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Original Article

Radiology Section

Magnetic Resonance Imaging of non-Traumatic Pathologies of Ankle and Foot

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ABSTRACT

Introduction: In patients with ankle and foot pain, especially in non-traumatic cases, MRI plays major role in identifying the etiology. MRI gives more information in the region of ankle and foot because of its high soft-tissue resolution and multi planar capability. As ankle region has so many soft tissues, MRI is very much useful in evaluation of pathologies in soft tissues.

Aim: To analyze MRI imaging appearances of ankle and foot in patients with heel pain without history of trauma and to find out the commonest etiology and age group most commonly affected.

Materials and Methods: This is a retrospective analytical study was conducted for the period of one year starting from March 2016 to March 2017. The study was done in the Radiodiagnosis Department of Tirunelveli Medical College Hospital, Tamil Nadu, India. In our institute, MRI of ankle and foot was taken in 40 cases. Out of all 22 cases without trauma history was taken for study. The findings were analyzed and hereby are presented.

Results: It is seen that most of non-traumatic pathologies detected in the age group 31-40 years.It is noted that infectious conditions i.e., osteomyelitis and tuberculous synovitis account for about 36%of cases . Both genders are equally affected in non-traumatic pathologies. MRI findings of non-traumatic pathologies of ankle and foot like ganglion cyst, osteomyelitis, tuberculous synovitis, rheumatoid arthritis and plantar fasciitis are discussed and it is noted that MRI plays important role in diagnosis.

Conclusion: In MRI of ankle and foot, T1W, T2W, PD with FATSAT, TIRM sequences are very much useful in identifying areas of abnormalities. The above study shows that MR imaging is the modality of choice for assessment of pathologic conditions of the ankle and foot.

Keywords: Arthritis, Cyst, Fasciitis, Osteomyelitis, Sequence

INTRODUCTION

MRI is very much helpful in assessing pathologic conditions of the ankle and foot. MRI gives more information in the region of ankle and foot because of its high soft-tissue resolution and multiplanar capability. It helps as a non invasive tool especially in cases of trauma. As ankle region has so many soft tissues, MRI is very useful in evaluation of pathologies in ankle region. Knowledge of normal MR anatomy of ankle and foot is very important for interpreting abnormalities. MR imaging has many advantages in detecting occult fractures and assessment of tendons, ligament, fascia around ankle [1].

MRI of ankle and foot is taken in trauma and non-traumatic conditions. In this article, the MRI findings of non-traumatic pathologies of ankle and foot are discussed. Most often MRI of ankle is taken in traumatic cases.

This study is done in non-traumatic cases to know about various non-traumatic etiologies, most common age group affected and to know about the importance of MRI to identify the pathologies.

MATERIALS AND METHODS

This is a retrospective analytical study was conducted for the duration of one year starting from March 2016 to March 2017. The study was done in the Radiodiagnosis Department of Tirunelveli Medical College Hospital, Tamil Nadu, India.

In our institute, 4412 cases of MRI have been taken in above period for various conditions. All the patients without trauma history for whom MRI ankle and foot was taken were considered for the study. Whereas, the patients with history of trauma and patients on post-operative follow-up were excluded. Among them MRI of ankle and foot was taken in 40 cases and out of them 22 cases, who fulfilled our inclusion criteria were taken for study.

MRI was done with 1.5 Tesla Siemens MRI scanner. T1W, T2W (axial, sagittal,) PD with FATSAT (coronal , sagittal), TIRM (coronal, sagittal) sequences are done for all patients with same MRI parameters in uniform slice thickness.These

sequences were applied over the region of interest i.e., ankle, hind foot, mid foot or forefoot. Contrast study was done in few needed cases.

All the bones of ankle and foot are carefully analyzed for marrow edema. Tendons are analyzed for signal abnormalities. Ankle joint space and other joint spaces are analyzed for joint space narrowing and fluid collections.Those findings were analyzed and hereby are presented.

RESULTS

In this study the selected patients have undergone MRI of ankle and foot. The results are analyzed as follows. It is seen that most of pathologies detected in the age group 31-40 years (45.45%) out of all the cases [Table/Fig-1].

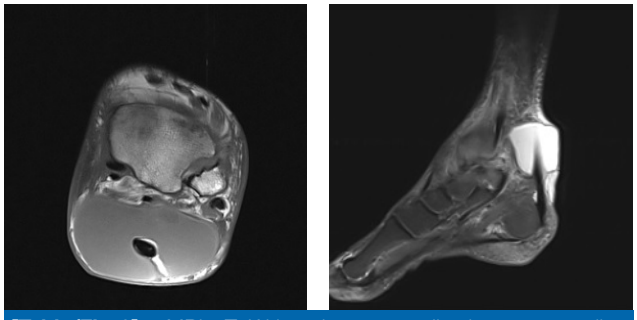
It is noted that infectious conditions i.e., osteomyelitis and tuberculous synovitis account for about 36.36% of cases [Table/Fig-2]. It is seen that both genders are equally affected in non-traumatic pathologies. A 54-year-old male was imaged with history of swelling in posterior lower leg. MRI T1W sequence shows hypointense collection surrounding tendoachilles with well defined capsule [Table/Fig-3]. MRI

S. No	Age Group (in years)	Number of Cases	Percentage (%)
1	0-10	0	0
2	11-20	4	18.18
3	21-30	2	9.09
4	31-40	10	45.45
5	41-50	2	9.09
6	51-60	3	13.63
7	61-70	1	4.55
Total		22	100

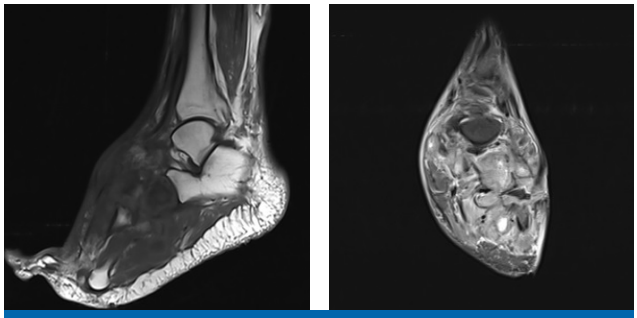
[Table/Fig-1]: Agewise distribution.

S.NO	Condition	Number of Male Cases	Number of Female Cases	Total Number of Cases
1	Neuropathic Joint	2	1	3
2	Osteomyelitis	3	3	6
3	Ganglion Cyst	1	1	2
4	Synovitis	1	0	1
5	Tuberculous Arthritis	2	0	2
6	Rheumatoid Arthritis	0	2	2
7	Plantar Fasciitis	2	1	3
8	Tenosynovitis	1	2	3
Total		12	10	22

[Table/Fig-2]: Genderwise distribution of pathological conditions.



[Table/Fig-3]: MRI T1W-hypointense collection surrounding tendoachilles with capsule. **[Table/Fig-4]:** MRI TIRM-hyperintense collection.



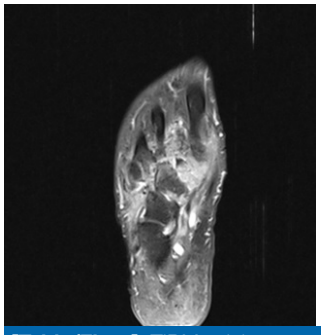
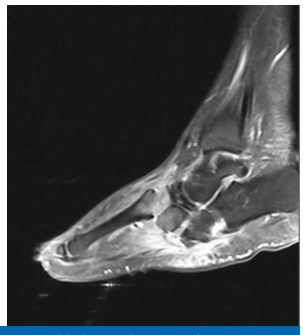
[Table/Fig-5]: T1W MRI-metatarsals destruction with extensive hypointense collection. **[Table/Fig-6]:** T2W MRI-hyperintense collection surrounding metatarsals.

TIRM sequence shows hyperintense collection [Table/Fig-4]. The diagnosis arrived was ganglion cyst.

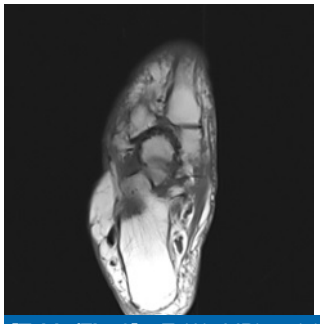
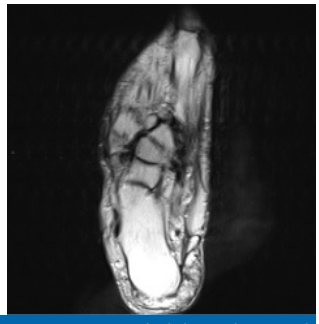
Another 38-year-old male admitted with diabetes with foot swelling took MRI. T1W MRI shows metatarsals destruction with extensive hypointense collection [Table/Fig-5]. T2W MRI shows hyperintense collection surrounding metatarsals [Table/Fig-6] the diagnosis of osteomyelitis with surrounding abscess was made.

Another 64-year-old male admitted with leprosy and foot swelling. TIRM axial section of foot shows tarsometatarsal joints destruction [Table/Fig-7]. TIRM sagittal section shows the tarsometarsal joint dislocation with surrounding soft tissue edema [Table/Fig-8]. The diagnosis in this case is neuropathic joint changes of foot. Another 55-year-old female admitted with foot pain and swelling. T1W MRI axial section shows tarsometatarsal joint abnormal hypointensities [Table/Fig-9]. T2W MRI axial shows the same hypointensities within the tarsometarsal joints with severe joint space reduction [Table/Fig-10]. The diagnosis is rheumatoid arthritis of foot joints. The patient is also suffering from rheumatoid arthritis of hands.

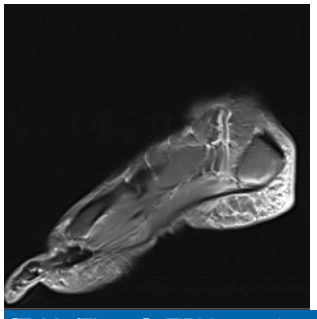
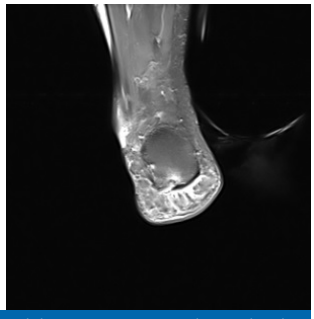
Another 45-year-old female was imaged for chronic foot pain. TIRM sag shows abnormal bone marrow edema in the calcaneum at the plantar fascia insertion [Table/Fig-11]. TRIM coronal shows marrow edema with erosions in calcaneum with surrounding soft tissue edema [Table/Fig-12]. The diagnosis in this case is plantar fasciitis. Another 52-year-old male was

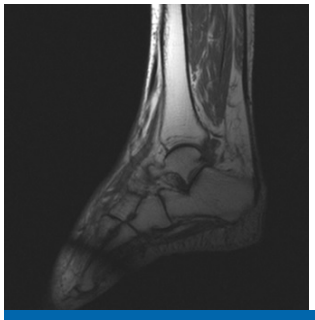
[Table/Fig-7]: TIRM axial-tarsometatarsal joints destruction. **[Table/Fig-8]:** TIRM sagittal-tarsometarsal joint dislocation with surrounding soft tissue edema.

[Table/Fig-9]: T1W MRI axial-tarsometatarsal joint abnormal hypointensities. **[Table/Fig-10]:** T2W MRI-hypointensities within the tarsometarsal joints with severe joint space reduction.

[Table/Fig-11]: TIRM sag-abnormal bone marrow edema in the calcaneum at the plantar fascia insertion. **[Table/Fig-12]:** TIRM coronal-marrow edema with erosions in calcaneum with surrounding soft tissue edema.




[Table/Fig-13]: T1W MRI sag-capsule thickening in posterior aspect of ankle joint. **[Table/Fig-14]:** PD with FATSAT-capsular thickening with minimal effusion.

imaged for chronic swelling with pain in the ankle joint. T1W MRI sag shows capsule thickening in posterior aspect of ankle joint [Table/Fig-13]. PD with FATSAT sagittal shows capsular thickening with minimal effusion [Table/Fig-14]. The diagnosis is chronic arthritis. This case on follow-up shows that this is a case of tuberculous arthritis.

DISCUSSION

Ganglion cysts are non-malignant cystic masses occurring in association with musculoskeletal structures [2]. They are seen most frequently in the dorsal aspect or in the region of the sinus tarsi in the ankle and foot [1]. MRI signals of ganglion cysts are similar to typical cystic lesions i.e., hypo/isointense to muscle in T1WI, high signal in T2WI [3]. Many reviews and meta-analyses show that MRI is very useful in imaging of osteomyelitis with sensitivity 90% and specificity about 80% [4]. For diagnosing diabetic foot osteomyelitis, MRI is presently considered the investigation of choice. In osteomyelitis, there is loss of signal in bones in T1-weighted images and increased intensity on T2-weighted images can show the pathology as early as 3 days after infection [5]. In acute neuropathic joint, the most commonly seen findings are joint effusion, Soft tissue edema, subchondral bone marrow edema of involved joints [6]. In MRI, edema and enhancement are absent or less prominent in the chronic form of neuropathic arthropathy [7].

To assess and quantify the disease manifestation in rheumatoid arthritis, the degree of synovial inflammation, erosions, bone marrow edema and tenosynovitis, several scoring systems are suggested, and the Outcome Measures in Rheumatoid-Arthritis Clinical Trials (OMERACT) and Rheumatoid Arthritis Magnetic Resonance Image Scoring System (RAMRIS) are the most used in clinical practice [8]. Fibrous pannus is seen in longstanding rheumatoid arthritis (particularly “burnt out” rheumatoid arthritis). It is easily differentiated from joint fluid by virtue of its lower T2 signal. It also demonstrates less avid enhancement [9]. MRI provides objective assessment of the morphologic changes associated with plantar fasciitis. It also helps in excluding other causes of heel pain [10].

In cases of plantar fasciitis, in 70% of cases, soft-tissue edema both superficial and deep to the plantar aponeurosis was the dominant abnormal imaging finding, although a higher frequency for edema superficial to the PA was reported previously [11]. In plantar fasciitis, there is limited marrow edema seen within the medial calcaneal tuberosity [12]. In T2W imaging if the joint shows intra articular lesions with low/intermediate signal intensity, then tuberculous arthritis should be one of the differential diagnoses [13]. In tuberculous arthritis, Uniform synovial thickening, large size of bone erosion, extraarticular cystic masses and rim enhancement at site of bone erosion are more frequent and more numerous. In the differentiation between rheumatoid arthritis and tuberculous

arthritis, MRI may be helpful [14]. In imaging evaluation of foot tumors, MRI is the method of choice [15].

LIMITATION

Contrast study done in half of cases only. This limitation may be overcome by reducing cost of MRI contrast imaging.

CONCLUSION

In this study, most of non-traumatic pathological conditions of ankle and foot belong to age group 31-40 years. Infectious conditions i.e., osteomyelitis and tuberculous synovitis account for about 36% of cases. Both genders are equally affected. T1W, T2W, PD with FATSAT, TIRM sequences in MRI over ankle and foot region give many informations regarding the abnormalities of bones, tendons and other soft tissues. The above study shows that MRI is the modality of choice in imaging of non-traumatic pathologies of ankle and foot.

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