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Invasive Sinocerebral Aspergillosis with Optic Nerve Involvement in a Young Immunocompetent Female: A Case Report

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ABSTRACT

We report the case of a 39-year-old immunocompetent female who presented with headache, decreased vision in the left eye, and generalized body weakness. Imaging and histopathology confirmed invasive sino-nasal aspergillosis with extension into the anterior skull base, bilateral frontal lobes, and both optic nerve. She underwent functional endoscopic sinus surgery (FESS) and bifrontal decompressive craniectomy with debulking of abscess along with IV antifungal therapy. This case highlights the aggressive nature of fungal infections even in immunocompetent individuals and the importance of early recognition and multidisciplinary management with aggressive antifungal therapy combined with timely surgical intervention in achieving optimal outcomes.

Key Words: *Invasive Aspergillosis, Voriconazole, Fungal Sinusitis, Neuro-ophthalmic Manifestations, Intracranial Fungal Infection*

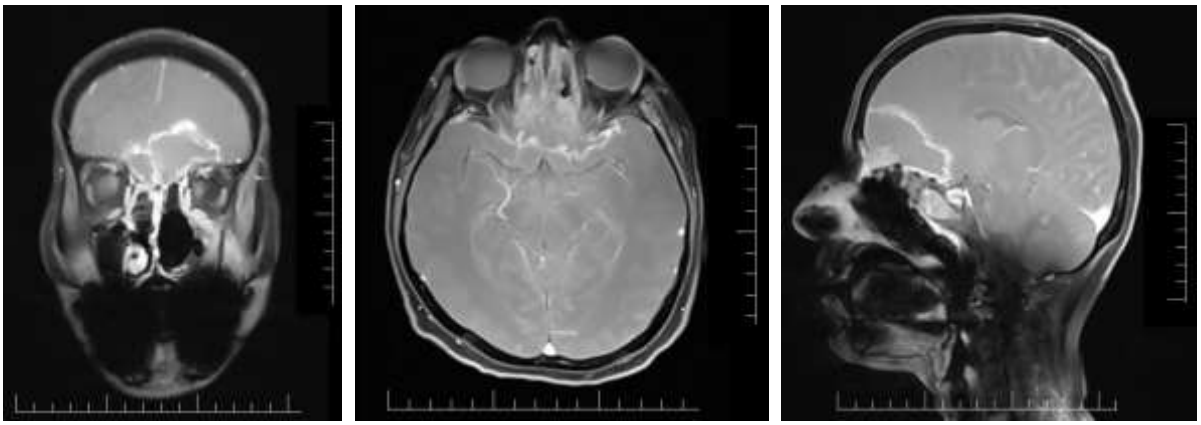
1. INTRODUCTION

Aspergillosis is caused by ubiquitous and saprophytic fungus of *Aspergillus* species, found in soil, decaying vegetation, and indoor environments. The most common human pathogen is *Aspergillus fumigatus*. However, *Aspergillus flavus* and *Aspergillus niger* have been recorded occasionally. (1) These infections can be classified into non-invasive and invasive infections. Risk factors for invasive aspergillosis are Immunocompromised individuals, including those with cancer, transplants, or other immune disorders. Patients with diabetes and HIV are more prone. (2) **Central nervous system (CNS) fungal infections often lead to severe outcomes, largely because they tend to present with vague symptoms, are diagnosed late, and have constrained therapeutic options. (2) Invasive fungal sinusitis** is a severe, life-threatening infection characterized by fungal invasion beyond the mucosal lining into surrounding tissues such as bone, intracranial structures and orbit. (3)

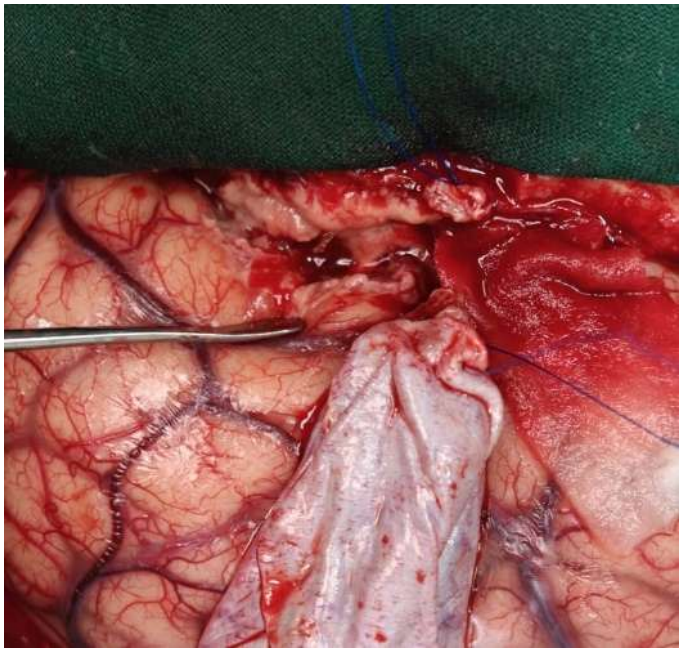
Case Presentation

A 39-year-old female with no significant past medical history presented with a 3-month history of continuous headache, progressive in nature dull aching type with diminution of vision in the left eye which was insidious in onset with no complaints of diplopia or change in vision, accompanied with generalized body weakness. She had undergone Endo-nasal biopsy at a different medical facility; a biopsy was taken revealing Aspergillosis Fungal Infection after which she referred to our hospital. There was no history of co-morbidities, corticosteroid intake, COVID-19 infection or any other significant past medical and surgical history. General Physical Examination was normal with stable vitals. Neurological examination showed normal higher mental functions and lobar functions. On ophthalmic examination, there was reduced visual acuity in the left eye, with findings suggestive of optic nerve involvement. A relative afferent pupillary defect (RAPD) was noted on the swinging flashlight test, indicating impaired optic nerve function. Fundus examination revealed optic disc edema. Colour

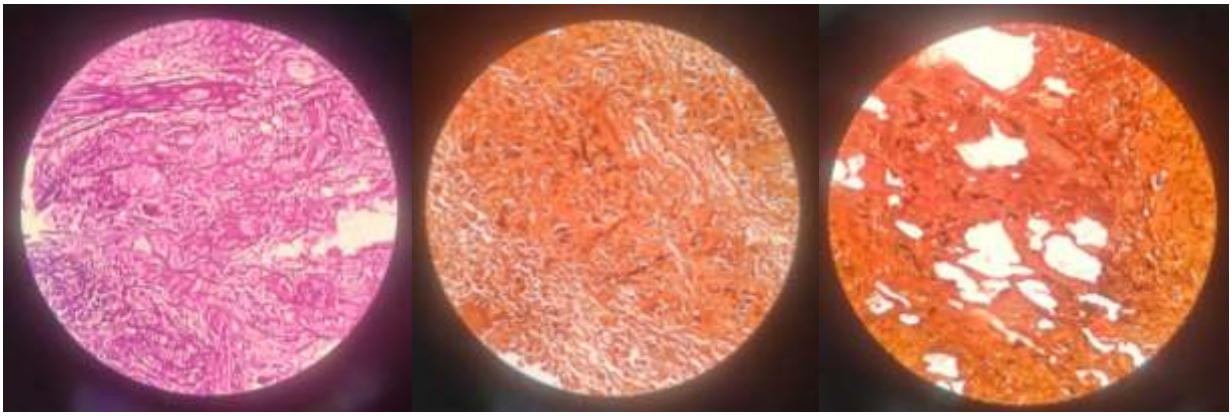
vision was also diminished, and visual field testing showed Altitudinal defect. Intraocular pressure was within normal limits, and the anterior segment was unremarkable. On, Anterior Rhinoscopy, Mucosa was congested, bilaterally black discoloration and foul smelling discharge debris was noted at inferior turbinate and occupying the middle meatus opening. MRI brain revealed heterogeneously enhancing mass lesion involving bilateral maxillary, sphenoidal, ethmoid and left frontal sinuses with anterior skull base erosion, pachymeningeal spread and cerebral abscess formation involving bilateral frontal region; more on left side, with adjacent vasogenic edema resulting in effacement, mass effect and subfalcine herniation to right. Extension of lesion to involve the optic chiasma and intracranial portion of bilateral optic nerves. Findings were consistent with invasive fungal sinonasal infection with fungal cerebral abscess.



Patient underwent bifrontal Decompressive craniectomy with debulking of abscess and functional endoscopic sinus surgery (FESS). Tumour was dark greyish in colour firm-hard in consistency, minimally vascular, distinct from surrounding brain parenchyma.



Sample was sent for histopathology which revealed multinucleated giant cells engulfing fungal hyphae which were are slender, septate with acute angle branching resembling Aspergillus species. The stroma shows chronic inflammatory infiltrate comprising of lymphocytes, and few plasma cells. PAS, GMS stains highlight the fungal elements. Ziehl Neelsen stain for acid fast bacilli was negative.



Patient was started on antifungal therapy with Voricanazole at 6 mg/kg twice daily on day one, followed by 4 mg/kg twice daily thereafter for 4 weeks. Patient's general condition gradually improved and after 6 weeks of surgery left eye vision was improved to 6/6.

2. DISCUSSION

Invasive sinocerebral aspergillosis is an aggressive fungal infection predominantly seen in immunocompromised individuals, particularly those with hematologic malignancies, prolonged neutropenia, or transplant recipients. However, in immunocompetent individuals, occurrence is rare and often leads to delayed diagnosis and treatment. Our case highlights an unusual presentation of Invasive sinocerebral aspergillosis in a young, otherwise healthy female, with rapid progression and optic nerve involvement, underscoring the need for heightened clinical vigilance.

The pathogenesis of Invasive sinocerebral aspergillosis in immunocompetent individuals remains poorly understood but may involve localized disruption of mucosal barriers, environmental exposure to Aspergillus spores, or undetected subtle immunodeficiencies. In our patient, no predisposing systemic immunodeficiency was identified, making this a rare presentation. Similar cases in the literature have proposed local factors such as chronic sinusitis, prior nasal surgeries, or trauma as potential contributors. (4)

The involvement of the optic nerve in Invasive sinocerebral aspergillosis is rare and can mimic other conditions, leading to potential misdiagnosis. Aspergillus species, particularly Aspergillus fumigatus, are opportunistic pathogens that can invade the central nervous system (CNS) through direct extension from the paranasal sinuses or via hematogenous spread. (5)

Diagnostic imaging, such as magnetic resonance imaging (MRI), may show nonspecific findings, including soft tissue masses and bony erosions. However, early-stage infections may not exhibit significant contrast enhancement, complicating the diagnosis. Therefore, a high index of suspicion and early histopathological examination are crucial for accurate diagnosis. (9)

The management of Invasive sinocerebral aspergillosis requires a multimodal approach, including surgical debridement and antifungal therapy. Surgical intervention aims to remove necrotic tissue and reduce fungal burden, while systemic antifungal agents, such as voriconazole, are essential for controlling the infection. In our case, the patient underwent functional endoscopic sinus surgery (FESS) and craniotomy to excise the fungal mass, followed by intravenous voriconazole therapy. (6) (7)

The prognosis of Invasive sinocerebral aspergillosis is generally poor, with mortality rates exceeding 90% in untreated cases. However, early diagnosis and aggressive treatment can improve outcomes. In our patient, timely intervention led to stabilization of the infection and recovery of visual function. Regular follow-up and imaging are essential to monitor for potential recurrence. (8)

3. CONCLUSION

Invasive sinonasal aspergillosis with cerebral abscess and optic nerve involvement is rare in immunocompetent individuals. This case illustrates the importance of early imaging, biopsy, and aggressive surgical and medical intervention. Multidisciplinary collaboration is crucial in improving outcomes in such complex presentations

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