

Contact sensitivity to standard series allergens in 1038 patients with contact dermatitis in Turkey

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We planned to determine the frequency of sensitivity to European standard patch test allergens in 1038 patients with contact dermatitis. From 1992 to 2004, 1038 patients with the diagnosis of contact dermatitis were patch tested with the European standard series. Seven hundred and five patients were female (67.9%) and 333 patients were male (32.1%). A total of 336 patients (32.3%) had one or more positive patch test reactions. The most common allergens were nickel (17.6%), cobalt chloride (5.3%), potassium dichromate (4.6%), neomycin (2.4%), fragrance mix (2.1%) and balsam of Peru (2.1%). Contact sensitivity to potassium dichromate and thiuram was significantly more frequent in male patients, whereas nickel and primin sensitivity was significantly more frequent in female patients. Higher sensitivity rates for potassium dichromate, neomycin, balsam of Peru, wool alcohol, fragrance mix and primin were noted in patients over 40 years of age. Sensitivity rates of the standard series allergens were all similar in atopic patients and in non-atopic patients. Metals, neomycin and fragrances are the leading allergens in Turkey. Although fragrances are among the most important sensitizers, sensitivity rates to fragrances and also to preservatives are much lower than the rates in Europe and the US.

Key words: Contact sensitivity; European standard series; patch test; Turkey. © Blackwell Munksgaard, 2005.

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Allergic contact dermatitis affects approximately 1%–10% of the general population (1). The incidence of allergic contact dermatitis has a tendency to increase in the industrialized countries parallel to the increase in the number of potential sensitizers. The patch test is an important tool in the confirmation and diagnosis of allergic contact dermatitis, and it helps in many cases where the causative allergen might not have been otherwise suspected in spite of a detailed history.

In this study, we planned to determine the frequency of sensitivity to European standard patch test allergens in 1038 patients with contact dermatitis followed between the years 1992 and 2004.

Patients and Methods

From 1992 to 2004, 1038 patients with the diagnosis of contact dermatitis were patch tested in the Department of Dermatology, Ankara University School of Medicine. The age, sex and occupation of the patients, duration and localization of the lesions were recorded. Patients with atopic dermatitis and/or mucosal atopy were

recorded as atopics. Atopic dermatitis was diagnosed according to the criteria of Hanifin & Rajka (2).

The allergens were applied with Finn Chambers on Scanpor tape to the upper back of the patients. The strips were removed after 2 days, and the reading was recorded after 30 min. The sites were re-examined after 4 days. Two experienced dermatologists participated in reading the tests. The results were evaluated according to the standard scoring system recommended by ICDRG (3). All patients were tested with the European standard patch test allergens excluding sesquiterpene lactone mix. When indicated, supplementary series and patient supplied products were used. In this study, only the results of the patch tests performed with the standard series allergens are presented.

Data were coded and processed on an IBM-PC compatible computer using the Statistical Packages for Social Sciences (SPSS). Chi-square and Fisher's exact tests were used for statistical evaluation, and the level $P < 0.05$ was considered as the cut-off value for achieving statistical significance.

Results

Seven hundred and five patients were female (67.9%) and 333 patients were male (32.1%). Male/female ratio was 0.47. The patients were from 6 years of age to 77 years of age (mean age 33.40 ± 13.70 years). The largest group of patients was represented by housewives (29.6%), individuals with an office occupation (25.4%) and health-care workers (5.6%). A total of 336 patients (32.3%) had one or more positive patch test reactions. The most common allergens were nickel sulphate (17.6%), cobalt chloride (5.3%), potassium dichromate (4.6%), neomycin sulphate (2.4%), fragrance mix (2.1%) and balsam of Peru (2.1%). The prevalence of contact sensitivity was 36.3% in females and 23.8% in males. Contact sensitivity to potassium dichromate and thiuram was significantly more frequent in male patients. On the other hand, contact sensitivity to nickel was significantly more frequent in female patients. Primin sensitivity was only noted in female patients. The frequency of positive patch test reactions and its distribution according to sex is shown in Table 1.

Seven hundred and twenty-six patients were below 40 years of age, and 312 patients were equal or above 40 years of age. Sensitivity rates for potassium dichromate, neomycin sulphate, balsam of Peru, wool alcohol, fragrance mix and primin were significantly higher in patients over 40 years of age. On the other hand, sensitivity to nickel sulphate was significantly higher in

patients under 40 years of age. Distribution of positive reactions according to age is shown in Table 2.

Sixty-two patients were below 16 years of age. 10 positive reactions were found in this age group. The most common allergen was nickel (5 cases) followed by p-tert-butylphenol-formaldehyde resin (2 cases), paraphenylenediamine, cobalt chloride, colophony, quinoline mix, paraben mix, mercapto mix and mercaptobenzothiazole (1 case each).

Localization

The hands and the face were the prominent sites affected by dermatitis (61.7% and 16.3%, respectively). The highest yield of patch test positivities were obtained in neck (45%) and face (40%) localizations. Localization of dermatitis in patients with contact dermatitis and distribution of positive patch test reactions according to localization is shown in Table 3.

Atopy

A positive history of atopy was found in 204 patients. A positive reaction to one or more allergens was noted in 32.0% of the atopics and 32.4% of the non-atopics. Sensitivity rates of the standard series allergens were all similar in atopic patients and in non-atopic patients. Distribution of positive patch test reactions in atopic and non-atopic patients is shown in Table 4.

Table 1. Patch test results and the distribution of positive patch test reactions according to sex

Allergen	% Vehicle	Total	% <i>n</i> = 1038	Male, <i>n</i> = 333	%	Female, <i>n</i> = 705	%	<i>P</i> -value
Potassium dichromate	0.5 pet.	48	4.6	25	7.5	23	3.2	<0.01
Neomycin sulphate	20.0 pet.	25	2.4	7	2.1	18	2.5	NS
Thiuram mix	1.0 pet.	21	2.0	11	3.3	10	1.4	<0.05
p-phenylenediamine	1.0 pet.	19	1.8	10	3.0	9	1.2	NS
Cobalt chloride	1.0 pet.	56	5.3	20	6.0	36	5.1	NS
Benzocaine	5.0 pet.	8	0.7	2	0.6	6	0.8	NS
Formaldehyde	1.0 aq.	13	1.2	5	1.5	8	1.1	NS
Colophony	20.0 pet.	11	1.0	4	1.2	7	0.9	NS
Quinoline mix	5.0 pet.	9	0.8	3	0.9	6	0.8	NS
Balsam of Peru	25.0 pet.	22	2.1	11	3.3	11	1.5	NS
N-isopropyl-N-phenyl-p-PPD	0.1 pet.	8	0.7	3	0.9	5	0.7	NS
Wool alcohols	30.0 pet.	5	0.4	1	0.3	4	0.5	NS
Mercapto mix	2.0 pet.	3	0.2	2	0.6	1	0.1	NS
Epoxy resin	1.0 pet.	7	0.6	2	0.6	5	0.7	NS
Paraben mix	16.0 pet.	3	0.2	2	0.6	1	0.1	NS
p-tert-butylphenol-formaldehyde resin	1.0 pet.	14	1.3	7	2.1	7	0.9	NS
Fragrance mix	8.0 pet.	22	2.1	9	2.7	13	1.8	NS
MCI/MI	0.01 aq.	1	0.09	—	—	1	0.1	NS
Quaternium 15	1.0 pet.	9	0.8	—	—	9	1.2	NS
Nickel sulphate	5.0 pet.	183	17.6	16	4.8	167	23.6	<0.001
Mercaptobenzothiazole	2.0 pet.	8	0.7	3	0.9	5	0.7	NS
Primin	0.01 pet.	15	1.4	—	—	15	2.1	<0.01
Total number of patients		510		143		367		

NS = not significant; pet. = petrolatum.

Table 2. Positive patch test reactions in patient below 40 years of age and in patients equal or above 40 years of age

Allergen	Number of patients below 40 years of age	% <i>n</i> = 726	Number of patients equal or above 40 years of age	% <i>n</i> = 312	<i>P</i> -value
Potassium dichromate	25	3.4	23	7.3	<0.01
Neomycin sulphate	9	1.2	16	5.1	<0.001
Thiuram mix	13	1.7	8	2.5	NS
p-phenylenediamine	11	1.5	8	2.5	NS
Cobalt chloride	40	5.5	16	5.1	NS
Benzocaine	4	0.5	4	1.2	NS
Formaldehyde	8	1.1	5	1.6	NS
Colophony	6	0.8	5	1.6	NS
Quinoline mix	6	0.8	3	0.9	NS
Balsam of Peru	5	0.6	17	5.4	<0.001
N-isopropyl-N-phenyl-p-PPD	5	0.6	3	0.9	NS
Wool alcohols	1	0.1	4	1.2	<0.05
Mercapto mix	2	0.2	1	0.3	NS
Epoxy resin	5	0.6	2	0.6	NS
Paraben mix	2	0.2	1	0.3	NS
p-tert-butylphenol-formaldehyde resin	11	1.5	3	0.9	NS
Fragrance mix	10	1.3	12	3.8	<0.05
MCI/MI	1	0.1	0		NS
Quaternium 15	9	1.2	0		NS
Nickel sulphate	153	21	30	9.6	<0.001
Mercaptobenzothiazole	5	0.6	3	0.9	NS
Primin	6	0.8	8	2.5	<0.05

NS = not significant.

Discussion

In our study, 336 patients (32.3%) were found to have one or more positive patch test reactions. The most common allergens were metals nickel sulphate, cobalt chloride and potassium dichromate. Nickel sulphate is the most common sensitizer in Europe and North America (4–8). Although prevalence varies from one country to another, sensitization rates ranging from 6% to 18.6% were found in most of the studies (5–11). Nickel sensitivity is overall 2–10 times more common in women as it is in men. In females, early ear piercing and higher exposure contributes to the higher frequency of contact sensitization (8, 12–14). In men, occupational exposure seems to be a greater risk factor. Occupations such as engineering, mining and electroplating provide a high level of exposure (15–17). In our study, nickel sensitivity was found in 21% of patients below 40 years of age, and it was 4.9 times more common in women than in

men in the same age group. Our findings are in accordance with the data of most of the recent studies (5, 7, 9, 10), and the high sensitivity rates in women can be explained by the custom of piercing the ears of girls at preschool ages in Turkey.

In nature, cobalt is frequently found along with nickel and chromates, and therefore cobalt sensitivity frequently accompanies nickel sensitivity in women and chromate sensitivity in men (1, 18). A positive reaction to cobalt, which was often associated with nickel and/or chromate sensitivity, occurred in 5.3% of our patients.

The greatest source of contact sensitivity to chromates is from exposure to cement and mortar, and therefore chromate allergy is seen more commonly in men, because of occupational exposure to construction materials (15–17). In our study, chromate sensitivity was found in 4.6% of our patients,

Table 3. Localization of dermatitis in patients with contact dermatitis and distribution of positive patch test reactions according to localization

Localization	Total number of patients	%	Number of patients with a positive patch test result	%
Face	170	16.3	58	34.1
Neck	40	3.8	18	45
Eyelids	45	4.3	18	40
Trunk	40	3.8	11	27.5
Extremities	86	8.2	30	34.8
Hands	641	61.7	192	29.9
Feet	78	7.5	27	34.6
Generalized	94	9.0	35	37.2

Table 4. Distribution of positive patch test reactions in atopic and nonatopic patients

Allergen	Positive reactions in atopic patients	% <i>n</i> = 215	Positive reactions in nonatopic patients	% <i>n</i> = 823	<i>P</i> -value
Potassium dichromate	13	6.0	35	4.2	NS
Neomycin sulphate	4	1.8	21	2.5	NS
Thiuram mix	4	1.8	17	2.0	NS
p-phenylenediamine	4	1.8	15	1.8	NS
Cobalt chloride	12	5.5	44	5.3	NS
Benzocaine	1	0.4	7	0.8	NS
Formaldehyde	1	0.4	12	1.4	NS
Colophony	4	1.8	7	0.8	NS
Quinoline mix	2	0.9	7	0.8	NS
Balsam of Peru	4	1.8	18	2.1	NS
N-isopropyl-N-phenyl-p-PPD	2	0.9	6	0.7	NS
Wool alcohols	—	—	5	0.6	NS
Mercapto mix	1	0.4	2	0.2	NS
Epoxy resin	1	0.4	6	0.7	NS
Paraben mix	1	0.4	2	0.2	NS
p-tert-butylphenol-formaldehyde resin	5	2.3	9	1.0	NS
Fragrance mix	6	2.7	16	1.9	NS
MCI/MI	—	—	1	0.1	NS
Quaternium 15	2	0.9	7	0.8	NS
Nickel sulphate	37	17.2	146	17.7	NS
Mercaptobenzothiazole	1	0.4	7	0.8	NS
Primin	3	0.9	12	1.4	NS

NS = not significant.

and men were 2.3 times more commonly affected than women. In another study, conducted in Turkey, nickel, cobalt and chromate were also found to be the most common allergens in 542 patients with contact dermatitis (19).

After metals, the most common allergens were neomycin sulphate, fragrance and balsam of Peru. Sensitivity rates for fragrance mix and balsam of Peru were 2.1%. These sensitivity rates are significantly lower than the sensitivity rates ranging from 8% to 14% in Europe and North America (5, 9–11, 20–23). Our study also revealed low-sensitivity rates to preservatives. The sensitivity rates to paraben mix, methylchloroisothiazolinone/methylisothiazolinone (MCI/MI) and quaternium 15 were all lower than 1%. Hillenbrand and Beyazit had also reported low-sensitivity rates to fragrance mix (5.5%), balsam of Peru (2%), quaternium 15 (0.6%) and MCI/MI (0.2%). No positive reactions were observed to paraben mix (19). These similar findings from two studies carried out in different parts of Turkey may be explained by the less frequent use of perfumed products and cosmetics in Turkey compared with most of the European countries. On the other hand, the low frequency of fragrance sensitivity may also be caused by the use of different fragrance chemicals in Turkey that are not included in the fragrance mix.

We noted low-sensitivity rates to epoxy resin and N-isopropyl-N-phenyl paraphenylenediamine, which tend to be occupationally related. This may be explained by the low number of

patients working in the rubber or plastic industry in our study.

Although allergic contact dermatitis is generally thought to be rare in children, sensitivity rates ranging from 14.5% to 71% were noted in recent studies (11, 24, 25). In these studies nickel, cobalt, chromate, mercury, rubber chemicals, fragrance and preservatives were found to be the most common sensitizers in children. We found positive reactions in 10 (16.1%) of 62 patients under 16 years of age. Nickel and p-tert-butylphenol-formaldehyde resin were the most common allergens in this age group.

A higher frequency of contact sensitivity to fragrance mix, balsam of Peru, wool alcohols and neomycin in patients with increasing age was described in previous studies (9, 11, 20, 26–28); besides those allergens, this was also the case in our study for potassium dichromate and primin. This is in contrast to nickel sensitivity, which is more frequent in young female patients.

The relationship between atopy and allergic contact dermatitis is still debatable. Most studies found either no association or a decreased frequency of contact sensitization in atopic patients (29–32). In our study, one or more positive reactions to standard series allergens were found in 32.0% of 204 atopic patients. Sensitization rates to contact allergens did not differ significantly between atopic and non-atopic patients. Therefore, we can conclude that atopy does not play a significant role in the development of allergic contact dermatitis.

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