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## CORRESPONDENCE

### Disseminated deep dermatophytosis caused by *Trichophyton rubrum*



Dear Editor,

Dermatophytes are fungal pathogens that commonly cause superficial infections. In rare cases, a dermatophyte infection may be invasive, such as in Majocchi's granuloma, dermal and subcutaneous invasion, and disseminated or systemic infections. The clinical manifestations include subcutaneous nodules, small erythematous vesicles, cysts, discharging sinuses, or blastomycosis-like pyoderma.<sup>1</sup> Here, we report a rare case of disseminated dermatophytosis.

An 88-year-old man had been diagnosed with chronic obstructive pulmonary disease 20 years previously, which was controlled by inhaled fenoterol therapy. He also had poorly controlled onychomycosis of the bilateral finger and toe nails. He was admitted to our hospital due to an acute flare up of chronic obstructive pulmonary disease with secondary infection. He was treated with both parenteral antibiotics and systemic methylprednisolone (2 mg/kg/day) for 2 weeks. The patient posteriorly switched to oral prednisolone with a maintenance dose of 20 mg/day.

Three weeks after administration, multiple purplish papules developed from the distal to the proximal part of four extremities. Upon physical examination, multiple fluctuant purplish papules and cyst-like lesions with peripheral erythematous patches were noted at the extensor site of the four limbs; some of which had a serpiginous pattern (Figure 1A–C). The lesions were easily ruptured and had necrotic and pus-like content. Tinea pedis and onychomycosis of the bilateral finger and toe nails were also present at that time. A laboratory investigation showed leukocytosis (white cell count: 21,200 cells/ $\mu$ L) with predominant segments (96%) and elevated C-reactive protein (79.1 mg/L). Liver enzyme and creatinine levels were within normal limits. An initial skin biopsy taken from one purplish papule of the right forearm revealed suppurative granulomatous inflammation with cyst-like cavity and multinucleated giant cells in the dermis and subcutis, and fungal spore-like bodies were also observed (Figure 2A and B). In periodic acid–Schiff staining, fungal spores and aggregates of septated and branching hyphae were identified (Figure 2C). The patient was then given empiric 200 mg voriconazole twice daily and 2% topical ketoconazole for the disseminated fungal infection. After 2 weeks of treatment, the skin lesions showed some improvement. However, fever and dyspnea occurred at that time and chest X-ray revealed mixed alveolar and interstitial infiltration of both lungs, and right-side hydropneumothorax. A sputum culture yielded *Nocardia* growth. Unfortunately, profound septic shock subsequently

developed, and the patient died from multiple organ failure 3 weeks after the initial diagnosis of disseminated fungal infection was made. Tissue culture finally disclosed the growth of *Trichophyton rubrum* (Figure 2D) after the patient's death, but blood culture yielded no pathogen growth.

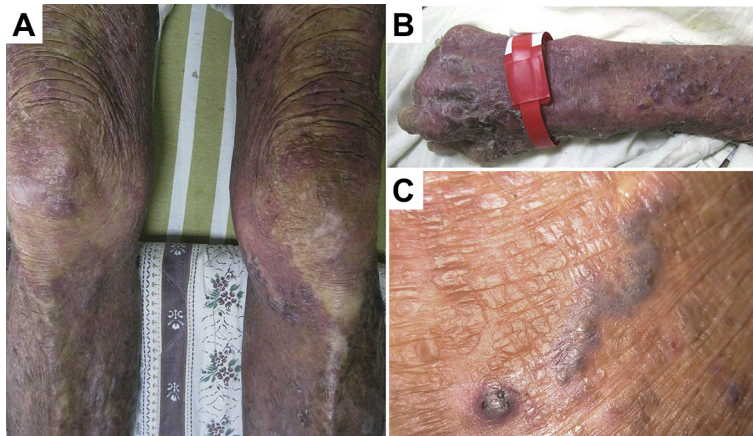
*T. rubrum* is the most common dermatophyte causing deep and invasive infections.<sup>2</sup> Patients with deep dermatophytosis often have immunocompromised status, including those undergoing solid organ transplantation, those with diabetes mellitus, hematological malignancy, human immunodeficiency disorder, and those using steroids.<sup>3–5</sup> In the present case, prolonged systemic steroid use was the most likely cause of the disseminated and deep dermatophyte infection.

Patients with deep dermatophytosis may have a history of uncontrolled superficial fungal infections such as tinea unguium and tinea cruris.<sup>6</sup> Therefore, autoinoculation may be the possible pathogenesis. In the present case, the stratum corneum was intact without hyphal invasion, and the distribution of fungal spores and hyphae was limited histopathologically to the dermis and subcutis. No obvious angioinvasion was noted microscopically. The thicker swollen septate hyphae present in microscopy were different from the typical slender hyphae of superficial dermatophytosis. A previous study of 17 cases also demonstrated the morphological variations of Majocchi's granuloma, including yeast forms, bizarre and swollen forms, and Splendore–Hoeppli phenomenon.<sup>7</sup> These unusual morphological features may be related to adaptations for survival in deep dermal and subcutaneous locations. In the present case, we also demonstrated a purplish serpiginous pattern of skin lesions that is uncommon in deep dermatophytosis. Unlike other vascular lesions, such as dilated or varicose veins, the serpiginous lesions were easily ruptured and had necrotic and pus-like content.

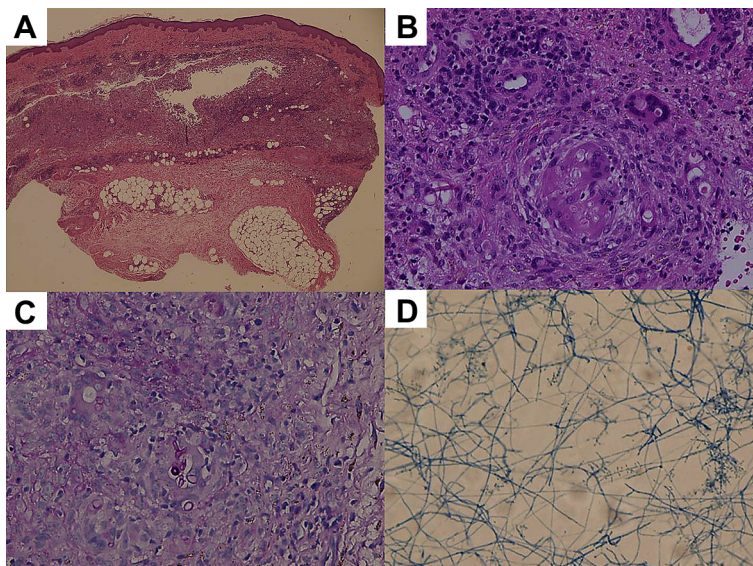
According to previous studies, most cases of deep and disseminated dermatophytosis were noted as having a benign clinical course and showed improvement after treatment.<sup>2</sup> Various therapeutic regimens have been reported, including terbinafine, itraconazole, ketoconazole, amphotericin B, fluconazole, and griseofulvin. However, to date, there is no consensus on the therapies for deep and disseminated dermatophytosis because only a few cases have been reported. Voriconazole, a newer triazole antifungal medication generally used to treat severe and invasive fungal infections, also had *in vitro* antifungal activity against *T. rubrum* and other common dermatophytes. In the present case, the patient had a clinical response to voriconazole, which has not been reported in the previous literature. Therefore, voriconazole may be a therapeutic choice worth considering for disseminated dermatophytosis.

In conclusion, we report a rare case of a disseminated dermatophytosis caused by *T. rubrum*. Localized dermatophytosis in

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**Figure 1** Erythematous patches and multiple purplish papules and cyst-like lesions are noted over (A) bilateral lower limbs and (B) the right arm. (C) Serpiginous purplish lesions are present on the left arm.



**Figure 2** (A) Low-power view shows suppurative granulomatous inflammation within the dermis and subcutis (H&E stain, 40 $\times$ ). (B) High-power view showed granulomatous inflammation with multinucleated giant cells and fungal spore-like bodies (H&E stain, 400 $\times$ ). (C) Fungal spores and aggregates of septated and branching hyphae are identified in periodic acid–Schiff staining (400 $\times$ ). (D) Microconidia alongside hyphae is demonstrated microscopically (Lactophenol cotton blue stain, 400 $\times$ ). H&E = hematoxylin and eosin.

immunocompromised patients may progress to a disseminated and invasive fungal infection. Therefore, physicians should be alert to the atypical presentation of disseminated infections of *T. rubrum* in patients with immunocompromised status. Aggressive treatment is recommended for such patients.

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