

Correlation of immunoglobulin E levels and peripheral eosinophilia with paranasal sinus mucosal disease

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Objective

The aim of this study was to assess whether total immunoglobulin E (IgE) levels and peripheral eosinophilia correlate with the extent of sinus mucosal disease on computed tomography (CT) of paranasal sinuses.

Patients and methods

CT scans were performed; total IgE and peripheral eosinophil levels were measured for all patients. The relationships between peripheral eosinophilia, total IgE levels, and the presence of mucosal disease on sinus CT imaging were also determined.

Results

The total IgE did not correlate with CT stage of the disease, whereas there was a significant moderate positive correlation between CT stage and peripheral eosinophil levels.

Conclusion

The data suggest that eosinophil levels contribute toward mucosal inflammation in paranasal sinuses and the presence of peripheral eosinophilia in patients with sinusitis indicates a high likelihood of extensive disease. However, IgE levels did not correlate with CT scan findings. Calculation of the percentage of peripheral eosinophils by measurement of the differential leukocyte count is a simple, easy, and rapid technique for assessment of the severity of chronic rhinosinusitis.

Keywords:

chronic rhinosinusitis, computed tomography scan, eosinophilia, immunoglobulin E

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Introduction

Chronic rhinosinusitis (CRS) remains one of the most common chronic diseases and affects millions of patients [1]. The disease is characterized by inflammation of paranasal sinuses, obstruction of sinus ostia, and retention of secretions. The term CRS is used when symptoms persist for longer than 3 months [2].

The management of CRS or recurrent rhinosinusitis problems is multifaceted and should include consideration of contributory and potentially correctable medical and anatomic factors. To date, the relationship between allergy and rhinosinusitis has not been clearly defined [3].

The eosinophil comprises ~2–5% of granulocytes in an individual without allergies. Activated eosinophils have been found to play a role in allergy, asthma, parasitic diseases, granulomatous disorders, fibrotic conditions, and several malignant tumors. Tissue eosinophilia in the upper and lower airway mucosa seems to be an important factor in the development of CRS and asthma. Eosinophils contain and release a number of toxic proinflammatory mediators, including major basic protein, eosinophil cationic protein, reactive oxygen species, lipid mediators, and cytokines [4]. Activation of eosinophils and lymphocytes causes inflammation of the sinus mucosa and causes the normally thin mucosal lining to thicken. This thickened mucosa can be detected by a computed tomography (CT) scan [5].

Many authors have suggested the presence of a clinical association between allergic upper airway disease and CRS. However, the relationship between immunoglobulin E (IgE)-mediated hypersensitivity, eosinophilia, and CRS remains poorly defined. The aim of our study was to evaluate the relationship between peripheral eosinophilia, total IgE levels, and the presence of mucosal disease on sinus CT imaging. We also assessed the application of differential leukocyte count (DLC) measurement as a simple noninvasive technique for the evaluation of percentage of eosinophils and hence the severity of CRS.

Patients and methods

The study was carried out in Assiut University, Departments of Otorhinolaryngology and Medical Microbiology & Immunology on 35 patients, 18 men and 17 women, from March 2009 to September 2011. Written informed consent was obtained from all patients. The study protocol was approved by the local ethical committee. Patients were older than 18 years of age. CT scans were performed for all patients using bone window settings, 3 mm thickness, coronal and axial cuts, without contrast. This was done after 2 weeks of medical treatment in the form of systemic steroids, mucolytics, and nasal decongestants. Total IgE and peripheral eosinophil levels were measured.

CT scans were graded using the Lund–MacKay scoring system [6]. This system grades each paranasal sinus (maxillary, frontal, sphenoid, anterior ethmoids, and posterior ethmoids) as follows: 0, no abnormality; 1, partial opacification; and 2, complete opacification. The ostiomeatal complex is scored as 0 when there is no opacification and 2 when it is obstructed. The total score possible with this system ranges from 0 to 24. A score higher than 12 is considered abnormal.

Total serum IgE levels (IU/ml) were measured using an enzyme-linked immunosorbent assay and DLC was determined for each patient to calculate the percentage of peripheral eosinophils. IgE levels greater than 100 IU/ml and percentage of eosinophils greater than 4% were considered abnormal.

SPSS, version 16 (SPSS Inc., USA), was used for data analysis; relationships were analyzed by Pearson's correlation.

Results

The mean CT score was 20.6. The mean total IgE level was 190.3 IU/ml, with 60.6% of abnormal IgE associated with an abnormal CT score. However, the total IgE did not correlate with CT stage of the disease ($r = 0.19$, $P = 0.2$).

The mean percentage of peripheral eosinophils was 10%. There was a significant moderate positive correlation between CT stage and peripheral eosinophil levels ($r = 0.4$, $P = 0.02$).

Discussion

Although it is still a matter of debate, our results did not indicate a correlation between serum total IgE levels and CT imaging. Consistent with our data, some studies also did not find a correlation between serum total IgE levels and CT imaging [5,7]. In contrast, others found a correlation between serum total IgE levels and CT imaging and this requires a further study of this association [8].

We found a positive correlation between eosinophilia and severity of disease on the basis of CT scan; in agreement with our data, some authors also found a correlation between eosinophilia and CT imaging [1,9], indicating the role that eosinophils may play in the pathogenesis of CRS, and the measurement of the level of eosinophils may be a good indicator of the severity of CRS.

Conclusion

The data suggest that eosinophil levels contribute toward mucosal inflammation in paranasal sinuses and the presence of peripheral eosinophilia in patients with sinusitis indicates a high likelihood of extensive disease. However, IgE levels did not correlate with CT scan findings. Calculation of the percentage of peripheral eosinophils by DLC measurement is a simple, easy, and rapid technique for assessment of the severity of CRS.

Acknowledgements

Conflicts of interest

There are no conflicts of interest.

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