

Hand contact dermatitis in hairdressers: clinical and causative allergens, experience in Bangkok

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Summary

Background: Hand dermatitis in hairdressers is a common occupational contact dermatitis. Irritant contact dermatitis is thought to be more common.

Objectives: To investigate the causes of hand dermatitis, common allergens, clinical patterns, morphology and onset of lesions among hairdressers.

Methods: Forty four hairdressers who were diagnosed with hand dermatitis in a dermatological outpatient department were included and investigated by patch testing with standard and hairdressing related allergens and/or prick test.

Results: Allergic contact dermatitis was diagnosed with a positive patch test reaction in 33 cases (75%), irritant contact dermatitis was found in 11 cases (25%). The clinical manifestations were mostly scaly plaques (68.18%) or vesicles (50%). The most common site of involvement was the palms (38.63%). The common causative allergens were paraphenylenediamine (45.45%), nickel (31.18%), fragrance mix (20.45%), p-toluenediamine sulphate (18.18%), ammonium persulfate (13.63%), and p-aminophenol (13.63%).

Conclusion: Allergic contact dermatitis is more common among hairdressers, PPD was the most common causative allergen in our study. (*Asian Pac J Allergy Immunol* 2012;30:306-12)

Key words: occupation, hairdresser, hand dermatitis, patch test, common allergen

Introduction

Hand eczema is a very common skin disease in the dermatologic clinic. Non specific hand dermatitis can be caused by environmental, occupational, and endogenous factors, including unknown genetic factors.¹ The most common cause of hand dermatitis is irritant exposure. Previous or current atopic dermatitis and genetic factors play a role in the development of hand dermatitis,¹⁻³ however, excessive exposure to water is also an aggravating factor for hand eczema.⁴ Occupational contact dermatitis is under recognized and under diagnosed, leading to under-treatment. Hand dermatitis in hairdressers is one of the common forms of occupational contact dermatitis and affects patients' quality of life and attendance at work. The purpose of this study was to determine the causes of hand dermatitis (allergic contact dermatitis: ACD, irritant contact dermatitis: ICD, combination of ACD and ICD), the common allergens involved, the clinical patterns, and the morphology and onset of lesions among hairdressers.

Methods

A prospective clinical study at the Institute of Dermatology, Bangkok, Thailand was conducted from November 2006 - June 2008. The study was approved by the ethical review board of The Institute of Dermatology. Prior to enrollment, informed consent was obtained from the patients. The inclusion criteria were; male and female hairdressers aged 13-60 years old. All patients were diagnosed with hand dermatitis by a dermatologist, according to the clinical findings. The exclusion criteria were the presence of other skin diseases, for example psoriasis, lichen simplex chronicus, lichen planus etc. Hand dermatitis was assessed according to the symptoms of itch, a stinging sensation (and or pain), together with the clinical findings of erythematous papules, patches, scales, and/or vesicles on both ventral and dorsal sides of the hands and fingers. Forty-four hairdressers whom dermatologists diagnosed as hand dermatitis patients who attended the dermatological out-patient department were included in this study. All patients were investigated

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by patch testing including 21 allergens of the 'standard' series and 11 allergens specific to hairdressing (Chemotechnique Diagnostics, Villinge, Sweden) (Table 1). The allergens were prepared on Finn Chambers® (diameter 8 mm) on Scanpore®, then applied to normal skin on the back of the patient for 48 hours. Patch test results were recorded at days 2 and 5. Prick testing was also investigated in patients who used protective gloves and had a history of latex allergy.⁵ Demographic data of the patients, including age and gender, age of onset, site of involvement, morphology of rash, duration of work, history of using gloves, history of atopy and positive patch test reaction were recorded (Table 2).

Results

All 44 hairdressers, 40 female (91%) and 4 male (9%) completed the study. The most common age group was 31- 40 years. The mean time of the development of the lesions was less than six months in 26 cases (59%). The duration of work was more than 10 years in 26 cases.

Table 1. List of allergens in the standard series and the hairdressing series.

| Standard series | Hairdressing series |
|------------------------------|------------------------------------|
| 1. Potassium dichromate 0.5% | 1. O-nitro-p-phenylenediamine 1% |
| 2. Neomycin sulphate 20% | 2. Resorcinol 2% |
| 3. Thiuram Mix 1% | 3. p-Toluenediamine sulphate 1% |
| 4. Paraphenylenediamine 1% | 4. Glyceryl monothioglycolate 0.5% |
| 5. Kathon CG 0.01% | 5. Ammonium thioglycolate 1% |
| 6. Benzocaine 5% | 6. Ammonium persulfate 2.5% |
| 7. Formaldehyde 1% | 7. 2,5 diaminotoluene sulfate 1.0% |
| 8. Colophony 20% | 8. Cocamidopropylbetain 1.0% |
| 9. Balsm of Peru 25% | 9. Zinc pyrithione 1.0% |
| 10. Mercaptobenzothiazole 2% | 10. Hydrogen peroxide 3.0% |
| 11. Black rubber mix 0.6% | 11. P-aminophenol 1.0% |
| 12. Wool alcohols 30% | |
| 13. Mercapto mix 2% | |
| 14. Epoxy resin 1% | |
| 15. Paraben mix 15% | |
| 16. PTBP 1% | |
| 17. Fragrance mix 8% | |
| 18. Ethylenediamine 1% | |
| 19. Quaternium15 1% | |
| 20. Nickel sulphate 5% | |
| 21. Cobalt chloride 1% | |

Table 2. Demographic data

| | No. | Percentage (%) |
|------------------------------------|-----|----------------|
| Sex | | |
| Male | 4 | 9 |
| Female | 40 | 90.9 |
| Age (yr) | | |
| <20 | 2 | 4.5 |
| 20 – 30 | 12 | 27.3 |
| 31 – 40 | 18 | 40.9 |
| 41 -50 | 7 | 15.9 |
| >50 | 5 | 11.4 |
| Onset | | |
| < 6mo | 26 | 59 |
| 6mo – 1y | 7 | 15.9 |
| < 5y | 5 | 11.4 |
| > 5y | 6 | 13.6 |
| Duration of work | | |
| < 6mo | 2 | 4.5 |
| 6mo – 1y | 7 | 15.9 |
| 1y – 3y | 12 | 27.2 |
| 3y – 6y | 2 | 4.5 |
| 6y – 10y | 2 | 4.5 |
| > 10y | 19 | 43.18 |
| Clinical features | | |
| Dry scaly plaque | 35 | 79.5 |
| Vesicle | 26 | 59 |
| Erythematous macule/patch | 15 | 34 |
| Erythematous plaque | 12 | 27 |
| Hyperpigmentation | 6 | 13.6 |
| Vesicle and patch | 6 | 13.6 |
| Site of lesion | | |
| Palms and palmar surface of finger | 17 | 38 |
| Dorsum of hand | 8 | 18.1 |
| Web space | 3 | 6.8 |
| Web space | 2 | 4.5 |
| Palm and web space | 5 | 11.4 |
| Lateral site of hand | 2 | 4.5 |
| Palms and soles | 8 | 18.1 |
| Other sites | | |
| History of using gloves | | |
| Using glove | 39 | 88.6 |
| No use | 5 | 11.4 |
| History of atopy | | |
| Yes | 12 | 27.2 |
| No | 32 | 72.7 |

Thirty-nine hairdressers (89%) used short arm latex rubber gloves while five hairdressers (11%) did not. None reported a history of latex allergy or symptoms when wearing gloves. Skin prick tests were not carried out in those with no symptoms. Twelve hairdressers (27%) had history of atopy,

such as asthma, allergic rhinitis, and a family history of atopy. Thirty-two hairdressers (73%) were non-atopic.

The linical features consisted of vesicles, scaly plaques, hyperpigmentation, erythematous macules, patches and plaques. The vesicular form was the most common, initial clinical manifestation (50%). Scaly plaques later developed in 35 cases (79.5%). The lesions appeared mostly on the palms and the ventral surface of the fingers (38% of all cases), the dorsum of hand (18%), the web spaces (7%), the lateral site of the hand (11%), and other sites (18%) (Figure 1).

Patch test results showed allergic contact dermatitis in 31 cases (70%), irritant contact dermatitis in 11 cases (25 %) and 2 cases (5%) had both allergic and irritant contact dermatitis (Table 3).

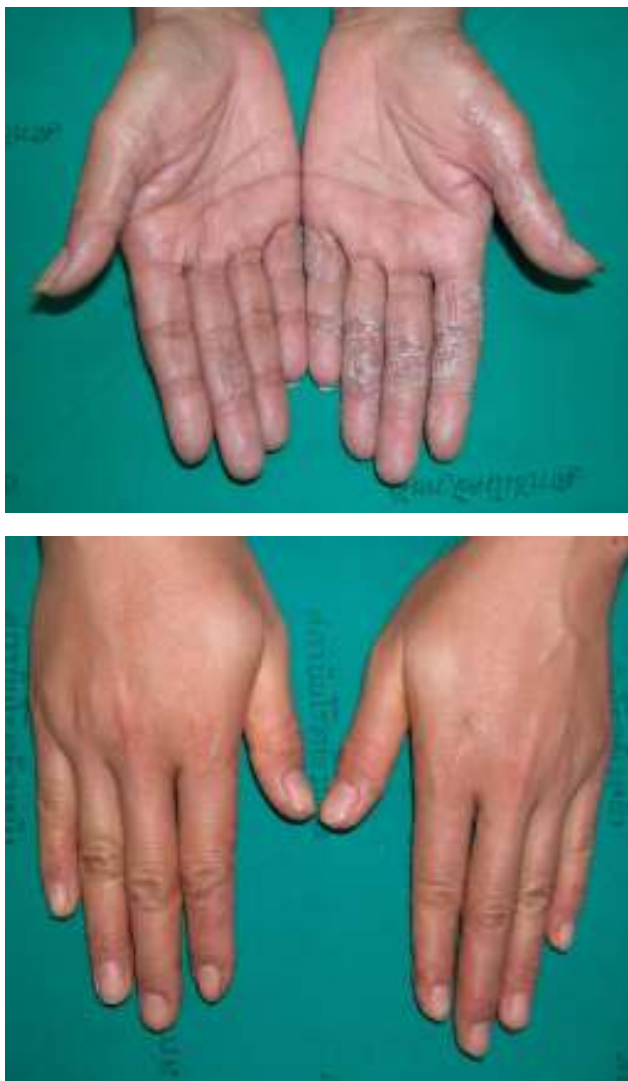


Figure 1. Clinical manifestations

The patch test results indicated a positive reaction in 32 cases (75%), whereas 12 cases (25%) were negative. Among those with positive patch tests, there were 8 cases with a positive patch test reaction to one allergen, 3 cases with two allergens, 4 cases with three allergens and 17 cases with more than three allergens (Figure 2). The causative allergens responsible for hand dermatitis in hairdressers are shown in Figure 3. Among the six common causative allergens, the most common was paraphenylenediamine (20 cases, 45.5% of all patients). Others included nickel (14 cases, 31.8%), fragrance mix (9 cases, 20.5%), p-Toluenediamine sulphate (8 cases, 18.2%) and there were 6 cases of ammonium persulfate and 6 cases of p-aminophenol allergy (13.6%).

Discussion

Occupational contact dermatitis is a dermatologic problem which affects patients' quality of life. Occupational irritant contact dermatitis is the most common diagnosis in patients who work with their hands in water. The POSH study showed that unprotected work in water of more than two hours per day and low ambient absolute humidity were the main risk factors.⁶ Our study has a statistically significant correlation (Pearson, $p < 0.1$) between the duration of working with hands in water and he onset of the lesions. Further analysis of patients with a shorter time to onset of less than 6 months and 12 months showed a higher correlation between exposure and onset.

ACD has been reported to be the major problem in hairdressers.⁷ Sensitization from allergens can developed through wet skin during the work process and impaired skin barrier function. Awareness of the need for hand protection increases the use of natural latex rubber gloves. Van der Walle & Brunsveld

Table 3. Diagnosis and patch test results

| | No. | Percentage (%) |
|--------------------------|-----|----------------|
| Result | | |
| Positive patch test | 32 | 75 |
| Negative patch test | 12 | 25 |
| Diagnosis | | |
| ACD | 31 | 70 |
| ICD | 11 | 25 |
| Combination of ACD & ICD | 2 | 5 |

ACD = allergic contact dermatitis

ICD = irritant contact dermatitis



Figure 2. An example of a positive patch test reaction in one of our patients

suggested the use of vinyl gloves for protection, as delayed reaction to latex mostly occur in combination with type I allergies.⁸ Kanerva & Leino reported a much lower prevalence of natural latex allergy among 500 hairdressers in Finland.⁹ We have no subjects with the symptoms and signs of type I allergy due to natural latex protein. Only two of them have allergic contact dermatitis to rubber accelerator with positive patch test results to thiuram mix at 96 hr. The patch test results are

clearly relevant to their work practices and both subjects were advised to use plastic glove for protection during work. The occurrences of hand dermatitis in hairdressers collected in a two-year study at The Institute of Dermatology were 44 with six common allergens causing allergic contact dermatitis. Paraphenylenediamine was responsible for sensitization in 45% of all patients in our study, which is similar to the findings of the study of Ruud Valks.¹⁰ Moreover, nickel, fragrance mix, and p-toluenediamine sulphate, ammonium persulfate and p-aminophenol were also on the list (Table 4). The positive patch test results identified allergens which were relevant to the subjects work practices.

Nickel allergy has been found related to hand eczema.^{1,10-13} In our study, fourteen patients had a positive patch test reaction to nickel. Eight of them were routinely exposed to nickel, while six patients had a history of previous exposure. Three patients had positive patch test reactions to nickel only, while the other eleven patients had positive patch test reactions to nickel together with other allergens. Among those who had positive patch test reactions to multiple allergens, three patients had positive patch test reactions to nickel, PPD, p-toluenediamine sulphate, ammonium persulfate and ammonium thioglycolate, one patient also had a positive patch test reaction to nickel, cobalt ammonium thioglycolate, p-toluenediamine sulphate and kathon CG; one reacted to fragrance mix and colophony and the other six patients had positive reactions to nickel and other allergens. Five cases were positive for thioglycolate and of these three cases were positive to both nickel and thioglycolate. We reported that paraphenylenediamine was the most common allergen; this is different from the findings of Suthipisal's study in which glyceryl monothioglycolate found to be the most common allergen (51 %).¹⁴ Two female hairdressers were diagnosed with nickel contact allergy-related hand eczema from prolonged skin contact with scissors and crochet hooks during their work.¹⁵ As nickel can be released from hair clips or nickel plated accessories by ammonium thioglycolate, the patients who have positive patch test reaction to both nickel and ammonium thioglycolate should consider avoiding these allergens in order to prevent recurrences.¹⁶

Captan, fungicide and bacteriostat in cosmetics and toiletries have been reported to be a rare sensitizer in hairdressers. The patient experienced bilateral eyelid swelling with intense pruritus and generalized eczema.¹⁷

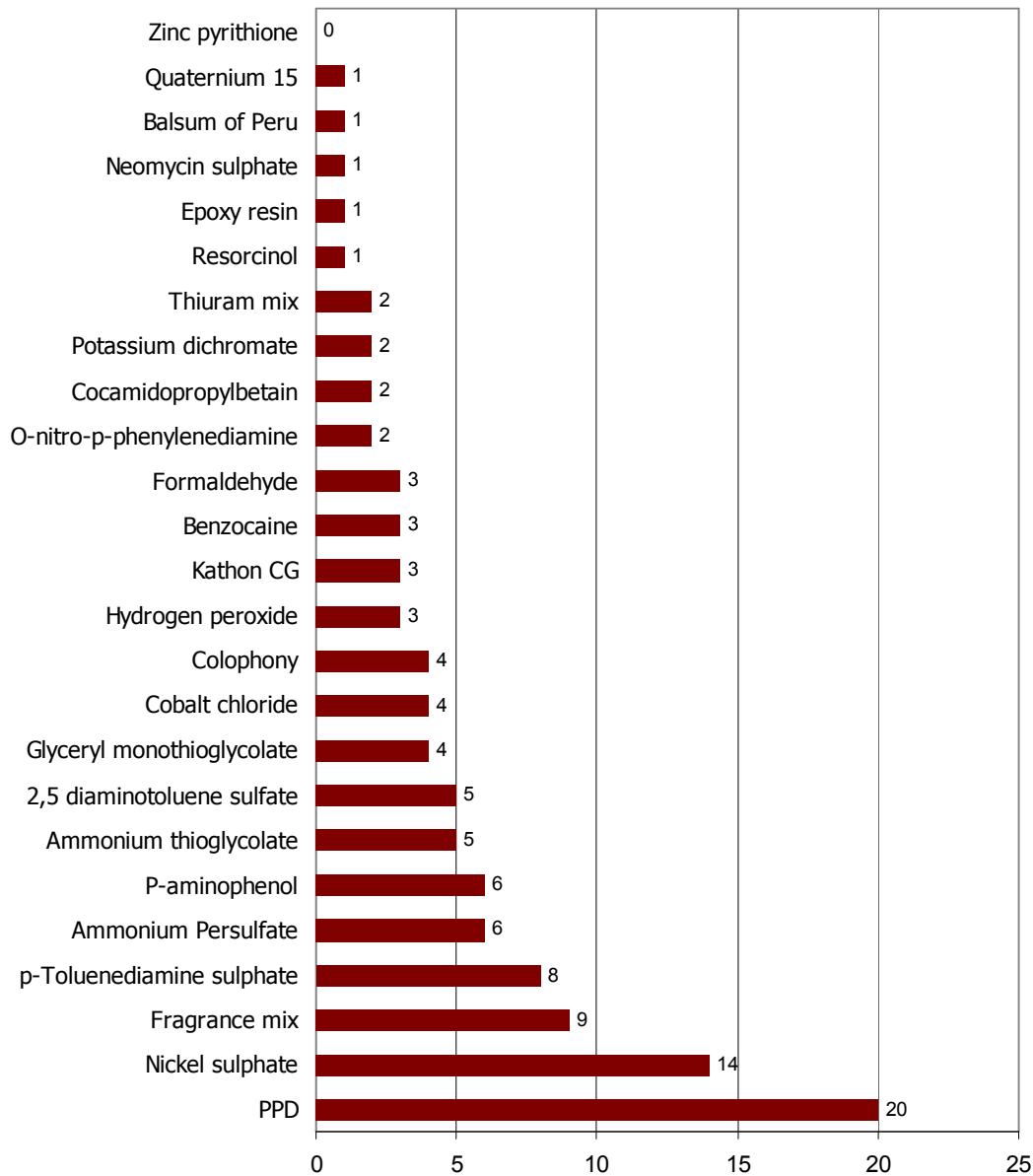


Figure 3. Causative allergens for hand dermatitis in hairdressers

Positive patch test results were found in 75% of the cases in our study, as compared to 78.3% and 60% in the study of Valks and Suthipisal, respectively^{10,14} (Table 4). The mean age of the patients in these studies is nearly the same. The common allergens were PPD, nickel and allergen in the hairdressing series. This may be due to the group of subjects we studied; our study focuses only on hand dermatitis in hairdressers. PPD still remains the major sensitizer in hand eczema patients.¹⁴

According to previous studies, the clinical picture starts with an initial irritant contact dermatitis, then later develops into allergic contact dermatitis. Irritant dermatitis which developed over

the metacarpophalangeal joints has been reported in junior hairdressers.¹⁸ The clinical manifestations in the patients in our study were those of hand eczema, erythematous papules, patches, plaques and vesicles. Some patients had various forms of lesions. Scaly plaques were the most common, occurring in 35 cases. Vesicles were also common (26 cases).

A history of atopic dermatitis conferred an increased risk for development of hand eczema. The prevalence of hand eczema in patients with a history of atopic dermatitis had been reported to be 2-10 fold higher than that found in non-atopic patients.^{6,11-12} In our study, 12 patients had an atopic history (such as asthma, allergic rhinitis, hypersensitivity reaction,

Table 4. Comparison of the present study results with those of Valks and Suthipisal

| | C. Swasdivanich | Ruud Valks , 2005 | N. Suthipisal, 1993 |
|------------------------------------|--|--|--|
| N | 44 | 300 | 143 |
| Duration of data collection | 2 y | 8 y | 5 y |
| Positive result | 75% | 78% | 60% |
| Mean age | 22 y | 23.7 y | 18 y |
| Average duration of lesions | 5 mo | 52 mo | 3 mo |
| Positive allergens | - PPD = 45.5% - Nickel = 31.8% -Fragrance mix = 20.5% - p-Toluenediamine =18.2% - Ammonium persulfate=13.6% - p-aminophenol = 13.6% | - PPD = 54% - 4-aminobenzene = 40.7% - Nickel = 37% - p-Toluenediamine = 15.3% - Ammonium persulfate=14.3% - Aminophenol = 9% | - Glyceryl monothioglycolate = 51% - Nickel = 27% - PPD = 24% - Ammonium persulfate =16% - p-Toluenediamine = 4% |
| History of atopy | 27.3% | 32.3% | 60% |

PPD = Paraphenylenediamine

and a family history of atopy). Eight of them had positive patch test results which were relevant to the atopic history and clinical manifestations.

The patients included in this study were hairdressers who were diagnosed as hand dermatitis by a dermatologist and allergic contact dermatitis was more commonly diagnosed than irritant contact dermatitis. However, patients enrolled in this study might not be representative of all hairdressers due to some limitations e.g. time restraint and less data collection from restricted cases.

Paraphenylenediamine can be found in hair dye, fur and leather dyes, lithography (printing inks), rubber and plastic industrial goods, photocopying and photographic developers. The patients should protect themselves by wearing vinyl glove.⁶ They should avoid azo-type dye related products such as panty hose, socks, and leather. They should also be wary when receiving anesthetic drugs such as procaine, benzocaine, epoxy resin hardeners and drugs like sulfonyleurea, p- aminosalicyclic acid, p-aminobenzoic acid and aspirin.¹⁶

Conclusion

Allergic contact dermatitis is more common than irritant contact dermatitis among hand dermatitis cases in hairdressers in our study. Paraphenylenediamine, nickel, and fragrance mix are substances frequently accountable for allergic contact dermatitis. Patch tests in hairdressers are

necessary to define the causative allergen. Better education and prevention for patients who are in contact with chemicals during work, will improve their quality of life.

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