



ORIGINAL ARTICLE

A COMPARATIVE STUDY OF MULLIGAN MOBILIZATION VERSUS PROPRIOCEPTIVE EXERCISE ALONG WITH CONVENTIONAL THERAPY IN PLANTAR FASCIITIS

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ABSTRACT

Background: Plantar fasciitis is a prevalent musculoskeletal condition characterized by heel pain and functional limitation, often linked to restricted ankle mobility and impaired proprioception. Effective interventions targeting these impairments can enhance recovery outcomes. **Objective:** To evaluate and compare the effectiveness of Mulligans Mobilization with Movement (MWM) for the talocrural joint and proprioceptive exercises in patients with plantar fasciitis. **Methods:** A total of 30 patients diagnosed with plantar fasciitis were randomly assigned into two groups. Group A (n=15) received Mulligans MWM for the talocrural joint, while Group B (n=15) received proprioceptive exercises. Both groups underwent treatment for 8 weeks. Outcome measures included pain intensity (NPRS) and functional ability (Foot and Ankle Ability Measure FAAM), assessed at baseline and post-intervention. **Results:** Group A demonstrated significantly greater improvements in pain reduction, ankle mobility, and functional outcomes compared to Group B ($p < 0.05$). While both interventions were beneficial, the addition of MWM produced superior clinical effects. **Conclusion:** Mulligans Mobilization with Movement is a significantly effective intervention in improving pain, mobility, and function in patients with plantar fasciitis, compared to proprioceptive exercises alone. It is recommended as a primary treatment approach in managing plantar fasciitis-related impairments.

Keywords: Plantar fasciitis, Mulligan mobilization, Mobilization with movement (MWM), Talocrural joint, Proprioceptive exercises, Ankle rehabilitation.

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INTRODUCTION

Plantar fasciitis occurs due to degenerative irritation at the origin of the plantar fascia, located at the medial calcaneal tuberosity of the heel and the surrounding peri fascial structures. The plantar fascia plays an essential role in the normal biomechanics of the foot and comprises three segments arising from the calcaneus. The fascia is essential in supporting the arch and providing shock absorption. Despite featuring the -itis suffix in the diagnosis, this condition stands out for its absence of inflammatory cells¹.

Plantar fasciitis is one of the most common causes of heel pain, affecting millions of individuals worldwide each year. It involves inflammation of the plantar fascia, a thick band of tissue that connects the heel bone to the toes and supports the arch of the foot (Buchanan et al., 2020). The condition typically presents with stabbing pain, especially with the first steps in the morning or after prolonged periods of rest. While plantar fasciitis is often associated with athletes, particularly runners, it can affect a wide range of people, including those who are overweight or who engage in occupations requiring prolonged standing (Cole et al., 2005).

Thick bands of fascia and connective tissues that form plantar arches strengthen the foot's structural integrity, promoting easy walking and weight bearing by improving biomechanical alignment and the foot's optimal physiological functioning.

Across the foot's plantar surface is a broad, fibrous aponeurosis called the plantar fascia. It stems from the anterior and medial sides of the calcaneus and aids in the division of the foot's intrinsic plantar muscles into three separate

compartments: lateral, central, and medial. The plantar fascia creates five digital bands at the metatarso phalangeal joints on the distal side. According to Zhang et al. (2018), each digital band then splits to pass on each side of the flexor tendons before entering the periosteum at the base of the proximal phalanges².

The strongest, thickest, and most frequently involved band in PF is the central band, also known as the plantar aponeurosis. It splits into five bundles at the mid tarsal level (Riddle et al., 2003, Rizk et al., 2017). Through the windlass mechanism, the plantar fascia oversees elevating and supporting the arch during stride³.

The plantar fascia plays an essential biomechanical role within the foot, contributing significantly to proper foot and lower limb mechanics during weight-bearing activities in daily life.

During the push-off phase of gait (propulsion), as the heel lifts and the first metatarso phalangeal joint (MPJ) dorsiflexes, the windlass mechanism is activated, resulting in a moment that raises the medial longitudinal arch and encourages STJ supination (Ward, 2003). Simultaneously, contraction of the gastrocnemius and soleus muscles increases tension in the Achilles tendon, which passes medially to the STJ axis. This tendon tension generates a supination moment at the STJ, aiding the natural supination process during propulsion. Thus, hallux dorsiflexion during gait assists these muscles in achieving the necessary supination for efficient foot function⁴.

Flatfoot deformity, characterized by a diminished medial longitudinal arch, is notably common, with an incidence of up to 78% (Sung, 2016). It can present as either rigid or flexible

flatfoot. In rigid flatfoot, the arch is remains absent in both weight-bearing and non-weight bearing states, whereas in flexible flatfoot, the arch is visible when non-weight-bearing but collapses during weight-bearing ⁵.

Specific exercises targeting the plantar fascia, Achilles tendon, and intrinsic foot muscles are a cornerstone of plantar fasciitis management. Focused stretching of the Achilles tendon and plantar fascia has been shown to significantly reduce pain and improve function (Di Giovanni et al., 2003) ⁶.

Strengthening exercises for the intrinsic foot muscles, such as toe curls (using a towel to curl toes) and marble pickups, enhance foot arch support and reduce stress on the plantar fascia (Cheung et al., 2016). These exercises improve foot biomechanics and have been associated with reduced pain in patients with chronic plantar fasciitis⁷.

Plantar fasciitis (PF) is a commonly encountered musculoskeletal disorder, primarily marked by heel pain and typically attributed to repetitive stress, biomechanical irregularities, or insufficient foot support. Manual therapy has gained recognition as a beneficial treatment modality for alleviating pain and enhancing functional capabilities in those affected by PF. This therapeutic approach encompasses various hands-on techniques, including soft tissue mobilization and targeted joint manipulations of the foot and ankle. Evidence from case series indicates that mobilization and manipulation of specific joints such as the talocrural, subtalar, and first tarso-metatarsal joints can lead to rapid symptom relief and improved mobility, suggesting these methods effectively address underlying biomechanical issues⁸.

Proprioceptive exercises, designed to enhance the body's awareness of its position and movement in space, particularly around the ankle and foot, are highly effective in managing plantar fasciitis, a common condition that disrupts normal foot biomechanics, leading to pain and reduced function. These exercises, including foot core exercises, target the intrinsic muscles of the foot and lower leg, which are critical for supporting the arches and maintaining proper foot mechanics. By improving the stability and strength of these muscles, foot core exercises enable more uniform force distribution across the foot, reducing pressure on the plantar fascia⁹.

Research demonstrates there is proprioceptive training, such as single-leg stance and wobble board exercises, significantly alleviates pain and enhances function by promoting better load distribution (Cheung et al., 2016). Additionally, Rathleff et al. (2015) found that a 12-week proprioceptive exercise program outperformed stretching alone in pain reduction and functional recovery, underscoring the importance of improved neuromuscular coordination.

Proprioceptive exercises also help prevent symptom recurrence, with Lee et al. (2019) reporting lower recurrence rates over a one-year follow-up in patients incorporating these exercises¹⁰.

MATERIALS AND METHODS

The study was conducted at JKKMMRF College of physiotherapy outpatient department. The patients were informed about the whole procedure and treatment methods. A written consent was obtained from the participation people in this study. There were 30 patients with plantar fasciitis were selected based on

the inclusion and exclusion criteria and they were divided into 2 groups, group A and group B.

Group A was treated by Mulligan Mobilization with Movement on Talocrural Joint.

Group B was treated by Proprioceptive Exercises for Ankle Joint. Both groups treated by Cryotherapy commonly after the interventions. Numerical pain rating scale [NRPS] And Foot and Ankle ability Measure [FAAM] were used as outcome measures. Each patient was given a therapy program for 8 weeks duration. The pre and post treatment values were measured before and after 8 weeks for comparison study.

Inclusive Criteria: Age group of 30–55 years, Both Gender, Patients with plantar fasciitis which was diagnosed by an Orthopedician, Pain in the morning when taking the first steps or prolonged rest (Sasun 2024), Unilateral involvement, Patients who give consents willing to participate in the study, Pain measured on Numerical pain scale of ≤ 8 , Plantar fasciitis with the duration more than 1 month.

Exclusive Criteria: Red flag like Tumor, Tuberculosis spine, Rheumatoid Arthritis Pregnant women, Recent lower limb fractures (past 6 months), any systemic illness like Rheumatism, A positive diagnosis of fat pad syndrome, Patient with the history of Tarsal tunnel syndrome, ligament injury around ankle or congenital tight TA, and Sub talar arthritis, the patients who injected with corticosteroid. (past 6 months) (Sasun 2024), patients with any significant cardiac problem, Uncooperative participants are excluded from the study.

Procedure and Protocols

Patients diagnosed with plantar fasciitis, referred to the physiotherapy department by the chief Orthopedician, underwent a thorough evaluation to determine eligibility for a clinical study. A researcher screened all referred patients based on predefined inclusion criteria and exclusion criteria, 30 individuals with plantar fasciitis who visited the outpatient department (OPD) and consented to participate, were enrolled in the study and randomly assigned to two groups, with 15 participants in each Group A and Group B.

GROUP A

MulliganS Mobilization with Movement (MWM)

Group A, received Mulligans Mobilization with Movement (MWM) targeting the talocrural joint.

The patient assumed a high-kneeling position with the affected ankle in a weight-bearing neutral stance, supported by holding onto a table for stability. A belt with a pad was placed over the inferior margin of the medial malleolus, with the same belt and pad used for all participants. The therapist stabilized the talus and calcaneus while gently drawing the tibia forward over the talus, facilitating a relative posterior talar glide. The glide was maintained with consistent force throughout the procedure. Per Mulligan's guidelines, two sets of ten repetitions were performed, with a two-minute rest between sets.

The exercise frequency began with 10 repetitions and progressively increased to 30 repetitions. The treatment regimen consisted of 45-minutes session comprising 15 minutes of

Mulligan mobilization with movement for talocrural joint, 10 minutes of calf and plantar fascia stretching, 10 minutes of strength training for foot intrinsic muscles, 10 minutes for cryotherapy. Duration of the study is one session per day, three times per week, for a total duration of eight weeks.

GROUP B

Proprioceptive Exercises

Participants in Group B were allowed to perform proprioceptive exercises for ankle. All exercise sessions began with a three-minute warm-up involving free gait. The proprioceptive training group was then guided through a series of targeted exercises designed to enhance ankle joint stability and neuromuscular control.

Calf raise, walking with lunges, Tandem walking, Single leg stabilization, Wobble board balance exercises, Star excursion balance exercises, Catching or throwing a ball, balancing one leg

The exercise frequency began with 10 repetitions and progressively increased to 30 repetitions. The treatment regimen consisted of 45-minute sessions comprise, 15 minutes proprioceptive exercises for ankle and foot, 10 minutes of stretching calf and plantar fascia, 10 minutes of strength training for foot intrinsic muscles and 10 minutes of Cryotherapy, one session per day, three times per week, for a total duration of eight weeks. The exercise frequency began with 10 repetitions and progressively increased to 30 repetitions.

RESULT

Descriptive statistics for numerical pain rating scale Group A & Group B.

Group	NPRS	Mean	Standard Deviation	Paired ' t' Value
Group – A	Pre Test	7.40	0.986	33.467
	Post Test	2.07	0.704	
Group – B	Pre Test	7.33	0.976	23.5
	Post Test	4.20	0.775	

Descriptive statistics for NPRS in Group -A shows that Paired t'test value of Pre and Post Test value of Group – A was 33.467 at 0.05% level which was greater than tabulated t' value 2.145, Group -B shows that Paired t'test values of Pre and Post test values Group -B was 23.5 at 0.05% level which was greater than tabulated t' values 2.145

This indicated a significant difference between the pre test and post test results of Group – A & Group B for the NPRS. This explained that there was significant reduction in post test average NPRS score for Group A & Group B.

Result – Numerical Pain Rating Scale (Post Test Analysis)

NPRS	Mean	Standard Deviation	Unpaired ' t' Value	Mean Difference
Group – A	2.07	0.704	7.895	2.13
Group – B	4.20	0.775		

The Unpaired 't' value of 7.895 was greater than the tabulated unpaired 't' value of 2.048 Which showed that there was a statistically significantly difference at 5% level between Group A & Group B.

The Pre and Post test mean of Group A was 2.07 and the pre vs post test mean of Group – B was 4.20 and the mean difference of Group A and Group – B was 2.13 , which showed that there was a significant reduction in numerical pain rating scale for Group A and Group B.

Descriptive statistics for FAAM Score - Group A and Group B.

Group	FAAM	Mean	Standard Deviation	Paired ' t' Value
Group – A	Pre Test	45.60	3.158	262.71
	Post Test	86.87	2.973	
Group – B	Pre Test	45.33	2.193	124.10
	Post Test	70.13	2.615	

Descriptive statistics for FAAM Score in Group A shows that paired 't' test value of pre and post test values of Group A was 262.71 at 0.05% level which was greater than tabulated 't' value of 2.145 Group B shows that paired 't' test values of pre and post test values of Group B was 124.10 at 0.05% level which was greater than tabulated 't' value of 2.145

This showed there is significant difference between Pre and Post test results of Group A & Group B for FAAM score. This explained that there was significant improvement in post test mean values in response to FAAM score in Group A & Group B.

Result – FAAM Score (Post Test Analysis)

FAAM	Mean	Standard Deviation	Unpaired 't' Value	Mean Difference
Group – A	85.87	2.973	15.39	15.74
Group – B	70.13	2.615		

The calculated 't' values is 15.39 which is greater than the tabulated 't' value is 2.048 at 5% level of significance.

This test showed that there was significant difference in foot and ankle ability measures between the effects of Group A & Group B.

DISCUSSION

The purpose of the study is to compare the mulligan mobilization with movement and proprioceptive exercises on pain and functional ability in subjects with Plantar fasciitis. Thirty subjects with plantar fasciitis were selected for the study.

The subjects were randomly assigned into two groups. Group A received a 45- minute treatment session comprising 10 minutes of cryotherapy, 15 minutes of Mulligan' s MWM targeting the talocrural joint, 10 minutes of calf and plantar fascia stretching (held for 20 seconds), and 10 minutes of foot strengthening exercises. Group B underwent an identical session duration that included 10 minutes of cryotherapy, 15 minutes of proprioceptive exercises for the ankle and foot, followed by the same stretching and foot exercise protocols as Group A. The study was conducted for 8 weeks.

In this study, subjects in Group A who received Mulligan' s Mobilization with Movement (MWM) targeting the talocrural joint, along with cryotherapy, demonstrated a greater

reduction in pain and functional disability compared to those in the control group.

The effectiveness of MWM in improving functional outcomes is supported by findings from the current study, where the experimental group demonstrated marked improvements in daily activities and mobility following MWM treatment⁸.

In this study, subjects in Group B who underwent proprioceptive training for the ankle and foot joints, combined with cryotherapy, exhibited a notable reduction in pain and functional disability.

The statistical analysis revealed that Mulligan' s Mobilization with Movement (MWM) was significantly more effective in reducing pain and improving functional ability in subjects with plantar fasciitis compared to proprioceptive exercises⁹.

Based on these findings, the study supports the alternate hypothesis and rejects the null hypothesis, indicating a meaningful difference in treatment outcomes between the two intervention groups¹⁰.

CONCLUSION

Mulligan's MWM demonstrated significantly greater improvements compared to those who performed proprioceptive training. This suggests that Mulligan's MWM is a more effective intervention in addressing biomechanical impairments and enhancing functional recovery in plantar fasciitis. Therefore, incorporating Mulligan's Mobilization with Movement into rehabilitation protocols may provide superior clinical benefits for subjects with this condition.

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