증례보고
Lab Med Online
Vol. 13, No. 1: 27-30, January 2023
https://doi.org/10.47429/lmo.2023.13.1.27

임상미생물학 LMO

면역기능이 정상인 성인 여성에서 *Schizophyllum commune*에 의해 발생한 기관지확장증 1예

A Rare Case of Bronchiectasis with Mucoid Impaction Caused by *Schizophyllum commune* in an Immunocompetent Woman in South Korea

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Schizophyllum commune is one of most widely distributed fungal species, often found on dead and decaying organic matter. Only a few cases of *S. commune* infections in immunocompetent patients, including the sinus, sino-orbital, bronchopulmonary, and extra-pulmonary areas have been reported. A 52-year-old female patient presented with symptoms of cough, whitish sputum, and chest discomfort lasting approximately one month. The patient denied any relevant medical history. Chest radiography revealed a mass-like consolidation at the right lower lobe. Bronchoscopy showed thick, white-yellowish mucoid plugs on several bronchi on the right middle lobe. Transbronchial biopsy and aspiration were performed. Gomori's methenamine silver staining on a prepared paraffin block and fungal culture revealed a few scattered degenerated fungal hyphae. DNA amplification and sequencing analysis of the Internal Transcribed Spacer gene demonstrated 100% identity with *S. commune*; access number MK029865.1. The patient was diagnosed with bronchiectasis with mucoid impaction caused by *S. commune* fungal infection and recovered fully after 4 weeks of oral administration of itraconazole 200 mg twice a day. In Korea, there have been only two cases of fungal infections caused by *S. commune* in immunocompetent patients. The cases were allergic fungal sinusitis and sino-orbital infection. This report provides additional evidence that invasive fungal infection by *S. commune* is possible in immunocompetent patients.

Key Words: *Schizophyllum commune*, Bronchiectasis, Immunocompetence

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Received: April 27, 2022
Revision received: July 7, 2022
Accepted: July 29, 2022

This article is available from https://www.labmedonline.org
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INTRODUCTION

Schizophyllum commune is a species of fungus in the genus *Schizophyllum*, family Schizophyllaceae, order Agaricales, class Agaricomycetes, and phylum Basidiomycota. It is one of most widely distributed fungal species, often found on dead and decaying organic matter [1]. Since the first report of probable pathogenic behavior of *S. commune*, it has been rarely reported in medical literature in association with human diseases compared to other disease-causing fungi [2]. The most frequently infected regions are the sinus, sino-orbital, bronchopulmonary, and extra-pulmonary areas, ranging from allergic respiratory conditions to severe life-threatening brain lesions in both immunocompetent and immunocompromised hosts [3]. Here, we report a rare case of bronchiectasis with mucoid impaction caused by *S. commune* in an immunocompetent woman in South Korea.

CASE REPORT

A 52-year-old female patient was referred to our institution from a local clinic for further examination of suspected bronchitis. The patient had symptoms of cough, whitish sputum, and chest discomfort lasting approximately one month. The patient was a nonsmoker and had no medical history of pulmonary tuberculosis, asthma, rhinitis, diabetes, hypertension, allergy, or gastroesophageal reflux disease. She was not receiving any medical treatments. Her occupation was a shoe vendor, and her family history included her brother's lung cancer. The patient's body temperature was 36.9℃, and her respiratory examination was normal, without wheezing. Upon laboratory investigation, white blood cell count was 5,490/μL with 373/μL eosinophils. Serum C-reactive protein levels were elevated to 1.35 (reference range <0.6), and total IgE was 216 kU/μL (<100). The culture and smear of a series of three sputum specimens and a serum aspergillus antibody test were all negative. Posteroanterior chest radiography revealed a mass-like consolidation in the right lower lobe. Mucoid impaction manifested as high-density beaded lesions in the right middle lobe (RML) and atelectasis of RML on pre-contrast axial CT scan. A bronchoscopic examination revealed thick yellowish mucoid impaction with total obstruction of the RML bronchus (Fig. 1).

Histopathological examination with Gomori's methenamine silver (GMS) staining on a prepared paraffin block revealed a few scattered degenerated fungal hyphae. Bronchoscopic aspirate specimens were plated as a fungal culture on Sabouraud dextrose agar and incubated at 36.5℃ for 24 hours and then at 25℃ for three days, showing dense, fine, soft, hair-like white mycelial growth, defined as fungal hyphae under GMS staining. Microscopic examination revealed several thin hyaline hyphal filaments without clamp connections or spicules (Fig. 2).

We performed molecular identification by DNA amplification and sequencing analysis of the Internal Transcribed Spacer (ITS) gene to identify the fungus. The primer pair used for amplifying ITS sequencing was ITS1 (5′-TCC GTA GGT GAA CT GCG G-3′) and ITS4 (5′ TCC TCC GCT TAT TCA TAT GC-3′). We used the basic local alignment search tool (BLAST) of the GenBank (http://blast.ncbi.nlm.nih.gov/) database to analyze the sequencing results. Comparative analysis of the partial ITS sequence demonstrated 100% identity with *S. commune* (access number MK029865.1).

The patient was diagnosed with bronchiectasis with mucoid impaction caused by *S. commune* fungal infection. The patient was given oral corticosteroids at 15 mg and 10 mg twice daily and the antifungal agent itraconazole 200 mg twice daily for 4 weeks. Her symptoms of cough, whitish sputum, and chest discomfort resolved after one month of treatment. The patient recovered fully without any complications.

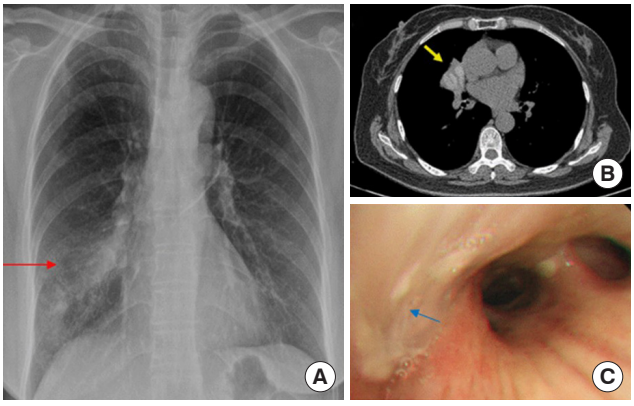

Fig. 1. (A) Postero-anterior X-ray revealed a mass-like consolidation in the right lower lung field (red arrow). (B) Mucoid impaction manifested as a high density on pre-contrast CT scan (yellow arrow). (C) The bronchoscopic examination showed thick yellowish mucoid impaction with total obstruction of the right middle lobe bronchus (blue arrow).

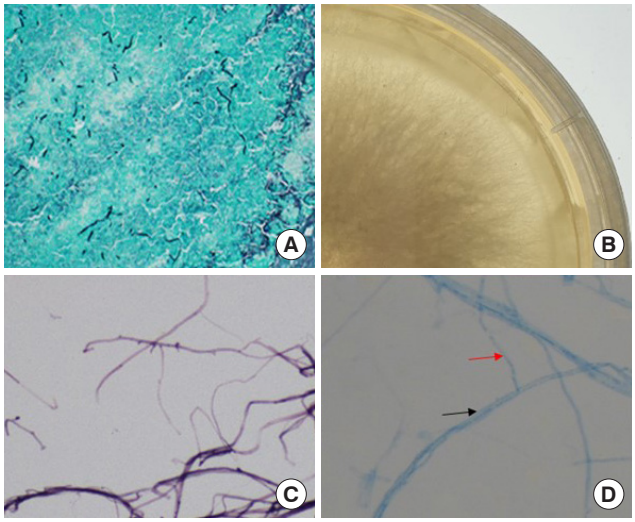

Fig. 2. (A) Gomori's methenamine silver (GMS) stain of a prepared paraffin block revealed fungal hyphae (GMS stain, ×200). (B) White, woolly colonies grew on Sabouraud dextrose agar after incubation of bronchoscopic aspirate specimens for 3 days. (C) GMS stain revealed several thin hyaline hyphal filaments without clamp connections or spicules on microscopic examination (GMS stain, ×400). (D) The red arrow indicates the narrower width hyphae, and the black arrow indicates the wider hyphae (lactophenol cotton blue stain, ×400).

https://doi.org/10.47429/lmo.2023.13.1.27

Table 1. Literature review of *Schizophyllum commune* invasive infection in immunocompetent patients

No.	Sex/Age (yr)	Diagnosis	Confirmation method	Treatment	Outcome	Country, Year [Reference]
1	M/58	Several lung and brain abscesses	Histologic finding	Amphotericin B deoxycholate and itraconazole	Died	The USA, 1996 [4]
2	M/53	Epidural abscess	Sequence analysis	Vancomycin, meropenem, and liposomal amphotericin B	Cured	Japan, 2018 [5]
3, 4, 5	F/45, F/37, F/30	Rhinosinusitis with mucosal and/or bone invasion	MALDI-TOF MASS spectrometry and sequence analysis	Surgery and voriconazole	Cured	France, 2015 [6]
6	M/56	Bronchogenic cyst	Sequence analysis	Surgery	Cured	Serbia, 2006 [7]
7	F/30	Sino-orbital infection	Sequence analysis	Amphotericin B deoxycholate and voriconazole	Cured	Korea, 2012 [11]
8	F/54	Mucoid impaction of the bronchi	Histologic finding	Itraconazole	Cured	Japan, 2007 [14]
9	F/50	Sino-orbital infection	Cycloheximide susceptibility (400 μg/mL) and tolerance to benomyl (10 μg/mL)	Surgery and amphotericin B deoxycholate	Cured	India, 2020 [15]
10	F/59	Pulmonary mycosis	Sequence analysis	Voriconazole and pulmicort inhalation	Cured	China, 2016 [16]

DISCUSSION

The rate of human infections caused by *S. commune* has been increasing recently [3]. Several cases have been reported in immunocompromised and immunocompetent patients [4-16]. We reviewed published reports of *S. commune*-induced invasive infections in immunocompetent patients (Table 1). Even in immunocompetent patients, *S. commune* induced serious inflammation such as pneumonia or epidural abscess [4, 5]. For example, in the US, an immunocompetent 58-year-old man died of pneumonia and brain abscess caused by *S. commune* [4]. In another three case reports in France, *S. commune* caused invasive rhinosinusitis in immunocompetent patients [6]. Globally, *S. commune* infection in a healthy human without an underlying disease is rare [2]. Therefore, when *S. commune* is isolated from an immunocompetent patient with mild symptoms, it might be considered a contaminant microorganism instead of suspected as a potential pathogen. Culture positivity alone is insufficient as a diagnostic method for fungal infection, and it is necessary to determine whether the sample is pathogenic or a contaminant. Furthermore, *S. commune* isolated from human specimens typically exhibits no distinctive microscopic morphological characteristics of its dikaryotic stage, such as spicules or clamp connections on hyphae [7]. We identified the corresponding sequences of *S. commune* by molecular genetic analysis of the ITS region. In our case, specimens were obtained using sterile techniques, directly GMS-stained fungal hyphae were found, and antifungal therapy was effective, so the possibility of contamination was excluded. A limitation of our study is that we could not conduct an antifungal susceptibility test for our case. In general, *S. commune* infections are easily manageable, and the mean minimum inhibitory concentrations observed for itraconazole remain low [8, 17].

In Korea, several cases of *S. commune* infections in immunocompromised patients have been reported [8, 9]. However, there have only been two case reports in immunocompetent patients, including allergic fungal sinusitis and sino-orbital infection caused by *S. commune* [10, 11]. Here, we report a rare case of bronchiectasis with mucoid impaction caused by *S. commune* in an immunocompetent woman in South Korea. This report shows that *S. commune* can cause serious infections even in immunocompetent patients.

요 약

*Schizophyllum commune*은 자연에 널리 분포하는 곰팡이 중 하나이며 죽거나 썩어가는 유기물에서 발견되기도 한다. 사람에서의 *S. commune* 감염 사례 보고는 많지 않으며, 비강, 안와, 기관지, 폐 및 폐 외 부위 감염 사례들의 보고가 드물게 있었다. 52세 여자 환자가 약 1개월 동안 기침, 희뿌연 가래, 흉부 불편감을 호소하며 호흡기내과 외래를 내원하였다. 환자의 과거 병력은 전혀 없었다. 흉부 방사선 사진에서 폐 우하엽에 종괴와 유사한 병변이 확인되었다. 기관지경검사에서 우중엽 기관지 분지에서 두꺼운 백색-황색 점액성 마개가 관찰되었고, 생검 및 흡입 검체 채취가 시행되었다. 기관지 생검 조직의 파라핀 블록 및 흡입 검체의 배양 양성 균종에서 GMS (Gomori's methenamine silver) 염색을 시행하였고, 산재된 균사를 확인할 수 있었다. DNA 증폭과 ITS (Internal Tran-

scribed Spacer) 유전자의 시퀀싱 분석을 통해 *S. commune* 분자동정 검사 결과를 확인하였다. 환자는 항진균제 치료 1개월 후 완전히 회복되었다. 국내 면역학적 건강인에서는 알레르기성 진균성 부비동염과 부비동-안와 감염의 질환 두 사례가 보고된 바 있다. 이 보고는 *S. commune*이 면역학적으로 건강한 성인에서 침습적인 폐렴을 일으킬 수 있다는 추가 증례가 될 것이다.

Conflicts of Interest

None declared.

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https://doi.org/10.47429/lmo.2023.13.1.27