

Accuracy of patient prediction of allergy skin test results

James T C Li, MD, PhD; Debra Andrist, RN; William R Bamlet, BS; and Troy D Wolter, MS

Background: The ability of patients to self-diagnose allergy is unknown.

Objective: To estimate the ability of patients to correctly predict the results of allergy skin tests.

Methods: We conducted a structured interview of 86 patients with chronic rhinitis or asthma undergoing aeroallergen skin tests. We asked, "Do you expect the skin tests to be positive or negative?" and "What do you expect the allergy tests to be positive for?" Responses to these questions were correlated with the results of aeroallergen skin tests. Skin tests were performed using the prick technique and included cat, grass pollen, tree pollen, weed pollen, dust mites, and molds.

Results: Seventy-three participants provided usable responses. Of those with a positive skin test, the number (percentage) of participants who predicted correctly was 10/18 (56%) for cat, 4/14 (29%) for tree, 7/26 (27%) for weeds, 5/23 (22%) for dust mite, 2/12 (17%) for grass, and 1/8 (12%) for mold. Of those with a negative skin test, the number (percentage) of participants who predicted correctly was 47/50 (94%) for dust mite, 51/59 (86%) for trees, 56/65 (86%) for mold, 52/61 (85%) for grass, 45/55 (82%) for cat, and 38/47 (81%) for weeds.

Conclusions: (1) Patients have limited ability to correctly predict positive skin tests to aeroallergen. (2) Patients are able to predict negative skin tests with reasonable accuracy. (3) "What do you think you are allergic to?" may be a good screening question for patients with asthma and rhinitis.

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INTRODUCTION

The evaluation and management of allergic rhinitis and asthma begin with the medical history. In many, if not most cases, a diagnosis of allergy is made predominantly on historical grounds without allergy skin tests or other tests of IgE antibody. Furthermore, for many patients, the management of allergic disease is based on a presumptive (not a definitive) diagnosis of allergy.

There are very few studies that examine the accuracy of the medical history in making the diagnosis of allergic rhinitis¹⁻⁴ or allergic asthma. These studies suggest that it is difficult to make an accurate diagnosis of allergy on clinical grounds alone.

The patient's perception of allergy is an important component of the medical history. We asked patients undergoing aeroallergen skin tests to predict the results of the testing. We compared the patient predictions with the actual skin test results.

METHODS

Patients

Study participants were adult patients undergoing aeroallergen skin testing. Patients were referred for allergy testing by generalists or specialists. All the participants were undergoing evaluation for a respiratory allergy (ie, for possible allergic rhinitis and/or asthma). Participants were asked, "Do you expect the skin tests to be positive or negative?" and "What do you expect the allergy tests to be positive for?"

Allergy Skin Testing

Skin tests were performed using the prick technique and included histamine

and diluent controls. The panel of skin tests was selected by the ordering physician and consisted of 35 to 70 individual skin tests (depending on the exposure history of the patient). Wheal size of 3 mm by 3 mm or greater was considered positive if accompanied by a surrounding zone of erythema. There were no reactions to the negative control skin test.

The skin testing reagents were used according to the manufacturers' instructions and were: histamine 2 mg/mL (Allermed Laboratories, San Diego, CA 92111) (A); glycerine control 50% [Alk Labs, Inc, Wallingford, CT (Alk)]; cat 5,000 BAU/cc (Alk); cattle 1:10 wt/vol [(Bayer) Hollister-Stier Lab, Spokane, WA (HS)]; cockroach 1:10 wt/vol (HS); dog 1:20 wt/vol [Greer Laboratories, Lenoir, NC (G)]; D.F. mite 10,000 AU/cc (HS); D.P. mite 10,000 AU/cc (HS); horse 1:50 wt/vol (HS); alternaria tenuis 1:10 wt/vol (HS); aspergillus fumigatus 1:100 wt/vol (HS); hormodendrum 1:10 wt/vol (HS); mixed smut 1:10 wt/vol (HS); penicillium mix 1:20 wt/vol (G); alder, red 1:20 wt/vol (HS); ash, white 1:20 wt/vol (HS); birch, black 1:20 wt/vol [Center Laboratories, Port Washington, NY (C)]; black walnut 1:20 wt/vol (HS); cedar, red 1:20 wt/vol (C); elm, American 1:20 wt/vol (HS); maple, soft/silver 1:20 wt/vol (G); oak, white 1:20 wt/vol (HS); pine, white 1:20 w/v (G); poplar, white 1:20 wt/vol (G); sycamore, American 1:20 wt/vol (HS); Kentucky blue 100,000 AUC/cc (Alk); orchard 100,000 BAU/cc (HS); timothy 100,000 BAU/cc (HS); Kochia 1:20 wt/vol (HS); pigweed 1:20 wt/vol (HS); Russian thistle 1:20 wt/vol (HS); short ragweed 336,448 AU/cc (G).

Data Analysis

The proportion of patients correctly predicting positive or negative skin test

Mayo Clinic and Foundation, Rochester, Minnesota.

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results to each allergen, in comparison to the actual allergy skin test results, were presented by reporting the number of patients predicting a positive or negative indication and the percent correct with their prediction. The definitive or standard test for determining the actual allergen result was the prick technique. The number of subjects with actual positive or negative skin test results were also reported. Of patients with a confirmed positive or negative skin test, the percent correctly predicting the actual skin test result was also presented. Exact 95% confidence intervals were calculated for the percent correct for each prediction of each allergen.

RESULTS

Eighty-six subjects were interviewed. There were 61 (71%) women and 25 (29%) men. The median age was 45 years (range 16 to 81 years). Seventy-three subjects provided usable information. Thirteen patients answered “Don’t know” to the two interview questions. The patient predicted and actual allergen skin test results are shown in the table. For all allergen groups, patients were more able to correctly predict a negative skin test result than a positive skin test result.

The first four columns of the table present the number of patients predicting either a positive or negative skin test result to each of the allergen groups and the percent of patients with

correct predictions. In each case for a positive prediction, the lower bound of a 95% confidence interval for the percent actually testing positive was less than 50% indicating the prediction wasn’t any better than a guess. None of the 95% confidence intervals for a correct negative test prediction contained 50%

The last four columns of the table present the same information by reporting the number of patients with actual positive or negative allergen skin test results and the percent of patients correctly predicting that result. In each case for a positive skin test result, a 95% confidence interval for the percent actually predicting positive contained 50%. Again, none of the 95% confidence intervals for a correct prediction given a negative test result contained 50%. All 13 patients who answered “Don’t know” had negative allergy skin tests.

DISCUSSION

This study is one of the first to examine the accuracy of patient prediction of allergy skin tests. The results suggest that patients are very limited in their ability to correctly identify the allergen(s) to which they are allergic. Only 10% to 63% of predictions for a positive skin test result were correct. The results show that 67% to 89% of negative predictions were correct suggesting that patients are better at predicting negative skin tests.

The results of this study are consistent with previously published reports. Kauppi showed that self-reported allergic rhinitis was correct only 31% of the time¹. Braun-Fahrlander studied a questionnaire on hay fever and found low sensitivity (2.6% to 42.7%) but high specificity (77.5% to 97.6%) compared with skin test results.³ Lindberg reported that patient reported allergy was most accurate for cat and least accurate for molds.⁴

There are several important limitations to this study. First, the study was conducted in an academic medical center with a diverse population of patients. This practice may be dissimilar to community practices. Second, the study was small involving only 73 patients. In addition, the clinical histories of the study subjects are unknown. Third, and most importantly, the study was based on the assumption that the allergy skin test results accurately defined the hypersensitivities of each patient.

Nevertheless, several conclusions can be drawn. First, patients have very limited ability to self-diagnose specific sensitivities to aeroallergen. Second, patients are able to predict negative skin tests with reasonable, but imperfect, accuracy. Whether physicians can do better using the entire medical history and the physical examination is not known.

These results have important clinical implications. The questions “Do you think you have allergy?” and “What do you think you are allergic to?” can provide useful information, especially if the response is negative or “Don’t know.” We agree with the recommendation that the diagnosis of allergic rhinitis and allergic asthma should be made using both the medical history and allergy testing.²

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Table 1. Patient Predicted and Actual Allergen Skin Test Results

Allergen Group	Patient Predicted a Positive Skin Test Result to Allergen				Actual Skin Test Result			
	Yes		No		Positive		Negative	
	N	% correct*	N	% correct*	N	% correct†	N	% correct†
Cats	20	50.0‡	53	84.9	18	55.6‡	55	81.8
Grasses	11	18.2‡	62	83.9	12	16.7‡	61	85.2
Mites	8	62.5‡	65	72.3	23	21.7‡	50	94.0
Molds	10	10.0‡	63	88.9	8	12.5‡	65	86.2
Trees	12	33.3‡	61	83.6	14	28.6‡	59	86.4
Weeds	16	43.8‡	57	66.7	26	26.9‡	47	80.9

* Given the test prediction of either positive or negative for a given allergen, the percent of patients actually having a positive or a negative skin test result for that allergen.

† Given the actual skin test result of positive or negative for a given allergen, the percent of patients correctly predicting that test result.

‡ The lower bound of a 95% confidence interval for the percent correct is less than 50.0%.

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- Request reprint should be addressed to:*
James TC Li, MD, PhD
Mayo Clinic and Foundation
200 First Street, SW
Rochester, MN 55905
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