

## CLINICAL REPORT

# Relation Between Vesicular Eruptions on the Hands and Tinea Pedis, Atopic Dermatitis and Nickel Allergy

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The aetiology of vesicular eruptions on the palms and on the sides of the fingers (pompholyx) is unclear. The present study was undertaken to establish whether tinea pedis, atopic dermatitis or nickel allergy is a risk factor for development of vesicular eruptions. Three-hundred-and-ninety-eight individuals (included from an ongoing population study on hand eczema in twins) were included. A history of previous hand eczema and atopic dermatitis was taken, and a clinical examination including a patch test with nickel was performed. A test sample for tinea pedis was taken from the fourth interdigital space on the right foot. The relative risk for vesicular eruptions present in individuals with tinea pedis was 3.58 (confidence limits 1.19–10.82,  $p < 0.05$ ). For individuals with atopic dermatitis, relative risk was 1.44 (confidence limits 0.34–6.07, n.s.) and for those with nickel allergy it was 0.45 (confidence limits 0.06–3.36, n.s.). A relationship between tinea pedis and vesicular eruptions on the hands was statistically confirmed in the present study. In this part of the population study material, no association with atopic dermatitis or nickel allergy was observed. *Key words: atopic dermatitis; nickel allergy; pompholyx; tinea pedis.*

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Vesicular eruptions on the hands without other symptoms of hand eczema are common. In a recently published questionnaire study of a population-based twin cohort (1, 2), this symptom was reported by 300 out of 5673 respondents (5.3%).

The condition of recurring vesicular eruptions is known as pompholyx, which is generally accepted as an acute or chronic vesicular recurrent eruption of the hands and feet (3, 4). The condition was earlier called “dyshidrosis”, but since sweat glands are not involved in the disease it has since been renamed “pompholyx”. The eruption begins as itching vesicles on the palms or soles extending to the side of the fingers. The severity varies from mild attacks to severe cases where the skin does not heal between eruptions.

The aetiology of vesicular eruptions and pompholyx has been studied extensively. No effect of sympathectomy has been reported and no relationship to sweat secretion has been found (5). Pompholyx has been reported in relation to type I allergy (4), but in a recent study of 59 workers with pompholyx a history of atopy was no more common than in other forms of hand eczema (6). Pompholyx has also been reported to be related to type 4 allergy, and sometimes caused by a systemic exposure to the allergen (7). Vesicular eruptions/pompholyx of the hands are often accepted by dermatologists as an allergic reaction to dermatophytosis (dermatophytid) (8). In a recent study, 29% of patients with culture-proven dermatophytosis on the feet were reported to have symmetrical, vesicular eruptions on the fingers and/or palmar aspects of the hands (3).

The aim of the present study was to establish if there is any association between vesicular eruptions on the hands and tinea pedis, atopic dermatitis (AD) or nickel allergy.

## MATERIAL AND METHODS

Participants were included from an ongoing population-based twin cohort study on hand eczema (1, 2). They were drawn from this cohort and examined by a mail questionnaire. All respondents who were living within 60 km of Copenhagen and who in the questionnaire had reported at least one symptom indicative of hand eczema, or twin sibs to persons fulfilling the set criteria for hand eczema, were invited. In the period June 1 to November 15, 1997 a total of 398 individuals were clinically examined in the hand eczema study and included in the present study. There were 129 men and 269 women, ages ranging between 20 and 44 (median 33). The large cohort study was performed during a 17-month period, and the period of the present study (summer and autumn) was chosen in order to include the months within this period with the hottest temperatures. This decision was based on the clinical experience that most people report the occurrence of isolated vesicles on their hands during the summertime.

Examination for tinea pedis was performed in all participants. A test sample for culture was taken from the fourth interdigital space on the right foot, as well as from all clinically suspect areas on the feet. No occurrences of sample failure were observed. The investigators used sharp one-time currettes rather than conventional dermatophyte sampling spoons, and this method secured an ample amount of tissue regardless of skin constitution.

Vesicular eruption was established by the presence of vesicles on the hands/fingers/fingerweb with no other symptoms

of hand eczema at the time of the investigation. Hand eczema was defined according to the criteria suggested by Rycroft (9) and refined by Coenraads et al. (10), which required the presence of papules, pustules, vesicles or exudation, or a history or presence of more than one of the following: erythema, scaling, oedema, fissuring or lichenification. Furthermore, the signs had to have been present for more than 3 weeks or on more than one occasion (10). Data on atopic dermatitis (AD) according to the UK-WP criteria for AD were obtained from all participants (11). Patch tests for self-application (True test standard series) were sent to the participants by mail, applied by the individuals on the back, and read by one of the authors on the day of the examination (72 h reading) using the ICDRG-criteria (12). No attempt to account for possible effects of previous sun exposure was made. Positive reactions to nickel were registered, and there were no failures in applying the patch test.

#### Statistics

The results are expressed as relative risk (RR) and corresponding 95% confidence limits. *P*-values <0.05 were accepted as statistically significant.

## RESULTS

Out of 398 individuals included in the study cohort, 283 had a history of hand eczema, while 115 had never had hand eczema. Twenty-three (5.8%, 18 men and 5 women) had a culture-proved dermatophytosis on the feet. Fourteen participants with hand eczema had dermatophytosis and 9 without hand eczema had dermatophytosis. The age range of the 23 individuals with dermatophytosis (21–44, median 30) was similar to the culture-negative patients, but a higher proportion of males was noted (78% versus 32%). Eleven had a *T. rubrum* and 12 *T. mentagrophytes* infection. The positive findings were evenly distributed over the period.

Sixteen persons had vesicular eruptions on the hands as their only symptom at the time of the investigation; 64 individuals had a regular hand eczema; 201 were diagnosed as having had hand eczema within the last year and 283 had a history of hand eczema (Table I). Of the 16 individuals with vesicular eruptions on the hands at the time of the investigation, 3 had tinea pedis.

Table I. The relationship between tinea pedis and different clinical manifestations (present vesicular eruptions, present eczema) or history of eczema (eczema last year or eczema ever) is given for the 283 participants with hand eczema ever. The results are expressed as relative risk (RR) and 95% confidence limits (CI). Individuals may be included in more than one group.

Individuals with	No. (%) with tinea pedis	RR (95% CI)
Vesicles present ( <i>n</i> =16)	3 (18.75%)	3.58 (1.19–10.82)*
Eczema present ( <i>n</i> =64)	4 (6.25%)	1.10 (0.39–3.12)
Eczema last year ( <i>n</i> =204)	11 (5.47%)	0.90 (0.41–1.99)
Eczema ever ( <i>n</i> =283)	14 (4.95%)	0.63 (0.28–1.42)

\**p*<0.05

From this, the RR for development of vesicular eruptions in individuals with tinea pedis can be calculated to be 3.58 (confidence limits 1.19–10.82, *p*<0.05), thus verifying that tinea pedis is a statistically significant risk factor for the development of vesicular eruptions on the hands. None of the other clinical manifestations (regular hand eczema, eczema within the last year or eczema ever) was statistically significantly related to the presence of tinea pedis (Table I).

Of the 16 cases with vesicular eruptions, 15 were identified in June and July, the numbers of individuals involved in the study being evenly distributed over the 5-month period.

In the part of our material presented here (*n*=398), neither AD nor nickel allergy were found to be risk factors, i.e. statistically associated with vesicular eruptions on the hands. The presence of vesicles was not associated with AD (RR=1.44; confidence limits 0.34–6.07) or nickel allergy (RR=0.45; confidence limits 0.06–3.36). Neither was the presence of vesicles associated with atopy, defined as a history or presence of asthma, hay fever, flexural eczema or childhood eczema (RR=0.54; confidence limits 0.20–1.46).

## DISCUSSION

Vesicular eruptions on the hands and the clinical syndrome pompholyx have troubled patients and dermatologists for well over a century. Careful analysis by light microscopy and lately electron microscopy has led to the theory of a relationship to sweat gland dysfunction being abandoned (4). Associations to fungal infections on the feet (13), to AD and to nickel allergy have previously been proposed (3, 14).

The present cohort study supports the hypothesis of tinea pedis as a significant risk factor for the development of isolated vesicular eruptions on the hands. Tinea pedis was not found to be related to hand eczema as such (present hand eczema, hand eczema within the last year or hand eczema ever). *T. rubrum* infections are typically found twice as frequently as *T. mentagrophytes* infections (13), and the atypical distribution in the present study is unexplained. A hypothetical explanation might be that systematic investigation of interdigital skin regardless of clinical findings catches mild, transient infections caused by *T. mentagrophytes*, which would normally go unnoticed. The incidences of *T. mentagrophytes* and *T. rubrum* are believed to be similar, but *T. rubrum* more often results in chronic cases of tinea pedis (13). A study design investigating only tinea pedis with visible signs might oversample chronic cases, which are more likely to be caused by *T. rubrum* infections. Likewise, a relationship between vesicular eruptions and AD or nickel allergy could not be confirmed in this part of the material.

In the present study, we focused on the presence of

vesicles at the time of the clinical examination. This ensures the diagnosis of vesicular eruptions, but also allows individuals with mild symptoms and without recurrent symptoms to be included in the study. Interestingly, 15 out of 16 vesicular eruptions were found in June/July. The seasonal variation of vesicular eruptions on the hands is well known, but has not proved attributable to any particular type of weather conditions. Parameters such as temperature, sun exposure or sport activities, which could be speculated to influence vesicular eruptions, were not included in the data sampling.

In conclusion, a relationship between tinea pedis and vesicular eruptions on the hands was statistically confirmed in the present study, and the frequency of vesicular eruption in patients with tinea pedis is increased more than three times. The results of this part of the study do not support an association with AD or nickel allergy. The study, however, does illustrate that dermatophytide is a relatively uncommon occurrence.

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