

Current treatment approaches for ankle ligament injuries: what has changed?

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Abstract

Because of inadequate and unsuccessful management of ankle ligament injuries (ALI), undesired chronic disabilities may unluckily be observed. Treatment of these patients should be planned comprehensively and in detail depending on patient's diagnosis, injury's severity and stage. Program should not only be focused on solving the edema. An integrated treatment covering injury's acute and subacute period and a comprehensive algorithm including an early rehabilitation program would provide better recovery times.

Keywords: Ankle, ligament, injury, treatment

Introduction

Today growing interest in a healthy lifestyle leads to an increase in sports consciousness in society. As a result of increased number of sports facilities and activities, incidence of sports-related injury rates and related complications due to these activities have also naturally raised. As a well-known fact, ankle injuries (AI) are one of the most common and troublesome injuries caused by these activities and nearly two million individuals suffer from ankle injuries each year in the United States [1, 2]. These injuries constitute 22% of sports-related trauma patients who are admitted to the emergency departments. Unluckily at least one sprain or fracture case is observed in every 8 foot-ankle injuries [3]. Exact frequency of these injuries may be higher than it was thought when it is considered many patients with AI do not need to do anything about their problems. AI are usually disturbing conditions which often resulted in immobilization and cause individuals to stay away from their social life. Also AI work regardless of the type of injury and unfortunately we still do not have a widely used algorithm which has reached a full consensus on regarding the acute treatment of ALI especially. Today, a well known and accepted approach -RICE (rest-ice-compression-elevation)-also has some differences in application among clinicians.

In this brief report we have tried to create a simple treatment algorithm for the management of ALI in the light of current knowledge.

Diagnosis and Staging

Despite ALI cases are seen in all kinds of sports activities, they are mostly observed after basketball, football and ice skating activities, moreover previous AI history increases the risk of recurrence significantly [4]. Among many other risk factors, gender, foot-shoe type and presence of general body laxities may also increase the risk of ALI [5].

General mechanism of AI is that the foot is subjected to inversion-adduction force when it is in internal rotation (supination) position. A lateral ankle ligament injury (anterior talofibular, calcaneofibular and posterior talofibular ligaments) is observed in 85% of the ligament injuries. Anterior talofibular ligament (ATFL) prevents the forward displacement of the ankle and allows the continuation of the internal rotation-inversion movement. When mechanism of ankle traumas and ATFL's physiological responsibility for preventing ankle are considered, question "why ATFL is the most injured ligament in ALI" can easily be figured out [6].

Diagnosis of ALI mainly depends on a well physical evaluation; interrogation of the injury's nascency, palpation of painful parts and anterior drawer test are required for revealing the potential ligament injuries in patients without bone injuries. In addition to edema, hematoma and pain with palpation, a positive anterior

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drawer test highly supports the possibility of ATFL injury [7]. The X-ray graphics are being requested from 80-95% of the injured patients admitted to the emergency departments, but unexpectedly an osseous pathology is only found in 15% of them [8]. In order to reduce unnecessary X-ray requests Ottawa ankle and foot physical examination rules were created for patients presenting to the emergency departments with the complaint of AI. According to Ottawa ankle and foot rules, tenderness with palpation at 6 cm proximal of the ends of medial and lateral malleolus at the posterior part of the bone and the patient's difficulty in weight bearing during walking (not being able to take 4 steps) are required for requesting an ankle radiography. Unfortunately it's high sensitivity, wide range of specificity rates were revealed such as 10-79% in recent studies [9]. Nowadays, magnetic resonance imaging (MRI) is the most preferred method to reveal a possible ligament injury in ankle traumas. MRI has become a key modality in the diagnosis of sprains or ligament tears. The sensitivity and specificity of MRI for ATFL lesions are 100% and 50%, and these rates for calcaneofibular ligament injuries are 92% and 100%, respectively [10].

Classification of the ALI is mainly based on the injury's severity, a Stage 1 ALI lesion describes slight stretching of ligaments (sprain) without a macroscopic rupture or joint instability. A Stage 2 lesion represents moderate edema and pain with a partial tear in the ligament (strain). Functional limitation and a low-to-moderate ankle instability may also exist in this phase. A Stage 3 lesion means; full thickness tear and significant pain with edema. In addition to instability and limited functions, ankle haemorrhages and bruising may also be observed in this stage [11].

Treatment

Most of ALI cases are usually treated with conservative medical therapy. It has been previously reported that, pain and instability remains in 5-33% of patients and sprain develops at least one in 34% of the cases despite a medical treatment. One year after the initial trauma, conservatively treated ALI patient's control findings also revealed unexpected outcomes; unluckily a complete improvement seems not a possible goal to achieve in 15-64% of the these patients [12]. Ineffectiveness observed in these ALI patients may probably be attributed to lack of a real homogeneity in the management of ankle soft tissue injuries. Inadequate diagnostic evaluation or grading and an inappropriate treatment based on that diagnosis may also contribute to having these undesired outcomes. High diagnostic accuracy and staging increase the patient's change of getting a better treatment. Nonetheless, neither a good diagnosis nor the RICE (acute treatment of injury) treatment constructed on this diagnosis can alone provide demanded results without a well designed rehabilitation program [13]. RICE mainly aims to reduce pain-edema and secondary hypoxic injury caused by acute inflammatory reactions in acute phase [14]. Nevertheless, despite it's

widely use in clinical practice, RICE is usually an insufficient treatment method to get success in the treatment of ALI and for preventing patients from future chronic ankle problems.

It's likely that the immediate weight bearing and strengthening exercises accelerate the regeneration of injured ligaments after AI [15]. Strengthening the lower leg, foot and ankle muscles as well as the ligaments and tendons, respectively, supports the ankle joint stabilization and pain relief. Ligament healing has been categorized into three phases; the inflammation phase is the first phase and it begins 2-4 days after the injury. Mild stretching exercises and an early rehabilitation program which have begun in this phase lead scar not to organize. The following phase generally lengthens up to 6 weeks after the injury and stretching exercises prior to strengthening in this stage provide reduction in the scar tissue's density. The third phase generally begins 3 weeks after the injury and continues up to 12 months. In this stage cellular tissue turns into a collagenous connective structure and healed ligaments move back to their functional position by contracting [15, 27, 35]. There are sings that a well designed rehabilitation program may help to gain and maintain injured ligament's regular position and tension in this stage [16]. But in case of excessive stretching or exercises (Greater stress and tension than the verge of safe load) scar tissue may possibly increase or complex regional pain syndrome may be triggered.

Ice application helps in tissue healing by reducing the temperature of the injured area (reducing under 15⁰), metabolic activity, edema and the inflammatory process after the injury. In addition, pain and muscle spasms are also reduced by slowing nerve conduction velocities [17]. Application of the ice together with exercises is an other entity called as cryokinetics. Cryokinetics is a technique involving ice application followed by active exercises. It is claimed that the ice application followed by exercises is superior to the ice application alone in terms of the efficacy of treatment [18]. Up to now different points of view are presented in literature regarding the duration and interval of ice application: such as for 10-20 minutes or 20-30 minutes with 2-4 times a day, for 30-45 minutes or for 20 minutes within 2 hours after injury. In a study conducted by Bleakley et al., 20-minute application of ice therapy was compared to two 10-minute applications with 10-minute interval, resulted as intermittent application of ice provided less pain than single use, but no difference was observed between two application group in terms of edema. Similar findings pointing out the intermittent application's superiority in pain to single one were also observed in other studies [19, 20]. Unfortunately knowledge on the use of cryotherapy in AI is mainly based on experimental studies and the level of evidence of cryotherapy after ALI is only C [21]. We believe that increasing number of evidence-based future studies searching for its effectiveness and an optimal

duration frequency are strongly needed.

To reduce the development of edema and hemorrhage caused by increased permeability of capillary wall and fluid extravasation, compression is usually performed in the acute and subacute period of AI. Different types of compressions are used to improve these impairments, in a study searching which one is more effective than other, the regional compression is found to be more effective than widespread one and statistically significant delayed functional recovery time rates were also observed in patients with regional compression [22]. Increased edema at the front and the bottom of the lateral malleolus can be reduced by a horseshoe-shaped compression pads placed on the malleolus and it seems implementation of a semi-solid compression instead of an elastic bandage provides a better edema control after ALI [6]. On the other hand no significant differences were observed between the effectiveness of the elastic bandage and orthosis in the first 3 days of the injury [23]. Unluckily numbers of evidence-based studies are not enough to prove compression's effectiveness after AI. Although compression therapy is the generally accepted application, there are still limited and conflicting research results about this application. Consequently, compression usage in ALI also has a fair scientific evidence level suggesting requirement of future studies as cryotherapy [21].

Even if RICE is an acronym which does not include initial of non-steroidal anti-inflammatory drugs (NSAIDs), use of (NSAIDs) in the management of ALI have the strongest level of evidence (A level of evidence) [18]. The studies performed with NSAIDs (such as piroxicam, celecoxib and naproxen) aiming to reduce pain, edema and restore functions revealed that NSAIDs had a quite challenging effect when compared to placebo in the acute and subacute period of ALI management [24, 25]. Nevertheless, in addition to NSAID's gastrointestinal side effects, clinicians should also be aware of their undesired other effects such as reduced tendon strength and power during healing. To minimise their systemic side effects, drugs may also be used as topical preparations [24, 25, 35].

Probably the most challenging conflict of interest is over the functional rehabilitation phase in the management of ALI patients. A functional treatment and rehabilitation program mostly includes a well-planned series of exercises for gaining impaired range of motion, strength and sensorimotor functions[26]. In the acute phase of injury, a well-structured rehabilitation program focuses on gentle stretching the calf, ankle and foot muscles to reduce pain, regain muscle strength and normalise ankle range of motion. At the same time progressive weight-bearing exercises, proprioception and resistance exercises are applied for 1-6 weeks. Proprioception exercises, particularly are an essential component of the rehabilitation program to reduce the risk of recurrent injury and ongoing pain. After reaching the goal of a painless

range of motion, rehabilitation requires strengthening dorsiflexors and evertors of the foot-ankle [35]. As well as the pain relief are achieved, balance-training exercises can be performed in order to ensure neuromuscular control [27]. It takes 1-3 weeks to return to work when the optimal rehabilitation program, described above, is applied.

Nowadays instead of immobilization which is recommended for Phase 1-2 patients with ALI for 10 days, ankle stabilization (elastic bandages or orthosis) together with progressive weight bearing and mild exercise programs are mostly performed to have satisfactory outcomes in the treatment [28-30]. In a trial comparing early mobilization's effectiveness with immobilization for 10 days, less pain and an early return to social life were observed in early mobilization group [29]. In addition, according to the National Athletic Trainers' Association (NATA) guideline [21], when compared to immobilization, a well designed functional rehabilitation program was found to be more effective in Phase 1 and Phase 2 treatment of ALI (A level of evidence).

Lack of posterior sliding movement of talus caused by ALI may lead to a limitation in ankle dorsiflexion. In the case of a limitation, in addition to stretching exercises, anterior-posterior joint mobilization techniques would also contribute to providing normal ankle range of motion earlier than expected in functional rehabilitation phase [31]. Sprain in ATFL may result due to the forward displacement of the fibula after ALI [32-34].

Studies reporting a positive correlation between the fibular forward displacement and ankle edema claim that the joint mobilization techniques can be helpful in reducing ankle edema in the event of a forward displacement of fibula. It is recommended after immobilization. It has been previously proved that when compared to using an elastic bandage alone, an early performed progressive functional rehabilitation program following below-knee plaster cast application for 10 days provides favourable functional capacity outcomes at the 3-month period after the injury [20].

Today, RICE treatment has been replaced with more reasonable PRICE (protection, rest, ice, compression, elevation) treatment. Patient's education procedures for the protection and prevention of possible injuries has come into prominence in recent years and protection of the affected area from further injuries; for example, by using a support has taken the first place both in the management and algorithm [18]. In the first 24 hours PRICE method has been found to be effective for only the control of edema, now current understanding more clearly represented that PRICE is not an adequate algorithm alone, the mild stretching exercise programs are also required for an earlier improve in decreased range of motion and power after 24 hours [6]. We believe in the necessity of a comprehensive treatment approach to prevent patients from

disabilities and recurrences. It's now clear that treatments like RICE and PRICE aiming to improve acute phase complaints are not enough to protect patients from further disabilities and limitations. In the light of all these findings we suggest an integrated treatment method covering not only injury's acute phase but also the subacute period and a comprehensive algorithm including an early rehabilitation (ER) program which will provide better recovery times and help patients to return their social lives earlier than expected. PRICEER (Protection, Rest, Ice, Compression, Elevation, Early Rehabilitation) would be a useful acronym in order to remind and keep a clinician's mind stayed on early rehabilitation's significance.

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