

Case report: Role of USG and MRI in diagnosis of Madura foot

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How to citation this article: Dr. Heera Ram, Dr. Arzoo Yadav, Dr. Ankit Godara, Dr. Hemant Kumar Mishra, “Case report: Role of USG and MRI in diagnosis of Madura foot”, IJMACR- May - 2023, Volume – 6, Issue - 3, P. No. 197 – 201.

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Type of Publication: Case Report

Conflicts of Interest: Nil

Abstract

Mycetoma or Madura foot is a chronic granulomatous infection of the dermis and epidermis caused by the bacteria *Actinomyces* (*Actinomycetoma*) or by true fungi (*eumycetoma*). It is more common in males than females. Although mainly a disease of the tropics, patients residing in temperate regions may also be affected. Although biopsy and microbiological culture provide definitive diagnosis, they are time-consuming procedures and may not be able to provide a definite diagnosis in cases of fastidious organisms. Mycetoma can be diagnosed with USG and MRI noninvasively and

early with the help of a highly specific sign the “dot-in-circle” sign which has recently been proposed.

Keywords: Dot-in-circle; magnetic resonance imaging; mycetoma; ultrasonography

Introduction

Mycetoma or Madura foot is a chronic granulomatous infection of the dermis and epidermis caused by the bacteria *Actinomyces* (*Actinomycetoma*) or by true fungi (*eumycetoma*). It is more common in males between the ages of 20 and 50 years. [2] Although mainly a disease of the tropics, patients residing in temperate regions may also be affected. It can be diagnosed with USG and MRI noninvasively and early.

Case Report

Clinical history: A 36 years old male patient presented with right foot soft tissue swelling and pain. Swellings was insidious in onset, gradually increased in its size with discharging sinuses and with yellow color pus discharge. Overlying skin discoloration and itching sensation was also present.

Clinical image

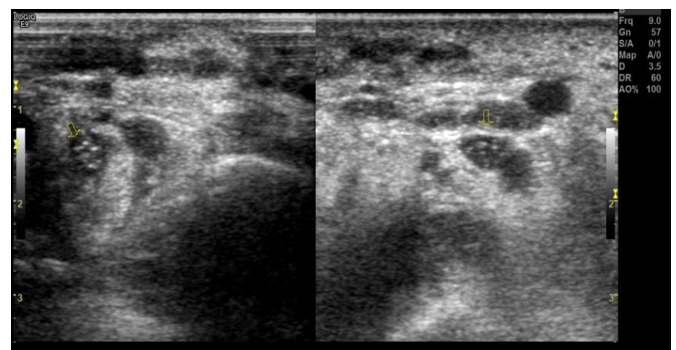


A clinical image (Fig. 1) of the lateral aspect of the right foot shows marked painful soft tissue swelling with multiple discharging nodule and sinuses.

Radiograph of Right Ankle its Antero-posterior (AP) { 2a } and Lateral view {2b})



X-ray right ankle AP (Fig. 2a) and lateral (Fig. 2b) views revealed erosion / destruction of tarsal/metatarsal bones with sclerosis and soft tissue swelling with multiple patchy lucent areas, resembling a moth-eaten appearance.



Ultrasonography (Fig. 3) with high frequency linear probe at local site demonstrates diffuse soft tissue thickening with multiple hypoechoic focal lesions with central echogenic dots consistent with “Dot in circle sign”(arrow).

MRI Findings

MRI was performed to evaluate the extent of the disease. The scan revealed extensive soft tissue and osseous inflammation. Multiple discrete, as well as,

conglomerate small spherical hyperintense lesions with peripheral hypointense rim were seen. Few of these lesions showed a central tiny hypointense focus characteristic “dot in circle” sign.

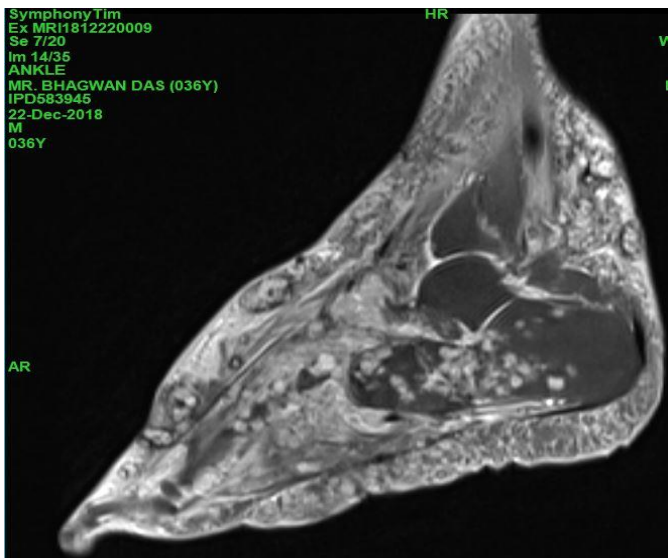
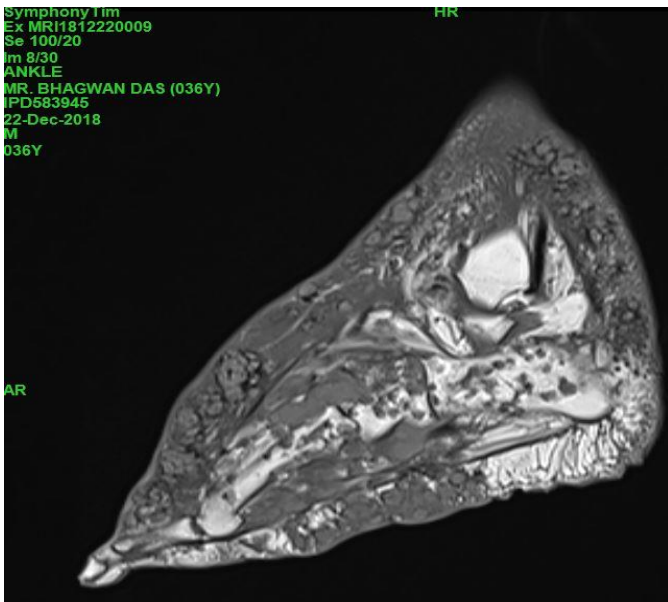


Figure (A) T1W and (B) T2W fat suppressed sagittal images show inflammatory changes with multiple soft tissue hyperintense lesions with peripheral hypointense rim. Few of them showing central low signal intensity (dot). This unique appearance known as “dot in circle sign” is highly suggestive of mycetoma.

Discussion

A. Background: Mycetoma or Madura foot is a chronic granulomatous infection of the dermis and epidermis caused by the bacteria *Actinomyces* (Actinomycetoma) or by true fungi (eumycetoma). It is endemic in the tropics, mainly Africa, Mexico and India. It is named after Madurai in India, where it was originally described in 1842. It commonly affects the feet, hands, back and gluteal region. Eumycetoma is more common in areas with scarce rainfall and actinomycetoma in areas of abundant rainfall.

B. Clinical perspective: It typically presents in farmers who walk barefoot. The infecting organism is directly inoculated after penetration of the skin with a sharp object, e.g., a thorn. Patients present with painless subcutaneous nodules and fistulae, from which a purulent exudate may be discharged. The process is usually indolent but with a potential for abscess formation, draining sinus tracts, osteomyelitis, and fistula formation, [4] with severe deformity and disability ensuing if treatment is not provided. It is important to differentiate between actinomycetoma and eumycetoma because of the different responses to treatment. Correct diagnosis of the fungus can save the weight-bearing function of the foot as well as circumvent the need for surgical amputation.

C. Imaging perspective: Radiograph shows changes of chronic osteomyelitis with soft tissue involvement, sclerosis, cavitation, cortical erosion and destruction of underlying bones. [3].

A few radiographic bone changes have been described that help distinguish between actinomycetoma and eumycetoma. Eumycotic lesions tend to form a few cavities in bone that are ≥ 1 cm in diameter, while

actinomycetes often form smaller but more numerous cavities, leading to a moth-eaten appearance.

CT scan provides better delineation of the bone changes than radiographs.

MRI is useful for visualizing soft tissue involvement and bone destruction. The “dot-in-circle” sign, seen as tiny hypointense foci within the hyperintense spherical lesions, was initially described by Sarriset al., [3] in 2003 on T2W, STIR, and T1W fat-saturated gadolinium-enhanced images.

Correlating the MRI and histological findings

They suggested that the high-signal areas seen on MRI represented inflammatory granulomata, the low-intensity tissue seen surrounding these lesions represented the fibrous matrix, and the small central hypointense foci within the granulomata represented the fungal balls or grains. This unique appearance known as “dot in circle sign” is highly suggestive of mycetoma.

This feature is also noted on ultrasound with multiple round hypochoic lesions containing hyperechoic foci. The USG appearances were initially described by Fahalet al., [4] who demonstrated on in vitro imaging of the mycetoma lesions that the hyper-reflective echoes corresponded to the grains; eumycetoma grains produce sharp hyperechoic foci, while actinomycetomas produce fine hyperechoic foci that commonly settle at the bottom of the rounded lesions.

Actinomycetoma more often delineate soft tissue microabscesses, bony periosteal reaction and reactive sclerosis, while eumycetoma frequently exhibit soft tissue macroabscesses with bone cavitation. However, culture studies remain the gold standard for species identification.

D. Outcome: Surgical debridement followed by prolonged antibiotic therapy for several months is

required for actinomycetoma. Eumycetomas are only partially responsive to anti-fungal therapy but can be treated by surgery due to their normally well circumscribed nature. Surgery in combination with azole treatment is the recommended regime for small eumycetoma lesions in the extremities. Amputation may be required in recurrent cases [4].

E. Summary:

- Typical clinical history with clear radiological signs can lead to early diagnosis of Madura foot and prevent deformity/remodelling. It is important to identify the causative species for implementing the correct line of treatment.
- Dot-in-circle sign is characteristic of maduramycosis on MRI and ultrasound.

References:

1. Al Gannass A. Chronic Madura foot: mycetoma and/or Actinomycetosis or actinomycosis. Case Reports. 2018 Sep 21;2018:bcr-2018.
2. Fahal AH, Suliman SH, Hay R. Mycetoma: the spectrum of clinical presentation. Tropical medicine and infectious disease. 2018 Sep 4;3(3):97.
3. Relhan V, Mahajan K, Agarwal P, Garg VK. Mycetoma: an update. Indian journal of dermatology. 2017 Jul;62(4):332.
4. Zijlstra EE, Van De Sande WW, Welsh O, Goodfellow M, Fahal AH. Mycetoma: a unique neglected tropical disease. The Lancet Infectious Diseases. 2016 Jan 1;16(1):100-12.
5. Laohawiriyakamol T, Tanutit P, Kanjanapradit K, Hongsakul K, Ehara S. The “dot-in-circle” sign in musculoskeletal mycetoma on magnetic resonance imaging and ultrasonography. Springerplus. 2014 Dec;3:1-7.

6. Sen A, Pillay RS. Case report: Dot-in-circle sign - An MRI and USG sign for "Madura foot". *Indian J Radiol Imaging*. 2011 Oct;21(4):264-6. doi: 10.4103/0971-3026.90684. PMID: 22223936; PMCID: PMC3249939.
7. Sarris I, BerendtAR, Athanasous N, Ostlere SJ. MRI of mycetoma of the foot: two cases demonstrating the dot-in-circle sign. *Skeletal radiology*. 2003 Mar;32:179-83.
8. Kumar J, Kumar A, Sethy P, Gupta S. The dot-in-circle sign of mycetoma on MRI. *Diagnostic and Interventional Radiology*. 2007 Dec 1;13(4):193.
9. ME AE, Fahal AH. Mycetoma revisited. Incidence of various radiographic signs. *Saudi medical journal*. 2009 Apr 1;30(4):529-33.
10. Czechowski J, Nork M, Haas D, Lestringant G, Ekelund L. MR and other imaging methods in the investigation of mycetomas. *ActaRadiologica*. 2001 Jan;42(1):24-6.