



## Plantar Fasciitis and Current Treatment Approaches

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### Abstract

Plantar fasciitis is the most common pathology of the musculoskeletal system, especially affecting the plantar fascia. Invasive and non-invasive treatment approaches have been shown to be effective when treatment mechanisms are considered biomechanically. In addition, non-invasive treatment applications, such as applications for restoration of muscle, bony and articular structures, correct alignment, enhancement of vascularization, and improvement of proprioceptive parameters, have been recorded in the literature. In this review study, plantar fasciitis formation mechanisms, clinical symptoms and evaluation, invasive and non-invasive treatment options, and physiotherapy and rehabilitation applications in conservative treatment options are given together with the results of the literature. In addition, the treatment protocol established with our clinical experiences is shared with the readers.

**Keywords:** Foot; Plantar fasciitis; Treatment modalities; Rehabilitation

### Foot and Plantar Fascia

Plantar aponeurosis is a connective tissue starting from the calcaneus, and composed of medial, central, and lateral segments. The medial and lateral segments surround the abductor digiti quinti and abductor hallucis muscles, and the central portion of the calcaneus, starting from the medial tubercle, is named as plantar fascia. Plantar fascia extends from the phalanges of the small fingers through the longitudinal septum and from the sesamoid bone to the thumb, and through the vertical fibers in the form of five bands passing along the arch of the foot [1]. Plantar fascia contributes to foot functions by providing static and dynamic shock absorption for the longitudinal arch [2]. The Windlass Mechanism is described by Hicks in 1954 as follows: plantar fascia pulls the distal end of the metatarsal head as it applies a continuous traction at the same time; as a result, the longitudinal arch ascends, the hind foot rotates, and the leg makes an external rotation as the hind foot makes inversion. This mechanism is completely dependent on bone and joint stability [3]. In summary, the elastic tension force stored during the stance phase provides the necessary force for the push phase with the contribution of the passive elastic structure of the plantar aponeurosis [4].

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### Plantar Fasciitis

Plantar Fasciitis (PF) is an inflammatory and painful condition occurring at the site where the medial part of the plantar fascia attaches to the calcaneus. This is one of the most common causes of plantar heel pain and is responsible for most of the foot pain, which is due to the biomechanical imbalance that occurs as a result of excessive strain in the fascia. Generally, the case may be accompanied by calcaneal epin, which may also be clinically asymptomatic. Plantar fasciitis-related heel pain occurs in a slowly increasing pattern, most notably in the morning when standing up or after long periods of inactivity [5].

### Risk Factors

PF usually develops due to the coexistence of many etiologic factors. Identifying the risk factors playing a role in the occurrence of plantar fasciitis is crucial for both the identification of etiology and the successful management of preventable risk factors.

The most common risk factors:

- Restricted ankle dorsiflexion
- Increased foot pronation
- Body mass index over 30 kg/m<sup>2</sup>
- Carrying out activities such as weight lifting

**Table 1:** Hacettepe Protocol in the treatment of plantar fasciitis.

Application	Application	Specifications
Cryo-stretching	Iced pet bottle rolling under the sole	Standing, weighted, 10 min (Figure 1)
Stretching exercises	Gastrocnemius muscle	By the wall, at knee extension, holding 5 sec at the end point, 20 repeats (Figure 2)
	Gastrosoleus muscle	By the wall, at knee flexion, holding 5 sec at the end point, 20 repeats
	Plantar fascias	By the corner of the wall, holding 5 sec at the end point, 20 repeats (Figure 3)
Strengthening exercises	Foot intrinsic muscles	Short foot exercises (Figure 4)
	Foot extrinsic muscles	Collection, paper wrinkling, holding 5 sec at the end point, 20 repeats
	Tibialis posterior muscle	In sitting position, applying resistance by hand, holding 5 sec at the end point, 20 repeats
Orthosis approaches	Medial longitudinal arch reinforcement	Height must be patient-specific
	Epin insole	In the presence of calcaneal epin
Shoe recommendation	Rocker bottom insole High toe box	
Taping	Elastic taping	Anti-pronation with Kinesio-tape
		Triceps Surae and sole taping with Dynamic tape (Figure 5)
Acute cases	Non-elastic taping	To prevent plantar fascial tension
	Transverse friction massage	Every other day, 4 min, in front of the medial calcaneal tubercle (Figure 6)
Chronic cases	Intensive physiotherapy rehabilitation program	Manual techniques, involving NMES and proprioceptive training, 3 days / week, 3 weeks
	ESWT	For patients with no improvement after 6-week home program and 3-week treatment. 3-5 sessions.

- Long distance runners
- Patients with an arch problem (pes planus, pes cavus)

Among them, the most important risk factor has been reported to be restricted ankle dorsiflexion. The PF risk rate has been cited to be increase by the reduction of ankle flexion angle. It has been shown that the probability of PF increases by 2.1 times in people with <10° angle flexion angle [6]. If there is a limitation in the ankle dorsiflexion, advanced level pronation develops in the subtalar joint as a compensation. This leads to an increase in the tension load in the plantar fascia [7]. Another common cause is the biomechanical dysfunction of the foot, as well as there may be infectious, neoplastic, rheumatic, neurological, traumatic, and other systemic causes. The tension occurring in gastrocnemius and soleus muscles and Achilles tendon is among the important risk factors for PF because it affects the foot biomechanics negatively. Aging and heel fat pad atrophy are among other degenerative risk factors [7]. All of these risk factors lead to recurrent intense-stress on the plantar fascia, and they sometimes result in pain along with degenerative changes. It is also considered that intrinsic muscle weakness may be inadequate to dynamically support the medial longitudinal arch, increasing the tension on the fascia, and thus, causing the formation of PF [8].

### Clinical Symptoms

The main complaint is increasing pain that is felt throughout the heel. Pain in acute injury and avulsion-type lesions begins suddenly and intensely. Apart from the onset characteristics of pain, the clinical picture is similar in acute and chronic cases [9]. Pain is often felt at the origin of the plantar aponeurosis and distally about a centimeter of this area, and typically there exists severe pain during the first step when standing up in the morning, or at the first load after an extended rest. Pain continues to increase with increased load and continues to exacerbate progressively with daily activities [10]. Abnormal stretching of the plantar fascia caused by biomechanical factors does not constitute as a clinical symptom. However, risk factors such as increased standing pronation, high longitudinal arch (pes cavus),



**Figure 1:** Iced bottle rolling exercise weight bearing position.

height inequality between extremes, body mass index over 30 kg/m<sup>2</sup>, occupations requiring long standing and running (such as military personnel), sedentary life, the tension of the Achilles tendon and the intrinsic foot muscles, activity on the hard floor cause recurrent micro traumas on plantar fascia and other structures, leading to the appearance of clinical symptoms [5,9]. The stretching of the plantar fascia occurs during the gait terminal stance phase, when the heel is raised and the body weight is transferred to the front of the foot. The touch of the heel on the ground increases the traction force by 20%, and the force is even higher when running. Addition of the forces of the intrinsic muscles adhering to the medial tuberculus increases the effect of traction on the medial calcaneal tuberculus. Changes in activity (downhill and uphill walking, running) cause longer durations than normal walking. The tearing of the implant results in micro-tears and, consequently, inflammatory reaction and pain.

### Evaluation

Diagnosis is usually clinically based on the characteristics of patients' pain complaints. Pain localization was defined in the middle



Figure 2: Gastrocnemius muscle stretching exercise.



Figure 3: Plantar fascia stretching exercise.

of the heel (52%), in the medial tubercle region (42%) and in the lateral tubercle region (37%) [11]. Increased plantar heel pain score with weight-bearing, pain in the palpation of the proximal insertion of plantar fascia, positivity in the windlass test, negativity in the tarsal tunnel test, antalgic walking, limitation in active and/or passive talocrural joint dorsiflexion joint motion, and abnormal Foot Posture Index (FPI) score are important in diagnosis. In addition, diagnostic ultrasound is an evaluation method that has recently been used as effective as MRI and scintigraphy in the diagnosis of plantar fasciitis [7]. In the clinical evaluation of patients, pain intensity, as determined with the Visual Analogue Scale (VAS-FA) and the postural features of the foot, as determined by FPI, as well as the patient's narrative and imaging modalities can be used. Functional status is also assessed by customized valid and reliable scales such as the American Orthopedic Surgeons Foot and Foot Ankle Scale (AOFAS), the Foot and Foot Ankle Ability Measure (FAAM), the Foot Health Status Questionnaire (FHSQ), the Foot Function Index (FFI), and the Lower Extremity Functional Scale [12-14]. PF has also been defined in accordance with the International Function Classification (ICF) system, which has been defined and used for various pathologies by health professionals in recent years. According to the ICF disorder-health-disability-based category, heel pain is associated with bodily function-related codes b28015 Pain in lower limb, b2804 Radiating pain as a segment or region; s75023 Ligaments and fasciae of ankle and foot, s75028 Structures of ankle and foot, neural as body structure; d4500 Walking short distances, d4501 Walking long distances, and d4154 Maintaining a standing position in codes related to activity and participation [15].

## Treatment Approaches

PF has a wide range of treatment modalities extending from conservative approaches to surgery. While 90 percent of patients are treated with conservative approaches, surgical approaches are sometimes needed in chronic and persistent cases [5].

### Conservative applications

Conservative treatment of plantar fasciitis involves non-steroidal anti-inflammatory analgesics, local steroid injection, *botulinum toxin* injection, and physiotherapy and rehabilitation (orthotic approaches, stretching and strengthening exercises, electrophysical modalities, taping, manual therapy and dry needling). Although it is not clear which of the treatment options is more effective, these treatments are often applied in combinations [5]. Local corticosteroid injection is one of the first invasive treatment modalities where non-invasive conservative treatment modalities are not effective. It has been shown that this practice, which is often administered before surgical approaches in patients with persistent pain, is faster and more

effective than other treatment options [16,17]. However, it is known that corticosteroid injection has more side effects than Extracorporeal Shock Wave Therapy, and it has been discussed whether the low-cost corticosteroid injection or non-invasive ESWT should be used first. In a previous study on the subject, it was emphasized that if the patient has perifascial edema, first corticosteroid injection should be used first, if not, ESWT should be used first [18]. Platelet Rich Plasma (PRP) injection, which is considered to be among the minimally invasive methods, have been reported to be effective in reducing plantar fascia pain, but it does not have a positive effect on the biomechanical function of the foot [19]. In another study comparing PRP with Low Dose Radiation (LDR), after 6 months, pain (as evaluated by VAS), AOFAS, and plantar fascia decreased significantly and PRP was found to be at least as effective as LDR [20]. In another study comparing the effect of PRP injection with corticosteroids in chronic cases, it has been shown that PRP is as effective as steroids in reducing pain at months 3 and 6, but PRP is more effective on pain and function at month 12 [21]. Considering the biomechanical basis of the development of pathology, the effects of restoration of muscle, bony and articular structures as part of physiotherapy and rehabilitation approaches, ensuring correct alignment, increasing vascularization, and improving proprioceptive parameters are absolute.

Karimzadeh et al. [22] compared the results of autologous whole blood injection with local corticosteroid administration, and it was found better than conservative treatment and it has nearly similar outcomes with corticosteroid injection rates. Because of improvements observed in the control group, researchers argued that the first option should be non-invasive and conservative treatments [22].

In a randomized controlled trial evaluating the efficacy of *botulinum toxin*, another treatment agent that has been in use recently, 50 patients were divided into two groups and one group received *botulinum toxin* and the other group received saline injection. Patients treated with *botulinum toxin* have been reported to have better results in pain (as measured by VAS) and foot function (as measured by FAAM), suggesting that this agent may be an alternative to non-surgical methods [23]. Another conservative practice is acupuncture. In a systematic review evaluating the effect of acupuncture on PF-induced pain, few studies have found evidence of short-term pain relief, while evidence of long-term responses is inadequate. More work on the subject is needed [24].

### Physiotherapy applications

Physiotherapy applications constitute the key part of conservative



treatments in PF. In particular, acute symptomatic patients experience a symptomatic relief by these non-surgical methods in a short time.

Although there are different and numerous treatment modalities administered, evidence is lacking which treatment method is most effective and there is a need for studies in this regard.

**Stretching exercises:** It is the most important part of the treatment program in the early period. Progressive stretching exercises of plantar fascia and gastro-soleus muscle groups were shown to reduce pain [25]. In an 8-week study, Healey et al. [26] found 52% improvement in the group exercised only plantar fascia stretch, while there was 22% improvement in the group exercised only gastro-soleus muscle stretching. Another study showed the importance of stretching plantar fascia, and also that gastro-soleus muscle group and plantar fascia stretching improved clinical symptoms, besides plantar fascia stretching was more beneficial than Achilles tendon stretching [27]. There is no consensus on the optimal stretching method, although studies have indicated that the effect of stretching on pain relief is between 2 weeks and 4 months [28].

**Strengthening exercises:** The local stabilizing intrinsic foot muscles, which contribute to the control of the foot arches, and the extrinsic foot muscles responsible for the global motion, support the foot arches as parts of the foot core structure and actively contribute against the shocks during walking.

The core structure of the foot resembles the lumbopelvic core system, and as a consequence of the weakness of these muscles along with an injury in any of the foot core components, the stress on the other structures increases and lower extremity injuries become inevitable [29]. Studies investigating the possible effects of intrinsic muscles on plantar fasciitis pathology are increasing. In a study comparing runners with plantar fasciitis to healthy runners, it was reported that symptoms in PF cases were associated with intrinsic muscle atrophy [30]. In addition to weakening in plantar and finger

flexors and abductor hallucis resulting from PF, decreases in forefoot muscle volume have been reported [31]. In the literature, for plantar intrinsic muscle strengthening, the patients are often given towel curls exercises or they are asked to pick up small objects like marbles with their toes. However, these exercises do not provide isolated intrinsic muscle training by activating the muscles of the flexor hallucis longus and the flexor digitorum longus in addition to the intrinsic muscles. After teaching the foot subtalar neutral position, the most effective exercise in intrinsic muscle strengthening has been shown to be short foot exercises that allow the isolated foot intrinsic muscles to contract by continuing in passive modeling active modeling and active modeling [32]. With the training of intrinsic foot muscles and their successful integration to the foot core system, it is possible to prevent plantar fasciitis due to increased foot control. Studies focusing on extrinsic muscles have reported that high intensity strengthening training leads to a faster reduction in pain and a faster development in function [33]. The improvement of pain in all groups in patients administered stretching and stretching plus strengthening exercises showed the importance of stretching in the program. In conclusion, strengthening intrinsic foot muscles is important in PF rehabilitation [29,32,34,35].

**Manual treatment methods:** Manual therapy applications are a common method used by physiotherapists. In a systematic review by Martin et al. [15] it was reported that manual techniques involving joint and soft tissue mobilization are effective in patients with plantar fasciitis by increasing lower extremity joint mobility, improved flexibility of the calf muscles, and in reducing pain.

Deep calf massage administered with neural mobilization exercises, and ankle and midfoot mobilization techniques, all of which are among manual techniques, are cited in the literature [36,37]. In a previous study, a group of patients conducting stretching exercises on their own was compared with a group receiving therapeutic ultrasound application of flat-leg neural mobilizations with deep myofascial massage and inflexible tape, and positive results were reported in terms of function in the second group [36]. When a treatment program is developed with many of the physiotherapy and rehabilitation programs, tibial, subtalar, and midtarsal joint mobilizations are performed along with stretching exercises or electrophysiological agents. Stretching exercises and physiotherapist-administered mobility of antero/posterior ankle in weighted and weightless positions, subtalar mobilization in the direction of inversion/eversion, and mobility of the midtarsal joint mobilization in the direction of pronation/supination were shown to yield similar results with therapeutic Ultrasonography (Usg), which is a conventional application in functional scales and stretching techniques [38].

In a study conducted by Celik et al. [39] a patient group that received only steroid injection was compared with group that received a program that included stretching exercises in addition to mobilization techniques, and they observed brief relief from pain and short-term improvement in functioning parameters in the injection group, and long-term favorable developments were observed in symptoms in the mobilization and stretching group. In a previous study, transdermal Usg (3 Mhz, 1.5 W/cm<sup>2</sup>, 100-Hz, 20 cycles/5 min) administered with dexamethasone iontophoresis was compared with manual physiotherapy techniques and exercise in plantar heel pain. In this 4-week therapy and 2-week follow-up study, the manual treatment group showed better results at both weeks 4 and 6 in terms



Figure 5: Plantar fasciataping technique with dynamic tape.

of LEFS and FAAM scores [37].

**Electrophysical modalities:** Electrophysiological agents are frequently used as treatment options in physiotherapy rehabilitation, and Therapeutic Usg (TUsg) is one of these methods commonly used in PF and plantar heel pain. However, in recent years, the results of the evidence-based practice published in the literature in this regard contradict with this condition. It was reported previously that no positive effects of TUsg (0.5 w/cm<sup>2</sup> 3 MHz) application for eight sessions per week were observed [40]. Shanks et al. [41] also reported in a review that TUsg use in this patient group did not produce the expected positive results. Based on these results, TUsg applications were found to be ineffective in the treatment of patients with plantar fasciitis. Electric stimulation is used with the assumption that it alleviates pain and accelerates healing in plantar fasciitis patients. In a study in which the effect of monophasic intermittent current was compared with stimulation plus stretch exercises, improvement was observed in both groups in terms of pain and function, but no significant difference was observed between groups. Because authors use monophasic intermittent current less frequently than stretching, they recommend it as an alternative [42].

Stratton et al. [43] conducted a randomized controlled trial and observed that low frequency electrical stimulation (10 Hz, 20 min) added to plantar fascia stretching exercises and prefabricated orthosis treatment has no effect after a 4-week and 3-month follow-up after treatment. In a previous study, all plantar fascial patients received whirlpool bath, orthopedic shoe use, and exercise, and after that one group received phonophoresis and ketoprofen gel and the other group received 1 Hz, 1 w/cm<sup>2</sup> TUsg. In this study, treatment continued for 6 min to 8 min 5 days for 3 weeks, and the measured pain intensity, range of joint motion, and muscle strength improved in both groups, but the results in the phonophoresis group were better [44]. The aim of laser application in PF therapy is to reduce the pain by affecting the cellular metabolism, protein synthesis and wound healing, but the desired results have not been reported in the literature. Basford et al. [45] did not observe a significant difference compared to the control group after 12 sessions of laser application. Extracorporeal Shock Wave Therapy (ESWT) is another non-invasive treatment used in the treatment of plantar fasciitis. The working principle of the treatment is to provide healing by neovascularization of the degenerative tissue [5]. Pain, ecchymosis, distress and stiffness can be seen after treatment, which is recommended for cases that did not benefit from conservative treatment for six months. A meta-analysis of 897 patients treated with ESWT showed improvement in the first

step taken in the morning [46]. It was stated that ESWT may be the preferred treatment method in patients with plantar fascia before opting for surgical intervention due to this marked improvement in the pain intensity parameter [2]. Another study reported a 60% improvement in VAS pain parameters after treatment with ESWT in plantar fascia patients [47]. In a study of 363 PF feet of 284 patients treated with ESWT, a single session was sufficient for most cases, but it was noted that having longer breaks between sessions in patients requiring more than one session was more effective on pain [48]. ESWT is one of the electrophysiological treatments, on which there is no established consensus regarding its long-term efficacy as well as the number of treatments, and it is recommended for patients receiving conservative treatment for at least six months with no effect [18].

**Taping techniques:** Therapeutic taping is a commonly used method in the conservative treatment of musculoskeletal problems in recent years for purposes such as reducing pain, supporting joints, and increasing proprioception [49]. The purpose of taping with elastic or non-elastic tapes using different techniques is to reduce the load on the plantar fascia and to control the pronation of the foot. Taping practice is effective in reducing calcaneal eversion, preservation of arch height, lateral transfer of plantar pressure to the midfoot, reduction of tibialis posterior and tibialis anterior muscle activity, and limitation of leg abduction and medial deviation of talus. Anti-pronation tape up to three weeks was reported to be effective in reducing pain and increasing function. It has also been noted that taping of the gastro-soleus muscle group and plantar fascia for one week with a flexible tape is more effective in reducing the pain and the thickness of plantar fascia compared to only physiotherapy treatment [50].

The Low-Dye taping technique has recently been used for plantar fasciitis to restrict the increase in pronation and to raise medial longitudinal arch. Using this taping method, it is aimed to bring the origo and insertion of the plantar fascia close to each other, and also to decrease the increased pronation of the foot and lower the fascial tension by fixing the subtalar joint, and thereby to relieve the symptoms [26,51]. Goff et al. [5] used this technique and observed that it is suitable for patients with mild-to-moderate symptoms, but it is not very effective in chronic patients. Podolsky et al. [49] reported that taping is an effective method to reduce pain in short term. In another study comparing the efficacy of US and the Low-Dye taping technique, it was observed that first step pain significantly reduced in the taping group [52].

Saxelby et al. [53] examined, via pedobarography, the pressure changes on the soles of the feet created by taping and observed that peak pressure under the heel and at the heads of the second and third metatarsals reduced, and it increased at the heads of the fourth and fifth metatarsals. These results were noted as an indication of a decrease in foot pronation [53]. In a study investigating the long-term effect of taping, it was noted that medial longitudinal arch height increased by 0.16 cm on average after 12-day taping [54]. Patients who benefit from tape are suitable for orthosis applications. Arch supports and night splints used to reduce foot pronation are among orthosis approaches.

**Pedorthotics:** For the correction of the deformed biomechanics of the foot, in addition to the elimination of pathologic risk factors, orthosis applications, such as orthotic insoles, arch supports, heel cups, and night splints and footwear modifications are used. In a systematic



**Figure 6:** Transverse friction massage.

review of the effects of orthoses on the kinematic parameters of the foot and ankle, shock absorption parameters, and neuromotor control data, it was determined that the orthoses reduced hind foot eversion and tibial internal rotation and, as neuromotor control mechanism, tibialis anterior and fibularislongus muscle activity increased [55]. The most effective means of benefiting from the positive effects of the extended stretching is night splints. These devices keep the foot in neutral position or in the plantar flexor during the night, preventing the foot's plantar movement throughout the night [51]. Using a custom-made orthosis, the subtalar joint is held in the neutral position and the midtarsal joint is supported by maximum pronation. The disadvantage of night splints is that they cannot be used for a long time because of discomfort during night use. It has been reported that night splints are better tolerated than posterior night splints [56]. In a study involving plantar fasciopathy patients in which the control group was compared with a therapeutic group of patients who received an ankle dorsiflexion dynamic splint in addition to NSAIDs, orthosis, and corticosteroid injections, significant differences in pain and functionality were recorded in patients using ankle dorsiflexion dynamic splint [57]. In a randomized controlled study, custom made orthosis, anterior night splint, and custom-made orthosis+anterior night splint were compared, and it was shown that both anterior night splint and foot orthosis provided short-term pain relief and improved function [58]. Findings suggest that custom-made or prefabricated orthoses improve pain and function within 1 to 3 months, but it is not clear which type of orthosis is better in improving pain [59]. In patients with plantar heel pain, the purpose of shoe modifications that can be used with orthosis or alone is to reduce the tension of the plantar fascia during thrust phase of gait and to ensure that the resulting load is transferred to the shoe. Mizel observed improved symptoms in more than half of the patients with the anterior rocker-bottom and steel support shoes, and Fong reported that the combined use of rocker-bottom shoe and foot orthoses reduced medial heel pain more than single use. The combined use of the rocker bottom shoes with foot orthoses is an add-on that reduces the weight on the plantar fascia and facilitates the thrust phase, especially in plantar fascia patients experiencing prolonged walking and standing [60-62].

**Dry needling:** Dry needling is one of the alternative methods that can be used to treat plantar heel pain. There are studies showing that dry needling application, which is one of the minimally invasive methods applied by therapists to myofascial trigger points in recent years, can be effectively used for reducing pain and functional return by applying to the trigger points in the plantar extrinsic foot muscle structure and plantar proximal muscles that play an important role in plantar heel pain. On the other hand, in a systematic review of the

subject, it was shown that there is insufficient evidence of the efficacy of applying dry needling and/or injection. Future work is needed because of inadequacy of results, lack of sufficient number of studies, and methodological problems [62,63].

### **Our Own Treatment Protocol (Hacettepe Protocol)**

Patients diagnosed with plantar heel pain due to plantar fascia are frequently referred to our unit, and a standardized treatment protocol based on home program is implemented in accordance with our cumulated experience with this condition. Our treatment protocol, which we call the Hacettepe protocol and whose results have not yet been published, show some differences based on patients having acute onset, chronic, and accompanying heel stiffness. The basic parameters of the treatment program we developed are shown in Table 1. The treatment protocol summarized under headings in Table 1 is taught to patients with plantar fascia who are referred to our unit for the first time, and they are instructed to exercise this protocol for 6 weeks at home. At week 6, symptoms, complaints, and foot biomechanical properties of the patient are evaluated in accordance with the initial status of the patient. After an evaluation of the results, the decision to administer an intensive physiotherapy program or ESWT is made, or the patient is referred back to his/her doctor. The patients are advised to apply before the check-up date if they experience increased symptoms during home treatment. Our clinical experience shows that NSAID use and non-elastic taping are effective in rapidly reducing symptoms in patients presenting with acute complaints. In addition, it has been observed that ESWT, which is applied repeatedly in chronic patients, affects the increase of pain in some cases. Our clinical experience shows that NSAID use and non-elastic taping are effective in rapidly reducing symptoms in patients presenting with acute complaints. It is considered that ESWT, which is applied repeatedly in chronic patients, has increased pain in some cases.

### **Surgical applications**

Surgical applications should be considered only when all other treatments fail in PF cases. Most cases are treated with stretching, taping, orthotic approach, and inflammation-treatment medicine, but only a small portion requires surgery. The main purpose in this application is to loosen the plantar fascia. The most commonly used method is partial open or closed plantar fasciotomy. Plantar fasciotomy is a popular approach where up to half of the fascia is removed in some cases. The open method requires a 3 cm to 6 cm plantar medial incision to release the fascia. Resection of nerve decompression and/or calcaneal dissection is also performed during this procedure. Endoscopy is used to release fascia in the closed method. In this method, the resection of the calcaneal protrusion is not performed. According to the results of a previous study, both types of treatment were reported to be of equal benefit [64]. The success rate in surgical methods is around 70% to 90%. The duration of healing after this surgery may range from a few weeks to several months [65]. Today, increasingly popular endoscopic plantar fasciotomy affects the plantar fasciitis at minimal extent and this method results in minimally invasive visualization of fascial bands. As a result of this application, the healing process also decreases [66].

### **Results**

Plantar fasciitis is a soft tissue pathology that is most often associated with pathomechanical problems in the foot, is a painful

and inflammatory condition that can cause secondary problems if not treated, and responds to physical therapy and rehabilitation. Although the choice of treatment modalities to be applied varies according to the characteristics of the patient and the pathology, there is a consensus that stretching, strengthening methods, manual techniques, and orthosis applications are effective. The use of new and not yet fully proven methods, along with other methods, will also have an impact on increasing effectiveness. PF is foot pathology with a wide range of treatment options with many risk factors.

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