Original Article

Onychomycosis of the Middle Finger of a Japanese Judo Athlete due to *Trichophyton tonsurans*

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ABSTRACT

We present a 17-year-old Japanese male high school student, who had applied steroid ointment for atopic dermatitis, with fingernail onychomycosis due to *Trichophyton tonsurans*. He was found positive for *T. tonsurans* infection based on hairbrush culture performed due to an epidemic of *T. tonsurans* infection in his judo club. The hairbrush culture method is very important in screening for this infection, and dermatologists should examine the entire body of athletes who are found positive using this method. For the diagnosis of *T. tonsurans* infection, other than the skin and hair, the nails should also be checked by dermoscopy because the fingernail may be the origin of this fungus.

Key words: dermoscopy, fingernail, judo, onychomycosis, *Trichophyton tonsurans*

Introduction

*Trichophyton tonsurans* infections are increasing in Japan¹. *T. tonsurans* is an anthropophilic dermatophyte that mainly infects human hair. The most important clinical sign is black dots on the scalp hair. However, there are many asymptomatic carriers of *T. tonsurans* infection. For control of infection by this dermatophyte, it is important to screen all members of the infected athlete club using the hairbrush culture method³. The entire body of athletes who are found to be positive for *T. tonsurans* by the hairbrush culture method must be checked. Moreover, the source of the local epidemic infection, such as scabies where the patient carries the infected eggs and adult mites, must be identified. In Japan, there is a low incidence of nail infection with *T. tonsurans*, and we found only one previous case⁵. Here, we present the second case of fingernail onychomycosis in a patient with atopic dermatitis who used steroid ointments for eczema of the hand.

Case

A 17-year-old Japanese male high school student had been treated with topical steroids for atopic dermatitis. He had had atopic dermatitis since he was a baby, and he applied a very strong class of topical steroid ointment on his hands and arms. One month before his first visit to our hospital, he was found positive for *T. tonsurans* infection by hairbrush culture performed due to an epidemic of *T. tonsurans* infection in his judo club. Approximately 35% (5/14) of the judo club members were infected with *T. tonsurans* 5 months before his first visit to our hospital, but he was negative for *T. tonsurans* infection by hairbrush culture at that time (4 months before his visit). We performed the second hair brush culture one month before his first visit. There were three new culture-positive members and two re-infected positive members (33%, 5/15). He was one of the new culture-positive members. All of the three culture-positive members were restricted from judo practice (in the tatami area) and use of the weight training equipment.
room. Physical examination of the patient revealed scaly erythematous lesions on the third and fourth interfinger areas resembling hand eczema (Fig. 1a), and left middle fingernail deformity (Fig. 1b). The middle fingernail had longitudinal striae that were white, brown, and yellow, with jagged proximal edges and no paronychia on dermoscopy\(^1\), consistent with distal and lateral subungual onychomycosis (DLSO) (Fig. 1c). We performed direct KOH examination of the scales from the third interfinger area and the middle fingernail, and found filamentous fungus from both areas (Fig. 1d). To make a diagnosis and rule out candida infection, we cultured clipped nail samples on SDA plates, and mahogany-colored colonies developed from all cultured clipped nails after 5 days of incubation at 27ºC (Fig. 2). The same kind of colonies also developed from the fourth interfinger area. Microscopically, septate hyphae with microconidia, and numerous giant forms of microconidia and chlamydospore-like structures were observed. Cultures of the fungus were preserved as IFM 64540 at the Medical Mycology Research Center at Chiba University. On the basis of the morphological characteristics and sequence of internal transcribed spaces of the ribosomal RNA gene regions (GenBank accession no.: LC317887), we confirmed the identity of the fungus as *T. tonsurans*.

The patient had been restricted from judo practice because of orthopedic surgery of the knee for 2 months prior to his visit, but had continued weight lifting to maintain his muscles. However, other members who had stopped judo practice in the tatami area were still found to be culture-positive. Therefore, we suspected the source of the epidemic infection of his judo club to be the weight training room. We stopped his practice at the training room and treated all culture-positive members with oral antifungal drugs.

The patient was treated with oral terbinafine (125 mg/day) and topical luliconazole cream, but he developed annular erythema on the neck after 6 weeks. Direct KOH examination of the scale from the neck lesion was negative, and he had hemorrhagic stool for two days. He requested to stop taking terbinafine, and we changed his treatment to itraconazole at 400 mg/day for 2 cycles.

Six weeks after the first visit, his hand lesions were cured, and after 10 weeks, his nail deformity disappeared and direct KOH examination of the nail deeper scrapings was negative.
Discussion

*Trichophyton tonsurans* infection epidemics among contact sports club members in Japan have been frequently reported since 2000\(^1\). The best way to control this infection is to perform hairbrush culture for all club members, and to check and treat the positive members\(^3,4\).

Although our patient had stopped judo practice, his use of steroid ointment on his hands made him susceptible to onychomycosis due to local immunosuppression. In Japan, onychomycosis due to *T. tonsurans* is rare, and only two cases have been reported, including our case (Table 1). Based on a literature review, onychomycosis of the fingernail has been reported as DLSO\(^5\), endonyx onychomycosis\(^6\) and onychomadesis in a very young infant\(^7\).

The incidence of onychomycosis caused by *T. tonsurans* is low in Germany\(^8,9\), and is approximately 3.5% in Spain\(^10\), 20.4% in India\(^11\), and 26% in Lebanon\(^12\). In India, onychomycosis of the fingernails was found more often than that of the toenails, with a ratio of 2.7:1\(^11\), and the availability of many inexpensive and irrational corticosteroid-antifungal-antibacterial combinations sold over the counter and their subsequent abuse have created a large pool of inadequately treated patients who serve as a constant source of infection\(^13\).

The increased incidence of tinea capitis due to *T. tonsurans* was demonstrated in Canada between 1985 and 1996. Onychomycosis due to *T. tonsurans* increased in parallel, especially after 1989\(^9\).

In our case, dermoscopy was useful for the diagnosis of onychomycosis\(^14-16\). Important symptoms of DLSO are longitudinal striae of different colors, and distal irregular terminations and jagged proximal edges. In our case, nail symptoms were onycholysis, and white, brown, and yellow longitudinal striae with jagged proximal edges, and no paronychia on dermoscopy\(^14-16\). More cases need to be examined to establish the dermoscopic description of onychomycosis due to *T. tonsurans*. We considered the hemorrhagic stool to be unrelated to terbinafine treatment, and the annular erythema on the neck to be dermatophytids.

In a recent study\(^7\), *T. tonsurans* was reported to form biofilms in nails similar to *Trichophyton rubrum* and *Trichophyton mentagrophytes*. In conclusion, since *T. tonsurans* mainly infects human hair, and fingernails sometimes come in contact with the scalp hair, *T. tonsurans* infection both of the hair and fingernails must be considered in contact sports athletes and their family members, particularly those who use steroid ointments for hand eczema. In particular, attention should be given to fingernail onychomycosis due to *T. tonsurans*.

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None.

Conflict of interest

The authors declare no conflict of interest.

References


| Table 1. Onychomycosis due to *T. tonsurans* in Japan |
|--------------|--------------|------------|----------------|----------------|
| Year | Author | Age | Gender | Site | Sports | Treatment |
| 1 | 2009 | Fujihiro M | 18 | Male | Right ring finger | Wrestling | TBF 250mg/day 6 weeks |
| 2 | 2017 | Sato T | 17 | Male | Right middle finger | Judo | TBF 125mg/day 6 weeks | ITCZ 400mg/day pulse 2 cycles | Topical Luliconazole cream |