Magnetic Resonance Imaging in Evaluation of Traumatic Ankle Joint Lesions

Mennat Allah Osama Zaki Gebriel[a*], Usama Elsaid Ghieda[a], Khaled Isamil Elshafaey[a], Tamer Mahmoud Dawoud[a]

[a]Radiodiagnosis and Medical Imaging Department, Faculty of Medicine, Tanta University, Tanta, Egypt

Abstract

Background: The use of magnetic resonance imaging (MRI) enhanced the examination of musculoskeletal disorders in the ankle joint.

Objectives: This study aimed to evaluate the effectiveness of MRI imaging in assessing traumatic ankle injuries. Change to patients with acute and chronic ankle injuries.

Patients and methods: This descriptive work included 50 participants aged from 7-71 years, presenting with clinical symptoms of ankle swelling, pain, or movement restriction due to trauma, acute and chronic symptoms were included due to traumatic etiology.

Results: The mean age was 40 ± 18.38 years, there were 28 (56%) males and 22 (44%) females. Joint effusion, sinus tarsi syndrome, bone lesions, and tendon injuries were insignificantly distinct among acute group and chronic group. Ligament injuries were significantly different as greater in acute group contrasted to chronic group (P=0.039). Joint effusion, bone lesions, ligament injuries, tendon injuries were insignificantly different between <30 Y and ≥30 Y groups. Sinus tarsi was significantly higher in ≥30 Y group than <30 Y group (P=0.015). Joint effusion, sinus tarsi, bone lesions, ligament injuries, tendon injuries were insignificantly different between male and female groups.

Conclusion: MRI is the diagnostic tool for different traumatic ankle injuries. Owing to its rapid noninvasive imaging, high soft tissue contrast resolution, multiplanar capabilities, and lack of ionizing radiation. MRI is the diagnostic tool of choice for different types of traumatic ankle injuries, as it is beneficial for evaluating soft tissue structures surrounding the ankle, including ligaments, tendons, and fascia, as well as for finding hidden bone lesions.

Keywords: MRI; Ankle Joint; Ligaments; Tendons; Bone Injuries .

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***Correspondence**: monmontwiny@gmail.com

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Introduction

The ankle joint is frequently susceptible to injury. The predominant injuries to the ankle comprise sprains and fractures, that affect the ligaments and bones of the ankle. Sprains of the ankle are the most prevalent injuries in the lower limb, with a frequency of 5-7 per 1000 individuals per year in Europe. They mostly affect young athletes and are most commonly caused by the foot inversion (less commonly eversion) **(Elgohary et al., 2017)**.

Due to the abundance of soft tissues in the ankle, magnetic resonance imaging (MRI) is highly valuable for assessing diseases in the ankle area **(Prabakaran and Shetty, 2021)**. Orthopedic surgeons face a difficult task in managing ankle injuries due to the wide variety of potential lesions involving the bones, cartilage, tendons, ligaments and capsules **(Barile et al., 2017)**

The use of MRI has greatly enhanced the examination of musculoskeletal disorders in the ankle joint. This is because MRI provides fast and non-invasive imaging, offers excellent resolution for distinguishing soft tissues, allows imaging in several planes, and does not involve the use of ionizing radiation **(Kharat et al., 2019)**.

MRI possesses the distinct ability to assess abnormalities to the bones, ligaments, tendons, and muscles around the foot and ankle **(Akram et al., 2024)**. This may be done with a single imaging scan, even before these injuries become apparent in other imaging methods, which can often make them challenging to diagnose. MRI can effectively evaluate injuries to soft-tissue components, enabling precise therapeutic intervention and rehabilitation **(Elgohary et al., 2017;Sharma et al., 2018)**.

Bone marrow edema (BME) is a frequently seen result on MRI scans following an ankle injury **(Villari et al., 2024)**. BME is a non-specific but very sensitive sign of an underlying disease and can serve as a valuable tool for accurate and systematic interpretation of MR examinations **(Szaro et al., 2020)**. This work aimed to assess the impact of MRI in the assessment of traumatic ankle lesions.

Patients and methods

This descriptive work was performed on 50 participants aged from seven to 71 years old, both genders.

Inclusion criteria presenting clinical symptoms of ankle swelling, pain, or movement restriction due to trauma, acute and chronic symptoms were included due to traumatic etiology.

The work was performed from July 2021 to May 2023 following permission from the Ethics Committee Tanta University Hospitals, Tanta, Egypt. All subjects or their relatives provided well-informed written consent.

Exclusion criteria were individuals with congenital anomalies of the ankle, patients with open fractures of the ankle, any absolute contraindication for MRI as having any metallic implants, metallic foreign body, or any other electronic or magnetically triggered implants, and individuals with claustrophobia and chronic non traumatic ankle joint lesions.

Each participant had been exposed to complete taking of history and MRI examinations.

MRI examination

The examination was conducted by an MRI 1.5 Tesla unit (GE Signa Explorer) closed magnet utilizing an extremity coil in the Radiodiagnosis and Medical Imaging Department, Tanta University Hospital. All patients were asked to eliminate all metallic items, such as coins, keys, wallets, jewelry, cards with magnetic strips, hearing aids, and hairpins. If feasible, offer a companion for patients who experience claustrophobia. Explanation of the procedure was done to the patient and instructed the patient to keep still. The imaging procedure involved positioning the foot perpendicular to the lower leg while the patient was lying in a supine position. A plantar flexion of 20 to 30 degrees has

been performed to decrease the occurrence of the "magic angle" artifact. An ankle extremity coil was often used for the ankle. Throughout the procedure, there was no movement permitted since the ankle was supported by pads. The laser beam localizer was centered over ankle joint. The choice of imaging planes, sequences, and coil selection varied based on the specific clinical conditions. The lower limb exhibited external rotation, and the imaging planes were aligned with the anatomical structure of the foot rather than with the magnet. The duration of the ankle MRI procedure ranged from 15 to 20 minutes. The FOV varies between 150 and 170 mm. The thickness of the slice varied between 3 and 5 mm, with a 1 mm gap. At the beginning, it is necessary to employ a three-plane localiser to accurately determine the location and arrange the sequences. Typically, localisers have a duration of less than 25 seconds. T1 scans with poor resolution were obtained.

Sequences, parameters, and Planning

The following sequences were done to examine every patient, (**Table.1**).

Table 1. Protocol of MRI Ankle joint (Zhao et al., 2023):

Plane	sequences	TR	TE	Slice thickness	Gap	Matrix	FOV	Fat Sat	TI
Axial	**T1WI**	400-600	15-25	3.5mm	0.5mm	256x256	15-17	OFF	----
	T2WI	4000-5000	110	3.5mm	0.5mm	256x256	15-17	OFF	----
	PD Fat Sat	3000-4000	15-20	3.5mm	0.5mm	320x256	15-17	ON	----
Sagittal	**T1WI**	400-500	15-25	4 mm	0.5mm	256x256	15-17	OFF	----
	T2WI	4000-5000	110	4 mm	0.5mm	256x256	15-17	OFF	----
	STIR	4000-5000	110	4 mm	0.5mm	256x256	15-17	OFF	130
Coronal	**T1WI**	400-500	15-25	4 mm	0.5mm	320x256	16-17	OFF	----
	T2WI	4000-5000	110	4 mm	0.5mm	320x256	16-17	OFF	----
	PD	3000-4000	15-20	4 mm	0.5mm	320x256	16-17	ON	----

FOV: field of view, STIR: short tau inversion recovery, TE: time of echo, TI: time of inversion, TR: repetition time, T1WI: T1-weighted image, T2WI: T2-weighted image, PD fat sat: proton density fat saturation.

Image Interpretation

MRI images had been analysed, and signal intensity evaluation had been conducted on picture archiving and communication system (PACS) workstation. Reviewing of the normal anatomy of the Ankle structures including (bone, muscle, ligament, tendon and fat) was performed. Description of the pathological finding in bone, tendon, ligaments and fat was carried out and diagnosis was established. All patients were followed up with 28 cases under medical conservation, surgery was done for 17 cases and arthroscope was done to 5 cases.

Statistical analysis

Statistical analysis had been conducted utilizing SPSS v26 (IBM Inc., Armonk, NY, USA). Shapiro-Wilks test and histograms were utilized to assess the

normality of the distribution of data. Quantitative parametric data had been displayed as mean and standard deviation (SD). Quantitative non-parametric data had been displayed as the median and interquartile range (IQR). Qualitative variables were displayed as frequencies and percentages (%).

Results

The mean age was 40 ± 18.38 years. There were 28 (56%) males and 22 (44%) females. There are 28 patients with right ankle trauma and 22 patients with left ankle trauma. The majority of chronic trauma was present in 34 cases (68.00%), in acute trauma was pain and swelling in 8 cases (50.00%) and swelling only in one case (6.25%), in chronic trauma was present pain only in 30 cases (88.24%) and instability only in one case (2.94%). Regarding the age of the studied patients, most males 10 (20%) were from age 60 <70 years while patients aged 1<10 years were 1 (2%) male. Most females 8 (16%) were from age 30 <40 years while not present in patients aged 1<10 years, **(Table.2**).

Table 2. Demographic data, lateralization, onset of trauma, complaint and distribution of sex regarding to age of the studied patients

Variables		N=50	
Age (years)		40 ± 18.38	
Sex	**Male**	28 (56%)	
	Female	22 (44%)	
lateralization	**Right**	28(56.0%)	
	Left	22(44.0%)	
Onset of trauma	**Acute**	16(32.0%)	
	Chronic	34(68.0%)	
Complaint			
Acute	**Pain only**	7(43.75%)	
	Swelling only	1(6.25%)	
	Pain and swelling	8(50.0%)	
Chronic	**Pain only**	30(88.24%)	
	Instability only	1(2.94%)	
	Pain and instability	3(8.82%)	
Distribution of sex regarding to age			
		Male (n=28)	**Female (n=22)**
Age/Sex	**1<10 y**	1 (2%)	0 (0%)
	10<20 y	2 (4%)	6 (12%)
	20<30 y	5 (10%)	2 (4%)
	30<40 y	2 (4%)	8 (16%)
	40<50 y	6 (12%)	3 (6%)
	50<60 y	2 (4%)	2 (4%)
	60<70 y	10 (20%)	1 (2%)

Data are presented as mean ± SD or frequency (%).

The joint effusion in this trial was the most prevalent pathology representing (88%) of total cases while sinus tarsi syndrome was present in 10 cases (20%). Most bone lesions were bone marrow contusion that was present in 28 cases (56%) while fracture was present in 9 cases (18%). Most tendon injuries were tenosynovitis that occurred in 25 patients (50%) while tear only occurred in one case (2%). Most ligament injuries were sprains only that occurred in 7 (14%) patients while tear only occurred in 5 cases (10%). Most bone fractures involved in this work were talus osteochondral defect (OCD) 4 cases (8%) while physis fracture, distal

tibia and calcaneus and distal tibia were present in one case (2%). Most of the contusion was talus that was present in 12 cases (24%) while other types were present in 6 cases (12%), (**Table 3).**

Table 3. Classification of (MRI pathological findings and injuries subtypes) and bone lesions in MRI of the studied patients

Variables		N=50
Joint effusion		44(88.0%)
Sinus tarsi syndrome		10(20.0%)
Bone lesions **Fracture** **Contusion**		37 (74%) 9(18.0%) 28(56.0%)
Tendon injuries **Tenosynovitis only** **Tear only** **Combined**		28 (56%) 25(50.0%) 1(2.0%) 2(4.0%)
Ligament injuries **Tear only** **Sprain only**		12 (24%) 5(10.0%) 7(14.0%)
Bone lesions in MRI		
Bone fracture	**Talus OCD fracture**	4(8.0%)
	Physis fracture	1(2.0%)
	Calcaneus	2(4.0%)
	Distal tibia	1(2.0%)
	Calcaneus and distal tibia	1(2.0%)
Contusion	**Talus**	12(24.0%)
	Calcaneus	10(20.0%)
	Others	6(12.0%)

Data are presented as frequency (%). OCD: osteochondral defect.

Lateral ligament was more common in ATFL than PTFL and CFL. ATFL tear was more common than sprain with 4(8%) cases of ligament tear and 2(4%) cases of ligament sprain. Medial (deltoid) ligament tear was more common than sprain with 5(10%) cases while sprain was present in one case (2%). Syndesmosis of anterior tibiofibular ligament was present in 2(4%) cases and posterior tibiofibular ligament was present in 2(4%) cases. Achilles tendon was the most injured tendon in the trial of 12(24%) patients; 11(22%) instances of tendinitis and 1(2%) cases of complete tear while anterior group was present in 3(6%) cases, (**Table. 4).**

Table 4. Ligamentous and tendon injuries in MRI of the studied patients

Variables			N=50
Ligamentous injuries			
Lateral ligament	**ATFL**	**Tear**	4(8.0%)
		Sprain	2(4.0%)
	PTFL		3(6%)
	CFL		2(4%)
Medial (deltoid) ligament	**Sprain**		1(2.0%)
	Tear		5(10.0%)
Syndesmosis	**Anterior tibiofibular ligament**		2(4%)
	Posterior tibiofibular ligament		2(4%)

Tendon injuries		
Posterior group (Achilles)	**Tendinitis**	11(22.0%)
	Tear	1(2.0%)
Lateral group	**Peroneus longus tendon: Tenosynovitis**	1(2.0%)
	Peroneus brevis tendon: Tenosynovitis	3(6.0%)
Medial group	**Tibialis posterior tendon: Tenosynovitis**	3(6.0%)
	Flexor digitorum tendon: Tenosynovitis	2(4.0%)
	Flexor Hallucis Longus tendon: Tenosynovitis	2(4.0%)
	Combined	2(4.0%)
Anterior group	**Tibialis anterior tendon: Tenosynovitis**	1(2.04%)
	Extensor halluces longus tendon: Tenosynovitis	1(2.04%)
	Extensor digitorum tendon: Tenosynovitis	1(2.0%)

Data are presented as frequency (%). MRI: magnetic resonance imaging, ATFL: Anterior talofibular ligament, PTFL: Posterior talofibular ligament, CFL: Calcaneofibular ligament.

Bone lesions were insignificantly different among acute and chronic groups, (**Table.5).** Ligament injuries were significantly different as greater in acute group contrasted to chronic group (P=0.039), (**Table.6).**

Table 5. Bone lesions in acute and chronic groups

Variables	Acute group (n=16)	Chronic group (n=34)	P
Bone lesions			
Fracture	4 (25%)	5 (14.71%)	0.572
Contusion	9 (56.25%)	19 (55.88%)	
Tear only	1 (6.25%)	0 (0%)	
Combined	0 (0.00%)	2 (5.88%)	

Data are presented as frequency (%).

Table 6. Ligament injury in acute & chronic groups

Variables	Acute group (n=16)	Chronic group (n=34)	P
Ligament injuries			
Tear only	4 (25%)	1 (2.94%)	**0.039***
Sprain only	1 (6.25%)	6 (17.65%)	

Data are presented as frequency (%). *Significant as P value ≤0.05

Joint effusion, sinus tarsi syndrome, and tendon injuries were insignificantly different among acute and chronic groups, (**Table.7).**

Table 7. Tendon, Joint effusion, and Sinus tarsi syndrome in acute & chronic groups

Variables	Acute group (n=16)	Chronic group (n=34)	P
Tendon injuries			
Tenosynovitis only	7 (43.75%)	18 (52.94%)	0.328
Tear only	1 (6.25%)	0 (0%)	
Combined	0 (0.00%)	2 (5.88%)	
Joint effusion	12 (75%)	32 (94.12%)	0.052
Sinus tarsi syndrome	3 (18.75%)	7 (20.59%)	0.880

Data are presented as frequency (%).

Joint effusion, bone lesions, ligament injuries, tendon injuries were insignificantly different between <30 Y group and ≥30 Y group. Sinus tarsi was significantly higher in ≥30 Y group than <30 Y group (P=0.015). Joint effusion, bone lesions, sinus tarsi, ligament injuries, and tendon injuries were insignificantly different between the male group and the female group, (**Table.8).**

Table 8.Comparison between age and sex groups regarding MRI findings

Variables		<30 Y group (n=16)	≥ 30 Y group (n=34)	P
Joint effusion		14 (87.5%)	30 (88.24%)	0.941
Sinus tarsi		0 (0%)	10 (29.41%)	**0.015***
Bone lesions	**Fracture**	3 (18.75%)	6 (17.65%)	0.888
	Necrosis	0 (0%)	1 (2.94%)	
	Contusion	9 (52.94%)	17 (50%)	
Ligament injuries	**Tear only**	3 (18.75%)	2 (5.88%)	0.213
	Sprain only	2 (12.5%)	4 (11.76%)	
	Tear& Sprain	1 (6.25%)	0 (0%)	
Tendon injuries	**Tenosynovitis only**	3 (18.75%)	11 (32.35%)	0.297
	Tendinosis only	2 (12.5%)	9 (26.47%)	
	Tear only	1 (6.25%)	0 (0%)	
	Combined	1 (6.25%)	1 (2.94%)	
		Male group (n=28)	**Female group (n=22)**	
Joint effusion		23 (82.14%)	21 (95.45%)	0.150
Sinus tarsi		4 (14.29%)	6 (27.27%)	0.254
Bone lesions	**Fracture**	6 (21.43%)	3 (13.64%)	0.284
	Necrosis	0 (0%)	2 (9.09%)	
	Contusion	16 (57.14%)	10 (45.45%)	
Ligament injuries	**Tear only**	3 (10.71%)	2 (9.09%)	0.736
	Sprain only	4 (14.29%)	2 (9.09%)	
	Tear& Sprain	1 (3.57%)	0 (0%)	
Tendon injuries	**Tenosynovitis only**	9 (32.14%)	5 (22.73%)	0.820
	Tendinosis only	6 (21.43%)	5 (22.73%)	
	Tear only	1 (3.57%)	0 (0%)	
	Combined	1 (3.57%)	1 (4.55%)	

Data are presented as frequency (%). *Significant as P value ≤0.05, MRI: magnetic resonance imaging.

Case 1: A male patient, 45 years old presented with left ankle pain and instability and had a history of falling from height 1 month ago before the MRI examination. **Diagnosis:** Nondisplaced talar neck (Type I) as well as talar dome fractures with surrounding BME, calcaneal fracture, sinus Tarsi syndrome, peroneii tenosynovitis and antero-lateral dislocation (grade 3) with superior retinacular injury, deltoid ligament deep part sprain and anterior Talofibular ligament partial tear, (**Fig.1).**

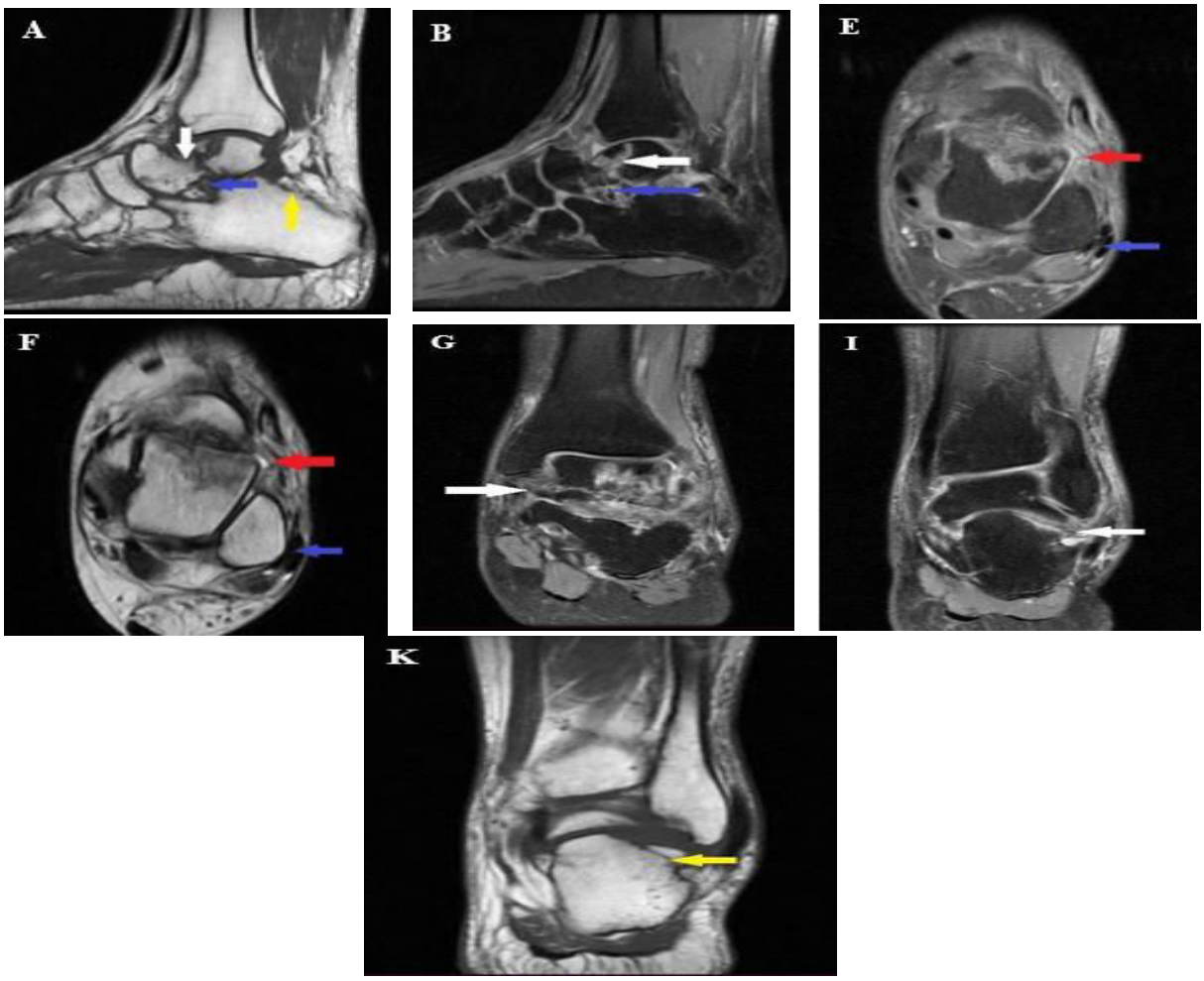
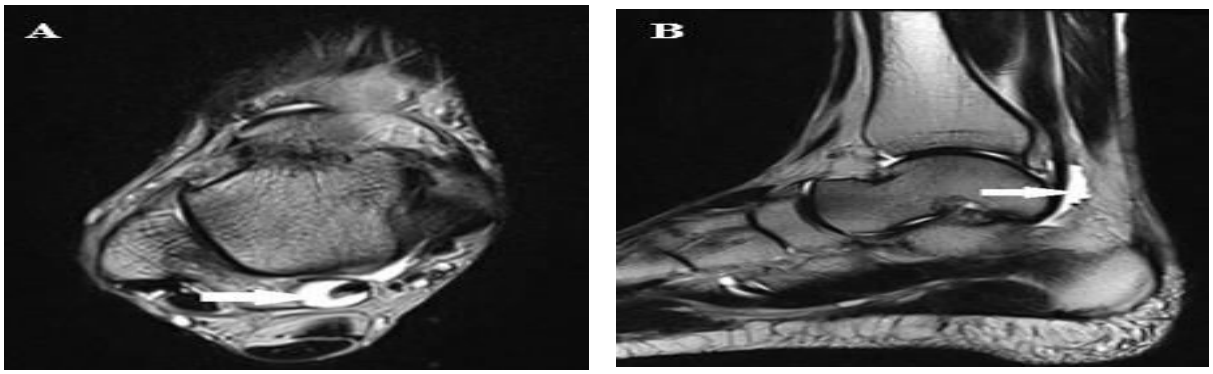


Fig.1. (A) Sagittal T1WI, (B) Sagittal STIR image, (E) Axial PD FS and (F) Axial T2WI (red arrow) demonstrates high signal intensity at the anterior talofibular ligament indicating partial tear while (blue arrow) demonstrates that both peroneus brevis and longus tendons are dislocated antero-lateral to the fibula with superior peroneal retinaculum injury, (G) Coronal PD FS and (I) Coronal PDFS and, (yellow arrow) at (K) Coronal T1W1 demonstrates hypointense fracture line at calcaneus

Case 2: Male patient, 38 years old presented with right foot pain worsened by extension, he gave history of limitation of movement for about 3 months before MRI examination. **Diagnosis:** Flexor hallucis longus (FHL) and Peroneus longus (PL) tenosynovitis, (**Fig.2).**



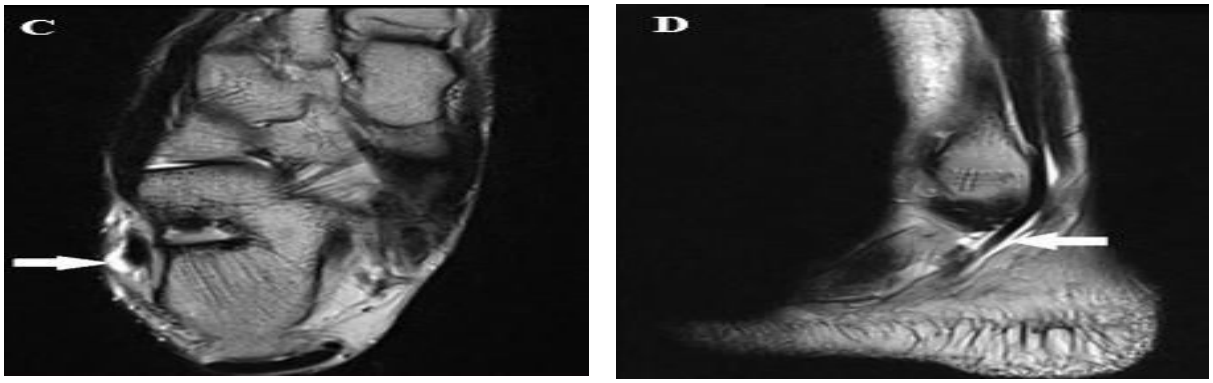


Fig. 2. (A) Axial T2WI image and (B) Sagittal T2WI demonstrate high signal- intensity fluid out of proportion to effusion surrounding the flexor hallucis longus (FHL) tendon (arrow). (C) Axial T2WI and (D) Sagittal T2WI demonstrate high signal-intensity fluid surrounding the peroneus longus tendon (arrow)

Case 3: Male patient 45 years old, presented with Right ankle pain and swelling anterior to ankle, foot drop and impaired gait for about 4 months before MRI examination and he gave history of repeated minor ankle trauma. **Diagnosis:** Tibialis Anterior (TA) tendon rupture and Achilles Tendon intersubstance tear, (**Fig.3).**

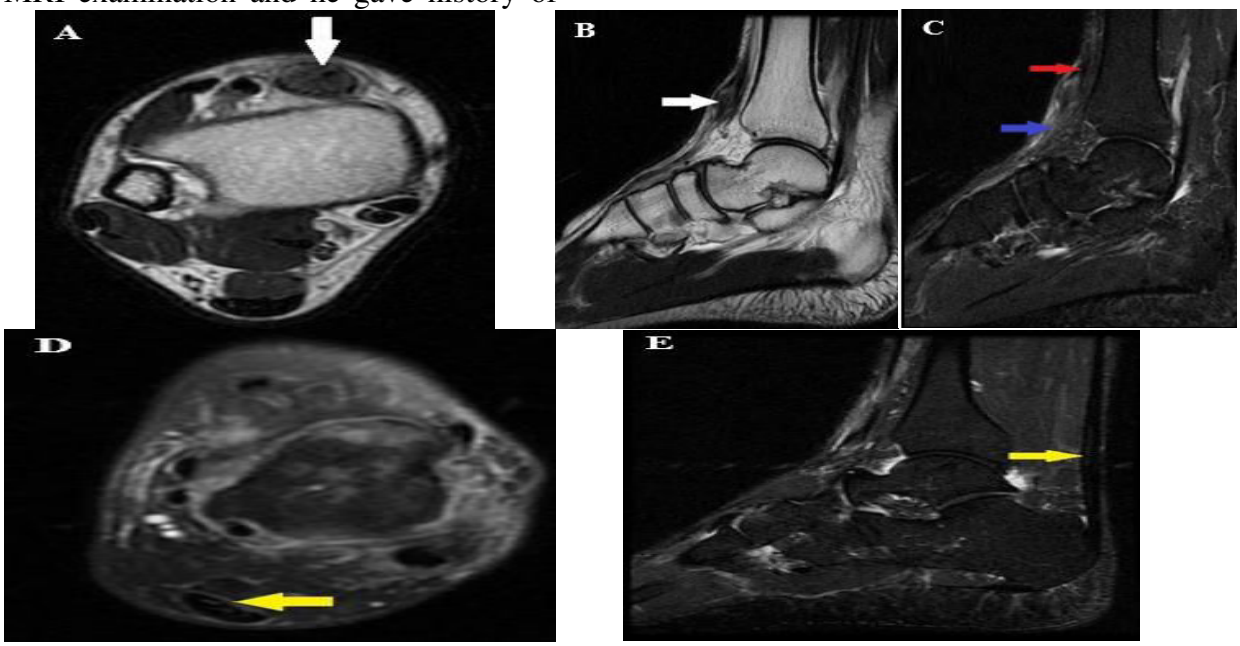


Fig. 3. (A) Axial T2WI and (B) Sagittal T2WI demonstrate thickened and swollen tibialis anterior (TA) tendon with complete disruption of fibers, retracted fibers with intermediate to high signal (white arrow), (C) Sagittal STIR demonstrates large thickened and swollen tibialis anterior (TA) tendon with complete disruption of fibers, retracted fibers creating gap measures 2.72 cm between (Red and blue arrows) and filled with intermediate to high signal (White arrow), (D) Axial PD FS and (E) Sagittal STIR demonstrate abnormal high signal intensity with in Achilles tendon fibers (yellow arrow)

Case 4: male patient, 24 years old, presented with sudden onset of pain and swelling at the left Achilles region, had a history of high jumping. **Diagnosis:** Partial Achilles Tendon avulsion tear with intra-tendinous avulsed bone & bony prominence at postero-superior aspect of calcaneous, (**Fig.4).**

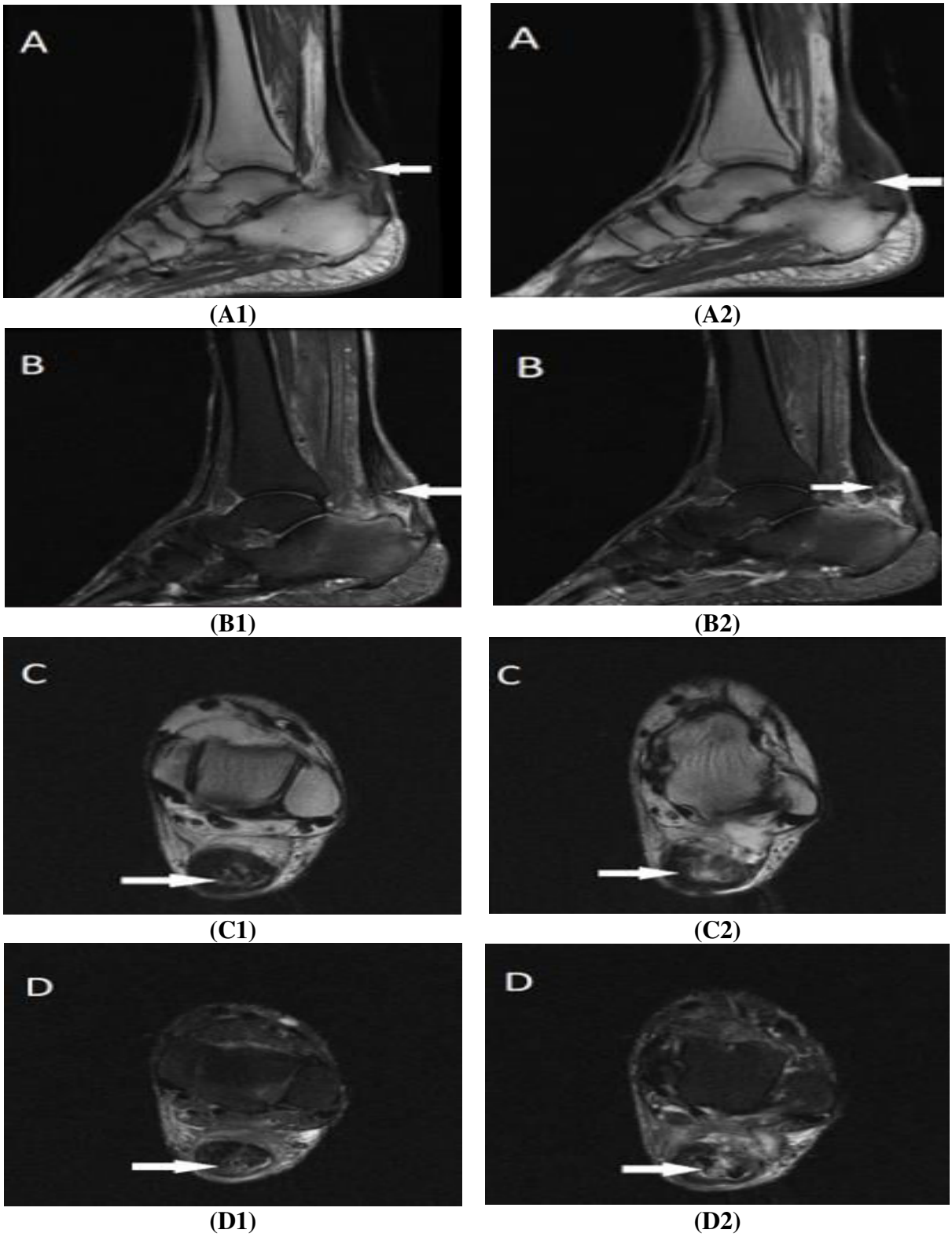


Fig. 4. (A) Sagittal T1WI & (B) Sagittal STIR image & demonstrate markedly thickened tendoachillis with altered low intra-substance signal in T1 & high in STIR with interruption of its fibers at distal part (its insertional site) ,still intact some fibers associated with intratendinous ill defines area of heterogenous signal . (arrow) & there is bony prominence at postero-superior aspect of calcaneous, (C) Axial T2WI image & (D) Axial STIR image demonstrates markedly thickened Achilles tendon with loss of the anterior concavity and internal abnormal hyperintense signal (arrow)

Discussion

One of the most prevalent diseases of the musculoskeletal system is acute ankle injuries. In Western nations, it has been calculated that one ankle sprain happens every 10,000 people every day **(Herzog et al., 2019;Gribble et al., 2016)**. Even more frequently, this occurs in sports. Sprained ankles account for 16–21% of all sports-related injuries **(Halabchi and Hassabi, 2020)**.

Regarding lateralization of the affected ankle trauma, our study showed that 28 patients had right ankle trauma and 22 patients with left ankle trauma. On the other hand, Sayed et al. **(Sayed E et al., 2021)** showed that 26 patients had right ankle trauma and 24 patients had left angle trauma.

Regarding the onset of trauma, our study showed that acute trauma was present in 16 cases (32.00%) and chronic trauma was present in 34 cases (68.00%). Abdellatif et al. **(Abdellatif et al., 2021)** reported that 17 cases (28.3) had acute onset of trauma while 43 patients (71.7%) had chronic onset. This is to our findings in terms of chronic vs acute but with a higher percentage regarding the chronic onset of trauma.

Regarding complaints of the studied patients, our study reported that in acute trauma pain only was present in 7 cases (43.75%), swelling in one case (6.25%), and pain and swelling in 8 cases (50.00%). In chronic trauma, it was reported that pain only was present in 30 cases (88.24%), instability only in one case (2.94%), and Pain and instability in 3 cases (8.82%). Abdellatif et al. **(Abdellatif et al., 2021)** reported quite similar findings to ours, as it was found that the patients who complained of pain (7 instances, 41.2%), swelling (one instance, 5.9%), and combined pain with swelling (9 instances, 52.9%). Patients with chronic onset complained of pain (39 instances (90.7%), instability no instances, and combined pain with instability (4 cases (9.3%).

Regarding patients with acute onset of symptoms, combined pain and swelling were the most presented complaints in our study and the study by Abdellatif et al. **(Abdellatif et al., 2021)**, while in patients with chronic onset, pain was the most prevalent finding in the two studies.

Regarding pathological findings of the MRI of the traumatic ankle, our study showed joint effusion was the most common pathology, our study included cases representing (88.00%) of total cases. Most bone lesions were bone marrow contusion that was present in 28 cases (56%). Most ligament injuries were sprains only that occurred in 7(14%) patients). Most tendon injuries were tenosynovitis that occurred in 25 patients (50%). By our findings, Abdellatif et al. **(Abdellatif et al., 2021)** found that joint effusion was the most common pathology observed in their patients with a slightly higher percentage than our study (91.7%) followed by bone lesions with 35 cases representing (58.3%), tendon injuries with 29 cases (48%), sinus tarsi 11 cases (18.3%) and the ligament injuries with 9 cases (16%).

Regarding the subtypes of injuries reported by MRI findings, most bone fractures included in this study were talus OCD 4 cases (8%). Most of the contusion was talus which was present in 12 cases (24%). Our study reported 28 tendon injuries, 11 (22%) tendinitis, 14 (28%) tendosynovitis, 2 (4%) combined tear and tendosynovitis, and 1 (2%) tear only. Abdellatif et al. **(Abdellatif et al., 2021)** reported that from the involved patients, 35 patients had bone injuries; 34 patients (56.7%) had bone marrow contusion which is higher than our study, and 9 patients (15%) had bone fractures which is similar to our study. Kharat et al. **(Kharat et al., 2019)** reported that 48% had no tendon lesions, 32% had tenosynovitis, 14% had complete rupture, 14 % had tendinopathy and 6% had partial thickness tear.

Comparable to our findings about bone fracture, Abdellatif et al. **(Abdellatif et al., 2021)** reported that talus dome OCD

was present in 5 cases (8.3%), physis (Salter Harries) fracture 1 case (1.7%), calcaneal fracture 2 cases (3.3%), distal tibial fracture 1 case (1.7%) and combined calcaneal with distal tibial fracture one case (1.7%).

Regarding ligamentous injuries, the lateral ligament was more common in ATFL than in PTFL and CFL. ATFL tear was more common than sprain with 4 cases of ligament tear (8%) and 2 cases of ligament sprain (4%). Medial (deltoid) ligament tear was more common than sprain with 5 cases (10%). Syndesmosis of the anterior tibiofibular ligament was present in 2 cases (4%) and the posterior tibiofibular ligament was present in 2 cases (4%). Contrarily to our findings, In Kharat et al. **(Kharat et al., 2019)** the following was observed, the most often injured ligaments are the anterior talofibular ligament (18%), calcaneofibular ligament (8%), and posterior talofibular ligament (6%). The least frequent injury occurred to the deltoid ligament complex.

Nine patients out of 60 had injuries in the ligaments; six had ATFL injuries and four had Deltoid ligament injuries. Three patients (5%) had ligament tears, five patients (8.1%) had ligament sprains, and one patient (1.7% had both types of injuries) in Abdellatif et al. **(Abdellatif et al., 2021)**.

Regarding tendon injuries, the Achilles tendon was the most injured in the study of 14 participants (28%); 11 instances (22%) of tendinosis, and 1 case of complete tear (2%). Similar to our results, Abdellatif et al. **(Abdellatif et al., 2021)** stated that in the analysis of 13 individuals, the Achilles tendon was the most damaged (21.7%); there were 12 occurrences of tendinosis (20%) and one instance of a total tear (1.7%). This is quite like our findings. On the other hand, Prabakaran et al. **(Prabakaran and Shetty, 2021)** reported that flexor tendons were the most commonly affected tendons followed by peroneus ones, and then comes the Achilles tendon.

Our study showed joint effusion, sinus tarsi syndrome, bone lesions, and tendon injuries were insignificantly distinction among acute and chronic groups. Ligament injuries were significantly different as greater in the acute group than in the chronic group. In contrast, Abdellatif et al. **(Abdellatif et al., 2021)** reported that the joint effusion, necrosis of bones sinus tarsi and contusion had been more in chronic onset contrasted to in acute. Acute cases had a higher prevalence of bone fractures, ligamentous injuries, and tears. Instances of bone necrosis, Achilles tendinosis, and mixed tendon injuries were exclusively observed in chronic instances.

Limitations of the work involved a relatively small sample size. The study was conducted at a single facility.

Conclusions

MRI is the diagnostic tool of choice for different types of traumatic ankle injuries, as it is beneficial for evaluating soft tissue structures surrounding the ankle, including ligaments, tendons, and fascia, as well as for finding hidden bone lesions.

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