

Conifer Pollen Sensitivity in Western New York: Cedar Pollens

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ABSTRACT

Cedar pollens might be significant allergens in areas where they have not been so considered but are prevalent. Eastern red cedar (*Juniperus virginiana*) and white cedar (*Thuja occidentalis*, American arbor vitae) are common plants in western New York. We analyzed skin test results from 158 patients with asthma, rhinitis, or both; 102 had positive skin tests to at least one pollen. Among those, 52 patients (51%) had positive skin tests to at least one of the cedar pollens. Patients sensitive on skin testing to cedar pollen were strongly likely ($p < 0.0001$) to be sensitive to deciduous tree, grass, or ragweed pollen. Sensitivity on skin testing to indigenous cedar pollens is common in our area of western New York and therefore could be clinically significant. (Allergy and Asthma Proc 26:352–355, 2005)

In certain places cedar (mostly *Juniperus* sp.) pollen is notoriously common and allergenic. In Texas, e.g., *Juniperus ashei* (or *Juniperus sabinoide*s) is a well-known and potent allergen, as is true in Japan for Japanese cedar (*Cryptomeria japonica*).¹ Different cedar pollens can be among the most prevalent pollens in western New York, where eastern red cedar (*Juniperus virginiana*) and white cedar (American arbor vitae, *Thuja occidentalis*) are frequently seen.^{2,3} However, they have not been considered significant aeroallergens.⁴ Cedar pollen season and deciduous pollen season overlap here, so symptoms can not be

assigned to one or the other according to what time of year they occur.

Cedars are conifers (order Coniferales), members of the family Cupressaceae. To this family belong the cypresses (*Cupressus* sp.) as well as *Cryptomeria*, *Juniperus*, and *Thuja*. Substantial literature documents the cross-reactivity among Cupressaceae pollen allergens. Several Cupressaceae, including Japanese cedar, cross-react with mountain cedar.^{5,6} Eastern red cedar exhibits wide skin-prick test cross-reactivity with mountain cedar and Japanese cedar.^{7,8}

Isolation and characterization of major cedar allergens has shed light on the issue of cross-reactivity. The major mountain cedar allergen, Jun a 1, is highly homologous with the major Japanese cedar allergen, Cry j 1, and other cedar major allergens^{9,10} including eastern red cedar.⁸ Although Jun a 1 is highly homologous and cross-reactive with the major eastern red cedar allergen, Jun v 1, another pair of allergens, Jun a 3 and Jun v 3, are not cross-reactive.¹¹ We wished to determine whether patients with asthma, rhinitis, or both had positive skin test reactions to local cedar pollens and how such sensitivity would compare with other locally prevalent pollens known to be allergenic.

METHODS

Allergists in our practice customarily tested patients with eastern red as well as white cedar pollen extracts. Their primary care physicians referred all patients for evaluation. We reviewed 21 months of records of one allergist. All patients had previously signed a consent statement that allowed their charts to be reviewed for medical research purposes. New patients with rhinitis, asthma, or both, for whom inhalant allergen sensitivity tests were indicated, were tested with a standard panel including white and eastern red cedars. Testing with these two allergens (among others) has been customary for many local allergists. Testing was done in the manner standard among local allergists. The allergist clinically defined asthma and rhinitis.

The deciduous tree allergens studied were ash, birch, silver maple, sugar maple, oak, and poplar. Grass sensitivity

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Abstract presented at the 54th annual meeting of the American Academy of Allergy, Asthma, and Immunology, Washington, D.C., March 16, 1998

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was tested with a pooid grass mixture (the prevalent grasses in this area belong to the family Poaceae). Ragweed sensitivity was tested with a mixture of the giant and short varieties. Eastern red cedar and white cedar were tested separately. All these allergens were among the standard panel of allergens to which many new patients with asthma, rhinitis, or both were tested. Extracts were from Bayer/Hollister-Stier (Spokane, WA). Concentration of each test reagent for scratch tests was a 1:20 w/v basis (these skin test results were before our introduction of standardized grass test extracts). Histamine phosphate, 2.75 mg/mL, in a solution 50% water/50% glycerin (v/v) with phenol 0.40% from ALK-Abello (Horsholm, Denmark) was the positive control. Normal saline with human serum albumin, 0.03%; NaCl, 0.90%; and phenol, 0.40% ("diluent"; Greer Laboratories, Lenoir, NC), was the negative control for both scratch and intradermal tests and for extract dilution as well. Each registered nurse who performed the tests first placed a drop of each reagent on the patient's arm. She then used a straight pin wiped with 70% isopropyl alcohol/30% water (commercial "rubbing alcohol"), air-dried, and placed it into a drop of reagent on the patient's arm. The skin was then lightly pricked (slightly raised) with the pin. The pin was then discarded; a new pin was used for each reagent. After all the scratch tests were done, the nurse blotted off the reagents with a tissue placed on the patient's arm. That nurse read the tests 15–20 minutes later.

Intradermal test reagent concentration each was 1:500 w/v. The positive control was sterile histamine phosphate solution of the foregoing composition and source diluted 1:10 with diluent. The nurse used 27-gauge needles affixed to 1-mL syringes, which contained and dispensed 0.02 mL of each reagent.

Patients could have a positive skin test either by scratch or intradermal skin test methods. For this study a positive scratch test was defined as a wheal at least 3 mm in diameter with a flare at least 20 mm in diameter. A positive intradermal skin test was defined as a wheal at least 6 mm in diameter with a discernable flare. For the purpose of this study, a patient with one or more positive skin tests was defined as "atopic." This study investigated only comparative skin test results to make the study less complicated. Data on degree and timing of patients' symptoms were not recorded. Statistical analysis of results was performed with Epi Info version 6.04b, distributed by USD, Inc. (Stone Mountain, GA).

RESULTS

The total number of patients who had been tested to the allergens we studied, and therefore eligible for study, was 158; 110 (70%) patients were women. The patients' overall mean age was 40 years (SD $\pm$ 13). Both gender subgroups were on average 40 years old.

Rhinitis was diagnosed in 119 patients (75%), asthma was diagnosed in 3 patients (2%), and both rhinitis and

asthma were diagnosed in 36 patients (23%). Sixty-five percent (102 patients) were atopic. Ninety (88%) of the atopic patients were sensitive to at least one tree pollen. Seventy-nine patients (77%) were sensitive to grass pollen and 86 patients (84%) were sensitive to ragweed pollen (see the totals columns and rows in Table I).

Of those 102 patients, 52 patients (51%) were positive to either or both cedars. Most cedar pollen–positive patients (32 patients [31%]) were positive to both. Relative risk for white cedar sensitivity if red cedar sensitive: 11.48 (95% CI, 5.47–24.09; $X^2 = 72.95$; $p < 0.0001$). Forty-five patients (44%) were sensitive to red cedar and 39 patients (38%) were sensitive to white cedar. Among the patients positive to red cedar, 6 (13%) were positive on scratch test; among those positive to white cedar, 10 patients (26%) were positive on scratch test. Cedar-sensitive patients were younger (mean, 34 years) than non-cedar-sensitive atopic patients (mean, 43 years; $p < 0.0002$). No significant differences were seen on comparison for gender and diagnosis.

Among the cedar-sensitive patients, 41 (79%) were sensitive to at least one member of one comparison pollen group (trees, grass, or ragweed), 8 patients (15%) were sensitive to two of the groups, and 2 patients (4%) were sensitive to all three groups. One patient was positive only to red cedar (this 34-year-old woman had a positive intradermal test). Any patient sensitive to trees, grass, or ragweed was significantly likely to be sensitive to red, white, or either cedar ($p < 0.0001$ for each result).

The Scratch and Intradermal columns in Table I provide the breakdown of the types of positive reaction for each category of pollen. Most of the positive reactions to cedar were on intradermal tests. Tree results were evenly split between types; grass and ragweed had the most positive reactions on scratch tests. If one looks only at scratch test results, 8/23 (35%) of tree-sensitive patients were sensitive to one of the cedars; 6/28 (21%) of grass-sensitive patients and 8/29 (28%) of ragweed-sensitive patients were cedar sensitive. Of note, cedar scratch test–positive patients were almost entirely scratch test positive for noncedar pollens. Among patients sensitive to either cedar, scratch test sensitivity to trees was 8/8 patients (100%), to grass was 6/7 patients (86%), and to ragweed was 9/10 patients (90%).

Among patients with rhinitis only, 40 patients (34%) were sensitive to either red or white cedar pollen, with 34 patients (29%) sensitive to red and 30 (25%) patients sensitive to white cedar. For patients with asthma plus rhinitis, 11 patients (31%) were sensitive to either red or white cedar pollen; 11 patients were sensitive to red cedar pollen, and 8 patients (22%) were sensitive to white cedar pollen.

DISCUSSION

We found that sensitivity to cedar pollens, although not as common as sensitivity to deciduous tree, grass, or ragweed pollens, is common in this area of western New York. About one-half of our patients with positive skin tests

TABLE I
Cedar Pollen Sensitivity among Tree-, Grass-, and Ragweed-Sensitive Patients

	Either Cedar Sensitive (%)			Red Cedar Sensitive (%)			White Cedar Sensitive (%)		
	Scr	ID	Total	Scr	ID	Total	Scr	ID	Total
Tree sensitive (90 pts. total)									
Scr	8 (9)	15 (17)	23 (26)	5 (6)	14 (16)	19 (21)	8 (9)	13 (14)	21 (23)
ID	0 (0)	24 (27)	24 (27)	0 (0)	22 (24)	22 (24)	0 (0)	17 (19)	17 (19)
Total	8 (9)	39 (43)	47 (52)	5 (6)	36 (40)	41 (46)	8 (9)	30 (33)	38 (42)
Grass sensitive (79 pts. total)									
Scr	6 (8)	22 (28)	28 (35)	5 (6)	19 (24)	24 (30)	6 (8)	22 (28)	28 (35)
ID	1 (1)	16 (20)	17 (22)	1 (1)	16 (20)	17 (22)	1 (1)	6 (8)	7 (9)
Total	7 (9)	38 (48)	45 (57)	6 (8)	35 (44)	41 (52)	7 (9)	28 (35)	35 (44)
Ragweed sensitive (66 pts. total)									
Scr	9 (10)	25 (29)	34 (40)	5 (6)	24 (28)	29 (34)	8 (9)	21 (24)	29 (34)
ID	1 (1)	14 (16)	15 (17)	1 (1)	12 (14)	13 (15)	1 (1)	7 (8)	8 (9)
Total	10 (12)	39 (45)	49 (57)	6 (7)	36 (42)	42 (49)	9 (10)	28 (33)	37 (43)

Percents may not add to totals because of rounding.

Scr = scratch test; ID = intradermal test; pts = patients.

to pollens had a positive test to either eastern red cedar or white cedar (*arbor vitae*) pollens. Most cedar-sensitive patients were sensitive to both. Among all subgroups examined, grouped by pollen sensitivity or by diagnosis, red cedar pollen sensitivity was more common than white cedar sensitivity.

A large fraction of patients defined as atopic in this study had positive skin test results—and positive intradermal test results—perhaps more than one would expect. This is likely because of a few factors: the selected (referral) nature of the population studied, the skin test method used, and the way “atopic” was defined.

Studies have questioned the clinical usefulness of intradermal test results and suggest that they may be overly sensitive and overused.^{12,13} This study was not designed to address that valid concern, but if one restricts analysis to scratch tests results, fewer patients are “atopic” and a smaller percentage of those were cedar sensitive—about one-third.

From this study we can not draw direct conclusions regarding the clinical relevance of cedar pollen sensitivity, but such sensitivity is common enough that this question is a valid one for additional work. Cedar pollens are antigenically distinct. This could conceivably impact immunotherapy treatment. Some cedar pollens are considered to be among the leading causes of seasonal allergic rhinitis in

some of their indigenous areas.^{1,14} We found cedar pollen sensitization (positive skin test results) to be common in our area but not as strongly sensitizing as deciduous tree, grass, or ragweed pollens.

ACKNOWLEDGMENT

The author thanks Ruth W. Kouides, M.D. for her help with statistics and John J. Condemi for his suggestions.

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