

Familial Sporotrichosis Due to Human-to-human Infection of *Sporothrix globosa*: A Case Report

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Typically, sporotrichosis follows an environmental transmission route via traumatic inoculation of contaminated plant or soil matter. Although familial occurrences of sporotrichosis are rare, human-to-human transmission is even rarer. Herein, we report two cases, a father and son, with sporotrichosis caused by *Sporothrix (S.) globosa*. A 33-year-old male who otherwise appeared healthy presented with a tender, erythematous, ulcerative crusted plaque on the left ala nasi and upper lip. A skin biopsy and mycological study revealed fixed cutaneous sporotrichosis. The patient irregularly received oral itraconazole with a relapsing course. Approximately a year later, his 3-year-old son developed a single plaque on the left leg. When the father carried his son on his shoulder, there was direct contact between the two lesions. Fungal culture results from the father and son's lesions confirmed *S. globosa* with ribosomal DNA ITS sequencing. In both patients, oral terbinafine exhibited better results than oral itraconazole. These cases are an excellent example of human-to-human transmission of sporotrichosis.

Key Words: Human-to-human transmission, *Sporothrix globosa*, Sporotrichosis

INTRODUCTION

Sporotrichosis is the leading subcutaneous mycosis caused by the *Sporothrix (S.) schenckii* complex. With the development of molecular biology methods, Marimon et al.¹ reported that the *S. schenckii* complex comprises six species as follows: *S. globosa*, *S. brasiliensis*, *S. luriei*, *S. mexicana*, and *S. pallida (S. albicans)*. Of these, *S. globosa* infection is primarily found in East Asia². Kim et al.³ reported that *S. globosa* is the causative organism of fixed sporotrichosis in Korea and proposed that *S. globosa* might be the only causative agent of sporotrichosis in Korea. Typically, *S. globosa* propagates through plant-transmitted infection⁴, and human-to-human transmission is not well reported. Although cases of familial sporotrichosis have been occasionally reported, in most cases, the suspected

source of infection was shared, and human-to-human transmission was extremely rare. Here, we report two cases of sporotrichosis due to *S. globosa* resulting from human-to-human transmission.

CASE REPORT

1. Case 1

A 33-year-old male presented with a yellow-brown verrucous nodule on the left ala nasi (size, 0.8 × 1 cm; Fig. 1A). The lesion developed in the form of a blister on the left side of the nose 3 years ago, which slowly increased in size, and was treated with topical steroids in a clinic; however, it worsened

Received: May 23, 2018 Revised: May 24, 2018 Accepted: June 14, 2018

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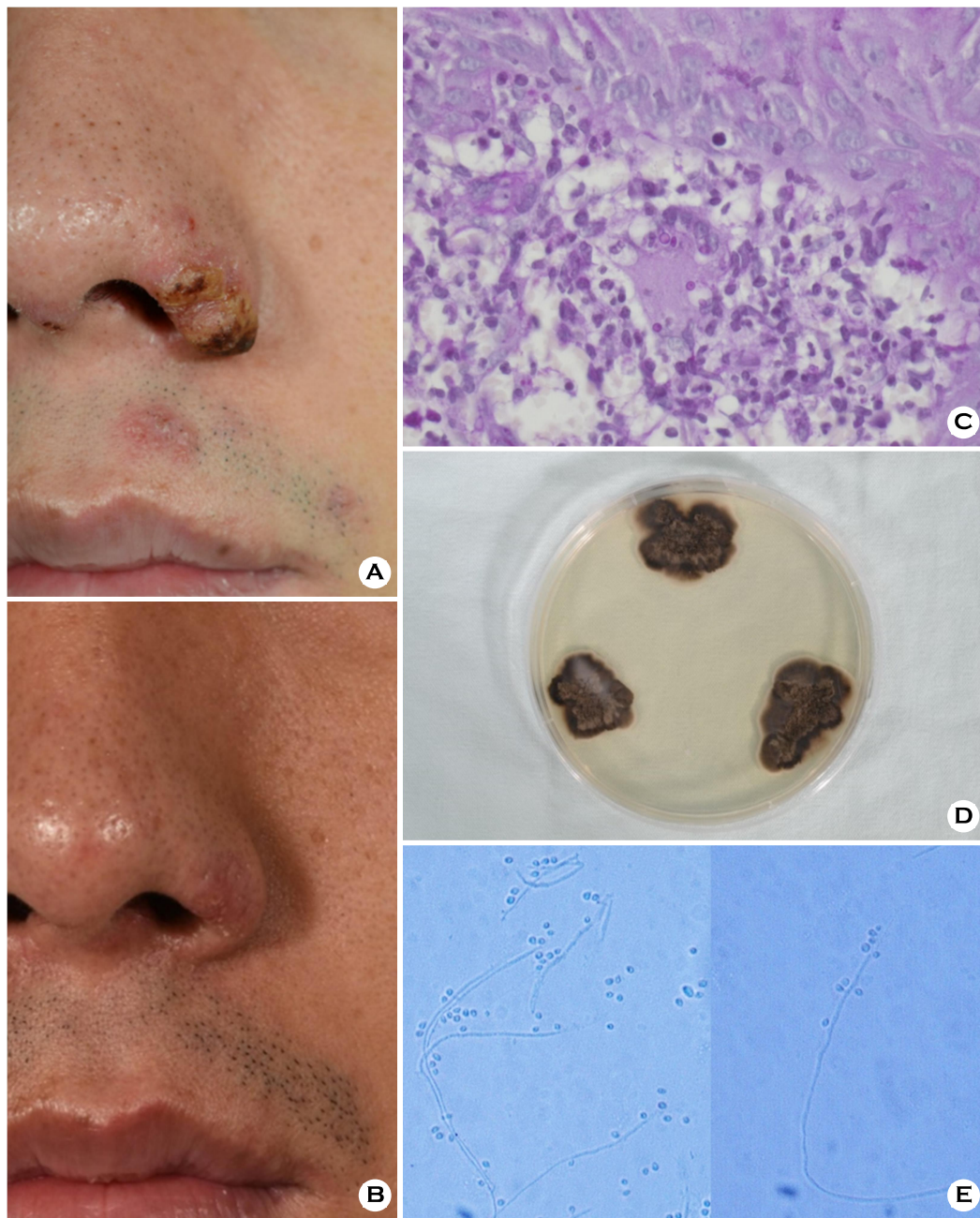


Fig. 1. Clinical findings of the father (A) Single, bean-sized, yellow-brown verrucous nodule on the left ala nasi (B) Improved skin lesion of the left ala nasi after antifungal treatments (C) Several spores positive for the periodic acid-Schiff staining in the upper dermis (PAS stain, ×400) (D) Dark-brown to black, moist and wrinkled colonies on Sabouraud's dextrose agar at 25°C for 2 weeks (E) In the slide culture, conidia developed from conidiogenous cells in a group or alongside the hyphae alone, conidia single-celled, tear-shaped, clavate or oval-shaped, and hyaline

without improvement. The patient was in good health and denied any medications that affected his immune status.

The KOH preparation test performed on the skin lesions

was negative. We performed a histological examination and cultured part of the specimen. Histologically, we observed chronic inflammatory granuloma comprising lymphocytes,

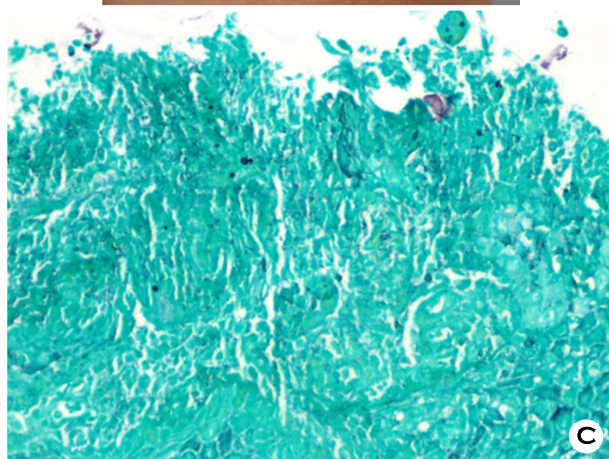


Fig. 2. Clinical findings of the son (A) Single chestnut-sized erythematous ulcerative crusted plaque on the left inner thigh (B) Improved skin lesion with a scar on the left inner thigh (C) Several spherical spores visible in the upper dermis (Gomori methenamine silver stain, $\times 200$)

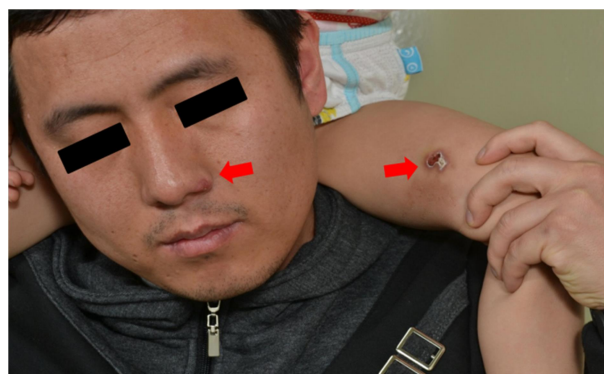


Fig. 3. In the shoulder ride position, there was direct contact between the father and son's skin lesions.

histiocytes, and giant cells in H&E staining and several spores with periodic acid-Schiff (PAS) staining (Fig. 1C). In addition, some parts of the biopsy specimen of the lesion were inoculated on Sabouraud's dextrose agar and cultured at 25°C; in 2 weeks, a grayish, dark-brown colony was observed (Fig. 1D). In the slide culture, conidia were developing from conidiogenous cells in a group or alongside the hyphae alone. Conidia were single-celled, tear-shaped, clavate or oval-shaped, and haline (Fig. 1E). Furthermore, BLAST® search revealed 100% similarity between nucleotide sequences of conidia and *S. globosa* (GenBank® accession number: MH499862). While skin lesions improved with the use of systemic antifungal agents (itraconazole, 100 mg BID; Fig. 1B), the symptoms recurred upon discontinuing the medication. Hence, we switched the medication to terbinafine, which was more effective.

2. Case 2

A 3-year-old male presented with a 2- × 2-cm ulcer on the left inner thigh (Fig. 2A). Initially, the lesion developed in the form of a blister on the left inner thigh a year ago, but it slowly increased in size; although it was treated in a clinic, it worsened without improvement. Two years ago, the patient's father was diagnosed with sporotrichosis. The family denied having any pets or growing plants. The child's mother, who shared a room with the patient, exhibited no skin symptoms. In the shoulder ride position that the father-son duo often enjoyed, a direct contact occurred between the father and son's lesions (Fig. 3). Notably, no fungus was noted in the KOH preparation test. A skin biopsy revealed chronic inflammatory granuloma; we observed multiple spores in the PAS and

Gomori methenamine silver staining (Fig. 2C). In addition, biopsy specimens were inoculated on Sabouraud's dextrose agar and incubated for 2 weeks at 25°C, displaying a grayish, dark-brown colony of fungi similar to the results of the father's fungal culture. The isolated primary colony was identified as *S. globosa* by the ribosomal DNA ITS sequencing (GenBank® accession number: MH499863). After sporotrichosis diagnosis, the patient received a systemic antifungal agent (itraconazole, 100 mg QD) for a year. The lesion exhibited gradual improvement but worsened upon discontinuing the drug. After switching to oral terbinafine, the patient exhibited better response (Fig. 2B).

3. Mycological study

Both strains did not grow at 37°C, and were susceptible to terbinafine (MIC 0.125 µg/ml), and resistant to itraconazole (MIC >16 µg/ml) and voriconazole (MIC >16 µg/ml).

DISCUSSION

Sporotrichosis, which commonly occurs in mammals, has two major transmission pathways: via animals and plants. Both routes involve impairment of the skin or subcutaneous tissue by trauma and injection of *Sporothrix* propagules into the skin. Skin lesions occur at the site of inoculation, and localized propagation might occur along the lymphatic pathway during the first 2~3 weeks of infection⁵. Typically, *S. schenckii* and *S. globosa* are spread by infection from contaminated plants; however, *S. brasiliensis* is mostly transmitted by scratch wounds caused by infected felines⁴.

In our cases, the family was living in an urban area with no home-grown plants, and the father was not working as a farmer. Thus, in the case of the son, we could exclude transmission via plants. In addition, the father and son's lesions did not simultaneously develop. The father intermittently received the medication as he was first diagnosed with sporotrichosis. The father informed that he often carried his son on his shoulders. In the shoulder ride position, we observed a direct contact between the father and son's lesions (Fig. 3). Presumably, the son might have had unrecognizable trauma, which induced infection of *Sporothrix* from the father's lesion. Reportedly, the inoculum load, host immune status, virulence of the inoculated strain, and inoculation depth are involved in the clinical manifestations of sporotrichosis⁶. The host is resistant to the strain primarily by cell-mediated immunity. When a human is infected by a *Sporothrix* spp., suppurative granuloma formation with scanty fungal elements is usually

observed on H&E staining. Perhaps, this potent immune response could explain the less human-to-human transmission of *Sporothrix* spp.

Considering the frequency of contact, there is a high possibility of sporadic spread of *Sporothrix* spp. in sporotrichosis occurring in the family. To date, 22 familial cases of sporotrichosis have been reported worldwide⁷⁻¹¹; of these, 17 were not related with animal transmission, which is not the usual transmission pathway of *S. globosa*. However, only three cases could be suspected because of human-to-human transmission while considering the temporal order, occupation, and frequency of contact among patients¹²⁻¹⁴. Moreover, none of the three cases presented the exact species because when these were reported, the *S. schenckii* complex was only classified as *S. schenckii* in the absence of a molecular technique. Thus, if human-to-human transmission of sporotrichosis is suspected, detecting the correct species by a molecular method will help the epidemiological study of sporotrichosis.

In our cases, several fungal elements were observed in the histological examination, itraconazole was ineffective, and a repetitive contact occurred between the father and the son — all contributing to the human-to-human transmission of *S. globosa*. In addition, the patients might have a genetic predisposition or susceptibility to *Sporothrix*. Hence, as *S. schenckii* is transmitted by felines in Malaysia, the possibility of *S. globosa* transmission by animals or humans should be carefully observed¹⁵.

CONFLICT OF INTEREST

In relation to this article, I declare that there is no conflict of interest.

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