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# Effectiveness of Mulligan's taping for the short term management of plantar heel pain - Randomised control trial

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### Abstract

**Introduction:** Plantar fasciitis is one of the most common causes of plantar heel pain. Numerous nonsurgical interventions such as rest exercise & modalities focus on relieving the symptoms associated with plantar heel pain, however orthotics and taping techniques address the underlying problem of poor foot biomechanics. Till date there is scarcity of data investigating the acute effects of attempting to control the position and alignment of the calcaneus during weight bearing through the use of Mulligan's taping.

Aim of study: To examine the effects of Mulligan's taping on the symptoms of plantar heel pain

**Methodology:** Subjects (n= 30) were randomly assigned into 2 groups, A & B (15 subjects each). Group A (control group) received ultrasound, plantar fascia stretching & sham taping. Group B (experimental group) received ultrasound, plantar fascia stretching & Mulligan's taping for plantar fasciatis.

**Outcome measures:** Visual analogue scale (VAS) for assessment of pain & Patient specific functional scale (PSFS) for assessment of functional activities. These were assessed pre & post one week of treatment.

**Results:** A significant difference was found post treatment among the groups for VAS (p=0.0265). A highly significant difference was found post treatment among the groups for PSFS (p=0.0062). There were significant difference found between pre and post VAS & PSFS scores in both experimental & control group.

**Conclusion:** Mulligan's taping is shown to be more effective tool for the relief of plantar heel pain than sham taping when given along with conventional physiotherapy.

Keywords: Plantar fasciitis, calcaneal taping, poor foot biomechanics

### **1. Introduction**

Plantar heel pain is one of the most commonly occurring foot complaints treated by healthcare professionals but a reliable incidence data is lacking in many countries [1-3]. Plantar fascia is a thick fibrous connective tissue which originates at the medial tuberosity of the calcaneus and inserts into the plantar plates of the metatarsophalangeal joints, the base of the proximal phalanges and the sheaths of the flexor tendons. It acts like a bowstring [4-6] to maintain and support the longitudinal arch of the foot and to assist in dynamic shock absorption by providing foot support and rigidity throughout gait cycle.

Poor foot biomechanics in any of the phases of gait cycle can lead to foot pathology resulting into plantar heel pain. [7,8]

Numerous non surgical treatments have been used to relieve symptoms of plantar heel pain. These include rest, exercise (stretching and strengthening), modalities (cryotherapy, therapeutic ultrasound), external supports (orthotics, night splint, taping), etc.[4,9] Stretching is still considered to be the easiest, and also most useful technique to reduce the symptoms associated with plantar heel pain. But stretching provides temporary relief and does not address the underlying pathology i.e. poor foot biomechanics. Therapeutic ultrasound also focus on relieving symptoms

However taping addresses the underlying cause i.e. poor foot biomechanics in plantar heel pain. Taping has been used as an adjunct to other physical therapy measures for the treatment of plantar heel pain. It can be used in acute as well as chronic stage prior to any orthotic use [7].

Various other taping techniques (Windlass taping, Low dye medial longitudinal arch taping taping of the rear foot) [10-12] has been found effective in controlling or relieving pain However

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effective but these methods are- cumbersome, timeconsuming and often uncomfortable for the patients. In Mulligan's concept, patients get instant pain relief and increasing the range of motion by maintaining the correction of positional fault, and patient can perform offending/restricted movements in a painfree way. The tape is applied in such a way that therapeutic glide is maintained because of tape hence making it different from sports and other taping techniques

Mulligan taping technique focuses on improving biomechanical position by correcting the positional fault of calcaneum, improving the alignment of the calcaneum and thereby reducing stress and subsequent microtrauma to the plantar fascia.

This technique is thus unique as it addresses biomechanics at the rear foot versus the mid foot unlike in various other techniques. Till date there are seldom studies done to investigate acute effects of attempting to control the position and alignment of calcaneus through the use of Mulligan taping

### 1.1 Hypothesis

Mulligan calcaneal taping is more effective in reducing pain and improving functional activity as compared to sham taping in patients with plantar heel pain

### 2. Methodology

**2.1 Study Design:** experimental, randomized, pretest /post test design

2.2 Sampling: sample of convenience

2.3 Sample size: Total 30 patients, 15 in each group2.4 Study setting: Outpatient department of V.S.P.M.'s College of Physiotherapy (Nagpur).

Before the commencement of the research Ethical Committee approval was taken. Patients were selected through a sample of convenience. Each prospective patient signed an informed written consent in the language they could comprehend. All these subjects completed a questionnaire pertaining to the selection criteria. Total 30 patients were selected and demographic data was recorded.

Visual Analogue Scale (VAS) and Patient Specific Functional Scale (PSFS) were administered on the first day. These patients were then randomly assigned into two groups with the use of random number table with 15 patients in each group. Group A (control group) received Therapeutic ultrasound, plantar fascia stretching and sham taping. Group B (experimental group) received Therapeutic ultrasound, plantar fascia stretching and Mulligan calcaneal taping. Intervention was given for one week, daily one session. VAS and PSFS were again administered on the seventh day with the tape on. Data thus collected was subjected to statistical analysis

#### 2.5 Inclusion criteria

- ▶ Age 18-35 years , both males and females
- ▶ Pain with first steps upon waking >= 3 on VAS
- Pain located at the heel or plantar surface of the mid foot consistent with plantar fasciitis Duration of symptoms more than 1 week and less than 6 weeks.

#### 2.6 Exclusion criteria

- Any medical or surgical treatment prior to or during the study period
- History of any lower limb injuries
- Spasticity throughout the lower extremity
- Use of an assistive device for ambulation

#### **3. Interventions**

### 3.1 Plantar fascia stretching

A passive stretch was applied to the big toe flexors so as to stretch the plantar fascia for three repetitions. Each stretch was held for a count of 30 secs [4,9,13]

#### **3.2 Therapeutic ultrasound**

3 Mhz ultrosound set to 1.0 w/cm2, continuous for 7 mins [9,14-17]

#### 3.3 Calcaneal Taping

Two types of tape are used. One is an under-wrap and other is brown rigid tape. An underwrap is adhesive cotton material tape which should be applied on the structure that is to be taped so as to avoid blister formation or allergic reaction from tape. Brown rigid tape used in this study is zinc oxide tape approximately 1-2 inches in width, slightly porous, adhesive and non elastic in nature.

Patient is seated at the edge of the couch with affected foot off the plinth affected hip in abduction and external rotation to maintain the position with relaxed ankle. An under-wrap is put in the same manner as the brown rigid tape but without any pull or tension on the under-wrap while applying it on a clean and dry skin. One end of the brown rigid tape is applied diagonally on the lateral surface of the affected calcaneum. Calcaneum is held into external rotation and adduction with one hand. The tape is pulled and wrapped around the ankle medially while this glide is sustained. Tape passes medially and superiorly to the tendon of Tibialis anterior to avoid problems while walking. First strip is placed obliquely around back of heel while calcaneum is externally rotated, exteded around lower leg. A second strip of tape is used to reinforce the first. The patient is asked to keep the tape in place for 24 hours. [18]

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#### 3.4 Sham Taping

The tape was simply applied to the skin without forcing external rotation of the calcaneus sham taping did not attempt to control or correct the alignment or position of the calcaneum

#### **3.5 Outcome Measures**

- Visual Analogue Scale (VAS): Patients self rated their foot pain on VAS based on their first few steps in the morning. Price *et al* demonstrated the validity and reliability of VAS to measure pain.[4]
- ▶ Patient Specific Functional Scale (PSFS): Patients were asked to list 3 activities they had difficulty doing or unable to do and self rate these activities on a scale of 0-10. Chatman *et al* showed PSFS to have excellent test-retest reliability, sensitivity to change and validity.[4]

#### 3.6 Data Analysis

- Data was analysed using software SPSS 20.0
- Descriptive statistics for dependent measures, mean and standard deviations, were calculated pre and post intervention in both experimental and control groups.
- Paired Student's t test was used to analyze difference in mean VAS and PSFS scores between and within the groups respectively



### Figure 2: Demographic Data



Table 1: Data Analysis & results						
Outcome Measures		Experimental Group		Control Group		p value
		Mean	± SD	Mean	± SD	(Between Groups)
VAS	Pre	6.93	1.16	6.71	1.39	0.67 (NS)
	Post	3.6	1.12	4.53	1.06	0.02 (S)
	p value (Within Group)	< 0.0001		< 0.0001		
PSFS	Pre	3	0.85	3.29	1.12	0.42 (NS)
	Post	5.04	0.91	4.02	0.96	0.006 (HS)
	p value (Within Group)	< 0.0001		< 0.0001		

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Figure 3: Data Analysis & results





There were significant difference found between pre and post VAS scores (p=0.0265) & PSFS scores (p=0.0265) in both experimental as well as control groups. When VAS scores were compared post treatment between the groups, significant difference (p=0.0265) was found post treatment among the groups, experimental group better than control group. A highly significant difference was found post treatment among the groups for PSFS (p= 0.0062) which also showed that experimental group better than control group.

#### 4. Discussion

The study aimed at examining the effects of Mulligan calcaneal taping technique on symptoms of plantar heel pain. Significant difference was found pre and post physiotherapy intervention in both control as well as experimental groups.

Significant difference was found in the control group can be attributed to ultrasound, plantar fascia stretching and sham taping. Ultrasound and plantar fascia stretching have been frequently utilized conservative treatment for plantar heel pain [1,9].

#### 4.1 Ultrasound

Use of a local modality is often considered to enhance the treatment effectiveness when managing a patient with plantar heel pain. Hayes *et al* suggests that ultrasound transducer administered at 1.0 Watts/cm<sup>2</sup> intensity, 3 MHz continuous for 6.67 minutes will increase the temperature of plantar fascia by 4 degrees Celsius above baseline. Thus it improves visco elastic properties of the soft tissue prior to stretching or any kind of manual manipulation for a more effective result.[9,14-16]

### 4.2 Plantar fascia stretching

Hyland *et al*[1,4] demonstrated, in comparison to no treatment, the plantar fascia stretching group obtained greater pain relief (p = 0.026). Rompe *et al*[1,19] identified that a program of manual stretching exercises specific to plantar fascia is more effective therapy for treatment of acute IJBAR (2015) 6 (07)

symptoms of plantar fasciopathy than radial shockwave therapy DiGiovanni *et al*[1,20] compared different stretching techniques, and found stretching of the plantar fascia in non weight bearing, to be significantly more effective than tendo Achilles stretching in weight bearing in reducing some pain, but not all aspects of pain at 8 weeks follow-up. A previous study demonstrates that in comparison to no intervention stretching was significantly more effective in reducing pain.[1]

### 4.3 Sham taping

Robbins *et al*[4,21] identified taping alleviates heel pain at proprioceptive level with tape providing foot position awareness. This can be one of the reasons for reduction of pain in control group that received sham taping along therapeutic ultrasound and plantar fascia stretching.

#### 4.4 Mulligan calcaneal taping

Significantly larger effect observed in the experimental group when compared to control group can be attributed to the proposed mechanism by Robbins *et al*[4,21] that taping addresses one of the presumed cause of pathology i.e. poor foot biomechanics. Basic rationale for taping is to provide protection and support to an injured part while permitting optimal functional movements. Hyland *et al*, 2006 found taping and controlling the calcaneus significantly decreased heel pain when compared to stretching and sham taping [4].

Various taping techniques such as Low dye taping[22] utilized to correct rear foot motion, Windlass taping <sup>(23)</sup> to correct rear foot motion as well as forefoot motion, were found effective in reducing plantar heel pain. But the technique described by Mulligan differs from previous attempts to mediate pain and function with tape in its ease of application and cost. With only two pieces of tape it is easier and less time consuming

Excessive foot pronation has been found to be an important mechanical cause of structural strain that results in plantar fasciitis. Taping calcaneus in external rotation prevents excessive pronation, and maintains a more neutral position presumably taking off the force from plantar fascia [24] Mulligan taping utilizes external rotation of calcaneus in relation to talus. The tape is applied in such a way that therapeutic glide is maintained because of tape.[18] According to Paul Kochoa,[24] in patients with plantar heel pain there is rotation component to calcaneus along with decreased arch

Tape can be a good adjunct to therapy, correcting the calcaneal rotation, increasing the arch and thus increasing the ability of the foot to absorb and control shock. Franettovich *et al*[25] found that antipronation tape has a biomechanical effect demonstrated by an increase in navicular height and medial longitudinal arch.

There is also an emerging evidence of neurophysiological effect that antipronation tape reduces muscle activity. This is in conjunction with a meta-analysis by Cheung *et al*[26] which also identifies that adhesive taping is most effective in controlling rear foot motion when compared with foot orthoses or motion control footwear.

However the relative benefits of this technique compared to other methods of taping are yet to be established.

### 5. Limitations

The present study was performed over a one week period. Thus analysis of the long term benefits of Mulligan calcaneal taping on plantar heel pain was beyond the scope of this study.

Patients were selected from a wide range of age and BMI was not taken into consideration. These can act as confounding factors.

### **6.** Clinical Implications

Mulligan calcaneal taping is effective, easy to apply and less time consuming. Patient's compliance is good with this type of technique. Self taping can be taught to patients with minimal training .taping can act as precursor therapy to orthotic prescription which has been shown to relieve symptoms of plantar heel pain in long term. Hence this study can be a short-term bridge to other long term therapies such as orthotic use.

### 7. Scope for Future Research

Studies involving long-term follow-up should be undertaken to determine continued effect of taping. Efficacy of Mulligan calcaneal taping should be compared with other methods of taping to explore the added advantage of Mulligan's taping if any. Researches involving biomechanical analysis should be conducted to substantiate the theoretical mechanical benefits of Mulligan calcaneal taping

### 8. Conclusion

Mulligan Calcaneal taping is an effective adjunct to conventional physical therapy interventions (ultrasound and plantar fascia stretching) in the short term management of plantar heel pain.

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