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Literature Review: Physiotherapy Management in The Case of Plantar Fasciitis

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ABSTRACT

Objective: *This study aims to review and summarize secondary data related to the management of plantar fasciitis injuries through a physiotherapy approach.* ***Method:*** *This study uses a literature review method, by collecting and analyzing scientific journals relevant to the topic of plantar fasciitis. Data sources were obtained from several academic databases such as Google Scholar, ScienceDirect, and PubMed.* ***Results:*** *From the review of several journals, it is known that patients with plantar fasciitis injuries can be given several physiotherapy interventions in the form of modalities and physical exercise tailored to the clinical symptoms experienced.* ***Novelty:*** *Based on the literature review, physiotherapy interventions such as Extracorporeal Shockwave Therapy (ESWT), ultrasound therapy, stretching exercises, and Active Release Technique (ART) are proven effective in reducing pain and improving the range of motion (ROM) in people with plantar fasciitis.*

INTRODUCTION

Sports are a physical activity that plays an important role in improving quality of life [1]. In practice, sports involve various body structures such as muscles, joints, meniscus, and ligament tissues, which make them vulnerable to injury, especially in the foot area. Biomechanically, the foot and ankle function as the main support for body weight during walking and running. Because both sides of the ankle bear the body's weight alternately, this area is prone to movement disorders and pain, one of which is plantar fasciitis [2]. Plantar fasciitis is a musculoskeletal disorder that affects the lower extremities, especially the plantar fascia—a thick sheet of connective tissue that extends from the heel bone (medial tubercle of the calcaneus) to the plantar surface of the metatarsophalangeal joints [3]. This structure functions as a balancer of the longitudinal arch of the foot as well as a shock absorber when the foot bears weight. When the plantar fascia experiences excessive pressure, tension can occur that triggers tissue damage [4].

Medically, plantar fasciitis is considered a chronic degenerative condition of the plantar aponeurosis and is one of the main causes of heel pain [5]. In the United States, more than 2 million cases of plantar fasciitis are treated each year, with a prevalence reaching about 10% of the total population, regardless of age, gender, or activity level. Although it is common in runners and military personnel, this condition is also widely found in women aged 40–60 years [6]. In the sports world, foot injuries including plantar fasciitis are quite common, especially in running athletes. The prevalence of heel pain in runners ranges from 4.5–10%, accounting for about 5% of injuries in novice runners and 11% in ultra-marathon runners. This injury occurs in both professional and amateur athletes, with a slightly higher incidence in female athletes. In addition to external factors

such as inappropriate footwear or running on uneven surfaces, there are also internal factors that increase the risk of plantar fasciitis such as obesity, abnormal foot shape (flat foot or pes cavus), leg length discrepancy, excessive external tibial rotation, and increased femoral anteversion [3].

Diagnosis of plantar fasciitis is generally established through clinical complaints and physical examination. The most common symptom is pain in the inner lower heel area, especially after a period of rest or when taking the first steps in the morning. Pain can also increase when dorsiflexion of the toes or ankle is performed. As activity continues, the pain usually subsides but may worsen again at the end of the day. In addition, limitations in dorsiflexion and tenderness on palpation are other supporting symptoms. Histologically, thickening and fibrosis of the plantar fascia are found, accompanied by collagen necrosis, chondroid metaplasia, and calcification [5], [7] .The mechanism of pain in plantar fasciitis begins with injury to the soft tissue in the attachment area of the plantar fascia, usually around the medial part of the calcaneal tuberosity. This injury is generally triggered by excessive pressure and traction, which causes inflammation and pain. The factors causing the pain include changes in load distribution on the soles of the feet, calf muscle stiffness, being overweight, and sudden injury [8].

RESEARCH METHOD

This study uses a literature review method by reviewing secondary data obtained from various scientific journals related to the topic of meniscus injury, accessed through databases such as Google Scholar, ScienceDirect, and PubMed.

RESULTS AND DISCUSSION

Results

Table 1. Summary of physiotherapy interventions in plantar fasciitis cases from literature review.

Author	Title	Intervention
Abdoli, A., & Nakhostin Roohi, B. [3]	Effect of extracorporeal shockwave therapy versus stretching in the treatment of athletes with chronic plantar fasciitis	This study consisted of 2 intervention groups: • **Group I (Extracorporeal Shockwave Therapy (ESWT))** In this group, therapy participants were positioned prone with their feet straightened outside the examination bed, while the knee and hip joints were kept in a neutral position. Ultrasound gel was used as a conductive medium, then the ESWT device head was applied to the inferior calcaneus,

Author	Title	Intervention
		precisely in the area with the highest pain pressure on the medial side of the calcaneus. No local anesthesia was used during the procedure. The ESWT device (enPlusPro Zimmer, Germany) was set with a frequency of 12–15 Hz and delivered 2500 pulses at a pressure of 2–3 bar. Therapy was given once a week for five weeks. • **Group II (Stretching)** Participants in this group underwent stretching exercises aimed at the plantar fascia, Achilles tendon, and calf muscles. Exercises were performed three times a day for five weeks. Each session consisted of ten stretches per area, each stretch lasting 20 seconds. **Results:** Pain score reduction based on the VAS (Visual Analog Scale) was recorded significantly in both groups after the intervention ($P<0.001$). In addition, there was a significant increase in range of motion (ROM) and plantar flexor muscle strength ($P<0.001$). However, no significant difference was found between the two groups ($P>0.05$).
Burton, I. [9]	Autoregulated Combined Resistance Training for Plantar Heel Pain in Athletes: Protocol for a Feasibility Prospective Cohort Study.	This study applied a progressive autoregulated exercise program for patients with plantar fasciitis injury. The program was divided into four levels based on progressiveness and difficulty level. • **Level 1:** PFSS performed daily as needed, 10 repetitions, each held for 10 seconds, three times a day. HSRT three times a week: Double Leg Heel Raise (5×8 reps), Double Leg Squat (5×8 reps).

Author	Title	Intervention
		• **Level 2:** PFSS continued; HSRT progressed to Single Leg Heel Raise (5×8 reps) and Single Leg Squat (5×8 reps). • **Level 3:** PFSS and HSRT continued; added two-foot jumping exercises (Double Leg Jumps 3×60, Stiff Knee Jumps 3×60, Forward/Back Jumps 3×5, Onto Step Jumps 3×5). • **Level 4:** PFSS and HSRT continued; added single-leg jump training once a week (Double Leg Jumps 3×60, Single Leg Hop 3×30, Stiff Knee Jumps 3×15, Forward/Back Jumps 3×5, Onto Step Jumps 3×10), plus running twice a week with warm-up.
Boonchum, Bovonsunthonchai, Sinsurin, Kunanusornchai [10]	Effect of a home-based stretching exercise on multi-segmental foot motion and clinical outcomes in patients with plantar fasciitis	This study applied a home-based stretching program for the calf muscles and plantar fascia. Exercises included: gastrocnemius stretch, soleus stretch, plantar fascia stretch. Each was held 20–30 seconds, with 10-second rest, repeated 10 times. Duration: 20 minutes/day, 5×/week, 3 weeks. **Results:** Significant improvement ($p<0.05$) in PFPS scores and strength of plantar flexor, inverter, everter, big toe flexor, and other toe flexors. No significant change ($p>0.05$) in multi-segmental foot motion or muscle length.
Katzap, Y., Haidukov, M., Berland, O. M., Itzhak, R. B., & Kalichman, L. [6]	Additive effect of therapeutic ultrasound in the treatment of plantar fasciitis: a randomized controlled trial	**Intervention Group:** Plantar fascia and triceps surae stretching twice daily + ultrasound therapy (1 MHz, continuous, 1.8 W/cm², 8 min). **Control Group:** Same stretching + sham ultrasound (3 MHz, 0.1 W/cm², pulsed 1:4, 8 min). **Results:** Both groups improved

Author	Title	Intervention
		significantly ($p<0.001$), no significant difference between groups.
Ahmed, ET, & Fouda, KZ [11]	Active Release Technique and Ultrasound Therapy versus Ultrasound Alone in the Management of Plantar Fasciitis	**Group A:** Ultrasound (1 W/cm², pulsed 1:4, 1 MHz, 5 min, alt days, 8 sessions) + plantar fascia stretch + calf stretch. **Group B:** Same as Group A + Active Release Technique (8–10 min, alt days, 8 sessions). **Results:** FFI score decreased from 96.33 ±6.51 to 76.38 ±3.46 (Group A) and 98.13 ±6.85 to 58.51 ±3.22 (Group B). VAS pain score decreased from 6.11 ±0.41 to 3.85 ±0.31 (Group A) and 5.92 ±0.39 to 2.05 ±0.22 (Group B).

Discussion

The plantar fascia is a collagen connective tissue that extends from the leg to the sole of the foot. Under normal conditions, this fascia functions like an arch support that absorbs shock, keeping the arch of the foot stable. However, if there is excessive tension on its fibers, small tears can occur. Inflammation of the plantar fascia causes pain when performing activities such as walking, running, or standing for long periods. If this inflammation persists, abnormal changes in the tissue structure can occur, causing osteophyte formation in the medial part of the calcaneus bone [2].

According to Katzap, plantar fasciitis is the main cause of pain in the lower heel. This condition begins with excessive stress that causes the plantar fascia to overstretch. Factors such as lack of flexibility of the plantar fascia, stiffness of the gastrocnemius and soleus muscles, weakness of the intrinsic foot muscles, especially m. tibialis posterior in the ankle, increased body weight, heavy activity, proprioception disorders, as well as foot deformities such as flat feet or pes cavus, can cause excessive traction on the fascia leading to tears and irritation [2], [6].

In Katzap's study, the intervention group that received ultrasound therapy and stretching and the control group that received sham ultrasound and stretching both showed pain reduction. However, there was no significant difference between the two groups, indicating that the additional effect of ultrasound did not improve the conservative treatment outcome for plantar fasciitis. Katzap stated that the pain reduction was most likely due to natural changes over time or because of the stretching performed, which aimed to reduce tension on the plantar fascia and stiffness of the Achilles tendon, both of which attach to the calcaneus bone [6].

Boonchum's study also provided a progressive stretching program on the gastrocnemius and soleus muscles combined with plantar fascia stretching. Increased tension on the Achilles tendon can cause greater pulling force on the plantar fascia during the stance phase, contributing to the development of plantar fasciitis. After exercise, there was a reduction in stiffness of the gastrocnemius and soleus muscles, which was associated with decreased pain and improved foot function and mobility, as reflected by better PFPS scores [10].

A similar study by Ahmed divided participants into two groups: group A received ultrasound and stretching of the plantar fascia and calf muscles, while group B received the same conventional treatment with the addition of the Active Release Technique (ART). The results showed a significant reduction in pain based on VAS scores, indicating that ART is effective in addressing connective tissue adhesions by releasing and stretching them, while also improving function, healing, blood and lymph circulation, range of motion, and muscle strength. ART has also been proven to improve muscle flexibility, which is important to prevent injury to the lower extremities [11].

According to Abdoli, besides causing pain, plantar fasciitis can interfere with the patient's mobility in daily activities. The study stated that Extracorporeal Shockwave Therapy (ESWT) and stretching were effective in reducing pain and increasing ankle range of motion (ROM). ESWT is a therapeutic method that uses energy waves from electromagnetic, piezoelectric, and electrohydraulic technology [12], [13], [14]. These shockwaves trigger an inflammatory response in the damaged tissue, increasing blood flow and tissue metabolism, thus aiding healing. The two main mechanisms of ESWT effects are influencing nociceptor physiology and stimulating tissue regeneration through microtrauma and the release of growth factors and molecular components [15]. Increased ROM observed is more likely due to reduced pain, allowing the ankle joint to move more freely. In addition, many studies support the positive effects of stretching in increasing ROM effectively and economically, and it can be performed independently by patients [3].

CONCLUSION

Fundamental Finding : Plantar fasciitis can be effectively managed with physiotherapy interventions such as Extracorporeal Shockwave Therapy (ESWT), ultrasound therapy, stretching, and the Active Release Technique (ART), all of which reduce pain and improve range of motion, although some modalities show no significant advantage over stretching alone. **Implication :** These findings support a multimodal treatment approach combining manual therapy and exercise, with stretching as an accessible, cost-effective option, guiding clinicians in tailoring rehabilitation to patient needs and improving functional recovery. **Limitation :** Variations in protocols, small sample sizes, and limited long-term follow-up reduce generalizability, and some modalities may not offer added benefit beyond stretching. **Future Research :** Larger, standardized trials with long-term follow-up are needed to assess sustained effects,

compare cost-effectiveness, and explore optimal combinations of physiotherapy modalities for plantar fasciitis management.

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