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CASE REPORTOPEN ACCESS

Invasive Sino-Orbital Aspergillosis: A Case Report and Comprehensive Review of Literature

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A B S T R A C T

Invasive aspergillosis of the paranasal sinuses represents a life-threatening opportunistic infection that predominantly affects immunocompromised patients. Despite advances in medical therapy, it remains a significant cause of morbidity and mortality, particularly when orbital involvement occurs. We present a detailed case analysis and comprehensive literature review of invasive sino-orbital aspergillosis, focusing on diagnostic approaches, treatment modalities, and outcome measures. A 62-year-old female with poorly controlled diabetes mellitus presented with right maxillary pain and swelling, complicated by sixth and seventh cranial nerve involvement. Through systematic diagnostic evaluation including radiological imaging, surgical intervention, and histopathological analysis, invasive sino-orbital aspergillosis was confirmed. The patient underwent successful treatment with a combination of intravenous Liposomal Amphotericin B, oral Posaconazole, and surgical debridement via Functional Endoscopic Sinus Surgery (FESS). Following aggressive medical and surgical intervention, the patient achieved complete resolution of infection with no evidence of recurrence during the follow-up period. This case emphasizes the importance of early diagnosis and aggressive treatment in managing invasive sino-orbital aspergillosis.

INTRODUCTION

The genus Aspergillus encompasses ubiquitous saprophytic fungi commonly found in soil and decaying vegetation worldwide [1]. While human exposure to these organisms is frequent through inhalation or ingestion, tissue invasion and disease development remain rare in immunocompetent hosts [2]. The pathogenesis of invasive aspergillosis is primarily linked to compromised immune function, with Aspergillus fumigatus being the predominant pathogenic species in both invasive and non-invasive sinusitis [3]. Recent epidemiological studies have demonstrated a significant increase in the incidence of invasive fungal infections, particularly in immunocompromised populations [4]. This trend correlates with the growing number of patients receiving immunosuppressive therapy, solid organ transplantation, and treatment for hematological malignancies [5].

Invasive fungal sinusitis presents unique diagnostic and therapeutic challenges, particularly when orbital involvement occurs [6]. The disease can manifest in either localized or fulminant forms, with the localized variant typically originating in the sinuses and potentially spreading to adjacent structures through bony erosion or vascular invasion [7]. Orbital involvement significantly worsens the prognosis due to anatomical pathways facilitating intracranial spread through the superior orbital fissure and optic canal [8]. Understanding the pathophysiology has evolved

significantly, with research elucidating multiple virulence factors contributing to tissue invasion, including thermotolerance, adhesins, and various enzyme systems [9, 10].

Case Report

A 62-year-old female presented to our tertiary care facility with a four-day history of right facial pain and swelling. Her medical history was significant for type 2 diabetes mellitus spanning 25 years, with medication discontinued three months prior to presentation. She maintained regular treatment for hypertension with calcium channel blockers. The patient reported progressive right-sided facial pain, periorbital swelling, and decreased visual acuity, along with difficulty in closing her right eye and deviation of her mouth to the left side. No history of trauma, recent dental procedures, or previous sinonasal surgery was reported.

Initial physical examination revealed the patient to be alert, oriented, and afebrile, with stable vital signs including blood pressure of 142/88 mmHg, pulse rate of 82 beats per minute, and respiratory rate of 18 breaths per minute. Facial examination demonstrated diffuse swelling on the right side involving the periorbital and maxillary regions with significant upper lip edema. The overlying skin showed erythema without fluctuation or discharge. Right-sided facial nerve palsy was evident with deviation of the angle of mouth to the left and incomplete right eye closure.

Ophthalmological assessment revealed right eye proptosis, restricted lateral gaze suggesting sixth nerve palsy, and diplopia in lateral gaze. Visual acuity was measured at 6/12 in the right eye and 6/6 in the left eye, with normal pupillary reflexes. Anterior rhinoscopy showed edematous nasal mucosa with minimal crusting in the right nasal cavity, without purulent discharge or tissue necrosis.

Laboratory evaluation demonstrated elevated fasting blood glucose at 286 mg/dL and glycated hemoglobin (HbA1c) of 11.2%. Complete blood count revealed leukocytosis with neutrophilic predominance (13,800/μL), elevated erythrocyte sedimentation rate (68 mm/first hour), and C-reactive protein (42 mg/L). Renal and liver function tests remained within normal limits, and HIV serology was negative.

Computed Tomography (CT) of the paranasal sinuses demonstrated extensive right maxillary sinus opacification with heterogeneous soft tissue density and areas of hyper density. Erosion of posterior and lateral maxillary sinus walls was noted, along with bilateral ethmoid sinusitis predominantly affecting the right side. The scan revealed obstruction of the right osteo-meatal complex and orbital involvement with minimal fat stranding.

Magnetic Resonance Imaging (MRI) with contrast further delineated the extent of disease, showing right maxillary sinus collection with characteristic T2 hypointense areas, dehiscence of posterior-superior and lateral walls, and extension into the infero-lateral extraconal orbital space. Extensive cellulitis was noted in the right cheek, nasal region, and infratemporal fossa, with enhancement of the right orbital apex and minimal intracranial extension. No evidence of cavernous sinus thrombosis was observed.

Following optimization of blood glucose levels and appropriate pre-operative preparation, the patient underwent Functional Endoscopic Sinus Surgery (FESS) under general anesthesia. Intraoperative findings included extensive fungal debris in the right maxillary sinus with mucosal erosion and areas of bone dehiscence. Complete debridement of fungal material was performed, with specimens sent for histopathological examination, fungal culture, and KOH mount. The natural ostium of the maxillary sinus was widened to ensure adequate drainage and ventilation.

Histopathological examination revealed characteristic septate hyphae branching at acute angles, consistent with Aspergillus species. Tissue invasion was evident, with fungal elements penetrating blood vessel walls and surrounding tissue planes. Fungal culture confirmed the presence of Aspergillus fumigatus, susceptible to standard antifungal agents.

Post-operative management included initiation of intravenous Liposomal Amphotericin B at 100 mg/day, gradually increased to 250 mg/day with careful monitoring of renal function and serum electrolytes. Regular wound care and nasal douching were performed to maintain surgical cavity cleanliness. After two weeks of intravenous therapy, with demonstrable clinical improvement and stable renal function, treatment was transitioned to oral Posaconazole with a loading dose of 600 mg followed by a maintenance dose of 300 mg daily.

The patient demonstrated steady improvement in clinical parameters, with resolution of facial swelling and progressive improvement in cranial nerve function. Follow-up imaging at six weeks showed significant reduction in mucosal inflammation and no evidence of residual fungal disease. The patient completed a total of twelve weeks of antifungal therapy, with regular monitoring of therapeutic drug levels and organ function.

DISCUSSION

Invasive sino-orbital aspergillosis represents a significant therapeutic challenge, particularly in immunocompromised hosts [11]. The present case illustrates several key aspects of disease presentation, diagnosis, and management that warrant detailed discussion. The patient's poorly controlled diabetes mellitus represents a well-documented risk factor for invasive fungal infection, highlighting the importance of metabolic control in disease prevention and management [12].

The rapid progression of disease in our patient, from initial symptoms to cranial nerve involvement, underscores the aggressive nature of invasive aspergillosis and the importance of early recognition and intervention [13]. The combination of maxillary sinusitis with orbital extension represents a particularly concerning pattern, as orbital involvement significantly increases the risk of intracranial spread and adverse outcomes [14]. The presence of both sixth and seventh cranial nerve palsies in our patient indicated extensive local spread, likely through perineural invasion, a characteristic feature of invasive fungal disease [15].

Our diagnostic approach combined conventional imaging with surgical exploration and microbiological confirmation, representing the current standard of care in managing invasive fungal sinusitis [16]. The radiological findings of heterogeneous sinus opacification with areas of bony erosion are typical of invasive fungal disease, though not pathognomonic [17]. Magnetic resonance imaging proved particularly valuable in delineating orbital and intracranial extension, essential for surgical planning and prognostication [18].

The therapeutic strategy employed in our case followed current guidelines emphasizing the importance of combining surgical debridement with systemic antifungal therapy [19]. The choice of Liposomal Amphotericin B as initial therapy reflects its established role as first-line treatment for invasive aspergillosis, while the transition to oral Posaconazole represents a contemporary approach to step-down therapy [20]. The successful outcome in our patient supports the efficacy of this protocol when combined with aggressive surgical debridement and careful monitoring [21].

Regular clinical and radiological follow-up proved essential in confirming disease resolution and ensuring the adequacy of treatment duration. The improvement in cranial nerve function during treatment served as a valuable clinical marker of therapeutic response [22]. The absence of recurrence during follow-up suggests that adequate source control was achieved through the combination of surgical and medical management [23].

CONCLUSION

This case illustrates the successful management of invasive sino-orbital aspergillosis through a comprehensive approach combining surgical debridement, appropriate antifungal therapy, and careful monitoring of the underlying medical condition. Early recognition of disease, prompt initiation of therapy, and regular follow-up represent key factors in achieving favorable outcomes. The experience gained from this case adds to the growing body of evidence supporting aggressive multi-modal treatment for invasive fungal sinusitis.

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