Using Patch Testing to Improve Therapeutic Outcome in the Treatment of Hand Eczema in Vietnamese Patients

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Abstract

BACKGROUND: Hand eczema is a common chronic and relapsing skin disease with various clinical features. Hand eczema aetiology can be allergic contact dermatitis (ACD), irritant contact dermatitis (ICD), atopic dermatitis (AD) and unknown or combination causes. If the causative agents are not detected treatment of hand eczema will be a failure. A patch test can be useful to detect causative agents in suspected allergic contact hand eczema. Then patients will avoid contacting them. This results in the improvement of hand eczema. In Vietnam, patch test has not been used before, so we conduct this study.

AIM: To identify causative allergens by using patch test with 28 standard allergens in consecutive patients.

METHODS: A group of 300 HE patients from the National Hospital of Dermatology and Venereology (NHDV) in Vietnam were enrolled in this study. They were divided into 4 groups-ACD, ICD, AD and unknown aetiology. The patient was patch tested with 28 standard allergens to identify the causative agents.

RESULTS: Among the 300 HE enrolled patients, ACD accounted for 72.7%, AD and ICD had the same rate of 12.7%. 39.3% of the patients had a positive patch test. Reaction to nickel sulfate was the most common (10.3%), followed by potassium dichromate (9.7%), cobalt (4%) and fragrance mix (3.1%). About one-third of the cases had relevant clinical reactions correlated with the contact agents and clinical history. Males reacted to cement, thiuram mix and formaldehyde more than females, while females reacted to a nickel more than males.

CONCLUSIONS: Hand eczema has variable clinical features and diverse aetiology. ACD is an important cause of hand eczema that can be managed with a patch test to detect causative allergens. Nearly 40% of HE cases had positive patch test. Relevant patch test reactions were seen in one-third of the patients. We propose using patch test detect causative agents in suspected allergic contact hand eczema. Then patients will avoid contacting them. This results in the improvement of hand eczema.

Introduction

Hand eczema (HE) is a common chronic dermatitis that affects a significant proportion of population all over the world (2-4%). HE often relapses and negatively impacts the patient's quality of life [1]. As HE is multifactorial disease [2], [3], treatment often leads to failure. Patch test has been used for years to detect causative allergen in ACD [4], [5]. A patch test is also proposed to determine causative reasons for HE, particularly in a group of allergic contact HE patients. Boonstra et al., studied 1571 hand eczema patients, reporting more than 50% of cases with positive patch test [6]. Agner et al., patch tested 416 HE patients showing 63% with positive patch test results [7]. However, in Vietnam, patch test has not been used before so conducted this study to explore patch test results with 28 standard allergens and common causative allergens in consecutive patients. Thus, we can provide patients with an effective treatment and prevention.

This study aimed to identify causative allergens by using patch test with 28 standard allergens in consecutive patients.

Materials and methods

In this study, 300 HE adult patients were enrolled from November 2015 to May 2017 at the NHDV, Vietnam. The diagnosis of HE was made based on the medical examination and record findings according to the criteria set by the Danish Contact Dermatitis Group (DCDG). We chose the ICD 10 classification to divide our patients into 4 groups-ACD, ICD, AD and unknown. We performed a patch test using TROLAB baseline series (28 standard allergens), Germany (See Table 1). The patch tests were applied to the upper back of patients for 72 hours occlusion as shown in Figure 1.
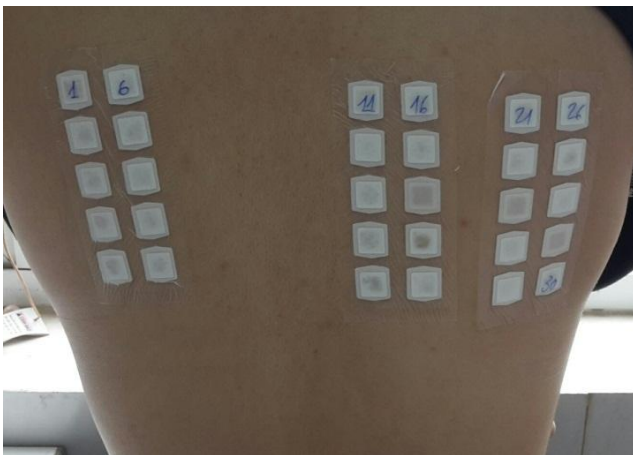

Figure 1: Finn chamber containing allergies on the patient's upper back

They were instructed to keep the test intact until their revisit at day 3 of the study. Patch test results were read after 72 hours. A positive reaction was noted if there were erythema and infiltration develops within the test area as shown in Figure 2.

Figure 2: Positive reactions

Double reactions were retested and categorised as negative or positive depending on results. The Patch test results were read based on the guidelines of the International Contact Dermatitis Group. In cases where the results did not meet standard quality, such as loss of tested film chamber was lost or film peeling off before 72 hours, the patch test was redone. Patients taking oral or topical steroid were excluded from the study. Based on the patch test results, patients were provided with relevant management for their HE.

Statistics

Data analysis was performed with SPSS 16.0. Data are presented as absolute numbers and percentages for categorised variables. We used Chi-square test for comparison between groups. Fisher's exact test was used when the data was small to do Chi-square test. A t-test was applied for comparison of continuous variables. Odd ratio (OR) were calculated to see the influence of gender on patch test results.

Results

Patch test results

Positive patch test reaction was seen in 39.3% patients. Reactions to one, two and three allergens were reported at 25%, 9%, and 5.3%, respectively as shown in Figure 3.
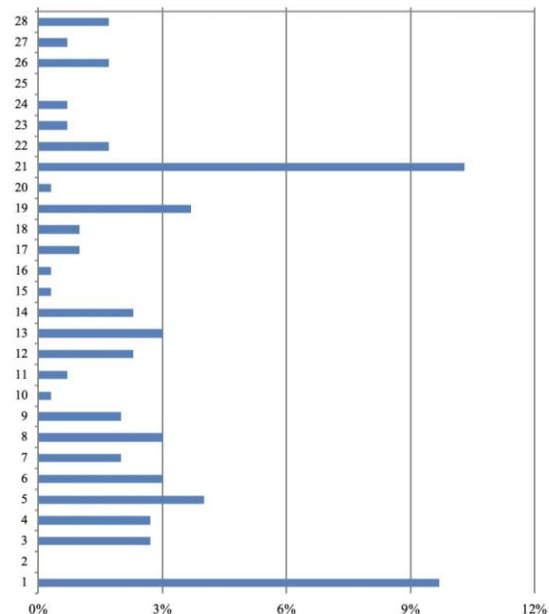

Figure 3: Rate of positive patch test reactions of 28 standard allergens

Around 27.7% of patients had clinically relevant reactions showing HE secondary to contact

allergy with nickel, cobalt in domestic goods, cement, fragrance mix, hair dyes, rubbers and synthetic plastic on the environment. Allergens number 10, 11, 15, 16, 24, 26, 27 and 28 showed positive patch test results but were not clinically relevant as presented in Table 2.

Table 1: List of 28 allergens

No	Allergens	Concentration
1	Potassium dichromate	0.5%
2	Neomycin sulfate	20%
3	Thiuram mix	1%
4	Fragrance mix II	14%
5	Cobalt chloride 6H20	1%
6	Paraphenylenediamine free base	1%
7	Benzocaine	5%
8	Formaldehyde (in water)	1%
9	Colophony	20%
10	Clioquinol	5%
11	Balsam of Peru	25%
12	N-Isopropyl-N'-phenylParaphenylenediamine	0.1%
13	Wood alcohols	30%
14	Epoxy resin	1%
15	Mercapto mix	1%
16	Budesonide	0.1%
17	Paraben mix	16%
18	Paratertiarybultyl phenol formaldehyde resin	1%
19	Fragrance mix	8%
20	Quaternium-15	1%
21	Nickel sulfate 6H20	5%
22	5-chloro-2-methyl-4-isothiazoline-3-one + 2-methyl-4-isothiazoline-3-one	0.01%
23	Mercaptobenzothiazole	2%
24	Sesquiterpene lactone mix	0.1%
25	Tixocortol pivalate	1%
26	Dibromodicyanobutane	0.3%
27	Hydroxymethylpentylcyclohexene-carboxyladehyde	5%
28	Primine	0.01%

Positive patch test reaction seen in males was 1.72 higher than females (p < 0.05, test $\chi 2$). Males react to potassium, thiuram mix and formaldehyde more often than females, while females react to a nickel more than males as shown in Table 3.

Table 2: Relevant patch test results

	Positive reaction	Clinical relevant reaction
	N =118	N = 83 (27.7%)
Potassium dichromate (1)	29	18 (62.1)
Thiuram mix (3)	8	4 (50)
Fragrance mix II (4)	8	5 (62.5)
Cobalt chloride 6H20 (5)	12	6 (50)
Paraphenylenediamine free base (6)	9	4 (44.4)
Benzocain (7)	6	2 (33.3)
Formaldehyde (8)	9	4 (44.4)
Colophony (9)	6	2 (33.3)
N-Isopropyl-N'-phenyl-Paraphenylenediamine (12)	7	3 (42.8)
Wood alcohols (13)	9	4 (44.4)
Epoxy resin (14)	7	3 (42.8)
Paraben mix (17)	3	1 (33.3)
Paratertiarybultyl phenol formaldedyde resin (18)	3	1 (33.3)
Fragrance mix (19)	11	5 (45.4)
Nickel sulfate 6H20 (21)	31	18 (58.1)
5-chloro-2-methyl-4-isothiazoline-3-one + 2-methyl-4-isothiazoline-3-one (soluted 3:1 in water) (22)	5	2 (40)
Mercaptobenzothiazole (23)	2	1 (50)

Regarding history of atopy, there was no difference between patch test reaction between atopy group versus non-atopy group (p ($\chi 2$): 0.228; CI: 1.34 (0.83-2.15).

Table 3: Patch test results in genders

	Potassium dichromate	Thiuram mix	Formaldehyde	Nickel sulfate
	n=58	n=16	n=18	n=62
Male	28 (23.1)	7 (5.8)	7 (5.8)	4 (3.3)
Female	1 (0.6)	1 (0.6)	2 (1.1)	27 (15.1)
Total	29 (9.7)	8 (2.7)	9 (3)	31 (10.3)
p (χ^2)	0.0001	0.006*	0.02*	0.001
OR	53.6	10.9	5.4	0.2
(CI95%)	(8.5-2202.9)	(1.4-495.2)	(1.0-54.2)	(0.05-0.58)

*Fisher's exact test.

Discussion

The rate of reacted patch test reported in our study was 39.3%. This number is consistent with others studies reporting positive patch test results ranging between 15% and 62.3%. Studies reporting a higher rate of positive patch test was typically done in such that the results were read in 3 separated time points-2, 3, and 7 days. By doing it this way, we would not miss the delayed response that has been documented to be as high as 20% [3]. Studies using additional allergens also reported a higher rate of a positive result because these allergens are more specific to patients' conditions than standard allergens.

Fall and Sabatini et al., conducted patch test studies, reporting a declined trend in patch test results to nickel sulfate, cobalt chloride, colophony and methylchloroisothiazolinone (MCI)/methylisothiazoli-none (MI), while an upward trend to p-phenylenediamine and fragrance mix. The explanation can be that the general public has become increasingly aware that offended agents such as nickel sulfate and cobalt chloride are to be avoided. In contrast, there are far more cosmetic, and odour products used in our daily life, that is making us have more reactive to these allergens [8], [9].

Among agents, nickel sulfate, potassium dichromate, cobalt, fragrance mix, paraphenylenediamine, formaldehyde, wood lanolin, and colophony was mostly registered as the suspected agents [10]. This trend was also observed in our studies.

Clinical relevant patch test reaction is a positive reaction that suitable with clinical situation. The rate of clinical relevant patch test reactions in our study was about 28%. Clinical relevant reacted allergens include potassium dichromate (62.1%), nickel sulfate (58%), cobalt (50%), fragrance mix, epoxy resin, paraphenylenediamine free base, etc. In comparison to other similar studies using additional series of allergens; the rate of relevant patch test with a standard allergen is often lower because they may be not specific to patient's contact history. As a result, a patch test with standard allergens can be considered as an initial screening test to detect potential sensitive allergens in patients with sensitive skin. After a follow of 3 months after the consultation to avoid offended allergens, hand eczema condition of the patients has been improved remarkably

In our study, males reacted to potassium, thiuram mix and formaldehyde more than females while females reacted to a nickel more than males. This observation was consistent with other studies. There are recent changes in reaction trends seen in both genders. Ertam at al. showed that nickel sulfate was the most common reacted allergen in female, particularly young ones under 35-year olds [10]. Also,

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reaction to potassium dichromate increases in young women because of their higher participation in construction works [8]. Besides, reaction to fragrance mix increases in males because they contact to odour products more and more [8], [9], [11].

We found that recurrent vesicular HE brought in a higher rate of positive patch test while hyperkeratotic HE is less reactive to any allergens. This suggests that recurrent vesicular might be induced by contact allergy while other types (such as hyperkeratosis) are not. The types of chronic fissure also have underlying aetiology with regards to contact allergy because there were more than one-third of cases with positive patch test [6]. These findings were in agreement with prior studies by Johansen and Diepgen et al., [12], [13], [14], [15].

In summary, we have demonstrated that patch test was particularly useful in certain population subgroups, highlighting the causal relationship between HE and common offended allergens. The result of the patch test studies was helpful in guiding patient treatment and disease prevention.

In conclusion, hand eczema has variable clinical features and a complex aetiology. Allergic contact dermatitis is an important cause of hand eczema, which can be managed with a patch test to detect causative allergens. Nearly 40% of hand eczema cases have a positive patch test. Relevant patch test reactions were seen in one-third of the patients in our study. We propose that patch test should be used to improve therapeutic outcome in the treatment of relapsing or stubborn hand eczema.

Acknowledgement

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