Onychomycosis Due to *Emericella quadrilineata*

Harish C. Gugnani,1 Vanan K. Vijayan,1 Puneet Tyagi,1 Sonal Sharma,1 Alberto M. Stchigel,2 and Josep Guarro2*

Vallabhbhai Patel Chest Institute, University of Delhi, India,1 and Unitat de Microbiologia, Universitat Rovira i Virgili, Reus, Spain2

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Nondermatophytic fungi are increasingly being reported as etiological agents of onychomycosis. We describe here a case of hand nail infection caused by *Emericella quadrilineata* (anamorph *Aspergillus tetrazonus*), a species not so far known to be an etiological agent of onychomycosis.

**CASE REPORT**

The patient, a 60-year-old male hailing from Bulandshahr in Uttar Pradesh in northern India admitted to our ward for acute exacerbation of chronic obstructive pulmonary disease, presented with dystrophy of all five nails of the right hand. All the nail plates were striated and had white patches on the proximal end (Fig. 1). The distal end was raised and hyperkeratotic. The patient was nondiabetic and could not recall any traumatic event associated with the nail. He had received oral antibiotics for his respiratory ailment prior to being admitted. He gave a history of contact with soil on his farm. Mycological investigation was suggested to determine the possible mycotic etiology of the diseased nails.

Scrapings from the basal layer of the nail plate and hyperkeratotic areas were collected. Direct microscopic examination of the samples in 40% KOH mounts revealed hyaline, contorted, septate hyphae. The scrapings were cultured on Sabouraud dextrose agar (SDA) incorporating chloramphenicol (0.5 mg/ml) and with or without cycloheximide (0.05 mg/ml), and the cultures were incubated at 28°C. Cultures on the medium containing chloramphenicol alone grew colonies that were morphologically similar, which were identified as belonging to *Emericella quadrilineata* (anamorph *Aspergillus tetrazonus*) on the basis of a detailed study of its macro- and microscopic morphology. Cultures on SDA slopes containing both chloramphenicol and cycloheximide did not yield any dermatophyte or any other mold. Two additional repeat samples collected at intervals of 5 and 9 days were positive by direct microscopy and yielded luxuriant growth of *A. tetrazonus*; no other fungi were recovered in culture. Histology of a portion of the excised nail also revealed the presence of septate and branched hyphal elements suggestive of *Aspergillus* species (Fig. 2).

Colonies of the isolate were moderately fast growing on SDA (3.8 to 4.0 cm after 10 days at 28°C). They were velvety and brownish buff with a purplish reverse side. Conidiophores were light brown with hemispherical vesicles bearing biseriate phialides on the upper half (Fig. 3). Conidia were spherical, smooth walled, subhyaline, finely roughened, and 3 to 4 μm in diameter. After about 3 weeks of incubation, purple ascosporangia were formed, surrounded by characteristic hülle cells. Asci were spherical, eight spored, 10 to 13 μm in diameter, and evanescent. The ascospores were reddish purple, lenticular, 5 to 6 × 3 to 4 μm, and smooth, with four short equatorial crests (Fig. 4). Living cultures were deposited in the Faculty of Medicine, Reus, Spain (FMRI 8166), in the Centraalbureau voor Schimmelcultures, Utrecht, The Netherlands (CBS 113684), and in the Institute of Hygiene and Epidemiology, Brussels, Belgium.

In vitro antifungal susceptibility testing of the isolate performed according to the NCCLS guidelines (8) using *Candida parapsilosis* ATCC 22019 and *C. krusei* ATCC 62258 as controls showed that MICs of itraconazole (0.12 μg/ml), ketoconazole (0.25 μg/ml), miconazole (4 μg/ml), voriconazole (0.12 μg/ml), and

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* Corresponding author. Mailing address: Unitat de Microbiologia, Departament de Ciències Mèdiques Bàsiques, Facultat de Medicina i Ciències de la Salut, Universitat Rovira i Virgili, carrer Sant Llorenç 21, 43201 Reus, Tarragona, Spain. Phone: 34 977759359. Fax: 34 977759322. E-mail: umb@fmcs.urv.es.

FIG. 1. Hand nail infection due to *E. quadrilineata* showing nail dystrophy, hyperkeratosis, and white patches.
terbinafine (0.06 μg/ml), albaconazole (0.06 μg/ml), ravuconazole (0.12 μg/ml), and amphotericin B (0.5 μg/ml) were low. The MICs of the other antifungals, viz., fluconazole (16 μg/ml), flucytosine (64 μg/ml), and micafungin (32 μg/ml), were rather high. The patient was put on an initial regimen of 200 mg daily of oral itraconazole and asked to report for evaluation after 3 weeks. Regrettably, the patient did not turn up again.

Discussion. Dermatophytes and some yeast-like fungi have been traditionally considered the only fungi to cause nail infections. However, in recent years there have been increasing reports of nail infections due to several other fungi. Among the nondermatophytic molds more commonly involved in onychomycosis are Scopulariopsis brevicaulis, Nattrassia mangiferae (“Scytalidium dimidiatum”), Onychocola canadensis, and species of Aspergillus, Acremonium, and Fusarium (3, 4, 6, 7, 9). The incidence of onychomycosis due to nondermatophytic molds varies according to geographic location. Such infections are more common in the toe nails, although hand nails may be involved. These molds can cause different clinical types of onychomycosis. Aspergillus species cause distal, subungual, and white superficial onychomycosis leading to partial or total dystrophy of the affected nail (13), as in our case. To establish the etiological role of a nondermatophytic mold in skin and nail infection, the need for repeated positive direct microscopy and

FIG. 2. Periodic acid-Schiff stain of a tissue section of nail plate showing invasion by hyphae of E. quadrilineata. Magnification, ×675.

FIG. 3. Lactophenol blue stain of conidiophore of E. quadrilineata and hülle cells. Magnification, ×750.

FIG. 4. Scanning electron microscope micrograph of E. quadrilineata. (a) Ascus and ascospores. (b) Ascospores.
culture and the absence of a dermatophyte in culture has been emphasized (3, 7). This criterion has been met in our report. The species of *Aspergillus* known to be involved in nail infections are *A. fumigatus*, *A. versicolor*, *A. terreus*, *A. flavus*, *A. candidus*, and *A. niger*; a few other *Aspergillus* species, viz., *A. nidulans* and *A. sclerotiorum*, are rare agents of nail infection (1, 2). The present report constitutes the first record of onychomycosis due to *E. quadrilineata* ("*A. tetrazonus*"). This species has been isolated from soil (11) and air samples (5). It was reported earlier to be a causative agent of mycotic dermatitis in sheep (12) and fungal sinusitis in a human (10). It is noteworthy that the isolate was susceptible in vitro to all the azoles tested except fluconazole.

REFERENCES