Scholars Journal of Applied Medical Sciences (SJAMS)
Abbreviated Key Title: Sch. J. App. Med. Sci.
ISSN 2320-6691 (Online)
ISSN 2347-954X (Print)

A Unit of Scholars Academic and Scientific Society, India
www.saspublisher.com

Orthopedics

MRI Evaluation of Ankle and Foot in Patients with Known Rheumatoid Arthritis

Dr. Rajeev Anand[1], Dr. Sujit Jos[2*], Dr. Padmanabha Shenoy[3], Dr. Kaitharath Vareed Sholy[4]
[1]Associate Professor of RadioDiagnosis, SN Medical College, Ernakulam, India
[2]Associate Professor of Orthopedics, SN Medical College Ernakulam, India
[3]Cheif Consultant Rheumatologist, CARE hospital, Ernakulam, India
[4]Consultant Radiologist, Little flower hospital, Ernakulam, India

Original Research Article

***Corresponding author**
Dr. Sujit Jose

Article History
Received: 03.04.2018
Accepted: 15.04.2018
Published: 30.04.2018

DOI:
10.21276/sjams.2018.6.4.90

Abstract: The role of MRI in the early diagnosis of rheumatoid arthritis, tendon and bone pathologies in Rheumatoid Arthritis, helps in early treatment before permanent damage occurs. The study aims to evaluate the role of MRI in patients with known RA presenting with ankle/foot pain and to compare the different imaging features with previous studies. The study was conducted in the Department of Radio-Diagnosis, S N Medical college and Little Flower Hospital Ernakulam during the period of January 2013 to April 2015. Study group involves patients with known RA and having ankle pain referred to the Radiology Department, SN Medical college, where UGG was done and as further investigation, undergone MRI at Little Flower Hospital Ernakulam for the time duration of January 2013 to April 2015. Contrast enhanced MRI scan was performed using 1.5T MRI scanner (GE Signa HDxt). Total 72 patients (36 patients each in study group and comparison group) were included in the study. In our study, synovial thickening was the most common pathology affecting the joints in inflammatory arthritis and was present in 100% cases of inflammatory arthritis. Our major observations are, MRI could detect 100% (n=62) of rheumatoid arthritis were associated with enhancing synovial thickening, 84% (n=52) had joint effusion, 58% (n=36) had bone erosion, 93.5% (n=58) had bone edema, 42% (n=26) had tenosynovitis, 51.6% (n=32) had secondary osteoarthritis, 3.2% (n=2) had deltoid ligament partial tear. Synovitis and effusion are difficult to differentiate on unenhanced MR images, hence needed contrast enhanced study to differentiate between the two. Our results were comparable to the reference studies. MRI is the only imaging modality, which helps in the complete visualization of the joint, bony and soft tissue pathology. MRI should be used for the gold standard for the diagnosis of RA, to evaluate the extent and severity of joint involvement.
Keywords: Contrast enhanced MRI, ankle, foot, rheumatoid arthritis.

INTRODUCTION

Ankle is the weight-bearing joint of our body [1]. Rheumatoid arthritis is the most common inflammatory arthritis, affecting approximately 1%of the world's population. Approximately 90% of patients have involvement of the foot or ankle at some point during their disease and 20% of patients present with foot problems. Early diagnosis of rheumatoid arthritis is essential for early treatment and clinical improvement of patients. MRI helps in early diagnosis of erosions, synovitis and bone marrow edema, which are found to be precursors of erosion. In the early months of rheumatoid arthritis, patients usually present with symmetric peripheral polyarthritis and early morning stiffness rather than nodules, erosions, and positive rheumatoid factor [2]. Synovitis is the earliest abnormality to appear in rheumatoid arthritis. MR imaging signs of synovitis include increased synovial volume, increased water content, contrast enhancement, or a combination these. Synovitis and effusion are difficult to differentiate on unenhanced MR images; however, very heavily T2-weighted images can be helpful in identifying synovitis, which has lower signal intensity than does joint effusion [2]. This early phase lasts for approximately 5minutes after injection. Joint fluid enhancement occurs within minutes, reaches a plateau after 30 minutes, and persists for at least 1 hour [3]. The OMERACT group defines bone edema at MR imaging as a lesion within the trabecular bone that has ill-defined margins and signal intensity characteristics consistent with increased water content and may be seen alone or surrounding an erosion or some other bone abnormality [4]. Bone marrow edema has been found in 39%– 75% of rheumatoid arthritis patients with disease duration of less than 1 year. In one series, bone marrow edema was present in 39% of cases of early rheumatoid arthritis (<3 years duration) and in 68% of

cases of established rheumatoid arthritis (>3 years duration) [5]. The detection of erosions in patients with early rheumatoid arthritis is a key imaging finding, since it indicates irreversible joint damage [6, 7]. MR imaging can assist in making an early diagnosis of rheumatoid arthritis by revealing erosions, whose presence constitutes one of the ACR 1987 diagnostic criteria [8].Tenosynovitis is clinically significant in early rheumatoid arthritis because joint synovitis and tenosynovitis represent the same process, and in some patients with early rheumatoid arthritis, tenosynovitis predominates over joint synovitis; therefore, according to Tehranzadeh *et al*., [9] these two conditions should be considered together to evaluate the degree of inflammation in a given patient. Tendon rupture has been related to invasion of the tendon by tendon-sheath synovitis and to fraying of the tendon against eroded bone margins. Alsuwaidi M *et al.*, [10] studied a total of 80 RA patients with a median age of 60 years and disease duration of 5 years. A total of 97 ankles were painful, whereas 63 ankles were asymptomatic. Overall, the predominant pathology was arthritis of the tibiotalar joint (TTJ) and/or talonavicular (TNJ) in 77%, followed by tenosynovitis of the medial compartment tendons in 28%. Arthritis of the TTJ was present in 59% and synovitis of the TNJ in 35% of the symptomatic ankles.

Javadis *et al*., [11] found 39% had tenosynovitis, and the tibialis posterior tendon (33.3%) was most commonly involved. For the ankle, 69.7% had active joint inflammation, with an average of2.4 joints involved (range, 0–5 joints), and the tibiotalar joint (52%) was most commonly involved. Suzuki T *et al*., [12] analyzed consecutive records of 100 ankles in 74 RA patients. Among 100ankles, synovitis of talocrural joint, subtalar joint, and talonavicular joint were detected in 35,33and27 ankles, respectively. YamaguchiS *et al*., [13], in their study to compare the anatomy of rheumatoid hallux valgus with that of idiopathic hallux valgus from the standpoint of joint-preserving surgery, the first metatarsal head shifted medially as hallux valgus angle increased in rheumatoid halluxvalgus, which was similar to the deformity of idiopathic hallux valgus. In the study conducted by Michelson *et al.*, [14] in their study to assess posterior tibial tendondys function in rheumatoid arthritis, between 13% and 64% of the study population were considered to have posterior tibial tendon dysfunction.

MATERIALS AND METHODS

The study was conducted in the Department of Radio-Diagnosis, S N Medical college and Little Flower Hospital Ernakulam during the period of January 2013 to April 2015.Study group were patients with known RA and having ankle pain referred to the Radiology Department, SN Medical college, where UGG was done and as further investigation, undergone MRI at Little Flower Hospital Ernakulam for the time duration of January 2013 to April 2015. Contrast enhanced MRI scan was performed using 1.5T MRI scanner (GE Signa HDxt). Total 62 patients (36 patients each in study group and comparison group) were included in the study.

RESULTS

The age group of patients ranged from 10 years to 74 years. In the present study, the most common age group of patients presenting with ankle and foot pain was in the fifth and sixth decade, constituting 54% of the cases, with the mean age of 47 years 90.3% of the patients with inflammatory arthritis were females and only 9.7% were males. The most common age group of patients presenting with inflammatory arthritis was fifth and sixth decades constituting 71% of the study population, with the mean age of 51 years. MRI could detect 100% (n=62) of rheumatoid arthritis was associated with enhancing synovial thickening, 84% (n=52) had joint effusion, 58% (n=36) had bone erosion, 93.5% (n=58) had bone edema, 13% (n=8) had bone collapse, 6.4% (n=4) had 1st tarsometatarsal dislocation, 42% (n=26) had tenosynovitis, 6.4% (n=4) had partial tear of tibialis posterior tendon, 3.2% (n=2) had Achilles tendinosis, 51.6% (n=32) had secondary osteoarthritis, 3.2% (n=2) had deltoid ligament partial tear, 16% (n=10) had extra articular lateral hind foot impingement and 16% (n=10) had FHL myositis. Joint effusion is the second most frequent joint pathology in inflammatory arthritis seen in 83.8 % of the inflammatory arthritis cases. Sinus tarsi is the most frequently affected site (71%) followed by posterior talocalcaneal and talonavicular joints (55% each). This is followed by the tibiotalar joint (45%). Bone erosion in juxtaarticular location was seen in 58% of inflammatory arthritis cases. It was involving talonavicular joint in 19.3% of inflammatory arthritis cases, posterior talocalcaneal joint in 13% and tibiotalar joint in 9.6% of inflammatory arthritis cases. In our study, 32.2% (n=20) of inflammatory arthritis cases were associated with tenosynovitis. In our study bone marrow edema is the most common bone abnormality in inflammatory arthritis affecting 93.5% of inflammatory arthritis cases. Bone marrow edema was seen affecting talus in 84% (n=52) of inflammatory arthritis cases.51.6% (n=32) cases of rheumatoid arthritis cases were associated with secondary osteoarthritis. MRI could detect 16% (n=10)) cases of lateral extra articular hindfoot impingement are associated with partial tear of tibialis posterior tendon.

DISCUSSION

All the MRI scans in our study were performed using Contrast enhanced MRI scan was performed using 1.5T MRI scanner (GE Signa HDxt). Our study comprised of 74.7% of females and25.3% of males.

In our study, synovial thickening was the most common pathology affecting the joints ininflammatory arthritis. Synovial thickening was present in 100% cases of inflammatoryarthritis. MRI could detect 100% (n=62) of rheumatoid arthritis was associated with enhancing synovial thickening, 84% (n=52) had joint effusion, 58% (n=36) had bone erosion, 93.5% (n=58) had bone edema, 13% (n=8) had bone collapse, 6.4% (n=4) had 1st tarsometatarsal dislocation, 42% (n=26) had tenosynovitis, 6.4% (n=4) had partial tear of tibialis posterior tendon, 3.2% (n=2) had Achilles tendinosis, 51.6% (n=32) had secondary osteoarthritis, 3.2% (n=2) had deltoid ligament partial tear, 16% (n=10) had extra articular lateral hindfoot impingement and 16% (n=10) had FHL myositis. This is similar to the study conducted by Alsuwaidi *et al*., [10] where thepredominant pathology was arthritis of tibiotalar joint and talonavicular joint and is alsosimilar to the study conducted by Suzuki T *et al*., [12] in rheumatoid arthritis patients wheresynovitis of talocrural joint, subtalar joint, and talonavicular joint were detected in 35%, 33%,and 27% of ankles, respectively. Joint effusion is the second most frequent joint pathology in inflammatory arthritis seen in83.8 % of the inflammatory arthritis cases. Effusion is seen maximum affecting the sinus tarsi (51%), followed by tibiotalar joint (48.3%). Narváez *et al*., [2] in their study have mentionedthat synovitis is the earliest abnormality to appear in rheumatoid arthritis and effusion isusually associated with synovitis.Bone erosion in juxtaarticular location was seen in 58% of inflammatory arthritis cases. Itwas involving talonavicular joint in 19.3% of inflammatory arthritis cases, posteriortalocalcaneal joint in 13% and tibiotalar joint in 9.6% of inflammatory arthritis cases (Figure-1). Narváez *et al*., [2] in their study have mentioned that the detection of erosions at MRimaging and is important for diagnosis and prognosis in patients with rheumatoid arthritis. MRimaging can assist in making an early diagnosis of rheumatoidarthritis by revealing erosions,whose presence constitutes one of the ACR 1987 diagnostic criteria [8].

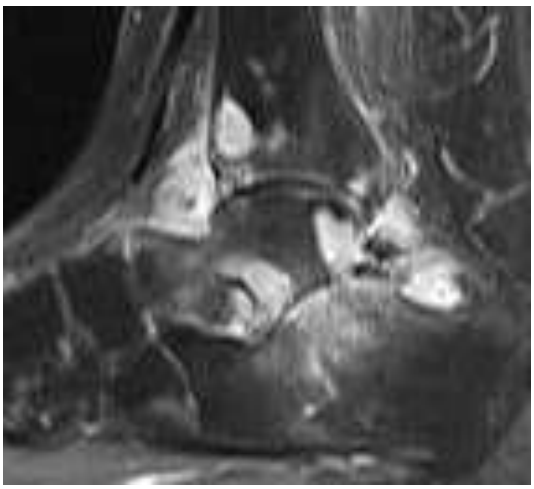

Fig-1: Sagittal contrast enhanced image shows enhancing synovial thickening with enhancing erosions in the distal tibia and talus.

In our study, 32.2% (n=20) of inflammatory arthritis cases were associated with tenosynovitis. 29% (n=18) of inflammatory arthritis cases were associated with tenosynovitis of flexor hallucis longus tendon and 25.8% (n=16) cases of inflammatory arthritis were associated with tenosynovitis of tibialis posterior tendon. Tenosynovitis of flexor digitorumlongus, peroneus and tibialis anterior tendons were seen in 16.1% (n=10), 9.6% (n=6) and3.2% (n=2) of inflammatory arthritis cases respectively. This is similar to the study conducted by Alsuwaidi M *et al*., [10], were tenosynovitis of the medial compartment tendons was seen in 28% cases with rheumatoid arthritis. The study of ankle conducted by Javadi *et al*., [11] also shows that in rheumatoid arthritis, tibialis posteriortendon (33.3% of cases) was most commonly affected by tenosynovitis. In the study conducted by Suzuki T *et al*., [12] in rheumatoid arthritis patients, ankle tenosynovitis was detected in 46% ankles at medial recess (mainly Tibialis posterior tendons), in 29% ankles atlateral recess (peroneal tendons), and in 10% ankles at anterior extensors. Overall ankle tenosynovitis was observed in 61% ankles. In our study bone marrow edema is the most common bone abnormality in inflammatoryarthritis affecting 93.5% of inflammatory arthritis cases. Bone marrow edema was seenaffecting talus in 84% (n=52) of inflammatory arthritis cases, calcaneus in 71% (n=44), navicular bone in 61% (n=38) and cuboid in 38.7% (n=24) of inflammatory arthritis cases. Savnik *et al*., [7] reported the presence of bone marrow edema in 68% cases of establishedrheumatoid arthritis. Bone collapse is found to be the least common abnormality involving only 12.9% ofinflammatory arthritis cases. It was involving navicular bone in 9.6% (n=6) and calcaneus in3.2% (n=2) of inflammatory cases. 51.6% (n=32) cases of inflammatory arthritis cases were associated with secondaryosteoarthritis. The posterior talocalcaneal

joint was most frequently affected by joint spacereduction (25.8%), subchondral cyst formation (19.3%), subchondral sclerosis (22.5%) andosteophyte formation (9.6%).In our study, 2 cases of inflammatory arthritis were associated with subluxation of 1stmetatarsophalangeal joint and in both cases the first metatarsal head was shifted laterally. 1 case of inflammatory arthritis is associated with subluxation with valgus deformity of interphalangeal joint of great toe. Yamaguchi S *et al*., [13], in their study, the first metatarsal head shifted medially as hallux valgus angle increased in rheumatoid halluxvalgus, which was similar to the deformity of idiopathic hallux valgus. In our study only 6.4% (n=2) of inflammatory arthritis cases were associated with chronicpartial tear of tibialis posterior tendon. Inflammatory arthritis was not associated with chronic partial tear of other tendons. Lateral extra articular hindfoot impingement syndrome is seen in16.1% (n=10) of inflammatory arthritis cases, of which 2 had chronic partial tear of tibialisposterior tendon and 1 had deltoid ligament tear. In the study conducted by Michelson *et al*., [14] in their study to assess posterior tibial tendon dysfunction in rheumatoid arthritis, between 13% and 64% of the study population were considered to have posterior tibial tendon dysfunction.

CONCLUSION

The ability of MRI in diagnosing the etiology of musculoskeletal pain is well established. MRI is the only imaging modality, which helps in the complete visualization of bony as well as soft tissue pathology. In our study, the most common finding in inflammatory arthritis was synovitis followed by marrow oedema. MRI should be used as the investigation of choice to both. Contrast enhanced MRI should be performed to differentiate synovial proliferation from joint, effusion in inflammatory arthritis. MRI also helped to detect the tendon involvement, to assess the extend and severity of the diesease and also the complications. Finally, MRI should be used for the gold standardfor the diagnosis of RA, to evaluate the extent and severity of joint involvement.

Funding: No funding sources

Conflict of interest: None declared.

Ethical approval: The study was approved by the institutional ethics committee.

REFERENCES

1. Rosenberg ZS, Beltran J, Bencardino JT. MR imaging of the ankle and foot. Radiographics. 2000 Oct;20(suppl_1):S153-79.
2. Narvaez JA, Narváez J, De Lama E, De Albert M. MR imaging of early rheumatoid arthritis. Radiographics. 2010 Jan;30(1):143-63.
3. Østergaard M, Klarlund M. Importance of timing of post-contrast MRI in rheumatoid arthritis: what happens during the first 60 minutes after IV gadolinium-DTPA?. Annals of the rheumatic diseases. 2001 Nov 1;60(11):1050-4.
4. Østergaard M, Peterfy C, Conaghan P, McQueen F, Bird P, Ejbjerg B, Shnier R, O'Connor P, Klarlund M, Emery P, Genant H. OMERACT Rheumatoid Arthritis Magnetic Resonance Imaging Studies. Core set of MRI acquisitions, joint pathology definitions, and the OMERACT RA-MRI scoring system. The Journal of rheumatology. 2003 Jun 1;30(6):1385-6.
5. Savnik AN, Malmskov HA, Thomsen HS, Graff LB, Nielsen HE, Danneskiold-Samsøe BE, Boesen JE, Bliddal HE. Magnetic resonance imaging of the wrist and finger joints in patients with inflammatory joint diseases. The Journal of rheumatology. 2001 Oct 1;28(10):2193-200.
6. Guermazi A, Taouli B, Lynch JA, Peterfy CG. Imaging of bone erosion in rheumatoid arthritis. InSeminars in musculoskeletal radiology 2004 Nov (Vol. 8, No. 04, pp. 269-285). Copyright© 2004 by Thieme Medical Publishers, Inc., 333 Seventh Avenue, New York, NY 10001 USA.
7. Farrant JM, O'Connor PJ, Grainger AJ. Advanced imaging in rheumatoid arthritis. Skeletal radiology. 2007 Apr 1;36(4):269-79.
8. Narváez J, Sirvent E, Narváez JA, Bas J, Gómez-Vaquero C, Reina D, Nolla JM, Valverde J. Usefulness of magnetic resonance imaging of the hand versus anticyclic citrullinated peptide antibody testing to confirm the diagnosis of clinically suspected early rheumatoid arthritis in the absence of rheumatoid factor and radiographic erosions. InSeminars in arthritis and rheumatism 2008 Oct 1 (Vol. 38, No. 2, pp. 101-109). Elsevier.

9. Tehranzadeh J, Ashikyan O, Anavim A, Tramma S. Enhanced MR imaging oftenosynovitis of hand and wrist in inflammatory arthritis. Skeletal radiology. 2006Nov 1;35(11):814-22.
10. Alsuwaidi M, Ehrenstein B, Fleck M, Hartung W. Asymptomatic VersusSymptomatic Ankle Joints in Rheumatoid Arthritis: A High_ResolutionB_Modeand Power Doppler Ultrasound Study. Arthritis care & research. 2016 Jun1;68(6):861-4.
11. Javadi S, Kan JH, Orth RC, DeGuzman M. Wrist and ankle MRI of patients withjuvenile idiopathic arthritis: identification of unsuspected multicompartmentaltenosynovitis and arthritis. American Journal of Roentgenology. 2014 Feb;202(2):413-17.
12. Suzuki T, Okamoto A. AB1306 Isolated tenosynovitis is frequently detected by ultrasound in symptomatic ankles of RA patients with significantly shorter disease duration. Annals of the Rheumatic Diseases. 2013 Jun 1;71(Suppl 3):712-.
13. Yamaguchi S, Tanaka Y, Shinohara Y, Taniguchi A, Sasho T, Takahashi K, Takakura Y. Anatomy of hallux valgus in rheumatoid arthritis: radiographic analysis using a two-dimensional coordinate system. Modern rheumatology. 2013 Jul 1;23(4):774-81.
14. Michelson J, Easley M, Wigley FM, Hellmann D. Posterior tibial tendon dysfunction in rheumatoid arthritis. Foot & ankle international. 1995 Mar 1;16(3):156-61.