Accuracy of patients' prediction in perennial allergic rhinitis

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Objective   :   *To determine the accuracy of patients' prediction of the result of their skin prick test in perennial allergic rhinitis.*

Design   :   *Prospectively descriptive study*

Methods   :   *Three hundred and fifty four patients who were diagnosed as perennial allergic rhinitis and were referred to the allergy and rhinology clinic by otolaryngologist and otolaryngic residents of the Department of Otolaryngology, King Chulalongkorn Memorial Hospital from January 1999 to December 2002 were recruited. They were requested to predict the result of their skin prick test before the test was run. Then the patients' predictions were compared to the results of their skin prick tests.*

Results   :   *The highest percentage of the correct predictions was from those who had positive results for allergy to dust and dust mite. The highest percentage of the correct predictions of negative results was from those who had allergy to dogs, feathers, cats and molds. Percentages of overall accuracy of patients' predictions were: 88.8 % for feather, 83 % for dust and dust mites, 83 % for dogs, 76.7 % for cats, 74.8 % for grasses and weeds, 65 % for molds, and 46.1 % for cockroaches.*

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Conclusions : *In general, the patients' prediction was quite accurate, especially when they predicted a negative result of skin prick test. They have very good ability to predict correctly positive result of skin test for allergy to dust mites. However, they have limited ability to predict the response to other allergens.*

Keywords : *Allergic rhinitis, Skin prick test, History, House dust mite.*

วัตถุประสงค์ : เพื่อศึกษาความแม่นยำของผู้ป่วยในการทำนายผลการทดสอบภูมิแพ้ที่ผิวหนังในโรคจมูกอักเสบจากภูมิแพ้

รูปแบบการศึกษา : เป็นการวิจัยเชิงพรรณนา

วิธีการวิจัย : ทำการศึกษาในผู้ป่วยโรคจมูกอักเสบจากภูมิแพ้แบบเป็นทั้งปีที่มาเข้ารับการตรวจในคลินิกโรคจมูก ไซนัส และภูมิแพ้ โรงพยาบาลจุฬาลงกรณ์ ทั้งหมด 354 คน ผู้ป่วยทั้งหมดได้รับแบบสอบถามซึ่งมีคำถามให้ทำนายชนิดของสารก่อภูมิแพ้ที่คิดว่าตัวเองแพ้ แล้วนำมาเปรียบเทียบกับผลการทดสอบภูมิแพ้ที่ผิวหนัง

ผลการศึกษา : สารก่อภูมิแพ้ที่ผู้ป่วยทำนายว่าแพ้ได้แม่นยำที่สุดคือ ฝุ่นและไรฝุ่น สารก่อภูมิแพ้ที่ผู้ป่วยทำนายว่าไม่แพ้ได้แม่นยำได้แก่ ขนนก สุนัข แมว และราความแม่นยำโดยรวมในการทำนายผลการทดสอบภูมิแพ้คิดเป็น ร้อยละ 88.8 สำหรับขนนก ร้อยละ 83 สำหรับฝุ่น ไรฝุ่น และสุนัข ร้อยละ76.7 สำหรับแมว ร้อยละ 74.8 สำหรับหญ้าและวัชพืช ร้อยละ65 สำหรับรา ร้อยละ 46.1 สำหรับแมลงสาบ

วิจารณ์และสรุป : การทำนายผลของการทดสอบภูมิแพ้ของผู้ป่วยโดยรวมค่อนข้างแม่นยำ โดยเฉพาะในการทำนายว่าตนเองไม่แพ้สารก่อภูมิแพ้ชนิดใด ส่วนในการทำนายว่าตนเองน่าจะแพ้สารก่อภูมิแพ้ชนิดใด จะมีความแม่นยำเฉพาะในฝุ่นและไรฝุ่นเท่านั้น

คำสำคัญ : จมูกอักเสบจากภูมิแพ้, การทดสอบภูมิแพ้ทางผิวหนัง, ประวัติ, ไรฝุ่น

Allergic rhinitis is a common disease worldwide. The prevalence of the disease in Thailand is as high as 20 % according to the survey of the World Health Organization in 1997.[1] Most of them are perennial allergic rhinitis.

In general, the presumptive diagnosis of allergic rhinitis is based upon clinical criteria. Although the most definite diagnosis is obtained by Ig E mediated response via skin prick test or serum specific Ig E, this test is not performed routinely. Most often, clinicians tend to rely on patient's history and the perception of their own allergy. However, few studies have been undertaken to determine the accuracy of the approach especially in perennial allergic rhinitis.

The objective of this study was to determine the accuracy of the result of patients' prediction of on their skin prick test for allergic rhinitis.

Material and Method

Patients who were diagnosed as perennial allergic rhinitis and were referred to the allergy and rhinology clinic by otolaryngologist and otolaryngic residents of the Department of Otolaryngology, King Chulalongkorn Memorial Hospital from January 1999 to December 2002 were recruited into the study. Based upon clinical criteria, all patients with clinical presentations of perennial allergic rhinitis were encouraged to take skin prick test. Those who undertook the test were required to stop taking any antihistamines for 5 days prior to the test. All patients completed a questionnaire in which they were asked about their general medical history and history of allergy. They were also asked to predict their sensitization to specific allergens by giving a list of

allergens they would be exposed to in the test under the heading "What do you think you are allergic to?". Upon completion of the questionnaire, a skin prick test was performed on the flexor aspect of forearms using standard methodologies. [2] The allergenic extracts (Greer Laboratories, USA) included, namely: Orris root, Acacia, tobacco, kapok seed, cotton linters, pigweed, careless weed, Bermuda grass, Johnson grass, Para grass, dogs, cats, feathers, *Dermatophagoides pteronyssinus*, *Dermatophagoides farinae*, American cockroaches, German cockroaches, grass smut, Penicillium, Alternaria, Aspergillus, Candida, Helmithosporium, Cladosporium. Histamine dihydrochoride 10 mg/ml (Hollister-Stier Laboratories, USA) was used as positive control, and 50 % glycerine/ 50 % buffered saline (Greer Laboratories, USA) was used as negative control. A reaction was considered positive if the wheal was 3 mm or larger in mean diameter with surrounding erythema. [2] The patient's prediction for dust mites, cockroaches, cat, dog, feather, molds, grasses and weeds allergy were compared to the results of the skin prick test, taken as gold standard. The positive and negative predictive values, sensitivity and specificity were calculated. The percentage of overall accuracy of the patients' predictions was calculated by the formula (True positive + True negative) x 100 / (True positive + True negative + False positive +False negative).

Results

In total, three hundred and fifty four patients were recruited. The results of their skin prick tests were positive in 261 patients. Those who had negative skin prick test (93 from 354 patients) were excluded from the study. The frequency of positivity and

negativity for each of the allergens is shown in the Table 1. The most commonly positive allergen was house dust mites (80.84 % of *Dermatophagoides pteronyssinus* and 78.93 % of *Dermatophagoides farinae*). The next most common positive allergen was house dust (65.52 %), followed by German cockroaches (49.81 %) and American cockroaches (47.89 %).

Of the 261patients, 248 were clinically in formative. Thirteen patients were excluded. Ten patients were diagnosed as intermittent allergic rhinitis, and hence were excluded from the study. The criteria defined for intermittent and persistent allergic rhinitis are based upon ARIA Workshop Group.[3] Three patients did not complete their questionnaire. The rest (248 patients), 84 of them were men (33.87 %)

Table 1. The frequency of positivity and negativity for each of the allergens.

Allergens	Positive (%)	Negative (%)
Orris root (n=261)	4.21	95.79
House dust (n=261)	65.52	34.48
Acacia (n=261)	3.44	96.55
Tobacco (n=153)	5.23	94.77
Kapok seed(n=261)	5.36	94.64
Pigweed (n=153)	2.61	97.39
Careless weed (n=261)	9.20	90.80
Bermuda grass (n=261)	9.58	90.42
Johnson grass (n=261)	14.94	85.06
Para grass (n=108)	4.63	95.37
Cockroaches, American (n=261)	47.89	52.11
Cockroaches, German (n=261)	49.81	50.19
Dogs (n=261)	4.21	95.79
Cats (n=261)	14.94	85.06
Feathers (n=261)	5.75	94.25
Dermatophagoides pteronyssinus (n=261)	80.84	19.15
Dermatophagoides farinae (n=261)	78.93	21.07
Candida albicans (n=153)	11.11	88.88
Grass Smut (n=153)	11.11	88.88
Penicillium (n=153)	5.23	94.77
Alternaria (n=153)	3.92	96.08
Aspergillus (n=153)	5.23	94.77
Helminthosporium (n=153)	2.61	97.39
Cladosporium (n=153)	1.96	98.04
Cotton linters(n=108)	2.78	97.22

and 164 were women (66.13 %). Their median age was 29 years (ranged 8 to 68 years). From the questionnaire, forty-two patients answered that they did not know whether they were allergic to any of the listed allergens. The percentage of patients who correctly predicted positive and negative results of their skin prick test is shown in Table 2. The sensitivity, specificity and the overall accuracy of the results are shown in Table 3. The highest percentage of those who correctly predicted positive results was from patients who had allergy to dust and dust mite. The highest percentage of patients who correctly predicted negative results was of those who had allergy to dogs, feathers, cats and molds. Percentages of overall accuracy of patients' predictions were as follows: 88.8 % for feathers, 83 % for dust and dust mites, 83 % for dogs, 76.7 % for cats, 74.8 % for grasses and weeds, 65 % for molds, and 46.1 % for cockroaches.

Table 2. Positive and negative predictive values of the question for predicting skin prick test results for each allergen.

Allergens	Positive predictive value (%)	Negative predictive value (%)
Dust, Dust mites	91.3	17.4
Dogs	12.1	96.5
Molds	13.3	86.3
Cats	24.2	86.7
Cockroaches	63.2	44.4
Feathers	7.1	94.8
Weeds, grasses	36.4	76.9

Positive predictive value = True positive x100/(true positive +false positive)

Negative predictive value = True negative x100/(true negative + false negative)

Table 3. Sensitivity, specificity, and accuracy of the question for predicting skin prick test results of each allergen.

Allergens	Sensitivity (%)	Specificity (%)	Accuracy (%)
Dust, Dust mites	89.8	20.0	83.0
Dogs	40.0	85.2	83.0
Molds	28.6	70.8	65.0
Cats	25.8	85.7	76.7
Cockroaches	10.3	92.2	46.1
Feathers	9.1	93.3	88.8
Weeds, grasses	8.2	95.5	74.8

Sensitivity % = True positive x100/ (true positive +false negative)

Specificity % = True negative x100/ (true negative +false positive)

Accuracy % = (True positive + true negative) x100/ (true positive+ true negative+ false positive+ false negative)

Discussion

Careful history taking is the first step in the diagnosis of allergic rhinitis. This generally begins with complete medical history and it should be followed by questions addressed to specific allergy. The potential triggers of nasal symptoms should all be documented including exposure in the home, workplace and school. The definite diagnosis of allergic rhinitis is based on the coordination between a typical history of allergic symptoms and diagnosis tests. Skin prick test is widely used to demonstrate an Ig E mediated reaction in the skin. It yields useful confirmatory evidence for a diagnosis of specific allergy. However, the skin prick test is not performed in every patient who was diagnosed with allergic rhinitis. Clinicians always rely on the potential allergen triggers from patient's history. There were few studies determine the accuracy of clinical history for predicting of allergy skin test's result especially in perennial allergic rhinitis. Li *et al*. (2000) studied the ability of patients to predict correctly the results of their skin allergy test. The study showed that patients have limited ability to correctly predict positive skin tests to aeroallergen but they were able to predict negative skin tests with reasonable accuracy.[4] In Thailand, most cases of allergic rhinitis are perennial because of the tropical climate and its all-year-round humidity. Tuchinda M *et al*. reported a 10-year surveillance of atmospheric pollens and molds in the Bangkok area. They showed that grass pollens are most commonly found throughout the year with their annual peaks during November and December. Weed pollens were found in moderate counts which often peak in August. Among the molds, Cladosporium was the most common, and it is found throughout the year with high counts during the winter season.[5] We hypothesized

that it was hard to know the trigger agents for allergic symptom in perennial allergic rhinitis because most allergens were found throughout the year. The result of our study showed that patients could accurately predict the negative result of their skin prick tests, but they had a limited ability to predict the positive ones. However, for the patients who were sensitive to dust mites, they accurately predicted their positive skin prick tests result to this allergen but they were much less capable of predicting their negative results. High accuracy of the prediction to positive skin prick test to dust mites is attributed to the highly prevalent allergy to dust mites and may explain the poor correlation in patients with no known prior history of allergy to dust mites. Likewise, its ubiquity is associated with patients' well awareness and, in turn, the high positive predictive value.

We conclude that the question "What do you think you are allergic to?" is of limited value to predicting sensitization to allergens but it helps predict the negative results, except for dust mites. Murray *et al*. (1995) studied the use of certain standardized questions for predicting sensitization to individual allergen group. They put several questions to the allergic children's parents and the answers were compared to the results of skin prick test. They found that most questions have low sensitivity, hence they not very helpful in detecting those who had positive skin prick test result to any particular allergen but they were helpful to identify those who will have a negative result. [6] Their findings also support the results of our study. Therefore, history taking alone is probably not sufficient to identify the allergens, and skin prick test serves as a valuable test to demonstrate the particular allergens.

Acknowledgements

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