

## A Case of Allergic Fungal Sinusitis Due to *Alternaria alternata*

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### Abstract

**Introduction:** Allergic fungal sinusitis may be seen in 10% of patients with chronic rhinosinusitis and polyposis. The disease caused due to allergic reaction to aerosolized environmental conidia of fungi. It is most prevalent in young adults. Diagnostic criteria for AFS contain findings at surgery of allergic mucin, radiologic evidence of pansinusitis, positive fungal cultures and immunological tests for both cellular and humoral immune responses. Various fungi such as hyaline fungi, yeasts, and dematiaceous fungi have been involved in allergic fungal sinusitis.

**Case:** Herein, we present a case of AFS in a 36-year old female due to a rare dematiaceous fungus. She had bilateral nasal congestion and antrochoanal polyps. After bilateral nasal polyp surgery (BNPS), clinical samples were sent to the medical mycology laboratory in serum saline for direct microscopic examination and culture. ITS1-5.8S-ITS2 region was amplified using universal fungal primers ITS1 and ITS4, and the amplicon was applied for sequencing. Sequence analysis was used to confirm phenotypic findings and *Alternaria alternata* was identified as causative agent of AFS.

**Conclusion:** Molecular techniques can be used as an effective tool for identification of microorganisms in clinical specimens that provide a precise presentation of the epidemiology of microorganisms and effective control of rare fungal infections.

**Keywords** Allergic fungal sinusitis; *Alternaria alternata*; Dematiaceous fungi

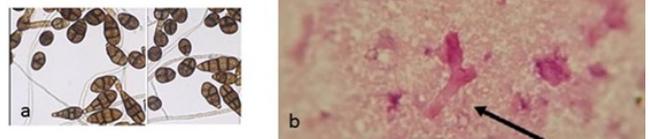
### Introduction

In recent decades, allergic fungal sinusitis (AFS) is rising among vulnerable population. The disease caused due to allergic reaction to aerosolized environmental conidia of fungi, containing *phaeohyphomycet* species. The infecting fungi are ubiquitous and cause an allergic reaction which results in sticky mucus, thick fungal debris, and blockage of the infected sinus. Patients with AFS may have allergies, asthma and nasal polyps. Clinical signs present with various symptoms including facial deformity, diplopia, nasal congestion, osteolytic impairment, and entanglement of the skull base. Untreated cases may lead to displacement of the eyeball and vision loss [1]. Different categories of fungal agents such as hyaline fungi, yeasts, and dematiaceous fungi (*phaeohyphomycetes*) have been involved in allergic fungal sinusitis. Here we report a case of AFS in a 36-year old female due to a rare dematiaceous fungus.

### Case

A 36-year old housekeeper woman was admitted to Kashani hospital, Isfahan, Iran, regarding 6-months intensive and prolonged headaches. She had bilateral nasal congestion and antrochoanal polyps (ACP) however she did not have any predisposing factors. During this period, ibuprofen and antihistamine was prescribed for her. After six-month, loss of smell (anosmia) was appeared, and she underwent

bilateral nasal polyp surgery (BNPS). Clinical samples were sent to the medical mycology laboratory in serum saline for direct microscopic examination and culture. Potassium hydroxide 20% and Sabouraud Dextrose Agar (SDA) with chloramphenicol (BD, USA) were used for direct microscopic examination and culture, respectively. Periodic acid-Schiff (PAS) (Sigma-Aldrich, USA) was applied for histopathological staining. After phenotypic tests, *Alternaria spp.* was detected as the etiologic agent of infection (Figure 1).



**Figure 1:** (a) Typical multicellular conidia (dictyoconidia) produced sympodially from simple, or sometimes branched, short or elongate conidiophores, (b) dark and septate hyphae in PAS staining.

Genomic DNA of microorganism was extracted and applied for cycle sequencing reactions in forward direction (Bioneer, Korea). ITS1-5.8S-ITS2 region was amplified using universal fungal primers ITS1 (5'-TCCGTAGGT-GAACCTGCGG-3') and ITS4(5'-TCCTCCGCTTATTGATATGC-3') (Sina Gene, Iran) [2], and the amplicon was applied for sequencing. Sequence result was evaluated using of NCBI BLAST searches against fungal sequences existing in

DNA databases (<http://www.blast.ncbi.nlm.nih.gov/Blast.cgi>). Molecular tests confirmed phenotypic results and *Alternaria alternata* was identified as causative agent of AFS.

## Discussion

For many years, fungal sinusitis was considered as rare disease however it is now being reported with expanding frequency throughout the world. Allergic fungal sinusitis is characterized by tissue edema, inflammation resulting in chronic rhinosinusitis, and sometimes polyposis. AFS may be seen in 10% of patients with chronic rhinosinusitis and polyposis. It is most prevalent in young adults [3]. Complications of AFS include cerebral and ophthalmic complications due to the entry of allergic mucin into the cranium or orbit causing visual changes, dystopia, and decreased central acuity due to compressive optic neuropathy, cavernous venous thrombosis, and proptosis [4]. Diagnostic criteria for AFS contain findings at surgery of allergic mucin, radiologic evidence of pansinusitis, positive fungal cultures and immunological tests for both cellular and humoral immune responses [5].

Since in some types of fungal sinusitis organisms invade the tissue but AFS is characterized by having no histologic invasion by the fungi. *Aspergillus* species and phaeohyphomycetes including *Curvularia spp.*, *Alternaria spp.*, and *Bipolaris spp.*, can cause hypersensitivity and may play a critical role in chronic allergic sinusitis [6]. *Alternaria* fungal sinusitis cannot be seen regularly in the reports, particularly in immunocompetent patients however in this present study, we showed this fungus as the etiologic agent of AFS in a patient with no predisposing factors. Pesic et al. [7] described the case of immunocompetent woman who suffered of nasal congestion for 10 years. With microscopically morphological characteristics of isolated fungi and ITS-sequencing, *Alternaria alternata* was identified as causative agent of AFS.

The *Alternaria* genus is saprophytic soil and air borne molds that is described as an important cause of fungal sinusitis, allergic, eosinophilic pneumonia and has been reported to be a major allergen associated with the development of asthma in children [8]. Mohammadi et al. [9] isolated *Alternaria malorum* in a diabetic patient with nasal congestion that underwent maxillary and ethmoid sinuses surgery. Treatment will typically include surgery, sinus irrigation with saline, use of systemic antihistamines, and intranasal or systemic corticosteroids as we performed for the patient in this study. Clinical manifestations of this disease may be similar to the infectious sinusitis because of sinus pressure, pain, and purulent drainages [10].

Patients with AFS may suffer from brown to black material discharged from the nose but the patient in our case report had no any black material discharge from her nose. Among AFS patients, pain is a rare symptom however, our patient complained of facial pain and prolonged headache. Detection of fungal elements is complicated on hematoxylin and eosin staining (H&E) and may be seen with PAS and Gomori methenamine silver. In the present study, we stained clinical samples with PAS, and fungal hyphae were diagnosed clearly (Figure 1b).

## Conclusion

Molecular techniques can be used as an effective tool for identification of microorganisms in clinical specimens that provide a precise presentation of the epidemiology of microorganisms and effective control of rare fungal infections.

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