

Patch testing and aeroallergen intradermal testing in suspected allergic contact dermatitis, unclassified endogenous eczema and non-atopic chronic urticaria

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The purpose of this study was to investigate the significance of contact allergen and aeroallergen sensitization in suspected allergic contact dermatitis (ACD), unclassified endogenous eczema (UEE) and non-atopic chronic urticaria (NACU). 63 cases of suspected ACD, 140 cases of suspected UEE and 21 cases of suspected NACU were patch tested with the standard series of Beijing Medical University and, if available, suspected materials as is. 22 such cases of ACD, 104 such cases of UEE and 42 such cases of NACU were intradermally tested with common aeroallergens. Patients with non-allergic skin disease served as controls. 85.7% of the suspected ACD patients, 57.9% of the suspected UEE patients and 52.4% of the suspected NACU patients were positive on patch testing, and the results in 81.0% of the suspected ACD patients and 23.6% of the suspected UEE patients were considered relevant. No patch test reactions in the NACU patients were considered relevant. 27.1% of the suspected UEE patients, 41.3% of the suspected ACD patients and 14.3% of the suspected NACU patients reacted to 2 or more contact allergens. High positive rates on aeroallergen intradermal testing were also found in suspected NACU (69.0%), UEE (49.0%) and ACD (59.1%) patients. These results support the conclusions that patients with allergic skin diseases will develop multiple sensitization, and that early detection and avoidance of sensitizing allergens is necessary. The exact rôle of aeroallergen sensitization in these diseases needs further study.

Key words: allergic contact dermatitis; eczema; urticaria; patch test; intradermal test; aeroallergen; clinical relevance. © Munksgaard, 2001.

Accepted for publication 23 March 2001

Allergic contact dermatitis, unclassified endogenous eczema and non-atopic chronic urticaria are very common in dermatology clinics. The cause of these diseases is often difficult to determine and recurrence is common. Patch testing has been proved a useful tool for the identification of allergens in contact dermatitis, and it has also proved useful in investigating the cause or exacerbating factors in certain other eczemas.

The rôle of aeroallergens in atopic dermatitis has been demonstrated by many researchers (1, 2). Aeroallergens can also induce an eczematous skin reaction in patients with atopic dermatitis or other kinds of eczema (2, 3). Since aeroallergens are universally distributed, it is interesting to investigate the positive rate of Type I reactions to aeroallergens in other skin diseases such as allergic contact dermatitis, unclassified endogenous eczema and non-atopic chronic urticaria.

The purpose of this study was to investigate the significance of patch testing and aeroallergen intradermal testing in suspected allergic contact dermatitis (ACD), unclassified endogenous eczema (UEE) and non-atopic chronic urticaria (NACU), to analyze the rôle of contact allergens and Type I reactions to aeroallergens in these diseases. Another aim of this study was to investigate the possibility of concurrent sensitization to contact allergens and aeroallergens in patients with suspected ACD, UEE and NACU.

Patients and Methods

Selection and definition of the patient population

Allergic contact dermatitis (ACD). ACD was suspected from a combination of disease history and clinical examination. Only patients with strong evi-

dence supporting the diagnosis of ACD were included.

Eczema was diagnosed and classified according to a standard textbook (4). Specific types of eczema, such as contact dermatitis, atopic dermatitis, asteatotic eczema, seborrheic dermatitis, infective dermatitis, dermatophytide, post-traumatic eczema, discoid eczema, gravitational eczema, metabolic eczema, eczematous drug reactions and pityriasis alba, were not included (4). The remaining patients with unclassified endogenous eczema were divided into 3 groups: (i) eczema on exposed areas, i.e. face, neck, hands or arms; (ii) eczema on non-exposed areas, i.e., lesions confined to covered areas; (iii) eczema of both exposed and non-exposed areas (4).

All patients were from the dermatology clinics in our hospital between August 1998 to November 1999. The patients were selected according to the patient selection criteria above and their willingness for patch testing or intradermal testing, i.e., patients with no such testing were excluded. Since atopy may affect the test results, all subjects with a personal history of atopic disease, such as atopic dermatitis, asthma, hay fever, and allergic rhinitis, were excluded from this study. Patients with a history of any atopic disease in a 1st-degree relative were also excluded. The patients were divided into 3 groups.

Group 1 comprised 63 cases of suspected ACD, 18 males and 45 females, with an average age of 36.7 ± 14.9 years (mean $\pm$ SD).

Group 2 comprised 140 cases of suspected UEE, 40 males and 100 females, with an average age of 33.4 ± 6.7 years (mean $\pm$ SD).

Group 3 comprised 45 cases of suspected NACU. There were 36 males and 9 females, with an average age of 38.2 ± 15.3 years (mean $\pm$ SD).

Patch testing

Patch testing was performed with the standard series of Beijing Medical University, Beijing, China (5). This series includes benzocaine, imidazolidinyl urea, neomycin sulfate, p-phenylenediamine, potassium dichromate, ethylenediamine dihydrochloride, colophonium, formaldehyde, epoxy resin, 2-bromo-2-nitropropane-1,3-diol, parabens, fragrance mix, nickel sulfate, ammoniated mercury and rubber mix (5). Allergens were applied to the upper back, using Finn Chambers, and the results were recorded at 2 and 3 days according to ICDRG recommendations (6). If the patient could supply suspected allergens, patch testing with the patients' own products was performed using methods in the literature (7). 63 cases of suspected ACD, 140 cases of suspected UEE and 21 cases of suspected NACU were patch tested. When the

contact allergen detected was found to be related to the patient's current skin condition or to skin problems in the past, the patch test result was considered relevant.

Intradermal testing

The aeroallergens for intradermal testing were bought from China Union Medical University, Beijing, China, in which 20 groups of common aeroallergens, such as house dust and house dust mite (*Dermatophagoides pteronyssinus* and *Dermatophagoides farinae*), pollens, ragweed, mugwort, molds, insects, cotton, silk, fowl feathers and animal hairs were included (8). Injections were performed on the outer upper arms and reactions were observed 20 min later. A papule or wheal of 0.5 cm or more in diameter was considered positive. This procedure is a standardized method for detection of hypersensitivity to aeroallergens in China (8). 22 cases of suspected ACD, 104 cases of suspected UEE and 42 cases of suspected NACU were so tested.

Controls

26 patients with non-allergic skin diseases patch tested in the same period served as controls for the standard series of patch tests. There were 7 males and 19 females, with an average of 38.3 ± 15.6 years (mean $\pm$ SD). 14 cases of irritant contact dermatitis, 8 cases of acne vulgaris, 2 cases of pruritus and one case of lichen simplex chronicus were included. All patients in the control group were non-atopic as well as being without any history of allergic disease. 20 patients tested intradermally served as controls for intradermal testing. There were 7 males and 13 females with an average age of 48.5 ± 16.4 years (mean $\pm$ SD).

Statistical analysis

$2 \times K$ χ^2 -test was used to compare the positive rate to each allergen in different groups (9).

Results

The results of patch testing in suspected ACD, UEE and NACU are shown in Table 1. The positive rate in these diseases was much higher than that in controls. Not surprisingly, the highest positive rate (85.7%) was found in the suspected ACD group and the results in 81.0% of such patients were considered relevant (Table 1). More than $1/2$ of the suspected UEE patients (57.9%), however, also showed positive results and the results in

Table 1. Results of patch testing

Dermatosis suspected	Positive rate (%)	Relevance rate (%)	No. patients with 2 or more positive results
ACD (<i>n</i> =63)	85.7%	81.0%* 94.0%**	26 (41.3%)
UEE (<i>n</i> =140)	57.9%	23.6%* 40.7%**	38 (27.1%)
NACU (<i>n</i> =21)	52.4%	0	3 (14.3%)
Controls (<i>n</i> =26)	7.7%	0	1 (3.8%)
<i>p</i> value (χ^2 -test)	<0.001		<0.002

* Rate calculated in total patients.

** Rate calculated in patients with positive patch test results.

Table 2. The classification of suspected ACD and results of patch testing

ACD suspected	Positive rate	Relevance rate
ACD from metals (<i>n</i> =20)	85.0%	80.0%* 96.5%**
ACD from cosmetics (<i>n</i> =17)	76.4%	76.4%* 100%**
occupational ACD (<i>n</i> =7)	85.7%	71.4%* 83.3%**
ACD from clothes (<i>n</i> =5)	80.0%	80.0%* 100%**
ACD from topical medicaments (<i>n</i> =5)	100%	80.0%* 80.0%**
ACD from hobbies (<i>n</i> =1)	100%	100%
ACD from 2 or more different materials (<i>n</i> =8)	100%	100%* 100%**

* rate calculated in total patients.

** Rate calculated in patients with positive patch test results.

Table 3. Classification of suspected UEE and the results of patch testing

Type	Positive rate	Relevance rate
eczema on exposed areas (<i>n</i> =63)	60.3%	33.3%* 55.2%**
eczema on non-exposed areas (<i>n</i> =25)	48.0%	12.0%* 25.0%**
eczema on both exposed and non-exposed areas (<i>n</i> =52)	59.6%	17.3%* 29.0%**
<i>p</i> -value (χ^2 -test)	>0.05	>0.05

* Rate calculated in total patients.

** Rate calculated in patients with positive patch test results.

Table 4. Common contact allergens in standard series in suspected ACD, UEE and NACU

Allergen	ACD (<i>n</i> =63)	UEE (<i>n</i> =140)	NACU (<i>n</i> =21)	<i>p</i> -value (χ^2 -test)
nickel	27 (42.8%)	21 (15%)	2 (9.5%)	<0.01
PPD	18 (28.6%)	16 (11.4%)	1 (4.8%)	<0.01
rubber mix	11 (17.5%)	21 (15%)	5 (23.8%)	
fragrance	10 (15.9%)	11 (7.9%)	0	
colophonium	7 (11.1%)	7 (5%)	3 (14.2%)	
ammoniated mercury	5 (7.9%)	9 (6.4%)	2 (9.5%)	
dichromate	3 (4.8%)	15 (10.7%)	0	

23.6% of these patients were considered relevant. 52.4% of the suspected NACU patients were also found to be reactive to contact allergens, though in none were these found to be relevant (Table 1).

The classification of suspected ACD is shown in Table 2. It was divided into 7 categories of suspected ACD: from metals in jewelry, eyeglasses or other adornments; from cosmetics; occupational; from elastic or dyes in cloth; from topical medicaments; from hobbies; and from 2 or more different materials; ACD from metals and cosmetics being the most common. High positive rates (from

76.4% to 100%) were found in different groups of suspected ACD patients and relevant results were found in most such patients (Table 2).

The classification and patch testing of suspected UEE are shown in Table 3. Most of the eczema was on exposed areas or on both exposed and non-exposed areas. High positive rates on patch testing were found in all such patients (from 48.0% to 60.3%, Table 3). Although the relevant rate of patch testing in suspected UEE on exposed areas was 2× that of the other groups, no significant difference was found (Table 3).

Table 5. Positive number (rate) on intradermal testing to aeroallergens

Allergen	ACD (n=22)	UEE (n=104)	NACU (n=42)	Controls (n=20)	p value (χ^2 -test)
total	13 (59.1%)	51 (49.0%)	29 (69.0%)	7 (35.0%)	<0.05
dust and dust mite	4 (18.2%)	26 (25%)	17 (40.5%)	4 (20%)	
animal hair	1 (4.5%)	3 (2.9%)	2 (4.8%)	1 (5%)	
mold	1 (4.5%)	21 (20.2%)	7 (16.7%)	1 (5%)	
pollen	7 (31.8%)	18 (17.3%)	15 (35.7%)	3 (15%)	
silk	3 (13.6%)	14 (13.5%)	6 (14.3%)	1 (5%)	
insect	5 (22.7%)	19 (18.3%)	9 (21.4%)	0	
grass and weed	2 (9.1%)	2 (1.9%)	2 (4.8%)	2 (10%)	
tobacco	4 (18.2%)	18 (17.3%)	11 (26.2%)	1 (5%)	
cotton	4 (18.2%)	9 (8.6%)	3 (7.1%)	1 (5%)	

The positive rate of common contact allergens from standard series in the patients with suspected ACD, UEE and NACU is shown in Table 4. Nickel was the most common contact allergen in suspected ACD (42.8%) and UEE (15.0%). Rubber mix was found the most common allergen in suspected NACU (23.8%). The positive rate of PPD and nickel was also much higher in suspected ACD than UEE and NACU.

The positive rate of intradermal testing to aeroallergens is shown in Table 5.

Discussion

By patch testing patients with the standard series and the suspected allergens, 85.7% of the clinically suspected ACD patients gave positive results and the results of 81.0% of such patients were considered relevant (Table 2). These results confirm patch testing to be a reliable method of diagnosis of ACD. Since the patients in this study were selected according to the clinical findings and the willingness of the patient to be tested, our results may not completely reflect reality. However, our results still showed a trend for ACD from metals and cosmetics being the most common ACD in our clinics (Table 2), and the most common contact allergens being nickel, PPD, rubber mix and fragrance (Table 4).

In our hands, 57.9% of suspected UEE patients were found to be positive on patch testing and the results of 23.6% of such patients were considered relevant (40.7% of positive patch test results considered relevant, Table 1). These results suggested that patch testing is also valuable in finding a cause or exacerbating factor in suspected UEE.

The most common types of UEE in this study were those on exposed areas and on both exposed and non-exposed areas (Table 3). High positive rates (48.0%–60.3%) were found in all kinds of UEE tested (Table 3) and 12.0%–33.3% of such patients' results were considered relevant. Although

the relevance rate in UEE on exposed areas was almost 2× that of the other groups, no statistical significance was found (Table 3). The most common contact allergens in suspected UEE were nickel, rubber mix, PPD and dichromate.

A 52.4% of positive rate of patch testing was also found in suspected NACU patients and none was considered relevant (Table 1). This result suggested that concurrent sensitization to contact allergens is common in urticaria. 27.1% of suspected UEE patients, 41.3% of suspected ACD patients and 14.3% of suspected NACU patients were found to react to 2 or more contact allergens (Table 1). This suggested that concurrent sensitization to contact allergens was very common in these diseases. High positive rates on aeroallergen intradermal testing were as also found in suspected ACD (59.1%) and UEE (49.0%) patients (Table 5), suggesting that concurrent sensitization to aeroallergens is also common in ACD and UEE. These results support the conclusions that the patient with allergic diseases may develop multiple sensitization, and that early detection and avoidance of sensitizing allergens is necessary.

The significance of aeroallergen Type I reaction in atopic dermatitis has been widely accepted (1, 2). In our hands, high positive rates on intradermal testing to aeroallergens were also found in suspected NACU (69.0%), UEE (49.0%) and ACD (59.1%) patients (Table 5). These results suggested that aeroallergen sensitization is also very common in suspected ACD and UEE patients. The exact rôle of such sensitization needs further study.

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