



RESEARCH ARTICLE

EFFECT OF MUSCLE ENERGY TECHNIQUE IN PAIN AND LOWER LIMB FUNCTIONAL ACTIVITY IN SUBJECTS HAVING PLANTER FASCIITIS- A RANDOMIZED CONTROL TRIAL

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ARTICLE INFO

Article History:

Received 28th March, 2017

Received in revised form

19th April, 2017

Accepted 22nd May, 2017

Published online 30th June, 2017

Keywords:

MET,

Planter fasciitis and RCT.

ABSTRACT

Question: Is the Muscle Energy Technique being effective in pain and lower limb functional activity in subjects having planter fasciitis?

Design: Randomized control trial.

Participants: 30 subjects with the clinical diagnosis of chronic planter fasciitis were randomly allocated by coin method into two study groups.

Intervention: Group A (control) 15 patients was given therapeutic ultrasound, foot intrinsic muscles strengthening exercises, planter fascia stretching exercises and Group B(experimental) 15 patients was given conventional treatment as group an added MET for 10 consecutive days.

Outcome measures: VAS, FAAM & Pressure algometry.

Results: comparison of score obtained by outcome measurers between the experimental and control group shows significant result (p value < 0.001). The mean value shows that experimental group is more significant than the control group.

Conclusion: experimental group showed better improvement in pain relief and increase in functional activity level. It can be said that MET if incorporated into the conventional treatment provide a better outcome than conventional.

INTRODUCTION

Plantar fascia is plantar aponeurosis, lies superficial to the muscles of the plantar surface of the foot. Plantar 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 (Dr. Jon Greenfield, 2001). 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 plantar fasciitis (Mario Roxas, 2005). Classical presentation of planter fasciitis–The classic presentation of PF 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 (Roberts, 2001). Various physiotherapy treatment protocols are 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 (Hronkova, 2000). MET is a type of Neuro-Muscular Re-education. MET are manipulative procedures that have evolved out of osteopathic medicine and are designed to lengthen muscle and fascia and to mobilize joints (Chaitow, 1996; Clark, 2001; Ellerines *et al.* , 1999; Mitchell, 1993 and Wilson, 2003). MET works on GOLGI TENDON ORGANS. MET teaches these receptors to accept the longer muscle length (Kaelyn, 2000). Several conservative treatments almost all the above-mentioned forms of therapy provide relief of symptoms. However, there is no consensus on what is the best treatment option for plantar fasciitis. Stretching has been identified as one of the best, safe and cost effective conservative therapy for plantar fasciitis (Hronkova, 2000; Crawford, 2000; Simons, 1984 and Kisner, 2007). To effectively treat the shortened plantar fascia, the goal of the stretching program is to reach the plastic deformation state. Studies have indicated the effectiveness of various stretching programs with documented decrease in pain on first steps in the morning, and relief of other symptoms associated with plantar fasciitis (Hronkova, 2000 and Crawford, 2000). One study has shown high success rate with a stretch of planter fascia, but has been criticized because it was not blinded & contained a bias because the analysis did not use the intention to treat method. Because it is impractical to do double – blind

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experiments involving stretching, such studies are vulnerable to placebo effects. The center for evidence based medicine has not rated any study of stretching as being of high quality. Hence many studies have been conducted which suggest that MET is effective than stretching in hamstring tightness but no studies are conducted to see the effectiveness of MET on planter fasciitis. The present study was undertaken with the intention to find out the effectiveness of muscle energy technique in plantar fasciitis.

The research questions were:

- Is the Muscle Energy Technique being effective in pain and lower limb functional activity in subjects having planter fasciitis?

MATERIAL AND METHODS

Design: Randomized control trial

Participants, Therapists, Centers: Total 30 patients diagnosed with chronic planter fasciitis.

Inclusion criteria

- Patients of planter fasciitis diagnosed with orthopedic surgeon.
- Condition more than 6 weeks.
- No history of rest pain in heel.
- Age 20-60 year. Both male and female.
- VAS at least 5 points for pain during the first few steps of walking in the morning.

Exclusion criteria

- Subjects with clinical disorder where therapeutic ultrasound is contraindicated such as infective conditions of foot, tumor, calcaneal fracture, metal implant around ankle.¹⁴
- Subjects with clinical disorder where MET (osteoporosis, arthritis, etc) and MFR (dermatitis, contagious or infectious disease) is contraindicated.
- Subjects with impaired circulation to lower extremities.
- Subjects with referred pain due to sciatica and other neurological disorders.¹⁴
- Generalized inflammatory arthritis, including ankylosing spondylitis, reiter syndrome, rheumatoid arthritis, or psoriatic arthritis.
- Subjects who have taken Corticosteroid injection in heel preceding 3 months.
- Subjects with bilateral planter fasciitis.
- Centers - AIMS, Red cross society and K .M trust, Ahmedabad. Gujarat.

Intervention

The selection of subjects was done by Simple random sampling. A total of thirty subjects were selected for the study and assigned to either the group A or group B according to their order of appearance by coin method. On the first visit, a complete orthopedic assessment was done. Subjects who were suitable for the participation in the study were requested to sign

consent form. Pre-participation evaluation form consisted of VAS , FAAM and PPT.

Clinical intervention

Study participants were requested to continue normal activities and avoid other forms of treatment for the duration of the study, apart from routine physician management. Subjects other than the designated protocol were not permitted to administer any other forms of electrotherapy or other techniques (steroids, acupuncture, or taping) during the intervention period of the trial. The subjects were divided into two groups, 15 in each group. All subjects were randomly selected and assigned to each group. Group A was given conventional treatment and group B was given *MEt al ong* with conventional treatment.

Group A (Control Group) was given therapeutic ultrasound (1 MHz, 1 watt/cm², pulsed mode 1:4,5 minutes) (Mario Roxas, 2005; Roberts, 2001 and Hronkova, 2000), foot intrinsic muscles strengthening exercises, plantar fascia stretching exercises.

Group-B Muscle Energy Technique (Chaitow, 1996)

Technique: In this study janda's 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 calf muscle. With the knee of affected leg is flexed if there is tightness of soleus is present.

Application

- The calf muscle is placed in a midrange position about halfway between a fully stretched and a fully relaxed state as shown in Figure 1.
- The patient contracts the calf muscle isometrically, using a maximum degree of effort for 5-10 seconds while the effort is resisted completely.
- 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. (Figure 2)
- 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.
- Effect was measured by using VAS, foot and ankle ability measures (FAAM) & pressure algometry

Outcome measures

Primary outcome

VAS scale is a self-assessing questionnaire which is an ordinal scale, using a 10-cm line divided into 10 equal sections, with 0 representing "no pain" and 10 representing "unbearable pain". Each participant was asked to indicate on the scale the level of pain. The patient would be marking on the scale himself indicating as a subjective experience.



Figure 1. Starting position of ankle during MET



Figure 2. End position of ankle during MET

Secondary outcomes: The foot and ankle ability measure (FAAM) is a self-report outcome instrument developed to assess physical function for individuals with foot and ankle related impairments. The foot and ankle ability measure is a 29-item questionnaire divided into two subscales: the foot and ankle ability measure, 21-item activities of daily living subscale and the foot and ankle ability measure, 8-item sports subscale. The sports subscale assesses more difficult tasks that are essential to sport, it is a population-specific subscale designed for athletes.

Secondary outcomes: Pressure Algometer (Chesterton, 2007; Pottera, 2006 and Nussbaum, 1998): has internationally been used by clinicians as an objective tool in the assessment of myofascial pain. It quantifies pressure pain threshold, the minimal pressure that causes pain. Pressure algometry can objectively and quantitatively document the improvement that corresponds to relief of pain.

Data analysis

The study comprised of total 30 subjects with plantar fasciitis; 15 subjects in each group. Data was analyzed using statistical software SPSS 20 version. Before applying statistical tests, data was screened for normal distribution. All the outcome measures were analyzed 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 between the groups.

RESULTS

Flow of participants, therapists, centers through the study: The mean age of patients in Group A & Group B is 45.00 years and 47.00 years respectively. The standard deviation in Group A & Group B is 11.26 and 12.99 respectively.

Table 1. Age (in years) distribution of the patients

Age group	Mean	Standard deviation
Group A	45.00	11.26
Group B	47.00	12.99

Table 2 displays the group statistics of Body Mass Index (BMI) among 30 subjects. The mean BMI of 15 patients in Group A was 25.85 kg/m² with standard deviation 4.29. In the Group B the mean BMI was 24.79 kg/m² with standard deviation 2.88.

Table 2. Mean bmi distribution of the patients

BMI	Mean	Standard deviation
Group A	25.85	4.29
Group B	24.79	2.88

Research question 1

Comparison of score obtained by VAS, FAAM & pressure algometry between the experimental and control group shows significant difference (p value < 0.001).

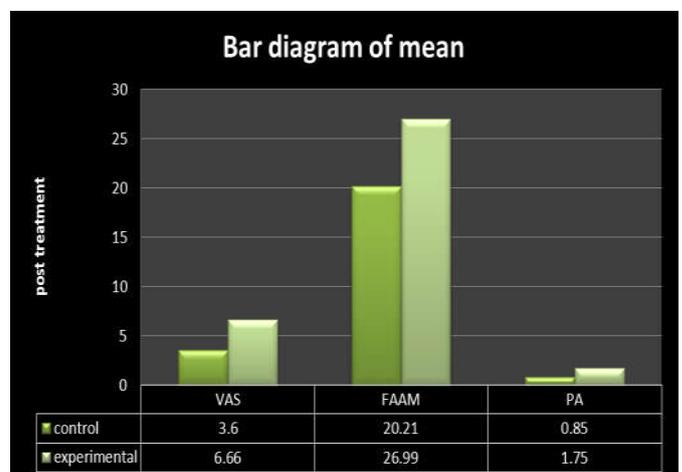


Fig. 3. Bar diagram showing Mean differences of VAS,FAAM and Pressure algometer

DISCUSSION

The present study was done to compare the effectiveness of MET in pain and lower limb functional activity in subjects having plantar fasciitis with mean age of 45.0±11.26 years in Group A and 47.00±12.99 years in Group B. As per results, Muscle energy technique are found to be effective on pain, pressure pain threshold and on lower limb functional activity within the group. The study showed significant decrease in

VAS score ($t = 17.56$, $p = 0.001$) in Group A receiving MET. MET may be better than others in decreasing pain for several reasons. The time it takes to administer MET is very short (less than 1 minute). It also allows the clinician to have physical contact with the patient, helping the patient to trust the clinician. Lastly, MET technique can be accomplished without causing further pain or harm to the patient. This is in accordance with a study done by Noelle Selkow (2009)¹⁸ who showed the effects of Muscle energy technique on pain in patients with non-specific lumbo-pelvic pain and demonstrated a decrease in VAS score. The decrease in VAS score by MET is also hypothesized by a neurological explanation for the analgesic effects of MET. The increased tolerance to stretch that results from MET are now considered (Fryer 2008)¹⁹ 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), localized activation of the periaqueductal grey, producing descending pain modulation, up regulation of analgesic endocannabinoids, altered fluid content of connective tissue due to sponge-like behavior during contractions (and compression) associated with MET-isometric contractions (Klingler *et al* 2004) and viscoelastic changes (Lederman 1997).

The study showed significant decrease in PPT ($t = 19.60$, $p = 0.001$) in Group A receiving MET. Myofascial trigger point deactivation has been shown to be enhanced by use of Muscle energy technique (Fernandez de las penal *et al* 2005). Also Luke Hamilton, Gary Fryer *et al* Investigated effect of MET stretch on pressure pain thresholds (PPT) in the suboccipital musculature in an asymptomatic population. They found that Muscle energy technique produced greater mean increases in PPT and effect sizes compared to the control group. They recommended effect of these techniques in a symptomatic population (Klinger, 2004). 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 onto the calcaneus.²¹ So stretching of either calf or planter fascia will reduce the stress on planter fascia and reduce the inflammation and pain due to planter fasciitis. By improving the flexibility of planter fascia and calf, patient can improve their daily functional activity which shows improvement in FAAM.

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)²² and as the muscle extensibility of calf increase with MET on calf muscle there will be less stress on planter fascia which directly improves the function of patients. This is in accordance with the study done by Ross A Clarkin 2008 they stated that MET, which can maintain muscle elongation for certain duration, may produce increase in muscle length by a combination of creep and plastic change in the connective tissue which results in the increases in the ROM.²³ MET stimulates joint proprioceptors, via the production of joint movement, or the stretching of a joint capsule. This may, be capable of reducing pain by inhibiting

the smaller diameter nociceptive neuronal input at the spinal cord level. (Hamilton 2007).²² So by decreasing pain and improving range of motion it improves lower limb functional activity.

Conclusion

On the basis of present study, it can be concluded that both the conventional treatment and MET have found to be effective in alleviation of symptoms in plantar fasciitis, However the subjects treated with MET showed an additional benefit in terms of reduction of pain on VAS & PA and functional ability in terms of FAAM.

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