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Musculoskeletal Physical Therapy Management for Movement and Functional Disorders in Plantar Fasciitis: A Case Report

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Abstract

Aims: Plantar fasciitis is a common musculoskeletal disorder caused by repetitive microtrauma to the plantar fascia, leading to severe heel pain, antalgic gait, and secondary kinetic chain dysfunctions that significantly limit occupational productivity. This study aims to investigate the musculoskeletal physiotherapy management in restoring movement and functional movement disorders in patients with plantar fasciitis.

Methods: Primary data was obtained through auto-anamnesis and physical examination of a 51-year-old female presenting with left heel pain of 2 weeks' duration. The musculoskeletal physiotherapy interventions administered included Infrared Radiation (IRR), Transcutaneous Electrical Nerve Stimulation (TENS), vacuum therapy, and muscle release. These were integrated with a progressive exercise program consisting of sitting calf raises, calf raises with a box, roller-with-ball, single-leg stand calf raises on a Bosu ball, and active stretching.

Results: Evaluation using the Visual Analog Scale (VAS) and Manual Muscle Testing (MMT) demonstrated a reduction in pain; however, no significant increase in muscle strength was observed during the immediate (short-term) assessment.

Conclusion: Routine and structured physiotherapy rehabilitation is proven to be effective in supporting functional recovery by reducing pain in patients with plantar fasciitis.

Keywords: Exercise therapy; Foot pain; Plantar fasciitis; Rehabilitation

Introduction

The human foot is a complex biomechanical structure that serves as the body's primary foundation, supporting total body weight and facilitating daily ambulatory activities such as walking, running, and jumping. As a critical weight-bearing organ, the foot is constantly subjected to repetitive mechanical stress during every phase of the gait cycle. Under normal physiological conditions, the structural integrity of the bones, ligaments, and intrinsic muscles of the foot efficiently distributes this load through the plantar arch system. However, driven by the increasing intensity of physical activities, modern occupational demands requiring prolonged standing, and

changing lifestyles, the risk of soft tissue injuries in the foot has risen significantly, potentially hindering mobility and reducing work productivity [1]. One of the most prevalent musculoskeletal disorders arising from the tissue's inability to tolerate such excessive mechanical loading is plantar fasciitis. This condition originates from repetitive microtrauma to the plantar fascia the dense band of connective tissue supporting the longitudinal arch of the foot which triggers a failure in the rapid physiological healing process and leads to structural degeneration. Clinically, this condition manifests as a localized sharp heel pain that is most severe when the patient takes their first steps in the morning, indicating a serious dysfunction within the foot's shock-absorption system [2].

The persistence of this plantar foot pain does not merely affect the localized heel area, but also triggers systemic disruptions throughout the body's entire kinetic chain due to compensatory movement patterns. To avoid pain during weight-bearing activities, patients subconsciously alter their locomotion into a maladaptive pattern known as an antalgic gait, such as shifting the weight distribution to the lateral aspect of the foot or shortening the stance phase. If left uncorrected over a prolonged period, this maladaptive movement pattern abnormally increases the mechanical workload on adjacent joints including the ankle, knee, hip, and lumbar spine thereby risking secondary pain in other body regions and creating a vicious cycle of movement dysfunction that severely diminishes the patient's quality of life [3]. Given these widespread functional impacts, physiotherapeutic intervention plays a crucial role in recovery management and the prevention of long-term disability. Physical therapy does not merely rely on passive modalities for transient pain reduction; instead, it implements a holistic approach based on an in-depth biomechanical assessment to identify the underlying etiology of the disorder. Through structured rehabilitation programs such as progressive loading exercises to enhance tissue capacity, manual therapy techniques for joint range of motion restoration, and comprehensive education regarding activity modification and proper footwear physiotherapy helps patients restore physiological movement patterns, optimizes functional recovery, and provides long-term protection against the risk of symptom recurrence [4].

Methods

This study was conducted at the Emphysio Clinic in Makassar from April 13 to April 25, 2026. Data were obtained from a single case study involving a 51-year-old female patient came to physiotherapy complaining of recurring pain in the left heel starting 2 weeks ago, having previously experienced pain since November 2025. Data collection involved patient interviews, clinical examinations, and functional assessments using relevant physiotherapeutic tools and protocols. The gathered data comprised both subjective and objective measures. Subjective data were collected through an anamnesis interview, while objective clinical findings were obtained through palpation, pain intensity measurements via the VAS, and muscle strength assessments of the affected foot using MMT. Primary data collection was carried out directly through structured interviews, clinical observations, and validated assessment instruments. This comprehensive approach aligns with established case study methodologies and data collection principles in observational clinical research.

Quantitative data, specifically pain scores and muscle strength measurements, were processed numerically to evaluate the severity of dysfunction and monitor the patient’s progress throughout the rehabilitation period. Meanwhile, qualitative data derived from interviews and clinical

observations were analyzed to identify patterns in the patient's complaints and responses to the interventions. The analysis compared the patient's clinical status before and after the physiotherapeutic treatment to evaluate the overall effectiveness of the rehabilitation program. This approach integrated quantitative and qualitative data seamlessly, fulfilling the requirements of a rigorous clinical case study method.

Upon visual inspection, the patient demonstrated incomplete foot contact during standing; furthermore, an abnormal gait pattern was observed, characterized by a noticeable limp accompanied by minimal facial grimacing due to the reported pain. Basic movement and functional examinations revealed that the patient had full range of motion (ROM) in all ankle movements with no objective limitations. However, pain was elicited specifically during passive and active ankle plantarflexion. Muscle strength assessment via Manual Muscle Testing (MMT) yielded a score of 4 across the ankle musculature, indicating that the patient was capable of moving against minimal manual resistance. Upon physical examination, the windlass test provoked pain in the patient. Furthermore, palpation over the medial calcaneal tubercle revealed tenderness.

Table 1. Score VAS after assessment

	Rest pain	Pressure pain	Motion pain
Score	0	8	2

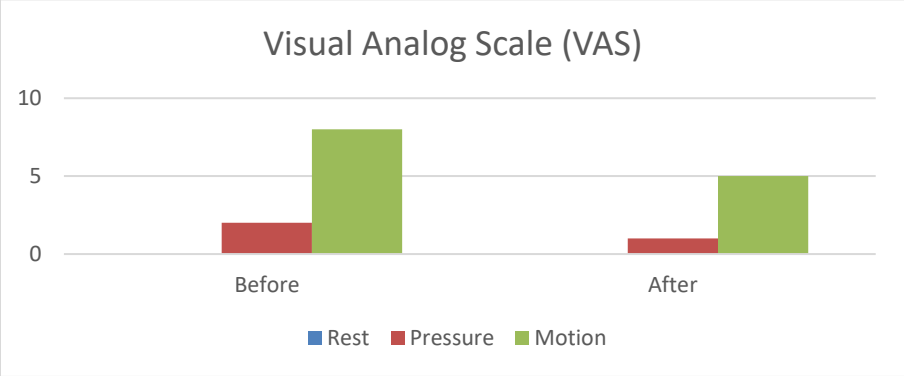
The clinical diagnosis was established based on the comprehensive findings from the anamnesis and physical examination, which were closely tailored to the patient’s immediate clinical presentation. A precise identification of the patient's primary complaints served as the cornerstone for formulating the physiotherapeutic problem list. To address these issues, the prescribed exercise program was systematically structured to achieve specific clinical goals at each stage of rehabilitation. Different types of therapeutic exercises were adapted to match the patient’s tolerance in each phase, with the training intensity being progressively increased across subsequent therapy sessions. Ultimately, the primary objectives of physical therapy for this plantar fasciitis case were to reduce pain, enhance muscle strength in the affected lower extremity, and successfully restore the patient's prior functional capabilities.

Table 2. Physiotherapy Intervension

Intervention	Dose
Infrared	F: Each Therapy I: Patient threshold T: local area T: 10 minute
Tens	F: Each Therapy I: Patient threshold T: pain area T: 15 minute
Manual therapy	F: Each Therapy I: Patient threshold T: muscle release T: 10 minute
	F: Each Therapy I: 15 reps, 2 set T: Active stretching T: 5 minute
Exercise therapy	F: Each Therapy I: 20repse, 2 set T: Sitting calf raise, roller with ball, calf raise with box and calf raise with single leg stand in balance ball T: 20 minute

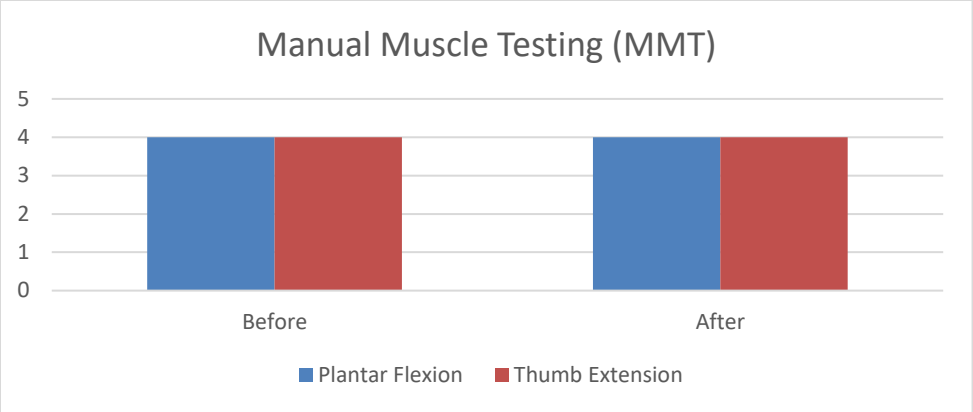
F: Frequency
I: Intensity
T: Technique
T: Time

Results



Figures 1. Score Visual Analog Scale (VAS)

Based on the immediate evaluation using the Visual Analog Scale (VAS) conducted before and after the intervention, the patient demonstrated positive clinical progress in pain reduction. The resting pain score remained stable at 0, indicating an absence of pain when the foot was at rest during both pre- and post-intervention assessments. However, notable improvements were observed in other pain indicators; motion pain decreased from a score of 2 to 1. Furthermore, the most substantial reduction was recorded in tenderness (pain under pressure), which dropped from a pre-intervention score of 8 to a post-intervention score of 5. Collectively, these immediate evaluation findings indicate that the administered physiotherapy intervention was effective in providing prompt relief for both motion pain and tenderness in the patient.



Figures 2. Score Manual Muscle Testing (MMT)

Based on the muscle strength assessment using Manual Muscle Testing (MMT) conducted pre- and post-intervention, no immediate or significant functional changes were observed. The patient's muscle strength for the ankle plantar flexion remained constant at a score of 4 during both the pre- and post-treatment evaluations. A similar trend was observed in hallux extension (thumb extension), where the MMT score persisted at 4. These immediate evaluation findings indicate that the therapeutic interventions administered within a single session did not exert an instantaneous effect or a direct short-term impact on enhancing the muscle strength capacity of the patient's affected foot.

Discussion

Infrared radiation has been shown to effectively mitigate excessive free radical accumulation within tissues undergoing inflammatory or oxidative stress. During an inflammatory response, localized free radical levels typically surge, subsequently aggravating nociceptive pathways and exacerbating pain. When administered at precise low dosages, infrared therapy prompts a down-regulation of these free radicals. This biochemical reduction effectively shields neural cells and adjacent tissues from further oxidative damage, ultimately contributing directly to a significant attenuation of pain intensity [5].

The stimulation of these large-diameter afferent nerve fibers propagates significantly faster toward the dorsal horn of the spinal cord compared to the pain signals carried by small, unmyelinated nociceptive fibers. Consequently, the rapid impulses generated by TENS effectively "close the gate" within the spinal cord. This mechanism blocks the ascending transmission of nociceptive signals to the cerebral cortex, thereby resulting in a profound reduction in the patient's perception of pain [6].

Myofascial release alleviates pain by stimulating Ruffini mechanoreceptors, which subsequently trigger a down-regulation of sympathetic tone and induce muscle relaxation. Furthermore, the mechanical shear applied during this technique alters the thixotropic property of the extracellular matrix, reducing tissue density to allow fascial layers to glide freely without compressing adjacent peripheral nerves. Concurrently, this intervention enhances local fluid circulation, which facilitates the clearance of pro-inflammatory biochemical mediators from the affected tissue [7].

An chronic, single-session intervention typically features an exceptionally brief total exercise duration, generally ranging from only 120 to 480 seconds. From a physiological standpoint, such

a limited timeframe is merely sufficient to modulate interstitial fluid dynamics and induce transient macroscopic elasticity within the tissues. Conversely, critical structural components governing muscle strength and joint stability—including tendons, the peripheral nervous system, and dense connective tissues—fail to undergo any meaningful strength adaptation when subjected to only a single bout of stimulation [8].

Strengthening exercises are effective for patients with plantar fasciitis because they enhance the load-bearing capacity of soft tissues and stimulate collagen synthesis to repair degenerated fascia structures. Furthermore, these exercises optimize biomechanics through the activation of the windlass mechanism and correct the patient's gait parameters, which are typically impaired due to pain.

A multimodal approach is chosen for the management of plantar fasciitis because the condition involves complex etiological factors, such as decreased muscle strength, limited flexibility, pain, and biomechanical impairments, where strengthening exercises alone often need to be combined with other supportive interventions for optimal results. Through a combination of strengthening exercises, myofascial release, and physical modalities, the multimodal approach is able to address various aspects of biomechanical dysfunction comprehensively.

Although a single exercise session can trigger an initial increase in muscle protein synthesis, the formation of permanent tissue structure requires a repeated dynamic balance between the synthesis and degradation of collagen and muscle proteins over time [9].

Limitations

Further studies incorporating larger sample sizes and extended observation periods are warranted to confirm the long-term efficacy of this physiotherapy program and to identify potential prognostic factors predicting rehabilitation success. Future research should also explore variations in more specific physical therapy protocols that account for individual differences in injury severity and patient characteristics. Additionally, subsequent investigations could evaluate the role of contemporary rehabilitation technologies and advanced modalities in accelerating the recovery process for patients with plantar fasciitis.

Conclusion

The immediate evaluation findings demonstrated a positive clinical shift characterized by a notable reduction in pain intensity directly following a single intervention session. This indicates that the applied combination of physiotherapeutic modalities possesses significant efficacy in providing instantaneous pain relief within the inflamed tissues. Conversely, this favorable outcome stood in sharp contrast to the patient's muscle strength measurements. Post-intervention, no increase in muscle strength scores was observed, with functional values remaining static at the baseline level. This phenomenon demonstrates that an chronic stimulation within a single, isolated therapy session is insufficient to trigger the neuromuscular adaptations or motor unit recruitment necessary to directly enhance mechanical muscle strength capacity.

Author Contribution

All authors have accepted responsibility for the entire content of this manuscript and approved its submission.

Conflict of interest

Authors state no conflict of interest.

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