

To Compare the Effectiveness of Muscle Energy Technique versus Myofascial Release in Pain and Lower Limb Functional Activity in Subjects Having Planter Fasciitis - A Randomized Control Trial

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Abstract: ***Background & purpose:** Planter fasciitis is an inflammation of planter fascia causes inferior heel pain. MET teaches Golgi tendon receptor to accept the longer muscle length which provide long-term relief. MFR changes the viscosity of the ground substance to a more fluid state which eliminates the fascia's excessive pressure on the pain sensitive structure and restores proper alignment. **Objective:** To find out the effectiveness of MFR and MET in planter fasciitis, in conjunction with conventional treatment and to compare the effectiveness of Myofascial release (MFR) vs Muscle Energy Technique (MET). **Method:** 30 subjects with the clinical diagnosis of chronic planter fasciitis were randomly allocated by coin method into two study groups. Group A - 15 patients were given therapeutic ultrasound, foot intrinsic muscles strengthening exercises, plantar fascia stretching exercises and MFR. Group B - 15 patients were given therapeutic ultrasound, foot intrinsic muscles strengthening exercises, plantar fascia stretching exercises and MET for 10 consecutive days. **Outcome measures:** VAS, FAAM & Pressure algometry. **Result:** comparison of score obtained by outcome measurers between the groups shows no significant difference between MET and MFR in pain and lower limb functional activity in subjects having planter fasciitis. **Conclusion:** As per results, both MET and MFR technique are found to be effective on pain, pressure pain threshold and on lower limb functional activity.*

Keywords: MET, MFR, Planter fasciitis, FAAM & VAS

1. Introduction

Plantar fascia is plantar aponeurosis, lies superficial to the muscles of the plantar surface of the foot. Planter fasciitis is a painful inflammatory process of the plantar fascia. The Achilles tendon, the calcaneus, and the plantar fascia are the three components of the foot that are involved in this problem.^[1]

With vigorous contraction of the gastroc-soleus muscles pull is applied through the Achilles tendon onto Calcaneum, this pull puts lots of pressure on the calcaneum. The pull of the Achilles tendon is transmitted through the calcaneus to the plantar fascia. When the area of attachment of the plantar fascia to the calcaneum is injured it becomes inflamed. This inflammation is called planter fasciitis.^[2]

Classical presentation of planter fasciitis is pain on the sole of the foot at the inferior region of the heel. Patients report the pain to be particularly bad with the first few steps taken on rising in the morning or after an extended refrain from weight-bearing activity.^[3]

Various physiotherapy treatment protocols such as rest, taping, orthosis-night splint, Silicon heel cups, stretching and myofascial release help in relieving pain. Electrotherapy modalities in the form of ultrasound, phonophoresis, laser, microwave diathermy, iontophoresis, cryotherapy, contrast bath is also proving effective.^[4]

Muscle Energy Technique (MET) is a type of Neuro-Muscular Re-education technique that have evolved out of osteopathic medicine and are designed to lengthen muscle and fascia and to mobilize joints.^{[5],[6],[7],[8]} MET works on

GOLGI TENDON ORGANS. Muscle Energy Technique not only abolishes trigger points in muscles but also relieves pain, painful ligaments and periosteum in the region of attachment. It also helps in reducing hypertonia and lengthening tight muscles.^[9]

Myofascial release (MFR) has been one of the physical therapy treatments given in the chronic conditions that cause tightness and restriction in soft tissues. Myofascial release is a soft tissue mobilization technique. By myofascial release there is a change in the viscosity of the ground substance to a more fluid state which eliminates the fascia's excessive pressure on the pain sensitive structure and restores proper alignment. Hence this technique is proposed to act as a catalyst in the resolution of planter fasciitis.^[10]

Many studies have been conducted on efficacy of MET & MFR independently, but none of study compare the effectiveness of both simultaneously.

The present study was undertaken with the intention to find out the effectiveness of myofascial release and muscle energy technique in planter fasciitis, in conjunction with conventional treatment and to compare the effectiveness of MFR vs MET.

2. Literature Survey

Study design: Randomized clinical trial study

Study setting: This study was conducted in physiotherapy department of AIMS college. All the patients were referred from orthopedic outpatient department

Sampling design: Simple random sampling

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Sample selection: The sample size consisted of 30 patients who were diagnosed as plantar fasciitis, as per the inclusion criteria and exclusion criteria.

Study duration: 6 months. The patients were treated daily (except Sunday) for 10 days, one session daily.

Sample size:

Group A: 15 patients

Group B: 15 patients

Inclusion criteria

- 1) Patients of planter fasciitis diagnosed by orthopedic surgeon.
- 2) Condition more than 6 weeks.
- 3) Pain felt maximally over plantar aspect of heel
- 4) No history of rest pain in heel.
- 5) Age 20-60 year. Both male and female.
- 6) Vas at least 5 points for pain during the first few steps of walking in the morning.
- 7) Those who were willing to participate in the study and willing to take treatment for ten successive days.

Exclusion criteria

- 1) Subjects with clinical disorder where therapeutic ultrasound is contraindicated such as infective conditions of foot, tumor, calcaneal fracture, metal implant around ankle.^[1]
- 2) Subjects with clinical disorder where MET (osteoporosis, arthritis, etc.) and MFR (dermatitis, contagious or infectious disease) is contraindicated
- 3) Subjects with impaired circulation to lower extremities.
- 4) Subjects with referred pain due to sciatica and other neurological disorders.^[11]
- 5) Generalized inflammatory arthritis, including ankylosing spondylitis, reiter syndrome, rheumatoid arthritis, or psoriatic arthritis.
- 6) Subjects who have taken Corticosteroid injection in heel preceding 3 months.
- 7) Subjects with bilateral planter fasciitis.

Materials used in the study:

- 1) Consent form
- 2) Vas scale
- 3) Assessment sheet
- 4) Foot and ankle ability functional scale
- 5) Ultrasound machine
- 6) Examination table
- 7) Cream
- 8) Marbles
- 9) Cloth piece
- 10) Tennis ball
- 11) Pressure algometer
- 12) Goniometer
- 13) Paper, pen, pencil



Figure 1: Materials

3. Method

A total of thirty subjects were selected for the study and assigned to either the group A or group B according to coin sampling method.

Group A was given muscle energy technique along with conventional treatment and group B was given myofascial release along with conventional treatment.

Effect was measured by using VAS, foot and ankle ability measures (FAAM) & pressure algometry.

Procedure

Group-A Muscle Energy Technique^[5]

Technique:

In this study janda post facilitation stretch method is used.

Position of the subject: The subject was asked to lie in supine position with knee extended if there is tightness of gastrocnemius muscle. With the knee of affected leg is flexed if there is tightness of soleus is present.

Application

- 1) The calf muscle is placed in a midrange position about halfway between a fully stretched and a fully relaxed state as shown in Figure 2.
- 2) The patient contracts the calf muscle isometrically, using a maximum degree of effort for 5-10 seconds while the effort is resisted completely.
- 3) On release of the effort, a rapid stretch is made to calf muscle to gain a new barrier, without any 'bounce', and this is held for at least 10 seconds.
- 4) The patient relaxes for approximately 20 seconds and the procedure is repeated between three and five times more. Some sensations of warmth and weakness may be anticipated for a short while following this more vigorous approach.



Figure 2: Starting and End position of ankle during MET

Myofascial Release Protocol ^[11]

Technique: -

In this study, direct myofascial release is used.

Position of the patient: -

Patient is in prone position with foot resting on the edge of the plinth.

Application: -

To apply myofascial release the therapist stand facing the patient's foot. Then with one hand stabilize the ankle and with knuckle of the other hand slowly sink on to the fascia, and apply the pressure of few kg of force. (Figure 3) contact the restricted fascia, then put a tension or stretch the fascia and maintained the stretch for 90 second and apply it for 15 minutes.



Figure 3: Direct MFR

Conventional Therapy Protocol:

It consists of the following:

1. Ultrasound: ^{[3], [4], [8]}

Patient position was prone. Ultrasound was given with the output of 1 watt/cm² for 5 minutes using pulse mode 1:4 ratio with frequency of 1 MHZ for 10 successive days.

2. Exercise for intrinsic muscles strengthening: ^{[3], [13]}

1) 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.

2) Toes curl up with marbles-

Patient in sitting position ask patient to pick up marble from the floor, put it in the bucket.

3. Active ankle exercises: ^[13]

For active ankle exercise –Dorsiflexion, Plantarflexion, Inversion and Eversion in supine lying 10 times.

4. TA stretching: ^[3]

Active achilles tendon stretching in standing by leaning against the wall, holding each stretch for 20 seconds and repeating 5 times each session.

5. Plantar fascia stretching with tennis ball: ^{[3], [12]}

Subjects sitting on the chair rolling foot on the ball for 5 minutes.

Home Program:

- 1) Contrast bath place the foot in warm water container for 4 minutes than in cold water container for 1 minute then repeat the procedure for 20 minutes. ^[14]
- 2) Towel curl up exercise.

- 3) Self-stretching of achilles tendon and plantar fascia
- 4) Patients were advised to avoid bare foot walking and were advised to wear soft heel sleepers.

4. Result

Data was analyzed using statistical software SPSS 16 version. Before applying statistical tests, data was screened for normal distribution. All the outcome measures were recorded at baseline and after 10 days of treatment using appropriate statistical test. Level of significance was kept at 95%. Changes in outcome measures were analyzed within group as well as between groups.

To analyze the difference in the VAS score after 10 days of intervention in both the groups, **paired t-test** was used. For both the groups A and B, p values were <0.0001 in both the groups, showing **extremely significant** difference in VAS score as compared to baseline.

Table 1: Comparison of Mean Vas Score Within Groups A & B

Group	Pre-Treatment		Post Treatment		t value	p value
	Mean	+SD	Mean	+SD		
A	8.07	0.88	2.87	2.00	17.5	<0.0001
B	8.27	0.79	2.60	1.2	19.7	<0.0001

The difference between the improvements in VAS score between two groups was analyzed using **unpaired t-test**. Fort=1.131, p=0.268, showing **no significant** difference in-group A compared to group B.

Table 2: Mean Difference in VAS Score In Between Groups A & B

Difference in VAS score	Group A	Group B	t value	p value
Mean	5.2	5.67	1.131	0.268
±SD	1.15	1.11		

To analyze the difference in the PPT (in kg) after 10 days of intervention in both the groups, **paired t-test** was used. For both the groups A and B, p values were <0.0001 in both the groups, showing **extremely significant** difference in VAS score as compared to baseline.

Table 3: Comparison of Mean PPT Within groups A & B

Group	Pre-treatment		Post treatment		t value	p value
	Mean	+SD	Mean	+SD		
Group A	1.10	0.46	3.36	0.29	19.60	<0.0001
Group B	1.17	0.50	3.53	0.40	19.85	<0.0001

The difference between improvement in PPT (in kg) value between two groups was analyzed using **unpaired t-test**. For t=0.703, p=0.488, showing **no significant** difference in group A compared to group B.

Table 4: Mean Difference in FFI Score between Groups A & B

Difference in PPT	Group A	Group B	t value	p value
Mean	2.27	2.38	0.70	0.488
±SD	0.48	0.44		

ToanalyzethedifferenceintheFAAMscoreafter10 days of in-

tervention in both the groups,

Wilcoxon Signed Rank Test was used. For both the groups A and B, p values were 0.001 showing **extremely significant** difference in FAAM score as compared to baseline.

Table 5: Mean Difference in FFI Score between Groups A & B

Group	Pre-treatment		Post treatment		W value	P value
	Mean	±SD	Mean	±SD		
A	38.17	11.30	82.29	22.27	3.237	0.001
B	36.18	13.29	89.25	9.11	3.408	0.001

The difference between improvement in FAAM value between two groups was analyzed using Mann Whitney U Test. For U=0.703, p=0.547, showing **no significant** difference in group A compared to group B.

Table 6: Mean Difference in FAAM Score Between Groups A & B

Difference in FAAM	Group A	Group B	U value	p value
Mean	49.92	53.07	98	0.54
±SD	1.21	1.42		

5. Discussion

The study showed significant decrease in VAS score (t= 17.56, p = 0.001) in Group A receiving MET. This is in accordance with a study done by Noelle Selkow (2009) [15] Fryer & Fossum C (2008) [16] have hypothesized a neurological explanation for the analgesic effects of MET. The increased tolerance to stretch that results from MET are now considered (Fryer 2006) to be due to a combination of nociceptive inhibition of the dorsal horn of the spinal cord (i.e. gating via mechanoreceptor stimulation during MET) AND/OR localized activation of the periaqueductal grey, producing descending pain modulation AND/OR up regulation of analgesic endocannabinoids AND/OR altered fluid content of connective tissue due to sponge-like behaviour during contractions (and compression) associated with MET-isometric contractions (Klingler et al 2004) [17] AND/OR viscoelastic changes (Lederman 1997).

The study showed significant decrease in PPT (t= 19.60, p = 0.001) in Group A receiving MET. Luke Hamilton, Gary Fryer et al Investigated effect of MET stretch on pressure pain thresholds (PPT) in the suboccipital musculature in an asymptomatic population

According to result, Muscle energy technique and myofascial release technique, both improved in FAAM. Stretching of the plantar fascia and Achilles tendon is considered to be one of the hallmark treatments in the management of plantar fasciitis. The goal of a stretching program is to relieve the stress put on the plantar fascia by either the plantar fascia itself being tight or the fascia being tightened by a tight achilles tendon, as both the plantar fascia and Achilles tendon insert on to the calcaneus. [18]

The study showed significant increase in FAAM (Z= 3.24, p = 0.001) in Group A receiving MET.

MET has been shown to improve muscle extensibility more effectively than passive static stretch both in short and long term (Mehta and Hatton 2006)

Group B receiving MFR showed significant decrease in the VAS score (t = 19.72, p= 0.001). This is in accordance with the study done by Suman kuhar et al (2007) [11] which demonstrated statistically significant decreased VAS score were found on 1st day through 10th day of MFR. myofascial release is believed to free adhesions and softens and lengthens the fascia. By freeing up fascia that may be impeding blood vessels or nerves, myofascial release is also said to enhance the body's innate restorative powers by improving circulation and nervous system transmission.

The study showed significant decrease in PPT (t= 19.85, p = 0.001) in Group B receiving MFR. The proposed mechanism of pain relief by MFR Vertical release involved the application of pressure at depth to the offending lesion which is considered to be the cause of pain reduction.

This pressure and movement in itself is of sufficient insult to normal tissues as to cause minor damage, resulting in the release of inflammatory chemicals such as histamine and bradykinin. These chemicals will have an effect upon the local circulation and on nociceptors (Williams et al 1989, Campbell et al 1989). The inflammatory chemicals will cause a local vasodilatation seen as traumatic hyperaemia. This last for a considerable time and may in itself have beneficial effects in terms of accelerating

The study showed significant increase in FAAM (Z= 3.40, p = 0.001) in Group B receiving MFR.

MFR is also effective in improving range and muscle extensibility in accordance with study done by AERON LEBAV-ER et al (2008) who showed that effect of MFR on an adult with idiopathic scoliosis. The subject improved with pain level, trunk rotation, posture, quality of life and pulmonary function.

6. Conclusion

Muscle Energy Technique and Myofascial Release were effective in reducing pain and improving PPT and function of lower limb in subjects with planter fasciitis. Both the treatments were effective in reducing pain and improving PPT and lower limb function.

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