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A comparative study on the effectiveness of non weight bearing tissue specific stretching exercise and weight bearing stretching exercise in reduction of pain and functional improvement on chronic plantar fasciitis patients

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Abstract

Objective of The Study: To find out the effect of non-weight bearing tissue specific stretching exercise and weight bearing stretching exercise on reducing pain and improving function among subjects with chronic plantar fasciitis.

Background: Plantar heel pain is the most common musculoskeletal disorders of the foot and ankle. Approximately 10% of patients with plantar fasciitis have development of persistent and often disabling symptoms. Treatment of the condition is generally conservative; however the effectiveness of many treatments frequently used in clinical practice, including heel pads, orthoses, steroid injections, night splints and stretching etc. Stretching is frequently utilized as a treatment, yet a systematic review focusing only on its effectiveness has not been published. A poor response to treatment may be due inappropriate nonspecific stretching techniques. This study chronic plantar fasciitis patient were managed with non-weight bearing tissue specific stretching exercise and weight bearing stretching exercise on reducing pain and improving functions.

Methods: 20 subjects from the Vinayaka Mission College of Physiotherapy attached to Vinayaka Mission Medical College Hospital, Salem, Tamilnadu, India were selected randomly and allocated into Group A and Group B. Subjects in Group A were received non weight bearing tissue specific stretching exercise (Plantar fascia stretching exercise) whereas subjects in Group B were received weight bearing stretching exercise (Achilles tendon stretch for 3 sets a day for 2 weeks. Visual Analog scale and Foot Function Index were used as an outcome measures for the study.

Results: Paired 't' test findings indicated significant difference ($p < 0.05$) in pain intensity (VAS) & Foot Function Index (FFI) when compared before and after the non- weight bearing tissue specific stretching exercise and weight bearing stretching exercise in subjects with chronic plantar fasciitis. Independent 't' test findings indicated no significant difference ($p > 0.05$) in VAS (Visual Analog Scale) and Foot Function Index (FFI) when compared between the non- weight bearing tissue specific stretching exercise and the weight bearing stretching exercise in subjects with chronic plantar fasciitis.

Conclusions: The result of this study concluded that there was no significant changes in pain intensity (VAS) and functional status (FFI) among subjects with chronic plantar fasciitis between non weight bearing tissue specific exercise (Plantar fascia stretching exercise) and weight bearing stretching exercise (Achilles tendon stretch). Therefore, this indicates both treatment interventions are effective relieving pain and increasing foot functions among subjects with chronic plantar fasciitis.

Keywords: Non weight bearing tissue specific stretching exercise, weight bearing stretching exercise, pain, function, chronic plantar fasciitis

Introduction

Plantar fasciitis is a common overuse musculoskeletal condition that present with heel pain and the prevalence of 11-15% with peak incidence occurring at the age group of 40-60 years [1]. It involves frequent load on the plantar fascia that results in micro traumas eventually lead to inflammation and degeneration of the connective tissue in the fascia [2]. It commonly affects adult population with clinical symptoms in 10% of plantar fasciitis patients [3].

Plantar fasciitis is treated by healthcare professionals and more than 1 million patients seek treatment annually for this condition, with two-thirds going to their family physician [4, 5]. This condition is due to several factors in origin such as aging, decreased range of motion especially in ankle and first metatarsophalangeal joint, obesity and undue weight bearing activities [6].

Typically, conservative treatments are used for 6-12 months before more aggressive approaches, including surgery, are employed. Conservative treatments for plantar fasciitis include stretching and strengthening exercise, night splints, massage, custom orthotics, over-the-counter arch supports, taping, magnet therapy, acupuncture, walking casts, laser therapy, ultrasound, cryotherapy, iontophoresis, and extracorporeal shock wave therapy (ESWT) [7, 8].

Most patients want to be relieved from the pain without needing to spend much time and cost and at the same time offers the most effective solution. Therefore, everyone is keen to find out the best solution for reducing pain and improving functions among subjects with chronic plantar fasciitis.

A wide-ranging management strategy has been developed to treat the disorder. A systemic review identified different conservative treatments that have been recommended for the treatment of plantar fasciitis such as heel pads, orthotics, steroid injections, night splints and extracorporeal shock wave therapy had been evaluated in randomized trials and also said that the effectiveness of many treatments frequently used in clinical practice, including stretching [8].

Treatments for plantar heel pain are varied and research findings supporting their use are sometimes conflicting [9]. Stretching is commonly used as a conservative treatment for plantar fasciitis; Systematic reviews investigating the efficacy of conservative treatments for plantar fascia have been published. However none of the reviews have focused specifically upon stretching [10-12].

Objective of the Study

To find out the effect of non-weight bearing tissue specific stretching exercise and weight bearing stretching exercise on reducing pain and improving function among subjects with chronic plantar fasciitis.

Methodology

After the university research ethical committee approval for the experiment, those who had plantar fasciitis were invited to participate in this experimental study. The experiment is based on the two group pre-test post-test design. This study was conducted at Vinayaka Mission College of Physiotherapy attached to Vinayaka Mission Medical College Hospital, Salem, Tamilnadu, India.

Subjects were selected randomly and allocated into Group A and Group B. Subjects in Group A were received non weight bearing tissue specific stretching exercise (Plantar fascia stretching exercise) whereas subjects in Group B were received weight bearing stretching exercise (Achilles tendon stretch for 3 sets a day for 2 weeks. 20 subjects (7 males and 13 females) with the mean age of 40.5 (range 26 to 69 year old) participated in this study for 2 weeks duration. The subjects were chosen based on the inclusion criteria and those who fall in the exclusion criteria were excluded.

The Inclusion criteria was the samples were in 26-69 years of age, unilateral plantar fasciitis, had the symptoms more than 12 weeks and the exclusion criteria were Any history

revealed any inflammatory, osseous, metabolic or neurological abnormalities and received any corticosteroid injection within the past three months. Visual Analogue Scale (VAS) & Foot Function Index (FFI) tools were used as outcome measures for this study.

Orientation of Subjects

Written informed consent was received from all subjects after a detailed explanation about the benefits and risks involved with this experimental study. Subjects were told that they were free to withdraw from the study at any time. The selected samples were received the stretching exercise (either plantar fascia stretching exercise or Achilles tendon stretch) procedure was explained verbally and being demonstrated prior to the study.

Procedures

Group A (4 males and 6 females) were assigned to performed non weight bearing tissue specific stretching exercise (plantar fascia stretching exercise) while Group B (3 males and 7 females) were assigned to performed weight bearing stretching exercise (Achilles tendon stretch). Measurements of pain intensity (Visual Analogue Scale) and functional status (Foot Function Index) were taken before the intervention for pre-test score and on the last day for post-test score. Both stretching exercises should hold for 10 seconds and repeated for 10 times as a set. All subjects have to perform 3 sets of stretching exercise per day for 2 weeks (14 days).

Non Weight Bearing Tissue Specific Stretching Exercises (Plantar Fascia Stretching Exercise)

Subject sits on a firm surface and crosses the tested leg over the other leg. By using the hand of the tested side, subject holds the tested foot and pulls the toes back towards the shin creating tension or stretch in the arch of the foot.

Subject should check for the appropriate stretch position by gently rubbing the thumb of the untested side left to right over the arch of the foot. It should feel firm like a guitar string.

Weight Bearing Stretching Exercises (Achilles tendon Stretch)

Subjects were taught to perform the exercise while standing and leaning into the wall with the affected leg placed behind the contralateral leg. Patients were specially instructed to avoid excessive midfoot pronation while stretching. They were also instructed to "toe in" or point the toes of the affected foot toward the heel of the front foot. Patients were told to bend the front leg while keeping the back leg straight with the heel firmly on the ground [13].

Data Analysis

Paired 't' test and independent 't' test was used to find out whether there is any significant difference on pain and functional scores before and after intervention.

Paired 't' test was used to interpret the results within the group and independent 't' test was used to interpret the results between the groups. The collected data were analyzed statistically using SPSS version 23.

Table 1: Visual Analog Scale (VAS) Paired ‘t’ test Values of Group A

S. No	VAS	Improvement			‘t’ Value	Sig (2_tailed) (P<0.05)
		Mean	Mean Difference	SD		
1	Pretest	8.00	3.5	0.94	9.3	0.000
2	Post Test	4.50		0.70		

Table 1 shows results of Paired ‘t’ test findings indicated significant difference ($p<0.05$) in pain intensity (VAS) when compared before and after the non- weight bearing tissue

specific stretching exercise in subjects with chronic plantar fasciitis.

Table 2: Foot Function Index (FFI) Paired ‘t’ test Values of Group A

S. No	FFI	Improvement			‘t’ Value	Sig (2_tailed) (P<0.05)
		Mean	Mean Difference	SD		
1	Pretest	66.86	24.5	8.7	6.5	0.000
2	Post Test	42.30		12.6		

Table 2 shows results of Paired ‘t’ test findings indicated significant difference ($p<0.05$) in FFI (Foot Function Index) when compared before and after the non- weight bearing

tissue specific stretching exercise in subjects with chronic plantar fasciitis.

Table 3: Visual Analog Scale (VAS) Paired ‘t’ test Values of Group B.

S. No	VAS	Improvement			‘t’ Value	Sig (2_tailed) (P<0.05)
		Mean	Mean Difference	SD		
1	Pretest	7.8	2.6	1.39	9.75	0.000
2	Post Test	5.2		1.22		

Table 3 shows results of Paired ‘t’ test findings indicated significant difference ($p<0.05$) in pain intensity (VAS) when

compared before and after the weight bearing stretching exercise in subjects with chronic plantar fasciitis.

Table 4: Foot Function Index (FFI) Paired ‘t’ test Values of Group B

S. No	FFI	Improvement			‘t’ Value	Sig (2_tailed) (P<0.05)
		Mean	Mean Difference	SD		
1	pretest	55.26	12.8	8.29	9.2	0.000
2	post test	42.43		7.59		

Table 4 shows results of Paired ‘t’ test findings indicated significant difference ($p<0.05$) in FFI (Foot Function Index)

when compared before and after the weight bearing stretching exercise in subjects with chronic plantar fasciitis.

Table 5: Visual Analog Scale (VAS) Independent ‘t’ test Values of Group A & Group B.

S. No	VAS Comparision	Improvement			‘t’ Value	Sig (2_tailed) (P>0.05)
		Mean	Mean Difference	SD		
1	Group A	4.5	-0.5	0.7	-1.0	0.331
2	Group B	5.0		1.4		

Table 5 shows results of Independent ‘t’ test findings indicated no significant difference ($p>0.05$) in VAS (Visual Analog Scale) when compared between the non- weight

bearing tissue specific stretching exercise and the weight bearing stretching exercise in subjects with chronic plantar fasciitis.

Table 6: Foot Function Index (FFI) Independent ‘t’ test Values of Group A & Group B.

S. No	FFI Comparision	Improvement			‘t’ Value	Sig (2_tailed) (P>0.05)
		Mean	Mean Difference	SD		
1	Group A	42.3	-0.12	12.67	-0.027	0.979
2	Group B	42.4		7.59		

Table 6 shows results of Independent ‘t’ test findings indicated no significant difference ($p>0.05$) in FFI (Foot Function Index) when compared between the non- weight bearing tissue specific stretching exercise and the weight bearing stretching exercise in subjects with chronic plantar fasciitis.

Discussion

Plantar heel pain is one of the common musculoskeletal disorders of the foot and ankle. It is estimated that more than 1 million patients seek treatment annually for this condition. It is the third most common running injury behind patellofemoral pain and iliotibial band friction syndrome. This overuse disorder seems to peak in people between the ages of 40 to 60 years among the general population.

20 subjects were included in this study based selection criteria and divided into 2 groups. Subjects in Group A were received non weight bearing tissue specific stretching exercise (Plantar fascia stretching exercise) whereas subjects in Group B were received weight bearing stretching exercise (Achilles tendon stretch).

All the participants involved in 3 sets of stretching program per day which means total of 42 stretching sets for 2 weeks. An initial baseline assessment and post treatment assessment of pain and functional scores were taken for data analysis in subjects with chronic plantar fasciitis.

Paired 't' test findings indicated significant difference ($p < 0.05$) in pain intensity (VAS) & Foot Function Index (FFI) when compared before and after the non- weight bearing tissue specific stretching exercise and weight bearing stretching exercise in subjects with chronic plantar fasciitis. Independent 't' test findings indicated no significant difference ($p > 0.05$) in VAS (Visual Analog Scale) and Foot Function Index (FFI) when compared between the non- weight bearing tissue specific stretching exercise and the weight bearing stretching exercise in subjects with chronic plantar fasciitis.

Digiovanni BF *et al* (2006) concluded that both the non-weight bearing tissue specific stretching exercise (Plantar fascia stretch) and weight bearing stretching exercise (Achilles tendon stretch) are effective in treating chronic plantar fasciitis^[14]. Pfeffer G *et al* (1999) concluded that the calf stretching has improved the flexibility of the Achilles tendon. The increase in tendon flexibility has directly taken off the stress on the plantar fascia and therefore reducing the pain in the plantar fascia. There was an improvement of as much as 72% in subjects participating in the eight-week calf stretching program to relieve plantar fascia pain.^[15]

This result suggests that there is a significant change on plantar heel pain and function among subjects with chronic plantar fasciitis within non weight bearing tissue specific stretching exercise group and weight bearing stretching exercise group. When compared both interventions with Group A and Group B, there is no significant change in pain intensity (VAS) and functional status (FFI) among subjects with chronic plantar fasciitis.

From the above analysis, it is clear that both interventions, non-weight bearing tissue specific stretching exercise (Plantar fascia stretching exercise) and weight bearing stretching exercise (Achilles tendon stretch) are effective in improving pain intensity and functional status among subjects with chronic plantar fasciitis and also there is no significant difference in effectiveness of both interventions on pain and functional status among subjects with chronic plantar fasciitis.

Conclusion

The result of this study concluded that there was no significant changes in pain intensity (VAS) and functional status (FFI) among subjects with chronic plantar fasciitis between non weight bearing tissue specific exercise (Plantar fascia stretching exercise) and weight bearing stretching exercise (Achilles tendon stretch). Therefore, this indicates both treatment interventions are effective relieving pain and increasing foot functions among subjects with chronic plantar fasciitis.

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