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SHORT COMMUNICATION

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Does the reaction size of skin prick test associated with the allergic rhinitis symptom severity?

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KEYWORDS

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ABSTRACT

Background: Skin prick test (SPT) has the best positive predictive value to diagnose respiratory atopic diseases, including allergic rhinitis (AR), but the association of severity of allergic symptom and SPT reaction size has not been clearly determined yet.

Methods: In this a cross-sectional investigation, the severity of disease is classified using a visual analog scale for main symptoms, and SPT was conducted according to the principles of the European Academy of Allergy and Clinical Immunology.

Results: Thirty seven percent of the participants had at least one severe symptom. Patients with sensitivity to Alternaria (common allergens in humans) or tree pollens had more severe symptoms. We found that in patients who had sensitivity to Russian thistle pollen, wheal size >6 mm, was associated with more severe symptoms.

Conclusion: Despite previous conflicts to rely on SPT test for starting immunotherapy, we recommend this test especially for patients sensitive to Alternaria, weed pollens, and tree pollens, considering the size of wheal in association with AR symptom severity.

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Introduction

History and physical examination are the first steps in diagnosing allergic rhinitis (AR), but precise diagnosis requires paraclinical tests such as skin prick test (SPT), which has the best positive predictive value to diagnose respiratory atopic diseases, including AR.^{1,2} In practice, a wheal size of 3 mm² with erythema is usually considered a positive SPT result for AR. The size of erythematous wheal has been considered as the degree of sensitivity to that allergen for many years (especially in Scandinavia).³ A 6-mm² size was introduced as a cutoff value associated with severe AR, but the accuracy has not been proved yet.⁴ Moreover, so far, the association of severity of allergic symptom and SPT reaction size has not been determined.⁵ We tried to illustrate whether aeroallergens SPT result is related to the severity of AR symptoms.

Methods

Study design and setting

This was a cross-sectional investigation performed in the Allergy Clinic of Bahrami Hospital, Tehran University of Medical Sciences, Tehran, Iran. The study was approved by the Ethics Committee of Tehran University of Medical Sciences, with ethical code "IR.TUMS.VCR.REC.1391.47." After approval, we enrolled patients with AR from January 1, 2020 to December 31, 2020.

Participants

Inclusion criteria of patients were as follows: (1) Presence of current AR diagnosed by allergy specialist defined as the main symptoms of AR in the absence of viral infection of upper respiratory tract for at least 1 year; (2) not using anti-allergic drugs for at least last 2 weeks before performing SPT; (3) not treated with allergen immunotherapy; (4) no history of anaphylaxis; (5) no smoking; and (6) nonpregnant women.

Data collection

The severity of disease was classified according to symptoms as mild, moderate, and severe by using a visual analog scale for main symptoms (sneezing, coryza, nasal pruritus, nasal congestion, day work disturbance, and

nighttime sleep disturbance) in accordance with their previous experience of having AR symptoms. Thirty eight allergens were selected for SPT with standard allergen extracts (Stallergenes Greer Company, US) according to the principles of the European Academy of Allergy and Clinical Immunology (EAACI).⁶

Results

We enrolled 120 patients (32% female and 68% male) with a mean age of 10 (± 4) years (30% aged <5 years, 30% children, 17% adolescents, and 23% adults). Around 70% of the patients had just mild symptoms, 46% had at least one moderate symptom with no severe one, and 37% had at least one severe symptom. All patients had active AR, 45% of them had four clinical manifestations of AR, and 14% had only one symptom.

In all, 62 (51.6%) patients had negative SPT, while 58 (48.4%) had positive results. Patients aged less than 5 years had significantly more negative SPT results compared to older patients ($P = 0.009$). Severity of symptoms was not related to SPT positivity ($P = 0.699$), but patients with all four symptoms of AR (coryza, pruritus, nasal congestion, and sneezing) had significantly more positive SPT compared to those with fewer symptoms ($P = 0.03$).

In positive SPT group, 74% of the patients had sensitivity to more than one allergen, and patients with sensitivity to *Alternaria* ($P = 0.007$) or tree pollens ($P = 0.023$) had more severe symptoms. Table 1 shows wheal size and its association with severity of symptoms of Russian thistle pollen. We found that in patients who had a sensitivity to Russian thistle pollen, wheal size > 6 mm was associated with more severe symptoms ($P = 0.029$).

Discussion

Nearly half of the patients had negative SPT, and 37% had at least one severe symptom. Patients with sensitivity to *Alternaria* or tree pollens had more severe symptoms. We found that in patients who had a sensitivity to Russian thistle pollen, wheal size > 6 mm was associated with more severe symptoms.

Finding a responsible allergen for rhinitis is important because if patient has a clear allergic basis for rhinitis, allergen immunotherapy must be considered as the main treatment.⁷ According to the latest version of *Middleton's Allergy Essential*, "Allergy skin testing using the prick-puncture method is considered to provide the best combination of

Table 1 Wheal size and its association with severity of symptoms in patients with sensitivity to Russian thistle pollen.

SPT result	Severity of symptoms	Moderate symptoms	Mild symptoms	Relation of wheal size and symptoms' severity
Wheal < 6 mm	0	2	1	$P = 0.029$
Wheal > 6 mm	18	3	4	
Wheal: 3-5 mm	0	2	1	$P = 0.072$
Wheal: 5-10 mm	3	0	1	
Wheal > 10 mm	15	3	3	

sensitivity and specificity.^{7,8} SPT defines allergic nature of AR with assessing presence of systemic specific immunoglobulin E (IgE) for aeroallergen,⁸ but sometimes AR occurs due to localized IgE production, which is not associated with positive SPT.^{4,9,10} Therefore, the question is whether we can only trust SPT to begin immunotherapy.

In our study, patients with all four clinical manifestations of AR (pruritus, nasal congestion, coryza, and sneezing) significantly had positive results for SPT; therefore, we can offer SPT as a measure for assessing the allergic nature of rhinitis with the existence of different symptoms of AR.

In addition, in patients with sensitivity to *Alternaria*, Russian thistle, and tree pollens, wheal size could be an index of severity of AR symptoms, and such patients may benefit from immunotherapy to get rid of clinical manifestations. Furthermore, regarding the association of Russian thistle pollen with an erythematous wheal size of more than 6 mm, this cutoff point could be considered as an important variable in the future to interpret this test.

The result indicated that diameter of more than 6 mm in SPT could be used as a cutoff value. However, the concentration of pricking fluid also influences the diameter of wheal. Therefore, higher concentration of pricking fluid creates wheals of larger diameter.

Despite previous conflicts to rely on SPT test for starting immunotherapy, we recommend this test especially for patients that are sensitive to *Alternaria*, weed pollens, and tree pollens, and considering the wheal size in association with the severity of AR symptoms.

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Conflict of interest

The authors declared that they had no conflicts of interest.

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