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Correlation Among Skin Prick Test, Total and Specific IgE UniCAP Tests in Atopic Patients from Zagreb, Croatia

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SUMMARY The correlation of pollen allergens, *Dermatophagoides pteronyssinus* and animal dender was assessed during a two-year period. Results of skin prick test, total and specific IgE UniCAP tests were compared in atopic patients (AP) with the following diagnoses: atopic dermatitis, allergic rhinitis, allergic conjunctivitis, allergic bronchitis or asthma, allergic urticaria and angioedema. The study included total and specific IgE (*in vitro*) tests to allergen mixtures (grass, tree, weed) or to single allergens of *Dermatophagoides pteronyssinus* (Der p), cat and dog fur, feather, etc. Comparison of skin prick test with total and specific IgE UniCAP immunoassay was done in 173 patients, i.e. 107 female and 66 male atopic patients aged 9-76 years. Allergies were most commonly recorded in the 25-35 age group. Total IgE ranged from 8.63 kU/l to >4000 kU/l, with specific IgE ranging from class 1 to class 5. Skin prick test showed high correlation with specific IgE for grass and weed pollen in patients with repiratory allergy (50.28%). Good correlation among all three tests was quite frequently observed. The results suggest that the study should be continued using these three tests in further cases of atopic dermatitis.

KEY WORDS test correlation; skin prick test; total IgE UniCAP; specific IgE UniCAP; atopic patients

INTRODUCTION

Atopic and allergic diseases have been on an increase for several decades. Moreover, unknown factors related to the western lifestyle appear to be important in the development of atopy. Different air-pollution patterns characterize east and west European countries, traffic-related pollution has been an increasing problem representing a mixture of nitrogen oxides, gas exhaust particles and other small-sized particles (1). Today, atopic dermatitis is prevalent in many countries and is difficult to treat. Hypersensitivity to house dust mite, especially *Dermatophagoides pteronyssinus* (Der p), is an important cause of atopic dermatitis (AD). AD combined with at least two atopic family members showed a significant risk of allergic airway disease manifestation. According to clinical atopic diagnosis, it is necessary to establish the hypersensitivity to allergens. In different atopic disseases, inhalation allergens are most commonly involved (2-4). Lau *et al.* compared dust screening for Der p 1 and Der f 1 with quantitative and semiquantitative ELISA (5). Allergen specific diagnosis (as well as therapy) should be based on purified standardized allergen extracts (6). The finding that human mast cells after

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IgE-mediated activation produced a wide range of cytokines suggests that IgE may contribute to subsequent inflammatory reaction such as airway eosinophilia and remodeling associated with the late allergic response (7). Zawodniak *et al.* (9) compared standard and modified skin prick test (SPT) method for allergen extract grass, weeds, trees, Der p and animal dender (9). SPT has become the basic, safe and widely used method for allergy diagnosis, and its positive results show strong correlation with clinical symptoms (10).

During two-year period, we compared SPT results with total and specific IgE UniCAP tests in atopic patients with the diagnoses of allergic rhinitis (AR), allergic conjunctivitis (AC), allergic bronchitis or asthma (AB), atopic dermatitis (AD), allergic urticaria (U) and angioedema (AO) according to literature data (2-8).

The aim of the study was to investigate and compare the clinical significance of atopic diseases with the results of SPT, total and specific IgE.

MATERIAL AND METHODS

In vivo SPT was performed at Allergy Clinic, University Department of Dermatology and Venerology, Zagreb University Hospital Center, Zagreb. Total and specific IgE *in vitro* tests were performed at Biochemistry Laboratory, Zagreb Children's Hospital, School of Medicine, Zagreb.

During a two-year period (2001-2002), sensitivity to most common allergens was tested in 173 atopic patients using SPT. The study included allergen mixtures (grass, tree, weed) or single allergens of *Dermatophagoides pteroyssinus* (Der p), pollen (coksfoot, timothy, birch, ragweed, mugwort), cat and dog fur, feather, etc. (3,8). In all study patients, we compared SPT with total and specific IgE UniCAP immunoassays. SPT allergens were produced at Zagreb Institute of Immunology, according to European standard. The immediate type of hypersensitivity to allergens was proven with SPT. We started with histamine as positive control and buffer solution as negative control; positive reaction was read after 20-25 minutes as weal and flare, from +1 to +4 (8). The patients were tested with 38 single allergens. The Pharmacia UniCAP system, and FEIA and Upjohn reagents were used for quantitative measurement of circulating total or specific IgE in human serum or plasma, with reading in classes from 0 to 6. The normal total IgE level was 100 kU/l, and specific IgE range (kUA/l) class 0-6.

RESULTS

SPT was positive in all 173 patients to at least one allergen. Correlation among SPT, total and specific IgE UniCAP tests was analyzed in all 173 patients with atopic diseases (AR, AC, AB, AD, U and AO). There were 107 (62%) female and 66 (38%) male AP patients, age range 9-76. Allergies were most commonly recorded in the 25-35 age group. Positive SPT reactions are shown in Table 1. Total IgE ranged from 8.63 kU/l to >4000 kU/l, and specific IgE from class 1 (concentration 1.42) to 5 (concentration 68.2). The comparison of *in vivo* and *in vitro* tests showed good correlation (50.28%) for respiratory allergy and combination of respiratory and skin allergy (Table 1).

Table 2 shows total number and percentage of allergens (single and mixture). The highest rate was recorded for grass pollen mixture (43.35%), followed by Der p (35.26%), whereas other allergens showed quite a low rate of 1.15% to 11.56%.

DISCUSSION

Traditionally, skin tests and specific IgE have been considered to be of major diagnostic importance. However, none of diagnostic tests can replace the rational judgment of clinical diagnosis (8).

In some Eastern European countries, very high levels of 'classic' pollution consisting mainly of sulfur dioxide (SO_2) and suspended particles are recorded. The possible causes of the risk of allergic diseases are ozone, NO_2 and particulate matter. Global evaluation of patients with allergies and therapeutic efficacy should include both clinical and instrumental parameters (1). The prevalence of allergy is on an increase (1). During routine diagnostic work-up, our 173 patients underwent SPT to 38 inhalation allergens. The most common allergens were similar to those reported in the literature (1,5,9).

When allergic pathogenesis of a disease is suspected, SPT to standardized allergens should be performed. The measurement of allergen specific IgE in serum (as single allergens or groups) is a

Table 1. Correlation between Skin prick test, total and specific IgE UniCAP tests in 173 atopic patients

No. of atopic patients	Diagnosis	Mostly positive reactions on SPT	Total IgE UniCAP KU/l	Specific IgE ranged from +1 to +6
39	AR*	Grass pollen +4	60.3-1002	+2(2.20)to +3(13.1)
		Der p +2		Ragweed +4(22.7)
		Weed pollen +3		Der p +2(2.20)
6	AO	Der p +1	60.5-170.0	+1(1.42) to +2(2.20)
				Der p +1(1.42)
16	U	Der p +3	8.63-78.8	+1(1.42) to 0(<0.35)
		Grass pollen +3		Der p +1(1.42)
		Feather +1		Coksfoot 0(<0.35)
70	AD	Der p +4; +3; +2;+1	58 to >4000	+1(1.42) to +4(58.1)
		Timothy +4; +3		Der p +4(58.1)
		Feather +1		Timothy +4(30.3)
		Mugwort +3		Feather 0(<0.35)
				Ragweed +4(30.3)
26	AD+AR	Der p +1	129-272.0	+1(1.42) to +4(60.0)
		Feather +1; +2		Der p +1(1.42)
		Grass +3		Timothy +4(50.6)
		Trees +2		Mugwort +4(60.0)
		Birch +2; +3		Birch +2(2.20)
		Cocksfoot +3		Feather +3(13.1)
		Mugwort +2		
6	AC	Der p +3	62-212.0	+2(2.20) to +3(8.66)
		Birch +3		Der p +3(8.66)
		Animal dender +1		Birch +3(8.66)
		Cocksfoot +3		Animal dender +2(2.20)
10	AB	Grass +2	29-797	+2(2.69) to +5(68.2)
		Cocksfoot +2		Ragweed +5(68.2)
		Birch +2		Cocksfoot +2(2.69)
				Oak +3(4.49)

*AR=allergic rhinitis; AC=allergic conjunctivitis; AB=allergic bronchitis and asthma; AD=atopic dermatitis; U=allergic urticaria; AO=angioedema

Table 2. Most common allergens in 173 atopic patients according to skin prick test

Allergen	n	%
Grass pollen mixture	75	43.55
Cocksfoot (*Dactilys glomerata*)	5	2.89
Tree pollen mixture	6	3.46
Birch (*Betula verrucosa*)	2	1.15
Ragweed (*Ambrosia elatior*)	20	11.56
House dust mite (*Dermatophagoides pteronyssinus*)	61	35.26
Animal fur	2	1.15
Feather	2	1.15

useful diagnostic approach. As sensitization to an allergen does not necessarily mean that the individual patient suffers from clinical disease, the clinical relevance of skin or specific IgE results should be demonstrated before introducing treatment such as immunotherapy (6).

In the literature, it is reccomended to analyze SPT (*in vivo*) and one of total and specific IgE tests (*in vitro*) (5). Some authors found good correlation for respiratory allergy, especially for allergic rhinitis and bronchitis (5,9). Our results revealed the best correlation for Der p and very good for pollen, which is in concordance with the report of Lau *et al.* (5).

However, increased levels of total IgE have been reported to be associated with the prevalence of asthma even in nonatopic subjects who do not produce specific IgE to common allergens (7). The association with increased IgE serum levels is also obvious for other allergic diseases such as seasonal allergic rhinitis, insect venom allergy or food allergies (7). Diagnostic tests for determination of total and specific IgE antibodies are radio immunosorbent test (RIST), fluoro immunoassay (FIA), fluoro enzyme immunoassay – CAP System (FEIA-CAP), and for determination of specific IgE antibodies radio allergosorbent test (RAST) and CAP System RAST (8). For pollen, it is recommended to analyze total and specific IgE during the season and in the period out of pollution. It is sufficient to use SPT once a year (2, 5, 9,10-14). The examined method may be considered as an alternative to SPT, as it is safe, cheaper and more convenient (9).

CONCLUSIONS

In order to obtain better test correlation for pollen allergens it is neccessary to perform testing twice a year (spring and autumn), and once a year to Der p, cat and dog fur, feather, etc.

The correlation of SPT with specific IgE for grass and weed pollen is better in patients with allergic rhinitis, conjunctivitis and bronchitis. In the present study, the three tests frequently yielded a very good correlation (50.28%). Patients with atopic dermatitis caused by Der p showed better correlation of SPT with total IgE. The results suggest that the study should be continued by use of these three tests in further cases of atopic dermatitis.

References

1 Smith-Siversten T, Tchachtchine V, Lund E. Atopy in Norwegian and Russian adults: a population-based study from the common border area. Allergy 2003;58: 357-62.

2 Alvarez MJ, Olaguibel JM, Garcia BE, Urbiola E. Comparison of allergen-induced changes in bronchial hyperresponsiveness and airway inflammation between mildly allergic asthma patients and allergic rhinitis patients. Allergy 2000;55:531-9.

3 Čustovic A, Simpson B, Simpson A, Hallam C, Craven M, Woodcock A. Relationship between mite, cat and dog allergens in reservoir dust and ambient air. Allergy 1999;54:612-6.

4 Gustafsson D, Sjöberg O, Foncart T. Development of allergies and asthma in infants and young children with atopic dermatitis – a prospective follow-up to 7 years of age. Allergy 2000;55:240-5.

5 Lau S, Schulz G, Sommerfeld C, Wahn. Comparison of quantitative ELISA and semiquantitative Dustscreen for determination of Der p 1, Der f 1, and Fel d 1 in domestic dust samples. Allergy 2001;56:993-5.

6 Cauwenberge van P, Bachert C, Passalacqua G, Bousquet J, Canonica GW, Durham SR, *et al*. Consensus statement on the treatment of allergic rhinitis. Allergy 2000;55:116-34.

7 Hamelmann E, Rolinck-Werningshaus C, Wahn U. From IgE to anti-IgE: where do we stand? Allergy 2002;57:983-94.

8 Batišta I, Toman Lj. *In vitro* diagnostic treatments in allergic diseases of respiratory system. Medicus 1997;6: 41-3.

9 Zawodniak A, Kupczyk M, Gorski P, Kuna P. Comparison of standard and modified SPT method. Allergy 2003;58:257-9.

10 Bousquet J. *In vivo* methods for study of allergy: skin tests techniques and interpretation. In: Middletoon E, Reed CE, Ellis FF, editors. Allergy principles and practice. St. Louis: CV Mosby, 1988:420-6.

11 Darsow U. Hautteste. In: Ring J, editor. Neurodermitis. Landsberg: Ecomed, 1998:70-6.

12 Nakayama H, Kumei A. House dust mite – an important causation of atopic dermatitis. SP World 2003;31: 13-20.

13 Kleine-Tebbe J, Rytter M, Haustein UF. Diagnostik beim atopischen Ekzem-Qualität *versus* Quantität. In: Ring J, Darsow U, editors. Allergie 2000: Probleme, Strategien und praktische Konsequenzen. München-Deisenhofen: Dustri-Verlag Dr. Karl Feistle, 2001: 129-36.

14 Asero R. How long does the effect of birch pollen injection SIT on apple allergy last? Allergy 2003:58:435-8.