



Comparison of Gastrocnemius-Soleus Stretching Program versus Tendoachilles Stretching Exercises for Management of Chronic Plantar Fasciitis

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ABSTRACT

Introduction: On the sole of the foot, the plantar fascia is a thick, multi-layered fibrous connective tissue. Plantar fasciitis is a painful and incapacitating ailment that frustrates both the patient and the physician. Stretching exercises that target the plantar fascia are an excellent therapy option for plantar fasciitis.

Objective: Objective of this study was to compare the outcome of Gastrocnemius-Soleus Stretching Program versus tendoachilles stretching exercises for management of chronic plantar fasciitis

Material and Methods: This randomized controlled trial was conducted from March 2020 to May 2021 at department of orthopaedic Chandka medical Larkana after getting approval from institutional ethical committee. Patients of age 30-70 years of either gender, undergoing chronic plantar fasciitis, were included and were randomly divided in two groups. In group A, Gastrocnemius-Soleus Stretching Program was applied. In group B, tendoachilles stretching exercises was applied. Pain score was noted at baseline and after 8 weeks, change in pain score was calculated. All the information was noted on proforma while entered and analyzed in SPSS version 21. Independent samples t-test was applied to compare the mean change in pain score in both groups. P-value<0.05 was considered as significant.

Results: In Gastrocnemius-Soleus Stretching group, the mean age of patients was 48.70 ± 9.80 years, while in Tendoachilles Stretching Exercises group, the mean age of patients was 48.63 ± 8.43 years. In Gastrocnemius-Soleus Stretching group, there were 16 (53.3%) males and 14 (46.7%) females, while in Tendoachilles Stretching Exercises group; there were 15 (50%) males and 15 (50%) females. In Gastrocnemius-Soleus Stretching group, the mean change in pain score was 2.57 ± 1.01 . While in Tendoachilles Stretching Exercises group, the mean change in pain score was 1.77 ± 0.57 . The difference in both groups was significant (p-value < 0.05).

Conclusion: It has been concluded that Gastrocnemius-Soleus Stretching exercise is more effective in reducing symptoms of Plantar Fasciitis in adult population.

Key Words: Gastrocnemius-Soleus Stretching Program, Tendoachilles stretching exercises, Chronic plantar fasciitis, Pain

INTRODUCTION

On the sole of the foot, the plantar fascia or plantar aponeurosis is a thick, multi-layered fibrous connective tissue.¹ It is a fibrous band that is approximately 2 to 4mm thick and found on the plantar area of the foot. This fascia aids in the formation of the foot's longitudinal arch, which is specifically intended to distribute weight over the calcaneus' plantar medial tubercle. When it comes to moving pressure to the forefoot, a heel lift might be useful.² Plantar fasciitis is a painful and incapacitating ailment that frustrates both the

patient and the physician. Plantar fasciitis is characterized by inflammation of the plantar fascia's origin and adjacent perifascial tissues. Despite substantial research into the issue, foot surgeons continue to disagree over the cause and genesis of plantar heel pain, as well as the best treatment option.³

According to recent study, fascia has the ability to change its biomechanical characteristics. Furthermore, because it connects skeletal muscles to form a body-wide network of multidirectional myofascial continuity, it calls into question the traditional view of muscles as autonomous actua-

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ISSN: 2231-2196 (Print)

ISSN: 0975-5241 (Online)

Received: 17.02.2022

Revised: 09.03.2022

Accepted: 16.04.2022

Published: 03.05.2022

tors.⁴ Conservative therapy is recommended in primary care, and many conservative approaches are discussed in the literature.⁵ Controlling inflammation, reducing pain, and encouraging healing are all part of a standard multi-treatment strategy routinely used by health care practitioners. The gastroc-soleus muscles are frequently stretched to increase dorsiflexion range of motion as part of the initial therapy for plantar fasciitis.⁶

The gastroc-soleus complex's inflexibility has been linked to excessive pronation and overcompensation of the plantar fascia at the first metatarsal phalangeal joint, increasing tension at the medial calcaneal insertion. As a result, gastrocnemius-soleus stretches are thought to be advantageous in the early stages of a plantar fasciitis therapy or rehabilitation program.⁶ Stretching exercises that target the plantar fascia are an excellent therapy option for plantar fasciitis.⁵ Rationale of this study is to compare the outcome of Gastrocnemius-Soleus Stretching Program versus tendoachilles stretching exercises for management of chronic plantar fasciitis. It has been stated in the literature that Gastrocnemius-Soleus Stretching Program is more effective in reducing pain as compared to tendoachilles stretching exercise. Not much work has been done in this regard and no local study has been conducted before on this topic. So to confirm the beneficial role of Gastrocnemius-Soleus Stretching, we want to conduct this study, so that in future we will implement the use of Gastrocnemius-Soleus Stretching instead of going for other failed management protocols.

OBJECTIVE

To compare the outcome of Gastrocnemius-Soleus Stretching Program versus tendoachilles stretching exercises for management of chronic plantar fasciitis

MATERIAL AND METHODS

This randomized controlled trial was conducted from March 2020 to May 2021 at department of orthopaedic Chandka medical Larkana after getting approval from institutional ethical committee.

Sample Size: About 60 cases; 30 cases in each group were estimated by keeping 95% confidence level, 80% power of study and mean change in pain score i.e. 2.50 ± 0.861 with Gastrocnemius-Soleus Stretching Program and 1.71 ± 1.006 with tendoachilles stretching exercises for management of chronic plantar fasciitis

Sampling Technique: Patients were recruited by applying the non-probability, consecutive sampling technique.

Sample Selection

Inclusion Criteria: Patients of age 30-70 years of either gender, undergoing chronic plantar fasciitis, which was defined as patient presenting with complaint of severe pain on placing foot on hard surface or walking for > 3 months and presence of maximum pain upon palpation of the origin of the plantar fascia on the medial calcaneal tubercle on clinical examination

Exclusion Criteria: Patients with anatomical abnormality of foot and ankle and neurologic abnormality (changes of deep tendon reflexes, motor or sensory deficit) or with history of systemic inflammatory disease, diabetes, previous heel surgery, or heel pain that is not consistent with proximal plantar fasciitis were excluded from the study.

Methodology: After taking approval from ethical board of the hospital, sixty patients, who fulfilled the selection criteria, were recruited from OPD. An informed consent was obtained. Demographic profile was also taken and patients were divided randomly into two equal groups by applying lottery method. In group A, Gastrocnemius-Soleus Stretching Program was applied and plantar fasciitis stretching was advised to apply. In group B, tendoachilles stretching exercises was advised to apply. At baseline, pain score was noted by using visual analogue scale. Then patients were followed-up in OPD for 8 weeks. After 8 weeks, patients were evaluated for pain score by using visual analogue scale and change in pain score from baseline was calculated. All the data was gathered in preform.

Data Analysis: Data was entered and analyzed through SPSS version 21. The numerical variables like age, BMI, duration of symptoms, pre and post treatment pain scores were presented as mean and standard deviation. The categorical variable like gender and lateral side were presented as frequency and percentage. Independent samples t-test was applied to compare the mean change in pain score in both groups. $p\text{-value} \leq 0.05$ was considered as significant. Data was stratified for age, gender, BMI, and duration of symptoms. Post-stratification, Independent samples t-test was applied to compare the mean change in pain score in both groups in each strata. $p\text{-value} \leq 0.05$ was considered as significant.

RESULTS

In Gastrocnemius-Soleus Stretching group, the mean age of patients was 48.70 ± 9.80 years, while in Tendoachilles Stretching Exercises group, the mean age of patients was 48.63 ± 8.43 years. In Gastrocnemius-Soleus Stretching group, there were 16 (53.3%) males and 14 (46.7%) females, while in Tendoachilles Stretching Exercises group, there were 15 (50%) males and 15 (50%) females. In Gastrocnemius-Soleus Stretching group, the mean BMI of patients was

26.43 ± 2.21 kg/m², while in Tendoachilles Stretching Exercises group, the mean age of patients was 27.30 ± 1.99 kg/m². The mean duration of symptoms was 2.20 ± 0.89 months in Gastrocnemius-Soleus Stretching group while 1.97 ± 0.81 months in Tendoachilles Stretching Exercises group. In Gastrocnemius-Soleus Stretching group, 11 (36.7%) patients had symptoms in left foot, 10 (33.3%) had symptoms in right foot, while 9 (30%) patients had symptoms in both feet. In Tendoachilles Stretching Exercises group, 9 (30%) patients had symptoms in left foot, 14 (46.7%) had symptoms in right foot, while 7 (23.3%) patients had symptoms in both feet. Table 1

In Gastrocnemius-Soleus Stretching group, the mean pain score of patients was 4.67 ± 0.92 which was reduced to 2.10 ± 1.03 after 8 weeks and the significant reduction in mean pain score (change = 2.57 ± 1.01) was observed in this groups. While in Tendoachilles Stretching Exercises group, the mean pain score of patients was 4.30 ± 0.60 which was reduced to 2.53 ± 0.57 after 8 weeks and the significant reduction in mean pain score (change = 1.77 ± 0.57) was observed in this group. The difference in both groups was significant after 4 weeks and there was significantly more reduction in pain score with Gastrocnemius-Soleus Stretching exercises (p-value < 0.05). Table 2

The mean change in age 30-50 years was significantly more with Gastrocnemius-Soleus Stretching exercises as compared to the Tendoachilles Stretching Exercises group i.e. 2.68 ± 0.95 vs. 1.76 ± 0.56, p-value <0.05. But the mean change in age 51-70 years did not significantly differ in both groups i.e. 2.36 ± 1.12 vs. 1.77 ± 0.60, p-value >0.05. The mean change in male patients was significantly better with Gastrocnemius-Soleus Stretching exercises as compared to the Tendoachilles Stretching Exercises group i.e. 2.94 ± 1.06 vs. 1.80 ± 0.56, p-value <0.05. But the mean change in females did not significantly differ in both groups i.e. 2.14 ± 0.77 vs. 1.73 ± 0.59, p-value >0.05. The mean change in patients of normal BMI did not significantly differ in both groups i.e. 2.25 ± 0.46 vs. 2.67 ± 0.58, p-value >0.05. While the mean change in pain score among overweight patients was better with Gastrocnemius-Soleus Stretching exercises as compared to the Tendoachilles Stretching Exercises group i.e. 2.70 ± 1.17 vs. 1.70 ± 0.47, p-value <0.05. The mean change in obese patients did not significantly differ in both groups i.e. 2.50 ± 0.71 vs. 1.50 ± 0.58, p-value >0.05. We also observed that the patients who had duration of symptoms from 1-2 months, the mean change in pain score was significantly better with Gastrocnemius-Soleus Stretching exercises than Tendoachilles Stretching Exercises i.e. 2.53 ± 0.96 vs. 1.78 ± 0.60, p-value <0.05. But the difference was insignificant in both groups in patients who had symptoms from duration 3-4 months i.e. 2.64 ± 1.12 vs. 1.71 ± 0.49, p-value >0.05. Table 3

DISCUSSION

In 1812, Wood originally characterized plantar fasciitis, a frequent medical ailment affecting the back foot.^{7,8} It affects about 10% of the population over the course of their lives.⁹ Only 5% of people with persistent plantar fasciitis get surgery. The hallmark signs and symptoms of chronic plantar fasciitis include discomfort in the first step in the morning for at least ten months and a localized medial calcaneal tubercle. Plantar fasciitis is also known as heel spur syndrome, painful heel syndrome, runner's heel, subcalcaneal discomfort, calcaneodynia, and calcaneal periostitis.^{7,10}

Plantar fasciitis is one of the most frequent foot ailments, resulting in one million doctor visits each year.^{11,12} It is thought to account for 11 to 15% of all adult foot complaints that require treatment. Proximal plantar fasciitis is the most common cause of heel pain affecting more than 2 million Americans each year.^{13,14}

Stretching the plantar fascia and Achilles tendon is well-known for treating plantar fasciitis. One of the trademark conservative therapy effects is the stretching exercise, which decreases tension on the plantar fascia and tight Achilles tendon.¹⁵ Only a tissue-specific plantar fascia stretching workout routine that recreates the windlass mechanism may maximize tissue tension through control stretch of the plantar fascia. There is a high level of pleasure with pain and functional limitations. The mechanism and ideal site are unknown. Many of the modalities were used in combination in other studies, making it difficult to access the results, but we only used one stretching modalities, which appears to be effective, inexpensive, and simple to implement in a patient-centered treatment protocol for chronic plantar fasciitis, and the results are promising.^{16,17}

For the treatment of symptoms of proximal plantar fasciitis, a program of non-weight-bearing stretching exercises specific to the plantar fasciitis is preferable than the typical program of weight-bearing Achilles tendon stretching activities. These findings offer a non-operative therapy option for individuals with persistent, debilitating plantar heel pain that differs from the current standard of care.¹⁸

In our trial, we observed that with Gastrocnemius-Soleus Stretching program, the mean pain score of patients was 4.67 ± 0.92 which was reduced to 2.10 ± 1.03 after 8 weeks and the significant reduction in mean pain score (change = 2.57 ± 1.01) was observed in this groups. While with Tendoachilles Stretching Exercises, the mean pain score of patients was 4.30 ± 0.60 which was reduced to 2.53 ± 0.57 after 8 weeks and the significant reduction in mean pain score (change = 1.77 ± 0.57) was observed in this groups. The difference in both groups was significant after 4 weeks and there was significantly more reduction in pain score with Gastrocnemius-Soleus Stretching exercises (p-value < 0.05).

Jha et al., conducted a similar trial found that the mean reduction in pain score was 2.50 ± 0.861 with Gastrocnemius-Soleus Stretching Program while 1.71 ± 1.006 with tendoachilles stretching exercises (on 10cm pain scale) for management of chronic plantar fasciitis ($p < 0.05$). Thus Gastrocnemius-Soleus Stretching Program is found to be more appropriate exercise for resolution of symptoms of plantar fasciitis.¹⁸ Digiovanni et al., conducted another trial and found that the mean reduction in pain score was 25.9 ± 3.4 with Gastrocnemius-Soleus Stretching Program while 12.3 ± 3.7 with tendoachilles stretching exercises (on 100cm pain scale) for management of chronic plantar fasciitis ($p < 0.05$). Thus trial supported the application of tissue - specific plantar - fascia stretching program as an important component for the management of chronic plantar fasciitis. The stretch has long-term advantages, including a significant reduction in discomfort and functional restrictions, as well as a high percentage of satisfaction. This method can give a health-care practitioner with a treatment procedure that is successful, economical, and simple.¹³

CONCLUSION

Through results of this trial, it has been observed and concluded that Gastrocnemius-Soleus Stretching exercise is more effective in reducing symptoms of Plantar Fasciitis in adult population. Thus in future we recommend the application of Gastrocnemius-Soleus Stretching exercise for resolution of Plantar Fasciitis in adults. But further trials should be done to confirm these results, as this study was done on small sample size due to lack of funding and short study period.

ACKNOWLEDGMENTS

Authors acknowledge the immense help received from the scholars whose articles are cited and included in references of this manuscript. The authors are also grateful to authors/editors and publishers of all those articles, journals from where the literature of this article has been reviewed and discussed.

PERMISSION:

It was taken from ethical review committee of the institute with letter no: CMCHL/3.2020/245-9

CONSENT:

Informed consent was taken from every participant of study

SOURCE OF FUNDING:

None

CONFLICT OF INTERSET:

None

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Table 1: Demographics of patients

	Group	
	Gastrocnemius-Soleus Stretching	Tendoachilles Stretching Exercises
N	30	30
Age	48.70 ± 9.80	48.63 ± 8.43
Gender		
Male	16 (53.3%)	15 (50%)
Female	14 (46.7%)	15 (50%)
BMI	26.43 ± 2.21	27.30 ± 1.99
Duration of symptoms	2.20 ± 0.89	1.97 ± 0.81
Lateral side		
Left	11 (36.7%)	9 (30%)
Right	10 (33.3%)	14 (46.7%)
Bilateral	9 (30%)	7 (23.3%)

Table 2: Comparison of change in pain score in both groups during follow-up

	Group		p-value
	Gastrocnemius-Soleus Stretching	Tendoachilles Stretching Exercises	
N	30	30	
Pain at baseline	4.67 ± 0.92	4.30 ± 0.60	0.073
Pain after 8 weeks	2.10 ± 1.03	2.53 ± 0.57	0.048
Change in pain score	2.57 ± 1.01	1.77 ± 0.57	0.000
p-value (paired sample t-test)	0.000	0.000	

Table 3: Comparison of change in pain score in both groups during follow-up for effect modifiers

		Group		p-value
		Gastrocnemius-Soleus Stretching	Tendoachilles Stretching Exercises	
Age 30-50 years	n	19	17	0.001
	Change in pain score	2.68 ± 0.95	1.76 ± 0.56	
Age 51-70 years	n	11	13	0.112
	Change in pain score	2.36 ± 1.12	1.77 ± 0.60	
Male gender	n	16	15	0.001
	Change in pain score	2.94 ± 1.06	1.80 ± 0.56	
Female gender	n	14	15	0.119
	Change in pain score	2.14 ± 0.77	1.73 ± 0.59	
Normal BMI	n	8	3	0.241
	Change in pain score	2.25 ± 0.46	2.67 ± 0.58	
Overweight	n	20	23	0.001
	Change in pain score	2.70 ± 1.17	1.70 ± 0.47	
Obese	n	2	4	0.132
	Change in pain score	2.50 ± 0.71	1.50 ± 0.58	
Duration 1-2 months	n	19	23	0.007
	Change in pain score	2.53 ± 0.96	1.78 ± 0.60	
Duration 3-4 months	n	11	7	0.058
	Change in pain score	2.64 ± 1.12	1.71 ± 0.49	