL, Sharkey PF. The use of night splints for treatment of recalcitrant plantar fasciitis. *Foot & Ankle International* 1991; 12:135-7.
- Young CC, Rutherford DS, Niedfeldt MW. Treatment of plantar fasciitis. *American Family Physician* 2001; 63: 467-74.

\*\*\*\*\*