

## Cutaneous Infection by *Fusarium solani* in an Immunocompetent Patient

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*Fusarium* species are widely distributed throughout the environment, and rarely cause infection in healthy individuals. Herein, we report a rare case of cutaneous infection by *Fusarium solani* in a healthy patient. A 64-year-old patient presented with a tender, erythematous, deep-seated nodule above the left ankle after an intralesional triamcinolone injection for lipoma was administered at a private clinic 1 month ago. Fungal hyphae were identified in subcutaneous tissue by skin biopsy using Gomori methenamine silver stain. Lactophenol cotton blue staining, fungal culturing, and 28S rRNA sequencing confirmed the presence of *F. solani*. After diagnosis, the patient was successfully treated with oral itraconazole.

**Key Words:** *Fusarium solani*, Itraconazole

### INTRODUCTION

*Fusarium* species are molds that are widely distributed throughout the environment, including soil, air, water, and plants<sup>1–3</sup>. They generally infect immunocompromised patients, especially those with hematologic malignancy, bone marrow transplantation, and neutropenia<sup>2,3</sup>. They rarely cause local infections, like septic arthritis, endophthalmitis, osteomyelitis, cystitis, and brain abscess, in immunocompetent patients<sup>2</sup>. However, they can cause cutaneous infections through skin breakdown by burns, trauma, foreign bodies, or vascular insufficiency<sup>2,3</sup>.

### CASE REPORT

The patient provided written informed consent. The patient was a 64-year-old male presented with a tender, erythematous,

deep-seated nodule on the outer aspect above his left ankle. This nodule developed one month after an intralesional triamcinolone injection for lipoma was administered at a private clinic (Fig. 1A, 1B). His vital signs were normal. He had no symptoms except for tenderness above his left ankle. He had no history of skin infection by *Fusarium*. Laboratory investigations showed that his complete blood cell count, liver function test, and renal function test reports were within the normal range. A skin biopsy was taken from the tender nodule and was stained with Gomori methenamine silver (GMS) stain. Additionally, fungal culture of the skin tissue sample was done on Sabouraud dextrose agar (SDA) plate. Histopathological examination showed dense mixed inflammatory cells and red blood cell extravasation in deep dermis. Fungal hyphae were observed in subcutaneous tissue stained with GMS stain (Fig. 2). The top view of the colonies obtained on the SDA plate appeared yellow in the center and had white floccose appearance (Fig. 3A). The bottom view of the

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Fig. 1. (A-B) Tender, erythematous, deep-seated nodule on the outer aspect above the left ankle (C) The fungal infection was cured and did not relapse during the 12-month follow-up period.

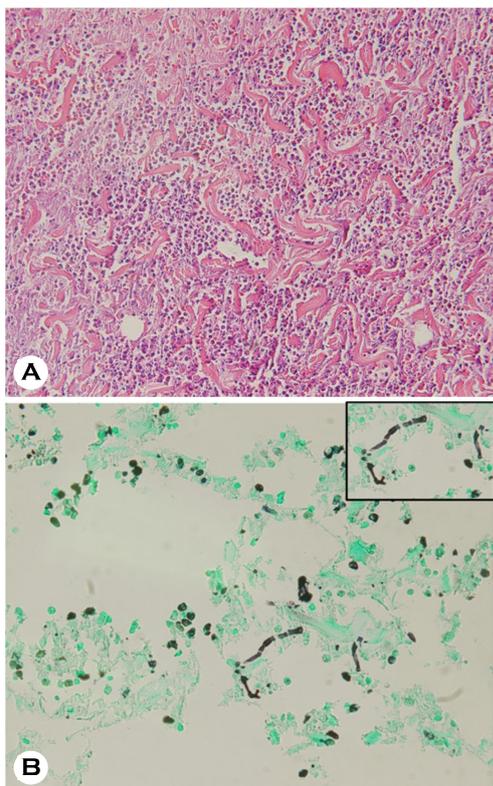
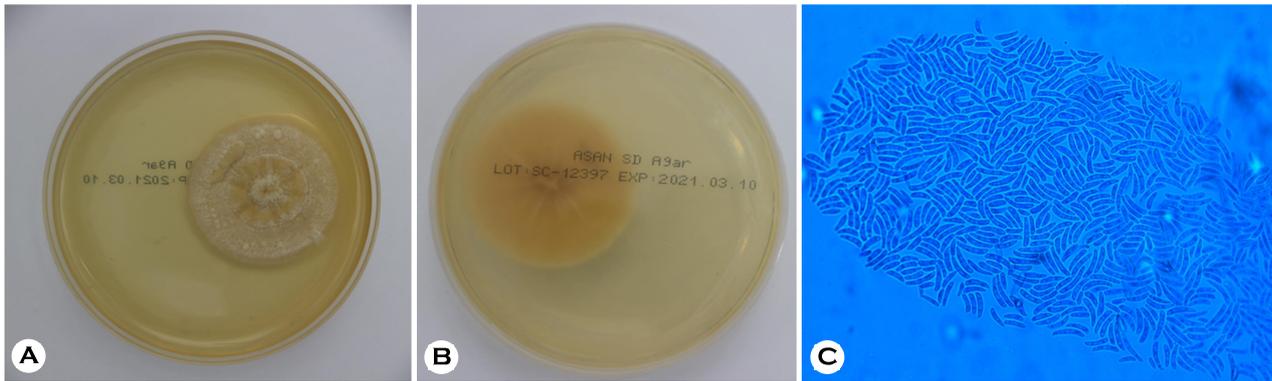


Fig. 2. (A) Mixed dense inflammatory cells and red blood cell extravasation in the deep dermis (H&E, ×200) (B) Fungal hyphae were observed in the subcutaneous tissue (Gomori methenamine silver stain, ×400).

SDA plate showed yellow-brownish colored colonies (Fig. 3B). Lactophenol cotton blue staining of the culture revealed sickle-shaped macroconidia with three thick septa (Fig. 3C). 28S rRNA sequencing was performed to confirm the fungal species, and the fungal culture was identified as *Fusarium solani* (Fig. 4). Based on these findings, cutaneous fungal infection by *F. solani* was diagnosed. The patient was treated with oral itraconazole (200 mg/day) for about 4 months and was completely cured. The patient was followed up for 12 months and showed no clinical signs of recurrence (Fig. 1C).

## DISCUSSION

*Fusarium* species are widely distributed throughout the environment. They are divided into several species complexes (SC) such as *F. solani* SC, *F. oxysporum* SC, *F. fujikuroi* SC, and *F. dimerum* SC<sup>4</sup>. *Fusarium* infection has rarely been reported in immunocompetent individuals. It shows slower progression in such patients than in immunocompromised patients<sup>5</sup>. Usually, patients with *Fusarium* infection have a previous history of infection through skin breakdown<sup>5</sup>. In this case, cutaneous infection occurred one month after intralesional triamcinolone injection. Therefore, cutaneous fungal infection should be considered even in healthy patients showing slowly progressing skin lesions with previous trauma history such as insect bites or needle injuries. Skin and soft



**Fig. 3.** (A) Top view of the Sabouraud dextrose agar plate showed a white floccose colony. (B) Bottom view of the colony showing yellowish to brownish color (C) Sickle-shaped macroconidia with three thick septa were observed (lactophenol cotton blue stain,  $\times 400$ ).

Query	1	TTTGAAATCTGGCTCTCGGGCCGAGTTGTAATTTGTAGAGGATGCTTTTGGTGAGGTGC	60
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Sbjct	709	CTTCCGAGTTCCCTGGAACGGGACGCCATAGAGGGTGAGAGCCCCGTCTGGTTGGACACC	768
Query	121	GATCCTCTGTAAAGCTCCTTCGACGAGTCGAGTAGTTTGGGAATGCTGCTCTAAATGGGA	180
Sbjct	769	GATCCTCTGTAAAGCTCCTTCGACGAGTCGAGTAGTTTGGGAATGCTGCTCTAAATGGGA	828
Query	181	GGTATATGTCTTCTAAAGCTAAATACCGGCCAGAGACCGATAGCGCACAAGTAGAGTGAT	240
Sbjct	829	GGTATATGTCTTCTAAAGCTAAATACCGGCCAGAGACCGATAGCGCACAAGTAGAGTGAT	888
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Sbjct	889	CGAAAGATGAAAAGAACTTTGAAAAGAGAGTTAAACAGTACGTGAAATGTTGAAAGGGA	948
Query	301	AGCGCTTGTGACCAGACTTGGGCTTGGTTGATCATCCGGGGTTCTCCCCGGTGCACTCTT	360
Sbjct	949	AGCGCTTGTGACCAGACTTGGGCTTGGTTGATCATCCGGGGTTCTCCCCGGTGCACTCTT	1008
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Sbjct	1009	CCGGCTCAGGCCAGCATCAGTTCGCCCTGGGGGATAAAGGCTTCGGGAATGTGGCTCTCT	1068
Query	421	CCGGGGAGTGTTATAGCCCGCTGCGTAATACCCTGTGGCGGACTGAGGTTTCGCGCATTTCG	480
Sbjct	1069	CCGGGGAGTGTTATAGCCCGCTGCGTAATACCCTGTGGCGGACTGAGGTTTCGCGCATTTCG	1128
Query	481	CAAGGATGCTGGCGTAATGGTCATCAGTGACCCGTCTTG	519
Sbjct	1129	CAAGGATGCTGGCGTAATGGTCATCAGTGACCCGTCTTG	1167

**Fig. 4.** RNA sequence alignment of the sample from the patient was 100% identical to the 28S rRNA of *Fusarium solani* (GenBank accession number KT313637.1).

tissue infections develop in approximately 75~90% cases of disseminated *Fusarium* infection<sup>1</sup>. According to previous reports, the upper and lower extremities are the most common sites. Common morphologic types of skin lesions include red or gray papular and macular type lesions with central eschar and necrosis and subcutaneous nodular type lesions<sup>1</sup>. Previous studies have reported various skin lesions such as necrotic tissue, cellulitis with necrosis, ulceration, and plaque type with vesicles and pustules in immunocompetent patients. Most of these patients had a history of skin breakdown such as burns, trauma, and preexisting onychomycosis<sup>5</sup>.

Most *Fusarium* species are resistant to antifungal agents<sup>2,3</sup>. In particular, *F. solani* SC shows high resistance to various antifungal agents<sup>6</sup> and has high minimal inhibitory concentration to many azoles including posaconazole, itraconazole, and difenoconazole<sup>4</sup>. The ideal treatment regimen for *Fusarium* infections is controversial. Combination therapy of liposomal amphotericin B and voriconazole is most commonly used<sup>6</sup>. However, unlike immunocompromised patients, cases successfully treated by oral itraconazole or local heat therapy have been reported<sup>7,8</sup>. In this case, the patient was effectively treated with oral itraconazole, and he had no recurrence during the 12-month follow-up period.

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The authors declare that there is no acknowledgment.

## CONFLICT OF INTEREST

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

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## PATIENT CONSENT STATEMENT

The patient provided written informed consent for the publication and the use of his images.

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