Case report

First Italian report of onychomycosis caused by Onychocola canadensis

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Onychocola canadensis is a non-dermatophytic mould that has been associated with onychomycosis particularly in temperate climates. Until now, O. canadensis has been isolated from patients in Canada (14 cases), New Zealand (three), France (nine), UK (four) and Spain (two). We describe the first Italian case of onychomycosis caused by this fungus.

Keywords Italy, Onychocola canadensis, onychomycosis

Introduction

Onychocola canadensis is represented in its teleomorphic state by Arachnomycetes nodosotousus, which was described as a member of the order Onygenales in the family Gymnoascaceae and has recently been reclassified in the family Onygenaceae [1,2].

The mould was first described in 1990 by Sigler & Congly [3] based on isolations from three cases of onychomycosis in Canada. Since then, it has been reported as an aetiological agent of onychomycosis or, in a few instances as a clinical contaminant, in other countries within the temperate areas of the world such as France, New Zealand, Spain and the UK [1,4–8].

Though O. canadensis seems to be cosmopolitan or at least pan-temperate in distribution, there are some conspicuous gaps in the regions from which cases have been reported, most notably the USA. This raises a question about whether the fungus has highly unusual distribution patterns, or whether, on the other hand, areas where the fungus has not yet been noted are those where dermatological mycological methods and laboratory perceptions have not been adapted to deal with this slow-growing pathogen. In order to advance further the evidence that O. canadensis is indeed at least pan-temperate, we describe the first Italian case of infection by O. canadensis. The fungus affected the first and second toenails on the right foot of a 73-year-old man.

Methods

Clinical case

The patient was an otherwise healthy 73-year-old retired man, who had never been abroad, and lived during the summer on the Adriatic coast (Torre Pedrera) in Emilia Romagna, where he frequently wore open-toed shoes without socks while pursuing his hobby of collecting wild edible plants. He was first seen at the Dermatologic Clinic of the University Hospital in Parma in December 2000. He had never shown localized or general symptoms so that it was difficult to establish the date of first appearance of the lesions.

The great toenail of the right foot had an elongated yellow-brown thickening, approximately 2 × 7 mm in area, situated at the external border. The surface of the lesion appeared to be hard, even though during the clinical sampling the layer beneath was found to be relatively friable. At the distal border of the second toenail, a small (1–2 mm in diameter), whitish, rounded lesion was observed. It was quite friable in clinical sampling and showed hyperkeratosis of the subungal bed (Fig. 1).
Laboratory investigations

Clinical samples were collected by scraping off the nail plate in the lesion sites and observed microscopically in 20% KOH. Small nail fragments (15–20) were implanted on slants of Sabouraud glucose agar (9 ml) (Difco Laboratories, Detroit, MI, USA) and on slants of Sabouraud glucose agar with chloramphenicol, chloramphenicol and cycloheximide (Becton, Dickinson and Company, Italia S.p.A., Milan, Italy) (glass tubes: height 14 cm, diameter 1.5 cm). Slants were incubated at 27 °C and 37 °C. A slide culture on potato glucose agar (Difco) was used to examine the morphology of the isolated fungus.

Results

Microscopic examination of the nail fragments in KOH revealed the presence of narrow, septate hyaline hyphae (Fig. 2).

In the media incubated at the different temperatures, a slow-growing mould developed from all of the inoculated nail fragments after 10 days. The fungus was characterized by fluffy, raised colonies of small diameter (10 mm after 3 weeks) appearing whitish on the surface and greyish on the reverse, with lobate margins, and, at maturity, scarcely adhering to the medium (Fig. 3). A second nail specimen was taken some months later and the same fungus grew again in multiple colonies. This was considered to confirm O. canadensis as the aetiological agent of the infection, and to greatly diminish, if not eliminate, the probability that a superimposed dermatophyte infection had been missed in the initial examination.

Microscopic observation of the slide cultures showed the development of numerous elliptical conidia of different sizes (4–8 x 2–5 μm) usually narrowing in the middle and borne singly, in pairs or in chains (Fig. 4).

The morphological features were consistent with O. canadensis. The identification was confirmed at the Centraalbureau voor Schimmelcultures (CBS), Utrecht, The Netherlands, and the strain was deposited in the CBS fungal collection as CBS 109438.

Discussion

Currently, 32 cases of dermatomycosis caused by O. canadensis have been described in the literature. Among these, 14 were reported in Canada, nine in France, four in the UK, three in New Zealand and two in Spain [1,3–8]. There is also a recent report from

Fig. 1 Clinical appearance of the lesion caused by O. canadensis.

Fig. 2 Direct examination of nail fragments showing narrow, hyaline hyphae (× 400).

Fig. 3 Colonial morphology of a subculture of O. canadensis on Sabouraud glucose agar.

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Turkey [9], however, the isolate from this case was sent to CBS, and though it arrived in a non-viable condition, in examination by R. C. Summerbell (personal communication), it was definitively identified and reported to the sender as an atypical *Trichophyton rubrum* isolate producing reduced macroconidia and intergrading arthroconidial chains, resembling the morphological variant described under the synonymous name *Trichophyton kanei*. The colony had low, velvety, spreading growth and a reddish-brown reverse on Sabouraud agar, differing entirely from the restricted, heaped growth and dull reverse of *O. canadensis*. Consistently, it caused a cutaneous infection in addition to onychomycosis [9]. This record can therefore be discounted.

The present report, then, extends the known Eurasian geographic range of this fungus significantly eastward. In all confirmed cases, the disease caused was onychomycosis, but there was also one case of suspected but unproven tinea manuum and one case of unproven tinea pedis interdigitalis [1,5]. *O. canadensis* may well have been isolated as a skin contaminant in these cases. One isolation of this species was definitively confirmed as an insignificant contaminant in an onychomycosis case reported by Gupta *et al.* [6]. In that case, the patient’s nail grew *O. canadensis* once, but in subsequent specimens, only *T. rubrum* was isolated.

The patients included 18 women and 14 men, prevalently living in rural areas. Twenty-four of these individuals were over 60 in age and, among these, 17 were more than 70 years old. Only six were between 39 and 54 years of age. Although the precise ages of two of the UK patients are unknown, they were both adult males. Interestingly enough, as yet, no clinical cases of onychomycoses caused by *O. canadensis* have been diagnosed in children.

The pathogenic role of *O. canadensis* in our case report was confirmed according to the requirements proposed by M.P. English [10] to consider a non-dermatophytic fungal isolate as the aetiological agent of onychomycosis. These included: (i) the demonstration of fungal elements directly in the clinical sample by microscopic observation with KOH; (ii) the lack of isolation of any dermatophyte species; (iii) the growth of the same fungus from several cultivated nail fragments. This counting criterion has been basically criticized as the value of such counts varies statistically with their number, e.g. a count of five non-dermatophytic colonies has a very low predictive value and could easily reflect contamination, even in nails where fungal filaments are present and no dermatophytes grew in culture, whereas a count of 15 or more has a predictive value over 90% for non-dermatophytic onychomycoses [11]. Of critical importance, however, is that the pathogenic role of *O. canadensis* in the present case was confirmed by a second isolation of the fungus after a few months (despite antifungal therapy, i.e. terbinafine *per os* 250 mg day⁻¹ for 4 months). Overall, if stringent confirmatory conditions are not met, isolates of *O. canadensis* should not be considered confirmed as pathogenic.

The similarities between the clinical case described in the present study and those reported previously are numerous, in particular with reference to the age of the patients, the clinical appearance of the onychomycosis, and the environmental factors in the patients’ daily lives as well as their occupations or hobbies. It should be stressed, though, that the present patient was not permanently in residence in a rural area, unlike several previously reported patients. As the patient investigated in this study had never travelled abroad, it is reasonable to claim that *O. canadensis* is an autochthonous fungus in Italy.

This report, together with the ones described in Canada, England, France, New Zealand and Spain, further confirm that the fungus probably inhabits all temperate areas. A temperate climate may well be preferred by the fungus, but, as mentioned above, the distribution of reports so far may also be influenced by the distribution of laboratories able to recognize and scientifically document this organism.

Despite the wide geographical distribution of *O. canadensis*, the number of clinical cases described until now have been surprisingly few. Reasons for this could be related to the slow growth of the colonies of this fungus, which sporulates poorly even after several...
weeks of incubation, and to the misidentification of *O. canadensis* isolates.

As has been reported in the French cases [7], moreover, the infection may not cause distinctive lesions, thus making clinical evaluations and mycological investigations difficult. Sensitivity to griseofulvin in some cases [3] may also contribute to the rare detection of infections caused by *O. canadensis*, thus implying that the prevalence of infections caused by this mould may be greatly underestimated.

**References**


