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Effect of phonophoresis and myofascial release in plantar fascitis

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Abstract
Background and objectives: Plantar fasciitis is an inflammatory disorder that produces pain and stiffness in the plantar surface of the foot's heel and medial arch. It is particularly common in people in their forties and fifties, as well as those who participate in running activities. Individually, phonophoresis and myofascial release have been utilised in physiotherapy for the treatment of plantar fasciitis and have been shown to be beneficial in lowering discomfort and improving the patient's functional status. The goal of the study was to assess the effectiveness of phonophoresis and myofascial release in the treatment of plantar fasciitis.
Method: A total of 20 individuals were divided into two groups, each with ten subjects of both sexes. Phonophoresis treatment was given to group A, while myofascial treatment was given to group B. On the first and tenth days of the intervention, data was obtained from all patients using two parameters: VAS and FFI.
Result: This study found a substantial difference between groups A (phonophoresis) and B (non-phonophoresis) (myofascial release). The mean SD VAS for group A was 4.800.94, while that for group B was 3.931.09, with a p value of (0.41), and the mean SD FFI for group A was 0.440.09, while that for group B was 0.310.17, with a p value of (0.015).
Conclusion: In patients with plantar fascitis, phonophoresis was found to be more helpful than myofascial release in lowering pain and improving functional status.

Keywords: plantar fascitis, phonophoresis, myofascial release, VAS scale, foot functional index

Introduction
Plantar Fascitis (pronounced "plarn-tar-fashy-ey-tiss") is a prevalent cause of foot discomfort. It is a medial arch and foot injury that occurs repeatedly. It is defined as an inflammatory disorder that develops as a result of the plantar fascia being overstressed. Plantar fasciitis, also known as heel pain syndrome, subcalcaneal pain syndrome, calcaneodynia, subcalcaneal bursitis, calcaneal periostitis, neuritis, heel spur syndrome, subcalcaneal spur syndrome, stone bruise, medial arch sprain, runner's heel, jogger's heel, and policeman's heel, was first described by Wood in 1812. Plantar fasciitis can be debilitating in the acute stage, but it seldom causes long-term problems. It is estimated that 10% of world's population will experience the condition during their lifetime [1].
The thick fibrous band of tissue at the sole of the foot known as the plantar fascia (aponeurosis). The central, lateral, and medial bands of the plantar aponeurosis begin along the calcaneus' medial tubercle. The plantar fascia runs anteriorly down the arch of the foot, dividing into slips that eventually penetrate into the sides of each toe's proximal phalanx and merge with the flexor tendon sheaths and transverse metatarsal ligament [2].
The plantar fascia is the principal stabiliser of the medial longitudinal arch of the foot against ground reactive forces, and it plays a key role in reshaping the foot into a solid platform prior to toe-off. Under normal circumstances, the plantar fascia accomplishes this role well and without harm. Plantar fasciitis is caused by an overloaded or overstretched band of tissue in the foot. Small tears in the fascia fibres are caused by this stress, especially where the fascia contacts the anterior calcaneus. Plantar fasciitis is thought to be an entrapment neuropathy involving the branch to the abductor digiti minimi, according to certain ideas [3].
Long periods of weight bearing have been linked to Plantar Fasciitis, according to reports. It is most commonly encountered in non-athletic populations in weight-bearing vocations.

65 percent of non-sports populations are overweight, with the majority of cases involving unilateral engagement. 10% of all running athletes are in the second major distribution in the athletic population. Plantar fasciitis is common in basketball players, tennis players, football players, long-distance runners, and dancers. Plantar fasciitis has been linked to people with a body mass index of 30 kg/m2 or above, according to research [4]. Because the plantar fascia is not elastic, it cannot expand when the forces on the foot to flatten the arch become excessive. The plantar fascia begins to detach from the weakest site of attachment, which is usually the heel bone, due to its inelasticity, resulting un distinct and manageable pain and inflammation. The most common symptom is severe pain in the inner aspect of the heel and arch of the foot during the first few steps in the morning, which gradually fades and becomes more intense with continuous weight bearing. "Irritation of pain fibres by repeated trauma or chronic pressure from a thickened plantar fascia against digital vessels, ischemic pain from chronic pressure from a thickened plantar fascia against digital vessels, enhanced effect of local pain chemicals such as substance P and glutamate, and increased nociceptor sensitivity," according to the study [5].

Plantar Fasciitis can be treated in a variety of ways. The outcomes of various therapy methods differ depending on the clinical situation. Plantar fasciitis is routinely treated with phonophoresis and myofascial release, two techniques utilised by physiotherapists. It is impossible to say that one modality is preferable to another.

This research compares the effects of myofascial release with phonophoresis in the treatment of plantar fasciitis. The therapist can use both of the above strategies in outpatient settings, and they can also be combined. The purpose of this study is to compare the benefits of both modalities and to highlight the benefits of one over the other.

Methods

A total of 20 people were enrolled in the study, all of them were diagnosed with plantar fasciitis at the Holistic Physiotherapy Clinic in Amritsar, India. The subjects gave their permission for the study to be carried out. There were two groups: Group A had ten patients who received phonophoresis, and Group B had ten patients who received myofascial release. The participants were between the ages of 35 and 55 years old. The duration of the study was 10 days.

Subjects were selected for the study if they fulfilled the following criteria. a) Plantar fasciitis due to mechanical pain, b) Patients between ages of 35-55 years of age of both genders, c) Patients with heel pain felt on the first step in the morning, weight bearing, after walking and running. d) Patients suffering from plantar fasciitis for the last one and half months. The subjects who were excluded were subjects with a) Infective conditions of foot, tumor, calcaneal fracture, metal implant around the ankle, b)Dermatitis, c)Impaired circulation to lower extremities, d)Corticosteroid injection within a year to heel, e) Diagnosed of plantar fasciitis with calcaneal spur, f)Rheumatoid arthritis.

Assessment was conducted on the first day and last day of the treatment session by the following parameters. a) Foot function Index b) Visual analog Scale

Foot Function Index: It is a 17-question questionnaire about how pain affects different tasks and activities. The questionnaire pain severity was calculated using the same scale as the patient assessment, with a score of 10 indicating severe pain or inability to function.

Visual Analog Scale: Subjects were given a horizontal scale of 1 to 10 on which they were asked to rate the degree of pain, as well as a 10 cm scale with 0 to 10 markings on which they were asked to show the mark on the scale that best defined the amount of pain.

The subjects were positioned in prone position in Phonophoresis and Supine position in Myofascial release.

Group A: Patients receive phonophoresis in addition to standard treatment. Phonophoresis was performed using diclofenac sodium gel. For 10 sittings over 10 days, ultrasound was employed with a 1 W/cm2 output for 5 minutes and a pulsed mode 1:4 ratio at a frequency of 1 MHZ.

Group B: For 15 minutes, patients underwent myofascial release along with traditional treatment using thumb, plantar cupping, and fingers. Supine lying with the heel of the patient protruding off the couch. The therapist stands near the couch with one hand over the toes for stability and the other hand moving down in the path of fascia, holding the myofascial stretch for 20 seconds, slowly, until the tissues under the hands relax. The stretch is then increased and maintained for 90 seconds.

In this study, descriptive statistical analysis was performed using SPSS version 20 with an alpha value of 0.05. The age difference between the two groups was tested using an unpaired t-test. The Chi-square test was conducted to see if there was a gender difference between the two groups. The Wilcoxon test was performed to determine the significance of the VAS and FFI differences. Whitney-Mann The significance of the difference in VAS and FFI between the groups was determined using the U test. Graphs, tables, and other graphics were created using Microsoft Word and Excel.

Results

Table 1: Baseline Data for demographic variables

Variable	Group A	Group B	p value
Age	44.13±6.4	43.06 ±6.8	>0.664
Sex(M/F)	5/5	5/5	>0.273

Table 2: Baseline Data for outcome variables

Variable	Group A	Group B	p value
VAS	8.20±0.86	8.60 ±0.73	>0.250
FFI	0.83±0.3	0.84±0.8	>0.250

Table 3: Effect of phonophoresis and conventional therapy on VAS and FFI

Variable	Pre	Post	p value
VAS	8.20±0.86	3.4 ±0.50	<0.001
FFI	0.83±0.3	0.38±0.1	<0.001

Table 4: Effect of MFR and Conventional Therapy on VAS and FFI

Variable	Pre	Post	p value
VAS	8.60±0.73	4.66 ±1.1	<0.001
FFI	0.84±0.8	0.53±0.15	<0.001

Table 5: Difference between Groups

Variable	Group A	Group B	p value
VAS	4.80±0.94	3.93 ±1.09	<0.041
FFI	0.44±0.09	0.31±0.17	<0.015

Discussion

Plantar fasciitis can be treated using a variety of methods. Individual treatment has been studied and found to be beneficial in lowering pain. Individually, phonophoresis and myofascial

release have been shown to be useful in relieving pain. The study examined the efficiency of two treatment strategy procedures in participants with plantar fasciitis and found that phonophoresis was more successful than myofascial release in reducing pain and that subjects improved clinically.

The mean VAS score in Group A treated with phonophoresis decreased from 8.20 to 3.4, with a p value of 0.001 indicating statistically significant improvement. The mean FFI score decreased from 0.83 to 0.38, with a p value of 0.001 indicating a statistically significant improvement. The improvement is in line with a study conducted by Odjel [6], who discovered that phonophoresis is more effective in lowering pain both at rest and while moving.

Pain alleviation in phonophoresis may be due to an effect on the central nociception pathway, according to Yuch-Ling Hsieh [7]. The peripheral effects of ultrasound and phonophoresis on the central modulation of the spinal nociceptive processing system are significant, and they may reflect the work being done by the spinal cord's neuroplasticity in response to peripheral US and phonophoresis input.

According to Bomana [8], phonophoresis induces an increase in local temperature, which increases the permeability of the cell membrane. Nancy N Byl [9] explained that phonophoresis raises the kinetic energy of molecules in the medication and the cell membrane, dilates entrance points like hair follicles and sweat glands, and enhances circulation to the sonicated area. Drug molecules have a better chance of diffusing through the stratum corneum and being collected by the capillary network in the dermis as a result of these physiological changes. The mechanical properties of the sound wave also aid drug diffusion by vibrating the cells at a high rate, changing the resting potential of the cell membrane, and possibly breaking the cell membrane of some of the nearby cells. To push medication molecules into the tissues, the radiation or streaming forces are powerful.

Ciccone found that the generated medication may have lowered prostaglandin synthesis by inactivating cyclooxygenase (an enzyme that transforms fatty acid into interstitial edema), so lowering inflammation at the tenoperiosteal junction and thus pain [10].

The mean VAS score in Group B treated with Myofascial Release decreased from 8.6 to 4.66, with a p value of 0.001 indicating statistically significant improvement. With a p value of 0.001, the mean FFI score decreased from 0.84 to 0.53, indicating a statistically significant improvement. This is in line with a study conducted by Suman Kuhar, who discovered that myofascial release is a viable therapy option for plantar fasciitis [11]. The pain is lessened as the viscosity of the ground substance changes to a more fluid state, removing the fascia's excessive pressure on the pain-sensitive structure and restoring normal alignment, as well as improved circulation and venous and lymphatic drainage.

Conclusion

The goal of the study was to examine the benefits of phonophoresis and Myofascial release in lowering pain and improving function in plantar fasciitis patients, as well as look for any significant differences. Both phonophoresis and myofascial release are thought to be beneficial in relieving pain. However, the findings of this study, which show that phonophoresis is more effective in reducing pain than Myofascial Release, lead us to accept the experimental hypothesis, which may be phrased as Phonophoresis is more effective in reducing pain than Myofascial Release. The experimental hypothesis is accepted since there is a statistically significant difference between phonophoresis and myofascial release therapy. The study revealed that phonophoresis treatment is beneficial in lowering pain and enhancing function in patients with plantar fasciitis when compared to myofascial release treatment.

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