

Contact hypersensitivity in hand dermatitis

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Contact hypersensitivity (CHS) in hand dermatitis (HD) was studied by patch testing (PT) 105 consecutive adult HD patients and 361 cases of suspected non-hand allergic contact dermatitis (NHD). The suspected offending agents were also investigated by a questionnaire. Age and sex distribution was no different between the 2 groups. The total positivity rate of PT in the HD group was much lower than in the control group (46.7% versus 63.2%, $p < 0.01$, χ^2 -test). The most common allergens in HD were rubber mix (17.1%), *p*-phenylenediamine (PPD) (14.3%), fragrance mix (9.5%), nickel (9.5%), colophonium (6.7%) and potassium dichromate (2.9%), while those in the control group, in sequence, were nickel (20.5%), rubber mix (16.9%), PPD (14.1%), fragrance mix (12.7%), potassium dichromate (5.5%) and colophonium (5.0%). The positivity rate to nickel was lower in the HD group (9.5% versus 20.5%, $p < 0.05$, χ^2 -test), while there was no significant difference for the other allergens. HD was divided arbitrarily into 5 groups: (1) vesicular form, in which fine papules and vesicles can be detected. 65.7% of the HD was vesicular form and 55.1% of them were PT positive; (2) fissured form, in which dry skin with fine fissures or desquamation is seen. 8.6% of the HD was fissured form and 30% of them were PT positive; (3) hyperkeratotic form, in which the lesions are thick, hyperkeratotic plaques – 6.7% of the HD was this form and no positive reaction was found; (4) hand and foot dermatitis (HFD) – 12.4% of HD was HFD and 53.8% of them were PT positive; (5) pompholyx – 6.7% of the patients had pompholyx and one positive result to nickel was detected. The suspected offending agents were reported in only 13 (12.4%) patients. These results suggest that CHS is less common in HD than in NHD and that other factors, such as skin irritation, may play more of a role in HD. Nickel allergy is less common in HD than in NHD. CHS may play a role in more than 1/2 of vesicular form HD, HFD and in some fissured HD also, but is less common in hyperkeratotic HD and pompholyx. Only a small proportion of the HD patients could report the suspected offending agents and PT should be performed in all patients with chronic HD.

Key words: allergic contact dermatitis; contact hypersensitivity; hand and foot; hand dermatitis; irritant contact dermatitis; nickel; patch test; pompholyx; rubber. © Blackwell Munksgaard, 2002.

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Hand dermatitis or eczema (HD) is very common in dermatology practice and very difficult to manage. Patients with HD are well known to have impaired quality of life and it often leads to frequent consultations. The aetiological diagnosis of HD is also often very difficult although allergic or irritant contact dermatitis or atopic diathesis have been implied (1). Most of HD may be a chronic effect of combinations of several endogenous or exogenous factors and the offending agents are very hard to determine.

Clinically, it may be helpful to divided HD into 5 categories: (1) vesicular form, in which erythema, oedema, fine papules and vesicles can be detected. This form of HD is usually suspected as being allergic contact dermatitis (ACD); (2) fissured form,

in which dry skin with fine fissures or desquamation is seen and skin irritation usually considered; (3) hyperkeratotic form, in which lesions are thick, hyperkeratotic plaques and endogenous factors may play more of a role than contact hypersensitivity (CHS); (4) hand and foot dermatitis (HFD), in which similar dermatitis can be detected on both hands and feet; and (5) pompholyx. The classification of HD is still controversial and the relationship between the clinical manifestations of HD and contact allergy is unclear. The clinical features of HD, including typical exogenous such as contact dermatitis, or endogenous may be non-specific.

Patch testing has proved a useful tool for the detection of allergic contact dermatitis and identi-

Table 1. Results of patch testing in hand dermatitis and control groups

Allergen	Hand dermatitis (n = 105)	Control (n = 361)	p-value (χ^2 -test)
Total	49 (46.7%)	228 (63.2%)	< 0.01
Rubber mix	18 (17.8%)	61 (16.9%)	> 0.05
p-Phenylenediamine	15 (14.2%)	51 (14.1%)	> 0.05
Fragrance mix	10 (9.5%)	46 (12.7%)	> 0.05
Nickel	10 (9.5%)	74 (20.5%)	< 0.05
Colophonium	7 (6.7%)	18 (5.0%)	> 0.05
Potassium dichromate	3 (2.9%)	20 (5.5%)	> 0.05

fication the contact allergen. The purpose of this study was to analysis the CHS in HD by patch testing and comparing the results with non-hand dermatitis patients. Contact allergy in HD with different clinical features will be also studied.

Patients and Methods

Diagnostic criteria

Hand dermatitis Hand dermatitis (HD) was defined as dermatitis confined to the hands, other skin diseases involving the hand, such as infective dermatitis, dermatophytide, post-traumatic eczema, discoid eczema, metabolic eczema, eczematous drug reactions, atopic dermatitis (AD), photosensitivity, psoriasis, and infectious skin diseases, being excluded by history and clinical examination. AD was diagnosed by using the UK diagnostic criteria for AD (2). Psoriasis was distinguished from HD by psoriatic lesions elsewhere and if the localized psoriasis could not be distinguished, the case would be excluded from the study.

Vesicular form of HD Vesicular form of HD was considered when the criteria of HD were met and erythema, oedema with fine papules and vesicles could be detected.

Fissured form of HD Fissured form of HD was defined as when the lesions of HD were dry with fine fissures or desquamation without vesicles;

Hyperkeratotic form of HD Hyperkeratotic form of HD was considered when the lesions were thick, hyperkeratotic plaques and deep fissures sometimes being seen;

Hand and foot dermatitis (HFD) HFD was diagnosed when a similar dermatitis could be detected on both hands and feet;

Pompholyx Pompholyx was diagnosed and distinguished from vesicular form of HD by typical recurrent, seasonal, transient vesicular attacks on palms and/or soles.

Atopic diathesis Atopic diathesis was considered when any of the following diseases, allergic rhinitis, allergic asthma, or atopic dermatitis, could be proved in the patients personal history or in the

blood-related family members within 3 generations.

Study populations

105 consecutive cases of adult HD, where the dermatitis had persisted for more than 1 month, were studied. All patients were from our contact dermatitis clinics between January 1999 to January 2001. There were 29 males and 76 females (female: male = 2.6), with an average age of 41.8 ± 15.5 years.

Investigation of suspected offending environmental agents by questionnaire

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

Patch testing

Patch testing was performed with the standard series of Beijing Medical University, Beijing, China (4, 5). This includes benzocaine, imidazolidinyl urea, neomycin sulfate, p-phenylenediamine (PPD), potassium dichromate, ethylenediamine dihydrochloride, colophonium, parabens, formaldehyde, epoxy resin, 2-bromo-2-nitropropane-1,3-diol, ammoniated mercury, fragrance mix, nickel sulfate and rubber mix (5). Rubber mix contains four mixtures. Rubber mix I is the mixture of mercaptobenzothiazole, N-cyclohexyl-2-benzothiazole sulfenamide and 2,2'-benzothiazyl disulfide. Rubber mix II contains tetramethylthiuram disulfide and tetramethylthiuram monosulfide. Rubber mix III contains N-phenyl-N'-cyclohexyl-p-phenylenediamine, N-isopropyl-N'-phenyl-p-phenylenediamine and N,N'-diphenyl-p-phenylenediamine. Rubber mix IV is a mixture of N,N'-diphenylguanidine, zinc diethyldithiocarbamate and zinc dibutyldithiocarbamate. Allergens were applied to the upper back, using Finn Chambers on Scanpor tape (Beijing Medical University, Beijing, China), and the results were recorded at 2 and 3 days (D) according to ICDRG recommendations (6).

Table 2. Classification of hand dermatitis and the number positive (%) on patch testing

Allergen	Vesicular form (n = 69)	Fissured form (n = 9)	Hyperkeratotic form (n = 7)	Hand and foot dermatitis (n = 13)	Pompholyx (n = 7)
Total	38 (55.1)	3 (30)	0	7 (53.8)	1 (14.3)
Rubber mix	12 (17.4)	1 (11.1)	0	3 (23.1)	0
p-Phenylenediamine	10 (14.5)	0	0	2 (15.4)	0
Fragrance mix	7 (10.1)	1 (11.1)	0	0	0
Nickel	5 (7.2)	0	0	0	1 (14.3)
Colophonium	6 (8.7)	0	0	1 (7.7)	0
Potassium dichromate	4 (5.8)	1 (11.1)	0	0	0

Table 3. Clinical features and results of patch testing in patients with reported suspected environmental offending agents

Number	Age	Sex	Occupation	Clinical diagnosis	Suspected agents	Positive patch test
1	30	F	Beautician	Fissured skin irritation	Working materials	None
2	32	M	Construction worker	Vesicular form ACD	Working materials	Colophonium
3	45	F	Car repairer	Vesicular form ACD	Working materials	Rubber mix
4	33	F	Office worker	Vesicular form ACD	Gloves, shoes	Rubber mix, PPD
5	76	M	Retired	Vesicular form ACD	Ping-pong racket	Racket as is, PPD, fragrance mix, colophonium
6	18	F	Welder	Vesicular form ACD	Electric plate	Colophonium
7	41	M	Metal worker	Vesicular form ACD	Metal	None
8	18	M	Hairdresser	Vesicular form ACD	Working materials	PPD
9	46	F	Chemical analysis	Vesicular form ACD	Benzene	PPD
10	20	M	Electric worker	Vesicular form ACD	Electrical wire	Rubber mix
11	21	M	Bicycle repairer	Vascular form ACD	Rubber	Rubber mix
12	30	F	Beautician	Fissured skin irritation	Working materials	Fragrance mix
13	54	F	Office worker	Vesicular form ACD	Topical CMM ^a	Fragrance mix

^aFragrance containing Chinese medicinal materials
Allergic Contact Dermatitis (ACD)

Controls

361 consecutive adult patients with suspected non-hand allergic contact dermatitis (NHD) were also patch tested in the same period. There were 101 males and 260 females (female/male ratio 2.57) with an average age of 41.5 ± 22.4 years. No difference in age and sex distribution between the HD and control group was found after statistical analysis.

Statistical analysis

$2 \times \chi^2$ -test was used to compare the positive rate to each allergen in each group (7).

Results

The results of patch testing in HD and controls are shown in Table 1. The total positivity rate in the HD group was much lower than in the control group (46.7% versus 63.2%, $p < 0.01$, χ^2 -test). The 6 most common allergens in the HD group were rubber mix (17.1%), PPD (14.3%), fragrance mix (9.5%), nickel (9.5%), colophonium (6.7%) and potassium dichromate (2.9%), while those in the control group, in sequence, were nickel (20.5%),

rubber mix (16.9%), PPD (14.1%), fragrance mix (12.7%), potassium dichromate (5.5%) and colophonium (5.0%). The positivity rate to nickel was lower in the HD group (9.5% versus 20.5%, $p < 0.05$, χ^2 -test), while no significant difference was found for the other allergens between the 2 groups.

There were 9 patients (8.6%) in the HD group and 26 patients (7.2%) in the NHD group who were atopic. No statistical difference could be found between the 2 groups ($p > 0.05$, χ^2 -test).

The classification of HD and the results of patch testing are shown in Table 2. 55.1% of the patients with the vesicular form of HD had positive findings. The remaining 44.9% of patients were patch test negative. In fissured form HD, 30% were patch test positive. No positive patch test result was found in hyperkeratotic form of HD. 53.8% of the HFD patients patch tested positive and the main allergens were rubber mix, PPD and colophonium. Only 1 patient in the pompholyx group was tested positive and the allergen was nickel.

Only 13 (12.4%) patients reported their suspected offending agents. The clinical diagnosis and the results of patch testing of these patients are shown in Table 3. Although 11 of them showed consistent results with patch testing, 1 patient

proved to have allergic contact dermatitis when skin irritation was suspected before patch testing.

Discussion

Although HD is very common in dermatological practice and the life quality of the HD patient is greatly impaired, few aetiological studies on HD have been reported. Contact allergy, skin irritation, atopic diathesis and systemic absorption of contact allergen have all been suggested in the pathogenesis of HD (1), though the aetiology of HD is still hard to determine in many patients.

In this study, by patch testing we have found a lower positive rate of PT in HD than in NHD. This result indicates that factors other than contact allergy, such as skin irritation and unknown endogenous factors, may play more of a role in HD than NHD. Considering the complex exposure of the hands 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.

A lower positive rate of PT to nickel was also found in HD in this study. It has been reported that HD may be related to atopic diathesis, and that atopic patients have a lower positive rate to nickel. However, in this study there were 9 patients (8.6%) in the HD group and 26 patients (7.2%) in the NHD group who were atopic. No statistical difference could be found between the 2 groups ($p > 0.05$, χ^2 -test). Continual contact with metals in jewellery, watches, glasses, or clothing decorations in NHD may contribute to the higher positive rate of nickel PT in NHD. The exact mechanism of this difference needs further study.

More than 1/2 of the patients with the vesicular form of HD showed positive PT results, supporting the hypothesis that most of vesicular HD is allergic contact dermatitis. However, 30% of patients with the fissured form of HD also gave positive results, indicating that, although fissured HD is usually due to skin irritation, CHS may also play a role. No positive PT results were found in the

hyperkeratotic form of HD, supporting the view that this type of HD may be endogenous. More than 1/2 of those with hand and foot dermatitis showed positive PT results, suggesting that CHS is common in HFD. In our study, a low PT positive result was found in pompholyx.

In this study, only 12.4% of the HD patients could report the suspected offending agents and most of these were occupational. This is suggestive that most patients are not aware of the relationship between environmental factors and their HD. Comparing this finding with the high positive rate of PT, it is clearly essential to patch test all patients with chronic HD.

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