Research Paper Medical Science

Role of Ultrasound in Evaluation of Ankle Joint

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ABSTRACT

High resolution ultrasound is an excellent cost-effective modality in imaging normal anatomy and abnormal pathologies in and around ankle joint. With advent of newer transducers and technological developments we will be able to image much superficial lesions. Beam steering or compound imaging can help to overcome anisotropy of tendons. Ultrasound can detect and evaluate acute injuries, chronic pain, chronic instability, impingement and failure of conservative treatment of ankle swelling. This article describes anatomy, pathology, scanning technique and protocol for ankle ultrasound.

KEYWORDS Ankle, joint, High-resolution, ultrasound, ultrasonography.

Introduction

The ankle joint has to be stable in order to withstand 1.5 times your body weight when you walk and up to eight times your body weight when you run. The ankle joint is a hinge joint and allows up and down movement of the foot. The subtalar joint sits below the ankle joint and allows side-to-side movement of the foot. Ultrasound is the best modality of choice when the symptoms are localized and specific clinical question and alternative to MRI especially for ankle tendons. The aim of this article is to familiarize various normal anatomy and abnormal pathologies in and around ankle joint.

Ankle Anatomy

Figure 1 : Surface anatomy of Tibiofibular, Anterior talofibular, Calcaneofibular and posterior talofibular ligaments.

The ligaments around the ankle can be divided, depending on their anatomic position Lateral ligaments (anterior talofibular, calcaneofibular and posterior talofibular),deltoid ligaments on the medial side and ligaments of the tibiofibular syndesmosis that join the distal epiphysis of tibia and fibula. The muscles around ankle are laterally: Peroneus longus and brevis tendons, Medially: Tibialis posterior, flexor digitorum, flexor hallucis longus, Anteriorly: Extensor digitorum, extensor hallucis longus and tibialis anterior tendon & Posteriorly: Achiles tendon.

Ankle pathology

An ankle sprain is one of the most common musculoskeletal injuries. Acute ankle sprains can be caused by sports injury, accident or stepping on an uneven surface or wearing high heels. Symptoms may include pain, swelling, stiffness and bruising. Acute ankle sprain is a stretching or tearing of one or more ligaments, the tough fibrous bands that hold the ankle bones in place. Mild sprain involves partial tearing of the anterior talofibular ligament. Moderate sprain involves a significant tearing of the anterior talofibular ligament and some tearing of the calcaneofibular ligament. Severe ankle sprain involves disruption of all the ligament on the lateral aspect of ankle (anterior talofibular ligament, calcaneofibular ligament and posterior talofibular ligament).

Chronic ankle instability results from an ankle sprain that has not healed properly. Peroneal tendon injuries are due to repetitive strain during normal activity such as walking or standing. Peroneal tendinitis is an irritation to the tendons that run past the back outside part of the ankle. Tendons are subjected to excessive repetitive forces during standing and walking. Peroneal tendon subluxation, dislocation, synovitis, partial or complete tear of the tendons can occur. Haglund`s deformity is an abnormal prominence of posterosuperior surface of calcaneus resulting in retrocalcaneal bursitis,inflammation can cause calcaneal erosions and achiles tendinosis.

Posterior ankle impingement is when posterior talus and soft tissues are compressed between tibia and talus during plantar flexion. Posterior ankle impingement diagnosed by achilles tendinopathy, retrocalcaneal bursitis, flexor hallucis longus

tenosynovitis and peroneal tendon subluxation.

Technique:

Good high resolution ultrasound machine with 8 – 15 Mhz small foot print probes, color and power Doppler to assess the vascularity. Beam steering and compound imaging to overcome anisotropy which is common artifact encountered during musculoskeletal ultrasound. Specific symptomatic site examination is done. Dynamic assessment and comparison with opposite side ankle joint is done in same sitting.

The ankle studied in medial, lateral, anterior and posterior with patient in sitting, supine and prone positions.

Indications :
Tendon, joint or ligamentous injury in and around the ankle joint. Soft tissue swelling, ganglion cyst, bursitis and foreign body are the most common indications.

Tendo-Achilles region: (POSTERIOR ASPECT)

Figure :2 Patient position for examination of tendoachiles.

Patient lying in prone with legs on the edge of the couch
Tendon is followed from its gastrocnemius and soleus origin to its insertion into calcaneus
Short axis - elliptical, flattens near insertion; AP diameter 5-6mm;

Flat/concave anterior (deep) margin and any convexity is pathological

No synovial sheath covering the tendoachiles and hence no physiological fluid in it and hence any fluid around tendoachiles is pathological

Para-tenon is seen as 2 echogenic lines

Plantaris tendon lies deep and medial to Achilles (in 20% blends with Achilles medial margin)

Kager's fat pad traingle lies deep to the tendon

Retorcalcaneal bursa: deep to the tendon

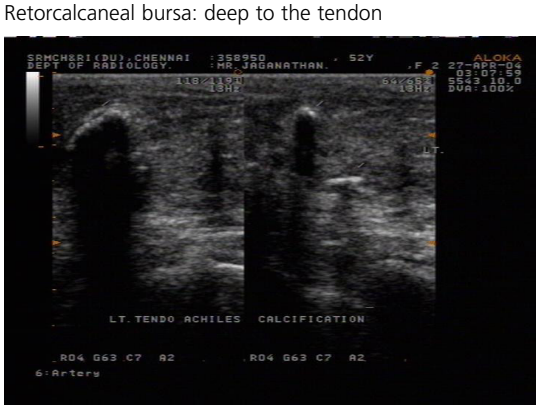

Figure :3 Tendoachiles calcification seen as hyperechoic area with acoustic shadowing.

Figure :4 Partial tear of tendoachiles seen as hypoechoic area with disruption of muscle fibers.

Peroneal compartment: (LATERAL ASPECT)

Posterior to lateral malleolus

Peroneus brevis is deep to peroneus longus, the former more commonly injured than the latter

Up to 3mm of fluid with the peroneal sheath is normal just below the fibula

Peroneus longus inserts into medial cuneiform and 1st Meta tarsal

Peroneus brevis inserts into 1st Meta tarsal

Peroneus quadratus is an accessory muscle, medial and superficial to the 2 tendons; seen in 10%; commonly inserts into calcaneus.

Peroneus digiti minimi extends from Peroneus brevis to insert into Proximal phalanx of 5th toe.

TDH group (invertors): (MEDIAL ASPECT)

Figure :5 Fluid seen around the tib ialis posterior – Tenosynovitis.

Tibialis posterior runs immediately posterior to medial malleolus and anterior most of TDH group; inserts into navicular; 4-6mm in diameter; Up to 4mm fluid around it; has a parallel course
Flexor digitorum longus is smaller than tibialis anterior.

Flexor hallucis longus is smallest; contains minimal fluid in synovial sheath

Accessory flexor digitorum longus may be seen adjacent to hallucis longus.

Extensor group: (ANTERIOR ASPECT)

Figure :6 Fluid seen around the ex tensor digitorum – Tenosynovitis.

Pathology is rare in these tendons.

From medial to lateral: Tibialis anterior, extensor hallucis longus, extensor digitorum longus

Small fluid up to 3mm is normal within these tendon sheaths

In the midfoot, these 3 tendons are superficial. Deep tendons from medial to lateral are extensor hallucis brevis and extensor digitorum brevis.

Hindfoot:

Pathology is rare in these tendons.

From medial to lateral: Tibialis anterior, extensor hallucis longus, extensor digitorum longus

Small fluid up to 3mm is normal within these tendon sheaths

In the midfoot, these 3 tendons are superficial. Deep tendons from medial to lateral are extensor hallucis brevis and extensor digitorum brevis.

Conclusion:

High resolution ultrasound is an excellent tool and more economical than MRI for the evaluation of ankle anatomy and its pathology. Real time ultrasound helps in correlating the study with the sympatomatic area.

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