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Exploring the Effect of Muscle Energy Technique on Hamstring Tightness in Planter Fasciitis Patient: A Case Study

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ABSTRACT

Background: Plantar fasciitis (PF) is a common cause of heel pain and is often associated with alterations in the lower limbs' biomechanics. According to recent research, hamstring tightness may put more strain on the plantar fascia via the posterior kinetic chain. The Muscle Energy Technique (MET), an active manual therapy that aims to improve neuromuscular control and muscle flexibility, may be useful in treating posterior kinetic chain tightness. Nevertheless, there is still no research on the application of MET to hamstring tightness in the treatment of plantar fasciitis.

Presentation of a Case: A 46-year-old male OT technician arrived with a 4-month history of left posterior heel pain, morning stiffness, and difficulty walking, which was exacerbated by prolonged standing. The clinical results indicate that the Windlass test was positive, ankle dorsiflexion was decreased, dorsiflexor strength was decreased, and hamstring and calf tightness was present. On the heel X-ray, a spur was also visible in the calcaneal area. The Numerical Pain Rating Scale (NPRS) was used to measure pain, the Foot Function Index (FFI) was used to measure function, and the Manual Muscle Testing (MMT) and goniometry were used to measure strength and mobility.Intervention: A two-week physiotherapy program was implemented, encompassing icing, therapeutic ultrasound, stretching and strengthening exercises for the foot and calf, and MET targeting the hamstring muscle, accompanied by a home exercise regimen.

Results: Ankle dorsiflexion range of motion (10° to 16°), dorsiflexor strength (MMT: 3/5 to 5/5), function (FFI: 46% to 20%), and pain (NPRS: 6/10 to 3/10) all significantly improved after the intervention.

Conclusion- this case study suggests that incorporating MET for hamstring tightness into an all-encompassing physiotherapy program may reduce pain, improve ankle strength and mobility, and improve functional outcomes for people with plantar fasciitis. In addition to standard treatment for plantar fasciitis, addressing proximal kinetic chain dysfunctions may be beneficial. To confirm these results, more controlled studies with bigger sample sizes are required.

Keywords: muscle energy technique, kinetic chain, hamstring tightness, and planter fasciitis

BACKGROUND

Plantar fasciitis (PF) is one of the main causes of heel pain, which is a common issue among people. It is primarily a degenerative process that is accompanied by tiny tears in the plantar fascia. It affects roughly 10% of the general population at some point (1), with a higher rate in people with higher BMIs and those who have long-standing jobs like traffic police, walking, or running. The prevalence is higher in women

than in men and in the 45–65 age range (1). According to certain research, young athletes have a higher prevalence rate of about 22% of PF (2).

There may be several contributing factors. Repetitive strain often results in microtears of the plantar fascia from its insertion into the medial and posterior calcaneal tubercle, causing degeneration, weakening, and rupture that causes excruciating pain, particularly during the first step in the morning.Pes planus and cavus, excessive pronation, and supination are some predisposing factors that lead to excessive strain on the planter fascia (3). The primary focus of management is on conservative, non-invasive techniques. These include stretching exercises for the plantar fascia and calf muscles, ice massage for pain relief, and the use of night splints to maintain the foot in a neutral position and reduce morning symptoms. Iontophoresis, deep myofascial massage, heel cups or foot orthoses, and recent studies show that methods such as extracorporeal shock wave therapy may help degenerative tissue heal and encourage neovascularization (4). Although PF primarily affects the foot, some research indicates that kinetic chain dysfunctions, especially in the posterior muscle group, may be a significant factor in the condition's development.

Hamstring tightness is often linked to altered lower-limb mechanics, such as reduced hip flexion, limited knee extension, and compensatory foot movements, because the fascia system connects the body. Because shortened hamstrings increase tension throughout the posterior kinetic chain, including the calf complex and plantar fascia, they may result in abnormal loading patterns during gait. This could result in strain on the plantar fascia and excessive forefoot loading during walking. The strain on the plantar fascia as the body attempts to compensate is another factor contributing to the tightness in the hamstrings. This connection implies that proximal areas should be treated in addition to the plantar fascia when treating plantar fasciitis.

Muscle Energy Techniques (MET) is an active manual therapy method in which a therapist applies controlled resistance to voluntary muscle contractions. These methods are known to enhance joint mobility, encourage relaxation, increase muscle flexibility, and lessen pain through mechanisms like autogenic and reciprocal inhibition. Although MET is frequently used to treat tight muscles, its potential to treat plantar fasciitis by focusing on the proximal posterior chain has not been fully investigated.

Given the biomechanical connection between hamstring flexibility and stress on the plantar fascia, using MET to improve hamstring flexibility may serve as a beneficial complementary intervention for reducing plantar fasciitis symptoms. This case study seeks to evaluate the effectiveness of MET in decreasing hamstring tightness and its impact on functional improvement in an individual with PF.

CASE PRESENTATION-

A 46-year-old man who works as an OT technician in a hospital presents to the physiotherapy department complaining of left posterior heel pain that has been accompanied for the last four months by stiffness in the plantar aspect of his foot. After standing for a while and taking the first few steps in the morning, the pain was excruciating, persistent, and occasionally acute.

Walking is uncomfortable for the patient. decreased foot dorsiflexion range. He has a history of standing for extended periods of time. The Numerical Pain Rating Scale (NPRS) is used to assess the patient's level of pain, and the patient gave it a score of six out of ten. There is no swelling, a grade 1 tenderness in the plantar aspect of the left heel, tightness in the calf and hamstring muscles, and a decrease in the left side's dorsiflexion strength following manual muscle testing. decreased foot dorsiflexion range as determined by goniometer. The Windlass test came back positive. The X-ray reveals a calcaneal spur following the radiological examination.

The patient was diagnosed with plantar fasciitis based on the aforementioned findings. Additionally, the same treatment was administered. The patient was given an explanation of the two-week treatment plan, which included a home exercise program.
The patient's physiotherapy schedule is as follows:
Ten minutes for icing
Ultrasound: 1.5 watts per centimeter, continuous mode, 1 MHz frequency
Plantar fascia stretching exercises To stretch the plantar fascia, the patient simultaneously dorsiflexes the foot and toes while maintaining a firm grip on the toes. For ten repetitions, ask the patient to maintain this posture for ten seconds before letting go. A softball rolling beneath the foot's plantar aspect
Calf Muscle: The patient can stretch the Achilles tendon and gastrocnemius muscle by placing a towel beneath the plantar fascia, keeping the leg straight, and pulling the towel upward.
Strengthening exercises include toe curls, toe spreading, toe and heel raising, pebble lifting, and Thera-Band exercises.
MET for Hamstring Muscle: The patient is not being treated and is lying supine. The right limb is extended, and the hip and knee on the left side are flexed. The left knee is then extended until the initial resistance is eliminated. Next, give the agonist hamstring muscle an isometric resistance, hold it for five to seven seconds, repeat three times, and then switch to a new resistance range.
The outcome measures include the Foot Function Index (FFI), the NPRS for pain, the Goniometer for range of motion, and the Manual Muscle Testing (MMT) for muscle strength.

UNIQUENESS-
This study is unique in that it emphasizes hamstring tightness, a proximal biomechanical factor, rather than local plantar fascia-directed therapies, thereby reinforcing kinetic-chain and fascial-continuity concepts in the treatment of plantar fasciitis.
This study presents clinical evidence for MET as a safe, noninvasive addition to conventional physical therapy. MET has been shown to improve hamstring flexibility, but its precise use in treating plantar fasciitis by altering proximal tightness is not well understood. The study combines posterior chain biomechanics with a fascia-based logic to support a mechanism-driven rehabilitation approach rather than symptom-based therapy.

RESULT - For Pre- assessment and post-assessment

Outcome measures	Pre- assessment	Post assessment
NPRS	6/10	3/10
Planter-flexors (ROM)	45°	45°
Dorsiflexors (ROM)	10°	16°
Planter-flexors (MMT)	5/5	5/5
Dorsiflexors (MMT)	3/5	5/5
FFI	46%	20%

Following the intervention, the outcome measurements revealed significant changes. According to the NPRS, pain levels dropped from 6/10 at baseline to 3/10 at post-assessment. Better ankle mobility was indicated by a change in ankle range of motion from 10° to 16° in dorsiflexion. Dorsiflexor strength on

the MMT significantly improved from 3/5 to 5/5, indicating a return to normal muscular strength. FFI scores showed a significant improvement in foot function, falling from 46% to 20%.

In conclusion, the findings show improved overall functional outcomes after the intervention, decreased discomfort, and increased dorsiflexion strength and range of motion.

DISCUSSION:

The effect of Muscle Energy Technique on hamstring tightness in PF patients was examined in this study. Plantar fasciitis and hamstring tightness have been linked more often in recent years. According to Sarfraz et al. (2023), the Active Knee Extension test revealed that individuals with PF had significantly more hamstring tightness than those without PF, indicating that a certain level of restricted hamstring extensibility may be linked to the onset and/or worsening of PF symptoms (5).

Similarly, Mohamed A. Sayed et al. (2019) found a strong inverse relationship between the hamstrings' range of motion and the thickness of the plantar fascia. This implies that the stress and thickness of the plantar fascia increase with hamstring tightness (6). Overall, these results support the hypothesis that improving hamstring flexibility may benefit PF patients therapeutically.

Increasing muscle and joint range of motion is a common goal of the Muscle Energy Technique, a manual therapy approach that combines stretching and isometric muscle contractions. MET is more effective than static stretching or no treatment for increasing hamstring flexibility, according to a recent systematic review and meta-analysis by Kang et al. (2023). This is likely because of its special combination of neuromuscular and mechanical effects on muscle tissue (7). These findings are consistent with the current study, which demonstrated that MET therapy is an effective treatment for hamstring tightness linked to PF by significantly increasing hamstring flexibility in patients with plantar fasciitis.

Nevertheless, there is conflicting evidence regarding the use of MET in PF. In people with chronic plantar fasciitis, Sarkar et al. (2018) compared MET with myofascial trigger point release and stretching. He discovered that while all of the interventions in his study showed improvement, myofascial trigger point release outperformed MET in terms of reducing pain and tenderness (8). This supports the theory that other soft tissue therapies, like trigger point release, may be more effective in treating pain and tenderness in PF, even though MET may be useful in improving flexibility. The inclusion of standardized self-stretching in all intervention groups with MET is noteworthy; Sarkar et al. suggest that MET may be most effective when used as an adjunct.

Additionally, according to other research, hamstring tightness is a significant factor in lower limb kinematic pattern disruption. According to a prospective study, hamstring tightness raises the risk of developing plantar fasciitis regardless of factors like heel spur presence and body mass index.

Excessive force application and forefoot loading during walking can result from hamstring tightness, which can disrupt normal gait mechanics and increase the load on the plantar fascia. The clinical significance of treatments like MET that aim to modify hamstring flexibility is highlighted by these biomechanical implications.

However, studies on flexibility interventions in general have also demonstrated positive outcomes. For instance, a pilot study by Krishna et al. (2020) found that traditional hamstring stretching combined with conventional therapy greatly enhanced PF's functional ability and reduced pain (9).

While increasing flexibility is the goal of both MET and traditional stretching, systematic reviews have shown that MET also initiates neuromuscular adaptations that may enhance flexibility gains.

CONCLUSION-

Overall, the current outcome is in line with the body of research showing that, as part of the treatment of plantar fasciitis, hamstring tightness can be effectively treated with MET or other soft tissue techniques. By normalizing lower extremity biomechanics, MET appears to be beneficial in improving hamstring extensibility and may also indirectly reduce plantar fascia strain. MET is used in clinical settings as a non-invasive, safe treatment for PF.

By addressing contributing dysfunctions farther away than in close proximity to a painful area, the incorporation of MET into routine physiotherapy procedures may improve outcomes. This entire strategy is consistent with contemporary rehabilitation techniques that emphasize treating the entire kinetic chain rather than just the affected area. To address flexibility and pain issues more thoroughly, MET likely functions best when combined with other interventions like myofascial release, trigger point therapy, or conventional stretching, according to the variability in results.

LIMITATIONS AND FUTURE SCOPE-

Despite the positive outcomes, there are certain issues that need to be resolved. Generalization may be limited by the length of the intervention and the relatively small sample size of one participant. Furthermore, without long-term follow-up, it is difficult to evaluate the durability of MET in relation to hamstring flexibility and plantar fasciitis symptoms.

Large sample size experimental studies that directly compare MET to other soft-tissue and manual therapy approaches in patients with plantar fasciitis should be the main focus of future research. To further clarify the long-term effects of hamstring flexibility on plantar fasciitis symptoms and function, a long-term follow-up evaluation would be beneficial.

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