

Fungi as Causative Agent of Nasal Polyps

*P Kordbacheh¹, F Zaini¹, A Sabokbar¹, H Borghei², M Safara¹

¹Dept. of Medical Parasitology and Mycology, School of Public Health, Tehran University of Medical Sciences, Iran

² Amir Alam Hospital, Tehran University of Medical Sciences, Iran.

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Abstract

Nasal polyposis is an inflammatory condition of unknown etiology that involves nasal and sinus mucous membrane. These polyps can impair a person's quality of life by nasal obstruction, recurrent sinusitis, persistent postnasal drainage, hyposmia, anosmia, changes in sense of taste and even bony destruction. It has been shown that chronic inflammation causes a reactive hyperplasia of the intranasal mucosal membrane which results in the formation of polyps. Recently, fungal elements were suspected to be the causative agent of chronic rhinosinusitis and a fungal etiology has been proposed to underlie severe nasal polyposis. The present study was undertaken to determine the role of fungi in development of nasal polyps. In this study resected polyps from 100 patients were examined by mycological and pathological methods for the presence of fungi. Fungal elements were shown in 9 samples by mycological methods and isolated fungi were *Aspergillus flavus*, *Aspergillus fumigatus* and *Rhizopus* sp. Tissue invasion by fungi also was seen by histopathological examination in 6 patients. Therefore, fungi could be considered as the causative factor in the development of nasal polyposis in those patients and since medical treatment of nasal polyps have become increasingly recognized in recent years, the present study also implying the benefits of topical antifungal therapy in such cases.

Keywords: Nasal polyps, Rhinosinusitis, Allergy, Fungi, Iran

Introduction

Nasal polyps are the most common tumors of the nasal cavity that resulted from chronic inflammation of the nasal and sinus mucous membranes. People who suffer from the nasal and sinus polyps are frequently very uncomfortable. Because these polyps may block nasal airways and create breathing difficulties or inhibit proper drainage of the sinus cavities, creating stagnant secretion and lead to sinusitis. Nasal obstruction due to polyps can also lead to hyposmia or even anosmia and with increased growth, by exerting pressure on bones, polyps may cause destruction of nasal and other facial bones and there may be orbital and intracranial complications(1).

Although nasal polyps are common and affect

1-4% of population but their cause remains unknown. There is, however some preliminary evidence to suggest that a local allergic process could be the cause of these polyps (2). But viral, bacterial and fungal infections and even environmental pollution have all suggested as possible causes of inflammation and developing nasal polyposis (3-6). Recent studies have suggested that fungal rhino-sinusitis could be involved in the development of nasal polyps and fungi had been proposed to underlie severe nasal polyposis (7, 8).

In the present study resected polyps from the patients with nasal polyposis were studied by mycological and histopathological methods to determine the role of fungi in developing nasal polyps.

Materials and Methods

Resected polyps from 100 patients with nasal polyposis were studied for the presence of fungi in Dept. of Medical Parasitology and Mycology, School of Public Health, Tehran University of Medical Sciences, Iran. All specimens were examined by direct microscopy after treatment of a preparation with potassium hydroxide (KOH), methylen blue, Gram and Giemsa stains. A portion of each sample was inoculated on sabouraud, sabouraud with chloramphenicol and brain heart infusion agar media and incubated at 25 and 37 °C. Hematoxylin and eosin (H&E), Gomori methenamine silver (GMS) and Periodic Acid Schiff (PAS) stains were applied to the sections of tissue samples in this study and were examined for presence of fungal elements. Slide culture also was used for identification of fungi grown on the culture media.

Results

From 100 patients, with a mean age of 41 years (ranging from 11-71 y), 65 were male and 35 were female. The patients had history of chronic rhinosinusitis, asthma and previous sinus or polyp surgeries. Direct microscopic examination of the specimens in this study, showed branched septate (n=8) and aseptate (n=1) hyphae in 9 cases (Fig. 1, 2). Mycological culture of the samples yielded pure growth of fungi in the above mentioned cases and the most commonly isolated fungi was *Aspergillus flavus* (n=7) followed by *Aspergillus fumigatus* (n=1) and *Rhizopus* sp. (n=1). Histopathological examination of these specimens also revealed soft tissue invasion by fungal elements in 6 cases. Dichotomous branching hyphae (n=5) and broad branched aseptate hyphae (n=1) were seen in tissue sections (Fig. 3, 4).



Fig. 1: *Aspergillus* hyphae in KOH preparation from nasal polyp

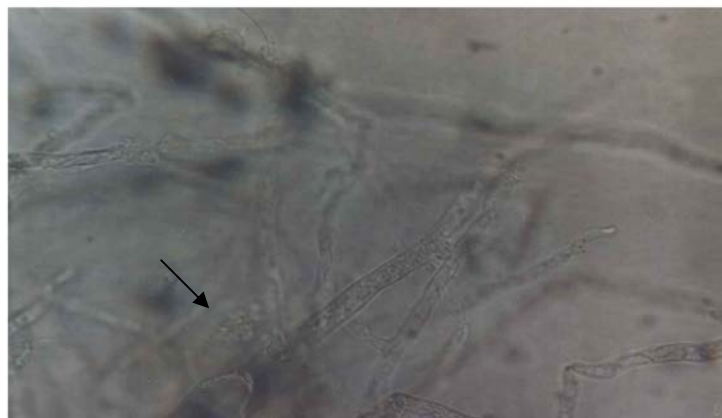


Fig. 2: *Rhizopus* hyphae in KOH preparation from nasal polyp

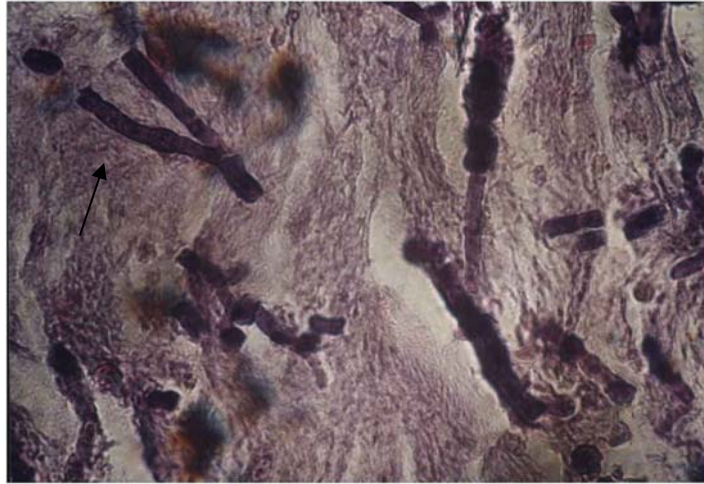


Fig. 3: Dichotomous hyphae of *Aspergillus flavus* in nasal polyp section (GMS, X1000).

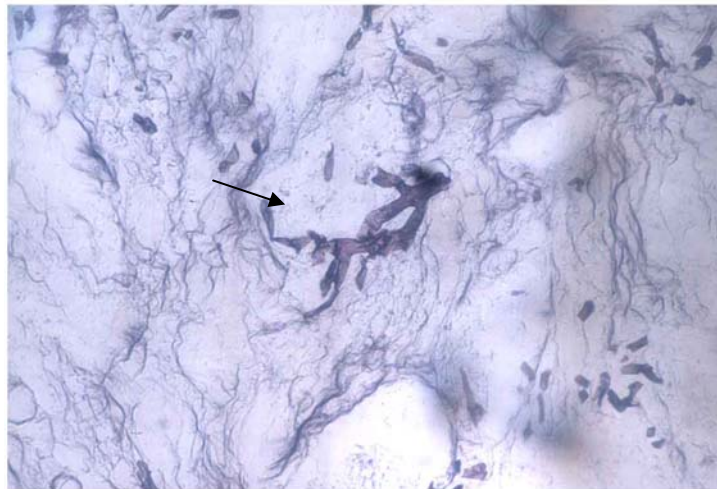


Fig. 4: Broad aseptate hyphae of *Rhizopus* sp. in nasal polyp section (GMS, X1000).

Discussion

Nasal polyps are the most common tumors of the nasal cavity and affecting 1-4 percent of the population. Although morbidity from the nasal polyps is directly related to their location and size, people who suffer from the polyps are frequently very uncomfortable and there may be intranasal, orbital and even intracranial complications. Causative agents of nasal polyps, however, remain unknown and even it is not the same in all patients. Most theories consider polyps to be ultimate manifestation of chronic inflammation. Therefore, conditions leading to

chronic inflammation in the nasal cavity can lead to nasal polyps (2, 9).

Fungal elements usually are regarded frequent innocent bystanders in cultures obtained from the respiratory tract in immunocompetent hosts. But allergic fungal rhinosinusitis is a well defined entity of chronic rhinosinusitis (CRS) and is regarded as an IgE-mediated hypersensitivity to fungal colonization of the paranasal sinus mucosa and it could be involved in the development of nasal polyposis. Recently a fungus-mediated process also has been postulated as the primary cause of CRS with or without pol-

yps. According to this concept, inhaled fungal elements become entrapped in the sinunasal mucus causing eosinophils to shift from respiratory mucosa into the lumen by an unknown mechanism. Eosinophils then cluster around and attack the fungal elements. During this process, they release toxic mediators resulting in secondary inflammation (10-16). Although the ubiquitous nature of fungal spores makes the role of fungal infection as cause or effect in nasal polyps difficult to determine, but recent studies show that these polyps may also be caused by fungal infection of the sinunasal mucosa (2-6,17). Therefore, nasal polyp formation and growth may be initiated by both fungal infectious and noninfectious inflammation. Since the management of nasal polyps should be based on causative factors, fungal eradication should improve the course of disease if fungal elements are the main cause of the CRS and nasal polyposis (8, 10).

In the present study we found fungi in the 9 percent of patients by mycological methods. Histopathological examination of the samples also revealed tissue invasion by the fungal elements in 6 percent of patients. The patients had a history of allergic rhinitis, chronic sinusitis, asthma and previous sinus and polyp surgeries. By these finding it could be considered that both fungal infection and a local allergic process to fungal colonization of sinunasal mucosa had effect in the nasal polyp formation in our patients. But in similar studies by standard cultures of the nasal mucosa fungi have been found between 5 to 95 percent in patients with CRS and tissue invasion by fungal elements was relatively uncommon mode of presentation of fungi as causative nasal polyps (1, 8). This may be due to the method of study and collecting specimens by nasal swabs or nasal lavages and because most of the cultivated fungi were environmental fungi so that possible contamination effects are not excluded. In this study *Aspergillus* spp. were the most common isolated fungi from the nasal polyps whereas in some other studies they had been isolated infre-

quently (12). This finding could be related to the environmental factors and effects of geographic differences in detection of fungal species from the nasal mucosa.

However, further studies will be needed to determine the precise role of fungi in development of nasal polyps and benefits of antifungal therapy in the patients with nasal polyposis.

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