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BIOMECHANICAL ASPECT OF CORRECTING PLANTARFASCIITIS IN RUNNERS.

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ABSTRACT

INTRODUCTION: Plantar fasciitis is a repetitive injury which causes micro trauma to the attachment of the plantar aponeurosis at the medial calcaneus of the foot. This condition is most prevalent among athletes involved in running sports, but can also occur in a sedentary individual. **AIM:** - The aim of the study is to evaluate the biomechanical approach of correcting plantarfasciitis in runners. **OBJECTIVE:** To evaluate the biomechanical approach of preventing plantar fasciitis in runners byusing the Foot and Ankle Disability Index Score and Sports Module. **METHOD:** - 10 male Subjects were selected from Sports Academy age between 18-24 who satisfied the inclusion criteria. Foot and Ankle Disability Index Score and Sports Module was measured as a baseline assessment. Then structured exercise was given to each individual for a period of 2 months. Re assessment was taken. **RESULT:** The result showed the significant difference in pre and post scores. **CONCLUSION:** The concluded that Biomechanical approach is effective in preventing and correcting plantar fasciitis in Runners.

KEY WORDS: Biomechanical Approach, Plantar Fasciitis, Foot Ankle Disability Index

INTRODUCTION

Plantar fasciitis is a repetitive injury which causes micro trauma to the attachment ofthe plantar aponeurosis at the medial calcaneus of the foot. This condition is most prevalent among athletes involved in running sports, but can also occur in a sedentary individual who is overweight and who predominantly stands on hard surface.

The classic symptoms of this condition are pain that occurs during 1st step in the morning, step after long period of rest or sitting, or at the beginning / end of a workout. The pinpoint, sharp, stabbing pain usually presents in the plantar aspect of the heel padat the fascial origin. With chronic plantar fasciitis, the pain extends distally along the plantar aponeurosis. Repetitive mechanical stress from alterations in normal biomechanical / anatomical structure and function are generally the primary predisposing factors for the painful plantar heel.

Mechanism -1 Windlass Mechanism.

The Plantar aponeurosis is a dense fascia that runs nearly the entire length of the foot. It begins posteriorly on the medial tubercle of the calcaneus and continues anteriorly to attach by digitations to the plantar plates and then, via the plates, to theproximal phalanx each toe. In normal windlass mechanism Tension in the plantar aponeurosis caused by metatarsophalangeal joint extension can draw the hind foot and fore foot to raise the longitudinal arch (supinate the foot). Supination of the weight bearing foot through lateral rotation of the leg or by applying a varus force to the calcaneus will decrease the angle between the struts (raise the apex of the triangle) and release the tension in the plantar aponeurosis. In absence of windlass mechanism

flattening of the triangle (pronation of the foot) in the weight bearing will increase the tension in the plantar aponeurosis and limit the metatarsophalangeal joint extension, which leads to plantar fasciitis.

Mechanism -2 Tightness of calf muscle.

During the propulsive phase of gait cycle from midstance to heel of there is 5° of dorsiflexion is needed in order to clearthe surface (Anterior translation of tibia over Plantar fasciitis is a repetitive injury which causes micro trauma to the attachment ofthe plantar aponeurosis at the medial calcaneus of the foot. This condition is most prevalent among athletes involved in running sports, but can also occur in a sedentary individual who is overweight and who predominantly stands on hard surface.

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Mechanism -3 weakness of tibialis posterior muscle.

The tibialis posterior muscle eccentrically controls pronation during foot flat and mid stance phase of gait cycle. Weakness of this muscle can cause excessive pronation of the subtalar joint and this puts more pressure to the plantar fascia which leads to plantar fasciitis.

Common treatments for plantar fasciitis, including ice, ultrasound, plantar fascia stretching and shoe inserts are helpful in reducing the symptoms. However, recurrence of the problem is common. By understanding the potential biomechanical causes of this disorder, it may be possible to correct the anatomical and biomechanical variables that cause plantar fasciitis and reduce the rate of recurrenceas well as speed up the rehabilitation process.

Treatment for the prevention of plantar fasciitis is stretching exercises for the tight calf muscle and strengthening exercise for the weak tibialis posterior and arch maintenance exercise for the foot to correct the absence of Windlass mechanism.

PATHOMECHANICS:

Absence of windlass mechanism:

In normal windlass mechanism Tension in the plantar aponeurosis caused by metatarsophalangeal joint extension can draw the hind foot and fore foot to raise thelongitudinal arch (supinate the foot). Supination of the weight bearing foot through lateral rotation of the leg or by applying a varus force to the calcaneus will decrease the angle between the struts (raise the apex of the triangle) and release the tension in the plantar aponeurosis. In the absence of windlass mechanism, flattening of the triangle (pronation of the foot) in weight bearing will increase the tension in the plantar aponeurosis and limit the metatarsophalangeal joint extension which leads toplantar fasciitis.

Tightness of calf muscle:

During the propulsive phase of gait cycle from mid stance to heel of there is 5° of dorsiflexion is needed in order to clear the surface (anterior translation of tibia over the talus). In case of calf muscle tightness or shortness, there is limited range of dorsiflexion and these short musculatures don't allow tibia to glide anteriorly. This can be compensated by pronation of the subtalar joint. This pronated foot causes lots of stress over the plantar fascia during the push off phase of gait that will lead to plantarfasciitis.

Tibialis posterior weakness:

The tibialis posterior muscle eccentrically controls pronation during foot flat and midstance phase of gait cycle. Weakness of this muscle can cause excessive pronationof the subtalar joint and this puts more pressure to the plantar fascia which leads to plantar fasciitis.

AIM:

The aim of the study is to evaluate the biomechanical approach of correcting plantarfasciitis in runners.

OBJECTIVE:

To evaluate the biomechanical approach of correcting plantar fasciitis in runners byusing the Foot and Ankle Disability Index Score and Sports Module.

DESIGN AND METHODOLOGY

Study Design: Pre and Post experimental study.

Study Setting: The study was conducted at DSU, Sports Ground, Trichy, Under the supervision of consent authority.

Study Sample: A total number of 10 subjects who are diagnosed as havingplantar fasciitis.

Sampling Technique: Purposive sampling technique

Study Duration: 2 months

INCLUSION CRITERIA:

- Age : 18-24years
- Only males
- Patients diagnosed with plantar fasciitis
- Complaint of tenderness to palpation of the medial calcaneal tubercleand the medial aspects of the proximal portion of the plantar fascia.
- The participants must have reported that the pain is usually the worstwith the first few steps after awakening, although it can also be triggered by long periods of standing or when you get up after sitting and gradually decreased throughout the day with ordinary walking; and worsened with prolonged activity.
- Participants were required to have the acute stage of signs andsymptoms.
- Habitually running at least 10 miles per week at the time of the study.

EXCLUSION CRITERIA:

- Patients who were determined to have other types of heel pain.
- Current injuries other than plantar fasciitis.
- History of lower extremity surgery on the affected side.
- Participants who are all diagnosed with foot deformity such as halluxvalgus; a neurological and systemic disorder that would predispose an individual to heel pain or muscle weakness.

MATERIALS USED:

- Towel
- Stairs
- Tennis ball
- Table
- Chair
- Paper
- Pencil
- Medicine ball (small size)

MEASUREMENT TOOL

Foot and Ankle Disability Index Score and Sports Module:

The Foot and Ankle Disability Index (FADI) is a region-specific self-report of function,firstly described in 1999 by Martin et al. The Foot and Ankle Disability Index is a 34- item questionnaire divided into two subscales: the Foot and Ankle Disability Index and the Foot and Ankle Disability Index Sport. The FADI has 26 items, and the FADISport has 8. The FADI contains 4 pain related items and 22 activity related items. The FADI Sport contains 8 activity related items. It assesses more difficult tasks thatare essential to sport. The FADI Sport is unique in that it is a population-specific subscale designed for athletes.

METHODOLOGY

PROCEDURE:

Subjects were selected from Sports Academy. The age between 18-24 males were selected. Subjects were informed with details of the study. Interested subjects were includedas per the inclusion criteria then for further experiment were to continue, we tested the subjects for any upper and lower limb injuries; any neurological disorders; any signs of trauma present. After performing the test oral consent is taken from the subjects.

Foot and Ankle Disability Index Score and Sports Module was measured as a baseline assessment. Then structured exercise was given to each individual for a period of 2 months. Re assessment was taken by using Foot and Ankle Disability Index Score and Sports Module. Data was collected for each individual in a similar manner.

BIOMECHANICAL APPROACH INCLUDE

- Stretching exercises for the tight calf muscle
- Strengthening exercise for the weak tibialis posterior
- Arch maintenance exercise for foot to correct the absence of windlassmechanism.

STRUCTURED EXERCISE:

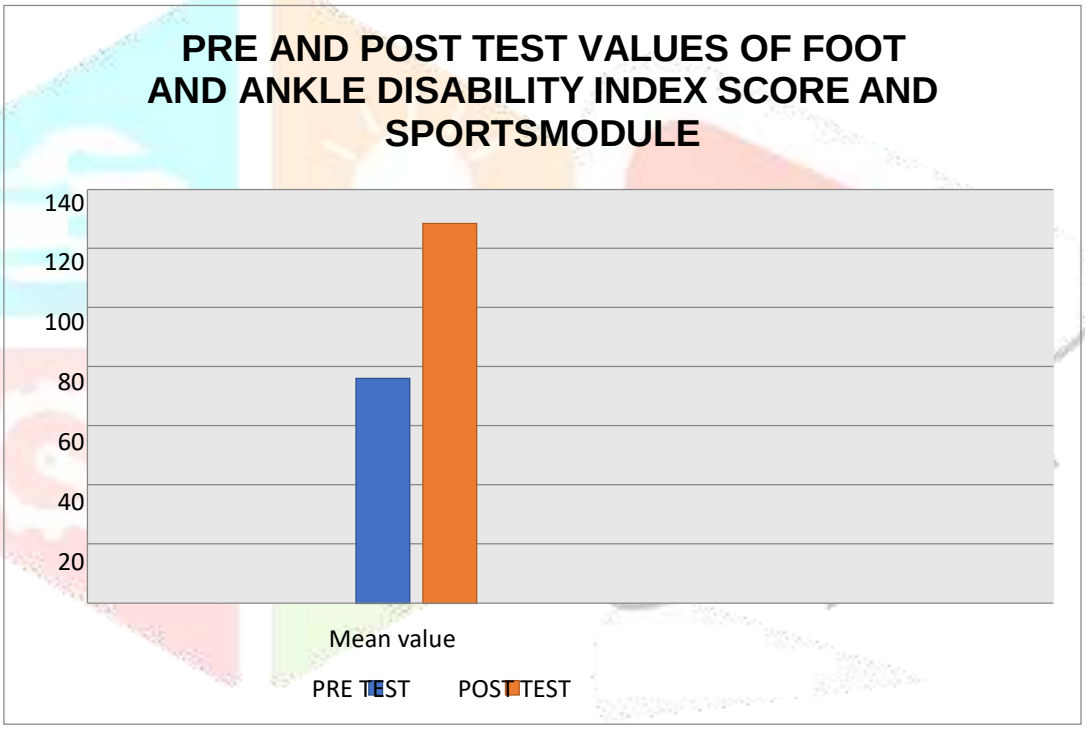
Stretching exercise (Calf)	**Strengthening exercise (Tibialisposterior)**	**Arch maintenance exercise (Windlassmechanism)**
Gastrocnemiusstretches Soleus stretch Step stretch for Achilles tendon Seated gastrocnemius stretch with towel	Heel raise or Toestanding Unilateral heelraise Toe walking Tibialis posterior strengthening exercise with ball	Tennis ballexercise Tennis ball rolls Arch lifts

Table1 - Represents pre test and post test values by using Foot and Ankle Disability Index Score and Sports Module

DATA	PRE SCORE	POST SCORE
N	10	10
Mean	76.2	128.8
SD	2.86	2.97
df	9	
SED	0.618	
T value	85.08	
P value	less than 0.0001	

GRAPH:

Graph1- Represents Pre test and Post test values by using Foot and Ankle DisabilityIndex Score and Sports Module



RESULT

The present study is a pre and post experimental study a comparison is done within the group among the score of pre and post intervention by using the outcome measure of foot and ankle disability index score and sports module was performed. There was a significant improvement in the pre and post values, before and after theapplication of manual therapy. Result showed, that the biomechanical approach waseffective in reducing pain, and in preventing plantar fasciitis in runners.

DISCUSSION

The present study reports that significant improvement was observed in reducing pain and in correcting arch in terms of foot ankle disability index scores with runners. The possible reason for this significant improvement in reducing pain and posture correction may be due to the probable manual mechanism that presents with plantarfasciitis in runners. These findings support the results of the present study, which demonstrated a significant change in the score of foot ankle disability index and sports modules.

CONCLUSION

The study concluded that, biomechanical approach is effective in preventing and correcting plantarfasciitis in runners.

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