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ORIGINAL ARTICLE

High resolution ultrasonography and magnetic resonance imaging in the evaluation of tendino-ligamentous injuries around ankle joint

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KEYWORDS

Magnetic resonance imaging;
Ultrasonography;
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Abstract *Purpose:* The aim of this study was to rule out the diagnostic accuracy of both ultrasonography (US) and magnetic resonance imaging (MRI) for the assessment of tendino-ligamentous pain around the ankle joint.
Patients and methods: This study included 35 patients (25 females and 10 males) complaining of unilateral ankle pain (acute or chronic), and they were subjected to plain X-ray (to exclude osseous pathology), US and MRI examinations.
Results: The study included 35 patients where 20 patients showed tendon pathology that was diagnosed into 21 pathological entities by both US and MRI imaging modalities with no difference in interpretation between them. 21 patients had pathological ligaments which were diagnosed by both ultrasound and MRI. However, two ligamentous lesions were diagnosed as partial tear by US, while MRI diagnosed them as complete tear. Associated findings were also diagnosed as retrocalcaneal bursitis in two patients, joint effusion in four patients and joint synovitis in three patients.
Conclusion: US is an excellent tool for imaging soft tissue abnormalities, as it allows rapid, inexpensive detailed examination of the structures of the ankle joint. US and MRI are two complementary tools of investigation with the former being used as primary effective tool of investigation and the latter is done to confirm the diagnosis.

1. Introduction

The ankle joint is the most frequently injured major joint in the body, where ankle sprains are frequently encountered in individuals playing sports, in addition to occurring in the general population. Imaging plays a crucial role in the evaluation of ankle ligaments (1). Ankle pain is often due to an ankle sprain but can also be caused by ankle instability, arthritis, gout, tendonitis, fracture, nerve compression (tarsal tunnel syndrome), infection and poor structural alignment of the leg or foot. Ankle pain can be associated with swelling, stiffness, redness, and warmth in the involved area (2,3).

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Ligaments on each side of the ankle also provide stability by tightly strapping the outside of the ankle (lateral malleolus) with the lateral collateral ligaments and the inner portion of the ankle (medial malleolus) with the medial collateral ligaments. The ankle joint is surrounded by a fibrous joint capsule. The tendons that attach the large muscles of the leg to the foot, wrap around the ankle both from the front and behind (1).

MRI has been proven to provide excellent evaluation of ligaments and tendons around the ankle, with the ability to show associated intraarticular abnormalities, joint effusion, and bone marrow edema. US performed with high-resolution linear-array probes has become increasingly important in the assessment of ligaments and tendons around the ankle because it is low cost, fast, readily available, and free of ionizing radiation. US can provide a detailed depiction of normal anatomic structures and is effective for evaluating ligament integrity (4). In addition, US allows the performance of dynamic maneuvers, which may contribute to increased visibility of normal ligaments and improved detection of tears. It can facilitate accurate identification, localization and differentiation between synovial, tendinous and entheseal inflammation as well as joint, bursal and soft tissue fluid collection (4,5).

1.1. The aim of this study

The aim of this study was to investigate the diagnostic accuracy of both ultrasonography and magnetic resonance imaging for the assessment of tendino-ligamentous pain around the ankle joint.

2. Patients and methods

2.1. Study population

This prospective study had been approved by Kasr El-Aini Hospital, Research and Ethical committee, Cairo University.

A prospective analysis with US and MRI was performed on thirty-five patients in the age range between 18 and 60 years, complaining of unilateral ankle pain. Consent was obtained from all patients before doing this study. All patients were referred to the Radiology department from the outpatient clinic of the Orthopedics department between September 2014 and February 2015.

Inclusion criteria: patients complaining of unilateral ankle joint pain (acute or chronic).

Exclusion criteria: previous ankle surgery, interventional intra-articular procedures (previous arthroscope, injections), systemic inflammatory disorders (collagen diseases), diagnosed osseous lesions.

All patients were subjected to history taking and clinical provisional diagnosis.

They underwent plain X-ray (to rule out osseous lesions to exclude these patients), real-time high resolution ultrasonography and MRI for the affected ankle joint.

2.2. Imaging studies

2.2.1. Plain radiograph

All patients were subjected to plain X-ray in AP and lateral views to exclude any osseous lesions.

2.2.2. Ultrasonographic examination

All patients had standardized ultrasonography of the injured ankle joint. Excess gel was used. Ultrasound examinations were performed using one of the following devices either GE Logic pro6 (12 MHz) or GE Logic 3 (12 MHz), USA.

Technique of the examination (Fig. 1)

Guided by De Maeseneer et al. (1), the ultrasonographic examination began with the patient in supine position (Fig. 1a). Longitudinal scanning of the ankle was first performed to get an overall view of the tibio-talar joint and to detect joint effusion. Then, the ankle joint syndesmosis and anterior inferior tibiofibular ligament (AITFL) were assessed on transverse plane at anterolateral aspect of the distal tibia. Finally, while the patient in the same position, individual evaluation of the extensor tendons of the ankle was performed in both longitudinal and transverse planes starting from medial to lateral (tibialis anterior tendon, then extensor hallucis longus tendon (EHL), and most laterally extensor digitorum longus (EDL) tendon).

Thereafter, slight inversion of the foot was performed (Fig. 1b) while the patient in the same position to examine the lateral collateral ligaments and peroneal tendons. The Anterior talo-fibular ligament (ATFL) was first examined in oblique transverse plane from the tip of lateral malleolus, antero-medially and slightly downward, till the talus. Then, the Calcaneo Fibular ligament (CFL) was examined in oblique longitudinal plane from the lateral malleolar tip downward and slightly backward to the lateral surface of the calcaneus. Regarding the peroneal tendons, they were examined from their supra-malleolar musculo-tendinous junction, and then just behind the lateral malleolus till their infra-malleolar course in both longitudinal and transverse planes. Dynamic examination was obtained in eversion and dorsiflexion position to detect tendon dislocation or subluxation.

The patient was then asked to laterally rotate the lower limb (Fig. 1c) while lying supine to examine the deltoid ligament and flexor tendons. The former was examined in longitudinal scanning from its origin in the tip of the medial malleolus till its insertion into the talus, calcaneus, and navicular bones. The ankle flexor tendons were examined similar to the extensor tendons in longitudinal and transverse planes from medial to posterolateral (tibialis posterior tendon, then flexor digitorum longus tendon, and most laterally flexor hallucis longus tendon).

Finally the patient is asked to lie prone (Fig. 1d) and rest on his/her toes. The Achilles tendon was examined from its musculo-tendinous junction to its calcaneal insertion in both longitudinal and transverse planes.

Power-Doppler imaging was used to detect tissue hyperemia.

Ultrasound analysis

The ability to delineate the tendons and ligaments around the ankle joint was assessed.

We referred to standard reference values for musculoskeletal ultrasonography (6) (Table 1).

Regarding the tendons pathologies, they were diagnosed by the following sonographic appearances:

- Tendinosis (Fig. 2.1A, B) appeared as hypoechoic with loss of the normal echogenic fibrillar appearance of the tendon