

SHORT COMMUNICATION

Analysis of Contact Allergens in Korean Polysensitized Patients by Patch Testing: A Pilot Study

Dae Suk Kim¹, Jung Min Bae¹, Hyunjoong Jee¹, Hemin Lee¹, Do-Young Kim¹, Soo Min Kim² and Min-Geol Lee¹¹Department of Dermatology and Cutaneous Biology Research Institute, Yonsei University College of Medicine, 50 Yonsei-Ro, Seodaemun-gu, Seoul 120-752, and ²Department of Dermatology, National Health Insurance Corporation Ilsan Hospital, Goyang, Korea. E-mail: mglee@yuhs.ac
Accepted Apr 1, 2013; Epub ahead of print Jul 1, 2013

Polysensitization refers to 3 or more contact allergies to environmental substances detected by patch testing (1). Polysensitization is associated with increased sensitization to further allergens (2). Many studies have been carried out regarding polysensitization and it is now considered as a special entity. However, study of polysensitization in Asian populations is limited. The objective of the present pilot study was therefore to analyse characteristics of Korean polysensitized patients and compare the results with previous reports from Western countries.

PATIENTS AND METHODS

A total of 715 patients underwent standard patch testing between 2005 and 2012 at a single tertiary hospital in South Korea. The indication for patch testing was suspected contact dermatitis. Only the data for patients who had at least one or more positive reaction were collected and included in the analysis. The patients were patch-tested with the Korean standard series (3). Patch tests were performed according to International Contact Dermatitis Research Group guidelines (4). A total of 501 patients were eligible for the present study, and they were grouped into a 1 or 2 allergens-sensitized group and a ≥ 3 allergens-sensitized group. Contact allergy to ≥ 3 allergens was defined as polysensitization (1). Sensitized allergens, sex ratio and ages in each group were analysed and compared. All statistical analyses were performed using SPSS software system, version 18.0 (SPSS Inc. Chicago, IL, USA).

RESULTS

A total of 501 patients who had at least 1 positive allergen were included in the study. Of these, 362 (72.3%)

were 1 or 2 allergens-positive and 147 (27.7%) were polysensitized. The mean age of the former group was 40.7 years, and that of the polysensitized group was 43.6 years. Female percentages in the groups were 72.7% and 81.0%, respectively. Statistical analyses revealed no significant differences between the groups with respect to mean age or sex ratio (χ^2 or Fisher's exact test).

Sensitivity rates for each allergen in the 1 or 2 allergens-positive group and the polysensitized group are shown in Fig. 1. The mean number of sensitized allergens in the polysensitized and the 1 or 2 allergens-positive group was 3.8 and 1.4, respectively. Sensitization to each of the 25 allergens was much more common in the polysensitized group. Nickel sulphate was by far the most frequent allergen in both the 1 or 2 allergens-positive group and the polysensitized group. In the 1 or 2 allergens-positive group, thiomersal (thimerosal), cobalt chloride and potassium dichromate were frequent allergens, in order, after nickel sulphate. In the polysensitized group, cobalt chloride, potassium dichromate and mercury were frequent allergens, in order, after nickel sulphate. Despite the difference in the order of allergen frequency in both groups, statistical analysis showed no significant differences in each allergen frequency between both group (Kruskal–Wallis test). However, among the 25 allergens tested, as is clearly shown in Fig. 1, absolute frequencies of several allergens in the polysensitized group showed considerable increase compared with those in the 1 or 2 allergens-positive group. Quinoline showed a 11.7-fold

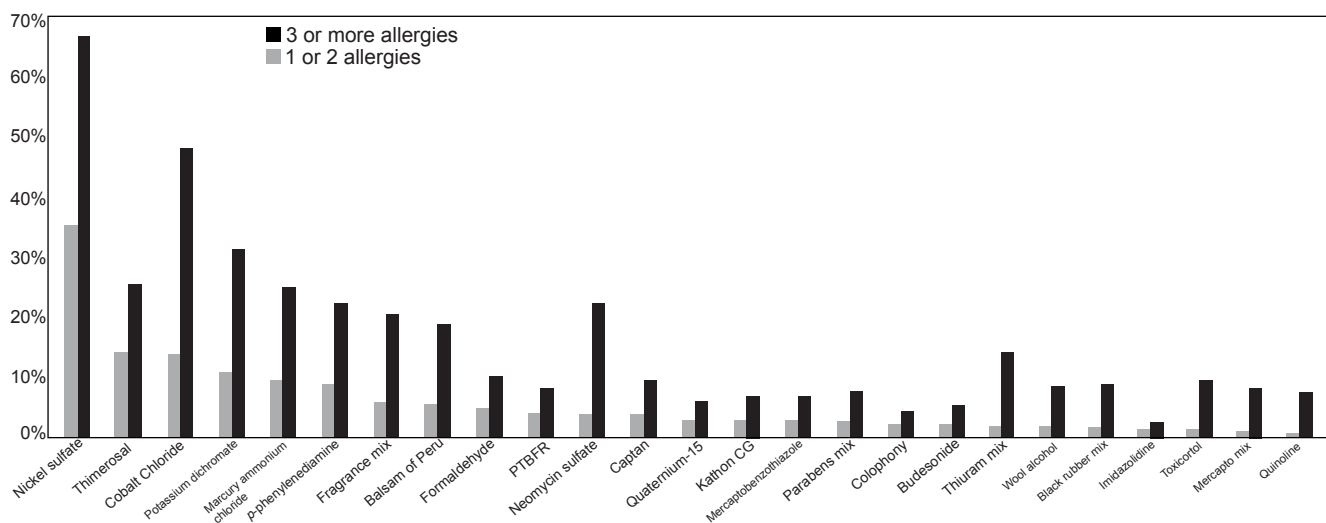


Fig. 1. Absolute allergen sensitivity rates among patients with 1 or 2 allergens-positive and polysensitization, respectively. PTBFR: *p*-tertiary butylphenolformaldehyde resin.

increase in absolute frequency, followed by mercapto mix (8.7-fold), tixocortol (8.5-fold), thiuram mix (8.3-fold), black rubber mix (6.3-fold) and neomycin sulphate (6.2-fold) in order. On the other hand, thiomersal showed least increase in absolute frequency, with only 1.8-fold increase, followed by imidazolidine (1.9-fold) and nickel sulphate (1.9-fold). Furthermore, to estimate the relative contribution of each allergen as a risk factor for being polysensitized, logistic regressions with odds ratios were calculated. However, none of the baseline allergens was a statistically significant predisposing factor for polysensitization.

DISCUSSION

Polysensitization is suggested as a special entity within patients with contact allergies (5, 6). Numerous studies have been performed to find a predisposing factor for polysensitization (1). Strong patch-test reactions, a few genetic markers, specific baseline allergens and concomitant skin diseases have been suggested as risk factors for multiple contact allergens. However, studies of polysensitization in Asian populations are limited in English literature. Therefore, as a pilot study, we analysed the contact allergens in 501 Korean who showed at least one positive reaction in standard patch test and compared with previous studies from Western countries.

Of the 1 or 2 allergens-positive group 72.3% were female, as were 81.0% of the polysensitized group. In previous reports, approximately 80% of polysensitized patients were female, which is in line with our results (1, 7). However, in contrast to slightly lower female predominance in our 1 or 2 allergens-positive group, female ratios in both groups were almost the same in previous studies. Carlsen et al. (8) reported 35.2% of polysensitized patients within at least ≥ 1 sensitized patients. However, our result showed a lower percentage of polysensitized patients (27.7%). The mean age of the polysensitized group was higher compared with the 1 or 2 allergens-positive group, which is in line with the fact that the proportion of patients with multiple contact allergens increases with age.

To date, there have been many reports about baseline contact allergens, which have strong associations with polysensitization. Parabens mix, wool alcohol, neomycin sulphate, potassium dichromate, cobalt chloride, *p*-phenylenediamine (PPD) and sesquiterpene mix are previously described contact allergens with strong associations with polysensitization (1, 2, 7–9). In our study, quinoline, mercapto mix, tixocortol, thiuram mix, black rubber mix and neomycin sulphate showed more than a 6-fold absolute frequency increase in polysensitized group compared with the 1 or 2 allergens-positive group. Only neomycin sulphate was associated with polysensitization in both our study and previous studies. The other allergens were different, and this finding might be due to several factors.

Environmental exposures and genetic factors are the main possible causes of polysensitization (1). Therefore both different environmental exposure and genetic factors in Korean subjects have resulted in differences in contact allergens. However, the relative contributing ratios of these factors are not fully understood.

In addition to the differences in contact allergens highly associated with polysensitization, as described above, the percentage of polysensitized patients and the relative female ratio in the polysensitized group showed differences compared with previous studies. The effect of race, other genetic factors and different environmental exposure on allergic contact dermatitis has been thoroughly studied and reviewed in other studies, with conflicting results (10, 11). However, these are studies regarding the factors for allergic contact dermatitis, not polysensitization. Therefore, further investigation is needed into which factors are major contributors to polysensitization, in the Korean population in particular. The results of the present study, which is the first pilot study of Asian patients with polysensitization, provide the basis for further investigation in the Asian population.

The authors declare no conflicts of interest.

REFERENCES

1. Carlsen BC, Andersen KE, Menne T, Johansen JD. Patients with multiple contact allergies: a review. *Contact Dermatitis* 2008; 58: 1–8.
2. Schnuch A, Brasch J, Lessmann H, Geier J, Uter W. A further characteristic of susceptibility to contact allergy: sensitization to a weak contact allergen is associated with polysensitization. Results of the IVDK. *Contact Dermatitis* 2007; 56: 331–337.
3. Kim BJ, Kwon HB, Lee JH, Lee SH, Lee AY. [An epidemiologic study on patch test positivities for patients with allergic contact dermatitis]. *Korean J Dermatol* 2008; 46: 1362–1368 (in Korean).
4. Fregert S. Manual of contact dermatitis. On behalf of the International Contact Dermatitis Research Group and the North American Contact Dermatitis Group. 2nd edn. Copenhagen: Munksgaard Publishers, 1981.
5. Moss C, Friedmann PS, Shuster S, Simpson JM. Susceptibility and amplification of sensitivity in contact dermatitis. *Clin Exp Dermatol* 1985; 61: 232–241.
6. Nielsen NH, Menne T. Allergic contact sensitization in an unselected Danish population. The Glostrup Allergy Study, Denmark. *Acta Derm Venereol* 1992; 72: 456–460.
7. Carlsen BC, Andersen KE, Menne T, Johansen JD. Characterization of the polysensitized patient: a matched case-control study. *Contact Dermatitis* 2009; 61: 22–30.
8. Carlsen BC, Menne T, Johansen JD. 20 Years of standard patch testing in an eczema population with focus on patients with multiple contact allergies. *Contact Dermatitis* 2007; 57: 76–83.
9. Carlsen BC, Menne T, Johansen JD. Associations between baseline allergens and polysensitization. *Contact Dermatitis* 2008; 59: 96–102.
10. Schnuch A, Westphal G, Mossner R, Uter W, Reich K. Genetic factors in contact allergy – review and future goals. *Contact Dermatitis* 2011; 64: 2–23.
11. Deleo VA, Taylor SC, Belsito DV, Fowler JF Jr, Fransway AF, Maibach HI, et al. The effect of race and ethnicity on patch test results. *J Am Acad Dermatol* 2002; 46: S107–112.