

The effectiveness of dorsiflexion night splint added to conservative treatment for plantar fasciitis

Plantar fasiitis için konservatif tedaviye eklenen dorsifleksiyon gece atelinin etkinliği

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Amaç: Plantar fasiitis tedavisinde gece ateli kullanımının etkinliği ve tedavi sonuçları değerlendirildi.

Çalışma planı: Çalışmaya plantar fasiitis tanısı konan 44 hasta (53 ayak) alındı. Yakınmaların süresi ortalama 7.2±5.9 haftaydı (dağılım 1-24 hafta). On iki ayakta eşlik eden kalkaneal çukıntı vardı. Tüm hastalara klasik konservatif tedavi uygulandı ve bu tedaviye ek olarak, uyurken ayak bileğini 5° dorsifleksiyonda tutan gece atelini sekiz hafta kullanmaları önerildi. Yirmi beş hasta (14 kadın, 11 erkek; 31 ayak) sadece konservatif tedaviyi sürdürdü. On dokuz hasta (12 kadın, 7 erkek; 22 ayak) ise gece ateli uygulamasını kabul etti. Değerlendirme, hastaların ilk başvurularında ve ikinci ay sonunda, AOFAS ayak bileği-arka ayak değerlendirme skalası ve görsel analog skala (GAS) ile yapıldı. Ortalama izlem süresi atel kullanmayan grupta 32.7 ay (dağılım 13-53 ay), atel kullanan grupta 33.8 ay (dağılım 12-54 ay) idi.

Sonuçlar: Tedavi öncesindeki ayak bileği-arka ayak değerlendirme skoru ve GAS skoru açısından iki grup arasında anlamlı farklılık yokken, ikinci ayda, atel kullanan hastalarda her iki skordaki düzelmenin anlamlı derecede daha fazla olduğu görüldü (sırasıyla, p=0.01 ve p=0.001). Takip süresi sonunda atel kullanmayan grupta dokuz ayakta (%29), atel kullanan grupta üç ayakta (%13.6) yakınmaların tekrarladığı görüldü. Tüm hastalar değerlendirildiğinde, kalkaneal çukıntı, iki taraflı tutulum ve vücut kütle indeksi ile memnuniyet oranları ve nüks arasında; kalkaneal çukıntı ile vücut kütle indeksi arasında anlamlı ilişki bulunmadı. Başvurudaki yakınma süresi ile nüks arasındaki ilişki ise anlamlıydı (r=0.326, p=0.031).

Çıkarımlar: Plantar fasiitis nedeniyle ilk kez tedavi gören hastalarda, diğer konservatif yöntemlere eklenen gece ateli kullanımını erken dönemde topuk ağrısının gerilemesini sağlamasına karşın, iki yıldan uzun takipte yakınmaların tekrarlaması üzerinde belirgin bir etki sağlamamıştır.

Anahtar sözcükler: Ayak bileği; fasiitis, plantar/tedavi; ayak hastalığı/tedavi; ağrı/etyoloji; hasta memnuniyeti; atel.

Objectives: We evaluated the effectiveness and results of night splint applications for the treatment of plantar fasciitis.

Methods: The study included 44 patients (53 feet) with plantar fasciitis. The mean symptom duration was 7.2±5.9 weeks (range 1 to 24 weeks). Calcaneal spurs were detected in 12 feet. All the patients received classic conservative treatment and all were recommended to use a night splint that kept the ankle in 5-degree of dorsiflexion for eight weeks. Twenty-five patients (14 females, 11 males; 31 feet) did not accept to use a night splint, whereas 19 patients (12 females, 7 males; 22 feet) did. Evaluations were made with the AOFAS ankle-hindfoot rating scale and a visual analog scale (VAS) before and after two months of treatment. The mean follow-up periods were 33.8 months (range 12 to 54 months) and 32.7 months (range 13 to 53 months) for those who completed treatment with and without the use of a night splint, respectively.

Results: Although there were no significant differences between the two groups with regard to the initial AOFAS and VAS scores, patients using a night splint exhibited significantly higher improvements in both scores at the end of the second month (p=0.01 and p=0.001, respectively). Heel pain recurred in three feet (13.6%) and in nine feet (29%) with and without night splint applications, respectively. Overall, the presence of a calcaneal spur, bilateral involvement, and body mass index were not correlated with patient satisfaction and recurrences. There was no correlation between the presence of a calcaneal spur and body mass index. However, symptom duration till treatment showed a significant correlation with recurrences (r=0.326, p=0.031).

Conclusion: Patients without previous treatments for plantar fasciitis obtain significant relief of heel pain in the short term with the use of a night splint incorporated into conservative methods; however, this application does not have a significant effect on prevention of recurrences after a two-year follow-up.

Key words: Ankle; fasciitis, plantar/therapy; foot diseases/therapy; pain/etiology; patient satisfaction; splints.

Plantar heel pain syndrome or plantar fasciitis is a common disorder seen in 10% of the population throughout their lives.^[1] It may present with bilateral symptoms in approximately 20-30% of patients^[2] and in this case, systemic diseases such as seronegative spondyloarthritis or Reiter's syndrome should be investigated. No treatment method has showed a significant superiority over others in treatment of plantar fasciitis. Rest, stretching and strengthening exercises, dorsiflexion splints, laser, physical therapy agents, NSAIDs, silicone heel cushions, orthosis, corticosteroid injections, casting, extracorporeal shock wave treatment (ESWT), surgery, botulinum toxin, are among the various treatment methods applied. In the present study, the efficiency of dorsiflexion splints applied during nights in treatment of plantar fasciitis, was investigated.

Patients and methods

Patients who have been diagnosed with plantar fasciitis in the Orthopedics and Traumatology Polyclinic due to heel pain between 2002-2005, were included in our study. Patients who had a treatment on their same foot due to heel pain prior to our study, were excluded. Height and weight of all the patients were recorded. They were asked on; whether they do sport regularly, presence of any physical activities out of their routine prior to the arising of their complaints, how much time they spend standing during daily life, and usage of different shoes.

Physical examination

Plantar fasciitis diagnosis was reached by determining presence of localized tenderness over facia at medial calcaneal tuberositas or as calcaneal bursitis beneath the heel, and via presence of a history of experiencing pain upon the first step in the morning or while shifting to standing position after a long period of sitting. During the examination of the foot; joint mobility of ankle and 1st metatarsophalangeal joint, stability of ankle and hindfoot, abduction/adduction of anterior foot, heel tenderness and localization, occurring of pain as a result of Windlass maneuver, presence of localized callus, foot arch disorders, were evaluated. Apart from the foot examination of the patients, lower back and both lower extremities were examined as well. Height difference, and any motor or sensorial loss in favor of neuropathy and radiculopathy, were investigated. Patients with neuropathy

or pain originating from lower back, were excluded from the study.

Laboratory examinations

Lateral foot x-ray was applied to each patient as standard radiography. In order to investigate the presence of an accompanying disease; CBC, CRP, sedimentation, rheumatoid factor, alkaline phosphatase, and fasting sugar analyses were carried out. Patients diagnosed with tarsal tunnel syndrome, systemic metabolic or rheumatismal diseases, or any disorders that may cause heel pain, were excluded from the study as a result of the physical and laboratory examinations.

Treatment

Standard conservative treatment method was given to each patient, however, night splint procedures were mentioned with their positive contributions as well. In patients who have been evaluated to be eligible for this treatment method both financially and physically, night splint was added to the standard therapy procedure.

Group I: Silicone heel cushion for shoes, silicone heel cushion for slippers, oral NSAIDs, activity modification, stretching exercises, and a diet for overweight patients (BMI>25), were recommended.

Group 2: Additional to the recommendations of group I, using a night split (figure 1) which maintains ankle at 5° dorsiflexion during sleep, was suggested for 8 weeks. All the splints were manufactured in the same orthosis-prosthesis center in a customized way.

Evaluation

Because patients chose to use the night split themselves as an additional treatment method, study results which have been designed as non-randomized and prospective, were evaluated retrospectively. During admittance and at the end of the 2nd month, patients were interviewed in light of AOFAS ankle – hindfoot scale (AHRF)^[18], and visual analog scale.^[19] Complaints of patients using night splints were investigated. Patients were reached after retrospective examination and their degree of satisfaction and presence of any recurrence were asked. While patients with same recurrence rates were classified as not satisfied, ones with mild and infrequent ankle pain were classified as satisfied, and patients without any complaints were classified as very satisfied. Mean follow-up period was 33.2 months (12-54) (Table 1).

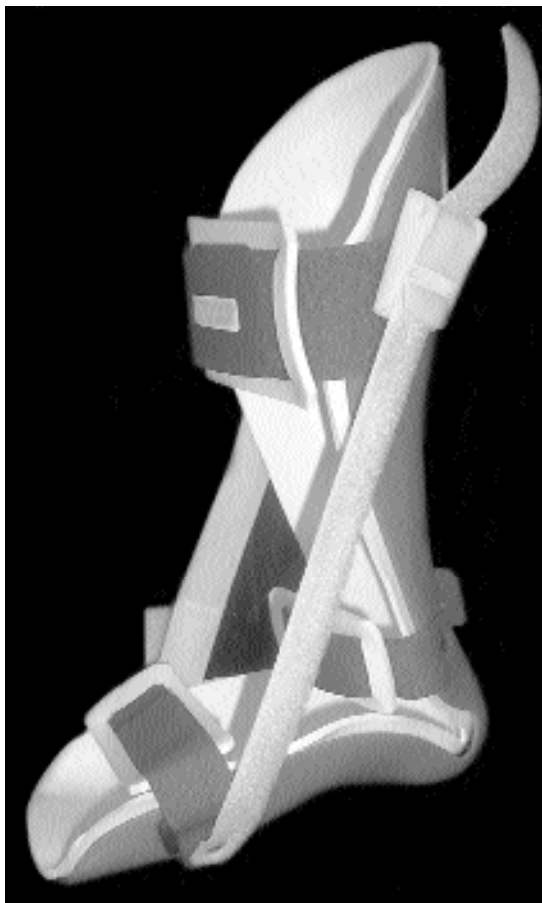


Figure 1. Appearance of custom night splint.

Statistics

Results were assessed with the following methods: Pearson chi-square test was used for demographic and table comparisons with addition of Fisher's exact chi-square when required; Mann-Whitney U, and if required T tests, were employed for comparisons between groups. $P < 0.05$ was accepted as statistically significant. Pearson correlation analysis was applied in correlation analyses.

Results

Fifty-nine patients in total were included in the study. Some of those patients were excluded from the study due to the following reasons: 4 patients didn't come to their follow-up visits at the end of the 2nd month, 4 patients could not be reached for their last follow-ups, 6 patients had a record of inadaptability for the use of night splints for which they had conceded in the beginning, and 1 patient experienced a traffic accident within the follow-up period and treated for the tibial fracture occurred in the same side. 53 feet of 44 patients who completed the total

follow-up measures, were evaluated.

Mean age of 26 female and 18 male patients was $50,5 \pm 12$ (27–70). Ankle pain was present and localized in right ankle of 19 patients, in left ankle of 16 patients, and in both ankles of 9 patients. 31 feet of 25 patients (14 female, 11 male) in non-splint Group 1 and 22 feet of 19 patients (12 female, 7 male) in splint Group 2, were included in the study. No statistical difference was found between the two groups regarding the demographic variables. Mean height was $168 \text{ cm} \pm 0,08$ (154–187), mean weight was $79 \text{ kg} \pm 9,88$ (58–102), and mean body mass index (BMI) was $28,1 \pm 2,83$ (21,8–35,5). According to the BMI classification (Table 2), 5 patients were determined to be normal, 29 overweight, and 10 fat. The mean duration passed between the beginning of the complaint and visiting a physician was $7,2 \pm 5,85$ weeks (1–24). None of the patients were actively participating in any kind of sport. Twenty-six patients were working in a job requiring them to spend too much time standing (>5 hours). In 11 patients, symptoms have begun following to wearing a different shoe or exerting overactivity. While 41 feet did not reveal calcaneal spur in direct radiography, 12 feet had an accompanying spur. In 63% (12 patients) of patients using splint, temporary complaints were observed. The rates of observed complaints in 19 patients were as follows: 42% (8/19) disruption in sleep order, 21% (4/19) mild numbness in toes, 16% (3/19) excessive sweating in feet. Patients told us that those complaints were relieving after a mean period of 3 weeks. 37% (7 patients) of them had used the splint without any difficulty.

Whereas mean AHRS scores were $64,3 \pm 5,56$ (54–76) for Group 1 patients, and $65,4 \pm 6,18$ (54–78) for Group 2 patients; two months later mean scores for Group 1 and 2 were as follows respectively, $81,8 \pm 9,68$ (70–100) and $89,5 \pm 7,92$ (74–100). While initially the mean VAS results were $5,8 \pm 1,12$ (4–8) and $6,2 \pm 1,34$ (4–8) respectively, 2 months later these results were $2,2 \pm 1,08$ (0–4) and $1,3 \pm 0,73$ (0–3) respectively. Whereas no statistically significant difference was present in terms of initial AHRS and VAS results, AHRS results of Group 2 patients using splint, were statistically significantly ($p=0.01$) elevated in the 2nd month follow-up (Figure 1a). A statistically significant difference ($p=0.001$) was determined between 2nd month VAS

results of the two groups in favor of Group 2 (Figure 2 b). While the complaints of Group 2 patients were determined to be reduced by %79 in terms of VAS, same reduction was 62% for Group 1 patients.

While the Group 2 patients expressed a significant reduction of pain felt during their first step in the mornings within the first 10 days, a relief was observed to be established 1 month later in Group I patients. The last interview with the patients revealed 9 recurrences (29%) during the 32,7 months-long (13-53) mean follow-up period for Group I patients, only 3 (13.6%) recurrences were determined during 33,8 month-long (12-54) follow-up period of Group 2 patients. While 28% (7 people) of patients in Group 2 were very satisfied with their condition, 44% (11 people) were satisfied, and 28% (7 people) were not satisfied. In Group 2; while 42% of the patients (8 patients) were very satisfied with the results, 42%^[8] were satisfied, and 16%^[3] were not satisfied. No statistical correlation was found between all of the patients in terms of; presence of calcaneal spur, presence or absence of bilateral involvement, BMI, recurrence, and treatment satisfaction level (satisfied, not satisfied, very satisfied).

A correlation was determined for all the patients in comparison of the complaint duration stated during initial presentation with the recurrence ($p=0,031$ ve $r=0,326$). No matter which group they belong, complaints of patients with longer than a 24-month follow-up, were found to be recurring at statistically significant ($p<0.05$) rates. No statistically significant correlation was determined among all of the patients between calcaneal spur and BMI ($p=0,535$ ve $r=0,096$).

Discussion

Pain in plantar fasciitis may occur starting from abductor hallucis longus muscle and radiating through medial arc or directly under the calcaneus, as calcaneal bursitis. The aim of the treatment is preventing long-term tension of plantar fascia by reducing the movement of the foot arch.^[20] Dorsiflexion night splints are first recommended for treatment of plantar fasciitis in 1991 by Wapner et Sharkey,^[21] and later on, its efficiency and advantages were outlined by various authors.^[7, 22, 23] Many indications have been described for use of dorsiflexion splints such as calcaneal apophysitis, prevention of contractures in children with cerebral palsy, bilateral achille tendini-

tis, idiopathic toe walking, calcaneal spur surgery.^[24]

Use of night splints may mostly cause conformity problems in patients. Therefore, a velcro band which is very light and placed to the tuberositas tibia, and a stockinette have been presented to the market by the name of "Strassburg Sock".^[25] Sleep disorder and application difficulties were observed in our patients as well. Thus, 6 patients who have been informed in detail about the splint application method and possible difficulties that could be encountered, discontinued using their splints after ordering and receiving their custom night splints. While there are studies on affects of epin calcanei on heel pain and its etiology,^[26,27,28] there are authors who decline any direct correlation.^[2,13] In the present study, more calcaneal spurs were observed in overweight people. However, in patients with more than 2 year spur follow-up, no statistically significant correlation was determined in terms of recurrence of symptoms, patient satisfaction, or treatment response. A special slipper, including a cushion made of a soft material such as silicone which supports the heel portion, was recommended to all the patients. During summer, patients, particularly women, were preferring to wear slippers outside as well. Patients who objected to use a shoe with a silicon heel cushion, outdoors, were persuaded to use slippers with heel cushion, both indoors and outdoors. Cultural background and preferences of popular trends may play a significant role in disease etiology and treatment process. Thus, modifications have been carried out in the treatment methods as to not affect the daily lives of patients. We believe; the short duration of complaint of the included patients (7,2 weeks), and absence of previous ankle pain complaint or any related treatment, might have caused to obtain relatively better results. We recommended that, the other alternative conservative treatment methods should be used or night splint application should be applied over a longer period in chronic patients, and cases with a longer history of complaints, or in patients presented with recurrence complaint. Orthosis, made of a specific hard plastic material, applied following the 2-week-long banding of the heel, was reported to give the most satisfactory results in patients with a mean complaint history of 20 weeks.^[29] Furthermore, statistically significant more satisfactory clinical results with less recurrence rates were obtained in patients of both of the

groups which had a short duration of complaints before presentation. Complaints of patients using night splints, were reduced in a shorter period of time. However, particularly in patients with a follow-up of more than 2 years, no significant difference was observed in terms of recurrence. Splint usage did not show any superiority over preventing recurrence of plantar fasciitis disease.

We believe combined treatment methods to be more effective in plantar fasciitis. The compliance of patient to the suggested treatment method bears great importance. Activity modification, weight loss, stretching exercises, oral NSAIDs, use of shoes and slippers supported by a silicon heel, addition of dorsiflexion night splint therapy, provide well clinical results and patient satisfaction in the short-term follow-up. In patients who are treated for the first time and present with a short duration of complaint, using dorsiflexion splint during nights for 8 weeks combined with other conservative methods, causes rapid regression of particularly the ankle pain occurring during the first step in the morning or after a long period of rest. However, it has no significant effects on recurring symptoms in the long-run.

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