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Case Report

# Aspergilloma as a Skull Base Tumor: A Case Report

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## ABSTRACT

**Background:** Aspergillosis is a fungus-related health problem that may include allergic reactions like allergic bronchopulmonary aspergillosis, which presents as upper and lower airway disease or chronic and invasive forms of fungal infection.

**Case Presentation:** Here, we report a young woman with a history of poorly controlled asthma. She was primarily diagnosed with a skull base tumor due to the left eye proptosis and soft tissue mass involving the orbit and skull base, with intracranial extension. The diagnosis of aspergillosis was confirmed after tissue sampling, and the patient was successfully managed with an oral anti-fungal agent.

**Conclusion:** Aspergillosis could be a differential diagnosis in the patients presenting with skull base tumor and a positive history of allergic asthma.

**Keywords:** Skull base neoplasm, Skull base, Allergic bronchopulmonary aspergillosis, Bronchiectasis, Asthma

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## Highlights

- Aspergillus infection can present as a tumor mimicking lesion.
- Special consideration of pulmonary presentations is a guide to early diagnosis.
- Histopathologic investigation is needed to rule out malignancies.
- Treatment is mainly medical, unless complications such as CNS abscess formation.

## Introduction

Aspergillosis is a fungus-related health problem that may cause allergic reactions and chronic and invasive forms of infection. Allergic bronchopulmonary aspergillosis (ABPA) is a hypersensitivity reaction to Aspergillus fumigatus antigens. Its prevalence is 1-5% in asthmatic and 2-15% in cystic fibrosis (CF) patients. Diagnosis should be considered in patients with poorly controlled or CF-associated asthma and multiple asthma exacerbations [1].

Radiological manifestations and histopathological features raise suspicion, although detecting fungus material in the smear of sinonasal specimens or positive mycological cultures are crucial diagnostic criteria. The other characteristics are increased total serum IgE and peripheral blood eosinophilia [2].

The treatment strategies aim to control asthma, prevent irreversible pulmonary consequences, and subside inflammation. Oral corticosteroid is the mainstay, along with anti-fungal medication, to reduce the fungal load in the respiratory tract. Although most patients achieve disease control, relapse occurs in about half of them [1].

Here, we present a patient who was noticed for a skull base tumor, an extremely rare disease presentation.

## Case Presentation

A 35-year-old woman was referred to our tertiary referral hospital in Tehran City, Iran, in January 2023 with a skull base tumor. She had presented with severe left eye proptosis and displacement of the eye globe to inferolateral since last year, which was insidiously progressing. She declared a history of asthma from childhood that was poorly controlled, although she seemed compliant with medical treatment. She had a history of intermittent oral corticosteroid use to manage asthma exacerbations in the past year. By the time of surgery, she was consuming steroid inhalers. On magnetic resonance imaging (MRI), a large soft tissue mass filled up the left ethmoid and sphenoid sinus cavities with extensive extension into the intracranial cavity and left orbit. There was also remarkable edema in the surrounding left hemisphere of the brain, with little shift from the midline to the right due to brain edema and limited central necrosis (Figure 1). A computed tomography (CT) scan showed bone erosion in the skull base and lamina papyracea (Figure 2).

She was scheduled to take a deep biopsy under general anesthesia. She was completely conscious without any respiratory distress, but coarse crackles and diffused wheeze on lung auscultation were detected on pre-operative physical examination. Visual acuity was symmetric and normal, and mild optic nerve inflammation was found in fundoscopy. Peripheral blood eosinophilia (>1000 cells/μL) and a high serum Ig-E level (1436 IU/mL) were detected. A severe obstructive pattern was noticed in the pulmonary function test despite her medical treatment for asthma (FEV1:30%, FVC:37%, FEV1/FVC:71%). In the venous blood gas (VBG) test, pH was 7.42, and $O_2$ saturation in the air room was 96%. As a result, a chest HRCT scan was performed. It revealed diffused bronchiectasis, multiple bronchoceles on both lungs, predominantly in the central regions of upper segments, and the so-called 'Tree- in–bud' pattern (Figure 3).

A biopsy of the skull base tumor was conducted through an endoscopic endonasal approach and considerations due to her lung and brain circumstances. Surprisingly, the histopathologic evaluation of the sinus, skull base and orbital mass favored aspergillosis. Fungal elements were observed in sinonasal tissue and the culture was positive for Aspergillus fumigatus. Oral anti-fungal medication was added to systemic corticosteroid after the diagnosis was confirmed, and she received itraconazole for 7 months while liver function tests were monitored. Oral corticoste-

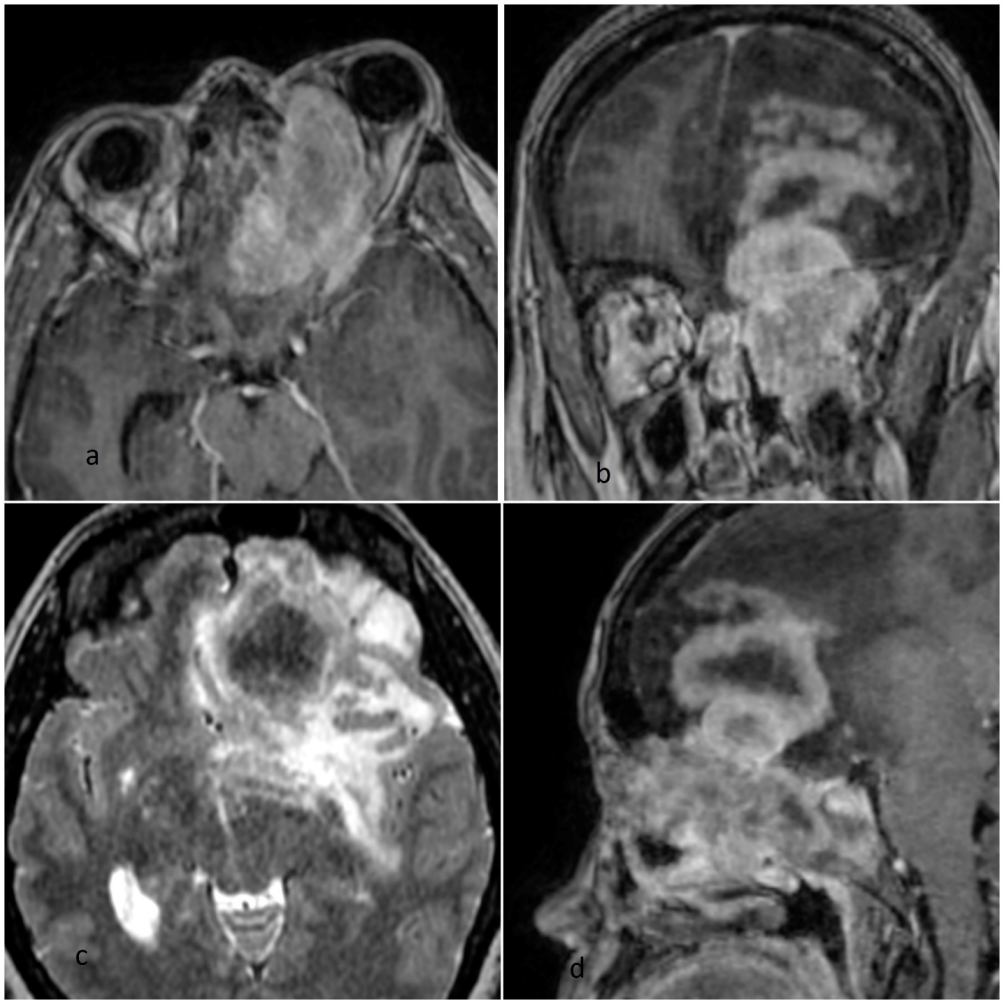


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**Figure 1.** MRI of the patient showing the skull base mass; a) Axial, b) Coronal view, T1 Weighted MRI; c) Axial view, T2 weighted; d) Sagittal view

roid was discontinued after the first month of treatment. After one year of follow-up, she had been recovered from headaches, proptosis, and diplopia. There was no need to perform surgeries for disease management.

## Discussion

Aspergillus-related diseases do not show gender or specific age group tendency. Rarely, it may be asymptomatic, but the main clinical presentation is asthma. Additionally, allergic aspergillus sinusitis is reported in some patients as a spectrum of hypersensitivity reactions to fungal antigens [2, 3]. Clinical features such as a mass-like lesion and cerebral involvement are extremely rare. Despite rare reports of brain abscesses following sinusitis and lung masses, orbital or brain mass presentation is even more scarce. In a large retrospective study in China, of 232 ABPA patients, 132 were misdiagnosed [4].

Mahmoud et al. reported a patient with undiagnosed asthma who presented with bilateral soft tissue tumors, primarily assessed as lung tumors. In histopathologic evaluation, aspergillosis was confirmed. The lesions resolved quickly after initiation of corticosteroid therapy [5]. In 1993, a case of non-responsive asthma and ABPA revealed signs of disseminated aspergillosis and grand mal seizure following oral corticosteroid therapy. The patient was diagnosed with a brain abscess following imaging studies that were related to aspergillus infection based on pathologic assessment. Neurologic deficits improved after performing a craniotomy for drainage of a large brain abscess and receiving amphotericin B, except for some memory loss [6].

There have been case reports of brain abscess as a complication in patients with ABPA sinusitis treated with surgical drainage and systemic anti-fungal thera-

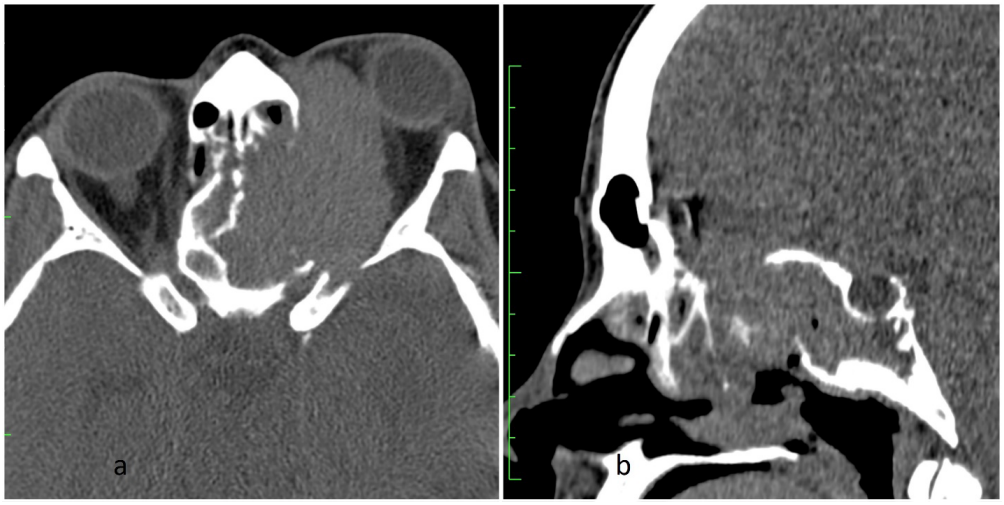


**Figure 2.** a) Axial, b; Sagittal CT scan



py. Although unsuccessful in some patients, which has ended in mortality, oral corticosteroid therapy has been proposed as a risk factor for disseminated ABPA [7, 8].

It has been noted that combined corticosteroid and antifungal therapy delay the time of acute asthma exacerbation compared to glucocorticoid alone [4]. Besides basic treatment methods, some adjuvant therapies, including oral corticosteroids and anti-fungal medications, are also recommended. The cochrane database systematic review recommends prophylactic antibiotics for 14 days, intermittently, in adult patients who frequently experience pulmonary infections [9].

Additionally, immunotherapy with monoclonal antibodies is offered, and omalizumab has been studied the most, a monoclonal antibody targeting serum Ig E because aspergillus-related diseases are Ig E-mediated diseases; moreover, its safety profile has been documented. Based on the results of systematic reviews and meta-analyses, omalizumab efficiently controls asthma exacerbations and reduces the need for oral corticosteroids [10]. On the other hand, nebulizing amphotericin B was ineffective maintenance therapy [11].

These treatment options may also be effective and proposed for central nervous system infections, or at least for decreasing the load of the fungal elements in the airway tract and reducing the risk of severe disease features in susceptible patients. However, the data is limited due to the rarity of the skull base and intracranial lesions.

It is worth considering aspergillosis as a possible diagnosis in patients with a history of difficult-to-control asthma, who also present with symptoms such as sinonasal, brain, or skull base tumors.

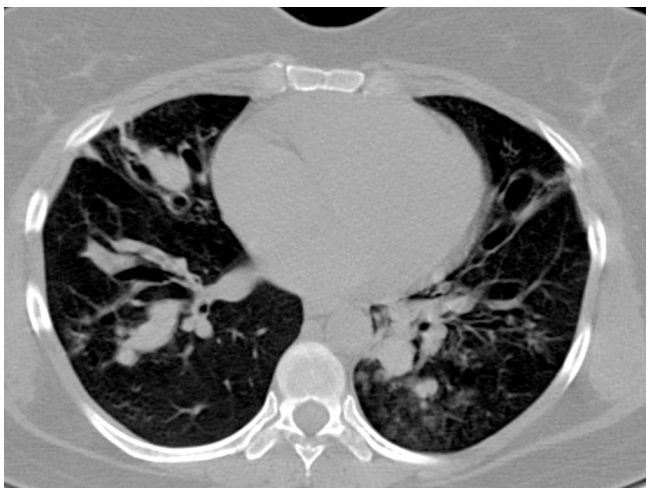

**Figure 3.** Chest high-resolution CT scan of the patient revealing bilateral bronchiectasis and mucus plugs

## Conclusion:

Aspergillus infection of the skull base can present as sino-orbito-cerebral tumor mimicking lesions. High level of suspicion, regarding related pulmonary manifestations are helpful for diagnosis, that is needed for initiation of essential medical treatment.

## Ethical Considerations

### Compliance with ethical guidelines

This study was approved by the Ethics Committee of Tehran University of Medical Sciences, Tehran, Iran. (Code: IR.TUMS.IKHC.REC.1403.310).

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### Authors contributions

Conceptualization: Sevil Nasirmohtaram; Investigation: Sevil Nasirmohtaram, Azin Tabari and Mohammadreza Salehi; Writing the original draft: Azin Tabari and Sevil Nasirmohtaram; Writing, review, and editing: Mehdi Zeinalizadeh and Seyed Musa Sadr Hosseini; Supervision: Seyed Musa Sadr Hosseini and Mehdi Zeinalizadeh; Resources: All authors.

### Conflict of interest

All authors declared no conflict of interest.

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