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Effect of Myofascial Release vs Low-Dye Taping on Pain in Patients with Plantar Fasciitis

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Abstract: ***Purpose: Plantar fasciitis is one of the most common conditions that causes of heel pain. The purpose of this study was to evaluate the effect of myofascial release vs low- dye taping on pain in patients with plantar fasciitis. Method:30 subjects with clinical diagnosis of chronic plantar fasciitis were selected according to convenient sampling method and equally assigned into 3 groups as Group A(n = 10) , Group B (n =10) , Group C (n =10) . All groups received therapeutic Ultrasound, calf stretching exercise, where addition to exercises Group B received Myofascial release for plantar fasciitis and Group C received low –dye taping. Treatment was given for 10 days. Data was analysed by using SPSS software version 16. Result: All three groups' shows significant reduction of pain. Between groups analysis, group B showed more significant reduction of pain. Conclusion: The finding of this study was that the use of myofascial release along with calf stretching and ultrasound are more effective in improving pain in plantar fasciitis.***

Keywords: Plantar Fasciitis, Myofascial Release, Low-dye Taping, Calf Stretching.

1. Introduction

Plantar Fasciitis (PF) is a common painful disorder of the heel and plantar surface of the foot characterized by inflammation, fibrosis or structural deterioration of the plantar fascia of the foot. The plantar fascia is a thick fibrous band of connective tissue that originates from the medial tubercle of the calcaneus (heel bone) and extends along the sole of the foot towards the toes and supports the arch of the foot. [1] The most common causes of PF are overuse activities, or poor biomechanics, resulting in abnormal functional pronation**.** [2] Functional risk factors include tightness and weakness in the gastrocnemius and soleus muscles, Achilles tendon and intrinsic foot muscles, a stiff subtalar joint, non-weight bearing rear foot varus or functional leg length inequality, obesity, training error, improper foot wear and occupation involving prolonged standing are risk factors of plantar fasciitis. [2] In the presence of these risk factors, excessive tensile forces may cause micro-tears in the plantar fascia. Repetitive trauma to the plantar fascia exceeding the fascia's ability to recover may lead to degenerative changes and an increased risk of injury.

Various attempts have been made till date to treat plantar fasciitis including rest, orthoses, stretching, mobilization, myofascial release, electrotherapeutic modalities such as ultrasound, laser. Myofascial release also helpful in reducing pain and improve functional ability as this technique have been shown to release fascia restriction and restore its tissue. This technique is used to ease pressure in the fibrous bands of the connective tissue or fascia. Gentle and sustain stretching of myofascial release is believed to free adhesion and soften and lengthens the fascia. [3] Low dye taping is a means of controlling pain by supporting the internal structures with externally applied non- elastic adhesive tape. Low –dye taping stabilizes the head of the first metatarsal during plantar flexion, prevents excessive pronation, reduces stress on the origin of the plantar fascia and provide rapid pain relief.[4] So, the main objective of this study were to determine the effects of myofascial release and low –dye taping on pain in patients with plantar fasciitis.

2. Methods

2.1 Patient selection

This prospective, experimental study was conducted in accordance with the principles of good clinical practice. The protocol was approved by Ethics committee of the DAV institute of physiotherapy and rehabilitation and written consent was obtained from all patients. The study consisted of 30 subjects, 10 in each group .Both male and female subjects participated in the study. The subjects were selected for study based on the inclusion and exclusion criteria.

Inclusion criteria include:

- Subjects of age between 18-40 years.
- Gender- Both males and females.
- Clinically diagnosed cases of plantar fasciitis not less than 6 weeks.
- Heel pain maximally over plantar aspect of heel.
- Pain was worst when first standing or walking after rest.
- Subjects willing to participate in the study and willing to take treatment for 10 days.
- No history of rest pain.

Exclusive criteria:

- History of any skin condition where myofascial release is contraindicated as dermatis.
- Subjects with impaired circulations to lower extremities.
- Subject with referred pain due to sciatica and neurological conditions.
- Subjects with arthritis, calcaneal fracture or stress fracture of foot.
- History of lower limb surgery.
- Corticosteroids injection proceeding 3 months.
- Subjects with known tape allergies.

Eligible patients were assigned into 3 groups according to convient sampling method.

2.2 Protocol

All subjects who met the inclusion criteria in the study were taken. A written consent was obtained and required assessment was done. For the measurement of the pain intensity, the subjects were asked to mark according to their pain intensity on the numerical pain rating scale (NPRS). Data was collected on 1^{st} ,4^{th} ,7^{th} ,10^{th} day. Subjects were placed in respective experimental groups A,B and C by according to convenient sampling method and after all evaluation, these subjects were divided into 3 groups-group A, group B, group C. Each group consisted of 10 subjects each. In group A choice of treatment was the ultrasound and calf stretching, group B was the myofascial release along with ultrasound, calf stretching and group C was the low dye taping along with ultrasound, calf stretching.10 successive days treatment was given to each group.

2.3 Procedure

Intervention of Group A
Ultrasound with output of $1w/cm^2$, pulsed mode 1:4 ratio, for five minutes with frequency of 1 MHz Ask the patient to do active calf stretch in standing by leaning against the wall, holding each stretch for 1 minute and repeating 5 times each session.

Intervention of Group B
Ultrasound and calf stretching is given same as group A. Myofascial release is given in patient in prone position with feet off the end of the table. Therapist use knuckles to engage the soft tissue just anterior of calcaneus. Take up a line of tension in an anterior direction. Work progressively through to the ball of the foot as well as into deeper layers in subsequent passes and then patient lift his toe with direction – lengthen the bottom of foot by taking toes under the table toward his knee cap. Dorsiflexion can also be used in conjunction with this.

Intervention of Group C
Ultrasound and calf stretching is given same as group A. Low-dye taping is given in this group. Non-elastic adherent sports tape was used. patient ‘s foot was be placed in a neutral position at about 90 degree of dorsiflexion and strip of tape starting at 5^{th} MPJ was brought around heel. The tape was anchored at 1^{st} MPJ and foot was turned medially. A second piece of tape identical to the first was taken. Same step was repeated. Full width strips were used to cover the sole of foot from the heel to the midtarsals. The tape was overlapped by half of its width and it is important that the tape strips should be laid down and not pulled so that the skin on the bottom of the foot does not wrinkle. A piece of another tape was measured which was twice the width of forefoot. Tape was placed on the top of forefoot extending from the lateral side and brought to medial side by pushing the foot in upward direction.

Home exercises: Active calf stretching was given to all the tree groups. it was performed in standing by leaning against the wall, holding each stretch for 1 minute and repeating 5times,3session per day.

2.4 Statistical analysis

SPSS version 16.0 was used for the statistical analysis. One way ANOVA test were used to determine significance of difference between group A, group B and group C. paired “t” test were done to determine significance of difference between subjects of same group(within group).A Turkey post hoc analysis was performed to interpret the findings .Level of significance selected for the study was $p<0.05$.

3. Results

Table 1, Figure 1 shows the distribution of mean value, standard deviation, F- value for intergroup analysis of age among the three groups. Group A (30.30 ± 6.45)
Group B (32.70 ± 2.21) 1.121 Group C (29.60 ±4.93)1.121. Non significant difference in age was seen among the groups.

Table 2, Figure 2 shows the within group comparison of NPRS for group A, B and C. This table highlights the group A (mean ± standard deviation) t value and p value between the 1^{st} – 4^{th}, 4^{th} – 7^{th}, 7^{th}-10^{th},1^{st}-10^{th} which are as follow D1 (5.70 ± 0.949) – D4 (5.60 ± 0.966) 1.000 , D4 (5.60 ± 0.966) - D7 (4.90 ±1.101) 3.380 , D7 (4.90 ±1.101) – D10 (5.70 ± 0.949) 3.674 , D1 (5.70 ± 0.949) - D10 (5.70 ± 0.949) 6.332 . Non significant difference was seen between the day 1-4 but the within group analysis exhibit that there is significant difference ($p<0.05$) and Group B the (mean ± standard deviation) t value and p value between the 1^{st} – 4^{th}, 4^{th} – 7^{th}, 7^{th}-10^{th},1^{st}-10^{th} which are as follow D1 (5.60 ± 1.838) – D4 (3.50 ± 1.354) 6.678 , D4 (3.50 ± 1.354) - D7 (1.60 ±1.265) 8.143 , D7 (1.60 ±1.265) – D10 (1.60 ± 1.265) 4.025 , D1 (5.60 ± 1.838) - D10 (1.60 ± 1.265) 8.883 the within group analysis exhibit that there is significant difference ($p<0.05$). Group C the (mean ± standard deviation) t value and p value between the 1^{st} – 4^{th}, 4^{th} – 7^{th}, 7^{th}-10^{th},1^{st}-10^{th} which are as follow D1 (7.00 ± 1.054) – D4 (4.60 ± 1.430) 7.060 , D4 (4.60 ± 1.430) - D7 (2.50 ±1.841) 7.584 , D7 (2.50 ±1.841) – D10 (0.90 ± 1.663) 4.311 , D1 (7.00 ± 1.054) - D10 (0.90 ± 1.663) 11.158 the within group analysis exhibit that there is significant difference ($p<0.05$).

Table 3 Figure3 it exhibits the distribution of (mean value ± standard deviation) F- value and p – value for the intergroup analysis of NPRS on day 1 among the three groups. Group A (5.70 ± 0.95)3.396 group B (5.60 ± 1.84).

3.396 Group C (7.00 ± 1.05)3.396. Significant difference in pain was seen among the groups and the distribution of (mean value ± standard deviation) F- value and p – value for the intergroup analysis of NPRS on day 4 among the three groups. Group A (5.60 ± 0.97)6.88 group B (3.50 ± 1.35) 6.88 Group C (4.60 ± 1.43)6.88. Significant difference in pain was seen among the groups and the distribution of (mean value ± standard deviation) F- value and p – value for the intergroup analysis of NPRS on day 7 among the three groups. Group A (4.90 ± 1.10)10.081 group B (1.60 ± 1.26) 14.081 Group C (2.50 ± 1.84)14.081. Significant difference in pain was seen among the groups and the distribution of (mean value ± standard deviation) F- value and p – value for the intergroup analysis of NPRS on day 10 among the three groups. Group A (4.30 ± 0.95)39.611 group B (0.10 ± 0.32)

39.611 Group C (0.90 ± 1.66)39.611. Significant difference in pain was seen among the groups.

Table 1: Comparison of age among the groups A,B,C

Groups	*MEAN±SD*	*F- value*	*Significance*
Group A	30.30±6.45	1.21	NS
Group B	32.70±2.21	1.121	NS
Group C	29.60±4.93	1.121	NS

NS- Non Significant

Table 2: Shows the within group comparison of NPRS for group A, B and C.

Days	Mean±S.D			t- value			Significance		
	A	B	C	A	B	C	A	B	C
D1	5.70±0.949	5.60 ±1.838	7.00 ±1.054	1	6.678	7.06	NS	S	S
Vs									
D4	5.60±0.966	3.50 ±1.35	4.60 ±1.430						
D4	5.60±0.966	3.50 ±1.354	4.60 ±1.430	3.28	8.143	7.584	S	S	S
Vs									
D7	4.90±1.101	1.60 ±1.265	2.50 ±1.841						
D7	4.90±1.101	1.60 ±1.265	2.50 ±1.841	3.674	4.025	4.311	S	S	S
Vs									
D10	4.30±0.949	1.60 ±1.265	0.90 ±1.663						
D1	5.70±0.949	5.60 ±1.838	7.00 ±1.054	6.332	8.883	11.158	S	S	S
Vs									
D10	4.30±0.949	1.60 ±1.265	0.90 ±1.663						

NS- Non Significant
S - Significant

Table 3: Comparison of NPRS between the groups

Days	Mean±S.D			F- value			Significance		
	A	B	C	A	B	C	A	B	C
D1	5.70 ±0.95	5.60 ±1.84	7.00 ±1.05	3.396	3.396	3.396	S	S	S
D4	5.60 ±0.97	3.50 ±1.35	4.60 ±1.43	6.88	6.88	6.88	S	S	S
D7	4.90 ±1.10	1.60 ±1.26	2.50 ±1.84	14.081	14.081	14.081	S	S	S
D10	4.30 ±0.95	0.10 ±0.32	0.92 ±1.66	39.611	39.611	39.611	S	S	S

NS- Non Significant
S - Significant

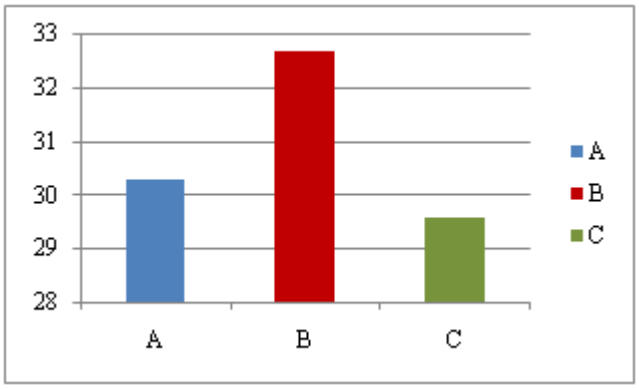

Figure 1: Comparison of age among the groups A,B,C

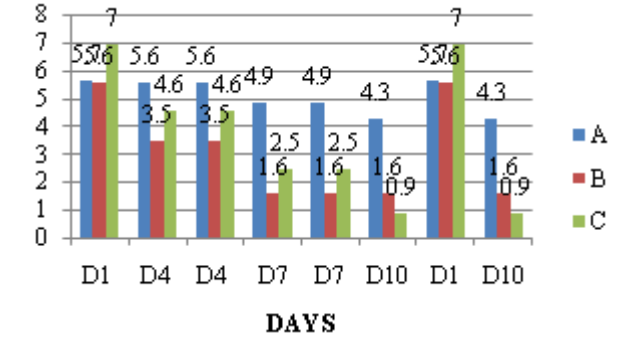

Figure 2: Shows the within group comparison of NPRS for Group A, B and C.

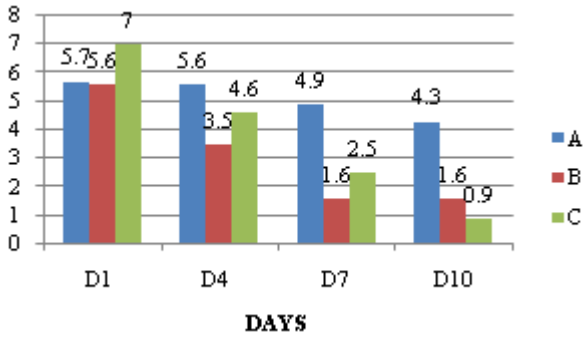

Figure 3: Comparison of NPRS between the Groups

4. Discussion

This study indicates was done to examine the effect of myofascial release and low dye taping in treatment of plantar fasciitis. Results showed that there was statistical Significant improvement in pain within groups and between A, B and C. this study indicates that calf stretching, ultrasound, myofascial release and low dye taping are helpful in reducing pain in plantar fasciitis though myofascial release is significantly more effective.

4.1 Effect of myofascial release along with ultrasound and calf stretching in patient with plantar fasciitis

Myofascial release are helpful in reducing pain as this technique have been shown to stimulate fibroblast proliferation leading to collagen synthesis that may promote

healing of plantar fasciitis by replacing degenerative tissue with stronger and more functional .[5,6] Myofascial release therapy uses hands on manipulation of the whole body to promote healing and relieving pain. The goal of myofascial release is to release fascia restriction and restore its tissue. This technique is used to ease pressure in the fibrous bands of the connective tissue or fascia. Gentle and sustained stretching of myofascial release is believed to free adhesions and softens and lengthens the fascia. By freeing up fascia that may be impending blood vessels or nerves, myofascial release is also said to enhance the body's innate restorative powers by improving circulation and nervous system transmission. Myofascial release for changes in the myofascial structures by stretching elongation of fascial or mobilizing adhesive tissues. [3]

The goal of calf stretching is to relieve the stress that put on the plantar fascia by either the plantar fascia itself being tight or fascia being tightened by tight Achilles that insert on the calcaneus. The stretching aims to reduce the contracture (tightness) of the gastrocnemius and soleus muscle, thereby reducing tension and stress on the plantar aponeurosis and stretching of the triceps surae and plantar fascia have been shown to improve range of the motion of the talocrural joint in dorsiflexion and help in the treatment of plantar fasciitis [7]. Limited dorsiflexion due to shortened calf muscles, cause greater compensatory pronation, increase the risk of the inflammation of the plantar fascia. Therefore calf muscle stretching is employed to increase the range of motion and decrease pressure on the inflamed plantar fascia. [8]

Pulsed ultrasound was used in this study as it's preferred for soft tissue repair and 1MHz was chosen as it is capable of reaching to deeper layer. Pain relief could have occurred due to the non thermal effects of pulsed ultrasound in the form of stimulation of histamine release from mast cells and factors from macrophages that accelerated the normal resolution of inflammation. Ultrasound heats tissues and tissue absorb the energy, resulting in an increase in tissue temperature and metabolism, tissue softening and increase in circulation. [9]

4.2 Effect of low dye taping along with ultrasound and calf stretching in patient with plantar fasciitis

Low dye taping is a means of controlling pain by supporting the internal structures with externally applied non-elastic adhesive tape. Low dye taping stabilizes the head of the first metatarsal during plantar flexion, provides rapid pain relief. [4]However low dye taping provides only transient support , with studies show that as little as 24 minutes of activity can decrease the effectiveness of taping significantly[10]. a significant restriction of pronation in resting calcaneal stance position was initially with the application of tape ,but was lost following 30 minutes of walking. The loss of control following exercise could be due to a reduction in the tape's adhesion to the skin or a loss in the tensile strength of the tape. [11] The role of ultrasound and calf stretching are mentioned above.

Based upon the above mentioned statement we can argue that myofascial release along with ultrasound and calf stretching showed an additional and more significant improvement as compare to low dye taping, ultrasound and calf stretching.

5. Future Scope

Further studies can be done on the basis of BMI(body mass index) for more accurate result.

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