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Original Research Article

A clinic-corelative observational study on nasal smear eosinophilia in allergic rhinitis verses non-allergic rhinitis

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ABSTRACT

Background: Diagnostic nasal cytology has been used in distinguishing allergic from nonallergic rhinitis.
Methods: We sought to determine prospectively the frequency of nasal eosinophilia in 100 patients in whom having allergic rhinitis, nonallergic rhinitis, and other atopic conditions not involving the respiratory tract have been diagnosed. A nasal smear was obtained from consenting adults using the rhino-probe curette. Patients taking local or systemic corticosteroids, those with chronic rhinitis associated with aspirin sensitivity, and those with sinusitis were excluded. All cytograms were coded and read by a single 'blinded' investigator. NE was considered significant if greater than 20% of sampled cells were eosinophils.
Results: 28 of 50 (56%) patients were with AR had NE. No NE was detected in the control population or in the skin test negative group of patients in whom having nonallergic rhinitis was diagnosed. One of 36 patients with allergic disease not involving the respiratory tract exhibited NE; this patient had atopic dermatitis with peripheral eosinophilia. No cases of eosinophilic nonallergic rhinitis were detected. There was no significant correlation of symptoms or the number of positive skin tests with NE.
Conclusions: These data suggest that the nasal smear for eosinophils is an insensitive but specific test for the diagnosis of allergic rhinitis, when patients with nasal polyposis and aspirin sensitivity and/or negative skin tests are excluded.

Keywords: Allergic rhinitis, Non-allergic rhinitis, Nasal eosinophilia, Diagnostic nasal cytology

INTRODUCTION

Allergic rhinitis, is a type of inflammation of nose which occurs when the immune system overreacts to allergens in the air.[1] Signs and symptoms include a runny or stuffy nose, sneezing, red, itchy, and watery eyes, and swelling around the eyes. Symptom onset is often within minutes following allergen exposure and can affect sleep, and the ability to work or study. Some people may develop symptoms only during specific times of the year, often as a result of pollen exposure. Many people with allergic rhinitis also have asthma, allergic conjunctivitis or atopic dermatitis.[2]

Allergic rhinitis is typically triggered by environmental allergens such as pollen, pet hair, dust, or mold. Inherited genetics and environmental exposures contribute to the development of allergies.[3] The underlying mechanism involves IgE antibodies that attach to an allergen, and subsequently result in the release of inflammatory chemicals such as histamine from mast cells.[4] Diagnosis is typically based on a combination of symptoms and a skin prick test or blood tests for allergen-specific IgE antibodies. These tests, however, can be falsely positive.[5] The symptoms of allergies resemble those of the common cold, however, they often last for more than two weeks and typically do not include

a fever. Several different types of medications reduce allergic symptoms: including nasal steroids, anti-histamines, and leukoterine receptor antagonists. Exposing people to larger and larger amounts of allergen, known as allergen immunotherapy (AIT), is often effective.[6] Nonallergic rhinitis is inflammation of the inner part of the nose that is not caused by an allergy. Nonallergic rhinitis involves symptoms including chronic sneezing or having a congested, drippy nose without an identified allergic reaction.[7] Other common terms for nonallergic rhinitis are vasomotor rhinitis and perennial rhinitis. The prevalence of nonallergic rhinitis otolaryngology is 40%. However, both allergic and non-allergic conditions have similar presentation, manifestation and treatment. Nasal itching and paroxysmal sneezing are usually associated with nonallergic rhinitis in comparison to allergic rhinitis. Nasal smear eosinophilia has been recommended as a useful tool for the diagnosis of allergic rhinitis.[8] The advantages of this test compared with others, such as skin tests or radio-allergosorbent tests, are: it is inexpensive, the result is available within minutes, and there is no need to refer the patient to a laboratory or specialist. In addition to the diagnosis of allergic rhinitis, nasal smear eosinophilia has been suggested for the diagnosis of a special type of non-allergic rhinitis.

Among patients with non-allergic rhinitis, diagnosed as such because of perennial symptoms and negative skin tests to inhalant allergens, patients can be identified who have many eosinophils in nasal secretions. This phenomenon has been called "eosinophilic non-allergic rhinitis" (ENR).[9] Identifying patients with ENR is said to be useful for choosing medication, since it has been proven that topical corticosteroids are extremely effective. In the present study we assessed; the diagnostic value of nasal smear eosinophilia for allergic rhinitis, and the prevalence of ENR in patients who consulted because of chronic or recurrent nasal symptoms.

Objectives

Objectives of current study were; to determine the association between nasal smear eosinophil count and AR, to correlate the eosinophil count of nasal secretions in clinically diagnosed patients of allergic rhinitis and patients with no nasal complaint (non -allergic rhinitis), to determine a cut-off value of the nasal smear eosinophil count that is significant for patients with AR and to determine whether the eosinophil count in nasal secretions is related to the predominant symptoms, duration of symptoms, or the type and severity of AR.

METHODS

Study design, location and duration

Current study was an original research article conducted at A. J. Institute of medical sciences and research center, Mangalore, Karnataka, India from August 2020 to December 2021.

Selection criteria and sampling technique

All patients presenting with two or more complaints of running nose, blocking of nose, itching and sneezing for less than four days a week or for less than four consecutive weeks were taken as intermittent allergic rhinitis and for more than four days a week and for more than four consecutive weeks were taken into persistent allergic rhinitis groups.

An equal number of controls who presented without any nasal complaints, without any history of allergy and not suffering from any chronic illness were selected for comparison after age and sex matching. Those who were diagnosed as having vasomotor rhinitis or on antiallergic treatment were excluded from the study. This study was done to perform simple and cost-effective test to understand the severity of Allergic Rhinitis. After applying inclusion and exclusion criteria suitable subjects were selected for the study. Simple random sampling was adapted as sampling technique.

Procedure

Total 50 patients who were clinically diagnosed on history and examination as allergic rhinitis were included as cases while control group consisted of 50 subjects having no symptoms of allergic rhinitis. These patients were subjected to nasal scrape cytology for which Cytobrush Plus was employed. Mucosal specimens were acquired by scraping the surfaces of the middle thirds of inferior turbinates with Cytobrush Plus. Nasal swab taken by scraping the mucous membrane of the inferior turbinate using a sterile air-dried cotton applicator and smear was made on a glass slide. The slide was stained with May-Grunwald and Giemsa stain. Staining technique:

The nasal smears are fixed in methanol for 10min. May-Grunwald's (MG) stain is diluted with an equal part of phosphate buffer (or tap water). Also, Giemsa stain is diluted with 9 parts of phosphate buffer for 10-15 min. The diluted M.G. stain is poured on the smear. After 5 minutes, the stain is removed and Giemsa Stain is poured. After a further period of 5 min, it is washed with phosphate buffer (pH 6.8) and waited for 5 min. The smear is later air dried and mounted on dibutylphthalate polystyrene xylene (DPX) and wait for 5 min. The percentage of eosinophils per hundred leucocytes are calculated and compared in both the groups.

RESULTS

Most of the cases were upto the age of 30 years (80%). The mean age of the study group was 24.43 while that of the control group was 23.53. In the study group 30 patients (60%) were males and 20 patients (40%) were

females. The same sex ratio was there in the control group. There were 25 patients (50%) with Intermittent Allergic Rhinitis and 25 patients (50%) with Persistent Allergic Rhinitis. Majority of patients 34 (68%) had the eosinophil count in nasal smears more than 10% (the value considered to be significant to represent AR) as shown in (Table 1).

Figure 1: (A) Instruments used and the procedure of taking sample for the nasal smear; (B) histopatological picture of nasal smear eosinophilia.

Table 1: Frequency distribution of nasal smears for eosinophilia.

Eosinophil % in nasal smear	Grades	N	%
<5	I	4	8
6-10	II	10	20
11-50	III	34	68
>50	IV	2	4
Total	-	50	100

Total 30 patients (60%) were having watery nasal discharge while 20 patients (40%) were having mucoid nasal discharge. The colour of the nasal mucosa was also noted. 30 patients (60%) were having dull red color, 15 patients (30%) were having pale color and 5 patients (10%) greyish blue color mucosa. The study group was strongly associated with nasal smear eosinophilia. The Chi-Square value=42.000 and p value=0.000 (<0.05) was statistically very significant as shown in (Table 2).

Table 2: Comparison of eosinophil count in study and control group.

No. of eosinophils (%)	Interpretation	Cases	Control
<5	Normal	4	42
6-10	Doubtful	10	6
11-50	Pathological	34	2
>50	Pathological	2	0

Also, intermittent AR was found to be associated with a higher nasal smear eosinophilia (20 patients among cases as opposed to 11 among the control group in the range of 11-50%). The Chi square value was 8.668 and p value was 0.013 (<0.05) which is statistically significant (Table 3).

DISCUSSION

In this study it is observed that, a strong association of nasal smear eosinophilia with allergic rhinitis exists which is in concordance with many other studies. Those patients with intermittent type of allergic rhinitis and cases with watery type of nasal discharge were found to be associated with nasal smear eosinophilia and the association was found to be statistically significant.

Table 3: Nasal smear eosinophilia vs. disease type.

Disease type	<5%	6-10%	11-50%	>50%	Total
Intermittent	0	2	20	3	25
Persistent	8	5	11	1	25
Total	8	7	31	4	50

Other studies which have compared nasal smear for eosinophilia with skin prick test, nasal smear for eosinophilia is found to be highly specific and moderately sensitive to diagnose allergic rhinitis and hence, we recommend this test to screen as well as to diagnose allergic rhinitis. Also, being a noninvasive and inexpensive out patient-based test, it can also be used to monitor the response to the treatment given. It is of paramount importance to come up with lesser invasive and easily applicable methods such as nasal smear for eosionphilia to easily screen, diagnose and monitor the patients during the follow up period in order to explore newer domains in the treatment protocol of allergic rhinitis. Miller et al claimed that the nasal smear for eosinophils appears to be a reliable diagnostic test with moderately high sensitivity and high specificity, while correlating among the intermittent and perennial type of allergic rhinitis, there was a significant association between the intermittent type and nasal smear positivity for eosinophilia.[10-15] This observation was in concordance with the observation by Canakcioglu et al who noticed rise in nasal eosinophilia during the spring and summer seasons in patients of allergic rhinitis, which are the common months of affection by the disease.[10-15]

In a study by Crobach et al was concluded that the sensitivity of nasal smear eosinophilia for allergic rhinitis was 18% and the specificity was 96%. In the study by Sood A 80% of the nasal smears were positive in various degrees for eosinophils while in the control group only 5% showed any kind of positivity.[10-15] In a study done by Canakcioglus, et al it was found that nasal eosinophilia in

AR significantly increased during the spring and summer seasons.[10-15]

CONCLUSION

The result of this study showed that evaluation of eosinophils in nasal smear is an insensitive but fairly specific test for the diagnosis of allergic rhinitis. In addition, it sees that the nasal secretions and nasal tissue represent two distinct cellular compartments.

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