

Original article

Evaluation of systemic allergy in infectious and inflammatory disorders of upper respiratory tract

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Received: 18 october 2012 / Accepted: 19 january 2013

Abstract

Objective; Upper respiratory tract has an important role in upper and lower airways homeostasis. In various diseases of the airways, proliferation and activation of B cells is the main pathogenic phenomenon. In exposure to antigens B cell class-switching results in synthesis of IgE which can mediate activation of airway mast cells and eosinophils and causes allergic reactions. So, in this study we evaluated serum IgE levels to show the role of systemic allergy in upper respiratory tract diseases.

Methodology; in this study, serum IgE level of 168 patients with infectious and inflammatory diseases of the upper respiratory tract has been evaluated by enzyme linked immunoabsorbent assay (ELISA).

Result; Allergic reaction was observed in 23.8% of patients with infectious and inflammatory disorders of pharynx, 24.1 % in chronic rhinosinusitis and 27.6 % in infectious and inflammatory disease of ear.

Conclusion; In conclusion, increased systemic allergic reaction plays an important role in upper respiratory tract diseases.

Key words: Upper respiratory tract, IgE, Allergy

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Introduction

Upper respiratory tract (URT) plays an important role in airway homeostasis and also is vital in the protection and homeostasis of lower airways because of warming up, humidifying and filtering incoming air. Pseudostratified respiratory epithelium covering URT armed by innate and acquired immune defense mechanisms (1). So, the URT infections become a trigger for lower airways pathology such as asthma or chronic obstructive pulmonary disease (COPD) in susceptible individuals (2). The inflammation seen in chronic rhinosinusitis (CRS) as a part of URT shows systemic signs of inflammatory cytokines and overproduction of eosinophil in bone marrow (3). In several diseases of the airways, proliferation and activation of B cells is the most important pathogenesis. In exposure to external antigens local B-cell class-switching result in synthesis of IgE which can mediate activation of airway mast cells and eosinophils(4-9). IgE levels are also increased in patients with allergic fungal rhinosinusitis(AFRS) and have been proposed as diagnostic factor for AFRS disease activity(10,11). The role of

allergy in URT is a subject of investigation and controversy in studies (10,11,12). Although allergic inflammation of the URT clearly alters the airway physiology and hence seems to be a primary etiology of URT diseases, the direct cause-and-effect relationship between allergy and URT disorders is currently lacking. Herein, we evaluated serum IgE level for detecting the role of systemic allergy in patients suffered from URT infections.

Methods and patients

Patients and samples

The study population included 168 patients with infectious and inflammatory disorders of ear, pharynx and CRS. Patients were recruited from the Ear,Nose,Throat (ENT) section of the university hospital (Mazandaran university of medical science, Sari, Iran).

All subjects gave their consent to participate in the study. Approvals for this study were obtained from the Mazandaran University of Medical Sciences, Sari, Iran. In the opinion of investigators, exclusion criteria included the conditions which could affect serum IgE levels such as malignancy, renal dysfunction, vascular

disease, diabetes mellitus and malnutrition or any other conditions that could make the participants unsuitable for the study.

Immunoglobulin assay

Serum IgE was measured in fasting morning serum samples of the volunteer patients by enzyme linked immunoabsorbent assay (Elisa)

(Monobind, USA). All assays were performed in duplicate at the time of samples collection. Normal ranges for the IgE AccuBind™ ELISA test system were indicated in table 1.

Table1. Normal ranges for the IgE AccuBind™ ELISA test system (IU/ml)

Age (Yrs)	IgE range
0-3	0-46
3-16	0-280
Adult	0-200

Statistical analysis

Quantitative data are presented as mean \pm SD. For statistical analysis, SPSS software (Version 15, Chicago, IL, USA) was used.

Results

The demographics data of the patients are summarized in Table 2. Patients

divided to three groups (patients with infectious and inflammatory disorders of pharynx (63 patients), ear (47 patients) and CRS (58 subjects)).our investigation revealed that 15(23.8%), 13(27.6%), 14(24.1%) of patients with infectious and inflammatory disorders of pharynx, ear and CRS showed systemic allergic reaction (elevated level of IgE), respectively.

Table 2.Demographic data of study population

	male	female	Age (mean \pm SD)
ear disorders	18(38.2%)	29(61.7%)	35 \pm 21.34
Pharynx disorders	30(47.6%)	33(52.3%)	34.1 \pm 19.3

Chronic rhinosinusitis	24(41.3%)	34(58.6%)	34.45 ± 24.3
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Table 3.Diagnostic values of IgE in infectious and inflammatory disorders of upper respiratory tract

	n	High level of IgE	normal level of IgE
ear disorders	47	13(27.6%)	34(72.3%)
pharynx disorders	63	15(23.8%)	48(76.1%)
Chronic rhinosinusitis	58	14(24.1%)	44(75.8%)

Discussion

This study was conducted to elucidate the role of systemic allergy in URT diseases. Antigen- presenting cells process the allergens in the URT epithelial mucosa, simultaneously with presentation of allergenic peptides by MHC class II molecules to T-cell receptors on resting CD4⁺ T lymphocytes in regional lymph nodes. Costimulatory signals induces allergen-stimulated T cells change into TH2-biased cells which produce IL-3, IL-4, IL-5, IL-13, and other cytokines. These cytokines cause B cell class switching with subsequent local and systemic production of allergen-specific IgE antibody by plasma cells, mast cell and eosinophilic infiltration into the URT mucosa (13).

Although IgE presents at the lowest serum concentration and has the

shortest half-life but it is an important antibody. IgE is correlated with hypersensitivity and allergic reactions, beside the response to parasitic worm infections .Recently, anti-IgE antibodies which designed to target free IgE as well as B cells with surface bound IgE, have used as therapy for allergy and asthma (14).

Different researches have declared that plasma cell count and antigen-specific IgE levels are elevated in the polypoid sinonasal mucosal tissue from patients suffer from CRS with nasal polyposis (15-17). But these studies didn't discuss about the role of serum total IgE in such patients. Chadwick N. Ahn et al. evaluated the local production of antigen-specific IgE in allergic fungal rhinosinusitis (AFRS). Their team examined if there are anatomic variations in local IgE expression or variations among fungal and non fungal

IgE exist. Samples from 11 patients with AFRS, 8 CRS without nasal polyps (CRSsNP), and 9 control participants underwent IgE measurement. They revealed inferior turbinate epithelium had greater IgE staining in AFRS than control and CRSsNP. A significant change was detected at the inferior turbinate subepithelial level for AFRS compared with controls and CRSsNP. In patients with AFRS, IgE was elevated in the subepithelium compared to epithelium. Analysis on inferior turbinate tissue from AFRS and controls showed elevated antigen-specific IgE for 5 of 14 antigens and total IgE. They found no significant anatomic differences between Inferior turbinate and sinus IgE staining (18). However, in consistent with our work, we examined serum total IgE levels in patients suffered from infectious and inflammatory disorders of URT to show majority of these patients are predispose to URT diseases due to systemic allergy. Our investigation revealed that 24.1 % patients with CRS, 27.6% with ear disorders and 23.8% with pharynx diseases were allergic patients.

In conclusion, increased susceptibility to infections and progress of autoimmune disorders may be a result of impaired immunity and tolerance

induction. Characterization of humoral responses in URT disorders requires further investigations as a future fertile research subject.

Acknowledgment

The authors are grateful to Mohammad Mirabi for excellent secretarial assistance.

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