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Physiotherapy Interventions in Sprain Ankle

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ABSTRACT

Background: An ankle sprain is an injury to the joint, with a tear in the ligament due to excessive, and repetitive joint stretching. In general, sprains are caused by falls, slips, or pressure on the body that causes cartilage to cause problems in the feet. Ankle sprains occur due to muscle weakness and ligament laxity by exercising muscles and increasing LGS using exercise therapy, and can help improve muscle weakness caused by damage to the lateral ligament complex.

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 sprain 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.

Conclusion: Based on the results of the literature review, it can be said that someone who has an ankle sprain can experience pain and a decrease in LGS.

Keywords: Sprain ankle, physiotherapy

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Background

Ankle sprains are a common musculoskeletal injury in the highly active and inactive population.[1] The most common ankle injury is the Lateral Ankle sprain (LAS), which accounts for 10% to 30% of all athletic injuries. LAS can have significant consequences for injured athletes regarding treatment costs and time lost from sports. The incidence rate for such an injury is 0.93/1000 athlete exposure. This condition even though only approximately 50% of patients are treated.[2] Every day, nearly 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 cases of sports-related trauma. 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%) having the highest percentage.[3] Ankle sprains are more common in women, children, and athletes who participate in indoor and field sports.[4]

Besides bone and muscle structure, several ligaments significantly contribute to the ankle joint's stability, which are distributed in the lateral, medial, and syndesmotic regions. Nearly 85% of ankle sprains involve the lateral ligaments. In approximately 65% of cases, the anterior talofibular ligament (ATFL) injury is isolated and in about 20% involves damage to the ATFL and calcaneofibular ligament. Posterior talofibular ligament injuries are rare. The remaining 15% involve syndesmotic and medial ankle sprains. A syndesmotic ankle sprain is an injury to one or more of the ligaments comprising the distal tibiofibular junction. It is often known as a "high ankle sprain".[5] Ligament tears can occur at the proximal attachment, the middle substance, or the distal attachment. The severity of ankle sprains is classified into three levels. Grade 1 is the mildest injury, defined as lateral ligament stretching without tearing. Grade 2 indicates a partial tear of one or more ligaments. Grade 3 is the most severe of the spins and classifies the injury with total disruption of all ligaments of the lateral ligament complex.[4]

Several parameters were defined as potential risk factors for ankle sprains. These are classified as intrinsic or extrinsic. Some intrinsic risk factors can be modified, and identifying these risk factors can assist in preventing potential injury. Several studies have investigated the proposed risk factors in athletic and military populations. These include demographics (including age, sex, weight, height, body mass index, limb dominance), anatomy (foot type, foot and ankle alignment, including foot hyper-pronation), weakness

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(generalized 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, history of previous ankle sprain, and exercise-related parameters (including the type of sport, level of competition, playing on artificial turf, playing position, type of sports shoe, lack of warm-up stretch, and landing technique after the jump). There is no convincing evidence of how significant or effective this parameter is. However, a history of previous ankle sprains, overweight, ankle joint weakness and balance disorders are some exceptions with which most studies have agreement on their importance. For example, it has been shown that overweight players with a previous ankle sprain are 19 times more likely to develop a non-contact ankle sprain compared to normal weight players without a previous ankle sprain.[5,6]

Injuries such as these lead to lost time in the field and decreased ability to function at school and work. Medical costs associated with ankle sprains are estimated at $3.65 billion. Therefore, it is important to speed up the recovery time associated with these injuries to reduce medical costs and improve the return of function.[7] Based on the description, some literature discusses ankle sprain interventions.

Methods

The research method used is a literature study using secondary data related to ankle sprains obtained through Google Scholar, Science Direct, and PubMed.

Results

There are five studies related to physiotherapy intervention for ankle sprains. Cleland et al. examined the effects of manual physical therapy and exercise versus supervised home exercise in managing patients with an inversion ankle sprain.[8] Manual therapy and exercise group was given manipulation techniques on the proximal tibiofibular joint, distal tibiofibular joint, talocrural and subtalar joint. The intervention was carried out twice a week for 4 weeks. Home exercise program group performed the following exercises: 1) Mobility for the feet and ankles for 3 sets with 15 repetitions, 2) Strengthening for which comprised isometric exercises such as pushing the foot against the wall for inversion, eversion, and plantar flexion, using the other foot to dorsiflexion resistance (hold 5 seconds for 5 repetitions in all directions), and scrunching a towel under the sole of the foot for intrinsic muscles, 3) Body weight resistance: heel lifts and mini-squats in a bilateral position, 4) Calf and heel stretching, started by sitting for a long time, using a towel to give manual stretches (3 reps with a duration of 30 seconds per rep), 5) Standing with one leg on the injured ankle, with arms abducted and eyes open (3 sets of 30 seconds per set), 6) Dynamic balance: standing on a balance board (or pillow) with eyes open (3 sets of 60 seconds duration), 7) Functional weight-bearing activities: walking, running, jumps, and jumps, according to the patient's activity and participation. The home exercise program is carried out as many as 4 sessions a week for 4 weeks.

Prabhakaradoss et al. explored the effect of manual therapy and conventional physiotherapy on pain, movement, and function following acute and sub-acute lateral ankle sprain.[2] There were two groups in this study. Manual therapy-mobilization with movement (MWM) group. MWM was given to this group for 5 minutes without PRICE and exercise therapy. The second group was given conventional PRICE guidelines and was encouraged to perform only free, pain-free movements. The exercise was given for 30 seconds in 3 sets with 5 repetitions. Both groups had eight treatment sessions over four weeks. All patients received standard orthopaedic care, which included compression bandages around the injured ankle and foot extended above the ankle and immobilization in the posterior ankle brace for no more than two weeks. Patients were also instructed to elevate their affected leg on a pillow while sleeping to apply ice to the affected ankle for 20 minutes at least three times a day after removing the brace and bandage. The patient is taught to continue walking as soon as possible, using a walking aid if necessary.

Wainwright et al. tested does neuromuscular electrical stimulation improve recovery following an acute ankle sprain.[10] In this study, there were two groups, the first group received standard therapy and the second group received standard therapy and NMES. Standard therapy included patient education, manual therapy if indicated, and personalized exercise prescriptions. Meanwhile, the group receiving NMES will be trained to apply NMES to the injured ankle.

Iammarino et al. investigated the efficacy of the stretch band ankle traction technique in the treatment of pediatric patients with acute ankle sprains.[7] This study consisted of two groups: PRICE and early elastic band mobilization. The PRICE group was instructed to do compression wrapping on the ankle if a lace-up ankle brace had not been installed. If brace compression has been given, the patient was advised to compress during activities for at least 8 hours a day. During the first 72 hours, the patient was instructed to rest using ice and intermittent compression and to elevate the sore ankle at least 12 inches, and the patient was advised to do this for 20 minutes twice a day. The early elastic band mobilization group performed exercises using terabands such as horizontal elastic band traction, vertical elastic band traction and horizontal elastic band traction with an overpressure setup. The movement was performed 10 rounds clockwise, after a rest plus 30 seconds.

Witjes et al. conducted The ANKLE TRIAL (ANKLE Treatment after Injuries of the Ankle Ligaments) to find out the benefits of external support devices in the functional treatment of acute ankle sprain.[11] There were three groups, the first group was given a pressure bandage and RICE (Rest, Ice, Compression, Elevation) for 5-7 days, followed by tape treatment for 6 weeks. The second group was given a pressure bandage and RICE therapy for 5-7 days and continued with a brace for 6 weeks. The third group was given

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RICE and pure functional treatment. All three groups will receive the same ankle exercise schedule just two days after the patient experiences an ankle trauma or sprain. All groups were allowed to take paracetamol for pain relief.

Discussions

An acute ankle sprain is the most common lower extremity injury in athletes and accounts for 16%-40% of all sports-related injuries. It is very common in basketball, American football, and soccer. Most sprains affect the lateral ligaments, especially the anterior talofibular ligament. Despite the high prevalence, most patients experience persistent sequelae and injury relapse. A detailed history and proper physical examination are the cornerstones of the diagnosis. Imaging is not indicated for the majority of ankle sprain cases. Several interventions have been recommended in the acute management of ankle sprains, including rest, ice, compression, and elevation, analgesic and anti-inflammatory drugs, bracing and immobilization, early walking and weight-bearing aids, foot orthosis, manual therapy, exercise therapy, electrophysical modalities and surgery (only in certain refractory cases). Exercise and braces have been recommended with a higher level of evidence and should be included in the rehabilitation process. The exercise program should be comprehensive and progressive, including the range of motion, stretching, strengthening, neuromuscular, proprioceptive, and sport-specific exercises. Some literature states that the interventions that can be given in cases of ankle sprains include exercise therapy (mobility, strengthening, body weight resistance, stretching, balance, dynamic balance and functional weight-bearing activities), manual manipulation therapy, PRICE, therapeutic exercise NMES, elastic band mobilization, RICE and pressure bandage.[5]

Research conducted by Joshua et al. has reported that patients with inverted ankle sprain often exhibit disorders of the joints that contribute to ankle mobility, including the proximal tibiofibular, distal talocrural tibiofibular and subtalar joints. Manual therapy helps restore movement in these joints, leading to improved foot and ankle mechanics, reduced pain, and improved function. It is also possible that the effects of manual therapy are neurophysiological. For example, it has been shown that the soleus and peroneal muscles show simultaneous inhibition of the artrogenous muscles in patients with ankle instability. The literature has suggested that this may result from altered mechanoreceptors following ankle sprains, leading to an impaired neural feedback system to ankle dynamic stabilizers. Manual therapy interventions stimulate the mechanoreceptors and thus aid in increased neural feedback, which can aid in dynamic stability and maximize the benefits of therapeutic exercise. In addition, that manual therapy intervention can result in a reduction in inflammatory cytokines, an increase in beta-endorphins, and hypoalgesia.[8]

Another study conducted by Prabhakaradoss et al. in which this study aimed to compare the effects of Manual therapy-mobilization with movement (MWM) along with conventional physiotherapy and conventional physiotherapy alone on pain, ankle ROM, and function in subjects with lateral ankle sprains. The experimental group received MWM and conventional physiotherapy for 4 weeks of treatment. After the treatment, this group showed a significant reduction in pain and improved ankle function and dorsiflexion in subjects with lateral ankle sprains. Other studies suggest that the application of MWM and exercise therapy improves clinical and rapid improvement compared to exercise alone. Most (84%) patients with a dorsiflexion ROM deficit after a subacute lateral ankle sprain responded well to the mulligan MWM protocol. Incorrect fibula position can cause pain and abnormal movement after a sprained ankle. MWM is applied to the fibula, and its biomechanical effects may be responsible for the increased ROM and hypoalgesic effect, causing pain relief. Mechanical hypoalgesia of MWM proposes a potential role of central mechanisms associated with nonopioid-mediated activation of descending pain inhibitory systems, variations in muscle activation, and behavioural mechanisms. In addition, exercise therapy concentrates on neuromuscular and proprioceptive exercises and joint mobilization to reduce pain and increase ROM in treating ankle sprains.[9]

Conventional physiotherapy administered for 4 weeks showed significant pain reduction and improved ankle function and dorsiflexion in subjects with lateral ankle sprains. The standard physiotherapy program for one week reduces pain and increases the eversion to ankle inversion ratio in grade I ankle sprains. The standard physiotherapy program consists of Protection, Rest, Ice, Compression, Elevation (PRICE) exercises, anti-inflammatory medication and weight-bearing support. Furthermore, neuromuscular training and balance training effectively manage muscle strength deficits. Strengthening exercises for weak muscles are essential for a speedy recovery, and such exercises prevent the recurrence of ankle sprains. Static stretching exercises showed a strong effect in increasing ankle dorsiflexion after acute ankle sprains. Generally, stretching exercises are applied to regain full ROM by promoting flexibility of the calf muscles. This may increase flexibility before pain perception and allow the viscoelastic properties of muscles and tendon joints to overcome the stretch reflex or increase stretch tolerance.[9]

In a comparison of the two groups, there was a significant difference between the effects of MWM along with conventional physiotherapy and conventional physiotherapy alone on pain, ankle ROM, and function in subjects with lateral ankle sprains. 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 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 of lateral ankle sprains. This study stated that Mulligan's MWM is more effective than Maitland mobilization in reducing pain and increasing ROM in patients with lateral ankle sprains due to the interaction of afferent

and efferent reflex arcs and tensile forces of active and passive mobilization.[9]

Other literature also states that using Neuromuscular Electrical Stimulation (NMES) in addition to standard care reduces oedema after grade I or II ankle sprains and is statistically significant compared to standard care alone, as measured by volumetric displacement. However, this finding did not have a statistically significant effect on functional recovery, which was also the main outcome measure of this study. Although the clinical relevance of oedema reduction is questionable as no clinically significant changes between the two groups were found, large-scale trials with long-term follow-up are needed to allow accurate interpretation of the clinical implications of adjunctive NMES use.[10]

Reduces post ankle sprain oedema in improving the level of pain 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 timeframe in which NMES was evaluated. The pain was decreased and ankle function improved in both treatment groups, indicating the value of each treatment plan. However, the differences between the changes were not significant. In this study, physiological effects were evaluated after 7 days, and an increase in this timeframe could create a clinically meaningful long-term relationship between reduced oedema, pain, and functionality. A "dose-response" relationship between NMES treatment induced increased strength and intensity of NMES training has been confirmed in various clinical populations. It may be necessary to have greater intensity or duration of electrical stimulation to reduce the presence of oedema and its effect on pain and function. (Wainwright, 2018). NMES was well tolerated by patients after a grade II ankle sprain and showed a statistically significant improvement in oedema reduction as measured by fluid displacement. No differences between groups in figure eight measures, function, or pain scores were observed. Further work is feasible and needed to confirm the clinical significance and effect on the long-term recovery of ankle sprains.[10]

Research conducted by Suzanne et al. on supervised and unsupervised physiotherapy interventions showed that the addition of talocrural distraction to supervised PT programs was no more effective than PRICE followed by supervised PT. These results contrast with findings from similar studies in the adult population. There are several possible reasons for the conflicting evidence. The first possible reason is that children recover well after an acute ankle sprain and the addition of manual therapy may not be necessary. Studies in adults have shown positive short-term results, but it is not known whether children may experience similar short-term benefits. Finally, this study assessed banded ankle traction with motion at the talocrural joint, which is a different technique for joint mobilization that has previously been shown to be effective in an older population. Manipulation of distraction at the talocrural joint has been shown to have positive results in adult studies. Still, the mobilization technique was a safer alternative for the pediatric population. Patients can perform the bandaged ankle traction technique independently (as a self-mobilization) with minor modifications and instructions. Early mobilization appears to be a safe intervention in pediatric patients with acute ankle sprains. Early mobilization resulted in similar pain, range of motion, and self-reported function outcomes compared with traditional PRICE treatment.[7]

Currently, new guidelines regarding the acute treatment of ankle sprains have been introduced in the Netherlands based on recent insights from the literature. The developers of this guide concluded that the rehabilitation of athletes after an acute ankle inversion injury should consist of various exercises to improve proprioception, strength and coordination and maintain limb function. Furthermore, a brace or tape is recommended in the subacute phase after the diagnosis of an acute ankle ligament injury.[11]

Conclusion

Based on the literature review results, it can be concluded that someone who experiences ankle sprains can experience pain and decreased LGS.

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