American Journal of Medicine and Medical Sciences 2025, 15(12): 4625-4628
DOI: 10.5923/j.ajmms.20251512.94

A Complex of Clinical and Diagnostic Studies Necessary for an Objective Assessment of Long-Standing External Ligament Damage and Chronic Ankle Instability

Gafforov Azamat Uygunovich

Bukhara State Medical Institute named after Abu Ali Ibn Sino, Bukhara, Uzbekistan

Abstract Due to the high rates of development of professional and amateur sports, leading to an increase in athletes' injuries, the problem of treatment and further recovery of patients with ankle ligament injuries is important and one of the most difficult in traumatology and orthopedics today. Therefore, a significant part of patients with ankle ligament injuries go to the hospital for treatment late after injury (from 6 months to 3 years). Incorrect diagnosis of ankle ligament injuries in the acute period leads to the development of chronic ankle instability in 20-40% of cases, which contributes to the development of degenerative-dystrophic changes in the joint, decreased performance and disability of patients. In the presence of crousarthrosis, 60-65% of patients lose their working capacity dramatically, 11.5% of them develop a disability, despite the fact that the dominant part of patients are relatively young and able-bodied.

Keywords Treatment methods, Deforming osteoarthritis, Degenerative-dystrophic

1. Introduction

Ligament damage accounts for about 85% of all ankle joint injuries, of which 80% is caused by the external supination mechanism of injury. Ankle ligament damage accounts for 14 to 21% of all sports injuries, about 40% in basketball players, and 25% in football players. In women, these injuries are more common than in men, with similar loads. Diagnosis of ankle ligament injuries in the acute period after injury is difficult due to severe pain syndrome, muscle hypertonia and severe restriction of movement in the joint. The correct diagnosis in the acute period of ankle ligament injury is not always correctly established on an outpatient basis. In such situations, the orthopedic traumatologist is limited to the well-known concept as "Ankle sprain", and additional examinations are not performed to clarify the volume and degree of damage to the ligamentous apparatus. Despite a large number of works on this topic, there is still no unified approach to the surgical treatment of the capsular ligamentous apparatus (CSA) of the external ankle joint. The presence of many described methods of surgical treatment of CSA of the external ankle joint indicates the dissatisfaction of traumatologists with the results of treatment of patients with this pathology. To date, the improvement of surgical treatment methods is aimed at reducing invasiveness and reducing the duration of rehabilitation. The active development of minimally invasive surgical techniques for large joints has led to the replacement of open techniques with arthroscopic ones. However, minimally invasive surgery of the CSA of the ankle joint stopped at intra-articular pathology [2,4,6,8].

* Corresponding author:
azamat_gafforov@bsmi.uz (Gafforov Azamat Uygunovich)
Received: Nov. 12, 2025; Accepted: Dec. 8, 2025; Published: Dec. 26, 2025
Published online at http://journal.sapub.org/ajmms

2. Results and Analyzes

Thus, the frequency of ankle ligament damage, the difficulty of diagnosis, the lack of a unified approach and the untimely treatment at the stage of chronic instability indicate the relevance of this study. The ankle joint refers to complex block-shaped joints with one degree of freedom, in which movements are carried out around the sagittal plane. Since the outer ankle is located posteriorly and the inner ankle is located anteriorly from the frontal line, the ankle axis is at an angle of 2550 °from the latter. Due to the oblique position of the axis of motion, slight adduction and supination of the foot occurs during flexion, and abduction and pronation occur during foot extension. The range of motion in the ankle joint is 60-90°, with flexion being 30-50° and extension 20-30°. The fibula articulates proximally and distally with the tibia. A connective tissue membrane runs between them throughout. The distal parts of the shin bones form a joint that is stabilized by the interosseous and transverse ligament. This joint plays an important role in the stability of the ankle joint. "The ligaments of the ankle joint, depending on their location, are divided into three groups: 1) medial ligament complex (deltoid ligament); 2) lateral ligament complex; 3) ligaments of the tibial joint. The lateral ligamentous complex consists of the anterior and posterior tarano-fibular ligaments and the calcaneal-fibular ligament. Of the lateral ligaments, the anterior tarano-fibular ligament (PMTS) deserves the most attention as the thinnest and weakest of all the external ligaments of the ankle joint." The "PMTS" originates from the anterior edge of the lateral ankle and attaches to the outer surface of the talus bone directly at the anterior edge of the external articular surface of the block. The ligament is closely connected to the joint capsule. The literature describes various variants of the structure of this bundle from single-bundle to three-bundle. In a neutral position, the tarano-fibular ligament runs almost parallel to the axis of the foot and is in a relaxed state. When the foot is in the flexion position, the ligament is parallel to the axis of the lower leg, is maximally tense and prevents the talus from shifting anteriorly. In this position, the ligament is most vulnerable to injury, especially if forced flexion is accompanied by inversion of the foot. Most authors consider the anterior fibular ligament to be the most important component of the external ligaments that ensure the stability of the ankle joint. The anterior tarano-fibular ligament provides both anteroposterior and lateral stability of the ankle joint. Its role in the mechanics of the ankle joint is to limit flexion, inversion of the foot, in addition, it prevents internal rotation of the talus." In most works, "PMTS is characterized as the most important element ensuring the stability of the external ankle joint." "The ligament provides joint stabilization in the anteroposterior and lateral directions." PMTS "plays an important role in the biomechanics of the ankle joint, namely, it restricts flexion, supination, and internal rotation of the talus." "The calcaneofibular ligament starts from the anterior surface of the lateral ankle, below the anterior taliofibular ligament, runs obliquely down and back and attaches to the lateral surface of the calcaneus. The more vertical course of the ligament reliably strengthens the outer part of the ankle joint, while providing additional protection for the anterior fibular ligament. This ligament is extraarticular, most of its fibers are located above the tendons of the peroneal muscles [1,3,5,6,7,8].

Often, the fibers of the anterior tarano-fibular and calcaneal-fibular ligaments connect. The options for the location of the calcaneal fibular ligament were studied by C. J. Ruth (1961): the calcaneal fibular ligament assumes a vertical position when the foot is extended, a horizontal position when the foot is bent, remaining tense during any movement. In the neutral position of the foot, this ligament is perpendicular to the axis of the foot, forming an angle from 10 to 45 ° with the longitudinal axis of the fibula. When the foot is extended, the ligament experiences the greatest stress and acts as the main stabilizer of the ankle joint. With excessive flexion of the foot, the calcaneal fibular ligament loses its stabilizing function, while the anterior fibular ligament is stretched. E. C. Persy et al. (1967) proved that this is the main ligament that stabilizes the ankle joint when the foot is extended and in a neutral position. It restricts inversion, prevents excessive extension of the foot and internal rotation of the talus." The ligament reaches its maximum tension when the foot is extended, thus, according to many authors, it is considered the main stabilizer of the ankle joint. In the position of maximum flexion, the ligament relatively relaxes and ceases to stabilize the joint, in this case, the tension of the anterior tarantula ligament increases, which will serve as a stabilizer. In the work of E. C. Persy et al. It is described that "the calcaneal fibular ligament acts as the main stabilizer of the ankle joint, in particular, both in the neutral position and in the extension position. The calcaneal fibular ligament prevents excessive supination, extension, and rotation of the talus." The posterior tarano-fibular ligament ranks second in strength among the ligaments of the external ankle joint. The bundle is capable of withstanding loads reaching up to 261 N. The dimensions of this bundle, according to various sources, are: length - 21 mm, width - 8 mm and thickness - 4.5 mm. "The posterior tarano-fibular ligament begins posterior to the inner surface of the lateral ankle and attaches to the lateral tubercle of the posterior process of the talus. This ligament has its own synovial sac. One of the most important functions of the ligament is to stabilize the joint during foot extension. The ligament prevents the rotation and displacement of the talus." "The deltoid ligament is triangular in shape. It is the most powerful ligament of the ankle joint. The ligament consists of several thick and strong bundles originating from the inner ankle and attached in front to the neck of the talus and navicular bones, behind to the inner surface of the talus, and below to the tip of the talus of the calcaneus. Most authors describe that it is represented by 4 portions: tibia-navicular, anterior tarano-tibial, posterior tarano-tibial, tarano-tibial. R. Golano et a1. (2010) in their study of the ankle joint on cadaveric material indicate that it is quite difficult to divide the deltoid ligament into groups on the preparation, since the bundles the ligaments fit snugly together, and there is no visible boundary between them, so the division of the deltoid ligament into components is conditional. The contradictory opinions of anatomists are probably explained by different variants of the norm. The deltoid ligament plays a major role in stabilizing the ankle joint. It inhibits excessive eversion movements, flexion, pronation and external rotation, and also prevents the hallux valgus. According to many researchers, the lower tibial syndesmosis is the strongest ligamentous element of the ankle joint and plays a huge role in joint function. In the process of joint flexion, syndesmosis ligaments experience extreme stress, which is about 40% of the total body weight. This joint is formed from 2 tibial ligaments (anterior and posterior), a transverse ligament and an interosseous membrane. As a result of this anatomical structure of syndesmosis, when the foot is extended, the wide part of the talus block moderately pushes the tibia apart. Due to the elasticity of the ligaments, when the ankle joint is bent, it returns to its physiological position. Due to the distal articulation of the tibia, the "fork" of the ankle joint constantly adapts to changes in the position of the talus. The ligaments of the distal joint also act as a stabilizer and limit the rotation of the talus. The muscles of the shin do not play an important role in terms of stabilizing the ankle joint. "Supination in the ankle joint occurs due to contraction of the tibial muscles. Peroneal muscles provide % of all pronation movements in the ankle joint." "The blood supply to the ankle joint is provided by the anterior and posterior tibial arteries and the peroneal artery. These arteries have branches that form vascular networks in the ankle joint, and they, in turn, give branches to the capsule and ligaments. Blood vessels approach the ligaments at the place of their attachment to the bone, forming a vascular network in them. The outflow of blood from the bone elements of the ankle joint is carried out through the intraosseous veins and veins of the periosteum. The venous network of the joint capsule is formed by superficial and deep venous networks. Further, blood outflow is carried out through the large and small subcutaneous veins and the anterior and posterior tibial veins. There is a dense network of anastomoses between all the veins." "The innervation of the ankle joint is carried out by the superficial fibular nerve, tibial and gastrocnemius nerves. The bone elements, ligaments, and capsule of the ankle joint are also innervated from the deep branch of the fibular nerve." Such a dense neurovascular network creates difficulties in operative access to the outer group of ligaments, as a result of which neurovascular formations are necessarily damaged. As a result, neurovascular injuries are a common complication in the surgical repair of the external ligaments of the ankle joint. Anatomical features of the ankle joint (in particular, the mismatch between the shape of the talus and the articular fork) contribute to the occurrence of both bone and soft tissue injuries, despite the complex structure of the ligaments that stabilize the joint. The block of the talus is wider in the anterior region than in the posterior. This affects the stability of the ankle joint in dynamics and plays an important role in the mechanism of occurrence of ankle ligament damage. During joint movements, rotational mixing of the talus occurs during both dorsal and plantar flexion, which is due to the anatomical features of the talus block. The block of the talus bone has a curvature in the form of an arc, both on the outside and on the inside. On the medial side, the radius of curvature of the anterior region is less than the radius of curvature of the posterior region, which is due to the displacement of the axis of the ankle joint during flexion and extension. Taking into account the differences in the radii of curvature of the inner and outer parts of the talus, two centers of rotation are determined from the medial side and one from the outside. When flexing in the ankle joint, the transverse axis of the talus is located medially, and the internal rotation of the talus is determined. During extension in the ankle joint, the transverse axis is located lower, and the external rotation of the talus is determined. Based on the above, the axis of rotation of the talus is far from parallel to the articular surface, the axis runs obliquely in the frontal plane through the talus and, intersecting with the longitudinal axis of the tibia, forms an angle of 820. The peculiarity of the ankle joint is that the tendons of the shin muscles are not attached to the talus and to the distal parts of the shin bones, and thus, in terms of stabilizing the ankle joint, the main load falls on the lateral ligaments. To date, arthroscopic approaches to the ankle joint (anterior and posterior) have been described and justified in detail. Despite the fact that the anatomy of the external ankle joint is well studied, there is no specific quantitative relationship between neurovascular structures and bone landmarks in the literature. There are frequent reports in the literature about the risk and damage to nerve fibers during arthroscopic access.

Some sources mention the risk of damage to nerve fibers located near the outer ankle, but there is no clear data on the quantitative ratio of the superficial fibular and gastrocnemius nerves and the lateral ankle. Cases of damage to the gastrocnemius and superficial fibular nerves during open reposition of fractures of the external ankle and osteosynthesis are described. There is also a risk of damage to the above-mentioned nerves during arthroscopic repair of the anterior tarano-fibular and calcaneal-fibular ligaments. The anatomical location of the superficial fibular and gastrocnemius nerves is of great importance during arthroscopic reconstruction of the anterior tarano-fibular and calcaneolobular ligaments. Arthroscopic approaches to the ankle joint are described in foreign literature, taking into account the passage of neurovascular structures, but there is no clear data on the risk of damage to nerve fibers during arthroscopic suturing of the anterior tarano-fibular and calcaneolobular ligaments. The introduction of new arthroscopic techniques for the restoration of the anterior fibular ligament dictates the need to return to the study of the topographic anatomy of the external ankle joint. Therefore, there is a need to study the relationship of nerves and vessels of the ankle joint, in particular the external part, where the suture of the anterior fibular ligament is performed. The gastrocnemius and superficial fibular nerves and the external ankle deserve special attention. A detailed study of these structures makes it possible to justify minimally invasive arthroscopic suture techniques for the anterior tarano-fibular and calcaneal-fibular ligaments. Previously, there was an opinion that the ankle joint works as a block joint. Now this opinion has been rejected and, based on many sources, the ankle joint is considered complex, in particular, the saddle joint. The axis of the joint is located distal to the tips of the medial and lateral ankles and is oriented anteriorly medially posteriorly and outwardly. During movement in the ankle joint, the talus rotates around its axis. Dorsal flexion is accompanied by pronation and abduction of the anterior region and valgization of the posterior region. With plantar flexion, supination, reduction of the anterior region and variation of the posterior region occur. During plantar flexion, internal rotation of the talus 4-80 occurs due to the deltoid ligament. Such movements are carried out with the help of mobility of the talus and distal part of the fibula. With the integrity of the capsule-ligamentous apparatus during movements, the anatomical relationships of the bones of the joint do not change. The rotation of the talus is accompanied by movements of the fibula: with dorsal flexion, it moves back and rotates outward, 20 with plantar flexion, in the opposite order.

3. Conclusions

The biomechanics of the ankle joint allow us to consider the joint as a closed ring surrounding the talus on all sides and formed by the articular surface of the tibia, medial ankle, deltoid ligament, calcaneus, external ligaments, external ankle and distal tibial syndesmosis. The outer ankle is a stabilizing link, according to many authors, it is a guiding element. Receiving from 7% to 30% of the axial load, the external ankle does not perform a significant supporting function, the main function is to keep the talus from external displacement. And also, when the limb is stressed, the distal part of the fibula migrates distally towards the tibia and, thus, stretches the distal tibial syndesmosis and deepens the fork of the ankle joint.

REFERENCES

[1] Arkhipov C.B., Lychagin A.B., Modern aspects of treatment of post-traumatic deforming arthrosis of the ankle joint // Bulletin of Traumatology and Orthopedics-2000 - No. 4 - pp. 64-67.

[2] Musalatov Kh.A., Arkhipov C.B., Lychagin A.B., Surgical treatment of degenerative and dystrophic diseases of the ankle joint by arthroscopic method // Congress of traumatologists and orthopedists of Russia, 7th-Novosibirsk, 2002 - p. 450.

[3] Arkhipov C.B., Lychagin A.B., Arthroscopic treatment of deforming osteoarthritis of the ankle. // Minimally invasive and endoscopic technologies in traumatology and orthopedics -Yalta 2002.

[4] Arkhipov C.B., Lychagnn A.V., Arthrodesis of the ankle joint by arthroscopic method. // Scientific and practical conference-Man and his health -St. Petersburg 2003.

[5] Lychagin A.B., Arkhipov C.B., Arthroscopic treatment of anterior ankle joint syndrome // Emergency medical care, V Congress of the Russian Arthroscopic Society -St. Petersburg, p. 57, 2003.

[6] Arkhipov C.B., Lychagin A.B., Minimally invasive method of arthrodesis of the ankle joint. // Scientific and practical conference-New technologies in the treatment and rehabilitation of patients with joint pathology-Kurgan, 2004.

[7] Kavalersky G.M., Arkhipov S.V., Drogni A. R., Lychagin A. V., Arthroscopic arthroscopy of the ankle joint. // Scientific and practical conference with international participation - New approaches in the diagnosis and treatment of injuries and diseases of the hip and knee joints- Kiev, 2004.

[8] Kavalersky G.M., Arkhipov S.V., Drogni A.R., Lychagnn A.V., A low-traumatic method of arthrodesis of the ankle joint // Pirogov student scientific conference; Bulletin of the Russian State Medical University, 2005, No. 3, 42.