**International Journal of Medical and Pharmaceutical Research**

Online ISSN-2958-3683 | Print ISSN-2958-3675
Frequency: Bi-Monthly
Available online on: https://ijmpr.in/

Case Report

# Chronic Granulomatous Infection of The Hand of Mycetoma: A Diagnostic Challenge

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*Received: 20-05-2026*
*Accepted: 10-06-2026*
*Available online: 30-06-2026*



## ABSTRACT

**Background**: Mycetoma is a chronic granulomatous infection characterized by progressive involvement of the skin, subcutaneous tissues, and occasionally bone. The "dot-in-circle" sign on magnetic resonance imaging (MRI) is considered highly suggestive of mycetoma and is often regarded as a key diagnostic feature. However, several chronic inflammatory and infectious conditions may demonstrate overlapping imaging characteristics.

**Case Presentation**: A 26-year-old male presented with gradually progressive swelling of the right hand associated with mild functional limitation. Contrast-enhanced MRI revealed a large infiltrative soft-tissue lesion involving the intermetacarpal spaces with extension into both palmar and dorsal compartments. The lesion demonstrated heterogeneous T2 hyperintensity with multiple small central hypointense foci producing the characteristic "dot-in-circle" appearance, along with features suggestive of osseous involvement. Based on imaging, a provisional diagnosis of mycetoma was made. However, subsequent histopathological examination revealed chronic granulomatous inflammation without evidence of fungal grains or filamentous bacteria, thereby excluding mycetoma.

**Conclusion**: This case emphasizes that although the "dot-in-circle" sign is highly suggestive of mycetoma, it is not pathognomonic. MRI findings must be interpreted in conjunction with histopathological and microbiological correlation to establish a definitive diagnosis. Recognition of potential imaging mimics is essential to prevent misdiagnosis and ensure appropriate management.

***Keywords***: Dot in circle sign, Hand infection, MRI, Mycetoma, Osteomyelitis.

## INTRODUCTION

Mycetoma is a chronic granulomatous infectious disease caused either by fungi (eumycetoma) or filamentous bacteria (actinomycetoma), and is mainly distributed in tropical and subtropical regions of the world (1,2). The disease is characterized by progressive involvement of skin, subcutaneous tissue, fascia, muscles and bones that may result in significant deformity and disability, if not treated. Early clinical diagnosis is difficult because the disease usually progresses indolently and painlessly, and rarely shows systemic manifestations. Imaging, especially MRI, plays a very important role in the evaluation of disease extent and in the detection of some characteristic features, among which the "dot in circle" sign is considered highly suggestive of mycetoma (3–6). We present a radiologically diagnosed case of chronic granulomatous infection of the hand, where the imaging features were typical for mycetoma infection.

**Case Presentation**

A 26-year-old male presented with a gradually progressive swelling over the right hand since past 12 months. The swelling had increased in size over time and was associated with functional discomfort. There was no documented history of acute trauma but a verbal history of thorn pricking was noted. Clinical examination revealed a localized swelling involving the dorsum of the hand with mild restriction of finger movements along with discharge **(Figure 1)**. No systemic symptoms were reported.

**Figure 1 (a and b)**: Clinical photographs of the right hand demonstrating dorsal soft-tissue swelling.

The patient was referred for radiological evaluation to characterize the lesion and determine its extent. A contrast-enhanced magnetic resonance imaging study of the right hand was performed, and the imaging findings were interpreted in accordance with the formal radiology report.

**Imaging Findings:**

Ultrasonography of the hand revealed a large ill-defined heterogeneous hypoechoic lesion involving the intermetacarpal spaces from the second to the fifth metacarpals, extending across both the palmar and dorsal aspects. The lesion infiltrated the subcutaneous tissues and intermuscular planes with involvement of the intrinsic hand muscles. Multiple small hyperechoic foci embedded within hypoechoic inflammatory tissue were noted, producing the characteristic "dot-in-circle" appearance suggestive of mycetoma **(Figure 2)**. Associated tenosynovitis with synovial thickening and fluid surrounding the flexor and extensor tendons was also observed. Color Doppler examination demonstrated internal vascularity within the lesion, consistent with active inflammatory disease.

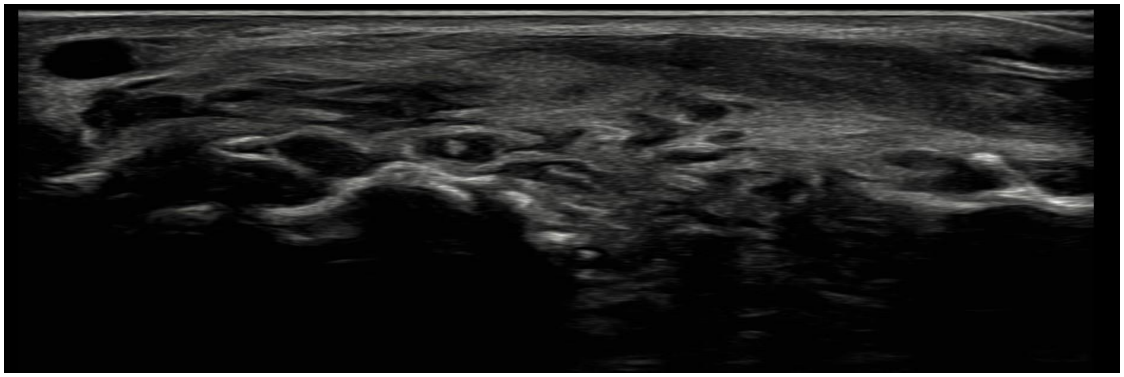

**Figure 2. Ultrasound image of the hand demonstrating the characteristic "dot-in-circle" sign of mycetoma, seen as hyperechoic foci within hypoechoic inflammatory lesions.**

MRI revealed a large, ill-defined heterogeneous lesion involving the intermetacarpal spaces from the second to the fifth metacarpals, predominantly between the third and fifth metacarpals. The lesion extended across both palmar and dorsal aspects of the hand, involving the subcutaneous tissues and intermuscular planes, with encasement of intrinsic hand muscles and associated muscular edema. Areas of associated tenosynovitis were also noted.

On T1-weighted images, the lesion appeared hypo- to isointense, while T2-weighted and STIR sequences demonstrated heterogeneous hyperintensity. Multiple small rounded hypointense foci were noted within the hyperintense lesion on T2/STIR images, producing the characteristic "dot-in-circle" sign, which is highly suggestive of mycetoma (3–6). Post-contrast images showed significant heterogeneous enhancement with multiple non-enhancing areas within the lesion **(Figure 3 and 4)**.

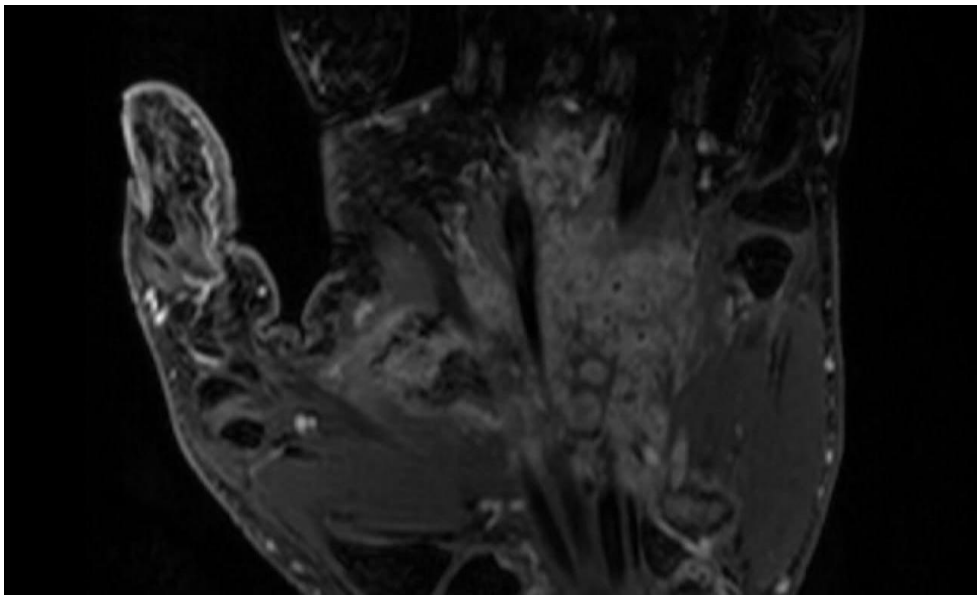

**Figure 3: Coronal T1-weighted fat-suppressed post-contrast MRI image of the hand showing multiple enhancing nodular and serpiginous lesions involving the subcutaneous tissues and intermuscular planes, with associated surrounding soft tissue enhancement, suggestive of mycetoma**

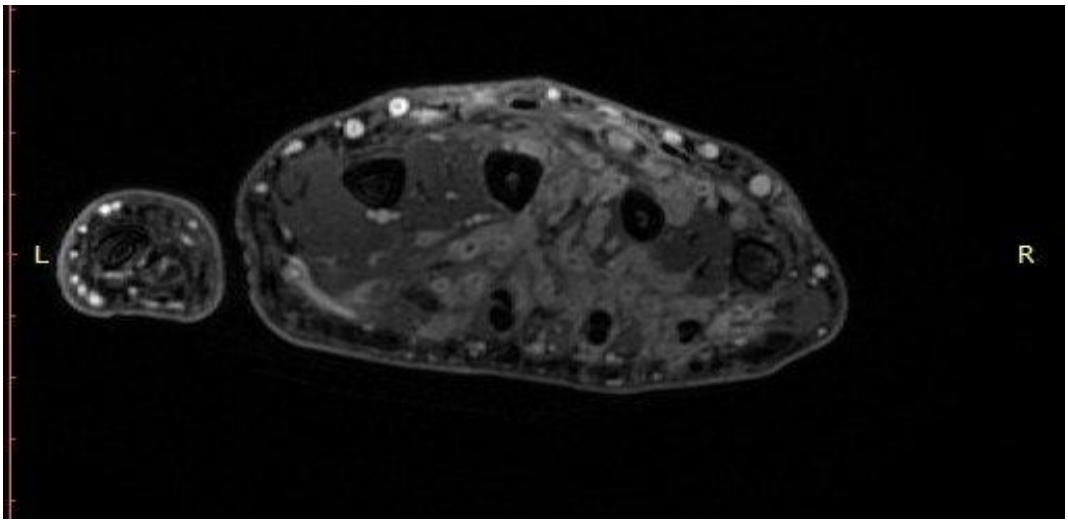


**Figure 4: Axial T1-weighted fat-suppressed post-contrast MRI image of the hand demonstrating multiple small, rounded enhancing lesions with central hypointense foci within the soft tissues, along with surrounding inflammatory enhancement consistent with the "dot-in-circle" sign, suggestive of mycetoma.**

## DISCUSSION

Mycetoma is a chronic infection of the foot in most instances, although less frequently, other extremities including the hand have been involved. The disease progresses slowly, often leading to delayed diagnosis and advanced local destruction at presentation (1,7). Imaging plays a crucial role in early detection and assessment of disease extent.

MRI is the imaging modality of choice for mycetoma due to its superior soft-tissue contrast and multiplanar capability (4–7). The "dot-in-circle" sign, described as small hypointense foci representing fungal grains or bacterial colonies within

hyperintense inflammatory tissue, is considered a characteristic and relatively specific MRI feature of mycetoma. MRI also accurately delineates involvement of muscles, tendons, and bones, which is essential for treatment planning.

Osseous involvement, as in this case, represents advanced disease and is associated with poorer prognosis if not treated appropriately (6,7). It is important to be able to differentiate it from other chronic infections, neoplastic lesions, and inflammatory conditions, and the imaging findings should be correlated with clinical and microbiological assessment when possible.

**Mycetoma Mimics on MRI:**
Several chronic conditions can mimic mycetoma on MRI, including tuberculous granuloma, chronic abscess, foreign body granuloma, actinomycosis, chronic osteomyelitis, and necrotic soft-tissue tumors. These entities may show heterogeneous T2 hyperintensity with internal hypointense foci and post-contrast enhancement, resembling the classic "dot-in-circle" sign. Although this sign is highly suggestive of mycetoma, it is not pathognomonic. Therefore, imaging findings must always be correlated with histopathological and microbiological evaluation to establish a definitive diagnosis.

## CONCLUSION

This case highlights the diagnostic challenge posed by chronic granulomatous infections of the hand that radiologically mimic mycetoma. Although MRI demonstrated features classically associated with mycetoma, including the "dot-in-circle" sign and osseous involvement, histopathological evaluation did not confirm the diagnosis. This underscores that while MRI is invaluable for assessing lesion extent and suggesting differential diagnoses, definitive diagnosis requires tissue confirmation. Careful clinicoradiological and pathological correlation is essential to avoid misdiagnosis and to ensure appropriate management.

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