A comparative study of plantar fascia tissue stretching and achilles tendon stretching for chronic heel pain

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Abstract

The purpose of this study is to find the effectiveness of plantar fascia stretching exercises with ultrasound in comparison of Achilles tendon stretching exercises with ultrasound in patients with chronic heel pain. For this, 20 subjects both males and females were randomized into two groups. Group A subjects were given the plantar fascia stretch with ultrasound and Group B subjects were given the Achilles tendon stretch with ultrasound for the duration of 7 days. A pain subscale of the Foot function index was used as a pre test and post test among both the groups. Results shows that Plantar fascia stretch significantly had greater influence than the Achilles tendon stretch. Plantar fascia stretching shows significant differences in post test (p<0.0001) compared to the Achilles tendon stretch.

Key words: Chronic heel pain, plantar fascia stretching and achilles tendon stretching

Introduction

Plantar fasciitis occurs over a wide age range and is seen in both sedentary and athletic individuals. It is seen in both male and female between the age group of (40 – 60) years and its prevalence rate is 21.7%. 10% of the population experience plantar heel pain at some point during their lifetime and plantar fasciitis accounts for approximately 1% of all outpatient visits to the orthopedic clinic (Riddle et al., 2004).

The etiology is multifactorial, mechanical overload is generally believed to be fundamental to the development of the condition. Obesity not only increases the risk of plantar fasciitis, but also increases the level of disability, which is proportional to the body mass index (Riddle et al., 2004). Work related weight bearing and biomechanical abnormalities in the foot such as Achilles tendon and reduced ankle dorsiflexion are common predisposing factors (Gill, 1997 and Riddle et al., 2003). Excessive pronation of the foot is an important mechanical cause of structural strain which can result in plantar fasciitis (Kwong et al., 1988). During stressful activities, a greater force is transmitted along the medial side of the plantar fascia. These factors cause repetitive microtears and microtrauma which impairs normal healing process resulting in chronic inflammatory reaction. Stretching exercises to be performed before stepping down from the bed in the morning, standing without stretching exercises may result in plantar fasciitis (Digiovanni et al., 2003).
Therapeutic ultrasound described as a high frequency mechanical wave, transmits energy through vibration and is extensively used in clinics. Ultrasound therapy given by means of two modes, that is continuous and pulsed. The mode was selected according to the duration of the condition. It produces the local blood flow, micro massage, pain relief with the power of intensity (0.8 to 2.5 wt/cm²). Stretching exercises improve the muscle flexibility and range of motion.

A program of non-weight bearing plantar fascia stretching exercise is compared with the weight bearing Achilles tendon stretching exercise. Thus the objective of this study was to prove the best functional outcome in patient with chronic heel pain who are managed with ultrasound therapy along with non-weight bearing plantar fascia stretching exercise and weight bearing Achilles tendon stretching exercise.

Materials and Methods

A Comparative study was undertaken in Physiotherapy OPD, Saveetha Medical College and hospitals. 20 subjects, both males and females were randomly included with the age group 40 to 60 years and subjects were excluded if they had any systemic disease, prior heel surgery, and heel pain that was not consistent with proximal plantar fasciitis.

Subjects with Heel pain were screened for plantar fasciitis and according to the inclusion and exclusion criteria they were selected randomly and divided into two groups - Group A and Group B. Informed consent has been obtained from all the subjects prior to the study. Durations of symptoms and the side affected was noted and initial evaluation for their pain profile performed using pain subscale of the foot function index scoring as a Pretest and Posttest. Subjects were taught stretching exercises and were asked to perform stretching early in the morning before taking the first step. And ultrasound therapy was provided at the Physiotherapy OPD and patient was monitored whether they were regularly and correctly performing the stretching exercises.

Group A: Received Ultrasound therapy and Plantar fascia stretching.

Plantar fascia stretching

The patient is asked to be in sitting position and then asked to cross the affected leg over the unaffected leg. Place the patient fingers across the base of the toes of the affected leg to hold the leg, the patient was asked to pull the toes back towards the shin until he (or) she felt a stretch/ tension in the arch of the foot for a 10 counts with 10 times repetitions for 3 sets of stretches per day.

Group B: Subjects in Group B received ultrasound therapy and Achilles Tendon stretching.

Achilles Tendon stretching

The patient should be in standing position and then asked to place the affected leg behind the unaffected leg, with the toes of the affected foot pointed towards the heel of the front foot and to lean into the wall. The patient was then instructed to bend the front knee and keeping the back knee straight and the heel firmly on the floor. The patient felt the stretch and was asked to hold each stretch for a 10 counts with 10 repetitions for 3 sets per day.

Ultrasound therapy was given to the subjects of group - A and group B with the dosage of 1 MHz and (2 wt/cm²) intensity is set for the duration of 8 minutes for a period of 7 days.

At the end of 7 days patient pain level was reassessed using pain subscale of the foot function index scoring and has been noted as the posttest evaluation.

Outcome Measures

A pain subscale of the foot function index has been used as pretest and posttest - questionnaire has been
Table – 1. Group – A, Comparison of pre - test and post - test results of Foot Function Index

<table>
<thead>
<tr>
<th>Test</th>
<th>Mean (It)</th>
<th>S.D (It)</th>
<th>Std. Error Mean (It)</th>
<th>Paired t-value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre test</td>
<td>58.30</td>
<td>1.95</td>
<td>0.62</td>
<td>32.0255</td>
<td>&gt; 0.0001</td>
</tr>
<tr>
<td>Post test</td>
<td>15.80</td>
<td>4.18</td>
<td>1.32</td>
<td>15.80</td>
<td>&gt; 0.0001</td>
</tr>
</tbody>
</table>

Table – 2. Group – B, Comparison of Pre test and Post test results of Foot Function Index

<table>
<thead>
<tr>
<th>Test</th>
<th>Mean (It)</th>
<th>S.D (It)</th>
<th>Std. Error Mean (It)</th>
<th>Paired t-value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre test</td>
<td>57.90</td>
<td>1.29</td>
<td>0.41</td>
<td>26.1873</td>
<td>&gt;0.0001</td>
</tr>
<tr>
<td>Post test</td>
<td>29.20</td>
<td>2.62</td>
<td>0.83</td>
<td>29.20</td>
<td>&gt;0.0001</td>
</tr>
</tbody>
</table>

designed to assess the ability of the patients in performing the daily activities in which the subject answered the questionnaire with the help of Visual Analogue Scale (VAS).

Results

The collected data was tabulated and analyzed using SPSS software. Pretest and post test differences within the group were assessed using paired t test (table 1 & 2) and the difference between two groups were assessed using student ‘t’ test shown in Fig.-1.

Discussion

Plantar fasciitis has become a major problem reported very often in physiotherapy clinics by both male and female individuals. The review shows that people with a lower or higher arched foot can experience plantar fasciitis. Patients with lower arches have conditions resulting from too much motion, whereas patients with higher arches have conditions resulting from too little motion. People from different foot types experience plantar fascia pain resulting from different biomechanical stresses. Forces generated during pronation and supination increase plantar fascia tension. The inefficient foot function can lead to increased tissue stress. The foot must have a balance between pronation and supination. Too much or too little of either motion at the wrong time of the gait cycle leads to inefficient foot function and potential dysfunction. This excessive pronation stresses the plantar fascia and inhibits efficient use of the windlass mechanism (Lori et al., 2004).

Subjects with plantar fasciitis often complain of pain during the first steps of the day in early morning, weight bearing activities seems to cause more pain and inflammation. Hence this non weight bearing plantar fasciitis stretch relieved the pain by recreating windlass mechanism and limits repetitive microtrauma. This protocol provides a non operative treatment option resulted in improvement of symptoms compared to traditional treatment methods for patient with chronic plantar fasciitis.

The pain subscale of the foot function index was chosen as an outcome measure as it is a validated instrument (Budiman et al., 1991). This scale consists of various questions that compares the pain at various stages like with shoes, early in the morning or while walking.
An improvement from the baseline symptoms was noted in both groups, group A had a greater effect compared to group B. Group A was treated with non-weight bearing plantar fascia stretching which had a significant effect in reducing pain compared to Achilles tendon stretching exercise. Achilles tendon stretching does not specifically recreate the windlass mechanism (Hicks, 1954) and it is routinely performed after the initiation of weight bearing.

Plantar fasciitis can be sub categorized into stages as acute, sub acute, and chronic heel pain. Plantar pain is commonly experienced due to biomechanical stresses. Plantar fasciitis can also be managed with various treatment options like manual therapy and taping techniques which helps to correct the biomechanical faults. Hence, this study concentrated on comparing the effectiveness of plantar fascia stretching with Achilles tendon stretching. Plantar fascia stretching proved to be effective as it recreated windlass mechanism.

Conclusion
Thus plantar fascia stretching was found to be effective than the Achilles tendon stretching with the ultrasound therapy in the patient with chronic heel pain.

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References