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The importance of rehabilitation treatment of ankle traumas in athletes

Importanţa tratamentului de recuperare în patologia traumatică a gleznei la sportivi

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Abstract

Background. Anatomically, the ankle and the foot form an anatomical and functional structure with the role of supporting body weight, maintaining orthostatism and performing walking.

Aims. The aim of this study was to highlight the importance of rehabilitation treatment in athletes diagnosed with trauma to the ankle. Monitoring of these patients was performed using pain assessment scores, assessing the quality of life, and performing functional clinical assessments.

Methods. The study was conducted on 60 athletes with mild and moderate ankle sprains. Patient selection was done in the Department of Rheumatology and Rehabilitation and in the Department of Orthopaedics, Mureş County Emergency Hospital from January 2013 - December 2013. Two groups of 30 patients each were studied. Patients in group C were only recommended rest, compression bandages, pain relievers and anti-inflammatory treatment, while patients in group E were recommended complex rehabilitation treatment procedures over a period of 14 sessions. Patients were evaluated initially, at the end of the treatment, two weeks after, and at an interval of 3 months using the visual analogue scale (VAS), clinical assessment, and joint testing.

Results. No statistically significant improvement was found in group C patients in terms of pain and joint mobility, while in group E a statistically significant improvement was found regarding the patients' pain assessed by VAS and mobility of the joint assessed by joint testing. Joint swelling was encountered in 70% of patients in group C 2 weeks after the traumatic event and in 40% of patients 3 months after. Only 25% of the patients in group E showed joint swelling 2 weeks after the injury, and only 10% after 3 months.

Conclusions. Our study shows that recovery treatment significantly alleviates pain and improves mobility in athletes with ankle traumas, maintaining positive effects in the long run.

Keywords: rehabilitation treatment, trauma to the ankle, athletes.

Rezumat

Premize. Glezna, ca structură anatomică, formează un tot unitar împreună cu piciorul, alcătuind o structură anatomofuncţională cu rol de susţinere a greutăţii corpului, de menţinere a ortostatismului şi de efectuare a mersului.

Obiective. Scopul acestui studiu a fost evidenţierea importanţei tratamentului de recuperare la pacienţii cu activitate sportivă diagnosticaţi cu traumatisme la nivelul gleznei, la care monitorizarea evoluţiei în timp s-a făcut utilizând scoruri de evaluare a durerii, a calităţii vieţii şi evaluări clinico-funcţionale.

Metode. Studiul a fost realizat pe pe un număr de 60 de sportivi cu entorse uşoare şi medii. Selecţia pacienţilor s-a făcut din Secţia de Reumatologie şi Recuperare şi Secţia de Ortopedie a Spitalului Clinic Judeţean de Urgenţă Mureş pe perioada ianuarie 2013-decembrie 2013. S-au luat în studiu două loturi de câte 30 de pacienţi. Pacienţilor din lotul C li s-a recomandat doar repaus, compresie cu bandaj elastic, tratament antiinflamator şi antialgic, în timp ce pacienţilor din lotul E li s-a recomandat un tratament complex de recuperare, pe o durată de 14 şedinţe. Evaluarea pacienţilor s-a făcut iniţial, la sfârşitul tratamentului, după două săptămâni şi la un interval de 3 luni, utilizând scala VAS (visual analog scale), evaluarea clinică a pacienţilor şi testingul articular.

Rezultate. În lotul C de pacienţi nu s-a constat o ameliorare statistic semnificativă în ceea ce priveşte durerea şi mobilitatea articulară, în timp ce în lotul E, s-a constat o amelioarare statistic semnificativă a durerii apreciată prin scala VAS (visual analog scale) şi a mobilităţii articulare evaluată prin testingul articular. Tumefierea articulară s-a menţinut în lotul C la 70% dintre pacienţi după evenimentul traumatic la 2 săptămâni şi la 40% dintre pacienţi la 3 luni. La pacienţii din lotul E, doar 25% mai prezentau tumefiere articulară la 2 săptămâni după traumatismul sportiv, în timp ce la 3 luni doar 10%.

Concluzii. Studiul nostru dovedeşte că prin tratamentul de recuperare se ameliorează semnificativ atât durerea, cât şi mobilitatea la sportivii cu patologie traumatică la nivelul gleznei, cu menţinerea acestor efecte pe termen lung.

Cuvinte cheie: tratament de recuperare, traumatisme gleznă, sportivi.

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Introduction

The ankle and the foot form an anatomical and functional complex that supports body weight, with a static and dynamic role, and they are involved in orthostatism, propulsion and lifting of the body. The ankle joint is formed by the fibula, tibia and astragalus. The foot is an anatomical structure composed of metatarsal bones, tarsal bones, three cuboid bones, cuneiform, navicular bones, calcaneus and talus. The foot movements are dorsiflexion, plantar flexion, while the subtalar joint allows for flexion, extension, abduction, adduction and rotation. These combined movements allow for foot pronation and supination. Pronation results by combining 3 movements: dorsiflexion, eversion and abduction; on the other hand, supination involves plantar flexion, inversion and adduction. Eversion occurs around a long axis with anterior-posterior orientation, the foot is turned outward, while inversion is around the same axis, but the foot is turned inward. Abduction occurs around a vertical axis, moving the foot in lateral direction (Sbenghe, 2002).

The talocrural joint is formed by the superior surface of the talus and the inferior extremities of the tibia and fibula. The joining elements are represented by the articular capsule, the lateral collateral ligament consisting of 3 fascicles: anterior talofibular, posterior, calcaneofibular, medial collateral ligament.

Foot movements are performed by different joints: in tibial torsion the joint associated with a small participation of the subastragalar joint achieves flexion and extension, the subastragalar joint and medial torsion perform inversion and reversion, in the same joint with a small participation of medial torsion, abduction and adduction are initiated.

Medial torsion and the tarsometatarsal joint have an important role in the elasticity of the foot. Foot muscles are extrinsic and intrinsic. Extrinsic muscles have the most important role in the dynamics and statics of the foot and include the triceps surae, anterior and posterior tibial muscles, finger flexors and extensors. The triceps surae is a plantar flexor of the foot and stabilizer and it is most active when the foot is lifted on the toe. The soleus muscle is more important in ankle mobilization than the gastrocnemius and very sensitive to the stretch reflex.

The medial side of the soleus is active in inversion, with an important role in foot mobilization and stabilization. The lateral side of the soleus is active in eversion and stabilization rather than in the mobilization of the ankle. Anterior tibial and finger extensors are involved in foot dorsiflexion. The anterior tibial muscle is contracted during the balance phase. Peroneal muscles are active in plantar flexion and inactive in dorsiflexion. Peroneal muscles are active in plantar flexion and inactive in dorsiflexion. The posterior tibial muscle helps with plantar flexion and inversion, with the ankle in plantar flexion. Intrinsic muscles are involved in various foot movements, especially in stabilizing the foot during propulsion and their action is on the subtalar and transverse tarsal joint (Sbenghe, 1987). The most common cause of ankle sprains, especially lateral sprains, is forced plantar flexion and ankle inversion (Chan et al., 2011).

Traumatic injuries of the ankle include contusions, sprains, dislocations, fractures that can affect all anatomical structures: skin, ligaments, tendons, vascular-nervous and muscular structures. Clinical assessments are: pain, swelling, tenderness, decrease of mobility, stability, straightening and balance.

Mild and moderate sprains occur with the ankle in inversion or eversion and the foot in plantar flexion, while severe sprains involve ligaments tearing, changing of the articular surface rate, without losing this rate (Popescu & Florea, 2008).

Sprain diagnosis is made based on symptoms, clinical signs and imaging investigationd. Grading a sprain is difficult because symptoms and clinical signs are common: pain, functional impotence, edema, sometimes ecchymosis that pleads for severe sprain. Ultrasonography plays an important role in sprain diagnosis, it evidences the interruption of continuity or disinsertion of the ligament. During rest, the linear and continuous aspect remains the same, but a small liquid collection may persist (Fodor, 2009).

It is important to treat correctly sprains in order to prevent complications: frequent relapse, instability, chronic pain and early onset of arthrosis. Mild and moderate sprains consist of ligament stretch, with no modification in continuity and resistance.

The most common sprain is inversion sprain that affects the external lateral ligament and shifts the astragalus away from the external malleolus. Passive inversion and eversion are possible. Eversion sprains are rare, affect the internal lateral ligament and sometimes the inferior peroneal tibial, and induce the diastase of the internal side of the astragalus from the internal malleolus.

Foot sprains are often confused with tenosynovitis and can affect various joints: subastragalar, medial tarsal, tarsometatarsal, metatarsophalangeal, and considering their low mobility, they are in general mild sprains (Sbenghe, 1981).

Treatment of mild and moderate sprains involves pain control, restoration of muscular balance, ROM and bone stability. Patients must be advised to avoid activities that can increase swelling and pain and to rest in order to facilitate early recovery. The ankle should be elevated above the heart level.

Most of ankle sprains do not necessitate cast immobilization, medical devices may be used for 4-21 days (Fongemie 2006). Velcro ankle associated with taping increases bone stability. Prophylactic semi-rigid ankle braces reduce the incidence of ankle sprains as well as recurrences for those involved in sports with a high risk for sprains (Gross & Liu, 2003).

Hyaluronic acid intra-articular infiltration represents a relatively new approach in non-surgical ankle sprains and can facilitate earlier return to sports activities (Seah & Mani-Babu, 2010).

Treatment must be complex based on analgesics, anti-inflammatory drugs, myorelaxants, postural rest, hydrotherapy, electrotherapy, massage, kinetotherapy, cryotherapy, bracing, MgSO4 compresses, local infiltration, thermotherapy such as alternative baths.

Massage has an antalgic and venous lymphatic drainage role in fighting edema in the abdominal and proximal

extremity of the thigh and on sole level in order to facilitate venous lymphatic return. For tendons and ligaments, Cyriax massage is recommended.

Electrotherapy has an antalgic, anti-inflammatory and muscle relaxant role and consists of the application of electric current.

TENS (transcutaneous electrical nerve stimulation) has an antalgic effect due to the release of endorphins and increases steroid and serotonin levels. Serotonin plays an important role in muscle spasm relief and depression (LiBrach, 1988).

In our study, it was applied twice per day for 20 min before and after meals. Transcutaneous electrical nerve stimulation (TENS) represents one of the most used forms of electro-analgesia. It is the election method in the treatment of ankle trauma injuries.

The mechanism of analgesia produced by TENS is explained by the gate-control theory inhibiting constant nociceptive transmission via C fibers, when painful peripheral stimulation occurs, the information carried by C fibres reaches the T cells and opens the gate which is usually closed, so the pain is transmitted to the thalamus and cortex, then the gate is closed again, preventing further central impulses in the activated myelinated fibres.

The closure of gates for the transmission of nociception through A delta and C fibers prevents pain from reaching the brain (Fernandez-Del-Olmo, et al., 2008; Liebano et al., 2013; Woolf & Thompson, 1994).

The galvanic current has the property of determining thermal effects, physiological and chemical effects. Passing through humans produces molecular dissociation. Iontophoresis (ionization) is used in order to make therapeutic substances penetrate through the skin. At the anode, it produces analgesia on receptors, sensitive fibers, it releases endorphins, and has a muscle relaxant effect. At the cathode, it produces vasodilatation by blocking vasomotor nerve transmission and by relaxing smooth vascular muscles. It rises local temperature by 2-3 degrees and releases histamine and also produces mastocyte degranulation (Rădulescu, 2004).

Ultrasonography has very good analgesic effects by inhibiting nociceptive receptors and also, anti-inflammatory, muscle relaxing, fibrolytic effects and performs a micro-massage on tissue. Ultrasound is commonly used for treating acute ankle sprains due to its anti-inflammatory and soft tissue healing effects by increasing the temperature (Rădulescu, 2004).

As soon as the rehabilitation program starts, the athlete returns to play. Prevention of recurrences depends on the type of activity performed by patients. Sports such as football, volleyball or basketball increase the risk for relapse (Fong et al., 2007; Curtis et al., 2008; Fong et al., 2008; Ivins, 2006). Some studies show that asymmetry in muscle testing of ankle flexors associated with overweight and a high body mass index increases the risk of sprains in football players (Fousekis et al., 2012).

Objectives

The aim of this study was to highlight the importance of rehabilitation treatment in patients diagnosed with ankle sprain; assessment of these patients was done using pain assessment scores, quality of life and functional clinical assessments.

We observed an amelioration of pain, joint mobility and tibial torsion joint swelling in both groups diagnosed with mild and moderate ankle sprains.

Hypothesis

We considered a significant amelioration of pain and mobility in the group that received recovery treatment compared to the other group to which no recovery treatment was applied.

Material and methods

The study was elaborated with the respect of all current deontological rules, obtaining the approval of the Ethics Committee and the patient informed consent.

Research protocol

a) *Period and place of the research*

The study was conducted on a group of 60 athletes with mild and moderate ankle sprains suffered during sport competitions or while training. The patients were selected in the Rheumatology and Rehabilitation Department and the Orthopaedics Department of the Clinical County Emergency Hospital Targu-Mures in the period January 2013-December 2013.

b) *Subjects and groups*

The patients were divided in two groups of 30 patients each: group C and group E. Age ranges varied between 18-25 for a number of 25 patients, while for 35 patients age range was between 25-35. There were 38 female patients and 22 male patients, all from urban areas.

For the patients of group C, we recommended only postural rest, anti-gravitational position of the injured ankle, elastic bandage, pain and anti-inflammatory treatment, while for group E we applied a complex rehabilitation program in 14 sessions. These patients received the same treatment as patients from group C, but associated with a rehabilitation program consisting of contrasting hydrotherapy, lymphatic drainage massage, electrotherapy, kinetotherapy.

c) *Tests applied*

Patient assessment was made initially, at the end of treatment, after 2 weeks and 3 months of follow-up using VAS (visual analogue scale), clinical assessment and articular testing. VAS assesses pain intensity from 0 to 10, where 0 means no pain and 10 represents the maximum of pain described by the patient within the last 48 hours.

d) *Statistical processing*

For data analyses, we used the SPSS statistical calculation program.

Results

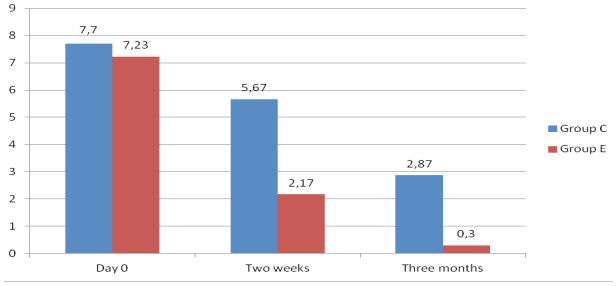

Fig. 1 – Pain amelioration in patients of both groups using the VAS scale.

We applied the VAS scale and muscular testing to both groups at baseline, 2 weeks after the completion of treatment in group E and after 3 months (Fig. 1).

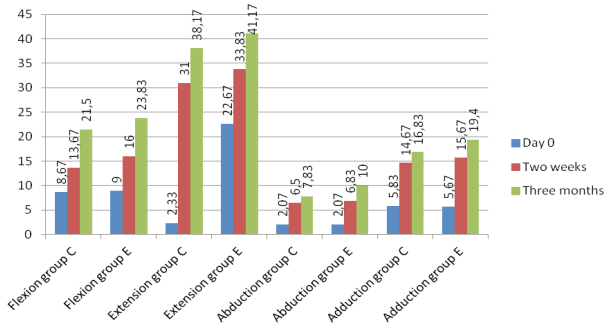

Fig. 2 – Functional assessment using joint testing.

In group, C we did not find a statistically significant improvement of pain and mobility, while in group B we obtained a statistically significant improvement graded using the VAS scale and also, an improvement of joint mobility evaluated by articular testing (Fig. 2).

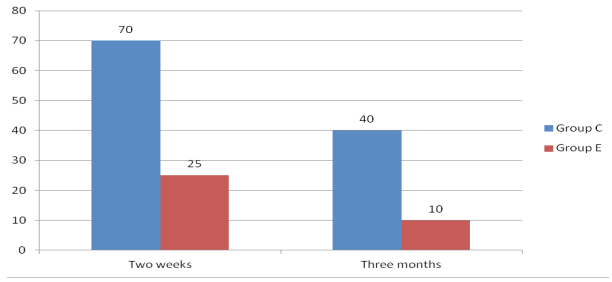

Fig. 3 – Persistence of joint swelling.

Mild joint swelling was maintained in 70% of the patients of group A 2 weeks after the trauma injury, and in 40% of patients it occurred intermittently due to overloading at 3 months follow-up. In group B only 25% presented joint swelling after 2 weeks from trauma and only 10% at 3 months follow-up (Fig. 3).

Discussions

Ice packing was applied during the first days, 4 times per day for 15 min, and contrasting hydrothermal therapy was applied initially, after 2 days from the trauma injury. We used alternative baths 2-3 times per day.

Electrotherapy included the relief of pain and anti-inflammatory procedures, TENS, ultrasonography with NSAID gel, laser therapy, ion galvanization with MgSO4. The procedures were performed daily for 14 days.

The main objectives of the rehabilitation program were: pain relief, restoration of mobility and bone stability, as well as muscle balance training. The restoration of muscle balance targets the whole body and requires muscle strengthening, regaining of motor control, coordination and feedback. Strengthening exercises based on isometric exercises, with resistance or progressive loading were aimed at the surae triceps, the anterior, posterior tibial, extensor and common flexor fingers, lateral fibula, flexor hallux, short flexor of sole. The restoration of motion included exercises for the stability of the contralateral limb, open kinetic chain exercises from decubitus, knee position, orthostatic position and walking. In coordination restoration, an important role was played by occupational therapy based on pedalling, rolling boards, easy jumping, various walking exercises. To increase ROM, patients performed passive mobilization, stretching and active mobilization. Some theories suggest that an exercise program based on balance and coordination training may have both local and central effects on the sensory-motor system and can promote neuromuscular improvements in the prevention and rehabilitation of ankle injuries.

Impaired neuromuscular control and its effects represent delaying factors in the rehabilitation program (Dundas et al., 2014). The rehabilitation program had 3 phases: phase I based on improving the range of motion, pain control, gait training and fighting inflammation. Phase II was characterized by improving strength, flexibility, increasing the range of motion and cardiac adaptation and also, facilitating proprioception. Phase II objectives: restoration of the prior level of function (Fongemie, 2006).

Conclusions

1. Our study demonstrates that a complex rehabilitation program ameliorates pain and mobility in athletes with ankle trauma injury, with effects in the long run.
2. Joint swelling occurs due to mechanical overloading and is more frequent in patients with no recovery treatment.
3. Rehabilitation treatment increases the chances for a quick recovery and resumption of sports activities for athletes.
4. The rehabilitation program prevents short and long-term complications.

Conflicts of interests

There are no conflicts of interest.

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