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# 'Dot in circle sign': a characteristic finding in ultrasound and MR imaging of soft tissue mycetomas

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## DESCRIPTION

A 36-year-old man presented with a history of painless swelling on his right distal foot progressively increasing in size since 2 years. Physical examination revealed a non-pulsatile, non-tender, firm swelling over the medial aspect of distal right foot. No discharging sinuses were noted.

Plain radiograph showed normal underlying bones with soft tissue swelling of the medial aspect of the right distal foot (figure 1). Ultrasound examination showed multiple, conglomerate hypoechoic lesions with a hyperechoic centre with diffusely increased Doppler signal pick up within (figure 2). MRI revealed hypointense intralesional signals on T1-weighted images and hyperintense intralesional signals on T2-weighted and short tau inversion recovery (STIR) images, involving the subcutaneous and muscular planes of the dorsal and plantar aspects of the medial aspect of the right distal foot. Also noted were multiple, conglomerate, spherical T2 and STIR hyperintense intralesional foci, with

hypointense rims, few of which also showed a central hypointensity (Dot in circle sign). The underlying bone appeared normal (figures 3 and 4).

On the basis of clinical presentation, examination and imaging features a diagnosis of mycetoma foot was made and confirmed with punch biopsy and histopathological analysis, which revealed filamentous fungal grains with amorphous brown matrix, suggestive of *Madurella mycetomatis*. The patient was started on itraconazole therapy for 12 months and showed significant resolution of the swelling on follow-up clinical evaluation at 9 months.

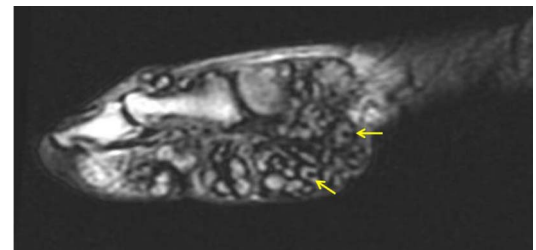
Mycetoma foot is a chronic granulomatous disease of the subcutaneous tissue native to the tropics. It was first reported in Madurai district of



**Figure 1** Plain radiograph of right foot showing soft tissue swelling with no calcifications in the medial aspect of the distal foot. The adjacent bone appears to be normal.



**Figure 2** Transverse high-resolution USG grey scale image (7–11 MHz) image (A) of medial aspect of distal foot showing hypoechoic lesions with central hyperechoic fungal grains (arrow).

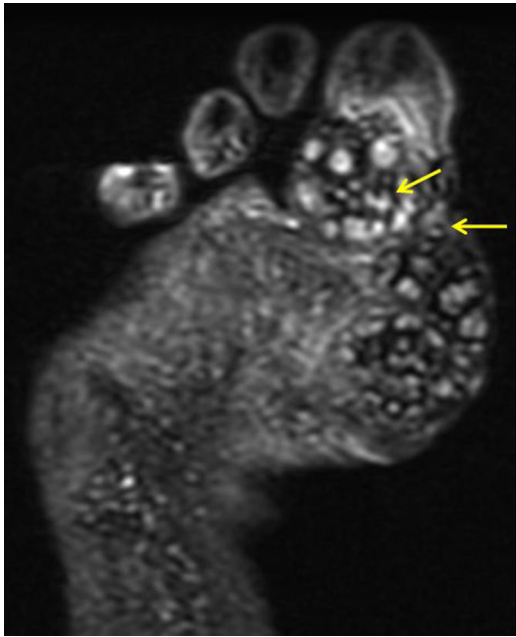


**Figure 3** Sagittal T2-weighted MR image of the foot showing conglomerates of discrete small round hyperintense lesions with peripheral hypointense rim and central hypointensities within (arrows) in the dorsal and plantar aspects of medial aspect of distal right foot, few lesions are noted to infiltrate into the muscles. The underlying bone appears to be normal.



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**Figure 4** STIR image showing conglomerates of well-defined hyperintense lesions with hypointense rims in the medial aspect of distal foot (arrows). The underlying bone appears to be normal. STIR, short tau inversion recovery.

South India, hence the name Madura foot.<sup>1</sup> A total of 8753 cases have been reported in the past 50 years, according to a meta-analysis based on 50 full articles.<sup>2</sup> Mycetoma commonly affects adults in the age group of 20–40 years, with men being more commonly affected than women with a ratio 3.5:1.<sup>3</sup> The disease is caused due to direct transcutaneous implantation of the causative organism *Actinomyces* (bacteria) or *Eumyces* (fungus) which are normal soil inhabitants, secondary to a penetrating wound like a thorn prick.<sup>1</sup>

Histologically, mycetoma is characterised by aggregates of the organism, known as grains within micro abscesses surrounded by abundant granulation tissue. This appearance is postulated to give rise to the ‘Dot in circle’ sign first described by Sarris *et al*<sup>4</sup>. This sign described on T2-weighted, STIR recovery, T1-weighted fat-suppressed gadolinium-enhanced images is characterised by a well-defined spherical hyperintense focus (representing inflammatory granulation tissue), surrounded by a hypointense rim (representing the intervening fibrous septa). The central hypointensity seen within the spherical mass is due to the susceptibility effects of the fungal grain.<sup>4</sup> This sign is considered to be specific for the diagnosis of soft tissue mycetoma, seen in up to 80% of individuals with the disease.<sup>3</sup> Ultrasound appearance of mycetoma was first described by Fahal *et al*<sup>5</sup> as

hyperechoic foci within hypoechoic lesions, where the hyperechoic foci were shown to be fungal grains.

Demonstration of the causative organism by biopsy and microbial culture is often difficult and necessitates repeat biopsy leading to delayed diagnosis and increased patient morbidity. Characteristic MRI and ultrasound features can lead to early diagnosis and prompt therapy. Depending on the extent of the disease, patients with only soft tissue involvement can be managed with antimicrobial therapy alone. Bone involvement would require surgical intervention with partial resection or amputation.

### Learning points

- ▶ A diagnosis of mycetoma is to be considered in the list of differential diagnosis for patients with long-standing, painless swelling of the extremities from endemic areas, even in the absence of multiple draining sinuses.
- ▶ ‘Dot in circle’ sign is a characteristic ultrasound and MR imaging finding for the diagnosis of mycetoma.
- ▶ Inclusion of MRI in the workup of patients with suspected mycetoma can aid in early diagnosis, as well as assess the extent of disease thereby aiding in the initiation of appropriate therapy.

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### REFERENCES

- 1 Cherian RS, Betty M, Manipadam MT, *et al*. The “dot-in-circle” sign—a characteristic MRI finding in mycetoma foot: a report of three cases. *Br J Radiol* 2009;82:662–5.
- 2 van de Sande WWJ. Global burden of human mycetoma: a systematic review and meta-analysis. *PLoS Negl Trop Dis* 2013;7:e2550.
- 3 Fahal AH, Shaheen S, Jones DHA. The orthopaedic aspects of mycetoma. *Bone Joint J* 2014;96-B:420–5.
- 4 Sarris I, Berendt AR, Athanasous N, *et al*. MRI of mycetoma of the foot: two cases demonstrating the dot-in-circle sign. *Skeletal Radiol* 2003;32:179–83.
- 5 Fahal AH, Sheik HE, Homeida MMA, *et al*. Ultrasonographic imaging of mycetoma. *Br J Surg* 1997;84:1120–2.

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