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Prediction of atopy via total immunoglobulin E levels and skin prick tests in patients with psoriasis

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Background/aim: Although the etiopathogeneses of psoriasis and atopy appear to be different, psoriasis has been found to be associated with atopy and atopic dermatitis. In this study, we aimed to determine the role of atopy by examining the medical history and clinical and laboratory findings of patients with psoriasis.

Materials and methods: Patients with psoriasis, asthma patients, and healthy volunteers were included in the study. Serum total immunoglobulin E (IgE) levels were obtained, and prick tests were administered to all groups.

Results: Psoriatic patients demonstrated percentages of atopy history (21.3%) that were higher than those of the healthy subjects (15.7%). The median total IgE level in psoriatic patients was found to be statistically higher than that in the healthy control group ($P > 0.05$). With respect to mite positivity, there were statistically significant differences in the psoriatic ($P < 0.05$) and asthmatic groups ($P < 0.001$) when compared to the healthy control group.

Conclusion: Our study is the first to use skin prick tests with psoriatic patients. Skin prick test sensitivity to mites increased in psoriatic patients, and we believe that this finding may be useful in protecting psoriatic patients from activation of psoriasis and in determining the appropriate treatment approach.

Key words: Psoriasis, total IgE, skin prick test

1. Introduction

Psoriasis vulgaris (PSO) is a common inflammatory skin disorder that affects individuals of all ages (1). A few studies have investigated the relationship between atopy and psoriasis (2–11); however, the literature on the correlation between psoriasis and serum immunoglobulin E (IgE) reveals conflicting results. Some authors maintain that the serum IgE level is not elevated in psoriatic patients, while others assert that the serum IgE level is high in these patients (5–10). A skin prick test is more sensitive than an observation of serum levels of specific IgE antibodies in the assessment of allergies (12). However, there has been no study conducted on the use of prick tests in psoriatic patients, and only a few studies conducted with specific IgE antibodies have appeared in the literature (2,4,11). In our study, we aimed to determine the association of atopy with patient history, as well as with clinical and laboratory findings (serum total IgE levels and prick tests) in psoriatic patients.

2. Materials and methods

2.1. Patient and control groups

Ninety-four adult patients with PSO who applied to our outpatient clinic were included in our study. Two control groups were formed: the asthmatic control group consisted of 52 volunteers who were admitted to the Ankara Atatürk Chest Diseases and Chest Surgery Training and Research Hospital and the healthy control group was composed of 57 volunteers (whose ages and sex were similar to the psoriatic group) who applied to our polyclinic. Patients with erythrodermic psoriasis and those who received topical or systemic treatment or had other diseases that could affect the test results were not selected to participate in the study. In choosing participants for the healthy

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control group, both atopic and nonatopic individuals who were using medication (tricyclic antidepressants, systemic steroids, or oral antihistamines) and those with a disease other than psoriasis were excluded from the study.

Approval for the study was obtained from the Ankara Numune Education and Research Hospital Scientific Committee. After informing the psoriatic patients and the control group members about the study, informed volunteer consent forms were signed by the participants.

The atopy histories of all participants in each study group were registered. Each participant was questioned about his or her history of atopic dermatitis, asthma, and allergic rhinoconjunctivitis. Following this, dermatological examinations were performed. Serum total IgE levels were obtained, and prick tests were administered.

The duration of disease was registered for patients with psoriasis; the longest duration was a period of 53 years, and the shortest was zero years in newly diagnosed patients.

2.2. Serum total IgE measurements

Serum total IgE levels were studied at the Ankara Numune Training and Research Hospital hormone laboratory using the reversed enzyme-linked immunosorbent assay (ELISA) method (ALLERG-O-LIQ, Dr. Fooke Laboratorien GmbH, Neuss, Germany). Venous blood, obtained from all group participants and centrifuged to separate serum and serum samples, was frozen at –80 °C and was later analyzed. The measuring range was 5–1000 IU/mL and values between 0 and 100 IU/mL were accepted as normal. Values above 100 were accepted as total IgE positive.

2.3. Prick tests

Skin prick tests were administered at the Ankara Atatürk Chest Diseases and Chest Surgery Training and Research Hospital Allergy Clinic. Prior to performing the skin prick tests, patients were examined for dermographism, and prick tests were not administered to those who tested positive for the condition. Dermographism was positive in 7 patients with psoriasis and in 6 healthy patients. Prick tests were administered to 87/94 individuals in the psoriatic group, to all individuals in the asthmatic group, and to 51/57 individuals in the healthy control group.

Stallergenes 20-panel skin prick tests (Stallergenes S.A., Antony Cedex, France) were used in the study, and histamine and normal saline were used in the positive and negative control groups. Results were read 15 min after the tests were applied. Wheals with diameters of 3 mm and over were accepted as positive reactions.

The 20-panel skin prick test materials were separated into the following four main groups:

Mite group: *Dermatophagoides pteronyssinus*, *D. farinae*, storage mites

Mold group: *Aspergillus*, *Cladosporium*, *Penicillium*, *Alternaria*

Animal dander and epithelium group: Cat epithelia, dog epithelia, feather mix, cockroaches, sheep's wool

Pollen group: Betulaceae, Fagaceae, Oleaceae, Salicaceae, grass mix, cereal mix, Compositae, *Parietaria officinalis*

2.4. Statistical analyses

Data were analyzed using SPSS 11.5 for Windows. Distributions of continuous variables were evaluated with the Shapiro–Wilk test. The significance of differences in the average age of the groups was observed via single-direction variance analysis (one-way ANOVA), and the significance of differences in total IgE levels was examined using the Kruskal–Wallis test. Categorical variables were examined using Pearson's chi-square test or Fisher's exact chi-square test. Results of $P < 0.05$ were accepted as statistically significant.

3. Results

The sex and age distribution according to groups is presented in Table 1. There were no statistically significant differences in average age between the 3 groups ($P = 0.109$). Clinical and demographical features for all groups are presented in Table 1.

There was a history of asthma for 5 patients (5.3%) in the psoriasis group and a history of allergic rhinoconjunctivitis for 17 individuals (18%) from the same group. There was a history of allergic rhinoconjunctivitis for 9 members (15.7 %) in the healthy control group. Prick test positivity to one or more allergens occurred in these patients, as well.

Age, sex, age at onset, type of psoriasis, and the Psoriasis Area Severity Index (PASI) scores for patients with PSO were registered. All of these clinical features were classified and are presented in Table 2.

In our study, serum total IgE levels indicated a wide distribution; for this reason, statistical analyses were completed according to the median value of the total IgE levels. Median IgE levels in the psoriatic, asthmatic, and control groups were 19.9 (0–572), 25.9 (0–355.9), and 11.1 (0–436.8), respectively. The median value of the total IgE levels was higher in the psoriatic group and showed significant statistical differences compared to those of the healthy control group ($P = 0.034$). Median values of the total IgE levels in the asthmatic group compared with those of the healthy control group demonstrated significant statistical differences ($P = 0.005$). There were no differences in the median value of the total IgE levels between the psoriatic and asthmatic groups ($P > 0.05$).

3.1. Total IgE positivity

Total IgE levels exceeding 100 IU/mL were accepted as positive. Total IgE positivity was observed to be numerically higher in psoriatic patients than in the healthy control group, but there were no statistically significant differences. Only the differences between the asthmatic

Table 1. An overview of demographic and clinical features for all groups.

Features	Psoriatic (N = 94)	Asthmatic (N = 52)	Healthy controls (N = 57)
Sex Female Male Average age	53 (56.4%) 41 (43.6%) 40.4 ± 13.9 (18–70)	9 (17.3%) 43 (82.7%) 42.7 ± 12.7 (18–72)	33 (57.9%) 24 (42.1%) 37.4 ± 12.1 (18–58)
Atopy history	N = 20 (21.3%)	N = 24 (46.1%)	N = 9 (15.7%)
Median total IgE level IU/mL	N = 94 (19.9)	N = 48 (25.9)	N = 57 (11.1)
Total IgE positivity (>100 IU/mL)	N = 16 (17%)	N = 12 (25%)	N = 4 (7%)
	N = 87	N = 52	N = 51
Prick test positivity	N = 17 (19.5%)	N = 24 (46.2%)	N = 2 (3.9%)
Polisensitization	13 (14.9%)	24 (46.2%)	2 (3.9%)

Table 2. The clinical features of psoriatic patients.

Psoriatic group (N = 94)			
Age	≤35 years old N = 40 (42.6%)	36–55 years old N = 36 (38.3%)	>55 years old N = 19 (19.1%)
Age of onset	≤20 years old N = 30 (31.9%)	20–40 years old N = 45 (47.8%)	>40 years old N = 19 (20.2%)
Psoriasis type	Plaque N = 75 (79.8%)	Guttate N = 12 (12.8%)	Palmoplantar N = 7 (7.4%)
PASI	Mild (PASI 0–5) N = 62 (66%)	Moderate (PASI 5–10) N = 22 (23.4%)	Severe (PASI >10) N = 10 (10.6%)

group and the healthy control group were statistically significant (P = 0.011).

In the psoriatic group, statistically significant differences were not observed with respect to age (P = 0.315), age of onset, psoriasis type, duration of disease, PASI score, and total IgE positivity.

Of the 20 atopic psoriatic patients, only 5 had total IgE positivity. Of the 24 allergic asthma patients, only 6 had total IgE positivity (>100 IU/mL). Of 9 patients in the atopic healthy control group, 2 had total IgE positivity. Patients who had atopy and those who did not in all groups were compared with total IgE positivity (>100 IU/mL), and there were no statistically significant differences between groups (psoriatic: P = 0.971, asthmatic: P = 0.363, and healthy controls: P = 0.182).

3.2. Prick test results

Prick test positivity was noticeably statistically higher in psoriatic patients than in the healthy control group participants (P < 0.05). There were statistically significant differences in prick test positivity between the psoriatic and asthmatic groups (P < 0.001) and between the asthmatic and healthy control groups (P < 0.001). Distributions of allergen positivity of the psoriatic patients and the asthmatic and healthy control groups are presented in Table 3. Mite positivity showed statistically significant differences in the psoriatic (P < 0.05) and asthmatic (P < 0.001) groups when compared to the healthy control group. Mite positivity showed statistically significant differences between the asthmatic group and the psoriatic group (P < 0.001). However, the groups showed no statistically significant differences with respect to mold (P = 0.362), animal dander (P = 0.122), and pollen (P = 0.146) positivity.

In the psoriatic group, prick test positivity to one or more allergens was not statistically different with respect to age (P > 0.05), sex (P > 0.05), age group (P = 0.218), psoriasis type (P = 0.247), or PASI score (P = 0.253). It was determined that duration of disease was longer in psoriatic patients whose prick tests were positive.

Table 3. Distributions of allergen positivity in psoriatic patients, asthmatic controls, and healthy controls.

	Psoriatic group (N = 87)	Asthmatic group (N = 52)	Healthy control group (N = 51)	P-value
Mite	7 (8.0%)	20 (38.5%)	0 (0%)	<0.001
Allergen mold	5 (5.7%)	4 (7.7%)	1 (2.0%)	0.362
Animal	5 (5.7%	6 (11.5%)	1 (2.0%)	0.122
Pollen	11 (12.6%)	8 (15.4%)	2 (3.9%)	0.146
*Total positivity on skin prick test	17 (19.5%)	24 (46.2%)	2 (3.9%)	<0.001

*Differences between psoriatic and asthma groups are statistically significant (P < 0.001); *differences between psoriatic and healthy control groups are statistically significant (P < 0.05); *differences between asthmatic and healthy control groups are statistically significant (P < 0.001). *There are multiple allergen positivities in some patients.

4. Discussion

Atopy is a formation of type 1 hypersensitivity to specific antigens via the effects of an antibody test (13). The literature contains few studies of atopy in psoriasis featuring specific IgE (2,4,11), and there is no similar study making use of prick tests.

Atopic dermatitis (AD) and psoriasis are common dermatological diseases (1,3) that feature similarities and differences, both clinically and histopathologically. Although the immune cell subgroups that take part in the pathogenesis of the diseases are different, the infiltration of T cells, dendritic cells, mast cells, and other inflammatory cells is substantial in both diseases. The inflammation in both diseases is determined by Th17 and Th1 cells (17–19). The association of psoriasis with atopy and AD is a topic that has recently drawn attention (3,4). The inflammation in AD and PSO is determined by Th17 and Th1 cells. Recent research has shown that Th1 cells play a role in AD pathogenesis and that B lymphocyte infiltration is present in psoriatic skin (17–19). Some authors have suggested that IgE increases in PSO serum with a shift from Th1 to Th2 (9). Consequently, etiopathogenesis-oriented data about an association between psoriasis and AD/atopy have been inadequate.

In our study, 21.3% of psoriatic patients and 15.7% of healthy volunteers had a history of atopy. Histories of asthma in 5 participants (5.3%) and of allergic rhinoconjunctivitis in 17 participants (18%) were observed in 20 psoriatic patients who also had a history of atopy. An AD history and the presence of the disease were not found in any of the psoriatic patients. In addition, psoriasis was not determined to be present in any of the patients with asthma.

Serum total IgE levels showed a broad range of distribution. In the psoriatic and asthmatic groups, serum total IgE median levels were found to be higher than those in the healthy control group (P < 0.05). The total IgE positivity was considered higher in the psoriatic patients (17%) than in the healthy control group (7%), but there were no statistically significant differences (P > 0.05). This finding was consistent with studies presented by several other authors (5–7). However, some authors have stated that total IgE levels increased in psoriatic patients (8–10). These conflicting results could be associated with different severities of involvement and different laboratory techniques. There were statistically significant differences between the asthmatic and healthy groups according to the total IgE positivity (P = 0.011), as shown in the literature (13).

Statistical discrepancies between age, sex, age of onset, and total IgE levels were not seen in psoriatic patients. Similar to the study conducted by Ovcina and Kurtovic et al. (9), correlations between the period of disease, clinical type, and total IgE levels were not found in our study. It was reported in the literature that total IgE levels were high in patients with epidemic psoriatic lesions (8,10). AD is included in the atopic disease category (13,14). In addition to patient history and clinical findings, the following tests are used in atopy diagnosis: a skin prick test, serum total IgE levels, RAST (in vitro allergen specific IgE assay), an atopy patch test, and a provocation test (13–16). The skin prick test, which is also used to diagnose sensitization to specific allergens, is more sensitive than specific IgE. However, in contrast to high total IgE levels in patients with computationally severe PASI results, statistically significant differences were not observed in our study. This situation may be related to the fact that our patient group was composed of patients whose disease was mostly of mild to medium severity or that patients with erythrodermic psoriasis were not selected for the study because prick tests could not be performed. We believe that an increase in the number of participants would result in different outcomes.

Prick test positivity was observed in 19.5% of the psoriatic patients in our study. The allergen groups demonstrating the most common positivity were the pollen (12.6%) and mite (8%) groups. In comparison to

the healthy control group, mite positivity was statistically significant ($P < 0.001$) and pollen positivity was not found to be significant ($P = 0.146$) in the psoriatic group. Mite positivity was observed to be higher in the asthmatic group than in the psoriatic group ($P < 0.001$).

Hajdarbegovic et al. (2) investigated the relationship between atopy and psoriasis using total IgE levels and specific IgE. In that study, there were three groups: PSO (N = 133), psoriatic arthritis (PSA) (N = 168), and healthy controls (N = 147). Studied inhalant allergens were cat and dog dander, birch pollen, grass pollen, house dust mites, and herb pollen. The authors found the proportions of patients with PSO and control patients sensitized to these common aeroallergens to be similar (35.4% versus 34.0%) but significantly higher than the 19.7% detected in the PSA group. Hajdarbegovic et al. (2) also reported that the differences between the PSO and control groups were not statistically significant. There were no patients with PSA in our study and, with respect to mite positivity, the difference was statistically significant between psoriatic patients when compared to the control group.

Pigatto detected positivity in 44% of 140 psoriatic patients in a study in which he analyzed allergen-specific IgE levels. He ascribed specific IgE levels to different allergens, including grass, weeds, beech, olive, *Cupressus*, horse chestnut, *Candida*, house dust mites, and cat dander. The author attributed positivity mostly to house dust mites (64%) and to grass pollen (53%) (4). In our study, a 20-panel prick test was administered. In psoriatic patients, the most common types of positivity were, respectively, to grass mix and cereal mix (9.6%), to *D. farinae* (6.9%), and to *D. pteronyssinus* (5.7%). Pigatto (4) observed positivity to house dust mites in 64% of patients in his psoriasis group. This was higher than the percentages noted in our study (8%). In our observations, grass pollen showed a 53% positivity rate, while a positivity rate of 9.2% was found via prick test results. Pigatto (4) observed more positivity for chronic psoriasis (58%) than for active psoriasis (22%). In his study (4), polisensitization in psoriasis was found to be frequent (59.6%). This rate was comparable to the one in our study, while positivity to a single allergen was 4%, and multiple allergen positivity was 14.9%. In our study, we also found prick test positivity to one or more allergens at a rate of 19.4% in plaque psoriasis and at a rate of 30% in guttate psoriasis; however, we did not determine positivity in patients with palmoplantar involvement. Although more positivity was observed in guttate psoriasis, we did not observe statistically significant differences in prick test positivity to one or more allergens among psoriasis types ($P > 0.05$).

According to our observations, there were no statistically significant differences between age of onset and prick test positivity to one or more allergens in psoriasis patients; however, it was observed that the duration of the disease was longer in psoriasis patients with prick test positivity. In our study, prick test positivity to one or more allergens was compared with PASI scores and was observed to be 15.79% in the mild group, 20% in the moderate group, and 40% in the severe group. With respect to these findings, digital elevations were observed, but statistically significant differences were not found in the group with severe PASI scores ($P > 0.05$).

Differences between our results and the results of Pigatto's study were due to the different methods used. While Pigatto (4) used specific IgE tests, we used skin prick tests, which were more sensitive in the detection of allergens. Additionally, the number and types of allergens used in the tests were different. Our study included 20 allergens, more than the number used by Pigatto (4). One of the most important differences between the two studies was that our study used control groups composed of both asthmatic and healthy volunteers in order to contrast the findings in the psoriatic patients.

As a result, it was observed that the skin prick test sensitivity of psoriasis patients increased, especially sensitivity to mites. Some authors have suggested that IgE increases in PSO serum with a shift from Th1 to Th2 (9). We suggest the same mechanism. We believe that our evaluation of psoriasis patients for atopy can benefit both prevention and treatment approaches. Our study is the first of its kind to evaluate all parameters simultaneously, apply both positive and negative controls, and use the prick test, which is more sensitive in detecting allergens.

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