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Unusual Case of Mucormycosis-Associated Central Retinal Artery Occlusion without Orbital Involvement: A Case Report

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ABSTRACT

Mucormycosis is an invasive fungal infection caused by fungi of the order Mucorales. It can lead to significant mortality and morbidity in immunocompromised and diabetic patients. We herein present a patient with untreated type 2 diabetes who was admitted for acute progressive vision loss. Following diagnostic findings, she was diagnosed with mucormycosis that directly infiltrated the cerebral arteries, resulting in blindness in her left eye. This is an uncommon presentation of mucormycosis, as it led to arterial invasion without involving the orbit. This case underscores the significance of promptly diagnosing mucormycosis in susceptible individuals to avert catastrophic outcomes.

Introduction

Mucormycosis is a fungal infection that often manifests as rhino-orbital-cerebral and pulmonary infections, particularly in immunocompromised patients and those with diabetes mellitus [1]. It is caused by species of the order *Mucorales*, which are commonly found in soil. The fungus grows rapidly and produces spores that can become airborne. While we are exposed to it daily, our immune system typically prevents infection [2].

These organisms thrive in hyperglycemic, acidic environments due to the activity of ketone reductase. Therefore, diabetic ketoacidosis is a risk factor for infection [3]. Spores attach to nasal turbinates through inhalation [4], and the organism invades blood vessels, leading to tissue infarction [5].

Certain underlying conditions increase the risk of mucormycosis, such as diabetes mellitus, glucocorticoid therapy, hematologic malignancies, organ transplantation, AIDS, and recent COVID-19 infection [6]. Rhino-orbital-cerebral infection is more common in individuals with diabetes [7]. It presents

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as acute sinusitis with symptoms such as fever, nasal discharge, headache, and sinus pain. The infection can spread to the palate, orbit, and brain [8].

Case Presentation

We report the case of a 38-year-old woman who presented with a 10-day history of headache, facial pain, and swelling localized to the left side of her face. Over the preceding three days, she had developed progressive vision loss in her left eye. Associated symptoms included fever, rhinorrhea, cough, and nausea.

On physical examination, her left pupil was fixed and unreactive to light, with visual acuity reduced to no light perception (NLP). Extraocular muscle movements were intact, but there was decreased sensation in the left frontal and infraorbital regions.

Laboratory evaluation revealed previously undiagnosed type 2 diabetes mellitus, with a random blood glucose level of 600 mg/dL on admission.

Fundoscopic examination demonstrated infiltrative lesions involving the optic nerve, while other ocular structures appeared unremarkable.

Nasosinusal endoscopy revealed necrosis of the middle turbinate, which was subsequently resected and sent for mycological analysis. Microscopic examination confirmed the presence of broad, non-septate fungal hyphae consistent with mucormycosis (Figure 1).

A computed tomography (CT) scan of the paranasal sinuses showed opacification of both sphenoid sinuses, the left maxillary sinus, and the left ethmoid air cells. Mild erosion of the posterior wall of the left maxillary sinus with adjacent retroantral fat stranding was also noted, but there was no evidence of intraorbital or intracerebral extension of infection (Figure 2).

Magnetic resonance imaging (MRI) of the paranasal

Fig. 1. Fungal elements with no septate hyphae

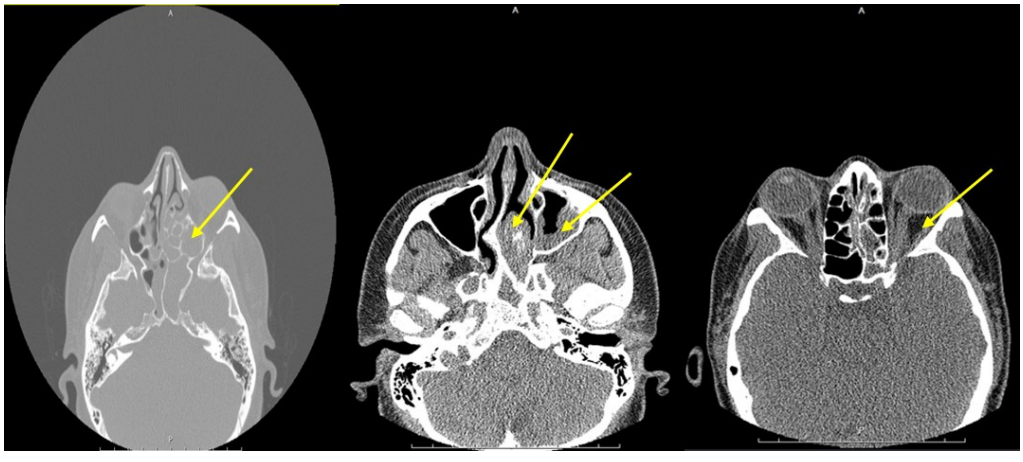

Fig. 2. CT scan: opacification in both sphenoids, left maxillary, and left ethmoid air cells. mild erosion in the posterior wall of the left maxillary sinus associated with retroantral fat stranding. there is no evidence of intraorbital or intracerebral

sinuses demonstrated findings consistent with an acute invasive fungal infection (Figure 3).

Brain MRI revealed fungal invasion of the left internal carotid artery and an acute external watershed infarction involving the territories of the middle and posterior cerebral arteries (Figure 4). Orbital MRI identified central retinal artery occlusion with subsequent central retinal infarction (Figure 5). Differential diagnoses included ischemic optic neuropathy, optic neuritis, papilledema, homonymous hemianopia, cortical blindness, central retinal vein occlusion, retinal detachment, acute maculopathy, and aspergillosis.

After completing a four-week course of intravenous liposomal Amphotericin B at a dosage of 450 mg/day (5 mg/kg/day), the patient demonstrated marked clinical improvement. Her systemic symptoms, including facial pain, nasal congestion, and headache, gradually resolved, and serial evaluations by the otorhinolaryngology (ENT) team confirmed the absence of residual or recurrent sinus infection. Laboratory parameters, including inflammatory markers and renal function tests, were closely monitored throughout therapy and remained within acceptable limits, indicating good tolerance to the antifungal regimen.

Following discharge, the patient was transitioned to oral Posaconazole syrup (10 mL every 12 hours) to ensure continued antifungal coverage and minimize

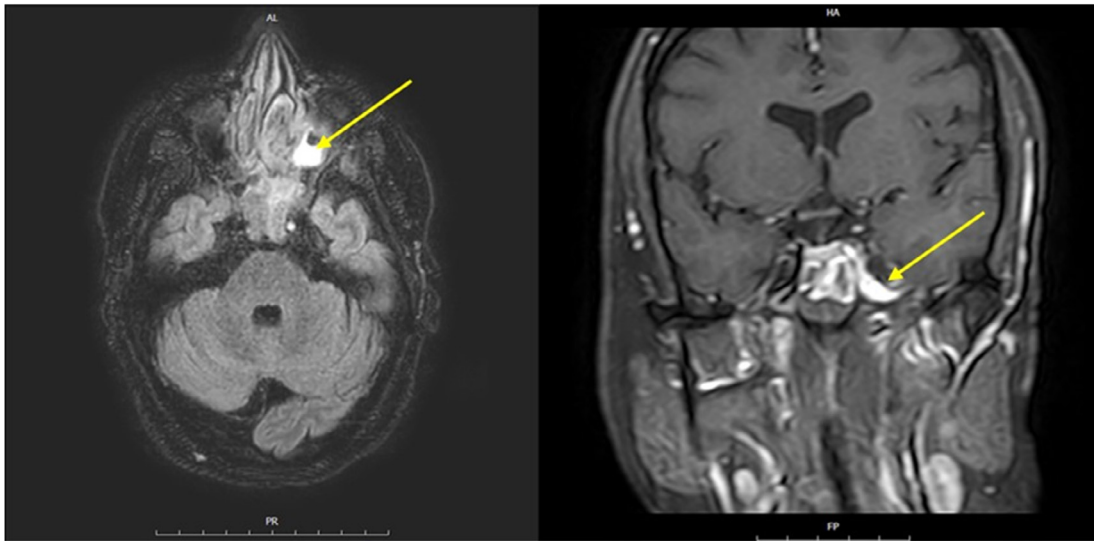

Fig. 3. Sinus MRI: acute invasive fungal infection

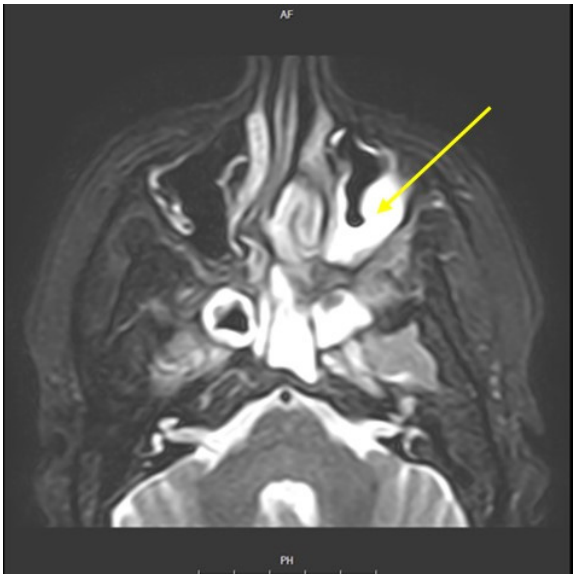

Fig. 4. Brain MRI: left internal carotid artery fungal invasion

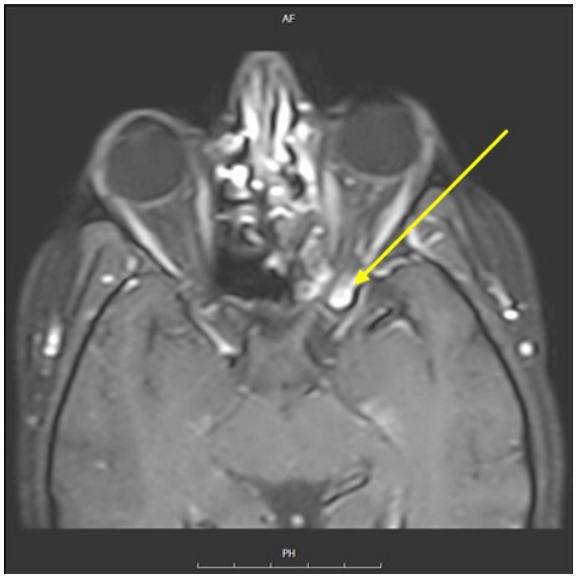

Fig. 5. MRI of the orbit: left central retinal artery occlusion

the risk of disease relapse. During subsequent outpatient follow-up visits, she maintained stable clinical status with no evidence of new lesions or fungal recurrence on imaging or endoscopic examination.

Despite overall recovery and resolution of the infection, the patient experienced irreversible vision loss in the left eye, likely due to prior vascular compromise and fungal invasion of the orbital apex before initiation of therapy. This outcome underscores the aggressive nature of mucormycosis and the importance of early diagnosis and prompt initiation of antifungal treatment to prevent irreversible complications. Nonetheless, the patient's general condition improved significantly, and her prognosis was favorable with sustained adherence to antifungal therapy and strict glycemic control.

Discussion

Mucormycosis is a rapidly progressive fungal infection caused by *Mucorales* species that predominantly affects individuals with uncontrolled diabetes and other immunocompromised conditions. The fungus invades blood vessel walls, leading to thrombosis, tissue ischemia, and necrosis. These vascular effects explain both the rapid, destructive local spread and its severe clinical outcomes, including stroke and blindness [9,10].

In diabetic patients, the typical presentation is rhino-orbital-cerebral mucormycosis (ROCM) [10]. The infection usually starts in the nasal cavity, often attaching to the nasal turbinates, and then spreads to the paranasal sinuses. From the sinuses, it can extend into nearby anatomical areas: first affecting the orbit (resulting in orbital cellulitis, ophthalmoplegia, and proptosis), then moving to the cavernous sinus, the cavernous segment of the internal carotid artery, and eventually infiltrating intracranial structures.

Imaging findings such as the "black turbinate" sign and early non-enhancement of the infected mucosa can be useful, but the disease can advance rapidly [11–14]. The fungus invades blood vessel walls and induces thrombosis, making vascular complications a significant source of morbidity.

In the orbital area, thrombosis of the orbital vessels, including the central retinal artery or its branches at the orbital apex, can lead to central retinal artery occlusion (CRAO) and sudden, often irreversible loss of vision [15,16]. Numerous case reports and studies have documented instances of CRAO associated with ROCM, sometimes as the initial sign of the infection and more frequently in patients who already exhibit orbital involvement on examination or imaging [17–20].

Another vascular pathway involves direct invasion from the sinuses into intracranial arteries, such as the cavernous sinus and internal carotid artery (ICA), without a significant orbital phase. When the infection affects the sphenoid or ethmoid sinuses, it can spread to the cavernous sinus and the cavernous ICA, leading to arteritis, luminal narrowing, or complete thrombosis. These complications can result in large-territory cerebral infarctions and can also cause

blindness by obstructing the primary blood supply to the eye without evident orbital cellulitis [16,21].

Most documented cases of CRAO in mucormycosis do involve orbital disease, and many case reports and series demonstrate that pattern [22–24]. However, a substantive subset of reports and several focused case series demonstrate direct extension from the sinuses to the cavernous sinus or ICA, producing arterial thrombosis, cerebral infarction, and blindness even when the orbit is not conspicuously involved. These reports confirm that vascular invasion can bypass a florid orbital stage [21,25–27].

In summary, both pathways are well documented in the literature and account for the severe visual complications associated with mucormycosis. These findings collectively underscore that mucormycosis is biologically aggressive due to its angioinvasive nature, and the pathway to blindness can be orbital, arterial, or potentially both. Importantly, the absence of obvious orbital symptoms does not eliminate the possibility of vascular causes for vision loss. Early identification, prompt imaging, timely surgical debridement, and immediate systemic antifungal treatment are crucial to minimizing mortality and preventing irreversible complications.

Conclusion

In conclusion, diabetic individuals face a significantly higher risk of developing mucormycosis due to the dual impact of impaired immune function and persistently elevated blood glucose levels, which create a favorable environment for fungal proliferation. Although mucormycosis commonly involves the nasal and orbital regions, cases presenting with cerebral artery invasion in the absence of orbital involvement are exceptionally rare but extremely dangerous, often leading to rapid neurological decline and poor prognosis if not promptly addressed.

This highlights the critical importance of maintaining strict glycemic control, particularly in individuals with poorly managed diabetes or those recovering from illnesses such as COVID-19, which can further weaken immune defenses. Moreover, healthcare providers should maintain a high degree of clinical suspicion for mucormycosis in diabetic patients who present with atypical neurological or sinus-related symptoms. Early recognition, rapid diagnostic evaluation, and timely initiation of antifungal therapy combined with surgical intervention when necessary are vital steps to prevent disease progression, reduce mortality, and significantly improve patient outcomes.

Ethical Considerations

Compliance with ethical guidelines

There were no ethical considerations to be considered in this article.

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Conflict of Interests

The authors have no conflict of interest to declare.

Data availability statement

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Ethics approval statement

Not applicable.

Patient consent statement

Written informed consent was obtained from all individual participants included in the study.

Permission to reproduce material from other sources

not applicable

Clinical trial registration

not applicable

Human and Animal Rights

This article does not contain any studies with human participants or animals performed by any of the authors.

Informed consent

Informed consent was obtained from all participants included in the study.

Author's contribution

All authors contributed to the study design, data collection, and drafting of the manuscript. All authors read and approved the final version of the manuscript.

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