Case Report

A Case of Cutaneous and Musculoskeletal Nocardiosis of the Hand in an Immunocompetent Patient

Esin Diremsizoğlu[1], Nilgün Sayman[1], Sema Aşkın Keçeli[2], Murat Üzel[3], Emel Azak[4], Gür Akansel[5], Najiba Ahmadova[5], Ahmet Tuğrul Eruyar[6]

[1]Department of Dermatology, Kocaeli University Faculty of Medicine, Kocaeli, Türkiye
[2]Department of Medical Microbiology, Kocaeli University Faculty of Medicine, Kocaeli, Türkiye
[3]Department of Orthopedics and Traumatology, Division of Hand Surgery, Kocaeli University Faculty of Medicine, Kocaeli, Türkiye
[4]Department of Infectious Diseases and Clinical Microbiology, Kocaeli University Faculty of Medicine, Kocaeli, Türkiye
[5]Department of Radiology, Kocaeli University Faculty of Medicine, Kocaeli, Türkiye
[6]Department of Medical Pathology, Kocaeli University Faculty of Medicine, Kocaeli, Türkiye

Abstract

A 77-year-old immunocompetent male agricultural worker presented with a 9-year history of hand stiffness, edema, and draining wounds. Despite two surgeries and antibiotic use many times, his condition persisted. Initially treated for a deep fungal infection with Itraconazole for 9 months without improvement, *Nocardia* spp. were later identified in deep tissue culture via microbiological examination by Gram-staining and isolation in culture media. He was treated with trimethoprim-sulfamethoxazole (TMP-SMX) 160/800 mg for six months, leading to regression of the cutaneous lesions. However, magnetic resonance imaging revealed osteomyelitis and tenosynovitis, prompting an extended 12-month treatment with increased doses of TMP-SMX and a month of ceftriaxone. Complete recovery was achieved after 12 months. This case highlights the rarity and diagnostic challenges of nocardiosis, emphasizing the need for thorough microbiological evaluation, extended antibiotic treatment, and imaging follow-up for persistent, deep localized infections. Primary cutaneous nocardiosis should be considered, particularly in patients with non-healing skin lesions and a history of soil exposure.

Keywords: Primary cutaneous nocardiosis, soil microbiology, trimethoprim-sulfamethoxazole, anti-bacterial agents, osteomyelitis

Introduction

Nocardia is an aerobic, gram-positive, partially acid-fast filamentous bacterium found in soil.[1] It can cause localized suppurative disease in humans and animals and is considered an opportunistic pathogen, although approximately one-third of infections occur in immunocompetent individuals.[2] Primary cutaneous nocardiosis is very rare and may occur due to skin-wound contamination or a thorn prick.[3] We present a male patient with progressive cutaneous nocardiosis complicated by osteomyelitis and tenosynovitis, emphasizing the rarity of this condition and the diagnostic and therapeutic challenges it presents.

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Case Report

A 77-year-old immunocompetent male patient presented with a 9-year history of stiffness, edema, and draining wounds on his left palm, which led to difficulty in making a fist and moving fingers. He underwent antibiotherapy many times and two surgical operations, with worsening symptoms in the last two years. He had no comorbidities or medication use and had a long history of agricultural work.

Dermatologic examination revealed hard edema covering the entire left palm and dorsolateral thumb, with numerous

Adress for correspondence: Esin Diremsizoğlu, MD, Department of Dermatology, Kocaeli University Faculty of Medicine, Kocaeli, Türkiye
Email: mdesinarslan@gmail.com
ORCID ID: 0000-0001-9824-481X

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inflamed nodules, papules, pustules, ulcerations, hemorrhagic crusts, and sinus openings (Figure 1a). No lymphadenopathy was present. Routine blood tests were normal, and serologic tests for hepatitis, human immunodeficiency virus, syphilis, and the Brucella Coombs test and typical and atypical mycobacteria polymerase chain reaction (PCR) tests were negative. Anaerobic, fungal, and mycobacterial cultures from the inflamed tissue showed no growth, and angiotensin receptor blocker staining revealed no acid-fast bacilli. Chest X-ray was normal. Magnetic resonance imaging (MRI) of the hand showed a 19x39 mm heterogeneous lesion near the flexor tendon of the left hand's second finger, hypointense on T1-weighted images and hyperintense on T2-weighted images, with intense contrast enhancement.

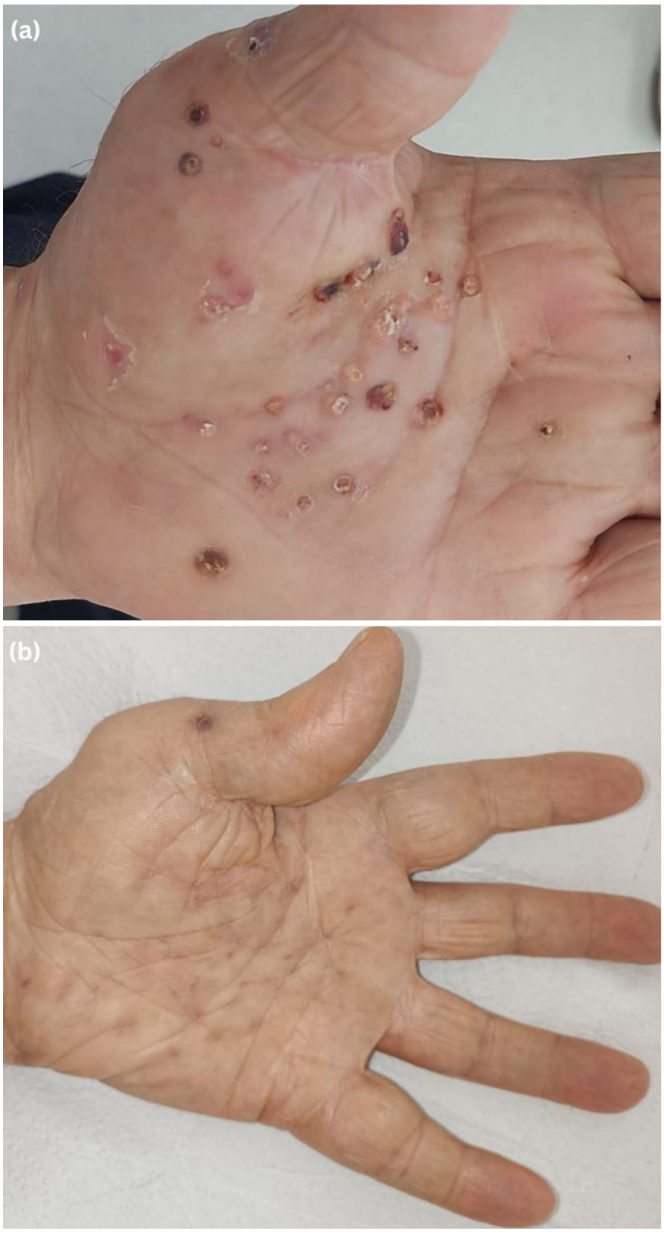

Figure 1. (a) On the palmar surface of the left hand, hard viscous edema, inflamed nodules, papules, and pustules, some with ulcerated scattered lesions, and hemorrhagic crusts and sinus mouths. (b) Improvement in cutaneous lesions at the end of the 12th month of TMP-SMX treatment
TMP-SMX: Trimethoprim-sulfamethoxazole

Histopathologic findings from the patient's previous surgeries revealed active chronic inflammatory granulation tissue. A punch biopsy was performed from the inflamed nodule on the hand. The preliminary diagnoses were deep fungal infection, actinomycosis, and cutaneous nocardiosis. The biopsy revealed lymphocyte-rich mononuclear inflammatory cell infiltration in the papillary dermis of an orthokeratotic and hyperplastic epidermis. Gomori methenamine silver staining revealed a few fungal spore structures within the keratin layer.

Itraconazole 200 mg/day, teicoplanin i.v. for 7 days, and trimethoprim-sulfamethoxazole (TMP-SMX) for 10 days were initiated with a presumptive diagnosis of mycetoma based on clinical and histopathologic findings. Despite nine months of treatment with itraconazole, the lesions did not regress, and new lesions appeared on the thumb, prompting repeated examinations, and the diagnosis was revised. Repeated skin biopsy showed diffuse lymphocyte-dominant mononuclear inflammatory cell infiltration in the papillary dermis, consistent with diffuse dermatitis. Cultures revealed gram-positive filamentous bacteria identified as *Nocardia* spp. (Figure 2), presumed to be *N. brasiliensis* due to its common association with skin infections; however, subtyping could not be performed. Itraconazole was discontinued, and TMP-SMX was started. After 3 months of treatment with TMP-SMX 160/800 mg per day without clinical improvement, the dosage was increased to twice daily TMP-SMX 160/800 mg. After a

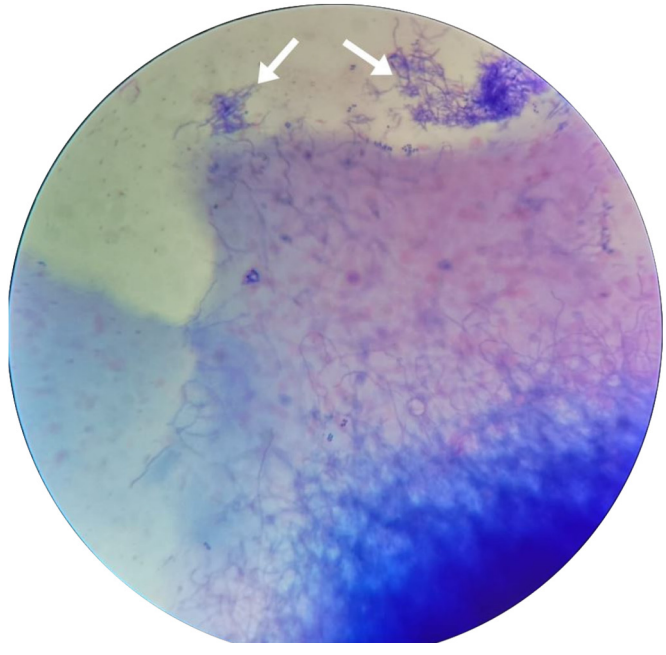

Figure 2. Modified acid fast staining: Filamentous colonies consistent with *Nocardia* spp.

total of six months of treatment, the existing draining fistulas and nodular lesions regressed almost completely.

A control X-ray of the left hand after 9 months of treatment showed mild soft-tissue swelling, cortical irregularity, and coarsening of the trabecular system along the metacarpal body of the thumb. Control MRI revealed increased lesion size near the flexor tendon of the 2nd finger and enlargement involving the palmar region, flexor tendons, and skin. Post-contrast T1-weighted images showed hyperintense lesions surrounded by a hypointense ring, with a central hypointense dot (dot in the circle sign), indicating tenosynovitis affecting the flexor tendons of all fingers, myositis in the thenar and hypothenar muscles, and osteomyelitis in the first metacarpal shaft (Figure 3a).

After 9 months of TMP-SMX therapy, the cutaneous lesions improved, but tenosynovitis and osteomyelitis were detected. Ceftriaxone 2 g/day was added to TMP-SMX for 4 weeks. Three months later, control MRI showed disappearance of the nodules extending proximal to the carpal tunnel and regression of the musculoskeletal infection in the thenar region (Figure 3b). After achieving complete clinical and MRI response, TMP-SMX was discontinued after 12 months (Figure 1b). At the six-month follow-up, improvement persisted. Informed consent was obtained.

Discussion

Primary cutaneous nocardiosis is rare and can occur through pulmonary infection from inhaled dust, cutaneous infection from contaminated wounds, or subcutaneous infection from thorn penetration.[3] Despite no history of trauma, long-term agricultural work and skin injuries from gardening with bare hands suggest soil transmission in our patient. Our case is notable for its unique features: The lesion's location on the palm, absence of a clear trauma history, and association with osteomyelitis. This case contributes to the literature by highlighting the diagnostic and therapeutic challenges of primary cutaneous nocardiosis, particularly in cases involving osteomyelitis and tenosynovitis, while emphasizing the importance of extended treatment duration and the use of MRI for both diagnosis and follow-up to ensure radiologic improvement.

Primary cutaneous nocardial infections can present as cellulitic, sporotrichoid, disseminated disease (often secondary to pulmonary involvement), or actinomycetoma.[4] Our patient had multiple draining sinuses and hard edema, consistent with mycetoma, which is the most commonly reported form. Deep inoculation leads to mycetoma, whereas superficial inoculation leads to pustules or abscesses.[3] Our patient had no history of immunosuppression, and chest

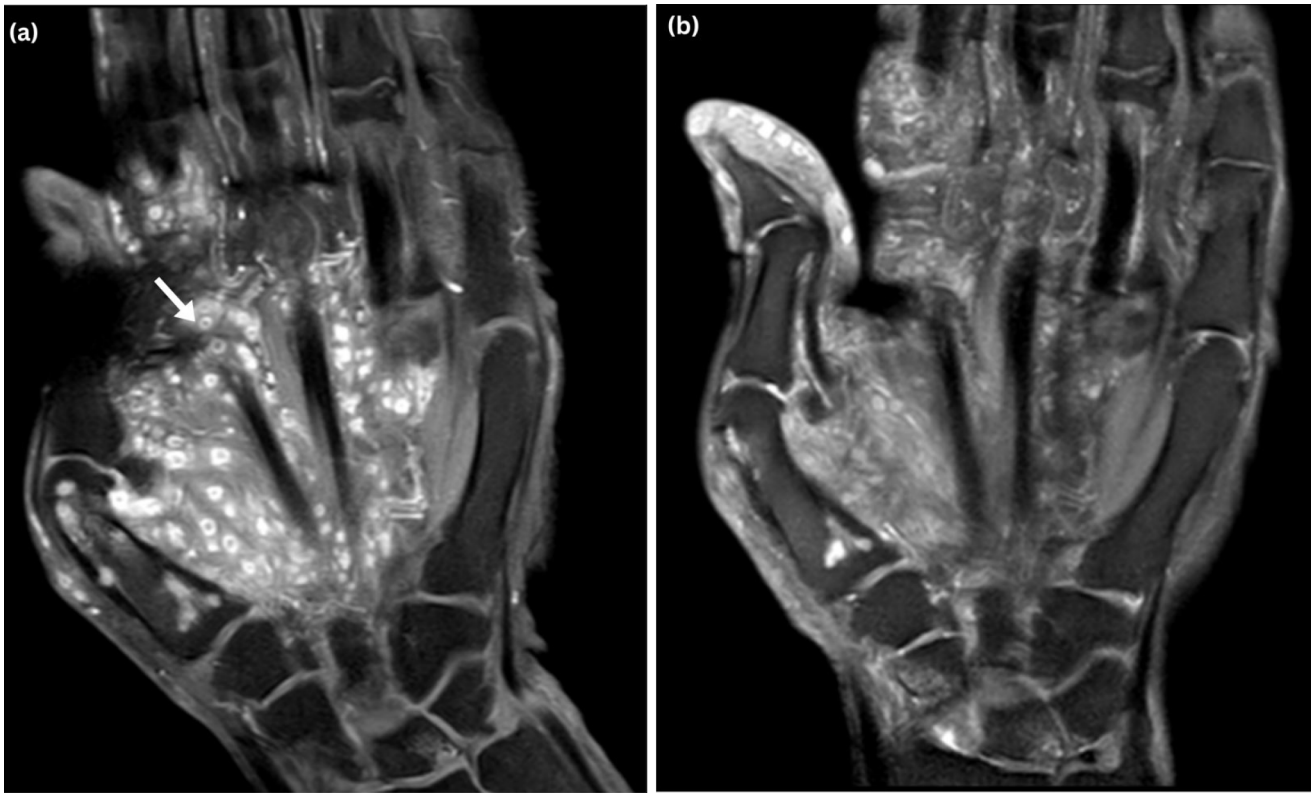

Figure 3. (a) Left hand magnetic resonance imaging (MRI) at 9 months of treatment: The lesion adjacent to the 2nd finger flexor tendon increases in size and appears enlarged involving the palmar region, flexor tendons, and skin (circle in a dot sign shown with arrows). (b) Left hand MRI at 12 months of treatment: Nodules extending proximal to the carpal tunnel had disappeared, and the infection findings in the thenar region had regressed

radiography showed no pulmonary involvement. Nocardiosis is typically opportunistic, but one-third of cases occur in immunocompetent individuals like ours.[2] Culturing *Nocardia* is challenging, as it is slow growing; Gram-staining provides an earlier diagnosis. It takes 5-7 days for *Nocardia* to grow in culture, and Ziehl-Neelsen staining with 1% sulfuric acid is used for identification.[2] Newer diagnostic methods, such as *PCR* and *16S rRNA* gene sequencing, have improved the speed and accuracy of detecting *Nocardia* infections, complementing traditional culture techniques; however, due to technical limitations, these methods could not be applied in this case.[5]

Radiological imaging plays a key role in the diagnosis of nocardiosis, particularly in deep tissue and bone involvement. MRI is the most sensitive method for detecting complications such as osteomyelitis and tenosynovitis. In mycetoma cases, T2-weighted images show the characteristic "dot in a circle" sign, showing small circular areas of high signal intensity surrounding a central low signal "dot". MRI is important for both the diagnosis and follow-up of nocardial infections.[6]

Treatment for primary cutaneous nocardiosis typically requires long-term antibiotics, with cotrimoxazole as the mainstay. Superficial infections need 1-4 months of treatment, whereas mycetoma requires longer. Resistant cases may need additional antibiotics like amikacin, imipenem, and third-generation cephalosporins.[5] In our case, despite significant regression after 6 months, treatment was extended to 12 months with the addition of ceftriaxone for 1 month because of bone involvement. Surgical intervention may be necessary for extensive infections.[3]

N. brasiliensis is the most common species found in cutaneous nocardiosis, accounting for 80% of all cases. In our country, *N. farcinica* has been isolated in case reports from three different cities, whereas *N. brasiliensis* has been reported in one case.[7-10] Primary cutaneous nocardiosis is rare in our country, and the reported cases have mostly been associated with post-traumatic inoculation. After total knee arthroplasty surgery, *Nocardia* infection showed limited clinical improvement at the 20th month despite treatment with amikacin, linezolid, and imipenem.[7] In another case, a subcutaneous abscess in the forearm following minor trauma showed improvement after 7 months of TMP/SMX treatment and 5 surgeries.[8] A patient with multiple nodules and draining sinuses in the foot achieved complete remission by the 10th month of TMP-SMX treatment.[9] Another case involved a Nocardia infection associated with intra-articular corticosteroid injection on the hand, which responded dramatically to a 3-week course of TMP-SMX.[10]

Previous reports in the literature included patients with a history of minor trauma treated with combinations of antibiotics and surgery, often requiring extended treatment periods to achieve remission. Our case was distinguished by the lesion's location on the palm, the absence of a clear trauma history, and the rarity of primary cutaneous nocardiosis with osteomyelitis. A similar case reported by Tariq et al.[2] in the USA was treated with ceftriaxone and TMP-SMX, but without a specified duration. Our patient improved clinically and radiologically after one year of TMP-SMX and one month of ceftriaxone treatment.

Nocardia infections are challenging to diagnose and require careful, multidisciplinary work. There is no clear consensus regarding the appropriate dosage and duration of antibiotic therapy. We recommend extended treatment for deep localized infections and bone or tendon involvement. MRI is essential for diagnosis and follow-up, and imaging should accompany clinical monitoring to ensure radiological improvement.

Footnote

Informed Consent: Informed consent obtained from the patient.

Authorship Contributions

Surgical and Medical Practices: E.D., N.S., S.A.K., M.Ü., E.A., G.A., N.A., A.T.E., Concept: E.D., N.S., S.A.K., M.Ü., E.A., G.A., N.A., A.T.E., Design: E.D., N.S., S.A.K., M.Ü., E.A., G.A., N.A., A.T.E., Data Collection or Processing: E.D., N.S., S.A.K., M.Ü., E.A., G.A., N.A., A.T.E., Analysis or Interpretation: E.D., N.S., S.A.K., M.Ü., E.A., G.A., N.A., A.T.E., Literature Search: E.D., N.S., S.A.K., M.Ü., E.A., G.A., N.A., A.T.E., Writing: E.D., N.S., S.A.K., M.Ü., E.A., G.A., N.A., A.T.E.

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