

THE PREVALENCE OF FUNGAL INFECTIONS IN NASAL POLYPOSIS

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Abstract- For many years, it was thought that nasal polyps are small tumors of the nasal or sinus mucosa. However, it is now believed that nasal polyps are formed as a result of frequent local swelling of nasal or sinus mucosa, which enlarge by increasing sub-mucosal edema and then expose to the air pipe and cause some symptoms. However, the main cause of polyp formation is not exactly understood. The prevalence of disease is 1-4% of population. With increasing use of antibiotics, many fungi both saprophytes and pathogens are appeared in many diseases. We also cannot rule out the importance of fungal infections in large cities because of air pollution. In this study, attempts were made to investigate prevalence of fungal infections in nasal polyposis, and suggest suitable treatment in addition to the routine one. During 7 months, polyp samples from patients with nasal polyposis were collected. From the total amount of samples (50), both direct test with 10% KOH and culture with Sabouraud's dextrose agar were performed. In direct test, 42% of samples were positive for fungus. 34% of samples showed fungal colonization in culture, which include 30% *Aspergillus flavus* and 4% *Aspergillus fumigatus*. However, none of invasive fungi were found in pathological lamella. Regarding to our results, it seems the high prevalence of fungal colonization in nasal polyposis may explain etiological factors, reasons of growth, increasing in numbers, and frequent recurrence of nasal polyps to some extent.

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Acta Medica Iranica, 45 (1): 46-50; 2007

Key words: Nasal polyposis, fungi, *Aspergillus flavus*

INTRODUCTION

Nasal polyposis is a chronic inflammatory disease of the mucous membrane in the nose and paranasal sinuses presenting as pedunculated smooth, gelatinous, semitranslucent, round or pear shaped masses of inflamed mucosa prolapsing into the nose (1).

In the general population the overall prevalence rate of nasal polyposis ranges from 1-4%. It is more common in adults than in children under 10 years of age (2, 3). The underlying mechanisms of nasal polyposis are still largely unknown. Several hypotheses have been put forward including chronic infection, aspirin intolerance, alteration in aerodynamics with trapping of pollutants, epithelial disruptions, epithelial cell defects/ gene deletions (CFTR gene in cystic fibrosis), inhalant or food allergies (1). Diagnosis can be made by history, clinical examination, radiography, nasal endoscopy and additional tests for allergy, aspirin sensitivity,

Received: 7 Jan. 2006, Revised: 24 May 2006, Accepted: 27 May 2006

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bacteriology, and pulmonary function tests (1, 4). Primary symptoms of nasal polyposis are nasal blockage, congestion, hyposmia or anosmia and if associated with chronic sinusitis a purulent nasal discharge. Secondary symptoms comprise post nasal drip, rhinorrhea, facial pain, headache, sleep disturbance and lowered quality of life (5).

Nowadays over 300000 species of fungus are found in the world, which 200 of them are the reason of infections in human-being. These pathogens vary from dermatophytes with nonspecific shapes to organisms which threatening systemic fungal infections. During past 50 years variation of diseases & their treatments have increased the importance of fungal infections specially saprophytes (6). Fungi are found mainly in air, dust, soil, plants, and decaying organic matter. They adhere to dust particles and are inhaled and deposited on the nasal and paranasal sinus mucosa. The warm, moist environment of the upper respiratory tract is an ideal environment for the proliferation of these organisms (7, 8). However, they are rarely pathogenic because host resistance is high except under favorable growth conditions in highly susceptible individuals. According to Corey JP research, persistence of allergic fungal sinusitis with recurrence of sinonasal symptoms (with or without polyposis) is common, particularly when there has been incomplete eradication of allergic fungal mucin. Even when the patient is clinically disease free, recurrence can occur, presumably from reexposure to fungal antigens. Therefore close clinical, endoscopic, and radiographic follow-up is important (9).

Regarding the prevalence of fungal infections in nasal polyposis, it seems finding the etiology, increasing in number and frequent recurrence of polyps can be explained.

MATERIALS AND METHODS

During 7 months, polyp samples from patients with nasal polyposis were collected from ENT ward at Imam and Amir-Alam Hospital. After polypectomy by surgery, samples were divided into two parts under sterile process in operation room. We put one part in sterile normal saline and the other in formalin then we took them to the fungus laboratory of Health Faculty of Tehran University. From the total amount of samples (fifty), direct microscopy of mucus and polyps with 10% KOH, Fungus culture of the nasal polyps in Sabouraud's dextrose agar and pathology were performed. In microscopic features of various *Aspergillus* species Hyphae are septate and hyaline. The conidiophores originate from the basal foot cell located on the supporting hyphae and terminate in a vesicle at the apex. Vesicle is the typical formation for the genus *Aspergillus*. Conidiophore of *Aspergillus flavus* is Colorless, rough and its Vesicle is Round, radiate head. Conidiophore of *Aspergillus fumigatus* is short (< 300 µm), smooth, colorless or greenish and its vesicle is round, columnar head. The color of the colony in *Aspergillus flavus* on the surface is yellow-green and on reverse side of plate is golden to red brown. *Aspergillus fumigatus* is blue-green to gray on surface and white to tan on reverse (10).

RESULTS

From the total amount of samples (fifty); 21 samples in direct smear (42%) and 17 samples in culture (34%) were positive for fungus which all of the fungi were aspergillus (Table 1). But, no fungi were found in pathological lamella.

Table 1. The prevalence of fungus in culture of nasal polyps

Fungus	Positive		Negative		Total	
	N	P	N	P	N	P
<i>Asp flavus</i>	15	30	35	70	50	100
<i>Asp fumigatus</i>	2	4	48	86	50	100

Abbreviations: N, number; P, percent.

The prevalence of fungal infections in nasal polyposis



Fig. 1. Microscopic view of *Aspergillus flavus*.



Fig. 2. Macroscopic view of *Aspergillus flavus*.

The most fungi which appears in smear and culture was *Aspergillus flavus* which is a saprophyte (Fig. 1, 2). There was a specific relation between direct test and culture in diagnosis of fungus in nasal polyposis (Table 2).

Of total samples, 30% were positive for *Aspergillus flavus* and 4% of samples were *Aspergillus fumigatus* in culture. The mean age of patients with positive fungal culture was 37 years old (Table 2).

There was not any significant difference between men and women in prevalence of fungal colonization in nasal polyposis (Table 2). The businessman patients had the most fungal nasal polyposis.

Most of women were housekeepers. Stuffs, retired people, students had less fungi from the above. At least 1 risk factor was found in the history of all of the patients with positive culture (allergy, previous surgery and chronic sinusitis).

Table 2. Relation between positive fungal culture and smear of nasal polyps, age and sex

	Positive		Negative		Total	
	N	P	N	P	N	P
Smear						
Positive	17	80.95	4	19.05	21	100
Negative	0	0.00	29	100	29	100
Total	17	34	33	66	50	100
Age						
10-19	2	28.54	5	71.46	7	100
20-29	3	33.33	6	66.67	9	100
30-39	5	41.66	7	58.34	12	100
40-49	4	40.00	6	60	10	100
50-59	1	20	4	80	5	100
90	2	28.57	5	71.43	7	100
Total	17	34	33	66	50	100
Sex						
Male	12	35.29	22	64.71	34	100
Female	5	31.25	11	68.75	16	100
Total	17	34	33	66	50	100

Abbreviations: N, number; P, percent.

DISCUSSION

It is important to remember that there is no single etiological factor that is responsible for the development of nasal polyposis, but that inflammation still remains to be the central major factor in all nasal polyps. Allergy, viral infection, bacterial infection, fungal infection, and environmental pollution have all been suggested as possible initial triggers that may upregulate inflammation of the lateral wall of the nose to develop nasal polyposis (1, 11).

The mean age for fungal nasal polyposis shows that adults who expose to air pollutant and use more antibiotics through their life suffer from the disease.

The people who had more prevalence of fungi in their nasal polyps had a long time exposure to dust at work or in their house. According to results mechanisms of nasal polyp formation can be explained; maybe local antifungal immune reactivity in nose, local imbalance of immunity at nasal mucus and hypersensitivity of polyps to fungus occur (3, 4, 11-13). The role of superficial and saprophyte fungus which cause imbalance in local immunity of nasal mucus are more important than invasive fungus (14-16). Hyper-reactivity to fungal organisms could be one of the mechanisms underlying the development of nasal polyposis according to Ricchetti study (4). So, considering the fungal colonization, infection and invasion in nasal polyposis is very important because suggests a suitable treatment in addition to the routine one.

If the culture is positive for fungi, the doctor should consider treatment with antifungal medication, even though there are no good studies to show the fungal medicines cure sinusitis, because the present treatment of cortisones works only in the short run, and may shortens life by causing osteoporosis, high blood pressure and obesity (17). If the fungus infection is positive, the person should be treated with the appropriate anti-fungal medication such as Sporanox, Lamisil or Diflucan. It is important to recognize this so that the underlying disease process can be treated appropriately (18-22).

Conflict of interests

We have no conflict of interests.

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The prevalence of fungal infections in nasal polyposis

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