

# ATOPIC HAND DERMATITIS: A COMPARISON WITH ATOPIC DERMATITIS WITHOUT HAND INVOLVEMENT, ESPECIALLY WITH RESPECT TO INFLUENCE OF WORK AND DEVELOPMENT OF CONTACT SENSITIZATION

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**Abstract.** A group of 77 patients with atopic hand eczema were compared with 136 atopic dermatitis patients without hand manifestations. Age distribution was identical in the two groups, peaking at 25-39 years of age. Both groups were dominated by female patients. No differences existed between them with respect to atopic heredity, occurrence of other atopic manifestations, or distribution of serum IgE values. The fingers represented the predilection sites for hand involvement. Patients with hand lesions changed jobs more frequently ( $p < 0.001$ ) than those with unaffected hands, and change from a wet or unclean occupation was more common ( $p < 0.001$ ) than from a dry one. Change of work entailed improvement in the skin status of both groups. Prevalence of positive patch test reactions was high and statistically identical in both groups. Occurrence of positive responses did not explain the development of hand affliction; in only 3 patients did the test result correspond to exacerbation of the hand eczema. The number of positive reactions was high in patients with low serum IgE levels, while high levels were associated with fewer positive patch test reactions.

**Key words:** Atopic dermatitis; Hand dermatitis; Patch test; IgE

Atopic dermatitis (AD) is one of the most common dermatological disorders. The prevalence is highest before twenty years of age, although adult affliction is common (9, 12, 13). Characteristically, flexural skin areas are involved. The hands are also frequently diseased, as was the case in 68% of 130 (2) and 67% of 233 (3) AD patients. In the latter group, 16% were also considered suffering from an allergic contact eczema. Interestingly, nickel-sensitized females 40-59 years of age afflicted with hand eczema are almost invariably atopics (10).

Inevitably, hand dermatitis in atopics signifies limitations with respect to occupational choice, and work factors may exacerbate the eczema. The present study compared two groups of AD patients, one with and one without hand dermatitis. These were investigated with respect to frequency of and reasons for change of occupation, as well as regarding changes in work routines and their consequences. In order to evaluate any significance of

contact allergy in the pathogenesis of hand eczema in atopics, possible deviations in results from patch testings between the two groups were also studied.

## MATERIAL AND METHODS

**Patients.** Patients 20 years or older who, during the years 1974-79, were diagnosed as afflicted with atopic dermatitis according to criteria established by Hanifin & Rajka (6) were summoned for further investigations: of those attending, 136 exhibited hand eczema and 77 were free of hand lesions. Patients were investigated and questioned according to norms outlined by Hanifin & Rajka and also with respect to possible precipitating conditions such as occupational factors.

**Patch test.** Patch tests were applied to the backs of patients using the method reported by Pirilä (11). Patches were removed after 48 hours and readings were performed 24 hours later. Reactions were ranked from 1+ (erythema) to 3+ (vesiculation).

The following series of test substances were used: potassium dichromate 0.5% (vas. flav. in petrolatum), merthiolate 0.1% (in petrolatum), formaldehyde 1% (in water), cobalt chloride 1% (in petrolatum), paraphenylenediamine 1% (in petrolatum), turpentine 10% (in olive oil), mercapto-mix 2% (in petrolatum), balsam of Peru 25% (in petrolatum), thiurammix 1% (in petrolatum), nickel sulphate 2.5% (in petrolatum), neomycin 20% (in petrolatum), benzocaine 5% (in petrolatum), procaine chloride 1% (in petrolatum), "Parabens" 15% (in petrolatum), PPD-mix 0.6% (in petrolatum), carba-mix 3% (in petrolatum), vioform® 5% (in petrolatum), sterosan® (in petrolatum), lanolin *per se*, naphthyl-mix 1% (in petrolatum), *p*-toluenediamine 2% (in petrolatum), soap perfume 5% (in petrolatum), colophony 20% (in petrolatum), disperse yellow 1% (in petrolatum), epoxy resin 1% (in petrolatum), wool alcohols 30% (in petrolatum), fragrance-mix 8% (in petrolatum).

**IgE.** IgE determinations were performed using the PRIST method (commercial method, Pharmacia, Sweden).

**Statistical evaluation.** Yates' corrected Chi-square test and Fisher's exact test were used for statistical comparisons of frequency of hand eczema in various groups of patients. With respect to occurrence of any heterogeneity in frequency of change of profession between patients with and without hand eczema, probability calculations were performed according to Fisher's methodology (4).

Table I. Age and sex distribution of patients

Age	With hand manifestation				Without hand manifestation			
	Men	Women	Total	%	Men	Women	Total	%
20-24	1	5	6	4	5	2	7	13
25-29	18	49	67	49	11	19	30	39
30-34	5	19	24	18	4	10	14	18
35-39	8	14	22	16	5	3	8	10
40-44	—	6	6	4	3	3	6	4
45-49	1	1	2	1	1	1	2	3
50-54	—	2	2	1	1	2	3	4
55-59	—	3	3	2	—	3	3	4
≥60	2	2	4	3	2	2	4	5
Total	35	101	136		32	45	77	

## RESULTS

Table I shows the age and sex distribution in the two patient groups, comprising 136 patients with and 77 without hand eczema. No difference existed between the groups regarding age distribution ( $0.20 > p > 0.10$ ); most patients were within the range 25 to 39 years of age. Of those with hand manifestations, 74% were females; most commonly, the fingers were afflicted, followed by the backs of hands (Table II). Atopic heredity and extradermal atopic manifestations were equally distributed between the groups.

The first appearance of hand eczema was unrelated to any change in occupation. Thus, frequency of change of job was the same ( $0.70 > p > 0.50$ ) regardless of whether the onset of hand manifestation occurred relatively early or late during the course of the AD (Table III). However, in both sexes, significantly more patients with hand eczema had changed occupation ( $p < 0.001$ ) compared with those free of hand lesions. In both groups, change of work led to a significant improvement in the eczema (Table IV). Although this measure did not cause a cure of the hand eczema, these manifestations no longer represented a major hindrance to the

performance of work subsequent to change of profession.

Of the 136 patients with hand eczema, 82 (60%) were first employed performing wet or unclean jobs; the corresponding figure for the 77 individuals without hand affliction was 47 (53%). In the former group, 52 (63%) changed their occupation, compared with 7 (17%) of those free of hand manifestations (Table V); this difference is significant ( $p < 0.001$ ).

The prevalence of positive patch tests was high in both groups (Table VI). Reactions graded 2+ or stronger occurred in 24% of those with, compared to 16% of those without hand eczema; when grade 1+ reactions were also included, corresponding figures were 38% and 29% respectively. Thus, no differences existed between the groups ( $0.30 > p > 0.20$ ;  $0.50 > p > 0.30$ ). Nor did any divergences appear between the groups ( $0.70 > p > 0.50$ ;  $0.30 > p > 0.20$ ) with respect to the mean number of compounds causing reactions in the test-positive individuals (Table VII). In 2 patients, one allergic to nickel and the other reacting

Table II. Localization of hand eczema

No. of patients	Localization to			
	fingers <i>n</i>	palms <i>n</i>	backs of hands <i>n</i>	All three localizations <i>n</i>
136	124	53	69	19
Per cent	91	38	50	13

Table III. Age at onset of hand eczema and number of patients who changed work

	Age at onset				Total
	<7 years	7-14 years	15-20 years	>21 years	
No.	42	23	39	32	136
Per cent	31	17	28	24	
No. of pat. who changed work	18	9	18	10	55
Per cent	43	39	46	31	40

Table IV. Number of patients who changed work because of eczema and number who improved

	With hand eczema			Without hand eczema		
	Men	Women	Total	Men	Women	Total
Total number of patients	35	101	136	32	45	77
Number of patients who changed work	16	39	55	6	1	7
Per cent	46	39	40	19		9
Number of patients who improved	12	28	40	6		6
Per cent	75	72	73	100		86

Table V. Number of patients who changed work and the type of change

	Total <i>n</i>	First job dry and clean <i>n</i>	Change of work <i>n</i>	Change to dry and clean <i>n</i>	First job wet and dirty <i>n</i>	Change of work <i>n</i>	Change to dry and clean <i>n</i>	Change to wet and dirty <i>n</i>
With hand eczema	136	43	3 (6%)	3	82	52 (63%)	40	12
Without hand eczema	77	36	—	—	41	7 (17%)	6	1

to rubber chemicals, a correlation existed between exacerbations of hand eczema and the test results. Although about half of the test-positive individuals in both groups reported a history indicating eczematous reactions to the actual compound(s), test responses did not correlate to fluctuations in their AD in any of the remaining cases (Table VIII).

High and low quantities of serum IgE were equally distributed between the two groups ( $0.50 > p > 0.30$  (Table IX). However, significantly more patients ( $0.05 > p > 0.02$ ) with IgE values  $< 120$  U/ml revealed positive patch test reactions than those with IgE values  $> 1000$  U/ml (Table X).

#### DISCUSSION

Patients with hand manifestations dominated our material; the 63% prevalence rate corresponds closely to the 57% and 68% rates among AD patients revealed by Cronin et al. (3) and Breit et al. (2) respectively.

As was the case in Agrup's (1) material, fingers or backs of the hands constituted predilection sites for atopic hand dermatitis. Although it is generally accepted that AD patients should avoid jobs entailing skin irritation, especially those with diseased hands, neither the effect of work-related skin trauma nor a possible benefit of transfer to alternative occupations has been convincingly documented. However, in a recently published article (8) it was shown that among employees performing wet work in hospitals, the presence of atopic symptoms sig-

nificantly favoured the development of hand dermatitis. Our study revealed that AD patients with hand eczema changed occupation from wet and unclean jobs to a much higher extent than those without hand lesions. The fact that for the former patients, a change to clean and dry work was favourable for the course of their hand lesions, explains the significance of their occupational choice. On the other hand, type of profession apparently does not influence the incidence of hand affliction in AD, as about half of our patients had diseased hands prior to their first job.

Cronin et al. (3) reported that 16% of AD patients developed an allergic contact eczema, while Agrup (1) stated that 31% of those with hand lesions had a positive patch test. Accordingly, hand affliction

Table VI. Frequency of patients with positive patch test reactions in the group with and without hand eczema

	Total <i>n</i>	Tested <i>n</i>	Test reaction	
			2+, 3+ <i>n</i>	1+, 2+, 3+ <i>n</i>
With hand eczema	136	128	30	48
Per cent		93	24	38
Without hand eczema	77	58	9	17
Per cent		75	16	29
Total	213	186	39	65

Table VII. Distribution of positive reactions among patients with and without hand eczema

	With hand eczema			Without hand eczema		
	1+	2+, 3+	1+, 2+, 3+	1+	2+, 3+	1+, 2+, 3+
Nickel sulphate	1	5	6	-	3	3
Potassium dichromate	6	3	9	1	-	1
Balsam of Peru	3	5	8	-	2	2
Neomycin	-	4	4	-	1	1
Rubber-mixes	8	3	11	2	-	2
Vioform	1	2	3	-	-	-
Colophony	3	3	6	-	-	-
Formaldehyde	-	2	2	-	1	1
Cobalt chloride	3	6	9	1	-	1
Parabens	1	-	1	1	-	1
Merthiolate	3	2	5	2	2	4
P-phenylenediamine	1	1	2	-	-	-
Epoxy resin	-	3	3	1	-	1
Lanolin	1	-	1	-	-	-
Perfume (soap)	3	-	3	1	-	1
Fragrance-mix	3	1	4	1	1	2
Wool alcohols	2	-	2	1	-	1
Total	39	40	79	11	10	21

could possibly emanate from contact sensitization rather than from chronic irritation. Our material also showed a remarkable high frequency of positive patch test reactions, even when the weakest reactions were excluded. However, whether the frequency of patients with some type of reaction(s) or the number of positive reactions per patient is accounted for, no statistical difference in sensitization rate emanated between those with versus those without hand involvement. Only in 3 patients did a clearcut correlation exist between patch test results and exacerbation of hand lesions; in all of the remainder revealing any reactions, the chemicals causing positive patch tests did not seem to affect the course of their hand lesions despite the

Table VIII. Number of patients with positive patch test reactions (2+, 3+) and number reporting contact eczema when touching the implicated compound

	Tested <i>n</i>	Posi- tive (2+, 3+) <i>n</i>	Contact eczema		
			Posi- tive <i>n</i>	Doubt- ful <i>n</i>	Nega- tive <i>n</i>
With hand eczema	128	30	16	6	8
Without hand eczema	58	9	5	-	4

fact that half of them had noticed a temporary eczematous reaction on the site of contact with the implicated compound(s). Therefore, our results do not support the hypothesis that any established contact sensitization is of major significance for the development or persistence of hand eczema in these individuals.

The incidence of 1+ reactions was remarkably high and equivalent to the frequency of stronger responses. However, the chemicals causing 2+ reactions or stronger deviated from those generating weaker reactions. Nickel, balsam of Peru and cobalt essentially gave rise to at least 2+ reactions, while only erythematous responses emanated especially from rubber chemicals, chrome and merthiolate. Accordingly, the latter compounds in the concentrations used may cause non-specific reactions in atopic dermatitis patients.

Table IX. IgE (U/ml) distribution of patients with vs. without hand eczema

IgE, U/ml	<120	120-1 000	>1 000	Total
With hand eczema				
No.	64	39	26	129
Per cent	50	30	20	
Without hand eczema				
No.	31	24	20	75
Per cent	41	32	27	

Table X. IgE (U/ml) distribution of patients with vs. without positive patch test reacting (2+, 3+)

Patch test	<120	120-1 000	>1 000	Total
Positive				
No.	22	12	3	37
Per cent	59	32	8	
Negative				
No.	62	49	38	149
Per cent	48	83	26	

During recent years it has been revealed that atopic dermatitis is associated with disturbances in cell-mediated immunity (7). The present study supports our previous findings (5) that patients with relatively high serum IgE levels, reveal a significantly lower incidence of positive patch test reactions compared with those with lower IgE levels, which we consider to be a consequence of an altered function of the cellular immune defence.

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