The Role of Ultrasound Assessment in Achilles Tendon Pathology

Thesis

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Huda Abdelhady

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List of Abbreviations

Abb.	Full term
AP	*Anteroposterior*
AT	*Achilles Tendon*
Cal	*Calcaneus*
CSA	*Cross-Sectional Area*
ECM	*Extracellular Matrix*
FB	*Fibularis Brevis*
FDL	*Flexor Digitorum Longus*
FHL	*Flexor Hallusis Longus*
FL	*Fibularis Longus*
G	*Gastrocinemius*
LM	*Lateral Malleolus*
MM	*Medial Malleolus*
MRI	*Magnetic Resonance Imaging*
MSK	*Musculoskeletal*
S	*Soleus*
SN	*Sural Nerve*
SSV	*Small Saphenous Vein*
TP	*Tibialis Posterior*
US	*Ultrasonography*

ABSTRACT

Background: Tendons are connective tissues that transmit the force produced by muscle to bone and also prevent muscle damage by acting as shock absorbers. The Achilles tendon is the single largest, thickest and strongest tendon in the human body that transmit the force of powerful calf muscles to foot facilitating walking and running. This has long been known as a site susceptible to disabling injury. Forces up to 12 times bodyweight may arise during sporting activity. 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.

Aim of the Work: to provide an overview of clinical applications of ultrasound in assessment of pathological Achilles tendons. And to demonstrate the role of ultrasound in diagnosis of Achilles tendon pathology after clinical diagnosis.

Patients and Methods: This study is a prospective study, it was conducted in Radiology Department at Ain-shams university hospitals (El-Demerdash) from September 2018 till March 2019. it included 20 patients who were referred from the orthopedics, sports medicine and physical medicine outpatients.

Results: In our study US was capable of detecting almost all Achilles tendon abnormalities with high accuracy. The main noticeable limitation was the assessment of the bone marrow. In our study, the sensitivity, specificity and accuracy for US for Achilles tendon were 100%, 75% and 95% respectively.Both US and MRI are used in the evaluation of superficial structures, such as tendons and ligaments. The choice between US and MRI in such evaluations is determined by availability, referring physician preference, and the experience of the radiologist because in many settings accuracies can be similar.

Conclusion: Ultrasonography is an accurate and sensitive modality in evaluation of the Achilles tendon, it and can be used either as primary tool of investigation or as complementary tool with MRI and even in some cases may be used as a final method of diagnosis without need for further correlation with any other imaging techniques.

Keywords: *Ultrasound - Achilles Tendon – Ultrasonography- MRI*

INTRODUCTION

Tendons are connective tissues that transmit the force produced by muscle to bone and also prevent muscle damage by acting as shock absorbers. The Achilles tendon (AT) is the single largest, thickest and strongest tendon in the human body that transmit the force of powerful calf muscles to foot facilitating walking and running. This has long been known as a site susceptible to disabling injury. Forces up to 12 times bodyweight may arise during sporting activity. [1]

AT disorders are among the more frequent maladies encountered in sports medicine. They are not only common but has shown enormous rise in incidence over the past three decades. They are commonly associated with overuse injuries and can affect quality of movement. The combined adaptive and micro traumatic course of action that produces an increase in the level of glycoprotein matrix, tenocyte and fibroblast proliferation leads to degeneration of tendon by forming disorganized collagen. This pathological process leads to thickening, vascularisation and hypoechogenicity of the diseased tendon.[2]

The various types of overuse tendon injuries include tendinopathies, peritendinitis and tendon rupture. Increased tendon thickness is the most commonly mentioned indicator of tendinopathies. A significant correlation between progressive AT thickening, AT rupture and tendon abnormalities has been reported in previous studies. [1]

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.[3]

US can provide a detailed depiction of normal anatomic structures and is effective for evaluating ligament integrity. 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 [2, 3].

The most common limitation of US is unfamiliarity with the Technique and pathologic condition at US [4, 5].

Aim of the Work

The aim of this study is to provide an overview of clinical applications of US in assessment of pathological Achilles tendons. And to demonstrate the role of US in diagnosis of AT pathology after clinical diagnosis.

Chapter 1
ANATOMY OF ACHILLES TENDON

Achilles, the ancient Greek hero of the Trojan war, gives his name to the AT. Achilles was the son of the nymph, Thetis, who tried to make him immortal by dipping him in the river Styx. However, he was left vulnerable at the part of the body she held him by: his heel.[6]

Achilles was killed by a poisoned arrow fired by the Trojan prince Paris which embedded in his only vulnerable point; his heel. This has given rise to the description of a persons weakest point being called their 'Achilles heel'.[6, 7]

The AT is the thickest and strongest tendon in the human body, It begins near the middle of the calf fusing with the gastrocnemius muscle proximally.

It is broad close to its origin and receives muscle fibres from soleus almost to its lower end **(Fig. 1).** It is located in the posterior superficial compartment of the lower leg. The nerve and vessels of the posterior compartment, the tibial nerve, the posterior tibial artery and the peroneal artery, either directly or through their branches, supply the AT and the originator muscles. [6, 7]

Fig. (1): A specimen shows posterior view of calf. AT begins near the middle of the calf fusing with the gastrocnemius muscle proximally. It is broad, flat shape near its origin and receives muscle fibres from soleus almost to its lower end.[7]

It is formed by confluence of the individual tendons of the gastrocnemius and soleus muscles. The tendon fibres those of the soleus component insert into the postero-medial aspect and that from the gastrocnemius inserts into the posterolateral aspect of the calcaneus

The gastrocnemius accounts for two thirds of the fibres of AT and soleus contributes one third but variation in this pattern occurs in adults, the tendon is about 10 to 15 cm in length and has a thickness of 4-7 mm. [7, 8]