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Research Article

Plantar Fasciitis - Effect of Treatment in a Specialist Rheumatology Clinic

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Abstract

Objectives: To investigate the effect of conservative treatment of patients, diagnosed with plantar fasciitis (PF) in a specialist rheumatology clinic, and uncover the compliance.

Methods: going through all case records from adult patients referred with heel pain within a year. Out of 97, 69 were diagnosed with PF. Treatments were exercises, shoes, insoles, taping, and glucocorticosteroid injections, and evaluation was VAS during treatment, and at follow-up by telephone interview 1-2 years after ended treatment.

Results: PF was primarily provoked by work or sport overload. Hyperpronation (65%) dominated. Male/female ratio of patients was 15/54. Overweight was common amongst the women. Morning stiffness, pain, and limitations in function (VAS scale) improved significantly during treatment, and further at follow-up. Ultrasound measured thickness of the PF decreased significantly during treatment. Compliance to given advices varied from 33-78%.

Conclusions: A conservative treatment regime over 1-5 visits considerably changes pain and function in PF patients.

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Keywords

- Plantar fasciitis
- Heel pain
- Conservative treatment
- Glucocorticosteroid injection
- Orthoses

ABBREVIATIONS

PF: Plantar Fasciitis; GS: Glucocorticosteroid; US: Ultrasonography; ESWT: Extracorporeal Shockwave Therapy

INTRODUCTION

[The plantar fascia or the plantar aponeurosis is a broad flat tendon like structure with irregularly ordered collagen fibers. It originates at the calcaneal tubercle, and runs in three more or less differentiated bands (lateral, medial, central) distally to the metatarsal heads. Dorsal flexion of the metatarsophalangeal joints will therefore stretch the fascia. The plantar fascia provides stability to the foot arch, and aids in resupination of the foot during propulsion. Upon repeated loading, the plantar fascia can be subjected to overloading and result in injury as well as clinical symptoms.

Plantar fasciitis (PF) is a frequently diagnosed condition, defined as pain at the medial tubercle of the calcaneus. 10% of the populations will at some point in their life experience this condition [1]. Earlier it was believed to be primarily an inflammatory condition of the plantar fascia, but histological examination in chronic states has demonstrated degenerative changes with no signs of inflammation [2].

A frequently reported complaint of PF is pain at the first steps in the morning, and pain and tenderness under the heel on weight bearing, resulting in limitations of physical activity. Clinically, there is palpatory medial plantar heel pain. On Ultrasonography (US) a thickening of the plantar fascia is often seen [3].

Accumulated loading of the plantar fascia seems to relate to development of PF, as it is commonly seen in runners, and those who are overweight [4,5]. Also the number of daily steps or simply time of standing has been shown to be a predisposing factor for the development of PF [6]. Pes planus or pes excavatus are considered to be predisposing for PF development, and orthoses made to decrease excessive pronation, and thereby offload the plantar fascia, are found to be helpful in some aspects of counteracting medial plantar heel pain [7,8]. Limited dorsiflexion in the ankle due to a tight triceps surae is also suggested as a predisposing factor [9], and stretching of triceps surae is often used as part of the treatment. Taping of the fascia and heel fat pad has also shown effect [10].

Orthoses and glucocorticosteroid (GS) injections are two widely used treatments. In most clinics this is the standard treatment, despite the fact, that a relatively recent Cochrane review found limited evidence for this particular treatment of

plantar heel pain [11]. Low evidence class studies have shown an effect of orthoses [4,12], also superior to non-steroid anti-inflammatory treatment [4]. Likewise, low evidence class studies have demonstrated an isolated effect of local GS injections [13,14], but none of the studies were properly controlled.

A recent review on treatment with orthotic or local GS injection found only six studies that were acceptable in terms of design [15]. The conclusion was that both the use of orthoses and local injection of GS showed positive effect versus placebo. However, in one study GS seemed to have only a superior short-term treatment effect (three months) compared to autologous blood injections [16], whereas another study showed effect on a VAS-scale for both GS injections and ESWT after 12 months [17]. Another study, in which the use of a night splint was compared to the use of foot orthoses, showed both good short and long term effect, with regard to pain level. Foot orthoses, however, proved a little higher effect and fewer side effects [8].

The objective of this study was to describe patients with heel pain in an outpatient rheumatology clinic in Denmark. For the patients diagnosed with PF, we wanted to evaluate the short and long term effect of a specified treatment regime, and uncover the compliance to the advices given. Also, we wanted to see if it would be possible to detect any risk factors correlated to poor outcome.

MATERIALS AND METHODS

[In a specialist rheumatology outpatient clinic, seeing approximately 2000 new patients every year, an independent investigator, not involved in the treatment, went through the case records of all patients, referred under the diagnosis heel pain within a year from 1 Sep 2009 until 31 Aug 2010. (n=97). Out of these 97 patients, 69 patients were further diagnosed with plantar fasciitis in the specialist rheumatology clinic, representing 75 feet. The diagnostic criteria for plantar fasciitis used by the rheumatologist in the specialist rheumatology clinic was "first step pain" in the morning, and pain at the medial attachment of the plantar fascia at calcaneus.

The patients diagnosed with plantar fasciitis received a treatment regime over a few visits in the rheumatology clinic over a couple of months. All visits included a thorough clinical examination, treatment and/or different advises. At first visit an ultrasound measuring the thickness of the fascia, was performed in most of the patients. Some of them had an ultrasound at the last visit as well.

The treatment regime, being a standard treatment regime in that particular specialist rheumatology clinic, consisting of a combination of different treatments based on literature, was used. The treatment regime consisted of advice on reduction in impact if possible, to use shock absorbing shoes, custom made or prefabricated insoles, depending on the foot misalignment found. If no misalignment was found, a shock absorbing heel cup was advocated. Taping of the fascia and heel fat pad was demonstrated, and recommended by need, when impact reduction by shock absorbing shoes was considered insufficient. Stretching exercises of triceps surae, and the fascia, were demonstrated, and recommended at least once a day to most patients. Patients with severe pain, who were considered or who had proved unable to improve by decreased loading and exercises, were offered a GS injection (1ml Xylocain 1% and 1 ml Depomedrol), and injected from the medial side under the sore part of the fascia plantaris.

The biomechanics of the feet were evaluated clinically by the rheumatologist in the specialist rheumatology clinic by judging the calcaneus valgus angle, and flattening of the median foot arch, with the patient standing on both feet with straight knees and 45 degrees bent knees, respectively. Excessive flattening and valgus angle of more than 10 degrees was rated as hyperpronation. No movement of the foot arch and constant calcaneus varus angle was rated hypopronation. With the patient lying prone with feet hanging free over the couch, with calcaneus placed in a neutral position, the varus angle of the forefoot was evaluated.

When finishing treatment in the specialist rheumatology clinic, the patients all received different advises to follow after their last visit.

A follow-up interview by the independent investigator, 1-2 years after ended treatment, depending on at which time of the referral year the patients had been seen in specialist rheumatology clinic, was successfully performed in 49 patients, representing 54 feet. Information on duration of symptoms, earlier treatments, predisposing factors and anthropometric data, was collected from the case records but also at the follow-up interview. Pain, limitation in function, and activity level was registered both at entry and at the end of treatment in the specialist rheumatology clinic, as well as 1-2 years after treatment at the follow-up telephone interview by the independent investigator. The patients were asked to describe their pain as a number from 0-10, where 0 is no pain, and 10 worst possible pains. Furthermore their limitation in function where 0 is no limitation in function, and 10 maximal limitations in function. Finally morning stiffness where 0 is no morning stiffness, and 10 worst possible morning stiffness.

Statistics: Results are presented as means, 95% confidence intervals (CI), and range. The statistical significance of BMI of women compared to that of men was found by using a two-sample t- test which is an unpaired t-test, the two groups being different from each other.

The difference in thickness of the plantar fascia measured by US was found by using a paired t-test for statistical significance, comparing the means of two variables for a single group.

The outcome measures, morning stiffness, pain, and limitations in function (VAS-scale 0-10), at first visit, last visit, and at the follow-up interview, were compared using a paired t-test again comparing the means of two variables for a single group.

RESULTS AND DISCUSSION

97 patients were referred with heel pain. 69 were diagnosed with PF, of these 10 with a comorbidity of heel fat pad syndrome. The 28 diagnosis *other than* plantar fasciitis made by the specialist were: Partial rupture of the fascia 1, heel fat pad syndrome 5, overweight/tenderness of the heel 1, heel spur/ calcaneal osteophytes 3, bursitis of the retrocalcaneal bursa 2, pes planus rigidus 1, Achilles tendon tenderness 7, Mb. Sever/ juvenile osteochondrosis 5, Haglunds deformity 1, N. Suralis irritation 1, Tarsal tunnel syndrome 1.

The male/female ratio of patients with PF was 15/54. Duration of symptoms before first visit was mean 11.94 months (range 0.25-120), and number of visits was 2.3 (range 1-5). Mean BMI of women, 26.7 (range 19.4-38.3), was significantly higher than that of men, 24.6 (range 21.4-28.9) (p=0.0345, two sample t-test). Amongst the 69 patients with PF, 6 had PF in both feet, and 63 in one foot, thus altogether 75 feet with PF. Of these, 34 right and 41 left feet. Biomechanically hyperpronation was predominant. (Figure 1).

For the 16 male feet with PF, represented by 15 men, we found that 3 were provoked by work overload, and 13 by sport overload, whereas for the 59 female feet with PF, represented by 54 women, the same numbers were 10 and 30 out of 59, respectively. The remaining 19 could not be explained by work and sport overload.

Out of 69 patients, 54 had received other treatment before the first visit in our clinic (Table 1).

In our clinic the patients received different treatments. On average 3-4 treatments per patient were given; (Figure 2), the predominant ones being local GS injection, stretching exercises, and tape.

GS injections were given to 60 PF (80%), and each of these PF received 1.95 (range 1-3) injections. Only a few patients

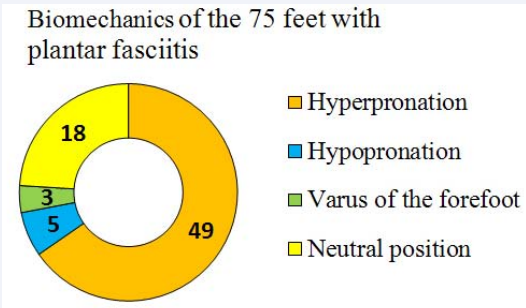

Figure 1 Foot Posture of the treated patients.

Table 1: Treatment before and during the study, and patient compliance.

Treatment of the patients before entering specialist rheumatology clinic		Treatment of the 75 PF in specialist clinic		Patient compliance after ended treatment
Physiotherapy	12	Stretching exercises	56	59%
Chiropractic	2			
Local glucocorticoid injection	7	Local glucocorticoid injection	60	
Arch support/shoes	39	Arch support	41	78%
		Shock absorbing shoes	53	57%
Reduced load	17	Reduced load	50	72%
Shockwave	10			
Taping	4	Taping	60	33%
Acupuncture	3			

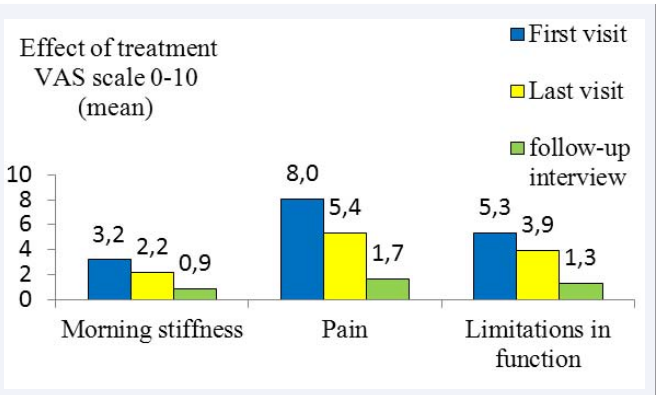

Figure 2 The effect of treatment on the outcome measures: morning stiffness, pain and limitation in function.

complained of increased pain for a few days following the injection. No other adverse events or severe side effects were registered.

At the end of treatment in the specialist rheumatology outpatient clinic, the patients had their recommended home treatments repeated.

To elaborate the compliance with the given recommendations, the patients were asked at follow-up if they remembered the advice given, and if they continued this treatment at home after last visit. See Table 1.

Ultrasonography (US) of the plantar fascia, was performed in 57 patients at first visit, and showed a mean thickness of 0.59 cm (range 0.10-0.95). 3/57 PF was less than 4 mm thick at entry. At last visit US was performed in 38 patients with some pain left, and showed a mean thickness of 0.49 cm (range 0.24-0.73). Mean: -0.1387, 95% CI:-0.1720 to -0.1054, p<0.0001. Paired t-test.

The outcome measures, morning stiffness, pain, and limitations in function (VAS-scale 0-10), were measured at first visit (n=54), last visit (n=46), and at the follow-up interview (n=54). See Figure 2.

There was a significant decrease in VAS concerning all three, both from first to last visit, and from last visit to follow-up. See Table 2.

Activity level at follow-up was compared to pre-injury level. For work the level was (n=41): 88% regained pre-injury level, and for sport (n=54): 78% regained pre-injury level or higher, see Figure 3.

At follow-up, 7 patients had ongoing symptoms: 2 suffered from morning stiffness, pain, and limitations in function, 4 suffered from pain and limitations in function, and 1 had remaining morning stiffness.

Lack of compliance and heel fat pad syndrome are suggested reasons.

We evaluated our data for possible prognostic markers. Neither gender, overweight, hyperpronation, hypopronation, duration of symptoms, or US measured thickness of the plantar fascia at entry could predict the outcome and showed no significant correlation.

Table 2: Statistics showing the changes in VAS (0-10) during and after treatment (paired t-test).

	Morning stiffness	Pain	Limitation in function
First to last visit Mean change (95% CI)	-1.1020 (-1.6621 to -0.5420) P=0.0003	-2.6304 (-3.2911 to -1.9698) P<0.0001	-1.7826 (-2.3629 to -1.2023) P<0.0001
First visit to follow-up Mean change (95% CI)	-2.3519 (-3.3897 to -1.3140) P<0.0001	-6.3704 (-7.2612 to -5.4795) P<0.0001	-4.000 (-4.9594 to -3.0406) P<0.0001
Last visit to follow-up Mean change (95% CI)	-1.2857 (-2.0635 to -0.5079) P=0.0017	-3.5870 (-4.4954 to -2.6785) P<0.0001	-2.3261 (-3.1107 to -1.5415) P<0.0001

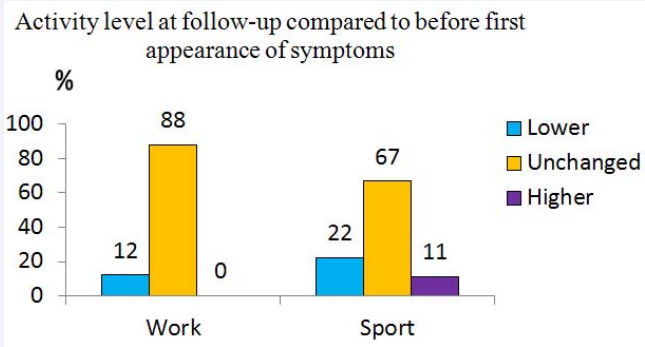

Figure 3 Activity level at follow-up compared to pre-injury level.

This study is not a RCT where the "efficacy" of certain treatments is tested after stringent inclusion and exclusion criteria on selected motivated patients, with motivated investigators that seek high compliance [18]. In daily practice the same efficacy cannot be found, because all patients must be treated. On the other hand the treatments can be individualized, and may consist of a combination of different treatments. Our study is therefore a pragmatic study, where all patients with heel pain, referred within a year to a rheumatology outpatient clinic, were described. No consensus exists regarding the diagnostic criteria for PF, but we used the clinical criteria described by Neufeld [1]: Pain at the medial tubercle of the calcaneus, and first step pain in the morning. In efficacy studis, an inclusion criteria is often US measured thickness above 4 mm. In our study 3/57 patients (5%) had a thickness below this threshold, but were still treated as PF. As we treated and followed all, and not only a selected part of the patients, we measured the "effectiveness" of the treatments [18], which makes the compliance to the recommendations very important. We found big variations in compliance. As an example the simple advice to use better shock absorbing shoes was only complied with by 57%. The recommended exercises were only performed by 59%. Taping was a little more difficult and also a time consuming procedure, which could explain that only 33% complied, whereas insoles were easier although more expensive, but showed 78% compliance. Other studies have found similar good compliance to different types of arch support. A study concerning foot orthoses and night splints for the treatment of PF revealed that more than 80% were still using foot orthoses at a 12 months follow-up, whereas a recommended night splint was only used by 3% [8]. Another study comparing custom-made orthoses, over-the-counter arch support, and tension night splints, found greatest compliance with the use of custom-made orthoses [12]. Yet, another PF study found a better patient compliance, using a designed splint, compared to a static splint [19]. In our study we did not use splints as a treatment.

Another concept is the "efficiency" of a treatment [18]. Here, the cost benefit of the treatment is also included. In our study only very few specialist visits (mean 2.3) were necessary to reach a considerable improvement in symptoms both in short-term and long-term. This could be the natural course of the disease, but on average the patients had symptoms almost one year before the first visit, with a range of 0.25 to 120 months, and they all responded equally well to our treatment. One study showed that PF patients with symptoms present for at least six weeks that were treated with either corticosteroid injection or extracorporeal shock wave therapy (ESWT) had significantly lower VAS-scores at 12 months than non-treated controls [17]. A study in which high-energy extracorporeal shock-wave therapy (ESWT) was used treating patients with PF symptoms for more than six months, showed good short-term results, that seemed to be maintained over time [21]. One study with long term follow-up has found a higher risk for continued symptoms in patients who had symptoms for a prolonged period, before seeking medical attention [20]. This could, however, not be confirmed in our study.

Our treatment over few visits improved the patients' symptoms significantly. Combined with a repetition of load reduction, with reduced standing and landing, shock absorbing shoes, insoles, taping, and stretching exercises at the last visit, the symptoms improved further in the following 1-2 years. The limitation of our study is primarily the limited number of patients and that it is retrospective with long-term follow-up. The level of evidence of our study we thus classified as 2b (Centre for Evidence-Based Medicine, Oxford (1a-5)). Therefore, the end result could be due to the natural course of the disease, despite the treatment given. However, the treatment effect in our study equalizes the effect in a prospective clinical trial, with two-year follow-up, with specific stretching exercises in chronic PF patients that proved total satisfaction and decrease in pain in more than 90%. Furthermore, 77% had no limitations in recreational activities after two years [22]. In our study 88% regained pre-injury working-level, and 78% regained pre-injury sporting-level.

Still 10% of the patients in our study following index treatments had symptoms after 1-2 years. We did not find a prognostic marker for poor outcome. It could be due to lack of compliance, but in our study this was not possible to elaborate as the patients were given an average of 3-4 different treatment recommendations. Some patients complied fully or partly to certain advice, whereas other patients complied to another combination of recommendations. The patients with continuous

severe symptoms were often offered an operation with plantar fascial release, although there is no level 1 evidence of an effect. However, many uncontrolled studies have shown an effect.

Changing thickness of the plantar fascia is found to be a valid objective measurement, to assess the efficacy of a given treatment, as it correlates with the patients' symptoms [23]. In our study, the US measured thickness of the fascia decreased significantly during treatment, simultaneously with improvement in symptoms. However, we question if 4 mm should be the threshold for the diagnosis of PF, as suggested by Mahowald [23], as we diagnosed more patients with PF, with thickness below this threshold. Logically, the threshold should be different for a tall man and a short woman.

In consensus with other studies, our results suggest overuse to be the main cause of PF. This overuse can be related to work, sport, or simply by being overweight. We found plausible overuse in many patients, but as we had no control group, we cannot make hard conclusions in this respect.

Biomechanical dysfunction, especially high- and low foot arch, is thought to be a predisposing factor for the development of PF [24]. In this study, we found that most of the patients had a biomechanical dysfunction in their feet, predominantly hyperpronation. Although we found a very high percentage having hyperpronation, we would still have needed a control group in order to be able to conclude that this could be the reason for the PF.

The effect of insoles is recognized [15], and the effect is probably achieved by compensating a foot dysfunction, thereby decreasing the tension in the plantar fascia, as shown in another study [7].

In later years, treatment of overuse injury in other tendon/aponeurosis-like structures has been dominated by an increasing documentation of a good curative effect of heavy controlled mechanical loading (eccentric strength exercises, or heavy slow resistance training), especially upon tendinopathic conditions in the patella tendon [25]. However, no studies have looked at the influence of physical training (e.g. strength training) on the diseased plantar aponeurosis. Also, no studies have examined the effect of a combination of giving local GS injection and training, on this or other tendon overuse entities. Surgery is very seldom compared with results of other treatment modalities. No randomized studies exist on the effect of operation versus a conservative standard-treatment.

It would also be interesting to see, if the results that we found in our study could be achieved through only one doctor visits, with thorough advice about reducing impact/loading and maybe assuring the benign course of the disease.

CONCLUSION

This study showed good short- and long-term effect of a combination of conservative treatments for plantar fasciitis given in a specialist rheumatology clinic. Many specified treatment methods has proven efficacy in RCT studies, but in the daily clinic no single treatment for musculoskeletal disorders like plantar fasciitis can help all patients. Some patients respond to one treatment better than another depending on the patients 'symptoms, biomechanics, compliance, previous treatment effects and other unknown factors. In our study we chose a combination of treatments all with proven efficacy. Thereby most patients regained full activity level both regarding to work and sport. Different randomized trials have proven the efficacy of several conservative treatments. As this is a retrospective study design, developing a hierarchy between different therapeutic options is not possible. Furthermore, the patient number is too small for any definite conclusions. However the compliance to different treatment options is important knowledge for future treatments. We think future studies should focus not only on efficacy studies on special treatments, but also on effectiveness studies with a combination of treatments in a pragmatic design, meaning that not all the patients are treated alike, but according to a treatment regime described in a flow chart, and this should be compared to a control treatment in a prospective randomized design.

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