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Case Report

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Revisiting Mycetoma: Predominant Intraosseous Dot-in-Circle Pattern on MRI in a Chronic Foot Infection

Sylvia Arce, Kevin Pierre, Diego A L Garcia*

Abstract

Mycetoma is a chronic granulomatous infection that predominantly affects individuals in rural environments and is often associated with delayed diagnosis and progressive tissue destruction. Magnetic resonance imaging (MRI) plays a central role in early recognition, particularly through the identification of the characteristic "dot-in-circle" sign.

We report the case of a 36-year-old male agricultural worker presenting with chronic foot pain and swelling. MRI demonstrated extensive disease with a striking predominance of intraosseous involvement, including multiple tarsal bones, characterized by numerous intraosseous "dot-in-circle" lesions, in addition to soft tissue infiltration and sinus tract formation. Microbiological analysis confirmed mycetoma.

This case highlights an atypical imaging pattern of mycetoma with predominant intraosseous expression, which may mimic multifocal osteomyelitis or neoplastic processes. Recognition of this presentation expands the known imaging spectrum of mycetoma and reinforces the importance of MRI in early diagnosis and disease characterization.

Keywords: Mycetoma; Dot-in-circle; MRI; Infection; Intraosseous

Introduction

Mycetoma is a chronic, progressively destructive infection involving the skin, subcutaneous tissues, and frequently the underlying bone [1-4]. It is caused by filamentous bacteria (actinomycetoma) or true fungi (eumycetoma), both of which share overlapping clinical and imaging features [3,5]. The disease is endemic in tropical and subtropical regions and disproportionately affects rural populations with repeated exposure to contaminated soil [1,2].

Clinically, mycetoma is characterized by a triad of tumefaction, draining sinuses, and granular discharge; however, early stages are often nonspecific, contributing to delayed diagnosis [5,6]. MRI has emerged as the most sensitive imaging modality for early detection and for assessing disease extent [7-10].

The "dot-in-circle" sign is considered highly specific for mycetoma and reflects granulomatous lesions containing central microbial grains surrounded by inflammatory tissue [8,10]. Classically, mycetoma demonstrates predominant soft tissue involvement with secondary osseous extension.

In this report, we describe an unusual presentation characterized by predominant intraosseous involvement with multiple intraosseous dot-in-circle lesions, expanding the known imaging spectrum of the disease.

Affiliation:
University of Florida, Department of Radiology, Gainesville, Florida, USA.

Corresponding author:
Diego A L Garcia. University of Florida, Department of Radiology, Gainesville, FL, USA

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Case Presentation

A 36-year-old male agricultural worker from a rural region presented with an eight-month history of progressive right foot pain and swelling. Symptoms began insidiously with mild discomfort during ambulation, followed by gradual enlargement of the foot. The patient reported frequent barefoot walking during agricultural activities and denied any history of trauma.

Over time, swelling worsened and was associated with intermittent discharge through small cutaneous openings. No systemic symptoms such as fever or weight loss were reported. Due to limited access to healthcare, evaluation was delayed until functional impairment became significant.

Physical examination demonstrated diffuse enlargement of the right foot with firm subcutaneous thickening and multiple draining sinus tracts. Mild tenderness was present without significant erythema or warmth.

MRI Findings

MRI of the right foot demonstrated extensive involvement of both soft tissues and multiple tarsal bones.

Soft tissue findings included numerous rounded and coalescent lesions with high signal intensity on T2-weighted and STIR sequences and low-to-intermediate signal on T1-weighted images. Multiple sinus tracts extending to the skin surface were identified.

A hallmark feature was the presence of multiple small central hypointense foci within hyperintense spherical lesions, consistent with the classic "dot-in-circle" sign [8,10,12].

Notably, these target-like lesions were predominantly located within the osseous structures, involving the calcaneus, navicular, cuboid, and cuneiform bones. These intraosseous lesions demonstrated marrow replacement, with low T1 and high signal on fluid-sensitive sequences, as well as patchy post-contrast enhancement [17,32].

This pattern of multifocal intraosseous dot-in-circle lesions is atypical, as mycetoma more commonly demonstrates dominant soft tissue involvement with secondary bone extension.

Cortical irregularity and early bone destruction were present, supporting progressive osseous invasion [17,32]. No large abscess collections were identified.

Microbiological Correlation

Samples obtained from draining sinus tracts revealed granules composed of filamentous organisms on direct microscopy. Culture confirmed the diagnosis of mycetoma [21,31]. Although species-level differentiation between actinomycetoma and eumycetoma was not available at the time of reporting, the microbiological findings supported the imaging diagnosis.

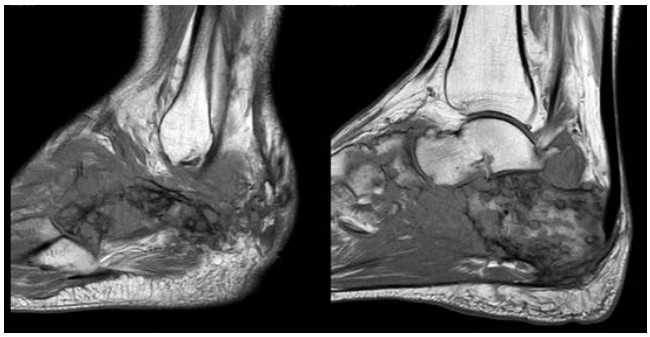

Figure 1: Sagittal T1-weighted MR images of the foot demonstrate multiple areas of abnormal low signal intensity involving the calcaneus, tarsal bones, and fourth metatarsal base, corresponding to marrow infiltration. Associated soft tissue thickening is also noted, reflecting the extent of the underlying infectious process.

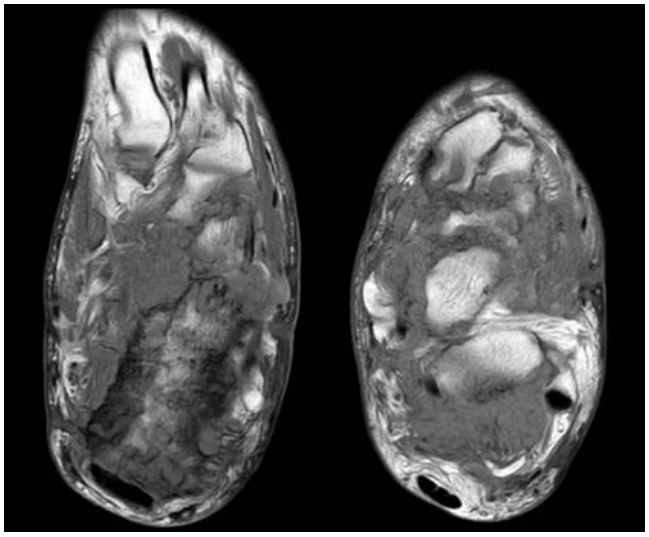

Figure 2: Axial T1-weighted MR image demonstrates extensive low-signal marrow replacement involving the calcaneus, consistent with osseous infiltration. There is also associated involvement of the surrounding soft tissues, which appear thickened and infiltrated, reflecting extension of the infectious process beyond the bone.

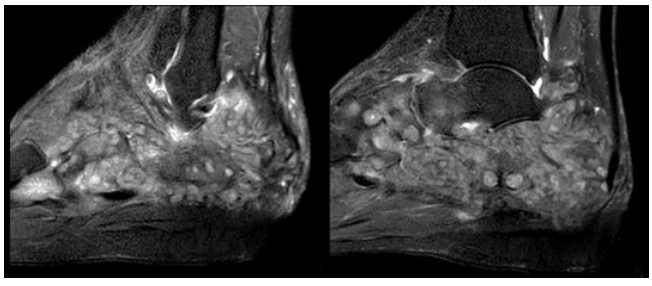

Figure 3: Sagittal fat-suppressed T2-weighted MR image demonstrates intermediate to hyperintense lesions again involving the calcaneus, tarsal bones, and fourth metatarsal, with multiple well-defined rounded foci containing central low-signal intensity, consistent with the "dot-in-circle" sign. Notably, these target-like lesions are more prominently distributed within the osseous structures than in the surrounding soft tissues, highlighting an atypical pattern of predominant intraosseous involvement.

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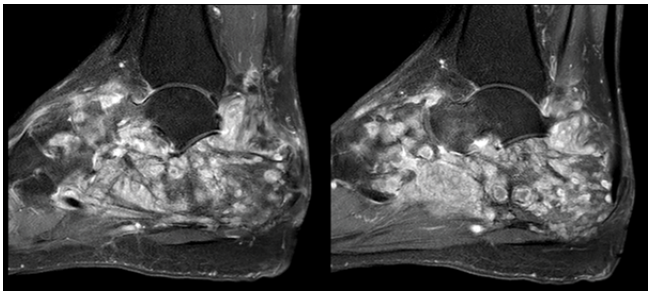

Figure 4: Sagittal fat-suppressed post-contrast T1-weighted MR image demonstrates multiple target-like lesions with predominantly peripheral enhancement, corresponding to the "dot-in-circle" appearance. There is also extensive surrounding marrow enhancement within the involved bones, consistent with reactive osteitis and active inflammatory infiltration.

Discussion

This case highlights an atypical imaging presentation of mycetoma characterized by predominant intraosseous involvement with multiple intraosseous dot-in-circle lesions.

MRI plays a central role in the diagnosis and staging of mycetoma, with the dot-in-circle sign considered highly specific [8,10,22]. This sign reflects compact microbial grains surrounded by inflammatory granulomatous tissue and fibrous septa.

Classically, mycetoma is described as a soft tissue–predominant disease, with bone involvement occurring in more advanced stages through contiguous spread [17,32]. In contrast, the present case demonstrates a striking predominance of intraosseous disease, with multiple tarsal bones extensively involved and containing numerous target-like lesions.

This atypical pattern has important diagnostic implications. Predominant intraosseous involvement may mimic chronic multifocal osteomyelitis, tuberculous infection, or primary and secondary bone neoplasms [33,39]. However, the identification of intraosseous dot-in-circle lesions provides a critical diagnostic clue favoring mycetoma.

The pathophysiology underlying this pattern may relate to early medullary invasion or rapid contiguous spread through adjacent structures, although this remains incompletely understood.

Recognition of this imaging variant is essential, particularly in endemic or high-risk populations, as delayed diagnosis may lead to extensive destruction and increased need for surgical intervention [30,35].

Conclusion

Mycetoma should be considered in patients presenting with chronic foot infection and characteristic MRI findings.

This case expands the known imaging spectrum by demonstrating a predominant intraosseous dot-in-circle pattern, which may mimic other pathologies. Awareness of this presentation is critical for accurate diagnosis and appropriate management.

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