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Case Report

Apophysomyces Necrotizing Infection in an Immunocompetent Child

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Abbreviations:

ED- emergency department

HD- hospital day

IV- intravenous

WBC- white blood cell

MRI- magnetic resonance imaging

PO- per oral

RLE- right lower extremity

ABSTRACT

Background: Mucormycoses are uncommon fungal infections with high morbidity and mortality rates. *Apophysomyces* spp are a known but rare pathogen. Successful treatment necessitates early diagnosis, surgical debridement, and systemic antifungal treatment.

Case Presentation: A 7-year-old boy sustained a minor trauma to his leg and developed necrotizing acute soft tissue infection secondary to *Apophysomyces varibilis*. He required multiple surgical debridements and systemic antifungal therapy. He recovered well and had excellent results following skin grafting.

Conclusion: *Apophysomyces varibilis* is an emerging pathogen in immunocompetent patients, most commonly acquired by traumatic inoculation.

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Background

Mucormycoses are rare infections associated with high rates of morbidity and mortality more commonly seen in immunosuppressed patients but can occur in the immunocompetent [1]. Most cases of mucormycoses are caused by the genus *Rhizopus*, followed by *Mucor* and *Lichtheimia*; together accounting for 70-80% of all cases. *Apophysomyces* spp, a less common etiology, has been reported in 3% of cases globally [2]. *Apophysomyces elegans* was first isolated from a soil sample from northern India in 1979; while the first case of mucormycosis secondary to *A. elegans* in the United States (US) was reported in 1985 [3, 4]. In 2010, three new species of *Apophysomyces*

were identified, including *A. varibilis* [1]. Successful management of mucormycosis requires early diagnosis, surgical debridement, and systemic antifungal therapy [2]. We herein report a case of an immunocompetent child who developed a necrotizing soft tissue infection from *Apophysomyces varibilis* following a minor trauma.

Case presentation

A 7-year-old Ethiopian male, with a past medical history significant for typhoid fever and malaria during his first year of life, presented to the emergency department (ED) with a 2-day history of right lower extremity (RLE) pain and swelling. Of note, his parents denied history

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of foreign travel for the patient in the past 5 years. He had sustained a small laceration to the anterolateral aspect of his right leg secondary to a fall against a concrete step at the beach 5 days prior. Despite local wound care with bacitracin ointment the RLE became progressively edematous. He received one dose of trimethoprim-sulfamethoxazole as an outpatient before becoming febrile to 103°F. At this time, he was given a dose of ceftriaxone and referred to the ED for further care.

On initial exam his temperature was 103°F, WBC 9,800, and his leg appeared edematous and indurated without evidence of fluctuance (Fig 1). The presumed cellulitis was initially managed with clindamycin and vancomycin. MRI on hospital day (HD) 1 revealed cellulitis and fasciitis, without necrosis, myositis, or osteomyelitis. On HD 2, as there was some clinical improvement, non-operative management with antibiotics was continued. Cefepime was added for pseudomonal coverage. On HD 6, the development of a fluctuant collection with an associated fever to 104°F with a WBC of 16,500 prompted incision and drainage (Figure 2). This revealed infected hematoma which was drained via counter incisions with placement of a Penrose drain. Preliminary results of intra-operative wound cultures were significant for enterococcus, prompting a change in antibiotic regimen to mono-therapy with piperacillin-tazobactam. By HD 8, the patient had continued fevers, for which vancomycin therapy was re-initiated, and noticeably boggy tissue on palpation with a thick, pasty, cheese-like substance expressed on exam. He was subsequently taken for excisional debridement. In the operating room the skin and subcutaneous fat were found to be necrotic, with no necrosis of the underlying fascia and muscle. The following day, preliminary tissue cultures revealed mold, and the patient was started on liposomal amphotericin. Final culture grew *Apophysomyces varibilis*.



Figure 1: Initial presentation



Figure 2: Hospital day 6, prior to first debridement

He was taken for subsequent debridement of devitalized tissue on HD 10. After complete excision and repeat tissue cultures to ensure no residual fungal growth, the wound bed was treated with negative pressure wound therapy. He remained on piperacillin-tazobactam until discharge (HD 17) and was sent home on IV liposomal amphotericin B (Figure 3). He completed 4 weeks of IV liposomal amphotericin B

followed by 4 weeks of PO itraconazole. Twenty-one days after initial presentation to the ED he underwent split thickness skin graft with 100% take (Figure 4) He healed well and had no recurrence of infection.



Figure 3: Wound appearance at time of discharge



Figure 4: Healed skin graft

Discussion

Mucormycoses are rare infections that more commonly afflict immunocompromised patients; however, recent reports demonstrate that *Apophysomyces* spp are an emerging pathogen in the immunocompetent host [5]. As seen in our case report, *Apophysomyces varibilis* has specifically been noted to mainly affect immunocompetent patients [1]. Traumatic inoculation of the organism is the most common mode of *Apophysomyces* infections, with almost half of all documented cases secondary to trauma. The most common sites are cutaneous/subcutaneous (53%), with local invasion and necrotizing soft tissue infections a common feature (83%), and the majority (79%) progressing to necrotizing fasciitis or gangrene. Similar to our patient, cutaneous infections can manifest with pain, swelling, abscesses, ulceration and necrosis, with the most common locations being the extremities, abdominal wall and perineum [2].

Management of these patients require both medical and surgical treatment. The antifungals that are standard of care for the management of *Apophysomyces* mucormycosis are amphotericin B and itraconazole, with recent studies showing promising results for other therapeutic agents [6]. Surgical debridement is associated with a decrease in fungal load, as well as improved tissue penetration of antifungal agents post resection. A prospective study demonstrated that the survival rate of amphotericin B plus surgery was 61.5% compared to 10.3% for amphotericin B alone (OR = 0.2, $p < 0.04$) [7]. In our case report, aggressive surgical debridement was initially delayed due to MRI findings not consistent with necrotizing infection and initial cultures demonstrating a bacterial source. Due to progression of the infection with initial treatment and cultures demonstrating mold, he underwent aggressive surgical debridement and IV antifungal therapy.

Conclusion

In conclusion, patients presenting with a necrotizing acute soft tissue infection, with or without a history of trauma, mucormycosis must be considered in the differential, even in the immunocompetent. In those suspected to have mucormycosis, early diagnosis and treatment with aggressive surgical debridement and systemic antifungal therapy is required for patient survival.

Ethics approval and consent to participate

No IRB approval required for this case report.

Consent for publication

Written consent for publication obtained from the patient's guardians.

Availability of data and materials

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Conflict of interest

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