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*Case Report*

# Vertebral osteomyelitis caused by *Scedosporium apiospermum* in an immunocompetent male: a case report

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**Abstract:** We describe an extremely rare case in which *Scedosporium apiospermum* caused vertebral osteomyelitis in an immunocompetent 47-year-old man after he nearly drowned in a pond. The patient was admitted to West China Hospital complaining of lower back pain. Computed tomography (CT) of the chest revealed a chest-wall abscess, and CT of the lumbar spine revealed destruction in the L-3, L-4, and L-5 vertebrae. *S. apiospermum* was cultured from a paravertabral necrotic secretion, and antifungal therapy with voriconazole was initiated. The lower back pain disappeared after antifungal treatment, and the previously elevated white blood cell count, pro-calcitonin level, and erythrocyte sedimentation rate returned to normal. Moreover, CT showed improvement in the condition of the chest wall and lumbar spine. We report this case to advise physicians that lower back pain in near-drowning victims should raise suspicion of vertebral osteomyelitis due to the ubiquitous fungus *S. apiospermum*.

**Keywords:** Vertebral osteomyelitis, Scedosporium apiospermum, near-drowning, antifungal therapy

## Introduction

*Scedosporium apiospermum*, is the asexual form of the filamentous fungus *Pseudallescheria boydii* [1]. It is highly invasive and opportunistic pathogen and can withstand high temperatures, high salinity, and hypoxia. It is found most commonly in soil, sewage, and stagnant water [2]. In recent years, the incidence of *S. apiospermum* infections has tended to increase in immunocompromised individuals, HIV/AIDS patients, leukemia sufferers, organ transplant recipients, and patients who received immunosuppressants for long periods of time. *S. apiospermum* infection can also occur in immunocompetent individuals in situations such as trauma and near-drowning [3-6]. *S. apiospermum* causes soft tissue infections, pneumonia, arthritis (most often in knee joints), and brain abscesses [7-10]. In near-drowning victims, pneumonia and brain abscesses are its most common effects, whereas osteomyelitis is rare [11]. Here, we describe a rare case of vertebral osteomyelitis in an immunocompetent man who contracted *S. apiospermum* infection after nearly-drowning.

## Case description

A motorcycle was submerged in a pond owing to a traffic accident. The driver, a 47-year-old healthy man, was trapped head-down under the sewage. After being rescued, he was admitted to the Affiliated Hospital of Southwest Medical University (first hospital), at which time he was diagnosed with aspiration pneumonia and respiratory failure. Antibiotics including moxifloxacin and biapenem were administered for the pneumonia. *Acinetobacter Baumanii* was detected in endotracheal sputum cultures. Clinical symptoms improved after administration of naproxen, vancomycin, and moxifloxacin to control the infection in the lungs. One week after treatment, the patient experienced right eye blindness and lower-back pain. Radiography revealed bone destruction, disc bulging, and endplate osteochondritis at the L-4 and L-5 vertebral levels. He was diagnosed with vertebral osteomyelitis, and extensive debridement, partial corpectomy, and internal fixation were performed at the L-4 and L-5 levels. Surgical findings included the presence of a necrotic secretion. Although the *Mucor* was detected in cul-

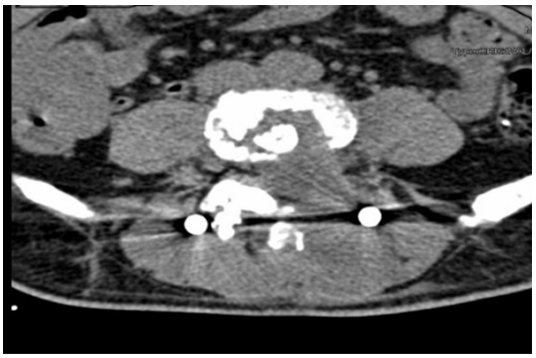

**Figure 1.** CT of the lumbar spine demonstrating bone destruction of the L5 vertebral body in April 21, 2016.

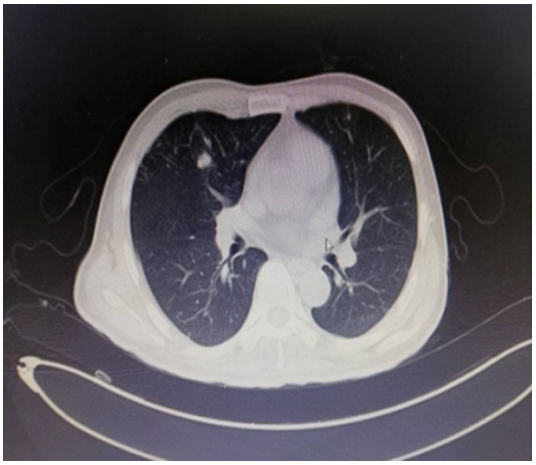

**Figure 2.** CT revealing the lungs scattering with nodular, hyper-dense shadows and local abscess of the right anterior inferior wall in April 19, 2016.

tures, the patient refused antifungal treatment and the fever recurred, as did infection of the L-3 and L-4 vertebrae as shown via CT. For further care, the patient was admitted to West China Hospital (Secondary Hospital), with a description of "a traffic injury 3 months ago and lower back pain for 2 months". Physical examination revealed right eye blindness and tenderness on the right side of the chest without local swelling. Sinuses were 1×1 cm in size at the L-4 and L-5 levels, with tiny amounts of pus, mild tenderness, and knocking pain. Heart and abdominal physical examinations showed no abnormal findings.

Laboratory examination revealed the following white blood cell count: $6.11\times10^9$/L, neutrophil ratio: 73.6%, pro-calcitonin level: 1.52 ng/mL, erythrocyte sedimentation rate: 70 mm/h, alanine aminotransferase: 24 U/L, aspartate aminotransferase: 23 U/L, albumin: 33.2 g/L. CT of the lumbar spine showed destruction of the L-3, L-4, and L-5 vertebrae (**Figures 1** and **6**), and CT of the chest showed the lungs scattering in the infected focus, inflammatory nodules, and an abscess in the chest-wall (**Figure 2**). An orbital CT scan of the anterior and posterior diameters of the right eye revealed that the density of the vitreous body was slightly above normal and that the lens was invisible. In etiological examinations, the following were negative: blood and chest-wall pus cultures; *Aspergillus* galactomannan, fungal (1,3)-beta-D dextran tests, and interferon gamma release tests; acid-fast staining; and gram staining of the paravertebral necrotic secretion. A biopsy of the chest-wall abscess was negative. Percutaneous needle aspiration biopsy of the L-4 and L-5 vertebrae revealed a large number of neutrophils, monocytes, lymphocytes, and plasma cells, but no septate hyphae.

After admission to West China Hospital, the patient's temperature fluctuated from 38°C to 38.5°C between April 20$^{th}$ and April 25$^{th}$. Levofloxacin and carbenin were administered to control the infection. *S. apiospermum* was present in cultures of the paravertebral necrotic secretion, and antifungal therapy (200 mg voriconazole intravenously for 12 hours) was initiated. The patient's temperature and inflammatory indexes (white blood cell count, neutrophil ratio, pro-calcitonin level, and erythrocyte sedimentation rate) decreased gradually. His lower back pain subsided, and less pus was secreted in the sinuses. These findings indicated that the infection had been controlled. During treatment, liver enzyme levels increased to 102 U/L, but then returned to normal after liver protective therapy. Eight weeks after receiving antifungal therapy, the patient was discharged home. He required oral administration of voriconazole (200 mg bid for 12 months) outside the hospital. In a telephone follow-up 6 months after discharge, the patient stated that he no longer had a fever or lower back pain. CT showed that his condition had improved.

All procedures performed in these studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. Informed consent was obtained from the patient included in the study.

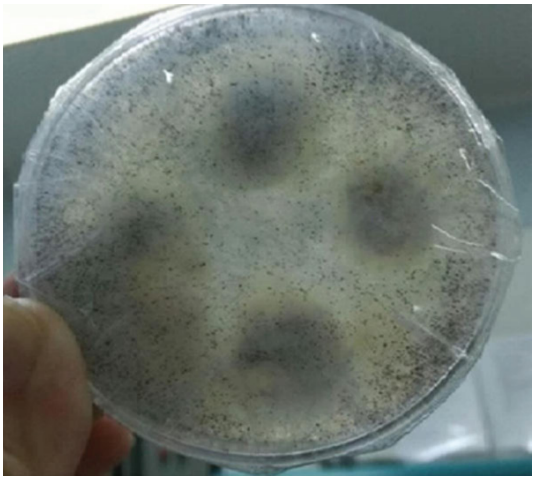

**Figure 3.** Sabouraud dextrose agar showing growth of *S. apiospermum* (multiple fungal colonies).

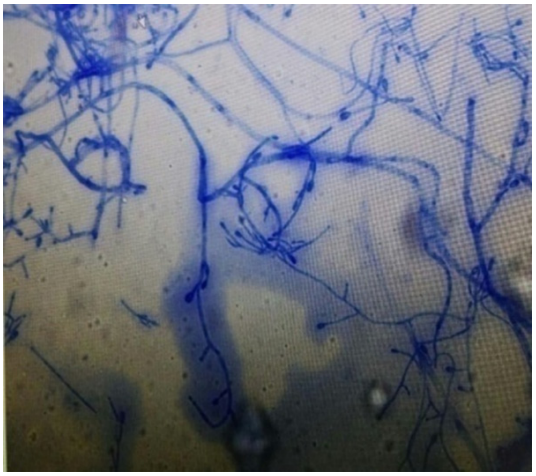

**Figure 4.** Photomicrograph of *S. apiospermum* (wet mount, lactophenol aniline blue stain) demonstrating multiple obovoid conidia with truncate bases, arising from short conidiophores or directly from hyphae.

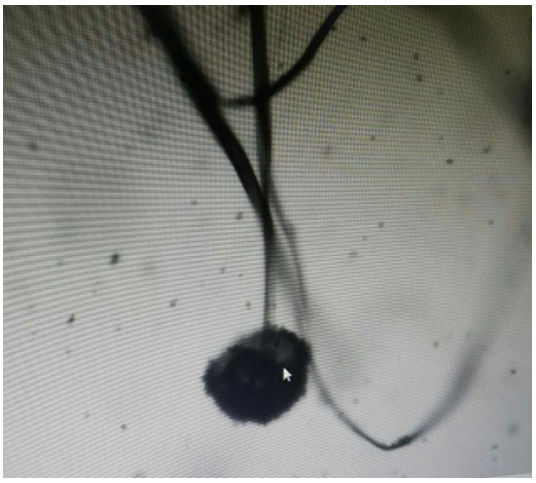

**Figure 5.** *S. apiospermum* conidiophores bearing one celled obovoid conidia produced singly under electron microscope.

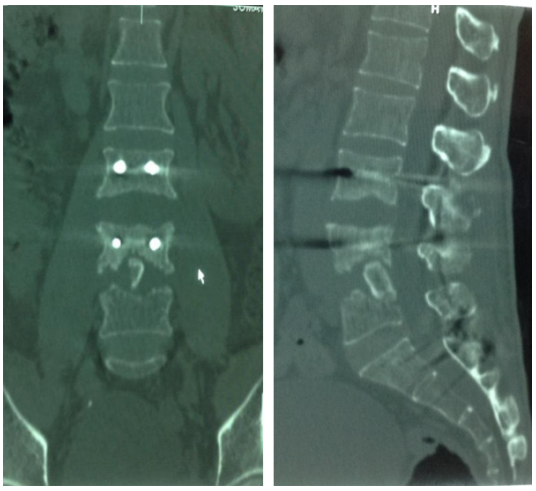

**Figure 6.** Reconstructed CT of the lumbar spine demonstrating bone destruction of the L-3, L-4 and L-5 vertebral bodies.

## Discussion

Suppurative spondylitis, which includes vertebral osteomyelitis and epidural abscesses, mainly occurs in young adults [12]. Because it has no specific symptoms, its early-stage diagnosis is difficult, and its consequences include spinal deformities, neurological damage, paralysis, and even death [13]. It is primarily caused by a hematogenous infection, followed by trauma and local spread of the infection [13]. The pathogens responsible for infection are usually bacterial (*Staphylococcus aureus* [14] and *Escherichia coli* [15]), whereas fungal sources are rare. *S. apiospermum* is a rare fungal pathogen hat can invade multiple organs, sometimes fatally. *S. apiospermum* infections typically occur in immunocompromised patients and common infection sites include the skin, lungs, joints, and nervous system. In our case, the patient had nearly drowned and was predisposed to infection. Our case is of interest for two reasons: the patient was a young immunocompetent man, and the *S. apiospermum* infection occurred in the lumbar vertebrae. Because he had no previous history of lumbar trauma or chronic lumbar spine disease, this case suggests that *S. apiospermum* can cause a dis-

seminated infection in immunocompetent individuals.

At present, diagnosis of an *S. apiospermum* infection is difficult because its clinical features and histopathology resemble those of infections caused by other filamentous fungi such as *Aspergillus* and *Fusarium spp*. Microorganism-detecting cultures are a reliable diagnostic tool. In the first hospital, *Mucor* was evident in patient-derived cultures. Unlike *Aspergillus* and *Fusarium*, *Mucor* resides in soil, feces, and wet environments, has thick hyphae and spores, and its mycelia are white in the early stages, turning black after maturity. *S. apiospermum* thrives in similar environments as *Mucor*, and its mycelia undergo similar changes (**Figure 3**). It has thin-walled, septate, transparent hyphae, and one or more conidiophorebores at the ends of the mycelia (**Figures 4** and **5**). Amphotericin B and its lipid derivatives are the most common first-line anti-*Mucor*therapies [16], while flucytosine, itraconazole, and voriconazole have no intrinsic activity, as demonstrated in multiple trials [17]. Two case studies report successful treatment of *Scedosporium* infections with voriconazole [18, 19]. In our study, the patient's symptoms were relieved and inflammation gradually declined after almost 8 weeks of voriconazole treatment. We believe that the misdiagnosis by the first hospital (i.e., a *Mucor* infection rather than an *S. apiospermum* infection) reflects the experience of the specialist, and the technical experience of the staff. This attests to the difficulty of detecting *S. apiospermum* in patient samples and the need for a greater understanding of *S. apiospermum* infections by hospital and laboratory personnel. Of note, Katragkou et al. [11] reported that the median time to diagnosis of a *Scedosporium* infection was 28 days, perhaps owing to the low sensitivity of routine culture methods.

The mode of *S. apiospermum* invasion and subsequent spread to the vertebrae remain ambiguous. The development of suppurative spondylitis presumably involves the aspiration of pathogens in polluted water and their dissemination from the lungs to the lumbar vertebrae via the bloodstream. Although biopsy of the right chest-wall abscess showed no fungal infection in our patient, voriconazole markedly reduced the size of abscess. Therefore, we believe that the abscess was due to *S. apiospermum* infection. In support, *S. apiospermum* was detected in cultures of the paravertebral necrotic secretion. Direct contact of the eyes with *S. apiospermum*-infested sewage can cause ocular and corneal infections, which can be painful and vision impairing. Indeed, the patient in our study became blind in the right eye after crashing his motorcycle into a sewage-containing pond. We could not rule out infection as the cause of the blindness without performing fungal staining or culturing. In addition, long-term use of broad-spectrum antibiotics and the resistivity drop of the patient after near-drowning were associated with the spread of fungi.

Voriconazole appears to be efficacious and generally well-tolerated and is the agent of choice for treatment of fungal vertebral osteomyelitis. In the study by Troke et al. [20], voriconazole achieved a successful therapeutic response in 57% of patients with scedosporiosis (n = 107); skin/subcutaneous (91%) and bone (79%) infections responded best. Side effects of voriconazole include transient visual disturbances, skin rashes, and hepatotoxicity [21, 22]. In our case, voriconazole effectively treated acute vertebral osteomyelitis, but was accompanied by hepatotoxicity. Hence, we should examine hepatic function regularly during antifungal therapy.

In summary, we believe that near-drowning victims with subacute or chronic lower back pain should be rigorously examined for spondylodiscitis resulting from fungal infection, especially *S. apiospermum* infections. Combined histological and microbiological analyses and antifungal therapies can reduce the risk of mortality in cases in which microorganism-induced infections are historically difficult to diagnose and treat.

## Disclosure of conflict of interest

None.

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