Comparison between two different assays for measurements of allergen-specific IgE and skin prick test in the diagnosis of insect venom allergy


Forty-one patients stung by wasp and 29 by bee were evaluated by comparing the correlation between skin prick test (SPT), Phadebas radioallergosorbent test (P-RAST) and Magic Lite SQ Specific IgE assay (LIA). All patients had had a systemic reaction to insect sting. In the patients stung by bee we found agreement between SPT and P-RAST, and SPT and LIA. Similarly, there were no significant differences in sensitivity between P-RAST and LIA (p>0.05). In patients stung by wasp, SPT was found to be more sensitive than P-RAST. There were no differences between SPT and LIA or between P-RAST and LIA.

Allergy to insect stings leads to life-threatening reactions and occasional deaths, and Hymenoptera-sting sensitivity is a relatively common cause of allergic reactions, affecting at least 0.4% and perhaps up to 4% of the population (3, 13).

When the diagnosis of insect venom allergy has been established, immunotherapy with Hymenoptera venom has proved to be effective (1, 7, 11). Immunotherapy is expensive and time-consuming, and studies suggest that on re-exposure patients treated with placebo or whole body extract have an incidence of systemic reactions of about 50% (4, 12). The problem, “whom to treat”, is however, unsolved to date.

The primary aim of this study was to evaluate the correlation between results from 2 different assays for measurement of specific IgE: the Magic Lite SQ specific IgE assay (LIA) and the radioallergosorbent test (RAST) and skin prick test in patients with previous systemic reactions after wasp or bee stings.

Material and methods

The study comprised 41 consecutive patients known to have been stung by wasp and 29 by bee. All patients had a systemic reaction characterized by one or more of the following symptoms: urticaria or angioedema apart from sting region, shortness of breath, hoarseness, nausea, diarrhoea, abdominal pain, or anaphylactic shock. None had been treated with insect venom or whole-body extracts. Sera were stored at −20°C.

Skin prick test (SPT) was performed in duplicate on the volar side of the forearm with wasp and bee venom in glycerol (50% w/v) in the concentrations 10, 30, 100, 300, and 1000 µg/ml, respectively. Histamine dihydrochloride 1 mg/ml and isotonic saline in glycerol (50% w/v) were used to check reactivity and as negative control (Soluprick SQ, ALK Laboratories A/S, Hørsholm, Denmark).

A lancet with a point length of 1.0 mm (Dome/Hollister-Stier (9, 14)) was passed through the drops at an angle of 90° to the skin. The wheal reactions were recorded at maximum size, i.e. 10–12 min after the prick. If the median wheal diameter on venom extract was > 3 mm, the skin prick test was classified as positive (10). In the results the lowest concentration at which the patients reacted was classified as positive.

The classic RAST (Phadebas RAST (P-RAST)),
using paper discs as sorbent for the allergen, was carried out according to the manufacturer’s instructions (Pharmacia Servieelaboratoriet, Hillerød, Denmark) (2). Results were expressed in Phadebas RAST units (PRU). All tests were made in duplicate. Values > 0.70 PRU (RAST-class ≥ 2) were considered positive.

Magic Lite SQ specific IgE assay (LIA) is a new immunochemiluminoimass assay for the quantitative and qualitative determination of circulating allergen-specific IgE in human serum and plasma. The allergens are covalently bound to microscopic paramagnetic particles which provide short diffusion distances between the bound allergens and serum IgE antibodies during incubation. This allows an incubation of 2 x 30 min. A large surface area of the solid phase and potent allergen extracts provides a 4- to 16-fold higher binding capacity than conventional paper disc procedures (6). The system uses a specific anti-human IgE monoclonal antibody labelled with acridinium ester as the chemiluminescent compound. The acridinium ester-labelled antibody has a high reactivity and a low background allowing a wide measuring range.

The assay is calibrated against a serum obtained from clinically characterized timothy grass-allergic patients and results are expressed in SU/ml (standardized units). A 2-point adjustment procedure is accomplished by using a master calibration curve established during manufacturing along with 2 calibrators for each assay (5, 8). Results are also expressed in allergy classes ranging from 0–5. The measuring range is 1.43–800 SU/ml. Values ≥ 4 SU/ml (allergy class ≥ 2) were considered positive. Sera were stored at -20°C.

Statistics

Relations in 2-way tables were evaluated by means of “the sign test”. The null hypothesis was that there were no differences between the different tests. P values < 0.05 were considered statistically significant.

Results

Bee

Twenty-one of 29 patients stung with bee had a positive SPT. By skin prick testing in the group of bee-sting reactors 7 patients reacted at 1000 µg/ml, 3 at 300 µg/ml, 9 at 100 µg/ml, 0 at 30 µg/ml, and 2 at 10 µg/ml. Eight patients had a negative skin prick test.

In 79% there was agreement between SPT and P-RAST (Table 1). In 62% SPT and LIA agreed and there were no significant differences in sensitivity between the 2 tests. 72% of patients with a systemic reaction had a positive P-RAST in contrast to 62% by the LIA analysis (Tables 1, 2). The concordance between P-RAST and LIA was 83%. There were no significant differences in sensitivity between the 2 tests.

If the limit for positive reaction was defined as RAST class ≥ 1 and allergy class ≥ 1 in this method, 6 additional patients would become positive (Table 2) and the concordance between the 2 tests was 93%, still with no significant differences in sensitivity between the LIA and the RAST test results.

Wasp

Thirty-seven of 41 patients had a positive SPT (Table 1). By skin prick testing in the group of wasp-sting reactors 3 patients reacted at 1000 µg/ml, 10 at 300 µg/ml, 14 at 100 µg/ml, 6 at 30 µg/ml, and 3 at 10 µg/ml. Five patients had a negative skin prick test. In 73% of the patients there was an agreement between SPT and P-RAST results (Table 1). SPT was found to be more sensitive than P-RAST (p<0.05). The agreement between SPT and LIA results was 76% (Table 1). There were no differences in sensitivity between these 2 tests. 68% were positive in P-RAST compared to 76% by the LIA analysis (Tables 1, 2). The agreement between P-RAST and LIA was 88% (Table 3), and there were no significant differences in sensitivity between these tests.

If a positive test was defined as RAST class ≥ 1 and allergy class ≥ 1, 6 additional patients would become positive (Table 2) and the concordance between the 2 tests was 88%, still with no significant differences in sensitivity between the LIA and the RAST test results.

Table 1. Results of P-RAST and LIA compared with SPT in 41 persons with systemic reaction to wasp and 29 persons with systemic reaction to bee

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</table>

Table 2. Comparison between P-RAST classes and LIA classes in 41 patients with systemic reactions to wasp and 29 patients with systemic reactions to bee

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become positive (Table 2) and the concordance between the 2 tests was 93% and still there were no significant differences in sensitivity between the 2 tests.

Discussion

This is the first study with bee and wasp venom allergy in which P-RAST and the LIA were compared. All the patients had experienced systemic reactions to stings. However, not all the diagnostic tests were positive. The explanation could be that some of the adverse reactions to insect stings had in fact been of non-allergic origin. We found no significant differences between the 2 tests.

As this study deals with diagnostic tests after the sting and not before, it is not possible to give a definite answer about which of the 2 tests – P-RAST or LIA – has the best predictive value concerning future stings.

We conclude that for venom-allergic patients there is no significant difference between LIA and P-RAST test results.

References

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