

Epicutaneous Patch Test Results in Patients with Allergic Contact Dermatitis in Karlovac County – A Retrospective Survey

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SUMMARY During the 1994-2003 study period, patch testing was carried out in 1102 subjects (740 female and 362 male, mean age 39.8, range 7-81 years) suspected to have allergic contact dermatitis (ACD). Epicutaneous patch test with a standard series of contact allergens was made by the Institute of Immunology, Zagreb, Croatia, according to the International Contact Dermatitis Research Group (ICDRG) rules. During the study period, 399 (36.2%) subjects with one or more positive tests were recorded, and 640 positive tests were observed. The most frequent allergens were nickel sulfate identified in 214 (33.4%), cobalt chloride in 64 (10%), fragrance mix in 60 (9.4%), wood tar in 47 (7.3%), potassium dichromate in 39 (6.1%), balsam of Peru in 29 (4.6%) and other allergens in 187 (29.2%) cases. According to the localization of ACD, hands as the most common site were involved in 535 (48.5%) cases, followed by the face in 167 (15.2%) and other locations in 400 (36.3%) cases. It is concluded that nickel is the principal allergen as the cause of ACD, mostly affecting women. The areas most frequently involved by ACD were the hands and face.

KEY WORDS: contact sensitivity; allergic contact dermatitis; allergens; patch testing

INTRODUCTION

Irritant contact dermatitis (ICD) and allergic contact dermatitis (ACD) are two the most common dermatologic maladies in industrialized societies, with a prevalence usually stated to be between 1% and 10%. ICD predominates and accounts for 80% of all such reactions (1). The causes of ACD are usually small chemical substances, which have to bind carrier protein to become complete antigen. ACD is a major cause of cutaneous disease affecting many individuals at home and at workplace. Patch testing is the most useful diagnostic tool for evaluation of patients suspected to have ACD (2).

The aim of this study was to evaluate the results of epicutaneous patch testing with a standard series of allergens in patients suspected to have ACD. Epicutaneous patch testing was performed at Department of Dermatology and Venereology, Karlovac General Hospital, during the 1994-2003 period.

MATERIAL AND METHODS

We revised clinical records of patients examined at Department of Dermatology and Venereology, Karlovac General Hospital, for suspicion of ACD during a ten-year period (1994-2003).

Epicutaneous patch testing with a standard series of contact allergens, made at Institute of Immunology, Zagreb, Croatia, was performed in 1102 patients (740 female and 362 male, mean age 39.8, range 7-81 years) (Table 1) with the clinical diagnosis of ACD (Table 2). Test substances were applied on the upper part of the patient's back, on the clinically uninvolved, untreated skin, without tape stripping with adhesive strips for patch test (Cura-test, Lohman-Rauscher, Germany). Patch test was removed and reactions were evaluated after 48 h and 72 h. Grading of positive patch test reactions from + to ++++ was done according to the International Contact Dermatitis Research Group (ICDRG) rules (3).

Peru in 29 (4.6%) and others in 187 (29.2%) cases (Table 3). A concordance was observed between nickel and cobalt allergy. According to localization, the most common site of affection were hands in 535 (48.5%), face in 167 (15.2%) and other locations in 400 (36.6%) cases.

DISCUSSION

Epicutaneous patch tests along with the history and clinical features are a very important steps in the identification of a specific causative allergen in ACD patients. ACD is as likely in infancy as in adulthood, and accounts for 20% of all cases of dermatitis in children (4). In study of Machovcova *et al.* Epicutaneous patch testing with 23 allergens of the Europe-

Table 1. Patch tested subjects according to sex and age

Age	<20 n (%)	21-30 n (%)	31-40 n (%)	41-50 n (%)	>50 n (%)	Total N (%)
Female	82 (11.2)	146 (19.7)	138 (18.6)	144 (19.4)	230 (31.3)	740 (67.2)
Male	40 (10.9)	71 (19.6)	64 (17.7)	72 (19.9)	115 (31.9)	362 (32.8)
Total	122 (11.1)	217 (19.6)	202 (18.4)	216 (19.5)	345 (31.4)	1102 (100)

RESULTS

During the ten-year period (1994-2003), 1102 patients suspected to have ACD were tested at our Department. The Croatian standard series of epicutaneous allergens was used. During the study period, 399 (36.2%) subjects with one or more positive tests were recorded and 640 positive tests were observed.

The most frequent allergens were nickel sulfate in 214 (33.4%), cobalt chloride in 64 (10%), fragrance mix in 60 (9.4%), wood tar in 47 (7.3%), potassium dichromate in 39 (6.1%), balsam of

Peru in 29 (4.6%) and others in 187 (29.2%) cases (Table 3). A concordance was observed between nickel and cobalt allergy. According to localization, the most common site of affection were hands in 535 (48.5%), face in 167 (15.2%) and other locations in 400 (36.6%) cases.

an standard series was performed in 12058 patients with suspected contact dermatitis, and showed 7661 (63.5%) patients to have one or more positive reactions. The most common allergens were metals (22.9%), especially nickel sulfate (13.8%), followed by balsam of Peru (7.3%), fragrance mix (5.8%), formaldehyde (4.2%) and lanolin alcohol (3.0%). The authors conclude that this standard series is suitable for the detection of ACD (5).

Results of patch testing carried out during the 2001-2002 period have been reported by the North American Contact Dermatitis Group (NACDG).

Table 2. Standard series of allergens used in patch testing

Allergen	Dilution (%) Vehicle	Allergen	Dilution (%) Vehicle
1 Potassium dichromate	0.5 vaseline	12 PPD-black rubber mix	0.1 vaseline
2 Cobalt chloride	1.0 "	13 Thiuram mix	1.0 "
3 Nickel sulfate	5.0 "	14 Carba mix	3.0 "
4 Fragrance mix	8.0 "	15 Wood tars	12.0 "
5 Paraphenylene diamine	0.5 "	16 Neomycin sulfate	20.0 "
6 Balsam of Peru	25.0 "	17 Paraben mix	15.0 "
7 Epoxy resin	1.0 "	18 Lanolin alcohol	30.0 "
8 Colophony	20.0 "	19 Formaldehyde	1.0 aqua
9 White mercury precipitate	10.0 "	20 Detergent	2.0 "
10 Benzocaine	5.0 "	21 Thimerosal	0.1 vaseline
11 Mercapto mix	2.0 "	22 Vaseline	As it is

Table 3. Results of patch testing in allergic contact dermatitis patients

Allergen	n	%
1 Nickel sulfate	214	33.4
2 Cobalt chloride	64	10.0
3 Fragrance mix	60	9.4
4 Wood tar	47	7.3
5 Potassium dichromate	39	6.1
6 Balsam of Peru	29	4.6
7 Others	187	29.2
Total	640	100.0

Patients (N=4913) were tested with an extended screening series of 65 allergens. The most common allergens were nickel sulfate (16.7%), neomycin (11.6%), balsam of Peru (11.6%), fragrance mix (10.4%), thimerosal (10.2%), etc. At least one positive allergic patch-test reaction was recorded in 69% of 4913 tested patients. The authors conclude that the usefulness of patch testing is improved when a greater number of allergens are tested (2). During a 30-month period, 1324 Mayo Clinic patients were patch tested with a standard series of allergens (mean 60 allergens). Overall, 917 (69.3%) patients had at least one positive reaction and 606 (45.8%) patients had two or more positive reactions. The most frequent causes of positive reactions were nickel sulfate hexahydrate, balsam of Peru, neomycin sulfate, cobalt chloride, fragrance mix, etc. (6). Marinović-Kulišić *et al.* reported during a 6-year period, contact allergic reactions were recorded in 4132 of 6341 patients (7). The prevalence of positive patch test results was 65%. An increased frequency of positive patch test reactions to potassium dichromate, nickel sulfate, thimerosal and neomycin sulfate has been reported during the 1998-2003 period (7). In the study by Schafer *et al.* (2001), at least one positive reaction was exhibited by 40% of tested subjects (N=1537). The most frequent allergens were fragrance mix, nickel sulfate and balsam of Peru (8). A 28-allergen screening series was used in 250 patients with a clinical diagnosis of contact dermatitis and/or atopic dermatitis; 126 (50.4%) patients showed at least one positive reaction and 23 (9.2%) patients had more than two positive reactions. The most common allergens were nickel sulfate (28.0%), cobalt chloride (12.8%), paratertiarybutyl phenol formaldehyde

resin (8.0%), potassium dichromate (5.2%), and colophony (5.2%). Nickel sulfate is the most common allergen in Iran, mostly affecting women and younger patients, probably due to the higher level of exposure (9).

Our patients (N=1102) were tested with the Croatian standard series of 23 contact allergens. We recorded 640 positive tests. Out of 1102 study subjects, 399 (36.2%) had one or more positive test results, yielding a mean of 1.6 positive reactions *per* patient. The most common allergens were nickel sulfate (33.4%), cobalt chloride (10%), fragrance mix (9.4%), wood tar (7.3%), etc. Our results confirmed nickel sulfate as the most common allergen, which is consistent with literature reports (2,5,10). Other common allergens are cobalt chloride, fragrance mix, balsam of Peru, thimerosal and wood tar. The rate of positive tests varies from 40% to 69.3% (5-8). In our study, positive patch tests results were lower in comparison with some earlier reports. The difference in these results depends on the subjects involved in patch testing and number of allergens used.

The frequency of sensitization to contact allergens varies in different countries because of both genetic and, more importantly, allergen exposure variations (9).

According to the localization of skin lesion, hands and forearms are the areas that are most commonly affected, followed by the face and neck, and other exposed parts of the body (7). In our subjects, the most frequent localization were the hands (48.5%), face (15.2%) and other parts of the body (36.3%). These results confirm previous reports that hands are most frequently involved by both irritant and allergic contact dermatitis (11). The hands are often affected because of their exposure to potent allergenic substances. Most cases of occupational dermatitis refer to the hands (12). The face is also a common site of ACD, especially with cosmetics as a causative factor.

We conclude that nickel sulfate is the principal allergen as the cause of ACD. The Croatian standard series of allergens provides satisfactory results, however, an extended patch test series may occasionally be required.

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Coty – perfumes, powders, creams, lipsticks; year 1935.
(from the collection of Mr. Zlatko Puntijar)