



# Treatment of post-traumatic ankle ligament adhesions – case report

## Leczenie pourazowych zrostów więzadłowych stawu skokowego – studium przypadku

Mirosz Parchimowicz<sup>1,2</sup>, Adam Michoński<sup>2,3</sup>, Oktawia Parchimowicz<sup>2</sup>, Anna Lubkowska<sup>1</sup>✉

<sup>1</sup>Pomorski Uniwersytet Medyczny w Szczecinie, Zakład Diagnostyki Funkcjonalnej i Medycyny Fizycznej, ul. Żołnierska 54, 71-210 Szczecin

<sup>2</sup>Centrum Rehabilitacji Terapia, ul. Dubois 27, 71-610 Szczecin

<sup>3</sup>Zachodniopomorska Szkoła Biznesu w Świnoujściu, Wydział Ekonomii i Nauk o Zdrowiu, ul. Grunwaldzka 47, 72-600 Świnoujście

✉ anna.lubkowska@pum.edu.pl

### ABSTRACT

Ankle sprains are the most common sports injuries, but they also happen to people that do not do any sports at all. Most of them are inversion-type traumas which could harm soft tissues like lateral collateral ligaments, capsule and peroneal tendons. The vast majority of these injuries are grade 1 sprains where there is no clinical instability. Very often treatment is based on conservative protocols, i.e. RICE (rest, ice, compression, elevation), immobilization and avoiding weight bearing. Besides the above procedures, in the following period of time some modalities are planned, and there is not enough attention paid to regaining function after the acute stage. Such a conservative approach over a longer period of time should be reserved for fractures and grade 3 sprains because immobilization leads to loss of proprioception and the formation of inelastic scar tissue caused by

ligamentous adhesions. It takes about 6 weeks to form adhesions, and clinically those patients complain about pain, sometimes also with swelling, after some exertion. One treatment option is deep friction and manipulation of adherent lateral ligaments to break the adhesions.

The aim of this paper is to show an alternative treatment option which is safer than manipulation. The authors propose the use of a shockwave therapy in combination with a home exercise stretching programme in positions reproducing the trauma mechanism to remodel the scar tissue. Additionally, there should be proprioception exercises for prophylaxis and regaining normal function.

**Keywords:** ankle sprain; anterior talofibular ligament; calcaneofibular ligament; shockwave therapy.

### ABSTRAKT

Skręcenia stawu skokowego są jednym z najczęstszych urazów sportowych, ale dotyczą także osób, które w ogóle nie uprawiają żadnych sportów. Większość z nich to tzw. urazy inwersyjne mogące powodować uszkodzenie tkanek miękkich, takich jak: więzadła poboczne, torebka stawowa, ściegna mięśni strzałkowych. Zdecydowana większość tych urazów to skręcenia I stopnia bez cech niestabilności klinicznej. Często leczenie w tych przypadkach opiera się na konserwatywnym protokole RICE (odpoczynek, chłodzenie, kompresja, elewacja), unieruchomieniu i odciążeniu kończyny. Powyższe postępowanie w późniejszej fazie uzupełnione jest o fizykoterapię, jednakże mało uwagi zwraca się na pracę nad funkcją stawu w momencie ustąpienia fazy ostrej. Konserwatywne postępowanie w dłuższej perspektywie powinno być zarezerwowane wyłącznie dla złamań i skręceń stopnia III, dlatego że długo trwające unieruchomienie

prowadzi do utraty propriocepcji i powstania nieelastycznej bliźnicy spowodowanej zrostami więzadłowymi. Tworzenie zrostów trwa ok. 6 tygodni. Klinicznie pacjenci zgłaszają ból, a czasem także obrzęki po pewnym wysiłku. Opcją leczenia jest głęboki masaż poprzeczny i manipulacja więzadeł pobocznych do rozerwania zrostów.

Celem pracy było zaproponowanie alternatywnej terapii, bezpieczniejszej niż manipulacja. Autorzy proponują zastosowanie terapii falą uderzeniową w połączeniu z programem ćwiczeń do wykonywania w domu odtwarzających mechanizm urazu tak, żeby przebudować nieelastyczną tkankę. Powyższe postępowanie musi być uzupełnione o ćwiczenia propriocepcji jako profilaktyka oraz celem odzyskania normalnej funkcji.

**Słowa kluczowe:** skręcenie stawu skokowego; więzadło skokowo-strzałkowe przednie; więzadło piętowo-strzałkowe; fala uderzeniowa.

### INTRODUCTION

Sprained ankle is one of the most common injuries in physically active populations. Predominantly, this injury occurs during sport activities (45%), recreation (20%), and during work (16%). Most traumas are inversion-type (60%), and include lesions of the lateral collateral ligaments complex. This consists of three ligaments: the anterior talofibular ligament (ATFL), the calcaneofibular ligament (CFL) and the posterior talofibular ligament

(PTFL). The largest percentage of injuries are isolated lesions of the ATFL and CFL. The PTFL is damaged less often [1, 2, 3]. The ATFL is an integral part of the joint capsule on the inner side, and it is covered by synovial membrane. It has its origin on the top and on the anteroinferior aspect of the distal fibula, and it runs to the neck of the talus. It is 2 mm thick, 12–20 mm long and generally comprises one bundle. The CFL is a cylindrical extracapsular ligament 8 mm thick and approximately 20 mm long. The CFL begins at the top of the distal fibula and

ends at the lateral part of the calcaneus. This ligament has a connection with the peroneal tendon sheath [4, 5]. Lesion of the ATFL and CFL occur due to the shifting of body weight on foot fixed in plantarflexion and inversion that leads to rotation of the talar bone as well as adduction and supination of the forefoot. There is reliance on the angle of plantarflexion during inversion. If there is more plantarflexion, the ATFL is injured. When the ankle joint is in a neutral position the CFL is damaged [5]. Ligament lesions are classified according to a three-grade scale depending on signs during inspection and functional examination. The most frequent injuries are grade 1 (71%). Grades 2 and 3 constitute 12% of the remaining injuries. Grade 1 is when fibres of ligament are slightly stretched and damaged. There is a mild swelling, tenderness on palpation, and the presence/absence of small haematoma. There is no clinical instability and movement could be slightly limited [6]. Grade 2 is a partial rupture of the ATFL and it leads to the formation of a larger and more tender swelling, loss of motion in the capsular pattern, and inability to bear weight. There is slight joint instability. Grade 3 is a total rupture of the ATFL, CFL and the lateral part of the joint capsule. Pain is severe, the haematoma and swelling are large, there is a severe tenderness, and a great inability to bear weight or walk. The loss of motion is significant, and there is a clear capsular pattern with muscle spasm [5, 7]. The decision about doing X-ray has to be considered when the fracture is suspected. To reduce unnecessary overdiagnosis the Ottawa Ankle Rules were proposed in 1992 to describe clinical symptoms indicating fracture: tenderness of malleoli, base of V metatarsal bone, navicular bone, inability to bear weight after the trauma and in the emergency department. Additionally, there are some other clinical signs indicating grievous injury, like nocturnal pain (haemarthrosis), age over 60 (fracture), capsular pattern of the upper and lower ankle joint (osteochondral lesion/haemarthrosis), severe pain at passive valgisation (lateral malleolous fracture), and weak and painful resisted test of peronei (fracture of V metatarsal) [5, 7, 8]. To this day ligament injuries grades 1 and 2 are still treated incorrectly using a conservative protocol based on immobilization and avoiding weight bearing. This leads to a loss of proprioception and the formation of inelastic scar tissue. Conservative treatment should be implemented in patients with fracture and injury grade 3. Cyriax suggests a local infiltration of triamcinolone in the acute stage in the first few days after injury to decrease the pain and inflammation [5]. Functional treatment of sprained ankle may also be implemented, consisting of progressive deep friction, manual mobilization grade 1, proprioception training and early weight bearing. In the case of late mobilization of sprain grades 1 and 2 adhesions could form between bone and ligament, and this can lead to chronic functional limitations seen at around 6 week after trauma. A medical history of patients with chronic ankle sprain is typical: there was some trauma, patients did not receive proper treatment, there is tenderness and small swelling around lateral malleolus after exertion. In clinical examination there is pain at the end range of motion of plantarflexion and plantarflexion-adduction-supination. Compared

with the other leg, the range of motion (ROM) could be slightly limited [5, 8, 9]. According to Cyriax, the most effective treatment is to break the adhesions by manipulation preceded by deep friction. Often one manipulation session helps to improve a problem that has caused continuous disability for weeks, sometimes even months. No anaesthesia is necessary except about 10–15 min deep friction of the sprained structure. The most important thing here is to be certain about the diagnosis. A distinction should be made between potential adhesions, peroneal tendinitis and subacute traumatic arthritis of the subtalar joint, which could also be the result of a previous ankle injury. In the first case the distinction is made by the end-feel during passive inversion and the negative findings during resisted eversion. In a slight problem the single resisted eversion test could be negative, but testing that repeatedly could cause some pain [5, 9]. In the second case, which is subacute traumatic arthritis, there is also some limitation of movement in the calcaneocuboid joint, which is caused by a spasm of the peronei. In the case of adhesions, the movement at the talocalcaneal joint should be normal, and the end-feel is not spastic but rigid. In both cases there will be no benefit from manipulation and we could aggravate the patient's symptoms [5, 9].

## CASE PRESENTATION

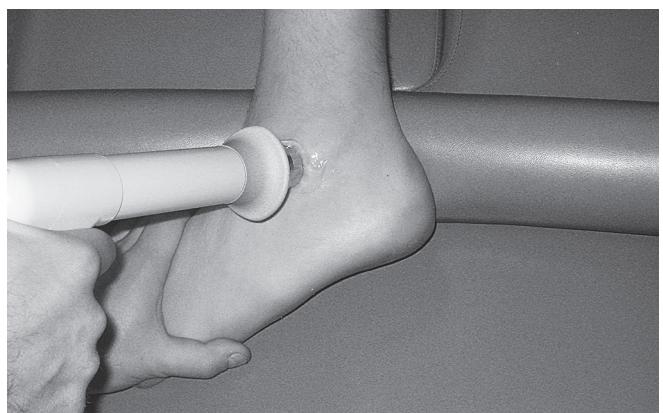
A 24-year-old patient sprained his ankle and had an X-ray a few hours later which proved no fracture. Although the foot was sore and swollen, the patient was able to walk. He was told by his doctor that this kind of sprain is classified as grade 1, and that his lateral ligaments were injured. The doctor told him to wear ankle foot orthosis, walk on crutches, avoid any movement and follow RICE (rest, ice, compression, elevation) treatment rules at home. The patient also received prescribed electrostimulating and laser therapy in a contracted health centre over the next 4 weeks. The patient felt better but avoided any activity. Six weeks after the injury he came to our Rehabilitation Centre complaining about pain on the anterolateral aspect of his foot, which was felt every time after 20–30 minutes of walking. In the functional examination passive plantar flexion and inversion was painful and stiff at the end of the range of motion. There was slight limitation compared to the other foot. Resisted movements were negative. There was no instability but proprioception was poor because it was the fourth sprain in 2 years. The diagnosis was posttraumatic ATFL and CFL adhesions that probably formed because of too conservative treatment in the first few weeks after injury (Figures 1 and 2).

## THERAPY

For the purpose of regaining full range of motion, but also for decreasing the risk of future injuries through improving proprioception, we decided to use a longer, alternative protocol of treatment. Instead of deep friction together with



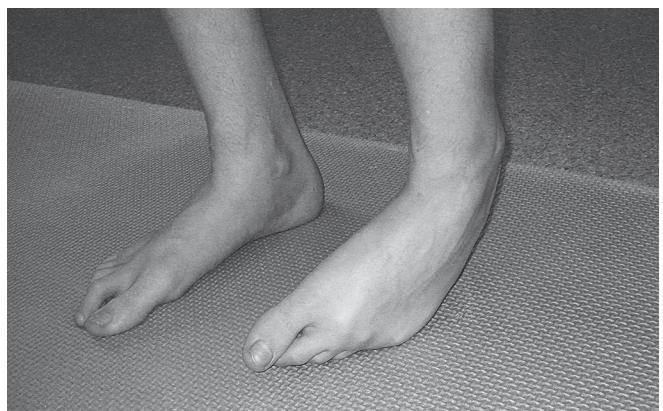
**FIGURE 1.** Functional examination – passive plantar flexion



**FIGURE 3.** Shockwave therapy for anterior talofibular ligament



**FIGURE 2.** Functional examination – passive plantar flexion–adduction–supination



**FIGURE 4.** Auto stretching

manipulation of the adhesions, which usually ends after one session, we decided to do shockwave therapy combined with auto stretching of the lateral ligaments as in the injury mechanism. Shockwave therapy mechanisms include neovascularisation, direct stimulation of healing and suppressive effects on nociceptors, as well as hyperstimulation mechanism which blocks the gate control mechanism [10, 11, 12]. Shockwave therapy was applied once a week, and afterwards the patient did stretching and proprioception exercises under supervision. Proprioception started with easier exercises like bilateral standing on a firm surface with eyes open, followed by unilateral standing on an unstable surface like a wobble board with eyes closed, or doing additional exercises while standing. The patient did all the proprioception training in front of a mirror, so he was able to control proper posture and knee position, where the middle of the knee cap should be over the second toe. Additionally, about 10–15 minutes of exercise daily at home was recommended. Since shockwave therapy in the ankle area is quite painful, the initial dose was 2000 strokes of 1.5 bar and a frequency of 10 Hz. The amount and frequency of strokes until the end remained unchanged, and the pressure in the subsequent treatments was gradually increased, and during the last treatment we used 2.5 bar. After 6 weeks of the treatment, functional testing showed a full range of motion and no pain during passive plantar flexion

and inversion. At the end of the treatment we did a 30-minute walking test on a treadmill at a speed of 5 km/h, which was painless (Figures 3 and 4).

## CONCLUSION

The alternative method of treating post-traumatic adhesions of lateral ankle ligaments was successful in our case because the patient regained the full range of motion and his main functional complaint was gone. Although the above described and proposed protocol takes more time than manipulation, there are some advantages of this longer therapy. First of all, there is a risk of potential misdiagnosing of post-traumatic adhesions with chronic peroneal tendinopathy or subacute traumatic arthritis at the subtalar joint. Differential diagnosis has already been explained. Manipulation in both cases is contraindicated because it could cause a new trauma, including a torn tendon or aggravation of inflammation in arthritis. Our alternative approach would be helpful in cases of misdiagnosing adhesions with tendinopathy because shockwave therapy and stretching would also be a treatment option [13]. We do not know about any benefits in the case of subacute traumatic arthritis at the subtalar joint, but for sure it would not be as traumatic as manipulation. If we are right and the patient's symptoms are caused

by adhesions, there will be a question about the therapists' manipulation skills. Our alternative treatment protocol can be used by a physiotherapist without any special training course. The longer time will also be beneficial to work on proprioception, which is the best strategy to reduce future sprains [14]. To restore proprioception, it must be a longer process with some progression of exercises. The process should start with easier exercises like bilateral standing on a firm surface with eyes open, and progress to unilateral standing on an unstable surface like a wobble board with eyes closed, or doing additional exercises while standing [15]. In the last year we have had over 100 patients with ankle sprains, but only 5 of them had a similar history to our study case patient. They all attended no earlier than 6–10 weeks after injury and complained about pain after some activity. They all did well with our protocol of treatment and were able to return to doing sport.

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