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Role of Ultrasound and Magnetic Resonance Imaging in Diagnosis of the Etiology of Chronic Ankle Pain

EMAN K. SULTAN, M.Sc.; MOHAMMED FOUAD SHERIEF, M.D. and EMAD M. MASHALY, M.D.

The Department of Radio-Diagnosis & Medical Imaging, Faculty of Medicine, Tanta University, Tanta, Egypt

Abstract

Background: In patients with ankle and foot pain, it is crucial to detect the lesion responsible for the pain for determining adequate treatment. MRI in combination with other radiologic images is currently regarded as the most appropriate diagnostic imaging of benign bone and soft tissue lesions in chronic ankle pain.

Aim of Work: To evaluate the role of ultrasound and magnetic resonance imaging in diagnosis of the etiology of chronic ankle pain.

Material and Methods: This study included ninety patients with chronic ankle pain. All patients were subjected to clinical evaluation, ultrasound examination and MRI.

Results: Both ultrasound and MRI revealed nearly the same results in evaluation of tendon abnormalities. Ultrasonography couldn't detect injuries of the posterior talo-fibular ligament as well as posterior tibio-fibular ligament while MRI could clearly detect them. Regarding other ligaments (anterior talo-fibular, anterior lower tibio-fibular and deltoid ligaments), MRI was slightly superior to ultrasound in evaluation of injuries of these ligaments. Ultrasonography could detect some cases of postero-medial impingement syndromes (caused by deltoid ligament injury), however it couldn't detect cases of posterior or anterior impingement (usually caused by bony abnormalities), these cases were better assessed by MRI examination. Cases of osteochondritis dessicans and bony tumors could be assessed by MRI examination however; ultrasonography was negative in detecting these lesions.

Conclusion: Ultrasound and MRI showed similar results in evaluation of tendon and ligament injuries as well as entrapment neuropathy, MRI was superior to ultrasound in evaluation of impingement syndromes and osseous pathologies.

Key Words: *Tendons – Ligaments – Impingement – Osteochondritis dessicans – Ultrasound – MRI.*

Correspondence to: Dr. Eman K. Sultan, The Department of Radio-Diagnosis & Medical Imaging, Faculty of Medicine, Tanta University, Tanta, Egypt

Introduction

THE musculoskeletal system can be subject to various injuries including contusions, strains or sprains, tearing of soft tissues, dislocations, fractures or any combination of these. Systemic diseases including rheumatologic, endocrine, vascular and so on can lead to alteration of musculoskeletal biomechanics, which ultimately can change one's function. Infection and tumours are other conditions that can lead to the musculo-skeletal morbidity of varied severity [1].

As technology has improved, clinical experience in performing Musculoskeletal Ultrasound (MSUS) has also advanced dramatically. The advantages of ultrasound imaging over conventional radiography, Computed Tomography (CT), radioisotope scan and Magnetic Resonance Imaging (MRI) are reported as being that it is: Painless, does not use ionizing radiation, less expensive, can be performed real time, needs no special environment and is clinically readily accessible [2].

Apart from pathologic processes involving tendons, a variety of other pathologic processes may involve adjacent soft-tissue structures, such as aneurysms and ganglion cysts. Soft-tissue processes, such as infection, the presence of foreign bodies, and tumors can be detected on sonography, which can also reveal the location of the abnormality and its relationship to the surrounding structures. Additional sonographic features such as echogenicity, internal blood flow, and compressibility can aid diagnosis [3].

In patients with ankle and foot pain, it is crucial to detect the lesion responsible for the pain for determining adequate treatment. MRI in combination with other radiologic images is currently regarded as the most appropriate diagnostic imaging of benign bone and soft tissue lesions in chronic ankle pain [4].

Ligamentous injuries at the ankle are reliably seen with MR, manifesting as abnormal laxity or discontinuity within the affected ligament or as soft tissue thickening and edema about the ligament in cases of partial tearing [5].

Owing to the advantage of detailed demonstration of soft-tissue structures and the capability for direct multiplanar demonstration of the ankle ligaments, Magnetic Resonance Imaging (MRI) has been increasingly applied to the evaluation of ligamentous injuries of the ankle [6].

Ankle impingement syndromes are painful conditions caused by the friction of joint tissues, which is both the cause and the effect of altered joint biomechanics resulting in chronic ankle pain [7]. From anatomic and clinical view points, these syndromes are classified as antero-lateral, anterior, antero-medial, postero-medial, and posterior [8].

In the appropriate clinical settings, MR imaging is useful technique for assessing the soft-tissue and osseous disorders present in the impingement syndromes of the ankle and for detecting other potential causes of ankle pain [9].

Patients and Methods

This study was performed in Radiology Department, Tanta University Hospital, during the period from January 2016 to January 2017.

This study included ninety patients; 35 males and 55 females with age ranged from 10 to 62 years (mean age 37 years). All patients were suffering from chronic ankle pain and were referred from Orthopedic and Rheumatology Outpatient Clinics of Tanta University Hospital.

Ethics Committee approval and informed consent were obtained. Inclusion criteria were any patient with chronic ankle pain (more than one month). No patients were excluded due to contraindication to MRI examination e.g. any metallic prosthesis or artificial pacemakers. All patients were subjected to relevant history taking and local examination, ultrasound examination and MRI imaging.

Ultrasound examination:

All patients included in this study were subjected to ultrasound examination of the ankle, using high-frequency linear transducers with frequencies ranging from 10 to 18MHz with the use of Color and power Doppler imaging assuming different positions that allow easy assessment of the anterior, lateral, medial, and posterior aspects. Ultrasound was performed using Toshiba ablio 500, Simens acuson X 300 and Philips affinity 70 at Radiology Department of Tanta University Hospital and private centers.

Structures imaged with US of the Ankle:

Standard ankle US examination:

- Anterior joint space, anterior tibial, extensor hallucis longus, and extensor digitorum longus tendons.
- Peroneus longus and brevis tendons.
- Posterior tibial, flexor digitorum longus, and flexor hallucis longus tendons.
- Achilles tendon and retro-calcaneal bursa.

Additional ankle examination (performed if specific symptoms are present):

- Intra-articular bodies.
- Ligaments.
- Plantar fascia.
- Synovial or ganglion cyst.

Magnetic resonance imaging:

MRI was performed using Toshiba Vantage Titan 1.5-T scanner closed magnet and GE Signa Explorer 1.5-T closed magnet at Radiology Department of Tanta University Hospital and private centers.

Preparation of the patients:

The patients were asked about any contraindications for MR imaging examination as cardiac pacemaker, artificial valves or aneurysm clips. The patients were informed about the nature and duration of the examination (ranged from 20 to 30 minutes), and were instructed to remove any metallic objects and not move during examination.

Type of coils used:

QD knee foot coil in Toshiba Vantage Titan 1.5-T scanner closed magnet.

HD T/R knee foot coil by invivo (CH 11) in GE signa explorer 1.5 T scanner closed magnet.

Patient position:

The patients were examined in supine position with the ankle adjusted in a neutral position and supported by foam sponges and straps to prevent motion during the examination with the foot trapped in full dorsiflexion of 10-20 degrees from neutral position.

The longitudinal alignment light lies in the midline and horizontal alignment light passes through level of the malleoli that corresponds to the center of the coil.

Protocol of MRI imaging:

The imaging protocol consisted of the following pulses:

- A scout 3 planes T1 Weighted Images (T1WI) were taken for localization of the subsequent slices.
- Axial T1 and axial T2 weighted images with or without fat suppression.
- Sagittal T1, T2, STIR and gradient weighted images.
- Coronal T1 and T2 weighted images.

The MRI examination was performed using Field of View (FOV) ranging between 8 and 16 cm with matrix size 256 X 256, slice thickness was about 2 to 4mm with inter-slice gap of about 0.2 to 0.5mm.

Statistical analysis:

Data was statistically described in terms of frequencies (number of cases) and percentages when appropriate. Accuracy was represented using the terms sensitivity, specificity, positive predictive value, negative predictive value, and overall accuracy. All statistical calculations were done using computer program SPSS (Statistical Package for the Social Science; SPSS Inc., Chicago, IL, USA) Version 15 for Microsoft Windows. Charts and graphs were done using Microsoft Excel 2010 (Microsoft Corporation, NY, USA).

Results

As Regard to ankle tendon pathology, it was found in 57 cases (63.33% of all cases) with the Achilles tendon being the most commonly affected tendon. Comparative study between ultrasound and MRI showed nearly similar results with no significant differences (Table 1).

As regard to Ankle ligament pathology: It was found in 49 cases with the anterior talo-fibular ligament being the most commonly affected ligament comparative study between ultrasound and MRI showed nearly similar results in all ligaments apart from posterior talofibular and posterior tibiofibular which couldn't be assessed by ultrasound (Table 2).

As regard to impingement syndrome: It was found in 21 cases with the posterior impingement being the most common type (found in 17 out of the 21 cases) and was mostly caused by prominent steida process (13 out of the 17 cases) comparative statistical analysis between ultrasound and MRI in evaluation of impingement syndrome revealed that ultrasound was able to detect some cases of posteromedial impingement, however it couldn't detect anterior or posterior impingement (Table 3).

As regard to osseous lesions, they were found in 16 cases with the Osteochondritis Dissecans (OCD) being the most common lesion (found in 11 out of the 16 cases) (Table 4). Ultrasound examination couldn't detect these osseous lesions.

As regard to entrapment neuropathy was found in 6 cases with the tarsal tunnel syndrome being the most common lesion (found in 5 cases). Comparative statistical analysis between ultrasound and MRI in evaluation of entrapment neuropathy revealed similar results of the two modalities (Table 5).

Illustrated cases:

Case (1): Fifty-five years old-female patient, presented with chronic posterior left ankle pain for about 5 months. Fig. (1).

Case (2): Fifty-three years old-female patient, presented with chronic deep right ankle pain notably on the lateral aspect for about 7 months. Ultrasound examination was normal. Fig. (2).

Case (3): Twenty years old-female patient, presented with chronic right ankle pain for about 4 months, ultrasound examination was normal. Fig. (3).

Table (1): Comparative statistical analysis between ultrasound and MRI in evaluation of tendon pathology.

Tendon pathology	US results	MRI results			US Diagnostic Accuracy				
		Negative N (%)	Positive N (%)	Total N (%)	Sens.*	Spec.*	PPV.*	NPV. *	Acc. *
Achilles tendinosis	Negative	52 (57.8)	5 (5.6)	57 (63.3)					
	Positive	0 (0.0)	33 (36.7)	33 (36.7)	86.8%	100%	100%	91.2%	94.44%
	Total	52 (57.8)	38 (42.2)	90 (100)					
Achilles complete tear	Negative	84 (93.33)	1 (1.1)	85 (94.4)					
	Positive	0 (0.0)	5 (5.5)	5 (5.5)	83.33%	100%	100%	98.8%	98.88%
	Total	84 (93.33)	6 (6.6)	90 (100)					
Achilles partial tear	Negative	88 (97.8)	0 (0.0)	88 (97.8)					
	Positive	0 (0.0)	2 (2.2)	2 (2.2)	100%	100%	100%	100%	100%
	Total	88 (97.8)	2 (2.2)	90 (100)					
Achilles enthesopathy	Negative	88 (97.8)	0 (0.0)	88 (97.8)					
	Positive	0 (0.0)	2 (2.2)	2 (2.2)	100%	100%	100%	100%	100%
	Total	88 (97.8)	2 (2.2)	90 (100)					
Achilles peritendinitis	Negative	88 (97.8)	0 (0.0)	88 (97.8)					
	Positive	0 (0.0)	2 (2.2)	2 (2.2)	100%	100%	100%	100%	100%
	Total	88 (97.8)	2 (2.2)	90 (100)					
TP tenosynovitis	Negative	75 (83.3)	3 (3.3)	78 (86.7)					
	Positive	0 (0.0)	12 (13.3)	12 (13.3)	80%	100%	100%	96%	96.66%
	Total	75 (83.3)	15 (16.7)	90 (100)					
FHL tenosynovitis	Negative	80 (88.9)	2 (2.2)	82 (91.1)					
	Positive	0 (0.0)	8 (8.9)	8 (8.9)	80%	100%	100%	97.5%	97.77%
	Total	80 (88.9)	10 (11.1)	90 (100)					
FDL tenosynovitis	Negative	82 (91.1)	1 (1.1)	83 (92.2)					
	Positive	0 (0.0)	7 (7.8)	7 (7.8)	87.5%	100%	100%	98.8%	98.88%
	Total	82 (91.1)	8 (8.9)	90 (100)					
Peronei tenosynovitis	Negative	82 (91.1)	1 (1.1)	83 (92.2)					
	Positive	0 (0.0)	7 (7.8)	7 (7.8)	87.5%	100%	100%	98.8%	98.88%
	Total	82 (91.1)	8 (8.9)	90 (100)					
TA tenosynovitis	Negative	84 (93.3)	1 (1.1)	85 (94.4)					
	Positive	0 (0.0)	5 (5.6)	5 (5.6)	83.33%	100%	100%	98.8%	98.88%
	Total	84 (93.3)	6 (6.7)	90 (100)					
EHL tenosynovitis	Negative	89 (98.9)	0 (0.0)	89 (98.9)					
	Positive	0 (0.0)	1 (1.1)	1 (1.1)	100%	100%	100%	100%	100%
	Total	89 (98.9)	1 (1.1)	90 (100)					
EDL tenosynovitis	Negative	89 (98.9)	0 (0.0)	89 (98.9)					
	Positive	0 (0.0)	1 (1.1)	1 (1.1)	100%	100%	100%	100%	100%
	Total	89 (98.9)	1 (1.1)	90 (100)					

Sens* : Sensitivity.
Spec* : Specificity.
PPV* : Positive Predictive Value.
NPV* : Negative Predictive Value.
Acc* : Accuracy.
TP : Tibialis Posterior.
FHL : Flexor Hallucis Longus.
FDL : Flexor Digitorum Longus.
TA : Tibialis Anterior.
EHL : Extensor Hallucis Longus.
EDL : Extensor Digitorum Longus.

Table (2): Comparative statistical analysis between ultrasound and MRI in evaluation of ligament pathology.

Ligament pathology	US results	MRI results			US Diagnostic Accuracy				
		Negative N (%)	Positive N (%)	Total N (%)	Sens.	Spec.	PPV.	NPV.	Acc.
ATFL sprain	Negative	71 (78.9)	2 (2.2)	73 (81.1)					
	Positive	0 (0.0)	17 (18.9)	17 (18.9)	89.5%	100%	100%	97.2%	97.8%
	Total	71 (78.9)	19 (21.1)	90 (100)					
ATFL tear	Negative	80 (88.9)	0 (0.0)	80 (88.9)					
	Positive	0 (0.0)	10 (11.1)	10 (11.1)	100%	100%	100%	100%	100%
	Total	80 (88.9)	10 (11.1)	90 (100)					
CFL tear	Negative	87 (96.7)	0 (0.0)	87 (96.7)					
	Positive	0 (0.0)	3 (3.3)	3 (3.3)	100%	100%	100%	100%	100%
	Total	87 (96.7)	3 (3.3)	90 (100)					
Deltoid sprain	Negative	79 (87.8)	1 (1.1)	80 (88.9)					
	Positive	0 (0.0)	10 (11.1)	10 (11.1)	91%	100%	100%	98.75%	98.88%
	Total	79 (87.8)	11 (12.2)	90 (100)					
Deltoid tear	Negative	89 (98.9)	0 (0.0)	89 (98.9)					
	Positive	0 (0.0)	1 (1.1)	1 (1.1)	100%	100%	100%	100%	100%
	Total	89 (98.9)	1 (1.1)	90 (100)					
A.Tib.F.L sprain	Negative	87 (96.7)	0 (0.0)	87 (96.7)					
	Positive	0 (0.0)	3 (3.3)	3 (3.3)	100%	100%	100%	100%	100%
	Total	87 (96.7)	3 (3.3)	90 (100)					
A.Tib.F.L tear	Negative	87 (96.7)	0 (0.0)	87 (96.7)					
	Positive	0 (0.0)	3 (3.3)	3 (3.3)	100%	100%	100%	100%	100%
	Total	87 (96.7)	3 (3.3)	90 (100)					

ATFL : Anterior Talofibular Ligament.
CFL : Calcaneofibular Ligament.
A.Tib.F.L : Anterior Tibiofibular Ligament.

Table (3): Comparative statistical analysis between ultrasound and MRI in evaluation of impingement syndromes.

	US results	MRI results			US Diagnostic Accuracy				
		Negative N (%)	Positive N (%)	Total N (%)	Sens.	Spec.	PPV.	NPV.	Acc.
Posterior impingement	Negative	73 (81.1)	17 (18.9)	90 (100)					
	Positive	0 (0.0)	0 (0.0)	0 (0.0)	0%	0%	0%	0%	0%
	Total	73 (81.1)	17 (18.9)	90 (100)					
Postero-medial impingement	Negative	84 (93.3)	1 (1.1)	85 (94.4)					
	Positive	0 (0.0)	5 (5.6)	5 (5.6)	83.33%	100%	100%	98.8%	98.88%
	Total	84 (93.3)	6 (6.7)	90 (100)					
Anterior impingement	Negative	89 (98.9)	1 (1.1)	90 (100)					
	Positive	0 (0.0)	0 (0.0)	0 (0.0)	0%	0%	0%	0%	0%
	Total	89 (98.9)	1 (1.1)	90 (100)					

Table (4): Frequency and percentage of osseous lesions.

The osseous lesion	Frequency	Percentage to osseous cases	Percentage to the total cases
OCD of the talar dome	11	68.75%	12.2%
NOF of lower tibia	2	12.5%	2.22%
Calcaneal lipoma	1	6.25%	1.1%
ABC of the talus	1	6.25%	1.1%
Bone island of the talus	1	6.25%	1.1%

OCD : Osteochondritis Dessicans.
NOF : Non Ossifying Fibroma.
ABC : Aneurysmal Bone Cyst.

Table (5): Comparative statistical analysis between ultrasound and MRI in evaluation of entrapment neuropathy.

Entrapment neuropathy	US results	MRI results			US Diagnostic Accuracy				
		Negative N (%)	Positive N (%)	Total N (%)	Sens.	Spec.	PPV.	NPV.	Acc.
• Tarsal tunnel syndrome	Negative	85 (94.4)	0 (0.0)	85 (94.4)					
	Positive	0 (0.0)	5 (5.6)	5 (5.6)	100%	100%	100%	100%	100%
	Total	85 (94.4)	5 (5.6)	90 (100)					
• Deep peroneal entrapment neuropathy	Negative	89 (98.9)	0 (0.0)	89 (98.9)					
	Positive	0 (0.0)	1 (1.1)	1 (1.1)	100%	100%	100%	100%	100%
	Total	89 (98.9)	1 (1.1)	90 (100)					

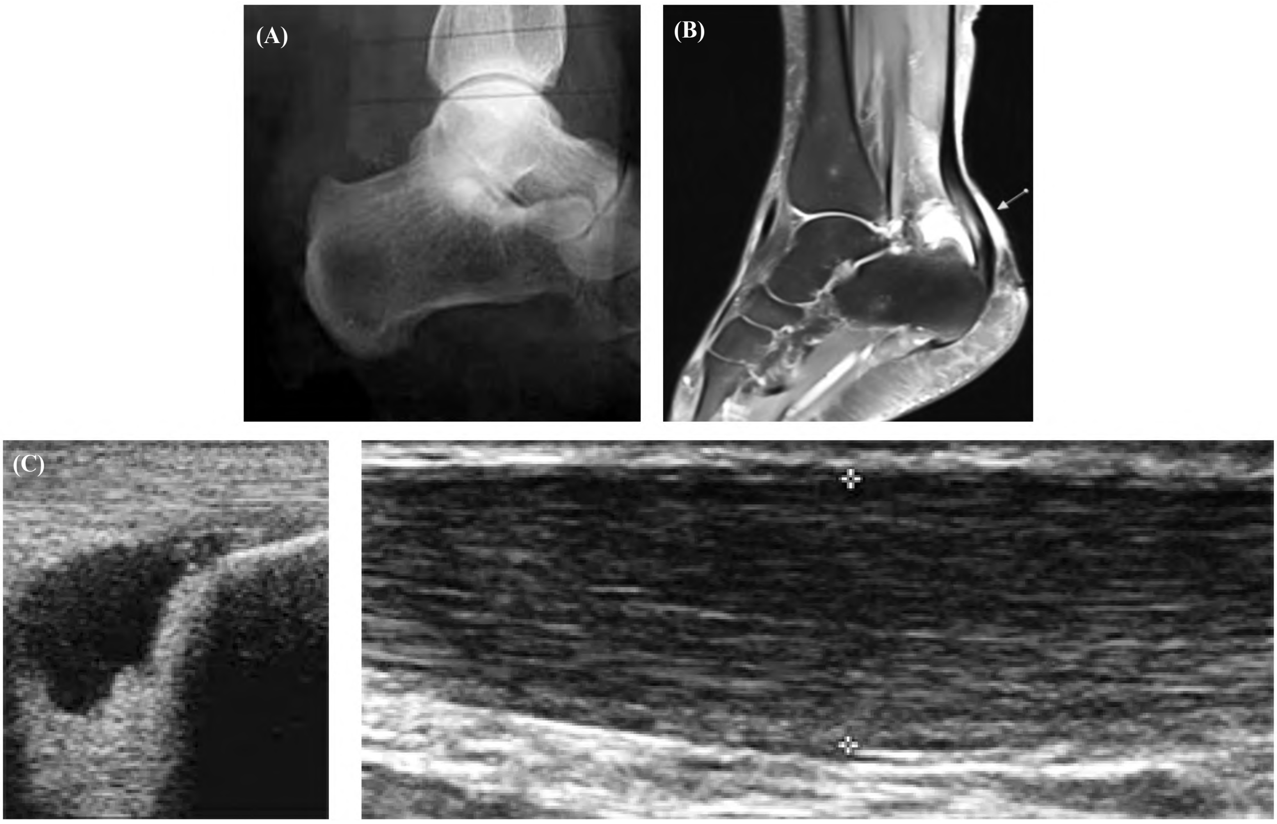

Fig. (1): (A) X-ray left ankle, lateral view showing the prominent postero-superior aspect of calcaneus. (B) Sagittal PD FAT SAT. Showing thickened Achilles tendon with intra-tendinous hyperintense signal associated with large retro-calceneal bursitis and superficial bursitis (arrow). (C) Ultrasound longitudinal image showing the fusiform thickening of the Achilles tendon & large retro-calceneal bursitis.

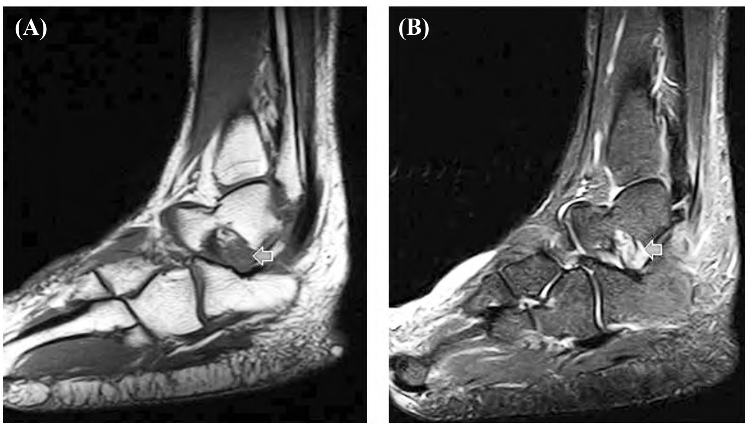

Fig. (2): MRI images, Sagittal T1WI (A) and sagittal STIR (B) showing hypointense signal in tarsal sinus that turned to hyperintense signal at sagittal STIR.

Fig. (3): MRI images, Sagittal T2WI (A), Sagittal STIR (B) and Coronal T2WI (C) showing non-displaced osteochondral lesion at the supero-medial aspect of talar dome (arrows), surrounded by talar bone marrow edema denoting osteochondritis dessicans.

Discussion

The ankle is commonly affected in trauma as well as overuse disorders and inflammatory conditions. Various imaging techniques may be used to assess the ankle, including CT, MRI, and sonography. Imaging plays a crucial role in the evaluation of ankle tendons and ligaments [10].

Magnetic resonance imaging has been proven to provide excellent evaluation of ligaments and tendons around the ankle, with the ability to show various types of soft tissue and bony abnormalities [11].

Ultrasonography (US) performed with high-resolution linear-array probes has become advanced in the assessment of ligaments and tendons around the ankle joint. US can provide a detailed depiction of normal anatomic structures and is effective for evaluating ligament and tendon integrity [12].

The aim of this study was to evaluate the role of both Ultrasonography (US) and Magnetic Resonance Imaging (MRI) in diagnosis of the etiology of chronic ankle pain.

Our study included ninety patients complaining of chronic ankle pain. All patients were subjected to real-time high resolution ultrasonography and MRI of the affected ankle (cases suspected to have osseous pathology were subjected to plain X-RAY ankle).

Our study included ninety patients; males represented 39% of all patients while females represented 61%, with their age ranged from 10 to 62 years (mean age was 37 years), the left side was affected in 55.5% of all cases while the right side was affected in 44.5%. This agreed with the study of El-Liethy and Kamal [13] which was performed on 35 patients with males represented 29% and females represented 71% with the age of cases ranged from 18-60 years (mean age was 37 years) with the left side was affected in 54.3% and the right side was affected in 45.7%.

Regarding tendon pathology, our study showed that tendon pathology was found in 57 cases (63.33% of all cases) with the Achilles tendon being the most commonly affected tendon (noted in 50 cases), this agreed with Liffen [14] who stated that the Achilles tendon is the most commonly injured ankle tendon.

Our study revealed various pathological entities of Achilles tendon injuries including tendinosis (76%), complete tear (12%), partial tear (4%), enthesopathy (4%) and peritendinitis (4%), this agreed with El-Liethy and Kamal [13] in which Achilles tendinosis was the most frequent Achilles tendon disorder (45.5%).

Comparative statistical analysis between ultrasound and MRI in evaluation of Achilles tendon pathology revealed 100% sensitivity of ultrasound regarding various pathological entities apart from Achilles tendinosis in which the sensitivity of ultrasound was 86.8% and Achilles complete tear in which the sensitivity of ultrasound was 83.33%, this agreed with Margetic et al., [15] in which the sensitivity of ultrasound compared to MRI regarding Achilles tendon pathology was 100%.

Follow-up of Achilles tendon tears, MRI was 100% sensitive in diagnosis of surgically proved tears, this was similar to Liffen [14].

Our study revealed that the tibialis posterior tendon was the most commonly affected tendon with tenosynovitis (26.3% of all tendon cases), this agreed with the study of Fessell and Jacobson [16].

Regarding other medial ankle compartment tendons, the flexor hallucis longus and flexor digitorum tenosynovitis represented 17.5% and 14% of all tendon cases respectively, this agreed with Mansour and Jain [17] who stated that the flexor digitorum longus tendon is rarely affected by tenosynovitis and the flexor hallucis longus tendon is more commonly affected.

Regarding anterior ankle compartment tendons, our study showed that the tibialis anterior tendon was more commonly affected by tenosynovitis (10.5% of all tendon cases), while the extensor digitorum and extensor hallucis longus tenosynovitis only represented 3.4% of all tendon cases, this agreed with Narvaez and Cerezal [18] who stated that the anterior ankle tendons are rarely affected by pathological processes and also stated that the tibialis anterior tendon is more commonly affected with tenosynovitis.

In our study, peroneal tenosynovitis represented 14% of all tendon cases, this agreed with the study of El-Liethy and Kamal [13] in which the peroneal tendon pathology represented 14.3% of all pathological tendon cases.

Comparative statistical analysis between ultrasound and MRI in evaluation of ankle tenosynovitis revealed 80% sensitivity of ultrasound in detection of tibialis posterior and flexor hallucis longus tenosynovitis, 87.5% sensitivity in detection of flexor digitorum and peronei tenosynovitis, 83.33% sensitivity in detection of tibialis anterior tenosynovitis and 100% sensitivity in detection of extensor hallucis longus and extensor digitorum longus tenosynovitis, this agreed with the results of El-Liethy and Kamal [13] in which the sensitivity of ultrasound was 100% in evaluation of ankle tenosynovitis.

Regarding ligament pathology, our study revealed Ankle ligament pathology in 49 cases with the anterior talo-fibular ligament being the most commonly affected ligament (noted in 29 cases) representing 59% of all ligamentous cases, this is followed by posterior talo-fibular ligament (noted in 20 cases) representing 40.8%, this agreed with Cheng et al., [19] who stated that the anterior talofibular ligament is the most commonly affected ankle ligament.

Our study revealed that CFL tear and PTFL tear were always associated with ATFL tear, this agreed with Michel et al., [20] who stated that, visualization of an intact ATFL virtually excludes rupture of any of the lateral collateral ligaments and also stated that CFL and PTFL ruptures are not found in the presence of an intact ATFL.

In our study, Deltoid ligament tear was found in only one case (2% of all ligamentous cases), this agreed with Cheng et al., [19] who stated that the deltoid ligament is the strongest ankle ligament and least to be injured.

In our study, ligament sprain was more common than ligament tear with the frequency of ATFL sprain was about 19 cases (38.7% of all ligament cases) and the frequency of deltoid sprain was about 11 cases (22.5% of all ligament cases). Ultrasound sensitivity in detection of ATFL sprain and deltoid sprain was about 89.5% and 91% respectively. On another hand, the study done by El-Liethy and Kamal [13] showed that the frequency of ligament tear was more than the ligament sprain with ultrasound sensitivity 100% in detection of ligament sprain.

In our study, correlation between the ability of ultrasonography compared to MRI in detection of ATFL and CFL tears yielded a sensitivity of 100%, this is similar to Margetic et al., [15] who stated that ultrasound results agreed with MRI in 100% of the cases.

For the cases of ATFL tear which compared with operative results, MRI revealed sensitivity of 80%, this agreed with Tan et al., [21] who stated that the sensitivity of MRI in cases of ATFL tear was 78%.

In our study the sensitivity of ultrasound compared to MRI in evaluation of anterior tibio-fibular ligament tear was 100%, when compared with the operative data, two cases of torn anterior tibiofibular ligament were operated and the ligament tear was confirmed in one case giving MRI sensitivity of 50%. Study done by Chun et al., [22] revealed 78% sensitivity of MRI in detection of anterior tibio-fibular ligament tears compared with operative data.

Posterior impingement was the most common impingement syndrome in our study with prominent steida process being the commonest etiological factor, this agreed with Yasui et al., [23] who stated that prominent steida process is the main osseous cause of the posterior ankle impingement.

Neoplastic lesion around the ankle represented about 5.5% of cases in our study and were all benign, this agreed with Hetts et al., [24], who stated that neoplastic lesions around the ankle are rare and are mostly benign.

Osteochondritis dessicans was a common cause of chronic ankle pain and represented about 12% of cases, this agreed with Zanon et al., [25], who stated than osteochondritis dessicans is a common finding at the talus and most lesions occur at the medial aspect of the talar dome.

Tarsal tunnel syndrome was the commonest entrapment neuropathy syndrome in our study, this agreed with Choufani et al., [26] who stated that the most common ankle entrapment neuropathy is tarsal tunnel syndrome which is mostly due to soft tissue masses within the tarsal tunnel.

Conclusion:

Ultrasonography showed high sensitivity and specificity in evaluation of various pathological entities of Achilles tendon including complete tear, partial tear, tendinosis, enthesopathy and peritendinitis. Similar results were found in evaluation of tenosynovitis involving other ankle tendons.

Regarding ligament injuries, both ultrasonography and MRI were nearly similar in evaluation of various injuries including sprain, partial tear and complete tear.

Cases of entrapment neuropathy were equally diagnosed by both ultrasonography and MRI.

Most cases of impingement syndromes as well as bony abnormalities were only detected by MRI examination.

Ultrasonography should be the preliminary imaging modality in evaluation of tendon and ligament injuries as well as cases of nerve entrapments with MRI examination reserved to cases with suspected bony abnormalities or impingement syndromes.

Competing interests:

The authors declare that they have no competing interests.

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دور التصوير بالموجات فوق الصوتية والرنين المغناطيسى فى تشخيص آلام الكاحل المزمنة

إشتملت هذه الرسالة على تسعين مريضا، خمس وثلاثون ذكرا وخمس وخمسون أنثى بمتوسط أعمار من عشر إلى أثنين وستين عاما (متوسط العمر هو سبع وثلاثون عاما).

خضع كل المرضى للفحص الإكلينيكى للمفصل متضمنا التاريخ المرضى وكذلك الفحص بالموجات فوق الصوتية والرنين المغناطيسى. فحص الأشعة العادية تم عمله فقط للحالات المشتبه فى وجود إصابات عظيمة بها.

إيجازا فإن الفحص بالموجات فوق الصوتية والرنين المغناطيسى أظهرا نتائج متقاربة فى تشخيص إصابات الأوتار والأربطة وكذلك حالات الإعتلال العصبى أما بالنسبة إلى حالات إنحشار الكاحل وكذلك إصابات العظام فقد تم إكتشافها فقط بالرنين المغناطيسى.

ولذلك فإن الفحص بالموجات فوق الصوتية يجب أن يكون الفحص الأولى لتقييم إصابات الأوتار والأربطة وحالات الإعتلال العصبى بينما يتم عمل الرنين المغناطيسى فى حالات الإشتباه فى إصابات عظيمة أو حالات إنحشار الكاحل.