

**“A COMPARISON BETWEEN KINESIOTAPING AND TISSUE
SPECIFIC PLANTAR FASCIA STRETCHING
EXERCISE TREATMENT IN PLANTER FASCIITIS”**

A Dissertation Submitted To

THE TAMILNADU Dr.M.G.R. MEDICAL UNIVERSITY

CHENNAI

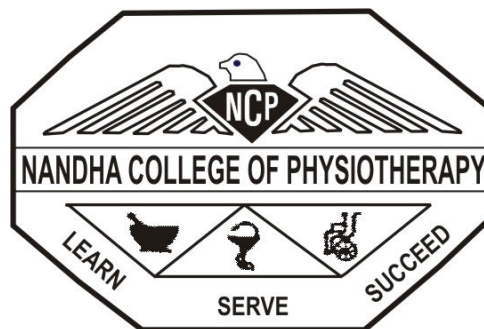
In partial fulfilment of the requirements for the awards of the

MASTER OF THE PHYSIOTHERAPY DEGREE

(SPORTS PHYSIOTHERAPY)

Submitted by

Reg. No. 271650082



NANDHA COLLEGE OF PHYSIOTHERAPY

ERODE – 638052

MAY- 2018

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Under the guidance of

Professor. S.BENAZIRM.P.T (Sports) ,M.I.A.P

The Dissertation Submitted To

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CHENNAI**

Dissertation evaluated on

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I wish him a great success in his dissertation work.

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This is to certify that the dissertation entitled “**A COMPARISION BETWEEN KINESIOTAPING AND TISSUE SPECIFIC PLANTAR FASCIA STRETCHING EXERCISE TREATMENT IN PLANTAR FASCIITIS**”. Is a bonafide compiled work, carried out by Reg.No.**271650082**, **Nandha College of Physiotherapy,Erode-638 052** in partial fulfilment for the award of graduate degree in Master of Physiotherapy as per the doctrines of requirements for the degree from **THE TAMILNADU Dr.M.G.R.MEDICAL UNIVERSITY, Chennai**. This work was done by my personal guidance

Place :Erode

Guide Signature

Date :

DECLARATION

I hereby and present my project work entitled “**A COMPARISION BETWEEN KINESIOTAPING AND TISSUE SPECIFIC PLANTAR FASCIA STRETCHING EXERCISE TREATMENT IN PLANTER FASCIITIS**” is outcome of original research work was undertaken and carried out by me under the guidance of **Professor. S.BENAZIR, M.P.T, (SPORTS),MIAP**

To the best of my knowledge this dissertation has not been formed in any other basic for the award of any other degree, diploma, associateship, fellowship, preciously from any other medical university.

Reg.No.271650082

ACKNOWLEDGEMENT

I am very happy to express my heartfelt thanks to the **GOD** almighty giving me strength and wisdom in successfully completing this project work in an efficient manner.

I would like to pay my gratitude to **My Parents & Sister** who always had so much confidence in me and always provided me with a constant silent support, encouragement and inspiration.

I express my sincere Gratitude to our **Principal** and also my guide **Professor.S.BENAZIRM.P.T., (Sports)., Nandha college of Physiotherapy, Erode** for leading me this success.

I am very much happy to express my heartfelt thanks to **Professors.V.VIJAYARAJM.P.T(Neuro).,M(Acu).,DVMS., MIAP., M. JANANI M.P.T (NEURO) and S. JANANI M.P.T(Sports)** for the valuable support for completing this project successfully.

I also express my gratitude to the beloved **staffs of Nandha College of Physiotherapy** for leading me to this success.

Last but not the least, I also have much gratitude to **my FRIENDS** for their known interest and in my academic excellence.

PREFACE

It was immense pleasure for me to present this project work on “**A COMPARISION BETWEEN KINESIOTAPING AND TISSUE SPECIFIC PLANTAR FASCIA STRETCHING EXERCISE TREATMENT IN PLANTER FASCIITIS**” because this opportunity made me learn a lot about this condition.

I have done this work with my best level by referring many Sports medicine books, manual therapy books, journals and websites. I have assessed and given treatment to patient to improve their condition. I believe this project work will prove to be very useful for the physiotherapists to give a better knowledge while assessing and treating hamstring tightness patients.

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INTRODUCTION

INTRODUCTION

Plantar Fascia is a thick aponeurosis help to supporting the longitudinal arch of foot and act as a dynamic shock absorber for the foot. It protects sensitive plantar structure such as nerves, vessels, muscles, and tendons, and in addition, is responsible for maintaining the plantar arch.

Plantar Fasciitis (PF) is a degenerative syndrome of plantar fascia resulting from repeated trauma at its origin on the calcaneus and often referred to as heel spur or painful heel syndrome. The other names are plantar heel pain, heel spur, and runner's heel etc. Proximal plantar fasciitis is a common problem in the adult population. It occurs over a wide age range and is seen in both sedentary and athletic individuals. It mostly affects patients between the ages of 8 and 80, but is most common in middle aged women and younger, predominantly male, runners.

The etiology of heel pain can be divided into multiple factors including increasing age and body weight. Intensive exercise, prolonged standing or walking is also major risk factors. Plantar fascia plays as important role in stabilizing the foot arch during walking. Excessing or repetitive traction of the fascia may cause micro trauma and result in plantar heel pain.

Pes planus or excessive subtalar pronation will overstretch the fascia and may cause plantar fasciitis. The symptoms usually start as a dull intermittent pain that most often progresses to a sharp persistent pain .The patient typically suffers pain with the first steps in the morning or after period of prolonged sitting. The most widely reported clinical sign of plantar fasciitis is pain localized to the medial tubercle of the calcaneus. Characteristically, the pain is exacerbated after periods of non-weight bearing, especially during the first steps in the morning.

The pain decreases after a few minutes of initial weight bearing but returns and worsens when time on the feet increases. This pain is aggravated by continuous weight bearing, and becomes progressively more severe. Its onset is insidious, and not always associated with a specific incident or trauma. Standard care at present is conservative treatment, but about 10% of patients fail to respond or heal

spontaneously. In most of the cases it is associated with a heel spur: however, many asymptomatic individuals have bony heel spurs, whereas many patients with plantar fasciitis do not have a spur.

Treatment modalities that have been described for plantar fasciitis, including orthotics, stretching, taping, extracorporeal shock wave therapy, laser therapy, and drug therapy in the form of systemic medication, percutaneous injection, and topical application, have all been investigated and have been shown to have variable clinical benefit. Paediatric physicians, rheumatologists, general practitioners, physiotherapists, and orthopaedic surgeons are the main healthcare providers involved in the treatment of plantar fasciitis. Herein, the question arises whether taping may mechanically change the stress to the medial tubercle, thereby decreasing pain. Up to 90% of patients treated conservatively as part of an intervention and while patients wait for manufactured orthotics, taping the foot is frequently used.

The purpose of taping the foot is to change the mechanical load toward the fascia enthuses. Several studies 18-20 have reported that anti pronation tape constructions change the longitudinal arch height and decrease facial pressure in the heel. Although this effect is decreased after exercise, it might be clinically relevant in patients with plantar fasciitis.

Taping as an intervention or as part of an intervention for the treatment of plantar fasciitis has been used for at least 70 years. In the addition, many individuals are prescribed rigid custom foot orthotic that have been reported, in a recent multicentre study, to result in poorer outcomes compared with those after use of prefabricated, flexible designs.

The response of patients with chronic (ten months or more) disabling proximal plantar fasciitis to a treatment protocol emphasizing structure-specific plantar fascia-stretching combined with the use of a prefabricated, flexible orthotic device and a brief course of non-steroidal anti-inflammatory medications is not known. We hypothesized that patients with chronic plantar heel pain who are managed with a tissue-specific plantar fascia stretching protocol have a better functional outcome after eight weeks of treatment compare with that after a standard Achilles tendon-stretching protocol.

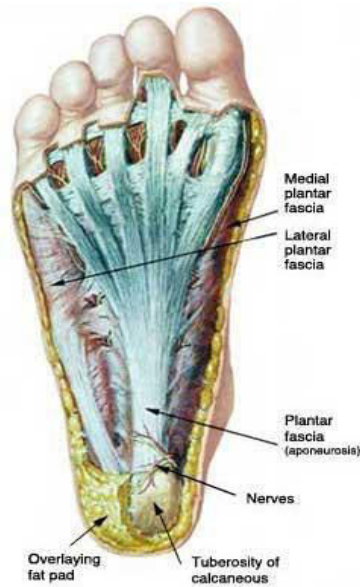


Figure 1.1 – The Structure of Plantar Fascia

Plantar fasciitis taping is often used to alleviate stress on the plantar fascia ligament since it limits the movement of the fascia. Plantar fasciitis taping thus can relieve some pain and inflammation associated with plantar fasciitis. Athletic tape is widely available in most drug stores. Taping is widely used among athletes can ease some of the tension and stress placed on the plantar fascia ligament by limiting the amount of stretching it can do, therefore keeping it from stretching excessively which could result in tears in the fascia fibers.

Taping for Plantar fasciitis is a relatively simple method used to help ease pain associated with the condition. Athletic tape can be applied in the morning do reduce strain throughout the day, or just prior to exercise to keep the fascia from moving too much during physical activity. It is recommended that the tape not be left on the foot all day as well as all night because this prevents the skin from being able to breathe. To help the tape stick, the feet should be cleaned with a non-moisturizing soap. In addition, feet should also be kept dry.



FIGURE 1.2 PLANTAR FASCITIS

The success of plantar fasciitis taping may vary depending on the person and on the severity of their individual case of plantar fasciitis. To maximize the amount of relief that can be achieved through plantar fasciitis taping, it is recommended that this treatment be used in two ways. First, this method can be used to help prevent the plantar fascia ligament from becoming over stretched during any physical activity such as running by simply preventing future occurrences of plantar fasciitis.

1.1 ANATOMICAL CONSIDERATION

PLANTAR FASCIA:

The deep fascia in the plantar aspect of the foot is known as plantar fascia. This plantar fascia (plantar aponeurosis) is the thickest fascia in the body.

ATTACHMENT OF PLANTAR FASCIA:

It attaches from a point just behind the medial tubercle of calcaneus's and runs anteriorly as five slips. As the slips approach the metatarsal heads, they split into superficial and deep layers.

The superficial layer attaches to superficial fascia beneath the skin while the deep layers divide into medial and lateral portions to allow the passage of flexor tendons. Each of the five portions attaches to the base of a proximal phalanx and to the deep transverse ligament.

PALPATION OF PLANTAR FASCIA:

Passively extend toes with hands, the plantar aponeurosis can then be seen can felt as a tight bar that is relaxed when the toes are flexed.

FUNCTIONAL ANATOMY OF PLANTAR FASCIA:

1. The plantar fascia is an important static support for the longitudinal arch.
2. When the toes dorsally flex the fascia is wound around the metatarsal head (windlass effect). In so doing that fascia is tightened and the longitudinal arch is elevated.
3. The plantar fascia elongate with increased loads act to as shock absorber, but its ability to elongate is limited.
4. The plantar fascia which binds the ends of arch together and has its tension altered in different position of the foot. When standing and walking it supports the arches of the foot and maintains the stability of arches and distribution of weight.

1.2 STRUCTURE AND FUNCTION OF PLANTAR FASCIA

The plantar fascia is a dense fascia that runs nearly the entire length of the foot. It begins posterior on the calcaneus and continues anteriorly to attach by digitations to the plantar plates and then, via the plates onto proximal phalanx of each toe. When the toes are extending at the metatarsophalangeal joints (regardless of whether the motion is active or passive, weight bearing or non-weight bearing) the aponeurosis is pulled increasingly tight as the proximal phalanges glide dorsally in relation to the metatarsals. The large metatarsal heads end up acting as pulleys around which the fascia is tightened.

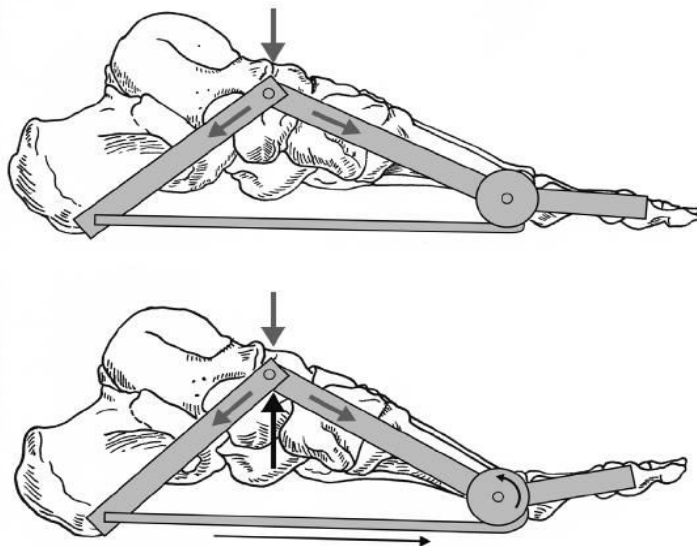


FIGURE 1.3 WINDLASS EFFECT

The tension in the fascia can contribute to the supination of the foot as the heel is drawn toward the toes by its action. When the joints of the hind foot and mid foot supinated and locking through the strong active plantar flexion force in weight bearing, continued force will cause the heel to lift and toes to extend metatarsal break.

The fascia will be tightened as the MTP extend, supporting the locked hind foot and mid foot structures through which the body weight must pass to reach the toes.

The tightened fascia will also resist excessive toe extension by creating passive flexor force across the MTP joint as the structure tightens. The mechanism of the fascia is considered to be the most effective from the second to fifth MTP. The effect of MTP extension on the fascia will be further discussed when the arches of the foot are presented.

STRUCTURAL VARIATIONS:

The plantar fascia is an important static support for the longitudinal arch of the foot. Strain on the longitudinal arch exerts its maximal pull on the fascia, especially its origin on the medial process of calcaneal tuberosity leads to plantar fasciitis. Weak peronei, often the result of incomplete rehabilitation following ankle sprain will reduce the support on the arch thus stressing the plantar fascia.

Excessive rear foot pronation will lower the arch and over stretching the fascia and reduction in mobility of the first metatarsal may also contribute to the condition. Congenital problems such as pes cavus will also leave an athlete more susceptible to plantar fasciitis.

Due to constant phenomenon extension of the toes increase the height of the longitudinal arch –the windlass effect of plantar fascia. So that the activity involving long term tip toe standing fascia leads to fasciitis in walking, during the 15% of the gait is subjected to pressure as much as 120% of the body weight.(Cunningham 1950). This load on the foot is supported by the passive structure (bone and ligaments).

The intrinsic muscles come into action only around the 30% of the gait cycle. Therefore the maximum stress of the body weight falls on the ligaments and the fascia. Significant stress falls on fascia in stabilizing the foot from heel raise to toe-off of gait again when the metatarsal phalangeal joints are extended (Hicks 1954). The repeated stress of the nature causes plantar fasciitis. The mean thickness of the fascia is greater on the symptomatic side before treatment the thickness had decreased significantly after treatment.

1.3 PLANTAR FASCITIS

DEFINITION

Plantar fasciitis is an inflammatory condition of the plantar fascia. This may be due to primary or secondary inflammatory causes. Plantar fasciitis is aseptic inflammation of the plantar fascia.

M.NATARAJAN

Summation of a series of micro trauma to the plantar fascia due to sustained stress of weight bearing hopping, jumping or running results in fasciitis.

JAYANTH JOSHI; PRAKASH KOTWAL

Plantar fasciitis produce a typical history of a gradual onset of pain felt over the medial plantar aspect of the heel. Pain is usually experienced along the plantar aspect of heel where the fascia inserts on the medial tubercle of the calcaneus. The site of the injury is very tender to palpation.

This is happened because continued demand is placed on the tissue before it is adequately healed, so the pain and inflammation continue. This condition can often be bilateral in nature and can be found in patients who have to prolonged period of time. The condition was once known as policeman's heel, back in the time when most of the policeman still 'walked the beat'

INCIDENCE:

Plantar fasciitis is more common in middle-aged woman and young male runners. Obesity is a predisposing factor in 90% of affected females and 40% affected male (gibbon and cassar-pullicipon,1994).

Persons of all age group are affected, mainly in middle age and in young running athletes where it constitutes appropriately 10% of running injuries seen.

ETIOLOGY:

Over use may cause micro tears and inflammation of the fascia insertion.

PATHOPHYSIOLOGY:

Sub calcaneal pain syndrome is through to be brought on by and overload of the plantar fascia. However, the mechanism of this overload is debated. Overload causes micro trauma at the fascia–bone interface of the calcaneus or within the substance of plantar fascia alone. The central band of the fascia is primarily affected where a hyper cellular, inflammatory response occurs within the fibers of the fascia, leading to degenerative changes.

A spur may result from the inflammation but is not implicated as the primary source of heel pain. Many studies have shown the presence of the spurs on the heel of symptomatic patients. One of the study found that only 10% of all calcaneal spur visible on x-ray were actually symptomatic.

SINGS AND SYMPTOMS:

- ❖ Pain
- ❖ Tenderness
- ❖ Deformity
- ❖ Morning stiffness
- ❖ Mild edema
- ❖ Possible small granuloma

EVALUATION:

1. History and Examination
2. Biomechanical assessment of foot
3. Pronated or pes planus foot
4. Cavus type foot

5. Assessment of fat pad
6. Examination of foot wear (Because on hard surface the shock absorbing quality of foot wear is important).

X-RAY:

Radiographic assessment with 45-degree oblique view and standard three view of foot.

- ❖ Presence of **calcification** for the condition lasting last for more than two weeks.
- ❖ Presence of **spur** for the condition lasting more than 4 – 6 weeks.

LAB INVESTIGATION:

Determination of the erythrocyte sedimentation rate and rheumatoid factor, HLA B27, uric acid and antinuclear levels may be helpful test for these might be considered if bilaterally symptoms exist, if other joints are involved or clinical picture is typical.

- ❖ Bone scan if recalcitrant pain (more than 6 weeks after treatment initiated) or suspected stress fracture from history).
- ❖ EMG studies if clinical suspicion of nerve entrapment.

DIFFERENTIAL DIAGNOSIS OF HEEL PAIN:

Heel pain is best classified by anatomical location.

- a) Inferior heel pain (e.g. Plantar fasciitis)
- b) Lateral heel pain (e.g. Lateral calcaneal neuritis)
- c) Medial heel pain (e.g. Tarsal tunnel syndrome)
- d) Posterior heel pain (e.g. Haglund's deformity)
- e) Diffuse (e.g. Calcaneal stress fracture)

MANAGEMENT OF PLNTAR FASCITIS:

Management for PLNTAR FASCITIS pain include anti-inflammatory medications, physical therapy, motion controlling orthotics, passive stretching, night splint, and in resistant case, surgery, micro cellular rubber foot wear .

FOLLOW-UP CARE

1. Avoid activities that irritate the condition and avoid barefoot walking outstanding on had surface such as concrete.
2. Two weeks rest period is usually sufficient to allow treatment to progress effectively.
3. Return to the regular activities can be attempted on a gradual basis as tolerated by patient.
4. Advice to apply a cold pack to heel at the point of maximal tenderness for 20-30 minutes after existing.
5. Advise to reduce weight in over weight pattern.

1.4 AIM OF THE STUDY:

To compare the effects of tissue specific stretching and kinesiotaping in the treatment of plantar fasciitis.

1.5 NEED FOR THE STUDY:

The importance of the study is to reduce pain and improve the foot functional activities in plantar fasciitis by giving stretching exercise and taping. These methods are commonly used to reduce pain in plantar fasciitis in order to reduce the difficulties faced by patients and to upgrade the performance of activities of daily living.

1.6 HYPOTHESIS

NULL HYPOTHESIS:

There is no significant difference in effectiveness of tissue specific stretching exercise and kinesiotaping in treatment of plantar fasciitis.

ALTERNATIVE HYPOTHESIS:

There is a significant difference in effects of tissue specific stretching exercise and kinesiotaping in treatment of plantar fasciitis.

REVIEW OF LITERATURE

Simon Bartold (2013) et al

Concluded that Taping is applied in the morning do reduce the strain throughout the day or just prior to exercise to keep the fascia from moving too much during physical activity³.

KO'Sullivan (2010) et al

Concluded that Taping is widely used among athletes can ease some of the tension and stress placed on the plantar fascia ligament by limiting the amount of stretching excessively which could result in tears in the fascia fibers.

H.R.Osborne (2010) et al

Concluded that Taping supports the longitudinal arch of the foot . It significantly reduce the peak plantar pressures of normal feet¹³.

Joel A Radford (2006) et al

Concluded that Taping is effective treatment of the common symptoms of “first step” pain in patients with plantar heel pain . It could be used as an inexpensive short term treatment for plantar heel pain, while patients wait for long term treatments^{8, 10}.

Mario Roxas, ND 2005 et al

Concluded that plantar fascia is pain on the sole of foot at the inferior region of the heel. Patient report the pain to be particularly bad with the first step taken on rising in the morning or after an extended refrain from weight bearing activity . After few steps and through the course of the day, the heel pain diminishes, but returns if intense or prolonged weight bearing activity is undertaken. Initial reports of heel pain may be diffuse or migratory; with time it usually focuses around the area of the medial calcaneal tuberosity.

Mario Roxas, ND 2005 et al

Active tendon Achilles stretching in standing by leaning against the wall, holding each stretch for 1 minute and repeating 5 times each session . Plantar fascia stretching with tennis ball. Subject sitting on the chair rolling foot on the ball for 5 minutes.

Simon J. Bartold 2004 et al

Concluded that Plantar fasciitis is the most common cause of inferior heel pain. The word ‘fasciitis’ assumes inflammation is an inherent component of this condition. In the non-athletic population, it is most frequently seen in weight bearing occupations. 65% of non-sports demographics are overweight, with unilateral involvement most common in 70% of cases. Second major distribution of plantar fasciitis is in the athletic population, 10% of all running athletes. Basketball, tennis, football, long distance runner and dance have all noted high frequency of plantar fasciitis.¹⁶

Keenan AM (2001) et al

Concluded that Taping is often used as a short term treatment for plantar fasciitis . These findings are the first quantitative result to demonstrate the significant therapeutic effect of this treatment modality in relieving the symptoms associated with plantar fasciitis.

Young CC, Rutherford DS, Niedfeldt MW 2001 et al

Concluded that Towel curl up For towel curl ups participants sat with foot flat on the end of towel placed on a smooth surface small weight is kept at the other end of towel. Keeping the heel on the floor, the towel was pulled towards the body by curling the towel with the toes, for 10 minutes. Active ankle exercises: For active ankle exercises – dorsiflexion, plantar flexion, inversion and eversion in supine lying 10 times.

Orlin MB(2000) et al

Concluded that Taping is often used to alleviate stress on the plantar fascia ligament since it limits the movement of the fascia. Plantar fascia taping thus can relieve some pain and inflammation associated with plantar fasciitis.

R.F.Betts (1997) et al

Concluded that Taping is an effective form of treatment in plantar fasciitis. The elastic tape is that the rebound one gets in tapes is that the rebound one gets in tapes mimics the rebound that the plantar fascia.⁴¹

Digivanin,Benedict F.Md (2003)

Concluded that stretching technique a programed of non-weight bearing stretching exercise specific to the plantar fascia is superior to the standard program weight bearing Achilles tendon –stretching exercise for the treatment of proximal plantar fasciitis.

Nawocznski , Deborah A PHD PT(2006)

Concluded that stretching technique this study of the supports the use of tissue specific plantar fascia stretching protocol as the key component of treatment of chronic plantar fasciitis.

Lance d berry dpm,yinpu chen PHD(2002)

Concluded that Plantar fasciitis is most common cause of heel pain ,yet the conservative treatment of plantar fasciitis is not standardized.

Mark w.cornwall and Thomas g mc poil;

Concluded that plantar fasciitis non-surgical management has been used in the treatment of plantar fasciitis .Reduce the pain and inflammation, reduce the tissue stress and tolerance level, and restoring the muscle strength and flexibility of involved tissue.

Charles cole MD criag seto MD (2008)

Concluded that Plantar fasciitis commonly causes inferior heel pain occurs to the 10 percent of the U.S population. Its accounts for more than 6000,000 outpatient visited in united states.

Lori a.bolgla and terry R Malone

Concluded that plantar fasciitis clinicians understanding of the biomechanical causes of the plantar fascitis should guide the decision making process concerning the evaluation and treatment of heel pain.

Pamela f davis MD

Concluded that plantar fasciitis Despite attention to outcome of surgical treatment of heel pain in the current literature initial treatment of heel pain non operative its used for successful outcome for 98.5 percent of patients.

J a Radford(2006)

Concluded that stretching technique Calf muscle stretching provides a small and statically significant increase in dorsal flexion .

Alan c league MD(2008)

Concluded that plantar fasciitis It is estimated that 11-15 percent of all foot complaints requiring medical attention can be attributed to this condition.

D morris msc PT(2008)

Concluded that taping technique There are moderate evidence that kinesio tape in conjunction with physiotherapy was clinically beneficial in physiotherapy.

Ali m alshami (2008)

Concluded that stretching technique Several conditions such as plantar fasciitis, calcaneal fracture rupture of the plantar fascia atrophy of the fat in heel may cause pain in the heel.

Daniel PT PHD(2006)

Concluded that stretching technique The plantar fasciitis increased the dorsiflexion of ankle decreased.it is the most important risk factor.

Joseph PHD(2009)

Concluded that taping technique These data indicate that a history of plantar fasciitis is associated with greater vertical ground reaction force load rates and a lower medial longitudinal arch of the foot.

David porter MD (2002)

Concluded that stretching technique Achilles tendon stretching exercise is the one of the most effective non-surgical treatment in heel pain syndrome.

MATERIALS & METHODOLOGY

3.1 MATERIALS:

1. Numeric pain rating scale (NPRS)
2. Foot Function Index (FFI).
3. Foam roller
4. Adhesive Tape, Scissors
5. Towel, Cotton, Pen, Pencil, Paper.
6. Couch
7. Assessment form, informed consent form.

3.2 1 .STUDY DESIGN:

QUASI EXPERIMENTAL STUDY-(Pre test post test design with two comparison treatment) where the pre test value were compared with post test values

3.2 2 .SAMPLE METHOD:

The Sampling method used for this study is Convenient Sampling Method.

3.2 3. STUDY OF SAMPLES:

30 subjects were selected for the study based upon fulfillment of the following criteria's

Using simple randomization method 15 students were assigned to each group.

GROUP-A- stretching exercise

GROUP-B- Taping

3.2 4. STUDY DURATION:

Seven months.

3.2 5 .STUDY SETTINGS:

This study was conducted in the **NANDHA COLLEGE OUT PATIENT DEPARTMENT and GOVERNMENT HEADQUATERS HOSPITAL ERODE SUDHA MULTY SPECIALITY HOSPITAL, LKM HOSPITAL ERODE.**

3.3 CRITERIA:

3.3 1. INCLUSION CRITERIA:

- Aged between 40-60 years of age
- Clinically diagnosed case of plantar fasciitis not less than 6 weeks
- Those who were willing to participate in the study and willing to take treatment for 10 successive days
- Heel pain felt maximally over plantar aspect of heel
- Pain in the heel on the first step in the morning
- No history of rest pain in heel

3.3.2. EXCLUSION CRITERIA:

- Subjects with clinical disorder stretching is contraindicated such as infective conditions of foot, tumor, calcaneal fracture, metal implant around ankle.
- Subjects with clinical disorder where stretching is contraindicated as dermatitis.
- Subjects with impaired circulation to lower extremities, foot deformities.

- Subjects with referred pain due to sciatica and other neurological disorders.
- Corticosteroids injection in heel preceding 3 months.

3.4 PARAMETERS:

1. Numeric pain rating scale (NPRS) was used to measure the pre and post test intensity of pain.

Pain intensity can be measured by NPRS. A 10cm line marked with numbers 0-10 can be used where 0 symbolizes no pain and 10 is maximum constraints. Respondents mark the location on 10 cm line corresponding to the amount of pain they experienced. This gives them the greatest freedom to choose their pain with exact intensity. It also gives the maximum opportunity for each respondent to express a personal response style.

2. Foot Function Index (FFI) was used to know the functional level of foot.

It is a functional index comprising of 17 items to know how foot pain has affected the patient's ability to manage in everyday life. Each time scoring from 0-10, the patient had to rate his pain, difficulty in performing activity and how much time of the day he had pain. This was used for assessment of foot function of patient.

TREATMENT PROCEDURE

30 patients with age group between 20-50 who had heel pain for not less than 6 weeks were randomly selected and were divided into group A and group B.

The samples were selected from **NANDHA COLLEGE OUT PATIENT DEPARTMENT AND GOVERNMENT HEAD QUARTERS HOSPITAL ERODE SUDHA MULTY SPECIALITY HOSPITAL , LKM ORTHO HOSPITAL ERODE** after due consideration to inclusion and exclusion criteria and after obtaining informed consent they were taken for the study.

Group A – Stretching exercise:

Purpose: To release muscle restriction and restore its tissue.

Patient: Supine position And long sitting position.

Physiotherapist: Walk standing position .

Technique: Stretching exercise for 30 sec and four repetition 15 minutes per session.

By using Hands and tools pressure was apply. Proximal to distal aspect of sole of foot for 15 minutes. All the subjects were advised to use soft heel foot wear, not to stand for long time and not to walk bare foot. Participants were instructed not to do any stretching exercises at home.

Group A Patients were given conventional physiotherapy and stretching exercise for about 10 session.

A. Stretching for intrinsic muscles.

1. Single plantar flexor stretching: Active plantar stretching in standing by leaning against the wall, holding each stretch for 30 sec and repeating 4 times each session.

2. Great toe flexor stretching: patient on supine position therapist hold the great toe then hold for 30 sec and repeating 4 times each session.

3. Plantar fascia stretching exercise: with foam roller. Subject sitting on the chair rolling foot on the ball for 5 minutes.

4. Single plantar towel stretching: patient on long sitting place one towel to hold the foot then pulling the towel and holding for 30 sec 4 repetitions.



Figure 4.1: Single plantar flexor stretch



Figure 4.2: Great toe flexor stretch



Figure 4.3: Foam roller stretching exercise.



Figure 4.4: Single plantar towel stretch

Group B – Taping.

The group B received conventional physiotherapy and kinesio taping. Start by taping around the upper part of calcaneal bone. Next, wrap another piece of tape attach to the distal plantar aponeurosis-of-the-foot. Finish the taping by applying tape horizontally across the foot to cover the previous strips. When this is finished, the ball of (plantar) surface of the foot should be almost entirely covered from the metatarsal region to the heel and cover another side of ball of the foot. This will add the support necessary to allow the fascia ligament to rest.

Same exercise programme continued for Group B.



Figure4.5 –Initial stage of taping.



Figure 4.6 –Taping to the end of plantar fascia.

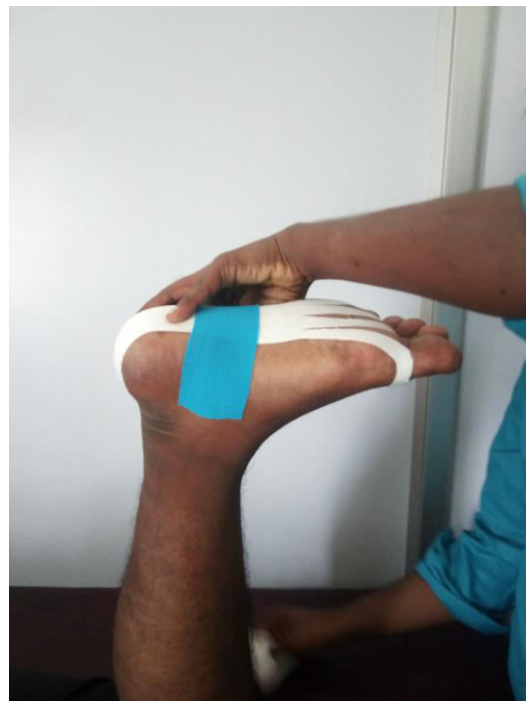


Figure 4.7 – Taping across Mid-foot transversely.



Figure 4.8 – End stage of Taping.

DATA PRESENTATION AND ANALYSIS

STATISTICAL METHODS

The statistical tools used in this study are paired “t” test and Student’s’ test.

Paired “t” test

The paired “t” test is used to compare the effectiveness of myofascial release and taping in treatment of plantar fasciitis.

$$S = \sqrt{\frac{[\sum d^2 - (\sum d)^2/n]}{n-1}}$$

$$t = \frac{\bar{d}}{s} \sqrt{n}$$

d = difference between pretest vs post test

\bar{d} = mean difference

n = total no of subject

S = standard deviation

Students' t' test

The student independent 't' test is used to compare the significant differences of pre and post test foot function index between group A and group B.

$$t = \frac{|\bar{X}_1 - \bar{X}_2|}{S \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$
$$S = \sqrt{\frac{(n_1 - 1) S_1^2 + (n_2 - 1) S_2^2}{n_1 + n_2 - 2}}$$

Where,

n_1 sample size in Experimental group

n_2 sample size in Control group

S_1^2 the square of standard deviation of Experimental group

S_2^2 the square of standard deviation of Control group

X_1 mean value of Experimental group

X_2 mean value of Control group

The calculated t value is compared with the standard $t^{\alpha-1}$ value where α is the level of significance which is usually maintained at 99.9.

DATA ANALYSIS OF PRE AND POST TEST SCORE OF FOOT FUNCTIONAL INDEX FOR GROUP A AND GROUP B

This chapter deals with analysis and interpretation of data collected from 15 patients with plantar fasciitis. Pre test versus Post test values of Foot Functional Index for Group A who has received stretching exercise.

TABLE-1

GROUP A	MEAN	MEAN DIFFERENCE	STANDARD DEVIATION	PAIRED “t” TEST
Pre Test	62.13	3.93	1.69	10.53
Post Test	58.20			

TABLE-2

GROUP B	MEAN	MEAN DIFFERENCE	STANDARD DEVIATION	PAIRED “t” TEST
Pre Test	62.66	11.7	2.25	20.12
Post Test	51			

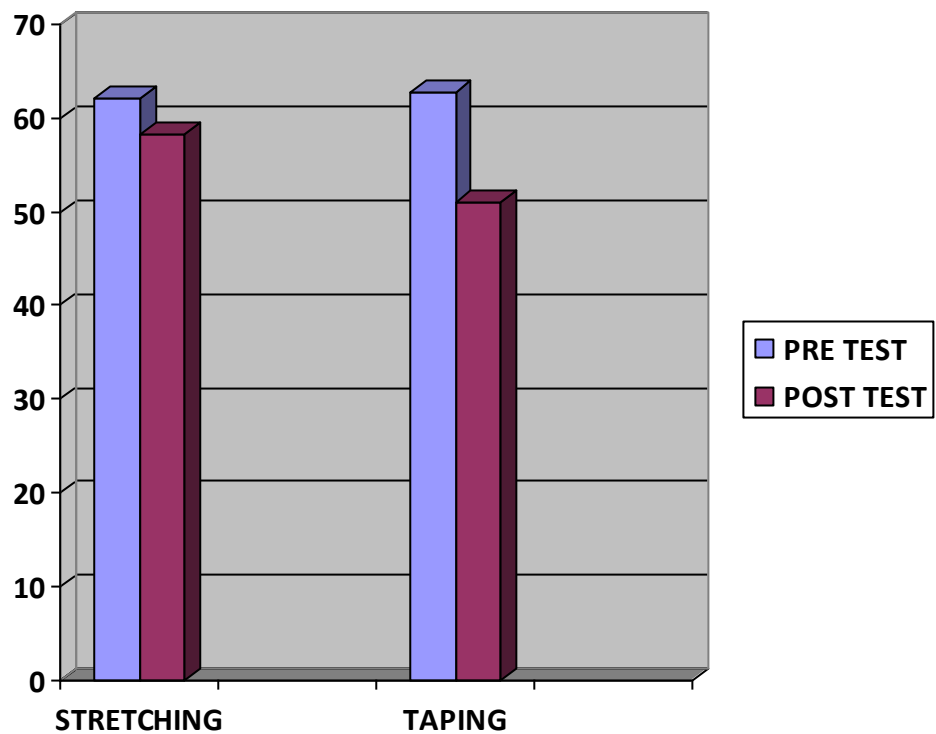
This table 1 shows the analysis of Foot Functional Index, the paired “t” test value of pre versus post sessions of group A which was 10.5 at 0.05 level of significance which was greater than the tabulated “t” value of 2.15. this showed that there was a statistical significant difference between pre and post test results. The pre test mean was 68.13, the post test mean was 58.20 and the mean difference were 3.93, which showed that there was significant reduction of pain between stretching exercise and taping.

TABLE -2

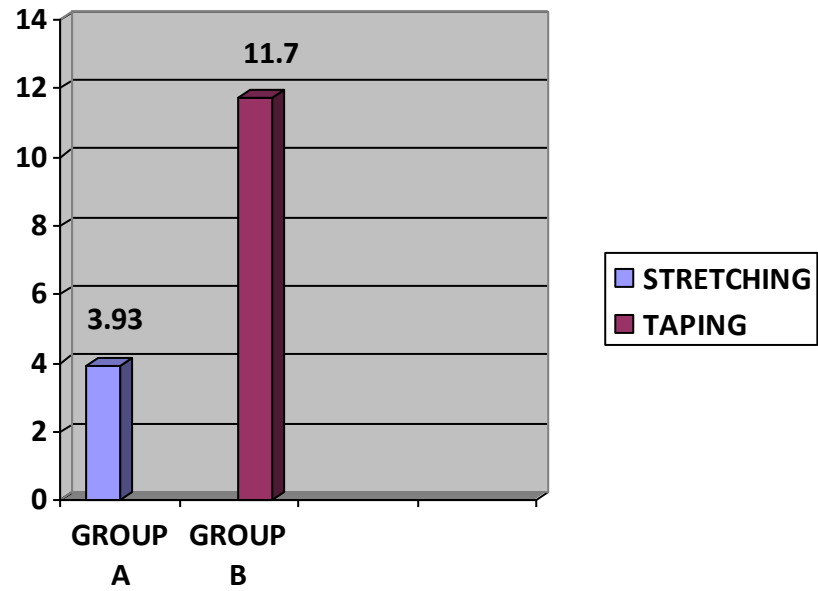
This table 2 shows the analysis of Foot Functional Index, the paired “t” test value of pre versus post sessions of group A which was 20.12 at 0.05 level of significance which was greater than the tabulated “t” value of 2.15. This showed that there was a statistical significant difference between pre and post test results. The pre test mean was 62.66, the post test mean was 51 and the mean difference were 11.7, which showed that there was significant reduction in foot function index pre value.

GRAPH 1

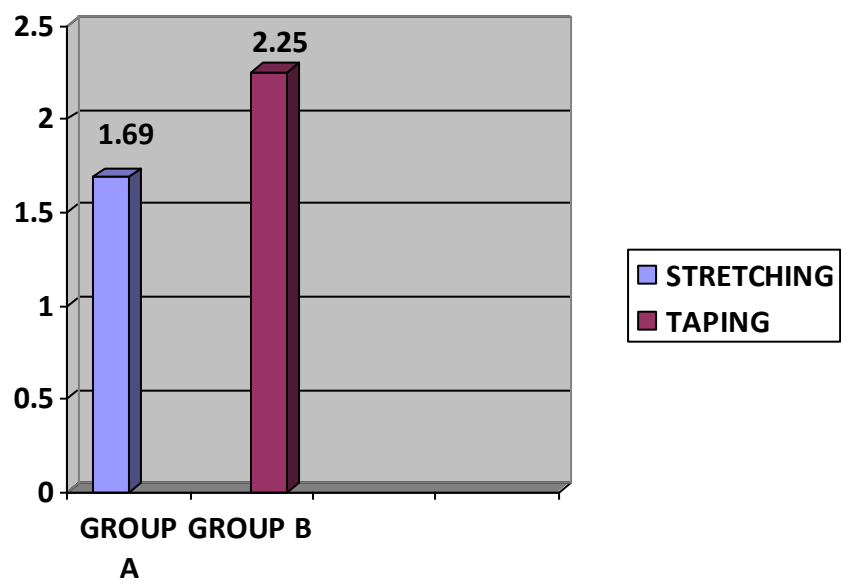
MEAN DIFFERENCE VALUE BETWEEN PRE AND POST TEST (FOOT FUNCTION INDEX)



GRAPHICAL REPRESENTATION OF MEAN DIFFERENCE AND STANDARD DEVIATION VALUES OF STRETCHING & TAPING



STANDARD DEVIATION



DATA ANALYSIS OF PRE AND POST TEST SCORE OF NEUMERIC PAIN RATING SCALE FOR GROUP A AND B

This chapter deals with analysis and interpretation of data collected from 15 patients with plantar fasciitis. Pre test versus Post test values of Numeric pain rating Scale for Group A who has received stretching exercise.

TABLE -3

GROUP A	MEAN	MEAN DIFFERENCE	STANDARD DEVIATION	PAIRED “t” TEST
Pre Test	6.46	2.39	0.50	18
Post Test	4.06			

TABLE-4

GROUP B	MEAN	MEAN DIFFERENCE	STANDARD DEVIATION	PAIRED “t” TEST
Pre Test	6.7	4.56	0.83	21.12
Post Test	2.13			

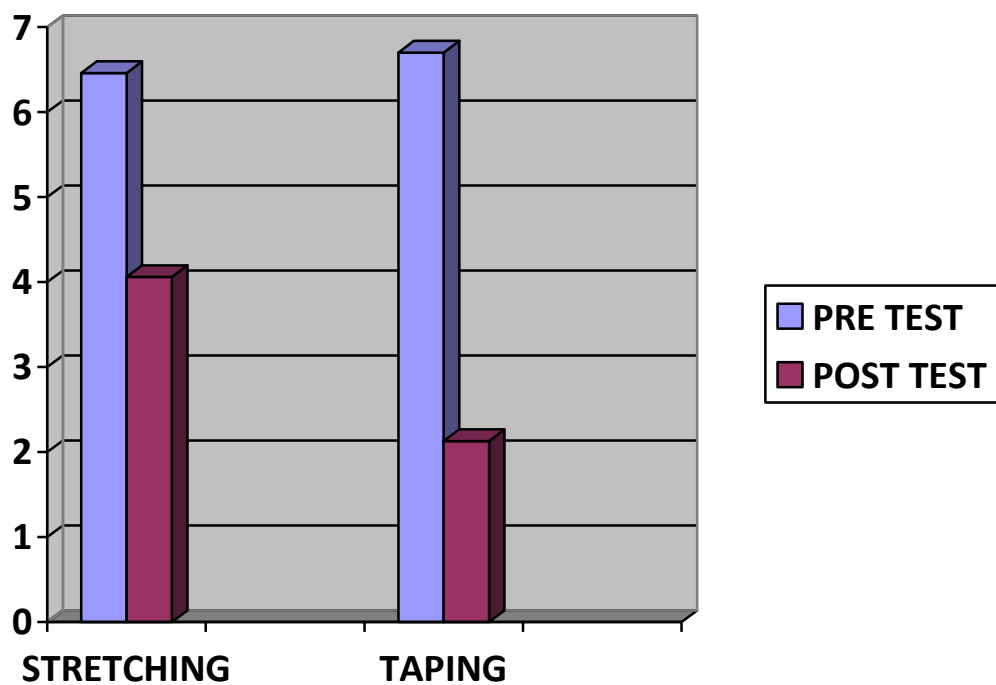
This table 3 shows the analysis of Numeric pain rating Scale , the paired “t” test value of pre versus post sessions of group A which was 18 at 0.05 level of significance which was greater than the tabulated “t” value of 2.15. this showed that there was a statistical significant difference between pre and post test results. The pre test mean was 6.46, the post test mean was 4.06 and the mean difference were 2.39, which showed that there was significant reduction of pain between stretching exercise and taping.

TABLE-4

This table shows the analysis of Numeric pain rating Scale , the paired “t” test value of pre versus post sessions of group A which was 18 at 0.05 level of significance which was greater than the tabulated “t” value of 2.15. this showed that there was a statistical significant difference between pre and post test results. The pre test mean was 6.46, the post test mean was 4.06 and the mean difference were 2.39, which showed that there was significant reduction of pain between stretching and taping.

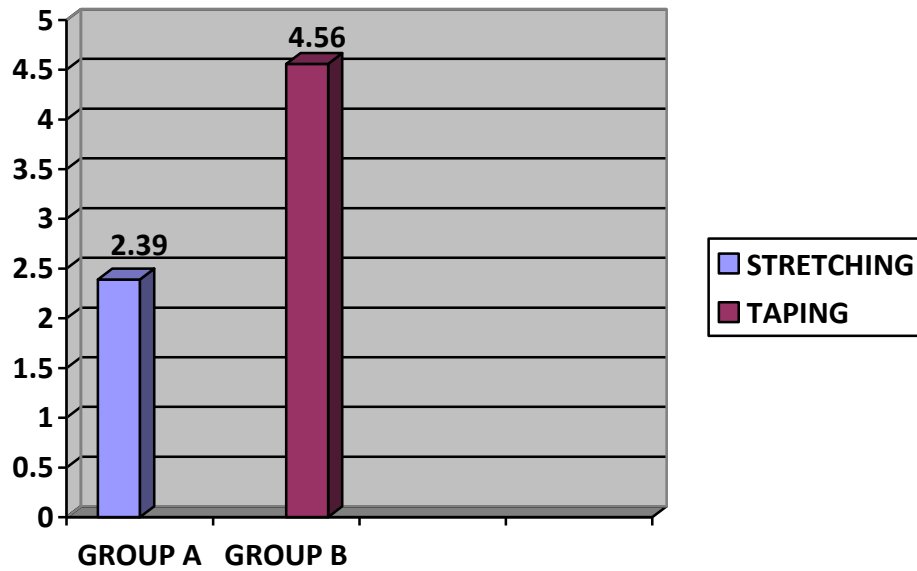
GRAPH

**MEAN DIFFERENCE VALUSE BETWEEN PRE AND POST
(NUMERIC PAIN RATING SCALE)**

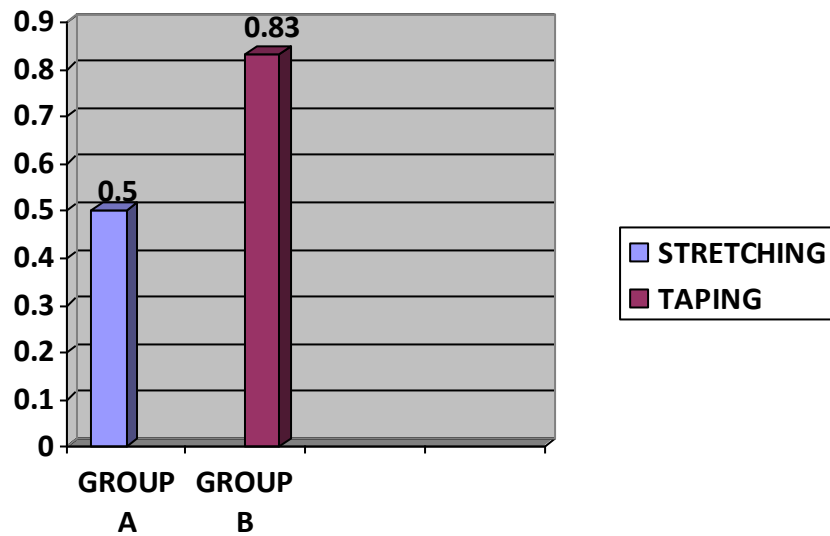


GRAPH-4

GRAPHICAL REPRESENTATION OF MEAN DIFFERENCE AND STANDARD DEVIATION VALUES OF STRETCHING EXERCISE & TAPING



STANDARD DEVIATION



**DATA ANALYSIS OF UNPAIRED ‘t’ TEST SCORE OF FOOT
FUNCTIONAL**

INDEX FOR GROUP A AND GROUP B

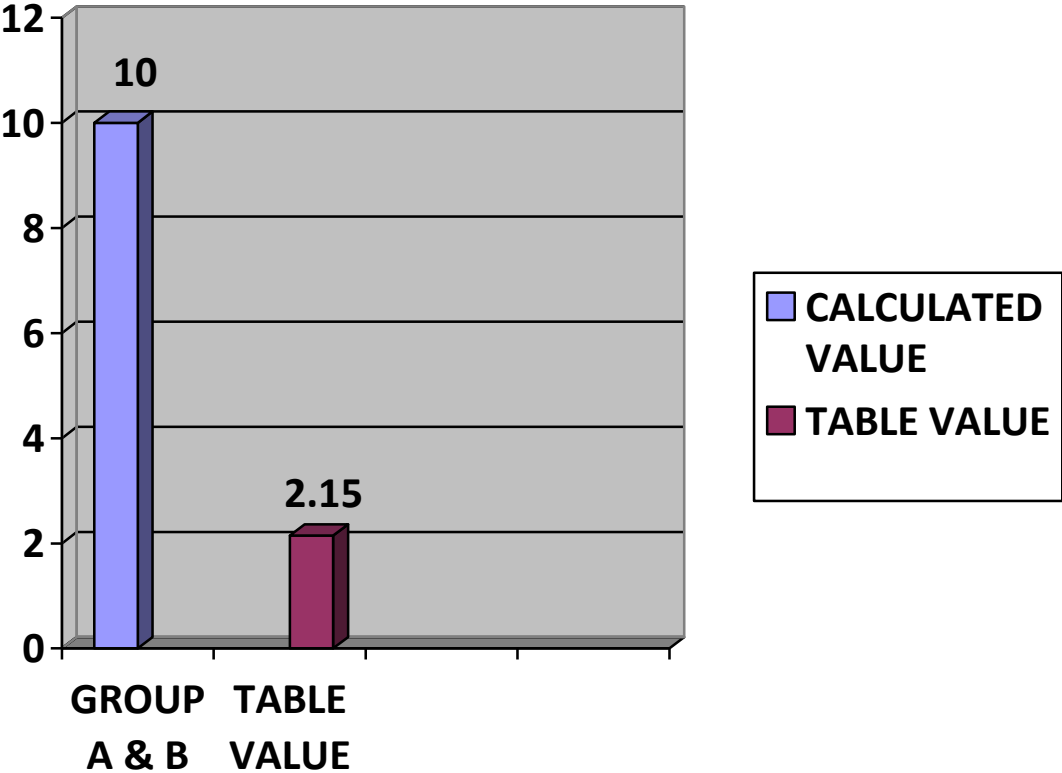
This Table represent the comparative mean values, mean differences, standard deviation and unpaired ‘t’ test scores between Group A and Group B on Foot Functional Index

TABLE -5

FOOT FUNCTIONAL INDEX	MEAN	MEAN DIFFERENCE	STANDARD DEVIATION	UNPAIRED ‘t’ TEST
GROUP A	4.03	3.4	1.99	10
GROUP B	7.43			

This table shows the analysis of Group A and Group B with Foot Functional Index. The unpaired ‘t’ test value 10 was greater than the tabulated ‘t’ value of 2.15 at 0.05. level of significance which showed that there was a statistically significant difference between group A and group B. The mean value of group A was 4.03, the mean value of group B was 7.43 and the mean difference was 3.4 which showed that there was greater reduction in pain in B than A.

**GRAPHICAL REPRESENTATION OF UNPAIRED 't' TEST
VALUES OF
FOOT FUNCTIONAL INDEX FOR GROUP A AND GROUP B**



DATA ANALYSIS OF PRE AND POST TEST SCORE OF NEUMERIC PAIN RATING SCALE FOR GROUP B

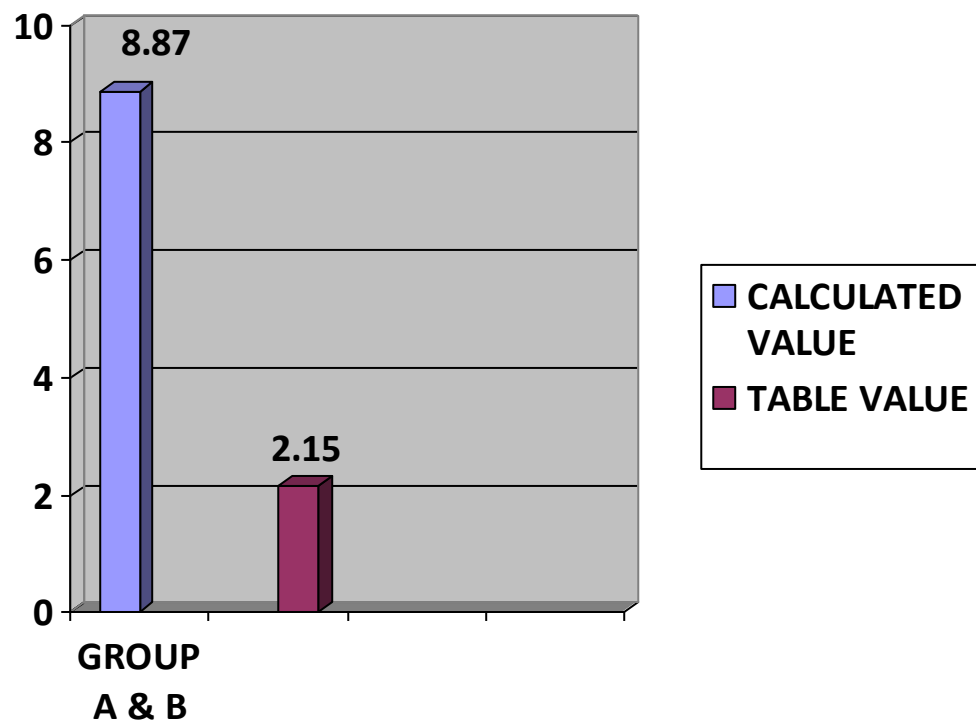
This Table represent the comparative mean values, mean differences, standard deviation and unpaired “t” test scores between Group A and Group B on Foot Functional Index

TABLE -6

VAS	MEAN	MEAN DIFFERENCE	STANDARD DEVIATION	UNPAIRED “t” TEST
GROUP A	2.39	7.0	0.68	8.87
GROUP B	4.56			

This table shows the analysis of Group A and Group B with Foot Functional Index. The unpaired “t” test value 8.87 was greater than the tabulated “t” value of 2.15 at 0.05. level of significance which showed that there was a statistically significant difference between group A and group B. The mean value of group A was 2.39, the mean value of group B was 4.56 and the mean differences was 7.0 which showed that there was greater reduction in pain in B than A.

**GRAPHICAL REPRESENTATION OF UNPAIRED ‘t’ TEST
VALUES OF
NEUMERIC PAIN RATING SCALE FOR GROUP A AND
GROUP B**



RESULTS

According to table I the pre test mean value in foot function index in stretching exercise was 62.13 and taping was 62.66 it shows P is lesser than 0.01 which shows statistically significant in foot function index between stretching and taping.

The post test mean values of foot function index of stretching was 58.0 and taping was 51.0, it shows that P is lesser than 0.01 which shows statistically significant in foot function index between stretching and taping .

According to table II the pre test mean values of numeric pain rating scale scale of stretching was 6.46 and taping was 6.76, it shows that P is lesser than 0.05 which shows statistically significant in numeric pain rating scale between stretching and taping.

The post test mean value was 4.06 and taping was 2.13, it shows that P is lesser than 0.05 which shows statistically significant in numeric pain rating scale stretching and taping. According to table III the pre test mean values of foot function index of stretching was 62.66 and post test values was 51.0, it shows that P is lesser than 0.01, which is highly statistically significant and indicates reducing pain and foot function index achieved after stretching.

The pre test mean value of numeric pain rating scale scale was 6.7 and post test values was 2.13, it shows P is lesser than 0.01, which is highly statistically significant and indicates reducing pain and foot function index achieved after stretching.

According to table IV the pre test mean values of foot function index of taping was 62.66 and post test values was 51.0, it shows that P is lesser than 0.001 which is highly statistically significant and reducing the pain and improves foot function index achieved after taping .

The pre test mean value of numeric pain rating scale was 6.7 and post test values was 2.13, it shows that P is lesser than 0.001, which is highly statistically significant and reducing the pain and improves foot function index achieved after taping.

The result of this study shows that the P value of stretching in foot function index is lesser than 0.01 which shows 99% of significant and in taping P value is lesser than 0.009 which shows 99.9% of significant. Hence it indicates taping is more effective for reducing pain and improves the foot functional activity of the plantar fasciitis.

DISCUSSION

The study proved that taping is more effective than stretching treatment among plantar fasciitis subjects in reducing the pain and improve the foot functional index.

The foot function index have been decreased from 62.13 to 58.20 among to stretching Group(Group A) and numeric pain rating scale score have been decreased from 6.46 to 4.06.

Robert I Cantu (2001) studied stretching to restore the flexibility of the fascia and release tension from the muscles.

Janet Travel MD (1974) studied stretching treatment is manual technique for lengthening the fascia with the aim to balance the body. The goal of stretching is to free fascia restriction restore its balance and functions.

The Group-B subjects who underwent taping showed decreased in foot function index score from 62.66 to 51.0 and numeric pain rating scale score from 6.7 to 2.13.

The mean pre test score of numeric pain rating scale among Group- A 6.46 and post test score was 4.06.the mean pre test score of numeric pain rating scale among Group-B 6.7 and post test score was 2.13. This shows a statistically significance of P is less than 0.01.

The mean pre test score of foot function index among Group-A is 62.13 and the post test score is 58.20.the mean pre test score of foot function index among Group-B is 62.66 and post test score was 51.0.this shows statistically significance of P is less than 0.001.

Statistical analysis showed a significance of P is less than 0.001 among Group-B.

Joel A Rad ford 2006 studied taping is effective treatment of the common symptoms of first step pain in patient with plantar heel pain.

H.R.Osborne (2006) studied taping supports the longitudinal arch of the foot. It significantly reduces the peak plantar pressure of normal foot.

Orlin.MN (2006) studied taping is often used alleviate stress on the plantar fascia ligament since its limits the movement of the fascia. Plantar fascia taping thus can relieve some pain and inflammation associated with plantar fasciitis.

Taping is often used alleviate stress on the plantar fascia ligament since its limits the movement of the fascia. Plantar fascia taping thus can relieve some pain and inflammation associated with plantar fasciitis

Taping can be applied in morning to reduce strain throughout the day, or just prior to exercise to keep the fascia from moving to much during physical activity. It is recommended that the tape not be left on the foot all day as well as all night because this prevents the skin from being able to breathe.

To help the tape stick, the foot should be cleaned with a non-moisturizing soap in addition foot should also be kept dry.

Comparatively there was more reduction of pain(NPRS) and improvement of foot functional Index scale showed significant result in subjects who received both taping than my stretching treatment.

RECOMMENDATIONS AND LIMITATIONS

RECOMMENDATIONS:

- This study can be done with larger sample size.
- As this study was done only plantar fasciitis, further studies are also suggested to detect the progress in patient with other foot problems.
- Variables like range of motion, muscle power, can be added.
- Same study can be done in athletic population.
- Same study can be done in different body mass index.
- Compare the effects of sex difference.

LIMITATIONS:

- Sample size was small.
- Variable studied were only pain and foot function index.
- This study done only 20-50 years of age groups.
- This study not considered body mass index of subjects.
- Ranges of motion, muscle power, were not taken as variables.
- The study was limited to plantar fasciitis.
- The study was limited to assess only the pain intensity by using NPRS and foot function by using FFI

CONCLUSION

The results of the study concludes that,

1. This study can be concluded by stating that both stretching technique and taping have got beneficial effect in reducing the pain intensity and improving the foot function in patients with chronic plantar fasciitis.
2. There was a significant reduction of pain and improvement of foot functional activities of both groups.
3. Comparatively there was more reduction of pain and improvement of foot functional activities in subjects who received both taping.

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ANNEXURE-1
ASSESSMENT CHART

Name:

Age:

Sex:

Occupation:

Address:

Date of Assessment:

Chief Complaints:

Present History:

Past History:

Pain Assessment:

Site & Side:

Onset:

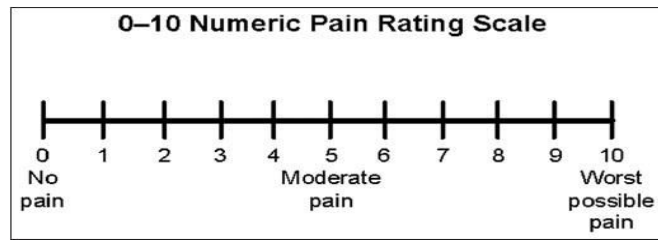
Duration:

Nature:

Type:

Behavior:

Severity of NPRS:



Irritability:

24 Hrs. Patterns:

Aggravating Factor:

Relieving Factor:

ON OBSERVATION:

➤ **GENERAL OBSERVATION:**

Built :

Posture :

Gait :

Mobility Aids :

➤ **LOCAL OBSERVATION:**

Local swelling :

Bony contour :

Soft Tissue Contour ;

ON PALPATION:

Tenderness :

Warmth :

Bony Spur :

ON EXAMINATION:

Range Of Motion :

Muscle Strength :

FUNCTIONAL ASSESSMENT:

Foot Function Index (FFI)

SPECIAL TEST:

Plantar Fascia Stretch Test.

MANAGEMENT:

Problem List

GOALS:

PHYSIOTHERAPY TREATMENT:

Orthotic/Prosthetic Advice:

Home Advices:

Follow Up:

ANNEXURE - 2

FOOT FUNCTION INDEX

Section 1: Patient Name: _____ Age: _____ Date: _____

Occupation: _____ Number of days of foot

pain: _____ (this episode)

No Pain 0 1 2 3 4 5 6 7 8 9 10 Worst Pain Imaginable

1. In the morning upon taking your first step?
2. When walking?
3. When standing?
4. How is your pain at the end of the day?
5. How severe is your pain at its worst?

Answer all of the following questions related to your pain and activities **over the past WEEK**, how much difficulty did you have? *Disability Scale*

No Difficulty 0 1 2 3 4 5 6 7 8 9 10 So Difficult unable to do

6. When walking in the house?
7. When walking outside?
8. When walking four blocks?
9. When climbing stairs?
10. When descending stairs?
11. When standing tip toe?
12. When getting up from a chair?
13. When climbing curbs?
14. When running or fast walking?

Answer all the following questions related to your pain and activities **over the past WEEK**. How much of the time did you:

Disability Scale:

None of the time 0 1 2 3 4 5 6 7 8 9 10 ***All of the time***

15. Use an assistive device (cane, walker, crutches, etc) indoors?

16. Use an assistive device (cane, walker, crutches, etc) outdoors?

17. Limit physical activities?

Section 3: To be completed by physical therapist/provider SCORE: _____/170 x100= _____% (SEM 5, MDC 7)

SCORE: Initial _____ Subsequent _____ Sub sequent _____ Discharge _____

Number of treatment sessions: _____

Diagnosis/ICD-9 Code: _____.

ANNEXURE - 3

DATA PRESENTATION

PRE AND POST TEST SCORES OF GROUP A AND

GROUP B

S. No.	GROUP-A STRETCHING				GROUP-B Taping			
	FFI		NPRS		FFI		NPRS	
	PRE	POST	PRE	POST	PRE	POST	PRE	POST
1	60	54	8	6	80	65	6	1
2	80	75	7	4	70	56	5	0
3	70	66	6	4	40	25	8	4
4	67	64	5	2	50	38	7	3
5	70	64	8	6	70	56	6	2
6	50	48	7	4	60	50	5	2
7	45	40	5	3	60	49	8	4
8	60	54	8	5	70	56	7	2
9	70	66	6	4	60	50	6	2
10	60	57	6	4	50	39	8	2
11	80	78	5	3	50	40	7	2
12	70	66	7	4	70	62	6	1
13	40	32	8	6	70	61	6	0
14	50	44	6	3	80	70	7	3
15	60	65	5	3	60	48	8	4

FFI- Functional Foot Index , **NPRS-** Numeric pain rating Scale.

ANNEXURE - 4

INFORMED CONSENT FORM

STATEMENT OF THE PARTICIPANT:

I _____ have been explained in detail about the procedures to be carried out in the study.

I have been given opportunity to discuss and ask questions with the responsible physiotherapist regarding the study.

I have understood that there is no harm to my health by participating in the study period.

I will not under go any other training method during in this study.

I agree to participate voluntarily in this study described in this form.

Name of subject	signature	Date
Name of Witness	signature	Date
(if necessary)		
Name of investigator	signature	Date