Quantitative Cytology of Nasal Secretion and Scrapings in Children with Perennial Allergic Rhinitis
A Comparison of Non-Infected and Infected Conditions

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Abstract
This study was performed to quantify the number of neutrophils and eosinophils in nasal secretions from paediatric patients with perennial rhinitis, under infected and non infected conditions, to differentiate infected bacterial from viral rhinitis and allergic from infected rhinitis.

Nasal secretions and mucosal scrapings of 93 children up to 12 years with symptoms and signs of perennial rhinitis were subjected to cytological analysis. The smears were stained with H and E and 10 HPF’s were examined. Grading was done utilizing the semiquantitative nasal cytology grading score of Meltzer. 21 healthy children were used as controls. The material was also subjected to bacteriological analysis. Additional ancillary investigations done were a CBC and an absolute eosinophil count.

There were distinctive differences in the grading scores between the cases of perennial rhinitis and the control groups, both were significantly higher in the former, we were able to differentiate between infected bacterial and viral rhinitis on the basis of bacteriological results.

However, the neutrophil scores were higher in all the cases of perennial rhinitis under both infected and noninfected conditions and we did not get a good clinicopathological correlation, on the basis of a predominance of eosinophils or neutrophils, of infected vs allergic rhinitis.

Thus, nasal cytology coupled with bacteriology is a quick, simple, noninvasive and inexpensive tool to distinguish between bacterial and viral perennial rhinitis.

Introduction
The common cold is not very significant for the common man as it is not a serious disease causing death. Hence nasal symptoms are often demeaned. However the impact of rhinitis is enormous; although not often a cause of mortality, rhinitis frequently produces morbidity of sufficient severity to keep the affected person from fulfilling his or her daily duties, whether he or she is at home, in school or at work. According to statistics, one among six people suffer from rhinitis, which makes it the most common chronic disease of man today, with a steadily increasing incidence all over the world, and approximately 50% are of allergic nature. However, rhinitis is often incorrectly treated due to failure in understanding the underlying aetiology. Hence the need of the time today is to differentiate between allergy and infection as the cause of rhinitis, so that appropriate therapy can be instituted. This can easily be done by a proper understanding of nasal symptomatology and a simple,
cytological examination of nasal secretions and scrapings to look for the presence of inflammatory cells i.e. eosinophils and neutrophils.

**Material and Methods**

This is a prospective study, extending over a period of 4 months. Nasal secretions and nasal mucosal scrapings of 100 children, 51 males and 49 females up to the age of 12 years, suffering from perennial allergic rhinitis, under both infected and non-infected conditions, were subjected to cytological analysis, to quantify the number of polymorphonuclear cells (PMNs) and eosinophils. The smears were stained with H and E, and 10 high power fields were examined under the light microscope. Grading (0-4+) was done utilizing the semiquantitative nasal cytology grading score described by Meltzer. 1 21 children without signs or symptoms of rhinitis were used as controls. The secretions and scrapings were also subjected to a bacteriological analysis i.e. smear using Gram’s stain and culture.

A detailed clinical history was elicited and a thorough general and systemic examination was done in all the cases, in addition to ancillary investigations i.e. X-ray of chest and sinuses, and CBC with an absolute eosinophil count, and the relevant findings were recorded on the following proforma.

**Proforma**

Case No.: 
OPD Registration No. :
Name: 
Address:

History of Acute Symptoms:
- Fever
- Cold
  - Duration
  - Character
  - H/S/O PND (diurnal variation)

- Medication taken and response in terms of change in consistency and colour.
- Cough
- Respiratory Distress
- Previous H/O similar episodes
  - Age at 1st attack
  - Frequency/Duration
  - Response to Medication
- H/S/O obstruction symptoms
  - Noisy breathing/Snoring
- Family history of Allergy/Asthma/Smoking/Rhinitis.
- Personal History - Seasonal/Perennial
  - Any H/O allergies to food
  - Any H/O skin allergy
  - H/O cradle cap/eczema in early infancy
- H/O any specific occupational exposure
- O/E
- Anthropometry
  - Weight
  - Height
  - Head Circumference
  - C.C.
  - M.A.C.
- Temp.
- Pulse
- Respiration
- B.P.
- URT, Adenoid (E.N.T. Ref)
- Sinus tenderness
- Lymph nodes
- Oedema Feet
- ENT exam (exam of nose in detail)

RS
CVS
PA

Gross Examination of Nasal secretions
- Cytological Examination
  - Cells
Bacteriology

- CBC-AEC
- XRC - SOS
- XR Sinuses - SOS

Co-incidental sinusitis picked on CT-Scan.

Observations and Results

Our study population comprised 100 children with perennial allergic rhinitis. Their mean age was 3.4 years (range 0-12 years). The majority of the cases, 71 out of 100, (71%) were > 3 years of age, whereas there was a smaller, almost similar percentage in the other two ranges of age groups i.e. 4-7 years: 15% and 8-12 years: 14%. The sex distribution was almost equal: 51 males (51%) and 49 females (49%).

In the study population, the percentage of children studied under non-infected conditions was higher than those studied under infected conditions (57% vs. 43%), the criteria utilized to distinguish between the two being clinical symptomatology i.e. fever, and neutrophilic leucocytosis i.e. Absolute leucocyte Count > 15 x 10^3 / cu.mm. The control groups were all in the non-infected category.

A comparison of neutrophil and eosinophil grading scores of the study population with the control group shows distinctive differences between the two; both the higher scores were significantly higher in the study population compared to the control group (Fig. 1).

A comparison of neutrophil and eosinophil grading scores, in infected cases, indicate higher neutrophil scores as compared to eosinophil scores (Fig 2). However a similar pattern is seen, even in the non-infected cases (Fig. 3).

In the group of 43 infected cases, culture could not be carried out in 8 cases. Out of the 35 cases sent for bacterial culture, 11 out of 35 cases were positive for nasal pathogens.

Fig. 1: Showing comparison of neutrophil and eosinophil scores of study population with control group.

Fig. 2: Showing comparison of neutrophil and eosinophil scores in infected conditions in study population.

Fig. 3: Showing comparison of neutrophil and eosinophil scores in non infected conditions.

Fig. 4: Showing comparison of neutrophil scores in culture positive and culture negative infected cases.
i.e. 31.4%, and 24 out of 35 were negative i.e. 68.6%. In the culture-positive group, the majority of cases i.e. 5/11 (45.4%) had a high neutrophil score of 4. The lower scores (i.e. 3, 2 and 1) were seen in fewer but equal number of cases (2/11 i.e. 18.1% each). In the culture-negative cases also, the majority had a high neutrophil score of 4, i.e. 10/24 cases 41.6%, but the lower scores of 0.5 and 1 were seen more frequently 6/24 cases - 25% and 4 / 24 cases (16.2%) than the intermediate scores of 3 and 2 (2 / 24 cases - 8.3% in each) (Fig. 4).

**Discussion**

Nasal cytology has been performed previously and reported using different specimen sources.

Although various techniques have been used to obtain cytologic specimens, a technique that permits the examination of the superficial mucosa or secretions is preferred as PMNs and eosinophils are present in both nasal secretions and within the nasal mucosa, we examined both the nasal secretions and scrapings in each case.

Different staining techniques, like the Hansel’s stain and the Wright-Giemsa stain have been used. We utilized the H and E staining technique and found it easy to identify PMNs and eosinophils with this stain.

Grading i.e. quantification of the number of neutrophils and eosinophils was done utilizing the semiquantitative nasal cytology grading score of Meltzer.

A comparison of the neutrophil and eosinophil grading scores in infected cases indicates higher neutrophil scores (NS) compared to eosinophil scores (ES). The findings are consistent with those of Shinogi et al. However under non-infected conditions, in their study the E.S was higher than the N.S. This has been substantiated by other authors. Igarishi et al. demonstrated that nasal eosinophils were significantly higher in the allergic group than in the control group. Lee et al. reported an E/N ratio of 0.1 to be a critical value for differentiating between allergic and non-allergic conditions and Miller et al. determined the diagnostic value of eosinophils in nasal secretions. We were, however, not able to substantiate this finding, and our NS were higher than the ES even in non-infected conditions. This could be explained by the fact that neutrophils of any degree are commonly found even in healthy children.  

In the group of the infected cases, the majority of cases (68.6%) were smear and culture negative for nasal pathogens. In this group the majority of cases had a high NS of 4 (10 out of 24 cases). This group was possibly
the group of infected viral rhinitis.

A smaller percentage i.e. 31.4% were smear and culture positive for nasal pathogens; in this group, as expected, the majority of cases (511 cases-45.4%) had a high NS of 4. This group was the group of infected bacterial rhinitis, so we were able to distinguish between the 2 groups with the assistance of bacteriology.

**Summary and Conclusions**

1. There were distinctive differences in the grading scores between the cases of perennial allergic rhinitis and the control groups, both were significantly higher in the former.

2. The neutrophil scores were higher in all the cases of perennial allergic rhinitis under both infected and non-infected conditions and we are not able to differentiate allergic from infective rhinitis on the basis of a predominance of eosinophils and neutrophils.

3. We were able to differentiate between infected bacterial and viral rhinitis on the basis of bacteriological results.

Thus nasal cytology coupled with bacteriology is a quick, simple, non-invasive and inexpensive tool to distinguish between bacterial and viral perennial rhinitis but was not of much help to differentiate between allergic and infected rhinitis in our patients.

**References**


**CORONARY BYPASS SURGERY WITH OR WITHOUT SURGICAL VENTRICULAR RECONSTRUCTION**

In a randomized trial, patients with coronary artery disease and an ejection fraction of 35% or less were randomly assigned to undergo either coronary-artery bypass grafting (CABG) or CABG plus surgical ventricular reconstruction. At a median of 48 months, there was no significant difference between the two groups in the primary outcome of death or hospitalization for cardiac causes.