

Environmental contact factors in eczema and the results of patch testing Chinese patients with a modified European standard series of allergens

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Environmental contact factors in eczema were investigated in China by clinical questionnaire and patch testing patients with a modified European standard series of allergens. 217 consecutive eczema patients were studied. Contact dermatitis (CD) was clinically diagnosed in 30% of the patients. Among the patients patch tested, 46 patients had clinically diagnosed allergic CD (ACD), 20 patients clinically had non-ACD (NACD) (including 16 cases of irritant contact dermatitis, 1 case of phototoxic contact reaction and 3 cases of asteatotic eczema) and 115 patients had clinically suspected ACD. 45 patients (98%) in the ACD group went on to have relevant patch test results. The most common ACD was from metals, fragrance materials, cosmetics and rubber materials. The most common contact allergens identified were nickel, fragrance mix, *para*-phenylenediamine (PPD), carba mix and thimerosal. No adverse reactions were observed to patch testing, except for pruritus in patch-test-positive patients. The positive rate of patch testing in ACD was much higher than that in NACD (98% versus 15%, $P < 0.05$, χ^2 -test). 60 (28%) patients had facial dermatitis (FD). Among these, 20 (33%) were confirmed as having ACD. 48 (22%) patients had hand dermatitis (HD). Among these, 7 (15%) were confirmed as having ACD. Fewer patients were confirmed as having ACD in the HD group than in the FD (15% versus 33%, $P < 0.05$, χ^2 -test). Although the difference was not significant, the total positivity rate in the HD group (55%) was lower than in the other groups. 65 (30%) patients had unclassified endogenous eczema (UEE). The total positive rate of patch testing in the UEE group (56%) was no different from that in the FD or HD groups. However, the relevance of positive patch tests was hard to determine in UEE. These results indicate that CD is common in eczema; relatively more patients with FD have ACD, while other factors, such as irritation, may play more of a role in HD. The total positive rate of patch testing in the UEE group was no different from that in the FD or HD groups, suggesting that patch testing should be stressed in UEE and the relevance of positive patch test results in UEE should be studied further. It is effective and safe to patch eczema patients with a modified European standard series of allergens in China.

Key words: allergic contact dermatitis; European standard series; facial dermatitis; hand dermatitis; patch test. © Blackwell Munksgaard, 2004.

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Eczema may be induced by a wide range of external and internal factors, acting singly or in combination (1). The precise aetiological diagnosis of eczema is often very difficult, even when allergic contact dermatitis (ACD), irritant contact dermatitis (ICD) or atopic diathesis suggest themselves clinically (2). Patch testing has proved a useful tool for the detection of allergic contact dermatitis and exact identification of the contact allergen. The purpose of this study was to analyse the environmental factors in eczema by using a questionnaire (3) and patch testing the patients with a modified European standard series of allergens.

Patients and Methods

Diagnostic criteria

Contact dermatitis. Contact dermatitis (CD) was diagnosed clinically by the disease history and clinical examination based on a standard textbook (4). Specific types of CD, such as ACD, ICD, etc., were clinically diagnosed accordingly (4). If similar ACD was elicited at least twice by the same contact allergen, ACD was considered clinically proved.

Eczema. Eczema was diagnosed and classified according to standard textbooks (1, 4). Specific types of eczema, such as CD, atopic dermatitis

(AD), asteatotic eczema, seborrheic dermatitis, infective dermatitis, dermatophytid, post-traumatic eczema, discoid eczema, gravitational eczema, eczematous drug reactions and pityriasis alba were clinically diagnosed accordingly (1, 4), and the remaining unspecified eczema was diagnosed as unclassified endogenous eczema (UEE).

Atopic dermatitis. AD was diagnosed by using the UK diagnostic criteria (5).

Atopic diathesis. Atopic diathesis was considered when any of the following diseases, allergic rhinitis, allergic asthma or AD, could be found in the patient's personal history or in blood-related family members within 3 generations.

Study populations

217 consecutive cases of eczema were studied. All patients were from our contact dermatitis clinics from July 2001 to February 2002. There were 83 males and 134 females (female: male = 1.6), with an average age of 43 ± 17 years.

Investigation of suspected environmental agents by questionnaire

The suspected causal agent was investigated by using a questionnaire (3).

Patch testing

Patch testing was performed with a modified European standard series of allergens supplied by

Chemotechnique Diagnostics, Malmö, Sweden (Table 1). Allergens were applied to the upper back, using Finn Chambers[®] on Scanpor[®] tape (Epitest, Tuusula, Finland), and the results were recorded at day 2 (D2) and D3 according to ICDRG grading (6).

Statistical analysis

2×2 χ^2 -test was used to compare the positive rate to each allergen in each group (7).

Results

The clinical diagnoses of eczema are summarized in Table 2. 65 patients (30%) were diagnosed as having CD, 48 of these ACD, 16 ICD and 1 a phototoxic CD.

Among the patients patch tested, 46 patients had clinically diagnosed ACD, 20 patients clinically had non-ACD (NACD) (including 16 cases of ICD, 1 case of phototoxic contact reaction and 3 cases of asteatotic eczema) and 115 patients had clinically suspected ACD. 45 patients (98%) in the ACD group went on to have relevant patch test results. 1 patient with allergic cosmetic CD clinically was patch test negative. The classification of ACD and the results of patch testing are summarized in Table 3. The most common ACD was from metals, fragrance materials, cosmetics and rubber materials. The most common contact allergens identified were nickel, fragrance mix, *para*-phenylenediamine (PPD), carba mix and thimerosal.

Table 1. The standard patch test series of allergens

Allergen
Benzocaine
Black rubber mix (IPPD, <i>N</i> -isopropyl- <i>N</i> -phenyl-4-phenylenediamine; CPPD, <i>N</i> -cyclohexyl- <i>N</i> -phenyl-4-phenylenediamine; DPPD, <i>N,N</i> -diphenyl-4-phenylenediamine)
2-bromo-2-nitropropane-1,3-diol (bronopol)
Carba mix (1,3-diphenylguanidine; ZDC, zinc diethyldithiocarbamate; ZBC, zinc dibutyl dithiocarbamate)
Colophonium
Epoxy resin
Ethylenediamine dihydrochloride
Formaldehyde
Fragrance mix (cinnamic alcohol, hydroxycitronellal, amylcinnamal, geraniol, eugenol, isoeugenol, oakmoss absolute)
Imidazolidinyl urea
Mercapto mix (<i>N</i> -cyclohexylbenzothiazylsulphonamide, mercaptobenzothiazole, dibenzothiazylsulphide, morpholinylmercaptobenzothiazole)
<i>N</i> -(cyclohexylthio) phthalimide
Nickel sulphate
<i>para</i> -Phenylenediamine base (PPD)
Parabens (methyl-4-hydroxybenzoate, ethyl-4-hydroxy benzoate, propyl-4-hydroxy benzoate, butyl-4-hydroxy benzoate)
Potassium dichromate
Sesquiterpene lactone mix (alantolactone, dehydrocostus lactone, costunolide)
Thiuram mix (TMTM, tetramethylthiuram-monosulphide; TMTD, tetramethylthiuramdisulphide; TETD, tetraethylthiuramdisulphide; PTD, dipentamethylenethiuramdisulphide)
Thimerosal (merthiolate)
Tixocortol-21-pivalate

Table 2. The clinical diagnoses of the patients

Diagnosis	Number (%)	Number of patients (%) patch tested
Contact dermatitis	65 (30)	60 (92)
Facial dermatitis	60* (28)	55 (92)
Hand dermatitis	48† (22)	47 (98)
Atopic dermatitis	7‡ (3)	5 (71)
Seborrheic dermatitis	4 (2)	0
Asteatotic eczema	4 (2)	3 (75)
Unclassified endogenous eczema	65 (30)	43 (66)

*27 cases of facial dermatitis were clinically diagnosed as contact dermatitis and were also counted in contact dermatitis.

†7 cases of hand dermatitis were clinically diagnosed as contact dermatitis and were also counted in contact dermatitis.

‡1 case of atopic dermatitis was clinically diagnosed having facial contact dermatitis and was also counted in both contact dermatitis and facial dermatitis. Therefore, 36 (27 + 7 + 1 + 1) patients were counted more than once.

No adverse reactions were observed to patch testing, except for pruritus in patch-test-positive patients. The positive rates of patch testing in ACD, NACD, FD and HD groups and total patients are summarized in Table 4. The positive rate of patch testing in ACD was much higher than that in NACD (98% versus 15%, $P < 0.05$, χ^2 -test).

60 (28%) patients had FD. Among these, 20 (33%) were confirmed as having ACD. The most common allergens in the FD group were nickel (26%), fragrance mix (15%), carba mix (11%), PPD (11%) and imidazolidinyl urea (9%).

48 (22%) patients had HD. Among these, 7 (15%) were confirmed as having ACD. Fewer patients were confirmed as having ACD in HD group than in the FD (15% versus 33%, $P < 0.05$, χ^2 -test). Although the difference was not significant, the total positivity rate in the HD group (55.1%) was lower than in the other groups. The most common allergens in the HD group were PPD (17%), fragrance mix (15%), nickel (11%), potassium dichromate (13%) and colophonium (6%).

65 (30%) patients had UEE. The total positive rate of patch testing (56%) in the UEE group was no different from that in the FD or HD groups. Common contact allergens in the UEE group were nickel (19%), fragrance mix (14%), carba mix (12%), PPD (9%), and thimerosal (9%).

Discussion

In this study, by clinical examination, questionnaire and patch testing, 30% of 217 consecutive eczema patients attending the contact dermatitis clinics were confirmed as having CD, indicating its frequency.

92.3% of the patients with CD, 91.7% of the patients with FD and 97.9% of those with HD were patch tested. Only 66.2% of the patients in the UEE group were patch tested (Table 2). However, the total positive rate of patch testing in the UEE group (56%) was no different from that in FD or HD groups (Table 4). These results suggest that patch testing should be stressed in UEE and the relevance of positive patch test results found should be studied further.

The positive rate in FD was high and relatively more patients were identified as having ACD. Fewer patients were identified as having ACD in the HD group than in the FD. These results indicate that factors other than contact allergy, such as skin irritation and unknown endogenous factors, may play more of a role in HD than in FD. Considering their complex exposure in our environment, it is reasonable to believe that the hands may be exposed to more irritant materials, such as water, soap or food, than other parts of the body.

In our hands, after patch testing eczema patients with a modified European standard

Table 3. Clinical classification of ACD and the results of patch testing

Clinical diagnosis	Number	Relevant patch tests
Metal ACD	14	14 reacted to nickel sulphate
Fragrance ACD	9	9 reacted to fragrance mix
Cosmetic ACD	8	7 reacted either to 2-bromo-2-nitropropane-1,3-diol (bronopol), fragrance mix, formaldehyde, imidazolidinyl urea or thimerosal
Rubber ACD	5	5 reacted either to carba mix or thiuram mix
Others	10	10 reacted either to mercapto mix, PPD, fragrance mix, formaldehyde, parabens or potassium dichromate

ACD, allergic contact dermatitis; PPD, *para*-phenylenediamine base.

Table 4. The positivity rates (%) of patch testing in our study compared to previously reported rates (1, 2, 4, 6)

Allergen	ACD (n = 46)	NACD (n = 20)	FD (n = 55)	HD (n = 48)	UEE (n = 65)	Total (n = 181)	Reported rates
Total	98	15	62	51	56	61	
Benzocaine	0	0	0	2.1	0	1.1	0.8–1.5
Black rubber mix	0	0	3.7	0	0	1.7	?
2-bromo-2-nitro-propane-1,3-diol (bronopol)	0	0	1.8	0	0	0.6	?
Carba mix	8.7	0	10.9	4.2	11.6	10.5	5.7
Colophonium	4.3	0	0	6.4	7.0	5.0	3.7
Epoxy resin	0	0	1.8	0	0	0.6	?
Ethylenediamine dihydrochloride	0	0	3.6	0	0	1.7	2.9
Formaldehyde	4.3	0	3.6	4.2	2.3	3.9	3–4
Fragrance mix	23.9	5	14.5	14.9	13.9	15.5	7.8
Imidazolidinyl urea	6.5	0	9.1	0	0	2.8	3.1
Mercapto mix	2.2	0	1.8	0	0	0.6	?
N-(cyclohexylthio) phthalimide	0	0	3.6	0	7	3.4	?
Nickel sulphate	30.4	5	25.5	10.7	18.6	22.1	30.0
para-Phenylenediamine base (PPD)	8.7	0	10.7	17	9.3	12.8	6.8
Parabens	2.2	0	5.4	4.2	2.3	3.3	1.0
Potassium dichromate	6.5	0	5.4	12.7	7	8.9	2–4
Sesquiterpene lactone mix	0	0	0	0	4.7	1.7	1–4
Thiuram mix	4.3	0	0	0	0	0.6	6.8
Thimerosal (Merthiolate)	8.7	5	5.4	6.4	9.3	7.7	10.4
Tixocortol-21-pivalate	0	0	0	2.1	0	0.6	?

ACD, allergic CD; NACD, non-allergic CD; FD, facial dermatitis; HD, hand dermatitis; UEE, unclassified endogenous eczema.

series of allergens, the highest positivity rate was yielded in clinically diagnosed ACD (98%). The positive rate to each allergen was comparable to reported results (Table 4). No adverse reactions were observed to patch testing, except for pruritus in patch-test-positive patients. These results indicate that it is effective and safe to patch test eczema patients in China.

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