

Nasal eosinophilia as a marker for allergic rhinitis: A controlled study of 50 patients

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Abstract

Eosinophils are the principal effector cells involved in the pathogenesis of allergic inflammation. We conducted a study to investigate the validity of the nasal smear examination for detecting eosinophilia in patients with allergic rhinitis. Our study group was made up of 50 patients with allergic rhinitis and 50 age- and sex-matched controls without allergic rhinitis. Smears were obtained from nasal secretions in both groups and then fixed, stained, and studied under light microscopy. Statistical analysis revealed that the odds ratio for eosinophilia positivity in nasal smears in the rhinitis group was 25.61 with a 95% confidence interval of 8 to 78. The sensitivity, specificity, positive predictive value, and negative predictive value of this test were 74, 90, 88, and 77%, respectively. We conclude that the nasal eosinophilia test is highly specific and moderately sensitive in diagnosing allergic rhinitis, and that it therefore can be used as an easy, noninvasive, and inexpensive procedure for screening patients and for conducting epidemiologic studies of this disorder.

Introduction

Allergic rhinitis is induced by an IgE-mediated inflammation of the nasal membrane following exposure to an allergen.¹ It is characterized by one or more symptoms that include sneezing, itching, nasal congestion, and

rhinorrhea.² Mucosal inflammation in allergic asthma and rhinitis is characterized by tissue eosinophilia.^{3,4} In affected patients, eosinophils and other inflammatory cells are released from the bone marrow under the influence of several Th2 cytokines, including interleukin 3 (IL-3), IL-4, IL-5, IL-13, IL-17, and eotaxin.^{3,5-8} The diagnosis of allergic rhinitis is based on the pattern of symptoms, findings on physical examination, and assessment of IgE antibodies by skin-prick testing or in vivo testing.^{1,2,9}

In this article, we describe our study of the utility of another method of diagnosing allergic rhinitis: the nasal smear examination for eosinophils.

Patients and methods

This study was carried out in the allergy clinic at Vali-e-Asr Hospital in Zanjan, Iran. Our study population was made up of 50 patients—21 males and 29 females, aged 5 to 53 years (mean: 23.73 ± 11.51)—with a diagnosis of allergic rhinitis. Forty-five of these patients had seasonal allergic rhinitis, and the other 5 had persistent or perennial rhinitis. The diagnosis had been established on the basis of the history, findings on physical examination, the presence of sneezing with rhinorrhea or nasal stuffiness¹⁰ of more than 2 weeks' duration, and a positive skin-prick test result with at least 1 of 16 common outdoor and indoor allergens, including tree, grass, weed, cockroach, feather, mite, mold, and cat.

Exclusion criteria included an upper respiratory tract infection, recent medical therapy for rhinitis, and the use of systemic or intranasal steroid therapy during the previous month.

A control group of 50 nonallergic, healthy, age- and sex-matched persons was selected from among our hospital's staff and our patients' relatives (table 1).

Smears of nasal secretions and nasal epithelium were

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obtained from the middle third of the inferior turbinate of both nostrils with a cotton swab. They were then fixed on a slide with ethyl alcohol, stained with Wright-Giemsa solution, and examined under light microscopy. For this single-blind study, all smears were coded and read by a single investigator. A finding of more than 5 eosinophils in 3 to 5 fields of view or a single finding of 20 to 30 cells (score: ≥ 1)¹¹ was considered to represent a positive finding for nasal eosinophilia.

Data were analyzed with the Statistical Package for the Social Sciences software (SPSS; Chicago).

Results

A positive nasal smear for eosinophilia was identified in 37 rhinitis patients (74%) and in only 5 controls (10%) (table 2). Thus, the odds ratio for eosinophilia in nasal smears was 25.61 with a 95% confidence interval of 8 to 78. The difference between the rhinitis and control groups was statistically significant ($p = 0.0005$). The sensitivity and specificity of the nasal smear test were 74 and 90%, respectively, and the positive and negative predictive values were 88 and 77%.

Of the 21 males in the allergic rhinitis group, 16 had a positive smear (76%) and 5 had a negative smear (24%). Among the 29 females, 21 were positive (72%) and 8 were negative (28%). In the control group, 2 males and 3 females had positive findings. Therefore, there was no statistically significant association between eosinophilia and sex in either group ($p = 0.76$).

Likewise, there was no association between eosinophilia and age in either group ($p = 0.172$), despite the fact that all 3 of the allergic rhinitis patients aged 40 years and older yielded positive results (table 3).

Discussion

At 90%, the specificity of the nasal smear test in our study was high, and this finding is similar those reported by Miri et al¹² and Miller et al.¹³ On the other hand, our finding of 74% sensitivity was higher than both of their findings. In another study, Sood reported results similar to ours, with high specificity and moderately high sensitivity.¹⁴

Lans et al reported that nasal eosinophilia was specific but not sensitive.¹⁵ Back in 1980, Mullarkey et al¹⁶ concluded that nasal eosinophilia was of little value in the evaluation of allergic rhinitis, but their findings might have been influenced by limitations in obtaining smears or the lack of a grading system for assessing nasal eosinophilia.

In our study, the positive predictive value of the nasal

Table 1. Demographic characteristics in the rhinitis and control groups

Variable	Rhinitis (n = 50)	Controls (n = 50)	p Value
Sex			
M/F, n	21/29	16/34	0.40
Age, yr, n (%)			
≤19	20 (40)	21 (42)	0.446*
20 to 29	14 (28)	13 (26)	
30 to 39	13 (26)	9 (18)	
≥40	3 (6)	7 (14)	

* This p value applies to all age groups.

smear test was 88% and the negative predictive value was 77%. Both of these figures are higher than what was reported by Crobach et al.¹⁷

In our study, the possibility that some patients or controls had nonallergic eosinophilic syndrome must be acknowledged, but since that condition is so rare, we doubt that it played any role in our results.^{14,17} The fact that 26% of our allergic rhinitis patients had negative smear results might be explained by an inadequate sampling of epithelial cells by cotton swabbing, or it might be attributable to sampling during the early phase of the allergic reaction before eosinophilic recruitment occurs. Conversely, the 10% of controls who had positive smears might have actually had an asymptomatic allergic condition or they might have come into contact with nonspecific irritants or stimuli.

Clinical and experimental observations have shown that the presence of eosinophils and their products in the airways is strongly correlated with disease severity and the development of airway hyperreactivity.^{18,19} Vinke et al showed that prior to the detection of specific serum IgE, cellular changes can be found in the nasal smears of atopic children.²⁰ Okano et al reported that nasal smear examinations for nasal eosinophilia may be a valuable means of predicting prolonged or recurrent

Table 2. The incidence of eosinophilia in nasal smears in the rhinitis and control groups, n (%)

Finding	Rhinitis (n = 50)	Controls (n = 50)
Positive	37 (74)	5 (10)
Negative	13 (26)	45 (90)

Table 3. Prevalence of eosinophilia in nasal smears in the rhinitis group according to age, n (%)

Age, yr	Positive (n = 37)	Negative (n = 13)
≤19	14 (38)	6 (46)
20 to 29	11 (30)	3 (23)
30 to 39	9 (24)	4 (31)
≥40	3 (8)	0

allergic rhinitis.²¹ Greiner and Meltzer reported that the use of steroids for allergic and nonallergic rhinitis leads to better control of symptoms in patients with eosinophilia-positive nasal smears.²²

We found the nasal smear examination for eosinophils to be highly specific and moderately sensitive. Since this test is also easy, noninvasive, and inexpensive, we recommend it not only for the diagnosis of allergic rhinitis, but in the differential diagnosis of a range of rhinitis disorders, as well.

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