



## EFFECT OF KINESIO TAPING VERSUS MULLIGAN TAPING IN TREATMENT OF HEEL PAIN

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### ABSTRACT

Plantar fasciitis is a common chronic overuse injury of the plantar fascia with its painful inflammation. The exact aetiology of plantar fasciitis is unclear being multi-factorial. 30 subjects fulfilling inclusion criteria were randomly allotted into two groups by randomized control trial. Initial intensity of pain was measured using visual analogue scale, disability measured by foot functional index. Both groups received 2 sessions of kinesio and mulligan taping on every 3<sup>rd</sup> day respectively. Along with taping the patient followed the conventional physiotherapy protocol for plantar fasciitis. Patients were reassessed after 6 days of treatment. This study demonstrates that both the techniques are effective in relieving pain. However; Mulligan Taping Technique showed better results to alleviate pain and improve functional measures (p value for VAS <0.012 and FFI <0.001). The tape is applied in such a way that therapeutic glide is maintained presumably taking off the force from plantar fascia and hence reducing pain.

**KEYWORDS** *Mulligan Taping, Kinesio Taping, Heel Pain, Foot Function Index*



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## INTRODUCTION

Plantar fasciitis is a common chronic overuse injury of the plantar fascia with its painful inflammation.<sup>1,2</sup> Pain usually branches out from the central portion of the heel pad or the medial tubercle of the calcaneus, But at times it may also extend along the plantar fascia into the medial longitudinal arch of the foot.<sup>1</sup> The exact aetiology of plantar fasciitis is unclear; diagnosis is usually based on clinical signs, including: plantar heel pain on weight bearing after a period of non-weight-bearing, pain that eases within but then increases with further use as the day progresses, pain on palpation etc.<sup>2,3</sup> Multi-factorial in origin the condition is thought to be related to various anthropometric and joint related factors such as increased weight, reduced movements at the foot, standing for long periods and age.<sup>4</sup> The 2 most common fundamental causes of plantar heel pain, degenerative and mechanical, are believed to result from years of overuse and trauma.<sup>5</sup> The windlass test was used for the diagnosis, the test consists of first metatarsophalangeal joint extension in both weight bearing and non-weight bearing. This causes the windlass effect of the plantar fascia which determines whether the patient's heel pain is reproduced.<sup>6</sup> Taping calcaneus in external rotation prevents excessive pronation, and maintains a more neutral position presumably taking off the force from plantar fascia. This technique is effective due to the biomechanical effect it has in the bones and adjacent joints.<sup>7</sup> Performing Kinesio taping technique is effective for pain reduction in individuals with plantar fasciitis. This is probably because the application of kinesio taping on the foot corrects the abnormal movement of the foot which in turn prevents foot injuries due to repetitive minor trauma

from the abnormal foot movement. It also increases the tactile stimulation at the site of application, facilitates recovery, if injured by controlling the pulling forces on the fascia.<sup>2</sup>

## MATERIALS AND METHODOLOGY

After ethical committee clearance from Dr. D. Y. Patil Vidhyapeeth (Ref:DPU/R&R (P)/406 (@) (22)/16 ), 30 subjects participated in the study from Dr. D.Y. Patil Medical College and Hospital. Subjects fulfilling inclusion criteria taken into study: Individuals of both genders between the age of 20-45 years, willing to participate in the study having pain in morning, after sitting a long time, increasing with extended walking or standing for more than 15mins, localized to area where the fascia attaches to the heel.<sup>8</sup> Subjects with a history of a recent surgery, pathology and fractures around ankle or foot, autoimmune or systemic or local inflammatory diseases, impaired circulation to lower extremity, neurological disorders or nerve entrapment, soft tissue abnormalities like fat pad syndrome, plantar fascia rupture, heel bruises etc, congenital deformity of ankle or foot and allergic to tape were excluded. All subjects were explained the study procedure and written consent was obtained.. 30 subjects were randomly allocated in 2 groups. Subjects in Group A received kinesio taping(Figure 1) and that in group B received mulligan taping(Figure2) along with the conventional physiotherapy protocol(Figure 3 & 4). Initial intensity of pain was measured using visual analogue scale (VAS), disability measured by foot functional index (FFI) and on 6<sup>th</sup> day post treatment. Both groups received 2 sessions of kinesio and mulligan taping on every 3<sup>rd</sup> day respectively.



**Figure 1**  
*Kinesio taping*



**Figure 2**  
***Mulligan taping***



**Figure 3**  
***Calf Stretching***



**Figure 4**  
***Intrinsic Muscle Strengthening***

## **STATISTICAL ANALYSIS**

Statistical analysis was done using Paired t test to compare results within the group and Unpaired T test to Compare between the groups.

$$\text{Mean} = \frac{\sum xi}{n}$$

Where,  $\sum xi$  = sum of total readings

$$\text{Standard Deviation (SD)} = \frac{\sum xi - x^2}{n-1}$$

Where,  $xi$  = individual values

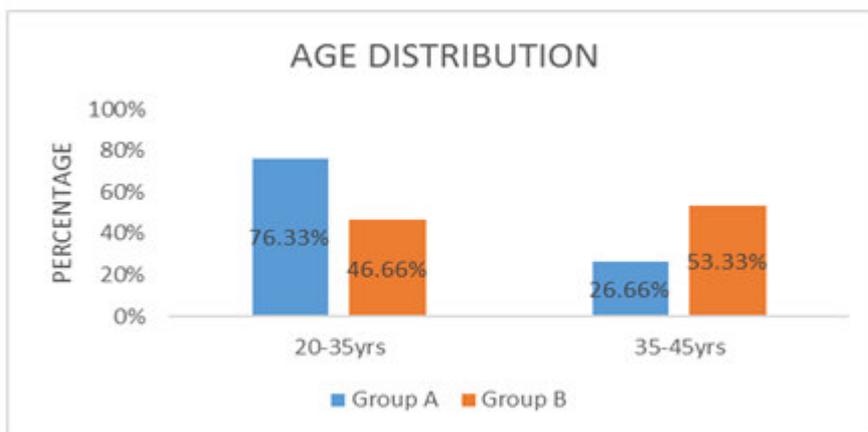
$x$  = mean

**RESULTS**

**Table 1**  
**Age distribution of patients studied**

Age in Years	Group A		Group B	
	No	%	No	%
20-35	11	76.33	7	46.66
35-45	4	26.66	8	53.33
Total	15	100	15	100
SD	±8.65	-	±8.10	-

±SD, n=15



**Figure 5**  
**Age distribution of patients studied**

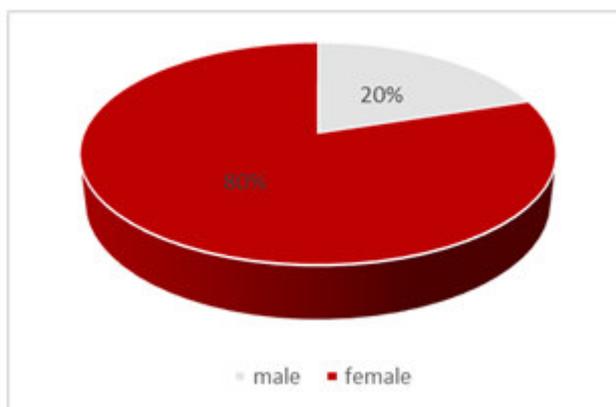
Table 1 and Figure 5 shows the distribution of age in Group A and Group B. In Group A out of 15 subjects, 11 were aged between 20-35 years and 4 were aged between 35-45 years whereas in Group B, there were 7 subjects aged between 20-35 years and 8 aged

between 35-45 years. Hence Group A had 76.33% subjects aged between 20-35 years and 26.66% between 35-45 years whereas Group B had 46.66% between 20-35 years and 53.33% between 35-45 years.

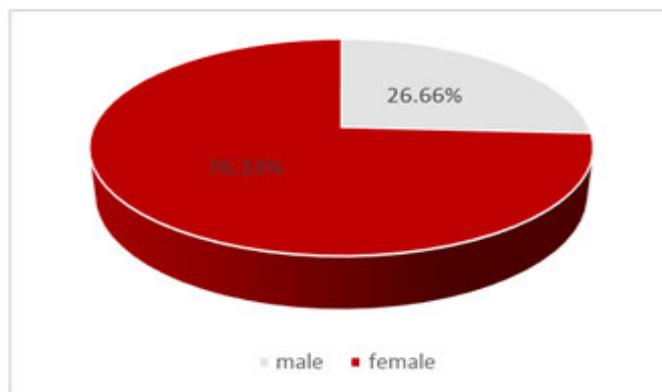
**Table 2**  
**Gender distribution of patients studied**

Gender	Group A		Group B	
	No	%	No	%
Females	12	80	11	76.33
Males	3	20	4	26.66
Total	15	100	15	100

±SD, n=15



**Figure 6a**  
**Gender distribution of patients studied- Group A**



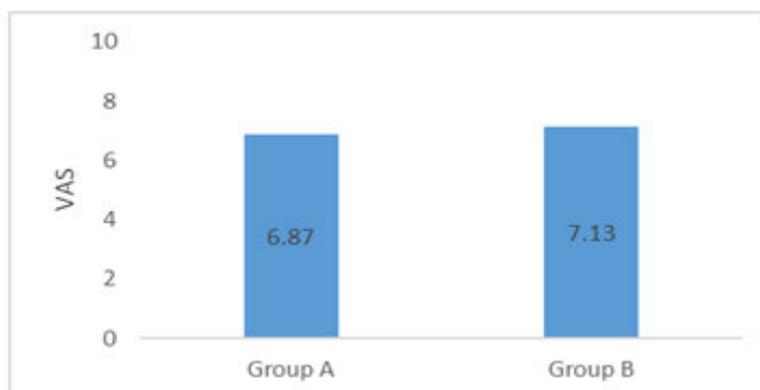
**Figure 6b**  
**Gender distribution of patients studied- Group B**

Table 2 and Figure 6a and 6b shows the distribution of gender of both groups in pie diagram. In group A out of 15 subjects, there were 3 males and 12 females whereas in Group B there were 4 males and 13 females. Hence Group A had 20% males and 80% females whereas Group B had 26.66% males and 76.33% females.

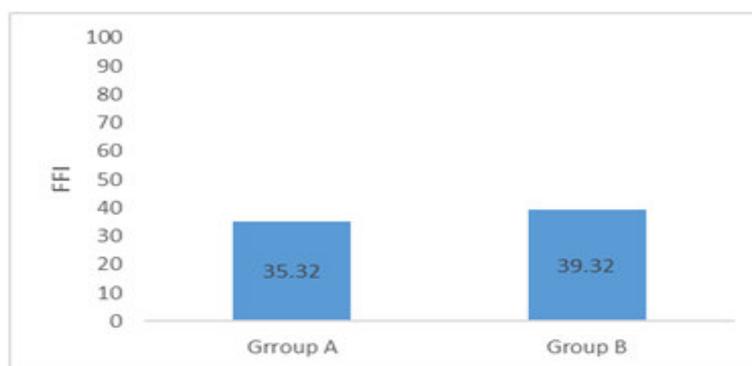
**Table 3**  
**Pre-treatment (Day 1) VAS and FFI scores between two groups**

Pre-treatment	Group A	Group B	p value
VAS	6.87 ± 1.48	7.13 ± 1.19	0.594
FFI	35.32 ± 11.87	39.32 ± 6.18	0.259

±SD, n=15



**Figure 7a**  
**Pre Treatment VAS Scores**



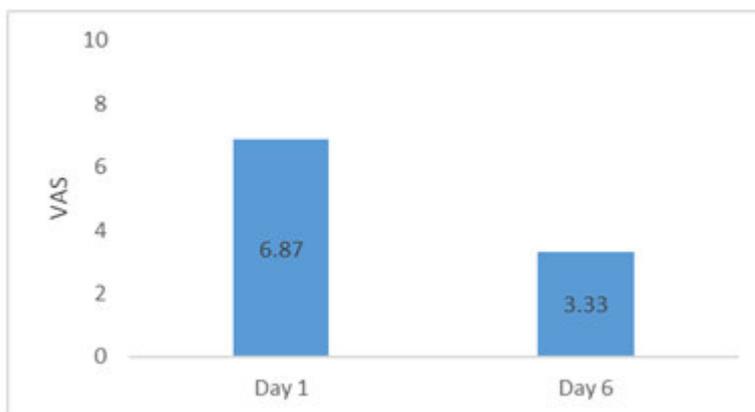
**Figure 7b**  
**Pre Treatment FFI Scores**

Table 3 and Figure 7a and 7b shows the pre treatment vales of VAS and FFI in group A and group B. In Group A mean of VAS was 6.87 and in Group B it was 7.13. In Group A mean of FFI was 35.32 and in Group B it was 39.32.

**Table 4**  
**Pre and Post-treatment values**  
**of Group A patients**

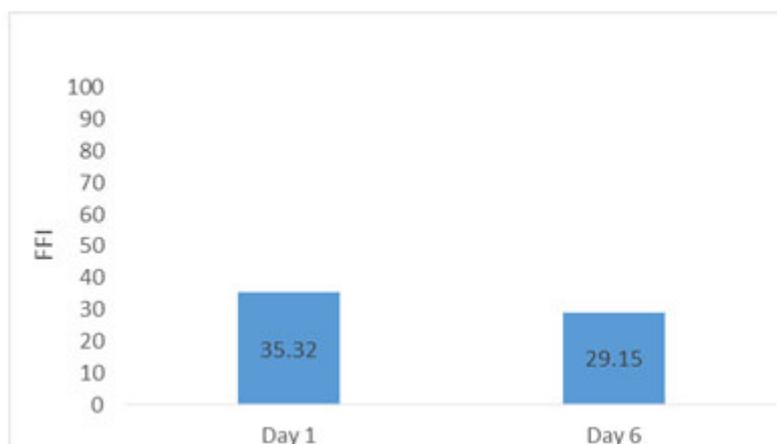
Group A	Day 1	Day 6
VAS	6.87 ± 1.48	3.33 ± 1.52
FFI	35.32 ± 11.87	29.15 ± 12.01

±SD, n=15



*p* value for VAS within Group A was <0.001 which is highly significant.

**Figure 8a**  
**Pre and Post treatment VAS Scores in Group A**



*p* value for FFI within Group A was <0.001 which is highly significant.

**Figure 8b**  
**Pre and Post treatment FFI Scores in Group A**

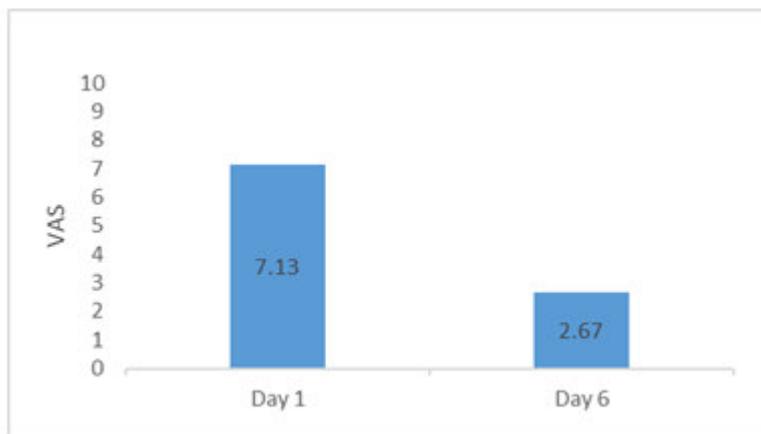
Table 4 and Figure 8a and 8b shows the pre and post treatment values of Visual Analogue Scale and foot Functional Index within Group A. For VAS, Group A mean decreased significantly from 6.87 to 3.33. The standard deviation also decreased. The *p* value is < 0.001 which is highly significant and the *t* value is 21.51 with 29 degrees of freedom. For FFI, Group A mean

decreased significantly from 35.32 to 29.15. The standard deviation also decreased. The *p* value is < 0.001 which is highly significant and the *t* value is 12.91 with 14 degrees of freedom. Hence statistically and graphically significant change is seen in pre and post treatment values of Group A.

**Table 5**  
**Pre and Post-treatment values of Group B patients**

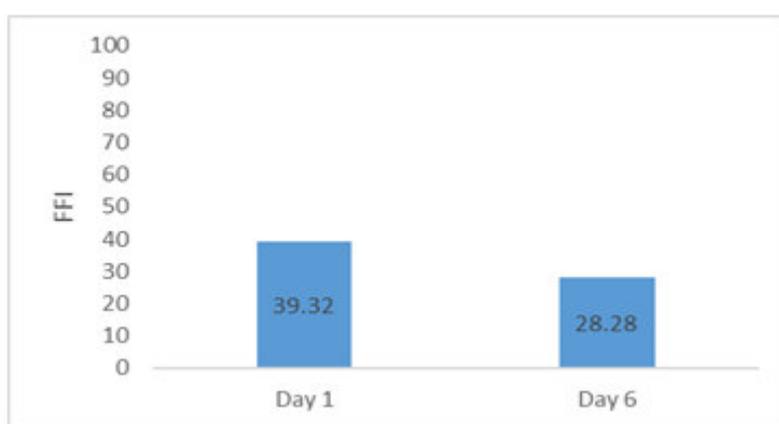
Group B	Day 1	Day 6
VAS	7.13 ± 1.19	2.67 ± 1.18
FFI	39.32 ± 6.18	28.28 ± 6.23

±SD, n=15



*p* value for VAS within Group B was <0.001 which is highly significant.

**Figure 9a**  
**Pre and Post treatment FFI Scores in Group A**



*p* value for VAS within Group B was <0.001 which is highly significant.

**Figure 9b**  
**Pre and Post treatment FFI Scores in Group A**

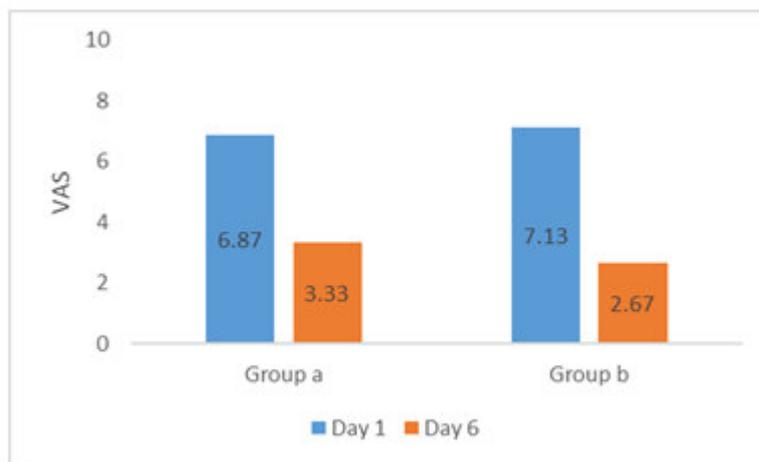
Table 5 and Figure 9a and 9b shows the pre and post treatment values of Visual Analogue Scale and foot Functional Index within Group B. For VAS, Group B mean decreased significantly from 7.13 to 2.67. The standard deviation also decreased. The *p* value is < 0.001 which is highly significant and the *t* value is 17.47 with 14 degrees of freedom. For FFI, Group A mean

decreased significantly from 39.32 to 28.28. The standard deviation also decreased. The *p* value is < 0.001 which is highly significant and the *t* value is 16.67 with 29 degrees of freedom. Hence statistically and graphically significant change is seen in pre and post treatment values of Group B.

**Table 6**  
**Comparative evaluation of VAS in two groups of patients studied**

VAS	Pre (Day 1)	Post (Day 6)	Difference	<i>t</i> value	Degree of freedom	<i>p</i> value
Group A	6.87 ± 1.48	3.33 ± 1.52	3.53	21.51	29	<0.001
Group B	7.13 ± 1.19	2.67 ± 1.18	4.47	17.47	14	<0.001
<i>p</i> value	0.594	-	<0.012	-	-	-

±SD, n=15



*p* value for VAS between Group A and Group B is <0.012

**Figure 10**

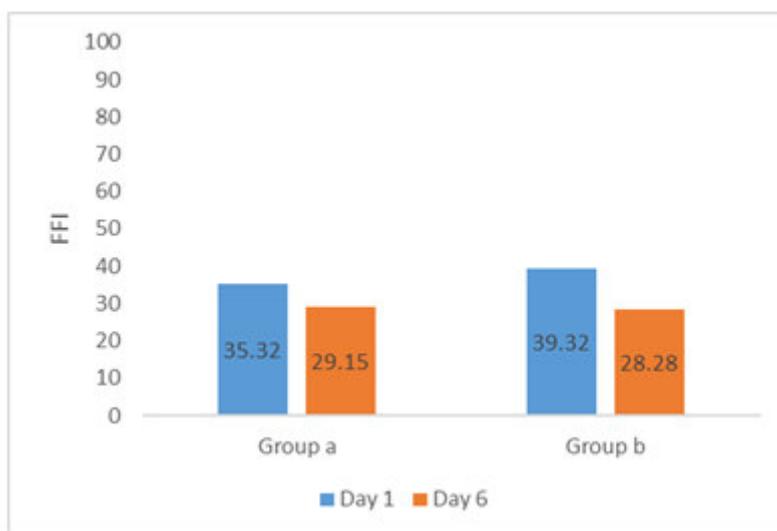
Table 6 and Figure 10 shows pre and post treatment values of Visual Analogue Scale between Group A and Group B. The mean value in Group A decreased from 6.87 to 3.33 and in Group B it also decreased from 7.13

to 2.67. The standard deviation in both the groups also decreased. The *p* value is 0.012 and the *t* value is 2.68 with 28 degrees of freedom.

**Table 7**  
**Comparative evaluation of FFI in two groups of patients studied**

FFI	Pre (Day 1)	Post (Day 6)	Difference	<i>t</i> value	Degree of freedom	<i>p</i> value
Group A	35.32 ± 11.87	29.15 ± 12.01	6.17	12.91	14	<0.001
Group B	39.32 ± 6.18	28.28 ± 6.23	11.04	16.67	29	<0.001
<i>p</i> value	0.259	-	<0.001	-	-	-

±SD, n=15



*p* value for FFI between Group A and Group B is <0.001 which is highly significant.

**Figure 11**

Table 7 and Figure 11 shows pre and post treatment values of Foot Functional Index between Group A and Group B. The mean value in Group A decreased from 35.32 to 29.15 and in Group B it also decreased from

39.32 to 28.28. The standard deviation in both the groups also decreased. The *p* value is <0.001 which is highly significant and the *t* value is 4.57 with 28 degrees of freedom.

## DISCUSSION

The aim of the study was to examining the effects of Mulligan taping technique versus kinesio taping on symptoms of plantar heel pain. Significant difference was found pre and post physiotherapy intervention in both groups. There was statistically significant difference between Mulligan's taping technique and Kinesio Taping technique on improvement of pain and functional disability for subjects with planter fasciitis. However, there was more improvement in the Mulligan Taping Group as compared to the Kinesio Taping Group.

### ***Possible Mechanism of Kinesio Taping in Treating Plantar Fasciitis***

The technique of kinesiotaping, including selection of taping site, pulling direction, and pulling force which are critical in treating soft tissue lesions. It follows the principle of motion analysis and biomechanics. The direction of the force is usually parallel to the direction of muscle fibres. The tape may cover the skin area to be stimulated too [tactile stimulation]. Application of kinesio taping on the plantar fascia, reduces the pulling force of the plantar fascia. Therefore, repetitive injury to the plantar fascia can be avoided which in turn facilitates tissue repair. The reduction in pain intensity was probably because of the reduced pulling force to the plantar fascia [negative tension from taping]. The improvement in focal circulation might also be an important factor for pain relief. It appears that after kinesio taping, the thickness at the insertion site was significantly reduced. It also appears that taping can effectively reduce the inflammatory reaction in a certain region [the insertion site] of the plantar fascia<sup>2</sup>.

### ***Possible Mechanism of Mulligan taping in Treating Plantar Fasciitis***

Mulligan taping was applied two times a week for 6 days. The possible mechanism by which the taping worked could be due to the correction of the positional fault that occurs at the ankle, subtalar joints. As seen, plantar fasciitis is a result of excessive pronation at these joints. When the mulligan tape is applied, it corrects this excess movement of the joint, leading to reduced strain at the surrounding tissues which in turn relieves the tissue of the micro-trauma caused by repetitive movements and pain reduction is achieved. Unlike other treatment methods which work only on the signs and symptoms of heel pain mulligan taping is directed directly towards the root cause of the pain. This is one of the important factors which lead to faster, better and long lasting effects of the treatment technique. Also as compared to other taping methods this technique uses rigid tape giving stronger stability and support to the joint triggering faster healing.

### ***Effectiveness of Mulligan Taping Over Kinesio Taping***

Significantly larger effect observed in the mulligan taping group as compared to kinesio group can be attributed to the proposed mechanism by Robbins et al 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<sup>7</sup>. Various taping techniques such as Low dye taping utilized to correct rear foot motion, Windlass taping 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. 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. According to Paul Kochoa, 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<sup>7</sup>. Franettovich et al found that antipronation tape has a biomechanical effect demonstrated by an increase in navicular height and medial longitudinal arch<sup>7</sup>. 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 which also identifies that adhesive taping is most effective in controlling rear foot motion when compared with foot orthoses or motion control footwear<sup>2</sup>.

## CONCLUSION

This study demonstrates that both the techniques are effective in improving the pain threshold in subjects with plantar heel pain. However; on comparison, Mulligan Taping showed better results to alleviate pain and improve functional measures. Hence, Mulligan Taping technique is better choice of treatment in improving pain thresholds in subjects with plantar heel pain.

## CONFLICT OF INTEREST

Conflict of interest declared none.

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