

Comparison of The Efficacy of Different Treatment Modalities in Use for Plantar Fasciitis: A Randomized Controlled Trial

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Received: 27-01-2023 / Revised: 21-02-2023 / Accepted: 13-03-2022

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Conflict of interest: Nil

Abstract

Background: Plantar fasciitis is a common musculoskeletal disorder presenting in the outpatient department of pain clinics. Multiple treatment options are available with limited benefits. Objectives- Thus, the present prospective randomized controlled clinical trial was conducted to compare different treatment modalities in treatment of plantar fasciitis with six months follow up.

Materials and Methods: This prospective randomized controlled clinical trial recruited 60 patients with a diagnosis of plantar fasciitis from Dec 2021 till December 2022. The patients in the age range of 20-65 yrs having symptoms of plantar fasciitis of moderate to severe grade for a minimum of 6 weeks were included in the study. Patients with a Body Mass Index > 25, pain in hip, knee, any surgery of the affected lower limb, history of steroid use, psychological disorders were excluded from the study. The patients were randomly divided into four treatment groups: Group A – Conventional treatment with analgesics (n=15), Group B– Heat treatment with silicone heel pad (n=15), Group C – Active plantar fascia stretching with sham calf stretching with 1 mL of 4 mg/mL dexamethasone sodium phosphate, Group D – Active calf muscle stretching with sham plantar fascia stretch (n=15). To assess the pain, disability, and restrictions in activities of daily living Numeric pain rating scale, Foot Function Index & Foot and Ankle Disability Index were recorded at baseline, every week till 4 months & then at 6 months. The effectiveness of each treatment module in improving the functional ability & prevention of its recurrence were recorded.

Results: 60 patients with a mean age of 45.7 ± 11.9 years were recruited. Out of 60, 41 were females and 29 were males. The mean BMI was 23.7 ± 1.4 . Statistically significant difference was noted in all the groups post treatment with respect to both indices ($p < 0.05$) (Table 2 & 3). The mean recurrence time was 12.4 weeks. On comparing foot function scores, statistically significant difference was found between Group A & B, Group A & C & Group A & D. On comparing foot & ankle disability scores, statistically significant difference was found between Group A & B, Group A & C & Group A & D & Group C & D.

Conclusion: The study concluded significant improvement in pain & disability in the group prescribed plantar fascia stretching exercises and inj dexamethasone & calf muscle stretching group than the analgesic group.

Keywords: Plantar Fasciitis, Plantar Fascia Exercises, Silicone Heel Pad, Foot Function Index, Foot and Ankle Disability Index.

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Introduction

Plantar fasciitis is a degenerative disease causing irritation & inflammation of the plantar fascia originating at the medial calcaneal tuberosity of the heel & also adjacent fascia. The plantar fascia supports the arch & helps in shock absorption. [1] The etiological & predisposing factors could be trauma, pes cavus, pes planus, excessive pronation or supination & limited ankle dorsiflexion & reduced muscle strength.[2] It affects both physically active and sedentary individuals. Its frequency is observed to be more in individuals with raised body mass index (BMI) [3], depression & anxiety.[4] No inflammatory cells are associated with this painful condition. It clinically presents as a sharp pain felt at the heel, also sometimes heel spur can be seen. Mostly the treatment modalities are non-surgical & not completely satisfactory for most patients with increased recurrence. [5] As a part of investigation, X rays are seldom required but if trauma is present or in refractory cases imaging can be done which can reveal calcification in the soft tissues or heel spurs in the inferior aspect with thickening and swelling of the plantar fascia. Also a magnetic resonance imaging can be done to disclose stress fractures, tears & osteochondral defects. [6]

Treatment should initiate rest & relief from exertion. Oral or topical Analgesics can be prescribed along with application of ice. Also, deep friction massage of the arch and insertion can be of additional relief. Shoe heel pads, orthotics & night splints can also be advised. Rehabilitation of Achilles tendon, plantar fascia, gastrocnemius, and soleus muscles should be done with the help of stretching exercises. If non-surgical modalities are not helpful, clinicians can resort to surgical treatments like extracorporeal shock-wave therapy, injecting autologous platelet-rich plasma, corticosteroids & dex prolotherapy.[7]

Many studies have reported the use of a multidisciplinary approach in treating plantar fasciitis as no single treatment is completely effective. The waning of the symptoms take weeks/months & should be treated properly. Pain clinicians, physiotherapists & rehabilitation specialists play an important role in subsiding of the symptoms & preventing recurrence. Also, weight reduction & simple plantar fascia stretching exercises should be advised. Patients should be advised not to be barefoot & properly support heel with the use of orthopaedic heel support shoes. [8]

Thus, the present study was conducted to compare different treatment modalities in treatment of plantar fasciitis with six months follow up.

Materials and Methods

This prospective randomized controlled clinical trial recruited patients with a diagnosis of plantar fasciitis from Dec 2021 till December 2022. The patients in the age range of 20-65 years having symptoms of plantar fasciitis of moderate to severe grade for a minimum of 6 weeks were included in the study. Patients with a Body Mass Index > 25, pain in hip, knee, any surgery of the affected lower limb, history of steroid use, psychological disorders were excluded from the study. A written informed consent was taken from all the participants. A patient having both feet affected with plantar fasciitis only the feet with maximum pain was included.

The patients were randomly divided into four treatment groups:

Group A – Conventional treatment with analgesics (n=15)

Group B– Heat treatment with silicone heel pad (n=15)

Group C – Active plantar fascia stretching with sham calf stretching with 1 mL of 4

mg/mL dexamethasone sodium phosphate (n=15)

Group D – Active calf muscle stretching with sham plantar fascia stretch. (n=15)

To assess the pain, disability and restrictions in activities of daily living following indices were recorded:

1. Numeric pain rating scale - An 11-point scale where 0 - no pain & 10 - worst imaginable pain was used to measure pain intensity. Recorded at baseline, every week till 4 months & then at 6 months.
2. Foot Function Index (FFI) - at baseline, every week till 4 months & then at 6 months
3. The Foot and Ankle Disability Index (FADI)- at baseline, every week till 4 months & then at 6 months.

Treatment was noted to be failed if the pain did not subside / pain worsened at the end of 3 weeks. Group A patients were prescribed Indomethacin (75 mg) once daily for weeks. If a patient allergic to Indomethacin, Diclofenac (100 mg) was prescribed. Group B patients underwent application of moist heat to the affected foot for 20 min at night. Also, in shoes insertion of silicone heel rubber pad was done while doing routine activities. Group C patients underwent plantar fascia stretching exercises wherein patients made to sit comfortably by crossing the affected leg over the opposite leg, then pulling the toes of the affected foot back towards the shin in the arch of the foot. Along with stretching exercises, plantar fascia was injected with 1 mL of 4 mg/mL dexamethasone sodium phosphate with 0.5 mL of 1% lidocaine by palpation guided method. Group D patients underwent calf stretching exercises in standing position. Subjects were asked to lean into the wall with unaffected leg placed in front of the affected leg, then the front knee bent while keeping the back knee straight and heel fixed on the ground until a stretch is felt in the Achilles tendon.

The effectiveness of each treatment module in improving the functional ability & prevention of its recurrence were recorded.

Statistical Analysis

The collected data was tabulated & put to statistical analysis. The data was expressed as mean & standard deviation. Pearson's Chi-Square test was used for analysis. P-value <0.05 was considered statistically significant.

Results

The present study recruited 60 patients with a mean age of 45.7 ± 11.9 years. Out of 60, 41 were females and 29 were males. The average duration of symptoms before treatment was 28.31 weeks. The mean BMI was 23.7 ± 1.4 . The demographic data of each group is presented in Table 1.

No significant difference was found between the groups with respect to age, BMI and duration of symptoms. On comparing Numeric pain rating score of the four groups, no statistically significant difference was noted in the pretreatment scores ($p > 0.05$). Statistically significant reduction in pain scores were noted post treatment in all the groups with greatest reduction in Group C ($p < 0.05$) (Table 2).

No statistically significant difference was observed prior to treatment between all the groups with respect to FFI & FADI ($p > 0.05$). Statistically significant difference was noted in all the groups post treatment with respect to FFI & FADI ($p < 0.05$) (Table 3 & 4). The mean recurrence time was 12.4 weeks.

On comparing FFI scores, statistically significant difference was found between Group A & B, Group A & C, Group B & C, Group C & D & Group A & D ($p < 0.05$). No statistically significant difference was found in FFI scores between Group B & D ($p > 0.05$).

Table 1: Demographic data of the Groups

| Groups | Mean age (years) | Mean BMI | Mean duration of symptoms (weeks) |
|---------|------------------|------------|-----------------------------------|
| Group A | 45.7 ± 4.5 | 24.1± 2.4 | 24.7 ± 31.2 |
| Group B | 42.9 ± 8.0 | 23.7 ± 1.4 | 29.7 ± 42.9 |
| Group C | 44.5 ± 11.4 | 24.5± 1.6 | 33.5 ± 45.2 |
| Group D | 41.6 ± 9.3 | 23.9 ± 1.2 | 28.2 ± 25.4 |
| p value | >0.05 | >0.05 | >0.05 |

Table 2: Numeric pain rating score of the groups

| Groups | Mean pre-treatment score | Mean post-treatment score | P value |
|---------|--------------------------|---------------------------|---------|
| Group A | 6.75±1.21 | 2.82±1.36 | p<0.05 |
| Group B | 6.91±1.59 | 2.73±1.93 | p<0.05 |
| Group C | 6.54±1.74 | 1.0 ± 1.10 | p<0.05 |
| Group D | 6.48±1.26 | 1.48±1.37 | p<0.05 |

Table 3: Foot Function Index (FFI) score of the groups

| Groups | Mean pre-treatment score | Mean post-treatment score | P value |
|---------|--------------------------|---------------------------|---------|
| Group A | 68.7 | 40.5 | p<0.05 |
| Group B | 64.9 | 6.8 | p<0.05 |
| Group C | 66.0 | 2.1 | p<0.05 |
| Group D | 70.4 | 11.2 | p<0.05 |

Table 4: Foot and Ankle Disability Index (FADI) score of the groups

| Groups | Mean pre-treatment score | Mean post-treatment score | P value |
|---------|--------------------------|---------------------------|---------|
| Group A | 62.8 | 79.6 | p<0.05 |
| Group B | 67.3 | 96.8 | p<0.05 |
| Group C | 61.9 | 97.4 | p<0.05 |
| Group D | 65.1 | 90.2 | p<0.05 |

On comparing FADI scores, statistically significant difference was found between Group A & B, Group A & C & Group A & D, Group B & C & Group C & D (p <0.05). No statistically significant difference was found in FFI scores between Group B & D (p >0.05). Thus, improvement in pain & disability were noted to be more in stretching group with dexamethasone injection than the Groups where only analgesic & stretching exercises were prescribed.

Discussion

Plantar fasciitis has been treated with different non-surgical modalities with different success & recurrence rates. In the present study, plantar fasciitis was treated using four different modalities, which were then compared, and findings recorded. The modalities were pain killers, silicone heel pad placement in shoe heel

with hot fomentation applied to the affected foot, plantar fascia stretching exercises with inj. 1 mL of 4 mg/mL dexamethasone sodium phosphate with 0.5 mL of 1% lidocaine & calf stretching exercises.

In the present study, the baseline characteristics were comparable in all the groups with female predilection. This is in accordance with Gupta R et al [9] study which noted plantar fasciitis in 67% of the females & Yucel et al [10] study which observed plantar fasciitis in 76.6% of the females. This may be attributed to females doing prolonged standing chores, common usage of flat or high heel footwear and habit of bare foot walking.

In the present study, in Group A consuming analgesics recurrence was noted after 3 weeks. Similarly in Gupta R et al study [9], analgesic group, observed treatment failure in 17 patients out of 35,

after 3 weeks post treatment, with rest of the patients having complete relief in one year follow up time. Also, in Biswas et al study recurrence was noted after analgesic discontinuation after two months. [11]

In the present study, Group C patients underwent plantar fascia stretching exercises with 1 mL of 4 mg/mL dexamethasone sodium injected in plantar fascia. This group showed greatest reduction on numeric pain rating score & FFI score and improvement in activities (FADI score) as compared to other treatment groups. Accordingly, study conducted by Biswas et al. compared analgesics with corticosteroid injection & documented significant pain relief after corticosteroid therapy, also the recurrence of heel pain was statistically significantly higher in the analgesic group. [11]

Corticosteroids have a strong anti-inflammatory effect and can speed up the pain relief. It inhibits proliferation of fibroblasts & ground substance protein expression, which are observed as a pathological feature in this painful condition. Li, Z. et al 2015 in a meta-analysis concluded inj. corticosteroid to be better in pain reduction than placebo in the treatment of plantar fasciitis. Corticosteroid inj. is cost effective & still the first-line treatment option for plantar fasciitis. [12] A systematic review by Chen et al 2018, summarized corticosteroids to be more efficient in reducing pain than non-surgical treatments within 3 months. Also, it provides significant pain relief at one & half months when compared to physical therapy. [13]

No statistical difference was observed between Group B i.e. heel pad with hot fomentation group & Group D i.e. calf stretching group. In a study by Pfeiffer et al, the comparisons were done in treatment of plantar fasciitis using a rubber heel cup, a felt insert and a silicone heel pad along with Achilles tendon and plantar fascia stretching and stretching alone. The pain scores were reduced more in the silicone

insert group than in the stretching-only group with no statistically significant difference. [14] Another study done by Petrofsky et al heat and moist heat when used along with and without Advil were noted to be helpful in pain reduction. [15] In another study, by Davis et al 89% of patients improved significantly with non-surgical treatment including NSAIDs, Achilles tendon and plantar fascia stretching exercises, heel cushion support & rest. They concluded stretching exercises are the most effective treatment of plantar fasciitis. [16]

Conclusion

Thus, the study concludes that Plantar fascia stretching exercises along with dexamethasone inj in plantar fascia are superior to other treatment modalities in treatment of plantar fascia with greater reduction in pain & disability scores.

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