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Correlation of symptoms with total IgE and specific IgE levels in patients presenting with allergic rhinitis

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Abstract:
Objective: The objective of this study was to investigate the correlation of symptoms in patients with presumed allergic rhinitis on the basis of their medical history and physical examination with the levels of total immunoglobulin E (IgE) and specific IgE, and to question the necessity of these tests in diagnosis.
Methods: The records of 295 patients, who had at least two complaints of nasal itching, nasal obstruction, runny discharge and sneezing, and/or presumed as allergic rhinitis on physical examination findings were retrospectively screened. The correlation between the levels of IgE, specific inhalant IgE, and food-specific serum IgE were evaluated in these patients.
Results: A total of 70 cases (23.7%) were determined to have a total value of IgE under 20 U/ml, 113 cases (38.3%) with IgE values between 20 U/ml and 100 U/ml, and 100 cases with IgE values above 100 U/ml. Results of total IgE could not be obtained in 12 (4.06%) patients. *Dermatophagoides farinae* was the most common allergy in this group with 74 (68.5%) cases.
Conclusions: The determination of IgE in allergic rhinitis is a supportive method. However, it cannot be recommended for routine use because of the time loss and high cost.

Keywords: allergic rhinitis, specific immunoglobulin E

Introduction

Allergic rhinitis is one of the cases most frequently faced by an ear, nose, and throat (ENT) specialist where patients present with nasal obstruction, runny nose, nasal itching, and sneezing [Naclerio, 1991]. Although the diagnosis for rhinitis is easy, patients with similar symptoms and evidence are referred to the ENT clinic without an allergic origin. Differentiation of allergic rhinitis from other etiologic-based rhinitis is frequently difficult. In such cases, the differential diagnosis could be based on clinical and laboratory examination such as anamnesis, physical examination, endoscopic and radiologic examination, prick test, nasal smear, and evaluation of the mucociliary activity. In addition, the response of the immune system of the sensitized person to the allergen as a result of a series of reactions, mediated by many immune mediators, including eosinophils, mast cells, and basophils, can be defined *in vitro* using various parameters such as total immunoglobulin E (IgE), specific IgE, and eosinophil count. Determination of the blood levels of these parameters provides a significant contribution to the physician in the differentiation of allergic-origin and nonallergic-origin rhinitis [Han *et al.* 2011; Pinar *et al.* 2005]. Although the determination of serum-specific lgE is less sensitive, more expensive, and requires more time than the allergen skin test, it has fewer risks.

In this study, we retrospectively investigated the efficiency of laboratory outcomes in the diagnosis of patients from a region rich in pollens, which constitute an important part of inhalant allergens, referred to our ENT clinic with suspected allergic rhinitis.

Methods

The records of patients who presented at the ENT clinic with complaints of allergic rhinitis were analyzed retrospectively. As a result of this screening 295 patients were included in the study.

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Table 1. The demographic structure and the distribution of the antibody.

	Age	Sex	Total IgE under 20 U/ml	Total IgE in range 20–100 U/ml	Total IgE above 100 U/ml	Total IgE not available	IgE antibody against specific inhalant (+)	IgE antibody against food allegen (+)
Patient number	Min: 6 Max: 80 Mean: 33.9	Female: 168 Male: 127	70 cases (23.7%)	113 cases (38.3%)	100 cases (33.8%)	12 cases (4.06%)	108 cases (36.6%)	67 cases (22.7%)

The inclusion criteria were at least two complaints of nasal drainage, sneezing, nasal obstruction, itching symptoms, and/or a defined positive examination finding. On anterior rhinoscopic examination, nasal colorless mucosa, serous drainage, and concha hypertrophy were accepted as positive examination findings. Serum total IgE, specific inhalant IgE, and specific food IgE values were obtained from the patient records. Total IgE outcomes were studied in three groups. The cases with a total IgE below 20 U/ml were considered as negative, values between 20 U/ml and 100 U/ml as suspected, and above 100 U/ml as positive allergy.

Results

A total of 295 patients with ages ranging from 6 years to 80 years of age (mean age 33.9 years) were included in the study. Of these cases, 168 (56.9%) were females and 127 (43.0%) were males.

A total of 70 cases (23.7%) had a total IgE under 20 U/ml, 113 cases (38.3%) had IgG values of 20–100 U/ml, and 100 cases (33.8%) had IgG values above 100 U/ml. Total IgE outcomes in 12 patients (4.06%) were not available. In 47 patients (15.9%), the IgE antibody against the specific inhalant was not studied. In this group, a specific IgE antibody against at least one of the 10 studied inhalant allergens was found to be positive in 108 (36.6%) out of of 248 cases (84.6%) (Table 1). The most common positive inhalant allergen among these was *Dermatophagoides farinae*, which occurred in 74 cases (68.5%) (Figure 1). A specific food allergen was not studied in 63 cases (21.3%). In this group, a specific IgE antibody against at least one of the 10 studied specific food allergens was found to be positive in 67 cases (22.7%) out of a total 232 cases (78.6%). The most common food allergen was defined as soyabean, which was determined in 49 patients (73.1%). The allergens studied as specific and food inhalants with the distribution of patients are shown in Figure 2.

Total IgE antibody values were under 20 U/ml in 16 cases (14.8%) out of 108 cases with specific inhalant allergies determined as positive, and in 12 cases (17.9%) out of 67 cases with food allergies determined as positive. On physical examination of 156 patients (52.8%), colorless bilateral nasal mucosa, serous drainage, and/or concha hypertrophy were defined, while 139 patients (47.1%) were assessed as normal on physical examination.

Discussion

Allergic rhinitis characterized by nasal discharge, sneezing, nasal obstruction, and itching symptoms is one of the most common types of atopic disease. Its prevalence differs between 5% and 22% [Naclerio, 1991]. Some substances of animal and plant origin inhaled as allergens cause an atopic reaction to develop mediated by IgE and known as classic type I immune response. This mechanism plays an important role in emerging allergic rhinitis. The effects of environmental change on respiratory allergic diseases are not yet completely understood [Varjonen *et al.* 1995; Ozdoganoglu and Songu, 2012]. On the other hand, when reviewing studies in the literature, a number of researchers have claimed that several allergens play a role as stimulators in allergic rhinitis as well as in asthma, which constitutes an important form of allergic disease [Bousquet et al. 2008; Penard-Morand *et al.* 2010]. In their study, Tang and Wu stated that various stimulating allergens play a role in allergic bronchial asthma and allergic rhinitis, and one of the most important of these allergens is the house dust mite [Tang and Wu, 1989]. In another study that examined rhinitis and asthma, the most general cause was reported to be pollens in rhinitis etiology [Kaliner *et al.* 1987]. Riketti reported that the most commonly encountered allergens are pollens and fungi in the seasonal form, and house dust mites and fungi in the perennial form in the etiology of allergic rhinitis [Ricketti, 1993]. In atopic individuals, it is inevitable that end-organ allergic reaction develops as

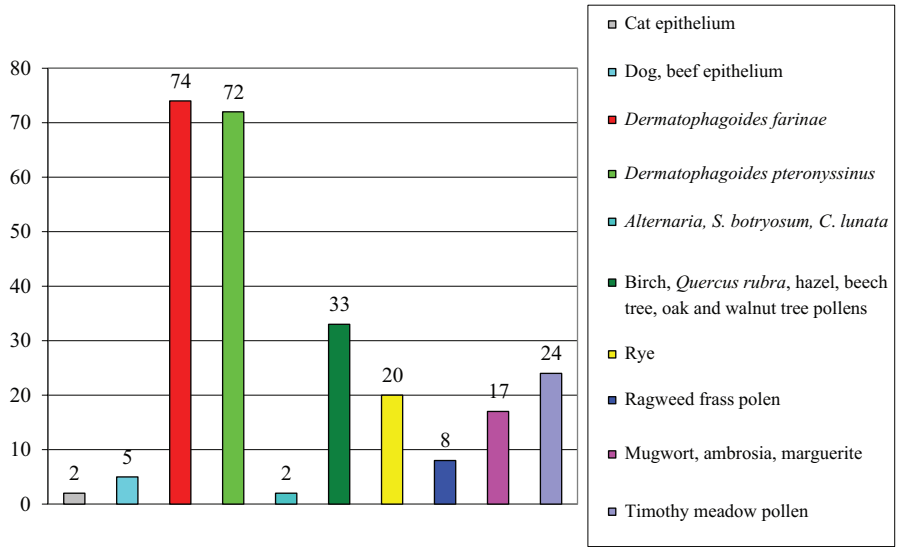

Figure 1. Inhalants codification (COD). 1 Cat epithelium; 2 dog, beef epithelium; 3 *Dermatophagoides farinae*; 4 *Dermatophagoides pteronyssinus*; 5 *Alternaria, Stemphylium botryosum*, *Curvularia lunata*; 6 birch, *Quercus rubra*, hazel, beech, oak and walnut tree pollens; 7 rye; 8 ragweed frass pollen; 9 mugwort, ambrosia, marguerite; 10 Timothy meadow pollen.

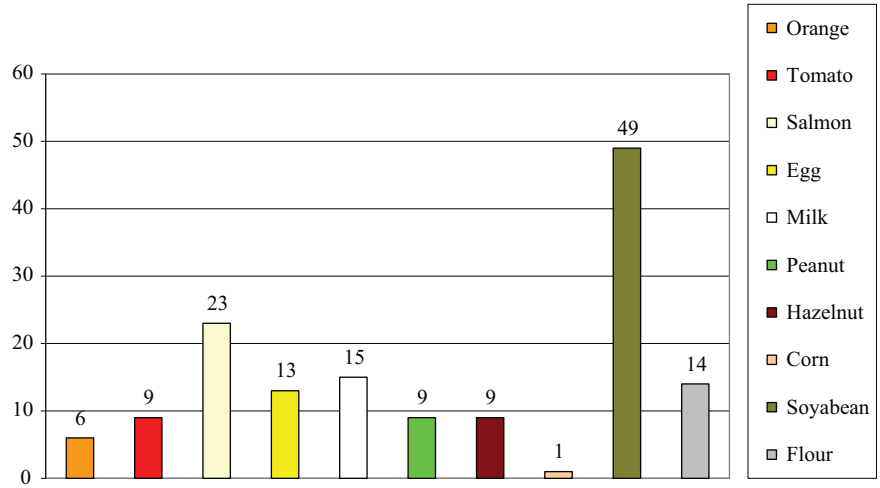

Figure 2. Foods codification (COD). 1 Orange; 2 tomato; 3 salmon; 4 egg; 5 milk; 6 peanut; 7 hazelnut; 8 corn; 9 soyabean; 10 wheat flour.

a result of allergen exposure in the proper conditions with specific lgE antibodies. However, since the mechanisms that contribute to disease occurrence are usually more complex, the relationship between the atopic reaction and laboratory cannot be easily understood in clinical practice. *In vitro* determination of the response created by the immune system of a sensitized person against the allergen as a result of a series reaction as the various parameters and detection of high blood levels of these parameters can provide an important contribution to the physician in the definition of the atopy and the differentiation of its clinical reflections in cases with nesting similar clinical manifestations. Numerous tests have been made on food and inhaled allergens were found to have a positive contribution to our work.

In this context, several laboratory techniques and tests are used to confirm the diagnosis in patients presumed to have allergic rhinitis by anamnesis and physical examination, and to define the etiological cause. There are numerous studies on understanding the relationship between allergies and laboratory. In a study, total serum levels of lgE were found to be high in approximately 88% of cases [Han, 2011].

Kim and colleagues reported on a patient with piperacillin allergy. They did not perform provocation and skin-prick tests with piperacillin, although they found piperacillin-specific IgE in the serum [Kim *et al.* 2011]. As a result of a large study on serum lgE and skin activity in 2657 patients, a group of authors reported that the lgE value is a parameter that should be investigated [Burrows *et al.* 1989]. Total lgE was examined in the sweat fluid out of serum, and a correlation was defined between the levels of lgE in the serum and sweat fluid of atopic individuals, and the lgE discharged with the sweat was suggested to be responsible for the skin reactions [Jung *et al.* 1996]. There are also several studies in the literature in which a positive correlation was found between the prick test, which is commonly used in the determination of allergy, and serum levels of lgE [Malinowska *et al.* 2002]. Serum levels of lgE examined in different periods from the birth of children of atopic parents indicated that positive values are important clues to the hereditary transmissions of atopy [Oldak *et al.* 2000]. Moreover, this study showed that the familial history should not be ignored in the determination of atopy. Generally, lgE positivity is acknowledged as strong evidence of atopy. Even the relationship of allergic rhinitis and lgE is not strong to the same degree, high serum levels of lgE is a strong argument confirming the rhinitis diagnosis. Kaliner and colleagues reported total levels of lgE were high in 30–40% of allergic rhinitis patients [Kaliner *et al.* 1987]. Pinar and colleagues found serum eosinophil cationic protein, nasal eosinophilia, and serum total IgE levels increase in patients with allergic rhinitis, but the same increase were not detected with seasonal or perennial allergens [Pinar *et al.* 2005].

In this study, in the 295 cases considered as allergic rhinitis on anamnesis and physical examination, total lgE outcomes were below 20 U/ml and defined as negative only in 70 patients (23.7%), while 113 cases (38.3%) were considered as suspected allergic rhinitis with a lgE of 20–100 U/ml, and 100 cases (33.8%) were positive with a lgE above 100 U/ml. The results obtained were consistent with results from the literature. In a total 213 of the patients we assessed with an allergic rhinitis prediagnosis, total lgE outcomes were defined as suspected or strongly positive. Therefore, total lgE outcomes strongly confirmed our prediagnosis. Literature data and our results demonstrated that if anamnesis and clinical and physical examination findings suggest allergic rhinitis, it is very likely our diagnosis will be accurate. The superiority of the skin-prick test to serum IgE has been documented and recommended in the management of allergic rhinitis in a multicenter study [Burrows *et al.* 1989]. Although total lgE values are strong evidence in confirming our allergic rhinitis diagnosis, we cannot recommend routine laboratory studies in each case of suggested allergic rhinitis in clinical practice. This is because, even though there is no risk in the examination of this parameter in the peripheral blood, it may cause time and financial losses. However, it is effective in those cases which do not respond to treatment or where there is difficulty with the diagnosis. Numerous tests have been made on food and inhaled allergens were found to have a positive contribution to our work.

Including only cases from the same region limited the effectiveness of our study in terms of allergen stimuli. We think that large multicenter studies will provide more precise data in terms of variety of allergens.

Conclusion

We believe that a detailed anamnesis and rigorous physical examination significantly contribute to the differential diagnosis of allergic rhinitis in which atopy is a significant etiological factor. Although the serum level of lgE is a strong factor in confirming the diagnosis, we cannot recommend it for routine use owing to its high cost and the time taken to carry out the test. Specially, in cases in which allergen-specific lgE could not be examined, it is known that the most common allergy develops against *Dermatophagoides farinae* as an inhalant allergen and soyabean as a food allergen, and this can be used to inform the patients' diagnosis.

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Conflict of interest statement

The authors declare no conflicts of interest in preparing this article.

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