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Literature Review: Physiotherapy Management in Ankle Sprain Cases

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ABSTRACT

Objective: *This study aims to summarize secondary data related to sprain ankle.* ***Methods:*** *The research method used is a literature study using secondary data in the form of journals related to the sprained ankle topic obtained through Google Scholar, Science Direct, and PubMed.* ***Results:*** *Several studies have shown that someone with ankle sprains can be given physiotherapy according to their condition.* ***Novelty:*** *The study emphasizes the role of exercise therapy in improving muscle weakness and ligament laxity caused by damage to the lateral ligament complex in ankle sprains, highlighting its importance in the rehabilitation process.*

INTRODUCTION

Ankle sprains are a common musculoskeletal injury in both highly active and inactive populations [1]. The most common musculoskeletal injury is Lateral Ankle Sprains (LAS), which account for 10% to 30% of all athletic injuries. LAS should have significant consequences for injured athletes regarding treatment costs and time lost from sport. The incidence rate for such injuries is 0.93/1000 athlete exposures, although only about 50% of patients seek medical attention [2]. Every day, almost one ankle sprain occurs per 10,000 people in Western countries, and over two million ankle sprains are treated annually in emergency departments in the United States and the United Kingdom. In sports, the incidence is even higher, accounting for 16%-40% of all sports-related trauma cases. Approximately 40% of all traumatic ankle injuries and nearly half of all ankle sprains occur during athletic activities, with basketball (41.1%), American football (9.3%), and soccer (7.9%) being the most common [3]. Ankle sprains are more frequent in women, children, and athletes participating in indoor and outdoor sports [4].

Besides bone and muscle structure, several ligaments make a significant contribution to the stability of the ankle joint, which are distributed in the lateral, medial, and syndesmotic regions. Almost 85% of ankle sprains involve the lateral ligaments. In approximately 65% of cases, anterior talofibular ligament (ATFL) injuries are specifically diagnosed, accounting for 20% of that number. Posterior talofibular ligament injuries are rare. The remaining 15% involves syndesmotic and medial ankle sprains. A syndesmotic ankle sprain is an injury to one or more of the ligaments that make up the distal tibiofibular joint, often referred to as a "high ankle sprain" [5]. Ligament tears can occur at the proximal, medial, or distal attachments. The severity of a sprained ankle is classified into three levels. Grade 1 is the least severe injury, defined as a lateral ligament

sprain without tearing. Grade 2 indicates a partial tear of one or more ligaments. Grade 3 is the most severe sprain, classifying injuries with total disruption of all ligaments in the lateral ligament complex [4].

Some parameters are potential risk factors for ankle sprains. This is classified as intrinsic or extrinsic. Some intrinsic risk factors can be modified, and identifying them can help in preventing potential injuries. Several studies have investigated the proposed risk factors in athletic and military populations. This includes demographics (including age, gender, weight, height, body mass index, limb dominance), anatomy (foot type, foot and ankle alignment, including foot hyperpronation), weakness (general joint weakness, ankle joint weakness, range of motion (ROM), including ankle and first metatarsophalangeal ROM, muscle strength), muscle reaction time, balance (single leg balance and star excursion balance test) and proprioception, previous history of ankle sprains, and sport-related parameters, including the type of sport in terms of technical aspects such as level of competition, playing on artificial turf, playing position, type of sports shoes, lack of warm-up stretching, and landing technique after jumping. There is no convincing evidence about how significant or effective this parameter is. However, a history of previous ankle sprains, being overweight, ankle joint weakness, and balance disorders are some exceptions that most studies agree on their importance. For example, it has been shown that overweight players with a history of ankle sprains are at a higher risk of non-contact ankle sprains compared to players of normal weight without a history of ankle sprains [5], [6]. Injuries like this cause lost time on the field and a decrease in the ability to function at school and work. The medical costs associated with ankle sprains are estimated to reach $3.65 billion. Therefore, it is crucial to try to accelerate the recovery time associated with this injury to reduce medical costs and improve the return of function [7]. Based on the description, there are several pieces of literature that discuss interventions for ankle sprains.

RESEARCH METHOD

The research method used is a literature study using secondary data in the form of journals related to the topic of the spring ankle, obtained through Google Scholar, Science Direct, and PubMed.

RESULTS AND DISCUSSION

Results

Table 1. Summary of Interventions in Various Studies on Ankle Sprain Treatment.

Author(s)	Title	Intervention
Joshua A. Cleland, Pt, Phd, Paul Mintken, Dpt, Amy Mcdevitt, Dpt, Melanie Bieniek, Dpt, Kristin Carpenter, Dpt, Katherine Kulp, Dpt,	Manual Physical Therapy and Exercise Versus Supervised Home Exercise in the Management of Patients With Inversion Ankle Sprain: A Multicenter	**HEP Group**: The patient receives therapy for 4 sessions, including foot and ankle mobilization exercises and strengthening exercises according to the patient's tolerance. - **Mobility**: Active

Julie M. Whitman, Pt, Dsc.	Randomized Clinical Trial	range of motion and mobilization exercises for foot and ankle: plantar flexion, dorsiflexion, inversion, and eversion. Target: 3 sets of 15 repetitions. - **Strengthening**: Soft strengthening exercises, initially consisting of isometric exercises: pushing the foot against the wall for inversion, eversion, and plantar flexion, using the other foot for dorsiflexion resistance (hold for 5 seconds for 5 repetitions in all directions), and scrunching a towel under the foot for intrinsic muscles. - **Body weight resistance**: Heel raises and mini-squats in a bilateral position. - **Stretching**: Calf and heel stretches, starting with long sitting, using a towel for manual stretching; 3 stretches of 30 seconds each. - **Balance**: Standing on one foot on the injured limb, with arms abducted and eyes open; 3 sets of 30 seconds. - **Dynamic balance**: Standing on a balance board/wobble board (or cushion) with eyes open; 3 sets of 60 seconds. - **Functional weight-bearing activities**: Walking, running, jumping, and hopping, according to the patient's activities and participation.
D. Prabhakaradoss, M. S. Sreejesh, Shahul Hameed Pakkir Mohamed, Arun Vijay Subbarayalu, Sivasankar Prabaharan	Effect of Manual Therapy and Conventional Physiotherapy on Pain, Movement, and Function Following Acute and Sub-acute Lateral Ankle Sprain: A Randomized Clinical Trial	This study consists of two groups: Both groups received eight treatment sessions over four weeks. All patients received standard orthopedic care, which includes compression bandages around the injured ankle and foot extended above the ankle and immobilization in a posterior ankle splint for no more than

		two weeks. Patients were also instructed to elevate their affected foot on a pillow while sleeping and to apply ice to the affected ankle for 20 minutes at least three times a day after removing the clips and bandages. Subjects were taught to continue walking as soon as possible, using walking aids if needed. - **Manual Therapy Group - Mobilization with Movement (MWM)**: Treatment was provided to the experimental group in addition to PRICE and exercise therapy. The treatment lasted for 5 minutes. - **PRICE and Therapeutic Exercise Group**: Conventional PRICE guidelines were provided, and patients were advised to perform only pain-free movements. The exercises were performed for 30 seconds, 5 times for 3 sets.
Thomas W Wainwright, Louise C Burgess, and Robert G Middleton	Does Neuromuscular Electrical Stimulation Improve Recovery Following Acute Ankle Sprain? A Pilot Randomized Controlled Trial	In this journal, there are two groups: Group 1 received standard therapy, and Group 2 received standard therapy and NMES (Neuromuscular Electrical Stimulation). Standard therapy includes basic patient therapy, including manual therapy and personalized exercise prescriptions. Group 2 received NMES intervention to the affected leg.
Kathryn Iammarino, DPT, SCS, James Marrie, PT, Mitchell Selhorst, DPT, OCS, Linda P. Lowes, PT, PhD	Efficacy Of The Stretch Band Ankle Traction Technique In The Treatment Of Pediatric Patients With Acute Ankle Sprains: A Randomized Control Trial	This study consists of two groups: the PRICE group and the Early Elastic Band Mobilization group. - **PRICE Group**: Instructed for compression wrapping on the ankle if a lace-up ankle brace has not been applied. If a brace is provided, compression is

		recommended during activity for at least 8 hours a day. During the first 72 hours, patients are instructed to use the ankle brace at least 12 inches from the injured ankle, recommended for 20 minutes per time each day. - **Early Elastic Band Mobilization Group**: Exercises with an elastic band were given, including horizontal elastic band traction, vertical elastic band traction, and horizontal elastic band traction with an overpressure setup. The exercises are performed in 10 clockwise rotations after rest, plus 30 seconds.
Suzanne Witjes, Femke Gresnigt, Michel PJ van den Bekerom, Jan G Olsman, and Niek C van Dijk	The ANKLE TRIAL (ANKLE Treatment after Injuries of the Ankle Ligaments): What is the Benefit of External Support Devices in the Functional Treatment of Acute Ankle Sprain? A Randomized Controlled Trial	- **Group One**: Received a pressure bandage and RICE (Rest, Ice, Compression, Elevation) for 5-7 days, followed by tape treatment for 6 weeks. - **Group Two**: Received a pressure bandage and RICE therapy for 5-7 days, followed by a brace for 6 weeks. - **Group Three**: Received RICE and pure functional treatment. All three groups received the same ankle exercise schedule, starting two days after the patient experienced trauma or an ankle sprain. All groups were allowed to take paracetamol to relieve pain.

Discussion

Acute ankle sprains are the most common lower extremity injury in athletes and account for 16% - 40% of all sports-related injuries. This is very common in basketball, American football, and soccer. The majority of sprains affect the lateral ligaments, particularly the anterior talofibular ligament. Despite its high prevalence, most patients experience persistent residual symptoms and injury recurrence. A detailed medical history and a proper physical examination are the diagnostic foundation. Several interventions have been recommended in the acute management of ankle sprains,

including rest, ice, compression, and elevation, analgesic and anti-inflammatory medications, bracing and immobilization, early weight-bearing and assistive devices, foot orthotics, manual therapy, exercise therapy, electrophysical modalities, and surgery (only in certain refractory cases). Among these interventions, exercise and bracing have been recommended with a higher level of evidence and should be included in the rehabilitation process. The training program should be comprehensive and progressive, including a range of motion, stretching, strengthening, neuromuscular, proprioceptive, and sport-specific exercises. Quoting from several pieces of literature, the interventions that can be provided for ankle sprain cases include exercise therapy such as mobility, strengthening, body weight resistance, stretching, balance, dynamic balance, and functional weight-bearing activities, manual therapy, manipulation, PRICE, therapeutic exercise, NMES, elastic band mobilization, RICE, and pressure bandage [5].

Research conducted by Joshua et al. has reported that patients with inversion ankle sprains often exhibit joint impairments that contribute to ankle mobility, including the proximal tibiofibular, distal tibiofibular, talocrural, and subtalar joints. Perhaps manual therapy is very helpful in restoring movement in this joint, leading to improved foot and ankle mechanics, reduced pain, and increased function. It's also possible that the effects of manual therapy are neurophysiological. For example, it has been shown that the soleus muscle and the peroneals must ensure that the same amount of time and peroneal muscles exhibit arthrogenic muscle inhibition in patients with ankle instability. The literature has explained that this may be the result of altered mechanoreceptors after a sprained ankle, leading to disrupted neural feedback to the dynamic stabilizers of the ankle. Manual therapy interventions stimulate mechanoreceptors and thus help improve neural feedback, which can aid in dynamic stability and maximize the benefits of therapeutic exercises. Additionally, manual therapy interventions can result in a reduction of inflammatory cytokines, an increase in beta-endorphins, and hypoalgesia [8].

Another study conducted by Prabhakaradoss et al aimed to compare the effects of Manual therapy-mobilization with movement (MWM) combined with conventional physiotherapy and conventional physiotherapy alone on pain, ankle ROM, and function in subjects with lateral ankle sprain. Based on the research results, the experimental group I received MWM along with conventional physiotherapy for the duration of the 4-week treatment. After the treatment duration, this group showed a significant reduction in pain and an improvement in function and ankle dorsiflexion in subjects with lateral ankle sprain. Other research suggests that the application of MWM and exercise therapy tends to improve clinical outcomes more quickly than exercise alone. The majority (84%) of patients with dorsiflexion ROM deficits after subacute lateral ankle sprains responded well to the Mulligan MWM protocol [9], [10], [11], [12]. An incorrect fibula position can cause pain and abnormal movement after a sprained ankle. MWM is focused on the fibula, and its biomechanical effects may impact ROM improvement and have a hypoalgesic effect, leading to pain relief. Additionally, exercise therapy focusing on

neuromuscular and proprioceptive exercises and joint mobilization can reduce pain and improve ROM in treating. ankle sprain [13].

Conventional physiotherapy given for 4 weeks showed a significant reduction in pain and an improvement in function and ankle dorsiflexion in subjects with lateral ankle sprain. A standard one-week physiotherapy program reduced pain and improved the ankle eversion-to-inversion ratio in Grade I ankle sprains. The standard physiotherapy program consisted of Protection, Rest, Ice, Compression, Elevation (PRICE) exercises, anti-inflammatory medication, and weight-bearing support. Next, neuromuscular training and balance exercises effectively manage muscle strength deficits. Strengthening exercises for weak muscles are crucial for a quick recovery, and such exercises prevent the recurrence of a sprained ankle. Static stretching exercises have shown a strong effect in improving ankle dorsiflexion after an acute ankle sprain. Generally, stretching exercises are applied to regain full ROM by targeting the flexibility of the calf muscles. This may increase flexibility prior to pain perception and allow the viscoelastic properties of muscles and tendon joints to overcome stretch reflexes or increase stretch tolerance [13].

In comparing the two groups, it was concluded that there was a significant difference between the effects of MWM combined with conventional physiotherapy and conventional physiotherapy alone on pain, ankle ROM, and function in subjects with lateral ankle sprain. After four weeks of treatment, MWM with conventional physiotherapy was found to be more effective than conventional physiotherapy alone in reducing pain and improving ankle function and dorsiflexion. This observed difference may be due to the biomechanical and hypoalgesic effects of MWM in combination with exercises that reduce pain and improve ankle function and dorsiflexion in lateral ankle sprains. This study states that Mulligan MWM is more effective than Maitland mobilization in reducing pain and improving ROM in patients with lateral ankle sprains due to the interaction of afferent and efferent reflex arcs and the traction force of active and passive mobilization [13].

Other literature also states that using Neuromuscular Electrical Stimulation (NMES) in addition to standard care reduces edema after a Grade I or II sprained ankle and is statistically significant compared to standard care alone, as measured by volumetric displacement. However, these findings did not have a statistically significant effect on functional recovery, which was also a primary outcome measure of this study. Although the clinical relevance of edema reduction may be questionable because no clinically significant differences were found between the two groups, large-scale trials with long-term follow-up are needed to allow for an accurate interpretation of the clinical implications of using NMES as an adjunct. treatment modalities for the current standard care after an acute ankle sprain [14].

Reducing post-sprain ankle edema to improve pain levels and dysfunction experienced by patients during recovery. This study did not find significant changes in pain and FAAM scores; however, it is possible that this was due to the short period over which NMES was evaluated. Pain decreased and ankle function improved in both

treatment groups, demonstrating the value of each treatment plan. However, the difference between the changes is not significant. In this study, physiological effects were evaluated after a 7-day period, and extending this duration could create clinically meaningful long-term relationships between edema reduction, pain, and functionality. The 'dose-response' relationship between NMES-induced strength training and the intensity of NMES training has been confirmed across various clinical populations, and greater electrical stimulation intensity or duration may be required to reduce the presence of edema and its impact on pain and function (Wainwright, 2018). NMES is well-tolerated by patients after a grade II sprained ankle and shows a statistically significant improvement in edema reduction measured by fluid displacement. There were no differences between the groups in the eight observed measurements of function or pain scores. Further work is warranted and necessary to confirm clinical significance and effects on long-term spring ankle recovery [15].

Research conducted by Suzanne et al on supervised versus unsupervised physiotherapy interventions. Showing that adding talocrural disturbance to a supervised PT program is no more effective than PRICE followed by supervised PT. These results contrast with findings from similar studies in adult populations, and there are several possible reasons for the conflicting evidence. The first possible reason is that children recover well after acute ankle sprains and the addition of manual therapy may not be necessary. Studies in adults show positive short-term results, but it is unknown whether children might experience similar short-term benefits. Finally, this study assessed banded ankle traction with movement at the talocrural joint, which is a different technique for joint mobilization that has previously been shown to be effective in older populations. Distraction manipulation at the talocrural joint has been shown to have positive outcomes in adult studies, but the mobilization technique was chosen as a safer alternative for the pediatric population, and with slight modifications and instructions, patients can perform the banded ankle traction technique independently (as self-mobilization). Early mobilization appears to be a safe intervention for pediatric patients suffering from acute sprained ankles. Early mobilization produces similar results in pain, range of motion, and function compared to traditional PRICE treatment [7].

Currently, new guidelines regarding the acute treatment of ankle sprains have been introduced in the Netherlands, based on the latest insights from the literature. The developers of these guidelines concluded that rehabilitation for athletes after acute ankle inversion injuries should consist of a variety of exercises that will improve proprioception, strength, and coordination, as well as maintain extremity function. Next, bracing or taping is recommended in the (sub)acute phase after the diagnosis of acute ankle ligament injury [15].

CONCLUSION

Fundamental Finding : Lateral ankle sprains are a prevalent injury that, if not rehabilitated optimally, can result in functional impairment and recurrence. The literature indicates that progressive exercise therapy is the most evidence-backed

intervention, specifically incorporating range of motion exercises, strengthening, neuromuscular, proprioceptive, balance, and functional weight-bearing activities. Manual therapy, particularly the Mulligan method of mobilization with movement (MWM), has been found to be more effective than conventional physiotherapy alone in reducing pain and improving dorsiflexion and ankle function. These improvements are believed to occur through biomechanical and neurophysiological mechanisms. **Implication :** The findings suggest that rehabilitation for ankle sprains should prioritize therapeutic exercises as the core intervention. Manual therapy and bracing or taping can support the rehabilitation process, with specific interventions tailored to the phase of healing. The inclusion of Neuromuscular Electrical Stimulation (NMES) can help reduce edema, though its benefits for pain and function are still limited, pointing to the need for further investigation. **Limitation :** While progressive exercise therapy has been established as the most effective treatment, the role of additional modalities, such as NMES, remains underexplored in terms of their long-term benefits for pain reduction and functional improvement. Moreover, the effectiveness of different rehabilitation methods may vary depending on individual patient factors, such as the severity of the sprain and the timing of intervention. **Future Research :** Future research should focus on the long-term effectiveness of Neuromuscular Electrical Stimulation (NMES) for pain reduction and functional recovery in ankle sprains. Further studies are also needed to compare the effectiveness of different manual therapy techniques and exercise regimens across diverse patient populations. Additionally, the development of more individualized rehabilitation protocols based on the specific healing phase and injury severity could enhance treatment outcomes.

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