



# Rhinorbitocerebral Mucormycosis in Uncontrolled Diabetes

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A 46-year-old woman with medical history of poorly controlled diabetes mellitus, including recent hospitalization for diabetic ketoacidosis, presented with left-predominant frontal headache that was not responsive to 1 month of oral antibiotics. Exploration in the operating room demonstrated black necrotic tissue in multiple areas concerning for fungal invasion (Supplemental Figures 1 and 2, available online at <http://www.mayoclinicproceedings.org>). She was admitted to her local hospital for high suspicion of mucormycosis, and intravenous (IV) liposomal amphotericin was initiated. The next morning, she was found to have new anisocoria with significant ophthalmoplegia of the left eye, consistent with orbital apex syndrome. She was admitted to the Mayo Clinic Hospital St. Marys Campus in Rochester for further management, where emergent magnetic resonance imaging

revealed frank invasion at the left rhino-orbital areas despite initial debridement (Figure 1).

The patient underwent a total of 5 surgical debridements. Multiple intraoperative specimens demonstrated invasive ribbon-like hyphae and fungal cultures grew *Rhizopus spp* (Figure 2; Supplemental Figures 3 and 4, available online at <http://www.mayoclinicproceedings.org>). Anti-fungal therapies included oral delayed-release posaconazole, IV caspofungin, IV liposomal amphotericin B, amphotericin nasal irrigations, and amphotericin retro-orbital injections. Symptoms, including her vision, improved, and she was discharged to home with oral posaconazole monotherapy.

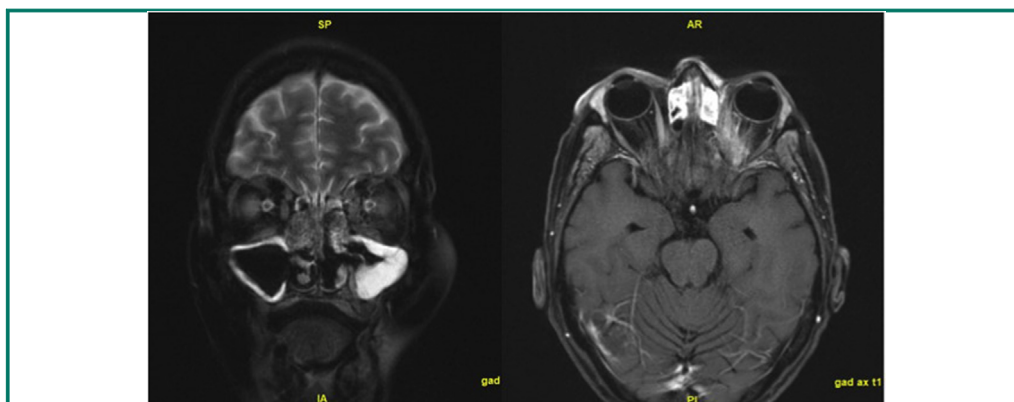
Mucormycosis, formerly known as zygomycosis, is a category of syndromes characterized by severe invasive fungal infections, generally seen in diabetic or



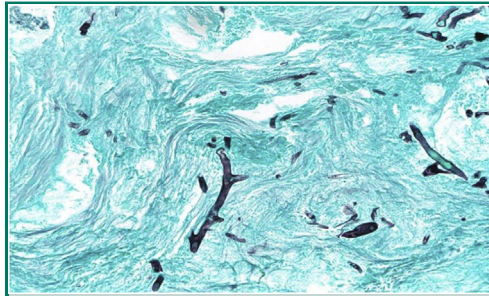
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**FIGURE 1.** Gadolinium-enhanced magnetic resonance image, sagittal view, demonstrating extrasinus invasion into the left retromaxillary region, pterygopalatine fossa, and left masticator space, with accompanying axial view demonstrating left orbital apex extension and inflammatory change, affecting the left intraconal orbit.



**FIGURE 2.** A Grocott's methenamine silver (GMS) stain showing 90-degree branching of ribbon-like hyphae, consistent with mucormycosis.

immunocompromised hosts.<sup>1,2</sup> It is named after the order Mucorales, a group of molds characterized by their broad hyphae with rare septations and irregular branching.<sup>2</sup> The exact incidence and prevalence of infections by these environmental organisms is unknown, but mortality may range from 40% to 80% depending on the syndrome.<sup>1-3</sup> Rhino-orbitocerebral mucormycosis is the classic presentation of invasion in patients with uncontrolled diabetes.<sup>1,2</sup> Optimal antifungal management is unclear; however, early administration antifungal agents is associated with improved outcomes.<sup>4</sup> Liposomal amphotericin B, delayed-release posaconazole, and isavuconazole are current mainstays of medical therapy, and adjunctive echinocandin therapy has been suggested to be of potential benefit.<sup>1,3,5,6</sup> Despite susceptibility to these antifungal agents, timely surgical debridement is the ultimate determinant of outcomes in these patients.<sup>1,3</sup> Otorhinolaryngology and infectious disease departments should therefore be consulted emergently if mucormycosis is suspected.

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#### SUPPLEMENTAL ONLINE MATERIAL

Supplemental material can be found online at <http://www.mayoclinicproceedings.org>. Supplemental material attached to journal articles has not been edited, and the authors take responsibility for the accuracy of all data.

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