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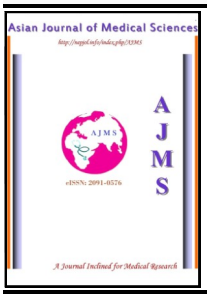

Efficacy of Stretching Exercises in the Treatment of Chronic Plantar Fasciitis: A Prospective Study in Manipal Teaching Hospital, Pokhara, Nepal

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Abstract

Objective: Chronic plantar fasciitis developed in ten percent of cases with poor response. Specific plantar stretching exercises alone improves the patient with better outcome. It is self limited process with resolution of symptoms within one year but five percent cases may require surgical intervention in intractable cases. The purpose of this study was to evaluate the long term outcomes of the plantar fascia specific stretching exercise only for chronic plantar fasciitis.

Material & Methods: 50 patients with chronic plantar fasciitis for more than three month duration were enrolled in our study for post treatment follow up with effect from Jan 2010 to Jan 2011 in Department of Orthopedics of Manipal College of Medical Sciences. All patients received plantar specific stretching exercise protocol for twelve months interval of one week, three week, two months, six months and twelve months.

Results: Out of 50 patients, 36(72%) were female and 14 (28%) were male. 36(72%) were left sided and 14 (28%) were right. Mean age of patients were 46.12±SD7.11 years. The pre treatment mean visual analogue scale score for all patients is significantly higher than every follow up (p=0.0001).

Conclusion: This stretching of the plantar fascia is a modification of the traditional stretch weight bearing to tissue specific plantar fascia stretching protocol to optimize tissue tension through a controlled stretch of plantar fascia by recreation of windlass mechanism with high rate of satisfaction in regards to decrease of pain and functional limitations.

***Key Words**: Chronic plantar fasciitis; stretching; windlass mechanism*

1. Introduction

Plantar heel pain is soreness under surface of the heel and may radiate from medial tubercle of the calcaneum extend along the fascia into the medial longitudinal arch of the foot and severity of pain and irritation noticeable on rising after rest.

Plantar fasciitis is a common pathological condition affecting hind foot and was first described by Wood in 1812.[1] It affects 10 percent population during the course of life time. Only 5 percent undergo surgery in chronic plantar fasciitis. The classical signs and symptoms of chronic plantar fasciitis are localized to medial calcaneal tubercle and pain in the first step in the morning for at least ten months. Plantar fasciitis is also referred to as planter heel pain syndrome, heel spur syndrome, painful heel syndrome, runner's heel, subcalcaneal pain, calcaneodynia, and calcaneal periostitis.[1]

Plantar fasciitis is one of the most common foot disorders responsible for approximately one million physicians visit per year.[2] It is estimated to account for 11 to 15 percent of all foot symptoms requiring treatment in adults.[3,4] Proximal plantar fasciitis is the most common cause of heel pain affecting more than 2 million Americans each year.[5] The incidence reportedly peaks in people between the age of 40 and 60 years in general population, particularly in females.[6] The

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predominance of the condition according to sex varies in different studies.[7] Plantar fasciitis affects individuals regardless of sex, age, ethnicity or activity level.[8] It is more likely to occur in persons who are obese or who spend most of the days on their feet or those who have limited ankle flexion.[9]

Experts believe that the pain is caused by acute or chronic injury to the origin of the plantar fascia from cumulative overload stress. The word "fasciitis" assumes inflammation of plantar fascia. However, recent research suggests that some presentation of plantar fasciitis manifest non inflammatory, degenerative process with marked thickening of plantar fascia at its origin and histological finding after calcaneal spur surgery shows that myxoid degeneration with fragmentation and degeneration of plantar fascia and bone marrow vascular ectasia and should be termed "plantar fasciosis".[10]

Non operative treatment for plantar fasciitis vary widely and include shoe modifications, use of prefabricated and custom inserts, stretching exercises, physical therapies, extracorporeal shock wave therapy, ultrasound, non steroid anti inflammatory medications, cortisone injection, night splints, application of cast or any combination of the foregoing modalities.[4]

According to the previous studies the reason for poor results of treatment with long lasting symptoms (more than 10months) was found to be either improper techniques followed or improper prescriptions on stretching given by therapists giving more stress on Achilles tendon than the plantar fascia.[11]

Individuals affected with plantar fasciitis were seen to naturally recover within a year. According to the work done by various researchers different conservative treatments were implemented both individually and in combinations and conclusions were made that conservative treatment resulted in better response in terms of relief of worst pain and also reduction of first step of morning pain.[11-14] The purpose of this study was to evaluate the long term outcomes of the stretching exercise only for chronic plantar fasciitis.

2. Material and Methods

Fifty patients were enrolled in this study. A prospective interventional study was done in Manipal Teaching Hospital, Pokhara for the period of one year January 2010 to January 2011.

Out of 50 patients, 36 were female and 14 were male. Mean age of patients were 46.12±SD7.11 years and all had chronic pain for more than 3 months. The tenderness of the sole of the foot at the origin of the plantar fascia on the medial tubercle of calcaneal also extending to medial arch when felt by palpating the tension in the plantar fascia with the contralateral hand confirmed the diagnosis of proximal plantar fasciitis.

The exclusion criteria were those patients who had a history of systemic disease, prior heel surgeries, calcaneal fracture, calcaneal nerve entrapment or heel pain that was not consistent with the diagnosis of proximal fasciitis, those who received steroid injections and those who were lost in periodic follow up. Out of 70 cases 20 were excluded and finally we enrolled 50 cases for study.

Initially patients were assessed both clinically and radiologically and the diagnosis was confirmed. The patient's pre treatment VAS score were also recorded. At the time of one year follow up, a questionnaire was asked to all the fifty patient enrolled in the study. The questionnaire was about reduction of pain, function and satisfaction level by VAS score on the pain sub-scale of foot function index after treatment.

To assess the baseline heel pain, VAS Score on the pain subscale of the Foot Function Index, methods were used to evaluate the outcome in respect of pain, function, and satisfaction with treatment. These methods have been checked by Pfeffer et al, Rompe et al, B.F. DiGiovanni for reliability.[4,6,18]

To perform the plantar fascia stretch, the patient was instructed to first cross the affected leg over the contralateral leg while seated. The patient then applied force distal to the metatarsophalangeal joints on the affected side pulling the toes upward towards the shin until the stretch was felt in the sole of the foot. Tension in the planter fascia was palpated with the contralateral hand while performing the stretch. The patients were instructed to hold the assigned stretch for ten seconds and to repeat it ten times. The patients were also encouraged to perform it prior to any weight bearing. They were instructed to perform the exercise three times a day, with the first stretch done before the first step was taken in the morning, the patient holding the stretch for ten seconds and repeat it ten times. They were asked to perform the stretching protocol for a minimum of two months and thereafter as pain demanded.

The patients were followed up at one week, three weeks, two months, six months and twelve months interval and the progress was documented. In every follow up the pain scoring was done with visual analogue scale (VAS) scoring system and noted. This study was totally a non pharmacological and no other intervention or modalities of treatment were used except physical method. So it is cost effective, specific outcome related to pain, function and satisfaction with treatment. It is very easy method performed at home by the patient himself.

Analysis was done using descriptive statistics and testing of hypothesis. The data was analyzed using Excel 2003, Statistical Package for the Social Sciences (SPSS) for Windows Version 16.0 (SPSS Inc; Chicago, IL, USA) and the EPI Info 3.5.1 Windows Version. The Chi-square test was used to examine the association between different variables. A p-value of < 0.05 (two-tailed) was used to establish statistical significance.

3. Results

Out of 50 patients, 36(72%) were female and 14 (28%) were male. 36(72%) were left sided and 14 (28%) were right. Mean age of patients were 46.12±SD7.11 years. As per the Table 1, the pre treatment mean visual analogue scale score for all patients is significantly higher than every follow up (p=0.0001).

Figure-1: Specific stretching exercise of plantar fascia

Further we did analysis on Gender and sides. In female, pre treatment VAS mean 7.42±SD1.3 were statistically significant when compared to 12 months VAS mean 0.17±SD0.38 (p=0.00001). In male, pre treatment VAS mean 8.21±SD0.975 were statistically significant when compared to 12 months VAS mean 0.14±SD0.363 (p=0.00001). In left, pre treatment VAS mean 7.56±SD1.4 were statistically significant when compared to 12 months VAS mean 0.14±SD0.351 (p=0.00001). In right, pre treatment VAS mean 7.86±SD0.949 were statistically significant when compared to 12 months VAS mean 0.21±SD0.426 (p=0.00001).

Table-1: Comparison of Pre and Post treatment VAS score

Variables		Mean	N	Std. Deviation	P value
Pair 1	pre treatment	7.64	50	1.290	0.00001**
	Post treatment 1week	6.12	50	1.136	
Pair 2	pre treatment	7.64	50	1.290	0.00001**
	Post treatment 3weeks	3.56	50	1.091	
Pair 3	pre treatment	7.64	50	1.290	0.00001**
	Post treatment 6months	1.98	50	0.742	
Pair 4	pre treatment	7.64	50	1.290	0.00001**
	Post treatment 8months	0.92	50	0.695	
Pair 5	pre treatment	7.64	50	1.290	0.00001**
	Post treatment 9months	0.52	50	0.505	
Pair 6	pre treatment	7.64	50	1.290	0.00001**
	Post treatment 12months	0.16	50	0.370	

** P<0.05 statistically significant

4. Discussion

Stretching of the plantar fascia and Achilles tendon in the management of plantar fasciitis is well known. The stretching exercise relieves stress on plantar fascia and tight Achilles tendon and provides one of the hallmark conservative treatment results.[12]

In our study, plantar fascia stretch was used by recreation of the windlass mechanism (metatarsophalangeal joint dorsiflexion and ankle dorsiflexion) limiting the micro trauma and associated chronic inflammation by performing exercises prior to the first step in the morning or after prolong sitting or inactivity.[5] It exhibits enhance outcome in regards to pain, function and satisfaction. It also provides non operative option which resulted in rate of improvement of symptoms for disabling chronic plantar fasciitis and should be a fundamental component.

Although a long duration of symptoms are present, majority of the nonoperative treatments for plantar fasciitis have demonstrated positive or encouraging results such as night splints, prefabricated and custom made inserts, shoe modifications, stretching exercises, non steroidal anti-inflammatory medications, cortisone injections, application of a cast, shock wave therapy, or any combination of these modalities.[15-17]

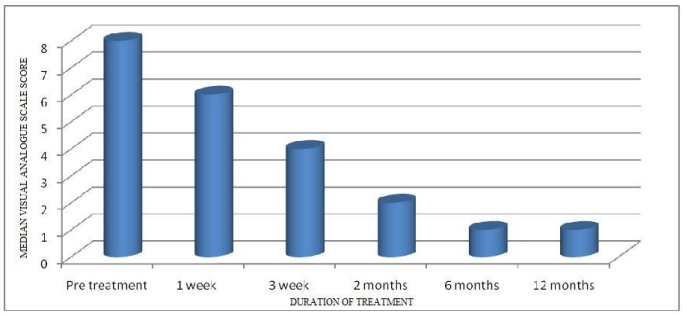

Figure-2: Median visual analogue scale score and duration of treatment

Figure-2 shows that the pain reduction after three weeks was more than 50 %, at the two months the pain reduction was more than 75% and at the final follow up the pain reduction was more than 90% in our study. The best reduction of pain was found after 3 weeks of starting the stretching exercises alone.

Pfeffer et al., studied the comparison of Achilles tendon and plantar fascia stretching alone to stretching along with one of four different shoe inserts. The differences between the stretching group and the silicone insert group were statistically significant.[4]

DiGiovanni et al. compared a non-weight bearing plantar fascia stretching along with three weeks of anti-inflammatory and soft in sole. He used Achilles tendon stretching instead of the plantar fascia stretching for patients with chronic plantar fasciitis and found that the plantar fascia stretching is significant. Outcome after eight weeks compared and found that planter fascia stretching is superior to Achilles tendon stretching.[5]

In the study by Turlik et al., the use of these different interventions along with the stretching programs makes it impossible to determine the effect of the stretching itself on the results of these studies.[17]

Rompe et al., compared shock-wave therapy and plantar fascia specific stretching exercises as treatment for plantar fasciitis and found on the basis of foot function index pain subscale (item1-7) that stretching exercise was more effective.[18]

American college of Foot and ankle surgery recommended surgery if the pain persists after 3 months of treatment. Effectiveness of operative and conservative treatment not yet proved.

Extracorporeal Shockwave Therapy is beneficial to runners who have chronic heel pain for years mostly because of inflammatory nature.

It is self-limited nature of condition and no evidence supporting effectiveness of any treatment and most patients improve without specific therapy or by conservative therapy stretching exercise focusing plantar fascia which should be utilized as the first step in the treatment.[8]

Majority of the plantar stretching exercise shows positive and encouraging long term basis within 6 months. Major advantages are:

a) It can be performed throughout the day prior to standing after prolong rest.

b) It is cost effective and patient can do it at home.

c) It is major contributor alone to the improvement[5]

After 6 months of study all of our study cases exhibit improvement in the pain in the first step in the morning. We have included 3months duration of chronic planter fasciitis not acute cases. The result with expected rate of improvement; this study provides important information after 6 months if no improvement another treatment is recommended. The chance of returning to full activity as well as no further treatment will be needed in more than 75% of cases and more than 90% is satisfied at the end on 12 months.

5. Conclusion

Tissue specific plantar fascia stretching exercise protocol alone can optimize tissue tension through control stretch of the plantar fascia by recreation of windlass mechanism (dorsiflexion of the first metatarsal and dorsiflexion of the ankle joint). It is noticed that high rate of satisfaction in regards pain and functional limitation. Mechanism and optimal position is not known clearly. Many of the modalities used in combination in other studies making it difficult to access the outcome but we have used only one stretching modalities which seems to be effective, inexpensive, easy method straight forward patient centred treatment protocol for the management of chronic plantar fasciitis and outcome is encouraging.

Further studies with larger population are required to determine the effectiveness of actual outcome and configuration of foot and ankle for better specific planter stretching exercise.

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