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THE ROLE OF PHYSIOTHERAPY IN THE TREATMENT OF PATIENTS WITH DIFFERENT DEGREES OF ANKLE LIGAMENT TRAUMA

Original research

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ABSTRACT
Introduction: The ankle joint is primarily a hinge joint that allows the foot to bend downwards and upwards, formed by three bones: the tibia (shin bone), fibula (shin bone) and talus (ankle bone). The ankle joint is provided with strength by ligaments, muscles and their tendons. Most ankle ligament injuries occur during sports activities or while walking on an uneven surface that forces the foot and ankle into an unnatural position. The degree of ligament injury depends on the action of force, pressure, fiber composition and torsion. Common clinical symptoms for all ankle injuries are swelling, pain to the touch, possible bruising, local hyperthermia (increased temperature), difficulty walking, limited and painful movements in the joint itself.
Objective: The objective of the research is to examine the role of physiotherapy in the treatment of patients with different degrees of trauma to the ankle ligaments.
Subjects and methods: Subjects of both genders and all age groups were included in the research in the period from January 2022 to October 2022 with different degrees of ankle ligament injury, which implies different traumatological treatment. After the primary treatment, the subjects were referred for physiotherapy in the physical therapy department at the RMC Safet Mujic Cantonal Hospital and at the Stari Grad Health Center.
Results: According to the degree of mobility of the ankle joint of subjects treated conservatively, after physiotherapy treatment we can see that in a total sample of 77 subjects, 76 subjects or 98.70% were without contracture, and 1 or 1.30% had a pronounced contracture.
Conclusion: Physiotherapy proved to be effective in reducing pain and improving the mobility of the ankle joint in patients with different degrees of ligament injury, confirming the success of conservative treatment.

Keywords: ankle joint, physiotherapy, treatment

INTRODUCTION

The ankle joint moves in the sagittal plane with small deviations towards the posterior and lateral. Movements in the ankle joint are dorsiflexion (flexion) and plantarflexion (extension). During the movement of the tibiotalar joint, there are changes in the amplitude of the movement due to the different shape of the body of the talus (from medial to lateral) and the axis of movement is followed by palpation of the malleolus (Harmonson, J.K. 1996).

Factors that can lead to injury of the ankle joint are endogenous and exogenous or their combination. Endogenous factors originate from the body (muscle weakness, poor coordination and proprioception, etc.) and exogenous factors originate from the external environment (inadequate footwear, inadequate surface, contact with another person, etc.). An ankle joint injury occurs when the ankle joint is twisted too far from its

hysiological position under the influence of one of the factors. Most ankle injuries occur during sports activities or walking on uneven surfaces that position or bend the foot and ankle in an unnatural position. An unnatural position of the ankle in high-heeled shoes or walking in unstable, loose clogs or sandals is also a factor that can contribute to ankle injuries (Johnston III RB. 1994; Jurdana, H. 2009; Kitaoka, H. B., 1997).

Ankle injuries are among the most common injuries that people present to primary care providers and emergency departments, and represent a significant loss of time and potential long-term absence from work. Ankle injuries can happen to anyone at any age, and they are defined by the type of tissue - bone, ligament or tendon - that is damaged (Lucijanić, I. 2009).

Treatment can be conservative and surgical. The term conservative includes drug therapy, immobilization and physical therapy. Surgical treatment involves performing a surgical procedure. Surgical treatment is most often used for grade 3 ligament injuries in which large ligament ruptures occur, which also leads to joint instability. Such situations are not so common, but if they occur, surgery is the best solution and the course of rehabilitation after surgery will be easier. In the very beginning, it is also advisable to wear orthoses that limit inversion and eversion movements, while plantar and dorsiflexion movements are enabled and recommended for performance. The recommendation to perform plantar and dorsiflexion movements is given to the patient to prevent muscle atrophy and reduce the range of motion. Such orthoses accelerate the rehabilitation process (Gulan, L. 2020.)

Physiotherapy intervention consists of the application of electrotherapy procedures, hydrotherapy, physiotherapy exercises, lymphatic drainage and cryotherapy. In the case of injury to the ankle ligaments, the most commonly used electrotherapeutic procedures are diadynamic (DDS) currents, interference (IFS) currents, TENS (transcutaneous nerve electrostimulation), muscle electrostimulation and LASER. Lymphatic drainage is applied as a type of massage to remove edema. Physiotherapy exercises include: passive exercises to increase the range of motion in the joint, active exercises, active exercises with resistance to strengthen muscles, proprioception and balance exercises, circulation exercises, and riding a stationary or regular bicycle is recommended, along with cryotherapy (Brison, R. J. 2016).

The aim of the research is to examine the role of physiotherapy in the treatment of patients with different degrees of trauma to the ankle ligaments.

METHODS

Study design and subjects

Subjects of both genders and all age groups were included in the research in the period from January 2022 to October 2022 with different degrees of ankle ligament injury. After the primary treatment, the subjects were referred for physiotherapy in the physical therapy department at the RMC Safet Mujic Cantonal Hospital and at the Stari Grad Health Center.
The study was conceived as a retrospective, randomized analysis, conducted using a descriptive-analytical approach, with the use of secondary data.

Criteria for inclusion and exclusion from the study

The criteria for inclusion in the study include subjects with different degrees of ankle ligament trauma who were treated conservatively and referred to the physical therapy department of the RMC Safet Mujic Cantonal Hospital and Dom Zdravlja Stari Grad, subjects who do not have injuries to other organs or organ systems, subjects who do not have chronic diseases that can affect the course and outcome of physiotherapy. The criteria for exclusion from the study include: subjects with different degrees of ankle ligament trauma who are treated conservatively and not referred to the physical therapy department of the RMC Safet Mujic Cantonal Hospital and Dom Zdravlja Stari Grad, subjects who have injuries to other organs or organ systems, as well as subjects who have chronic diseases that can affect the course and outcome of physiotherapy.

The research was approved by the Ethics Committee of the University of Sarajevo - Faculty of Health Studies, approval number 04-7-10-15/22 dated March 22, 2022. year.

Statistical analysis

After data collection, a database was created in Excel and statistical processing was done in accordance with the type of study, set hypotheses and objectives of the work.
The results are presented in absolute and relative numbers and compared using non-parametric statistical methods.

RESULTS

T A total of 77 respondents were included in the study entitled "The role of physiotherapy in the treatment of patients with different degrees of ankle ligament trauma", of which 55 were male and 22 were female.

In the total sample of 77 subjects, 65 subjects or 84.42% felt moderate pain after the injury, and 11 or 14.28% did not feel pain after the injury, and 1 subject had severe pain 1 or 1.30%. We conclude that most subjects come with moderate pain before physical therapy (Table 1.).

Table 1. The degree of pain before physiotherapy of subjects treated conservatively

		N	%
Degree of pain before physiotherapy of subjects treated conservatively	No pain	11	14.28
	Moderate pain	65	84.42
	Intensive pain	1	1.30
	OVERALL	77	100

In the total sample of 77 subjects treated conservatively, 65 subjects or 84.42% after ankle injury after physiotherapy treatment treated conservatively had no pain in the joint, 11 or 14.28% had moderate pain in the ankle, and 1 subject had severe pain in the ankle, which is 1.30%. And these results confirm that after physical therapy most subjects did not feel pain (Table 2.).

Table 2. The degree of pain after physiotherapy of subjects treated conservatively

		N	%
Degree of pain after physiotherapy of subjects treated conservatively	No pain	65	84.42
	Moderate pain	11	14.28
	Intensive pain	1	1.30
	OVERALL	77	100

In the degree of ankle joint mobility treated conservatively before treatment, we can see that in the total sample of 77 examinees, 65 examinees or 84.42% after ankle joint injury occur without contracture, and 11 or 14.29% moderate contracture, and 1 examinee after ankle joint injury that was treated conservatively has pronounced contracture 1 or 1.30%. With these results, we confirm that the majority of examinees treated conservatively before physical therapy occur without contracture (Table 3.).

Table 3. The degree of mobility before physiotherapy of subjects treated conservatively

		N	%
Degree of mobility before physiotherapy of subjects treated conservatively	No contractures	65	84.42
	Moderate contracture	11	14.28
	Severe contracture	1	1.30
	Overall	77	100

In the degree of ankle joint mobility treated conservatively after physiotherapy treatment, we can see that in the total sample of 77 examinees, 76 examinees or 98.70% are without contracture, and 1 or 1.30% had pronounced contracture. This also confirms the representativeness of the sample from the aspect of uniform representation of examinees from this category. We conclude that the vast majority of subjects treated conservatively after physical therapy appear without contraindications, and that the success of physical treatment can be determined (Table 4).

Table 4. The degree of mobility after physiotherapy of subjects treated conservatively

		N	%
Degree of mobility after physiotherapy of subjects treated conservatively	No contractures	76	98.70
	Moderate contracture	0	0.00
	Severe contracture	1	1.30
	Overall	77	100%

DISCUSSION

Ankle injuries are among the most common injuries presented to primary care providers and emergency departments and can cause significant lost time due to injury and long-term disability. Sprains of the ankle joint on the medial side occur less frequently than those on the lateral side. High ankle sprains are less common in the general population.

Brison et al conducted a study with the aim of evaluating the effectiveness of a physiotherapy program in the rehabilitation process in patients with simple ankle sprains of the first and second degree. The participants were divided into two groups: one received standard care (which included written guidelines on protection, rest, cryotherapy, compression, elevation and gradual loading of the extremities), while the other, in addition to the same standard care, included an additional program of supervised physiotherapy. After three months, the percentage of patients who achieved an excellent recovery showed no statistically significant difference between the groups (physiotherapy group: 43%, 98/229; control group: 37%, 79/214; absolute difference: 6%, 95% CI: -3% to 15%). Furthermore, even the analysis according to the protocol did not show a greater benefit than physiotherapy, and after six months even a reverse trend was observed (Brison, R. J. 2016).

A study by Bleakley et al indicates that rehabilitation based on a structured exercise program significantly reduces the risk of recurrent injury after acute ankle sprain, compared to usual care alone. Despite the positive findings, the authors point out that there is still no consensus in the literature when it comes to the optimal content, intensity and extent of exercise within rehabilitation protocols for this type of injury. (Bleakley, C.M. 2018).

Lazarou et al conducted a study with the aim of examining the effects of two different proprioceptive

programs - balance training and PNF (proprioceptive neuromuscular facilitation) - in people who are in the post-acute phase of recovery after an ankle sprain. The follow-up included a total of 20 respondents. After the eight-week program, both groups showed statistically significant improvements ($p < 0.017$) in dorsiflexion (ROM) and most functional ability tests. Additionally, the balance training group showed significant improvements in frontal balance and pain reduction.
Based on the findings, the authors recommend the inclusion of balance training and PNF programs in clinical practice, with the aim of improving range of motion and functional performance, while balance training stands out as an effective approach for pain reduction (Lazarou, L. 2018).
A study conducted in Iran examined the effects of integral versus conventional physiotherapy in 60 patients with chronic ankle instability. The results showed that the integral therapy, which includes hip strengthening exercises and balance training, led to a significant improvement in functionality. For other parameters (pain, range of motion, balance) there were no significant differences between the groups. It was concluded that an integral approach can be more effective for improving function in patients with this type of instability (Negahban, H. 2023).

A study by Wright et al examined the effectiveness of two rehabilitation methods in people with chronic ankle instability: balance training on a board and strengthening with elastic bands. The main objective was to evaluate which approach gives better results from the patients' perspective.
The results showed that the group that did balance exercises had a significant improvement in functionality in daily activities, while there was no change in the group that did resistance exercises. Other indicators (such as balance, sports function and general health) improved in both groups, but there was no significant difference between them.
The conclusion of the study is that even one targeted exercise during four weeks can improve the condition of patients with chronic ankle instability, and there is limited evidence that balance training is slightly more effective than strength training (Wright, C. J. 2018).

The results of our research indicate that the physiotherapy treatment had a significant impact on the reduction of pain, considering that after the therapy as many as 84.42% of the subjects were pain-free, while only 14.28% reported moderate pain and only 1.30% severe pain. These findings confirm the clinical effectiveness of applied physiotherapy in the treatment of ankle joint injuries. We find similar results in the research of Lazarou et al. (2018), where balance training led to a significant reduction in pain, which further confirms the importance of a targeted therapeutic approach. In contrast, Brison et al. (2016) did not observe significant differences between standard care and additional physiotherapy, which suggests that the content of the therapy itself, and not its presence, is a key factor in the recovery process - which is additionally confirmed by our results.

Our results clearly indicate a significant improvement in the mobility of the ankle joint after the physiotherapy treatment, since 98.7% of the subjects were without contractures after the therapy. This confirms the effectiveness of the applied therapeutic approach in restoring the functional range of motion. Similar effects were recorded by Lazarou et al. (2018), who achieved significant improvements in dorsiflexion and total ROM through proprioceptive exercises, including PNF and balance training. On the other hand, research by Negahban et al. (2023) did not show a difference in ROM between integral and conventional physiotherapy, which suggests that consistent application of therapy, regardless of its specific form, may be crucial for mobility recovery.

Although our research did not explicitly state which methods we used during the physiotherapy treatment, the results showing a reduction in pain and an improvement in mobility suggest that the applied approach was functionally oriented. These results are in accordance with the findings of Wright et al. (2017) and Negahban et al. (2023), who emphasized the importance of including balance and stabilization exercises in rehabilitation, because these components led to better functional recovery in patients with chronic ankle instability. Although standardized functional tests such as FAAM or LEFS were not used in our study, improvements in pain and range of motion indirectly indicate an improvement in overall joint functionality.

Our study includes patients with different degrees of ankle injury, which represents the clinical population encountered in practice. Unlike the study by Brison et al., who focused on mild and moderate first and second degree injuries, our research includes a wider spectrum of injuries. Despite greater heterogeneity, the achieved results in terms of a significant reduction in pain after physiotherapy suggest that an adapted and individualized approach to therapy may be more effective in daily clinical practice.

CONCLUSION

Based on the set goal and the obtained results, we conclude that physiotherapy has a significant role in the treatment of patients with different degrees of ankle ligament trauma. Most of the subjects felt moderate pain after the injury, but after the physiotherapy treatment, a large percentage of the subjects were

pain-free, which indicates the effectiveness of the conservative approach. Also, the treatment led to a significant improvement in the mobility of the ankle joint, with almost the entire sample free of contractures after the therapy. The results confirm that physiotherapy successfully contributes to reducing pain and restoring the functionality of the ankle joint in patients with different degrees of ligament injury.

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Conflict of Interest

The authors do not have any conflicts of interest to disclose. All co-authors have reviewed and concurred with the manuscript's content, and no financial interests need to be reported.