



NASAL EOSINOPHILIA IN ALLERGIC RHINITIS

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Conflicts of Interest: Nil

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ABSTRACT

Background: Allergic rhinitis (AR) is a common condition characterized by inflammation of the nasal mucosa due to an IgE-mediated hypersensitivity reaction to allergens. Nasal eosinophilia is a hallmark of allergic rhinitis, as these cells are recruited to the nasal mucosa during allergic inflammation. This study aims to evaluate the role of nasal eosinophilia in allergic rhinitis, focusing on its correlation with symptom severity and treatment outcomes.

Methods: A total of 120 patients with clinically diagnosed allergic rhinitis were included in this study. Nasal mucosal biopsies were obtained from each patient to assess eosinophil counts using histopathological techniques. Symptom severity was assessed using the visual analogue scale (VAS) and the Allergic Rhinitis and Its Impact on Asthma (ARIA) classification. Patients were treated with antihistamines, intranasal corticosteroids, and/or nasal decongestants. Eosinophil counts were correlated with symptom severity and treatment efficacy.

Results: Eosinophil infiltration was observed in 85% of AR patients, with a significant positive correlation between eosinophil count and symptom severity ($r = 0.72$, $p < 0.05$). Patients with higher eosinophil counts demonstrated a poorer response to antihistamines alone and had more frequent relapses. Intranasal corticosteroids significantly reduced eosinophil counts and improved symptoms in patients with high eosinophilia.

Conclusion: Nasal eosinophilia plays a critical role in the pathogenesis of allergic rhinitis and is associated with more severe symptoms and poorer treatment outcomes. The findings suggest that eosinophil count could be a potential biomarker for assessing the severity of AR and guiding treatment decisions.

Keywords: Allergic rhinitis, eosinophilia, nasal mucosa, treatment response, nasal biopsies, symptom severity, intranasal corticosteroids.

INTRODUCTION

Allergic rhinitis (AR) is a prevalent condition affecting a significant portion of the global population, leading to considerable morbidity and impairment in quality of life. It is characterized by nasal congestion, itching, sneezing, and rhinorrhea, which result from an inflammatory response triggered by exposure to allergens such as pollen, dust mites, mold, or animal dander (1). The pathophysiology of AR involves complex immune mechanisms, primarily driven by IgE-mediated

hypersensitivity. Upon allergen exposure, sensitized individuals experience the release of inflammatory mediators such as histamine, leukotrienes, and cytokines from mast cells, leading to the recruitment of eosinophils to the nasal mucosa (2).

Nasal eosinophilia, defined by an elevated number of eosinophils in the nasal mucosa, is a characteristic feature of allergic rhinitis. Eosinophils play a central role in the

inflammatory cascade by releasing toxic proteins, such as eosinophil cationic protein (ECP) and major basic protein (MBP), which contribute to tissue damage and prolonged inflammation (3). Eosinophils are also involved in the recruitment of other immune cells and the release of pro-inflammatory cytokines, which further exacerbate the allergic response (4).

The role of nasal eosinophilia in allergic rhinitis has been well-documented, but its exact relationship with symptom severity and treatment outcomes remains an area of ongoing research. It is hypothesized that patients with higher eosinophil counts experience more severe symptoms and may require more aggressive treatment. Moreover, eosinophil counts have been suggested as a potential biomarker for predicting disease severity and treatment response, particularly in cases of moderate-to-severe AR (5).

In this study, we aim to assess the relationship between nasal eosinophilia and symptom severity in allergic rhinitis, and to evaluate the impact of different treatments, including antihistamines and intranasal corticosteroids, on eosinophil infiltration and clinical outcomes.

Aim and Objectives

Aim:

To evaluate the role of nasal eosinophilia in the pathogenesis and treatment outcomes of allergic rhinitis.

Objectives:

1. To assess the correlation between nasal eosinophil count and symptom severity in allergic rhinitis patients.
2. To evaluate the effect of treatment (antihistamines, intranasal corticosteroids) on nasal eosinophil levels and symptom control.
3. To explore the potential of nasal eosinophil count as a biomarker for assessing allergic rhinitis severity and treatment response.

Materials and Methods

Study Design:

This was a cross-sectional study conducted in a tertiary care hospital. A total of 120 patients diagnosed with allergic rhinitis based on clinical history and positive skin prick test (SPT) or serum-specific IgE test were included.

Inclusion Criteria:

- Patients aged 18-50 years.
- Diagnosed with allergic rhinitis based on clinical history, SPT, or serum-specific IgE.
- Symptomatic with nasal congestion, itching, and rhinorrhea.
- No history of other nasal or systemic diseases (e.g., chronic sinusitis, asthma).

Exclusion Criteria:

- Patients with non-allergic rhinitis or chronic rhinosinusitis.
- Pregnant or breastfeeding women.
- Patients with recent nasal surgery or trauma.

Nasal Biopsy and Eosinophil Count:

Nasal mucosal biopsies were obtained from all patients to assess eosinophil infiltration. Tissue specimens were stained with Hematoxylin and Eosin (H&E), and eosinophil count was quantified using light microscopy. The eosinophil count was reported as the number of eosinophils per high-power field (HPF).

Symptom Severity Assessment:

Symptom severity was assessed using the Allergic Rhinitis and Its Impact on Asthma (ARIA) classification and a visual analogue scale (VAS) ranging from 0 to 10 for each symptom (sneezing, nasal congestion, itching, and rhinorrhea).

Treatment Protocol:

Patients were treated with either antihistamines (oral or intranasal) alone, or a combination of antihistamines and intranasal corticosteroids for four weeks. After this period, patients were re-assessed for symptom improvement and nasal eosinophil count.

Statistical Analysis:

Data were analyzed using descriptive statistics, and Pearson’s correlation coefficient was used to determine the relationship between eosinophil count and symptom severity.

Treatment outcomes were compared using paired t-tests. A p-value of <0.05 was considered statistically significant.

Results

Table 1: Demographic and Baseline Characteristics

| Parameter | Value |
|-------------------------------------|-------------|
| Total Number of Patients | 120 |
| Mean Age (years) | 32.4 ± 6.8 |
| Male/Female Ratio | 60/60 |
| Mean Duration of Symptoms (months) | 24.5 ± 10.2 |
| Preoperative Eosinophil Count (HPF) | 8.2 ± 3.1 |

Table 2: Treatment Outcomes

| Treatment Group | Eosinophil Count (HPF) | Symptom Severity (VAS Score) |
|---|------------------------|------------------------------|
| Antihistamines Only | 8.1 ± 3.2 | 6.5 ± 1.3 |
| Antihistamines + Intranasal Corticosteroids | 4.2 ± 2.1 | 3.7 ± 1.5 |
| Control Group (No Treatment) | 8.3 ± 3.5 | 7.2 ± 1.2 |

Results Summary:

- **Eosinophil Infiltration:** Nasal eosinophilia was observed in 85% of the AR patients. The mean eosinophil count was 8.2 ± 3.1 eosinophils/HPF at baseline.
- **Symptom Severity:** A significant positive correlation was found between eosinophil count and symptom severity (r = 0.72, p < 0.05). Patients with higher eosinophil counts (≥10 eosinophils/HPF) exhibited more severe symptoms, particularly nasal congestion and rhinorrhea.
- **Treatment Outcomes:** Patients receiving a combination of antihistamines and intranasal corticosteroids showed a marked reduction in eosinophil counts (4.2 ± 2.1 eosinophils/HPF) and symptom severity (VAS score 3.7 ± 1.5), compared to those treated with antihistamines alone (eosinophil count: 8.1 ± 3.2, VAS score: 6.5 ± 1.3). The control group showed minimal changes in both eosinophil count and symptom severity.

Discussion

Nasal eosinophilia is a key feature of allergic rhinitis, reflecting the underlying allergic

inflammation. In this study, we observed a significant correlation between nasal eosinophil counts and symptom severity, with patients exhibiting higher eosinophil infiltration experiencing more severe symptoms. This finding supports the role of eosinophils in mediating the inflammatory process in allergic rhinitis, contributing to symptoms such as nasal congestion, sneezing, and rhinorrhea (6).

The efficacy of treatment, particularly with intranasal corticosteroids, was evident in the reduction of both eosinophil counts and symptom severity. Intranasal corticosteroids are known to reduce eosinophil recruitment and activity, thereby alleviating the inflammation that underlies the symptoms of allergic rhinitis (7). The results of this study align with previous research demonstrating the superior efficacy of intranasal corticosteroids in managing eosinophilic inflammation in allergic rhinitis compared to antihistamines alone (8).

Furthermore, the findings suggest that nasal eosinophil count could be used as a biomarker to assess the severity of allergic rhinitis and monitor treatment efficacy. Monitoring eosinophil counts may help guide clinicians in tailoring therapy, particularly in patients with moderate-to-severe disease.

Conclusion

Nasal eosinophilia plays a crucial role in the pathogenesis of allergic rhinitis and is closely correlated with symptom severity. Treatment with intranasal corticosteroids significantly reduces eosinophil counts and improves symptoms, highlighting the importance of targeting eosinophilic inflammation in the management of allergic rhinitis. Monitoring eosinophil levels could serve as a valuable tool for assessing disease severity and treatment response.

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