

# IMMEDIATE EFFECT OF FOAM ROLLING ON PAIN AND WEIGHT DISTRIBUTION IN PATIENTS WITH PLANTAR FASCIITIS: A PILOT STUDY

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## ABSTRACT

**Background:** Plantar fasciitis is an inflammatory condition of the plantar fascia usually caused due to repetitive micro trauma. The classical sign of plantar fasciitis is that the worst pain occurs with the first few steps. The pain begins at the beginning of the activity and reduces after warm up. The usual treatment includes ultrasound, NSAIDS, cortisone injection, arch taping, heel cups, orthotics, shoes, stretching and strengthening and surgery. Various systems are available which measures the distribution of the foot and provide information about the foot functions.

**Materials and Method:** 12 patients under the age group 45-65 years with plantar fasciitis were included for the study. The patients were selected in the control or experimental group by convenient sampling. A foot scanning was done by PODOTECH foot scanner before starting the intervention. The intervention for control group included was conventional physiotherapy. Conventional physiotherapy included- a) Plantar fascia towel stretch- 3 reps, 30 sec hold, b) Plantar fascia standing stretch- 3 reps, 30 sec hold, c) Towel crumple- 3 reps, 30 times. The intervention for experimental group included conventional physiotherapy and foam rolling with flexbar for 3 minutes. Post intervention a foot scan was done. Pre and post intervention results were compared.

**Results:** When the differences in the pain values of both the group were considered, the experimental group which included intervention by foam roller and conventional treatment proved to be more significant than the control group. During the static position, the affected foot showed significant changes in the average pressure and thrust in the control group. During walking, the affected foot presented significant changes in the area, average pressure and maximal pressure in the control group.

**Conclusion:** This study concludes that foam rolling is effective for pain reduction and the conventional treatment given was effective for changes in the weight distribution.

**KEY WORDS:** Plantar Fasciitis, Conventional Treatment, Foam Rolling, Weight Distribution, Foot Scanner, Flexbar, Average Pressure, Thrust.

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## BACKGROUND

Plantar fascia is a connective tissue aponeurosis which attaches from the calcaneal tuberosity to the proximal phalanges. The posterior tuberosity of calcaneum has medial and lateral

processes. The flexor digitorum brevis, abductor hallucis, medial head of quadratus plantae and central band of plantar fascia. The plantar fascia is attached to the calcaneum by a fibrocartilage. It is triangular in shape. Proximally, it attaches to the calcaneal tuberosity and distally diverges to attach at the mid-tarsal level. The function of the plantar fascia is to provide longitudinal arch support statically and for shock absorption dynamically [1].

Plantar fasciitis is an inflammatory condition of the plantar fascia usually caused due to repetitive micro-trauma. The risk factors include excessive running, wearing faulty shoes, running on unyielding surfaces, having a pes cavus (high arched foot) and shortened Achilles tendon [2].

The classical sign of plantar fasciitis is that the worst pain occurs with the first few steps. The pain begins at the beginning of the activity and reduces after warm up. The pain increases on prolonged standing and may worsen at the end of the day. There is a biomechanical problem related to reduced intrinsic strength and reduced force distribution secondary to acquired flat feet or high arch. The usual treatment includes ultrasound, NSAIDs, cortisone injection, arch taping, heel cups, orthotics, shoes, stretching and strengthening and surgery [3]. There is a problem with the alteration in the load bearing status of the foot. This leads to increased tensile stress on the fascia leading to degeneration [4].

In normal activities like walking and sports, the human body is subjected to various loads which can be measured by ground reaction forces. Clinically, it is important to compare the various loads in injured and non-injured, pre and post-operative or between patient and control groups. By measuring the plantar pressure distribution, it gives information about the pressures and force loads of the different regions of the foot. The whole foot can be divided into fore foot, mid foot, hind foot, medial and lateral parts of the foot. It also provides information on the weight bearing areas of the foot. Various systems are available which measure the distribution of the foot. Each system is specific to the technical specification and application. These systems are available in various forms.

There are sensor principles (resistive, capacitive,

and piezoelectric) and devices (platform, insole, single transducer system). Platform systems are used for barefoot measurements and in laboratory settings only. Insole and single transducer systems are embedded in shoes and hence are easier to measure the differences in the pressure distribution. The information provided can be used clinically for shoe construction or modifications in orthotics. Clinically, many problems related to foot pressures can be diagnosed, prevented and be treated [5].

These devices provide information about the foot functions before and after therapeutic intervention which can be used to enhance studies, research and improve the way we practice. Effective clinical utilization of these devices or systems depends on their scientific basis, capabilities and limitations [6].

**Purpose:** This study will compare the effect of foam rolling and conventional physiotherapy for pain and weight distribution in patients with plantar fasciitis. An objective biomechanical method like foot-scanner is useful as a diagnostic aid, to identify individuals predisposed to this condition and for evaluating the efficiency of various treatments.

## MATERIALS AND METHODS

Total 12 subjects in between age group 45-65 years with plantar fasciitis, unilateral involvement, pain score above 5/10 and patients under medications were included in the study and those with any traumatic injuries, foot deformities or any other diseases were excluded from the study.

This study design includes Randomized Controlled Trial (convenient sampling). The subjects were explained their role in the study and a written consent was taken from the patients. The outcome measures used were- 1) Pain- Numerical Rating Scale (NRS) and 2) Weight Distribution- PODOTECH foot scanner.

The subjects were divided into 2 groups:

**Control group:** The intervention included conventional physiotherapy. Conventional physiotherapy included-

- a) Plantar fascia towel stretch- 3 reps, 30 sec hold
- b) Plantar fascia standing stretch- 3 reps,

30 sec hold

c) Towel crumple- 3 reps, 30 times

**Experimental group:** The intervention included conventional physiotherapy and foam rolling with flexbar for 3 minutes.

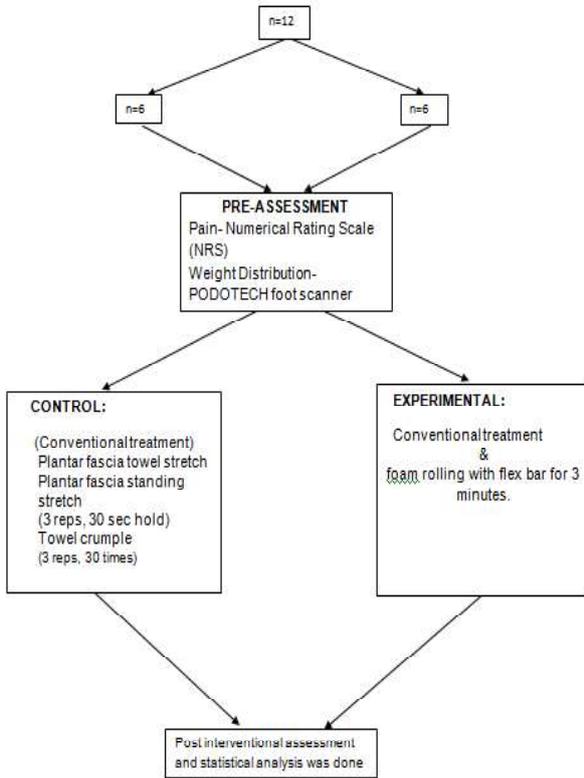


Fig. 1: Showing the Plantar Fascic Stretch with Towel.



Fig. 2: Showing the Plantar Fascia exercise with towel crumple.



Fig. 3: Showing the foam rolling with flexbar.



Fig. 4: Showing the foot scanner.



Fig. 5: Showing the foot scanner image.

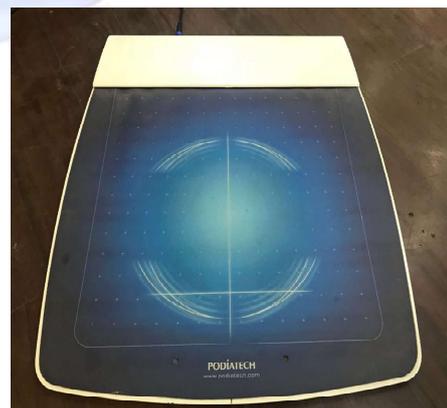
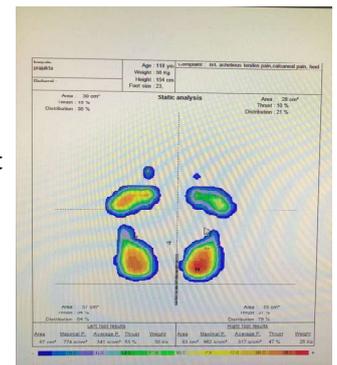


Fig. 6: Showing the foot scanner image.



## RESULTS AND DISCUSSION

Intra group analysis was done by the Wilcoxon Signed Rank test for pain and paired t test for weight distribution. Inter group analysis was done by the Mann Whitney U test for pain and unpaired t test for weight distribution.

The p values for pain scores in both the control and experimental group each were significant. The p values for experimental group were more significant than the control group in case of pain scores.

The earlier studies by Young and Rutherford have proven that conventional treatment is effective for plantar fasciitis. They have also suggested that the treatment given is more effective when the time span between the onset of symptoms and the treatment given is less [3].

The current study proves that the experimental as well as the control group were effective in reducing pain in patients with plantar fasciitis. When the differences in the pain values of both the group were considered, the experimental group which included intervention by foam roller and conventional treatment proved to be more significant than the control group.

H.S. Bedi and Bruce Love, used Tekscan's F-scan system to determine the impulse distribution of fore, mid and hind foot based upon vertical foot-floor reaction forces and time. The study was performed on individuals with plantar fasciitis. A greater proportionate of load was borne by the forefoot as compared to mid and hind foot [4].

In the current study, assessment for weight distribution was done in a static position as well as during dynamic state i.e. during walking. During the static position, the affected foot showed significant changes in the average pressure and thrust in the control group. The thrust is the force loaded by the foot on the ground.

$P=F/A$

Where, P= pressure, F= force (thrust)

$A = \text{area} \therefore F = P \times A$

The thrust of the foot is proportional to the average pressure of the foot and the area covered by the foot.

Also, the average pressure and thrust of the normal foot showed significant changes in the

control group.

During walking, the affected foot presented significant changes in the area, average pressure and maximal pressure in the control group. Thus the changes observed in static position reflected in the dynamic state also in the control group.

The foot was also evaluated for fore foot, mid foot and hind foot pressures. But there was no significant changes seen in these values. A longer interventional period on more number of subjects would have been more effective to show changes in these values.

Since foam rolling has been proven to be more effective for reducing pain with the conventional treatment, its usage in clinical scenarios would be effective.

Further studies can be done to prove the longer interventional period of foam rolling on weight distribution in patients with plantar fasciitis.

Smaller sample size was a limitation for the study.

## CONCLUSION

This study concludes that foam rolling is effective for pain reduction and the conventional treatment given was effective for changes in the weight distribution.

## ABBREVIATIONS

**awf -avg p:** affected whole foot- average pressure

**awf-th:** affected whole foot- thrust

**daf -area:** dynamic whole affected foot- area

**daf -avg p:** dynamic whole affected foot- average pressure

**daf -max p:** dynamic whole affected foot- maximal pressure

**nwf -avg p:** normal whole foot- average pressure

**nwf -th:** normal whole foot- thrust

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**Conflicts of interest: None**

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