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CASE REPORT

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Mycobacterium marinum: MR imaging and clinical course of a rare soft tissue infection

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Abstract *Mycobacterium marinum* is a rare cause of soft tissue infections. The imposing MR appearance of the soft tissue involvement is in contrast to the chronic painless clinical manifestation.

Keywords *Mycobacterium marinum* · Index finger · MR imaging · Infection

Introduction

Mycobacterium marinum is a rare but well-known cause of skin infections [1, 2]. The incidence of this infection is not very well known. In the literature we found 63 cases over a period of 3 years in France [3], 38 cases over 3 years in Singapore [4], 39 cases in 8 years in Spain [5], 31 cases in California [6] and 41 cases in Maryland [7]. Perhaps the frequency of this infection is greater, but is currently influenced by frequent misdiagnosis or non-diagnosis due to low clinical suspicion [8].

The deep soft tissues can be involved with or without skin lesions [1]. Rare musculoskeletal manifestations of non-tuberculous mycobacterial infection include tenosynovitis [9], synovitis and osteomyelitis [10]. In the series of Aubry et al. [3] the infection spread to deeper structures in 29% of cases. In the report by Edelstein local or lymphatic spread occurred in 52% [6]. Non-tendon/tendon sheath soft tissue infections have been less well documented. Non-tuberculous mycobacterial infections often run a protracted course of up to 1–2 years. There is usually a painless palpable soft tissue mass [11] and no history of trauma.

The aim of this case report is to review the soft tissue infection of *Mycobacterium marinum* and to describe the MR imaging appearances with pseudotumor presentation. To our knowledge, excluding tendon and tendon sheath involvement, MR imaging of deep soft tissue infection

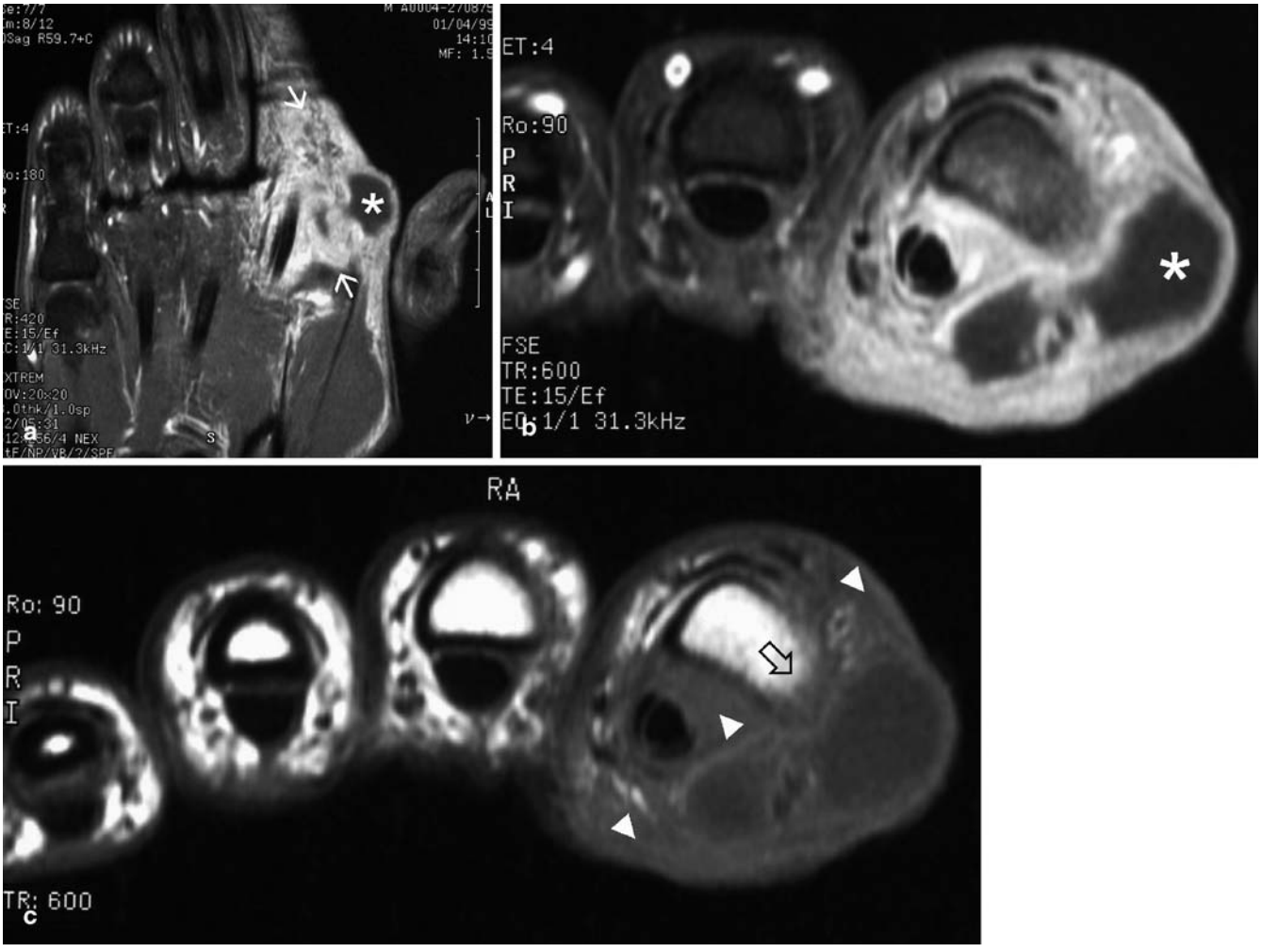

Fig. 1 **A** Coronal T1-weighted fat-saturated contrast-enhanced MR image (TR: 420, TE: 15) shows a focal fluid collection (*) as well as diffuse soft tissue involvement, with marked contrast enhancement (*white arrow*). **B** Axial T1-weighted fat-saturated contrast-enhanced MR image (TR: 600, TE: 15) shows marked diffuse soft tissue enhancement with a polylobulated abscess (*). Associated subtle changes of flexor tenosynovitis were noted. **C** Axial T1-weighted MR image (TR: 600, TE: 15) shows cortical bone erosion (*open arrow*) and a mass effect of involved soft tissues (*arrowheads*). The flexor tendons are intact at this level. Again the soft tissue abscess is noted

with *Mycobacterium marinum* forming a clinical painless mass has not been well described in the world literature.

Case report

A 24-year-old male mason presented with a mass-like painless swelling of the metacarpophalangeal joint of the right index finger. Over the course of time the swelling, which was initially located on the dorsal aspect of the finger, spread to the palmar side. There was no history of trauma, animal or tick bites and hand function was minimally affected. The general physical examination was normal except for superficial skin ulceration of the right index finger. The ulceration had a diameter of 2 cm with raised and infiltrated borders. There was adjacent granulation tissue and a deeper associated soft tissue tumoral mass. The white cell count and C-reactive protein were normal. Serology for human immunodeficiency virus was negative.

A radiograph of the hand was obtained (not shown) which showed a subtle periosteal reaction on the radial aspect of the proximal phalanx of the index finger. Given the long clinical history initially there was concern for tumor, though infection was considered in the differential diagnosis. An MR examination (1.5 T GE, Milwaukee, Wis.) of the hand was performed 1 week later to define the lesion. The MR imaging study (Fig. 1) showed a soft tissue process of the index finger with two components: a fluid-filled region with contrast-enhancing rim corresponding to an abscess (Fig. 1A) and ill-defined involvement of the deep soft tissues with mass effect. The flexor tendons were displaced by the mass effect of the involved deep soft tissues and there were subtle changes of flexor tenosynovitis (Fig. 1B). The adjacent bone showed cortical destruction and subtle altered medullary bone signal intensity consistent with osteomyelitis (Fig. 1C). To exclude the possibility of a foreign body reaction with infection, an

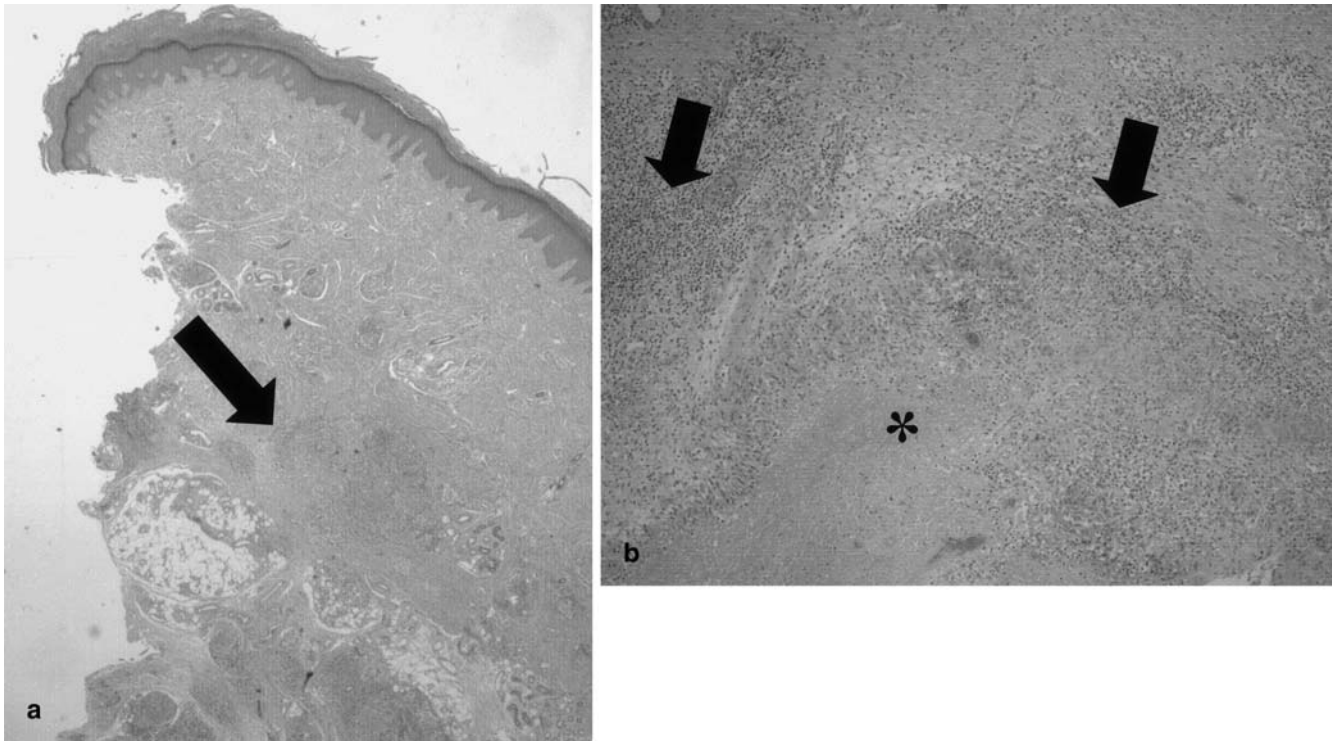

Fig. 2 **AA** Hematoxylin and eosin (HE) stain with a ×2.5 magnification shows the deep location (*arrow*) of the inflammation at the level of the junction the skin and hypodermis. **B** HE stain with a ×10 magnification shows the cellular reaction with lymphocytes and macrophages (*arrow*) surrounding necrosis (*) as well as the presence of epithelioid and giant cell formation

additional gradient-echo sequence was performed that showed no blooming artifact.

The patient underwent an excision-biopsy for histological and bacteriological examinations. Histological analysis (Fig. 2) identified a granulomatous reaction with epitheloid cells and with multiple Langhans-type giant cells surrounding confluent areas of necrosis, suggestive of mycobacterial infection. Ziehl-Neelsen-staining revealed 1–9 acid-fast bacilli per low-power field of view that were identified as *Mycobacterium marinum* after 5 weeks of selective culture at 28 °C. Based on the results of the histological and microscopic examination as well as the MR finding of subcutaneous abscesses, an antimycobacterial treatment directed against both *M. tuberculosis* and non-tuberculous mycobacteria was initiated with rifampicin 600 mg q.d., isoniazid 300 mg q.d. and clarithromycin 500 mg b.i.d. When the culture results became available the regimen was changed to rifampicin 600 mg q.d. and ethambutol 2400 mg q.d. Clinical and radiological follow-up after 1 year demonstrated no evidence of soft tissue swelling, the skin ulceration was no longer visible and the bones were normal.

Discussion

Mycobacterium marinum is a facultative intracellular non-tuberculous mycobacterium belonging to the Runyon group I (photochromogen) [12]. It usually requires 7–10 days of incubation for mature growth [13]. Its optimal growth temperature of 30 °C may explain why most infections are limited to the skin. It may be responsible for chronic ulcerative skin lesions. The first description of *Mycobacterium marinum* infection was cutaneous associated with ulceration with a long healing time [14].

Usually *Mycobacterium marinum* infection is associated with minimal trauma during fish or crustacean manipulation or working with aquariums. Normally there is spontaneous healing, though occasionally a chronic form may develop with periarticular or articular disease giving rise to septic arthritis [2]. However, patients may be in good health [2, 15] as was the case in our patient, and may not remember any history of trauma or manipulation of fish or crustaceans [16]. The infectious diseases literature states that the most frequently involved joints are the wrist and metacarpophalangeal and proximal interphalangeal joints, and that the disease is mostly painless and of a chronic nature [2, 15], making the clinical diagnosis often difficult. Typically soft tissue may be affected without or before skin ulceration has occurred and can be associated with increased fluid collections as was seen in our case with a 2 cm abscess [17]. Atypical mycobacterial infections may be slow-growing and may create chronic ulcerations that can mimic chronic skin ulceration of malignant etiology such as that of a lymphoma or sarcoma [12].

The pseudotumor-like appearance of the infected, poorly defined deep soft tissues can be explained histo-

pathologically by a type 4 chronic cellular inflammatory granulomatous reaction, with the invasion of the infected soft tissues with lymphocytes and macrophages, and the formation of giant cells and necrosis. Due to this type of chronic diffuse soft tissue reaction, there is an infiltrative appearance to the infection with swelling of the soft tissues and associated displacement of adjacent structures such as tendons which show only subtle changes, as was seen in our case (Fig. 1C). This may potentially make the radiological diagnosis difficult [8], with a differential diagnosis that may include epithelioid sarcoma.

Atypical mycobacterial infection with tenosynovitis of the wrist and hand has been demonstrated with MR imaging [18] and the article by Jaovisidha et al. [19] describes atypical tuberculous tenosynovitis and bursitis; however, to our knowledge diffuse deep soft tissue involvement with inflammatory parenchyma from the skin surface extending through the subcutaneous space to bone, with bony erosion, extending around an adjacent tendon, associated with joint synovitis and soft tissue abscess, have been sparingly described unlike the MR imaging findings of tenosynovitis [20, 21]. The painless deep soft tissue infection had a mass-like effect and this would explain the initial clinical provisional diagnosis of a soft tissue tumor. The diagnosis of an infection with *Mycobacterium marinum* may be quite difficult. Many pathogens are responsible for soft tissue infections associated with chronic skin ulceration and the diagnosis would include tuberculosis, tertiary syphilis, blastomycosis and botryomycosis [12] as well as malignant etiologies. In this clinical setting it is important to try to identify a causative relationship with water and fish contact.

Mycobacterium marinum is associated with abscess formation though other atypical mycobacteria such as *Mycobacterium terrae* or *M. kansasii* are less likely to be associated with abscess formation [22]. Awareness of the imaging appearances of the diffuse proliferative soft tissue pattern may help the radiologist include an atypical mycobacterium in the differential diagnosis. In our case, with an MR appearance highly suggestive of a focal abscess associated with marked diffuse soft tissue involvement and an intact tendon, the diagnosis of an atypical infection was made.

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