

The importance of exposure to contact allergens in patients with allergic contact dermatitis

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Abstract

Introduction: Allergic contact dermatitis is a skin disease representing a type IV immunological reaction, also known as a delayed reaction, according to Gell and Coombs' classification. It results from hypersensitivity to contact allergens and manifests itself as allergic contact dermatitis skin lesions. This clinical problem mainly affects adults and can be of occupational or non-occupational origin. Nowadays, there are more than 3000 recognised contact allergens which may be responsible for the development of allergic contact dermatitis. Hand dermatitis is the most common location of allergic contact dermatitis.

Aim: The main purpose of this study was to evaluate the importance of exposure to contact allergens in allergic contact dermatitis patients. Moreover the detailed characteristics of sensitizing allergens in the examined group of patients are presented.

Material and methods: Fifty patients in whom allergic contact dermatitis was diagnosed were enrolled in the study. The patients were also examined with the use of a questionnaire regarding exposure to contact allergens. Allergological diagnostics of type IV immunological reaction was performed according to mandatory procedures.

Results: Nickel sulphate, cobalt chloride and potassium dichromate were acknowledged as the most common allergens in the examined group of patients. In the group of female patients, in contrast to the group of men, it was possible to indicate the allergen source which was responsible for developing or exacerbating allergic contact dermatitis skin lesions.

Conclusions: The questionnaire results suggest that health education plays a crucial role in improving patients' health status. Especially, it should be associated with giving detailed information to the patients concerning the possible sources of contact allergens in articles of daily use or those related to occupational or hobby activities. It would enable them to eliminate or at least limit exposure to the factors associated with development or exacerbation of allergic contact dermatitis symptoms.

Key words: allergic contact dermatitis, contact allergens exposure.

Introduction

The incidence of allergic contact dermatitis in recent years has increased significantly and is estimated at about 10% [1, 2]. The pathomechanism of allergic contact dermatitis is based on reaction type IV (according to Gell and Coombs' classification), also called a delayed reaction, or contact reaction [1-4].

Various substances present in the surrounding environment often act as contact allergens and are responsible for skin lesions characteristic of allergic contact dermatitis. The most common environmental allergens

include: metals (chrome, nickel, cobalt), resin, aldehydes, amines and a large group of drugs [5-7].

The initial occurrence of hyperresponsiveness in relation to one allergen (monovalent allergy) is common but after some time it extends significantly and immune intolerance to many substances (polyvalent or multivalent allergy) occurs. Contact hypersensitivity reactions can be triggered by allergens included in the same product. There are more and more cases of contact allergy in relation to substances included in cosmetics, for example preservatives added in order to prolong their durability, as well as

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substances or ingredients added to improve the smell of cosmetics or drug substrates [3, 4, 6-8].

Currently there are over 3000 known substances potentially causing allergic contact dermatitis. Most of them have the nature of haptens, which acquire their sensitizing properties only after binding to proteins of the epidermis. Langerhans cells present haptens to the immune system, where they are recognized as "foreign" [2, 6-9]. Small, lipophilic and electrophilic substances are the most allergenic because they can easily pass through the protein-lipid membrane of the epidermis. The small size of the molecule allows free penetration of the compound by diffusion. Lipophilicity enables it to bond with fatty compounds of the stratum corneum, and electrophilicity simplifies the creation of chemical bonds with the amino acids forming the proteins of the epidermis [8].

Characteristics of the most common contact allergens

Metals

Metals are one of the main groups of compounds contributing to the establishment of contact allergy. The most allergenic are nickel sulphate, potassium dichromate and cobalt chloride.

Nickel sulphate is the most frequent contact allergen. After many years of observation, three groups have been identified: women, the young and patients suffering from atopic dermatitis. The most common allergy is related to non-professional activities, and the hypersensitivity is principally caused by nickel-plated objects and nickel alloys. Allergic reactions caused by wearing braces and prosthetic devices used in dentistry or orthopaedic implants are great inconveniences. The list of objects containing nickel sulphate is very long; they include jewellery, watches and metal elements found in clothes [6, 8, 10]. Nickel is also present in food products such as legumes, nuts, cocoa (chocolate), seafood (especially oysters), red wine, beer and food stored in metal containers [6, 8, 9].

Allergy to potassium dichromate is more common among men than women, as well as among elderly people, and usually is associated with occupational exposure, particularly in the construction sector. Hexavalent chromium, which easily penetrates through biological membranes, has the strongest allergic features. As far as the risk connected with one's occupation is concerned, cement is the main source of hexavalent chromium. Moreover, allergic reactions are also often caused by lubricants and industrial oils, lotions, liquids used for galvanizing, substances used for tanning leather, those used for wood preservation, anti-corrosive coolants and fluids, gases and welding fumes, paint and varnishes [8, 11]. In conditions not related to professional work, the allergy to potassium dichromate is equally common among both sexes. In these cases the source of hypersensitivity is tanned leather (leather goods, footwear). Among these patients

showing a tendency to allergy, the intensification of the skin lesions may be influenced by a diet including a lot of chromium. The patients are suggested to limit the consumption of coffee, cocoa, nuts, dried figs and apricots, as well as products made with wholemeal flour [6, 8, 11].

The allergy with monovalent sensitivity to cobalt chloride is rare. Among males it usually coexists with hypersensitivity to potassium dichromate, and among women with contact allergy to nickel sulphate. Cobalt oxides are poorly soluble in water; therefore they hardly diffuse through healthy skin. However, skin inflammation increases the skin permeability and increases the occurrence of allergic reactions. Cobalt chloride is present in cement, in jewellery products, paints (especially those for painting porcelain or glass) as a component of alloys, in many everyday objects, clothing and detergents (vestigial amount) [6, 8, 12].

Rubber components

For the manufacture of rubber and rubber products India rubber and synthetic rubber are used. The components which most often cause contact allergy are the substances accelerating the vulcanization process and the antioxidants prolonging the durability of rubber. Chemically, they are: mercaptans (mercaptobenzothiazole, a mercapto mix, whose main ingredient is TMTD – tetramethylthiuram disulfide), thiurams (a mixture of thiurams), amines (IPPD – N-isopropyl-N-phenyl-4-phenylenediamine), thiazole derivatives (chloromethylisothiazolinone) and thiourea derivatives and phenols. The representatives of the first two mentioned groups, mercaptans and thiurams, induce allergy much more frequently than the other compounds. Nowadays, eczema caused by rubber allergens is becoming an increasingly common clinical problem [8, 10-12].

Plastics

Plastics are a group of materials consisting of very large molecules, called polymers, and other, additional ingredients, that give them specific manufacturing and functional properties. They have frequently the form of resins, which are used for direct processing or provide raw material for moulding, adhesives, paints and varnishes. The most contact allergenic plastics are epoxy, phenolic resins, acrylates and urea-formaldehyde resins, while less allergenic ones are polyesters, polyurethanes and polyvinyl [8, 11, 12]. A soft natural resin obtained from coniferous trees, mainly pine, is rosin [8]. Epoxy resins are widely used, including in many industries such as electronics, metallurgical, automotive, chemical, pharmaceutical, and food industry, as well as in construction. Both resins and their hardeners, which cause hypersensitivity before and immediately after using them, can induce allergy [8, 11, 12].

The ingredients of cosmetics

According to the Food, Drugs and Cosmetic Act passed by U.S. Congress in 1938, cosmetics are defined as "arti-

cles intended to be rubbed, poured, sprinkled, or sprayed on, introduced into, or otherwise applied to the human body or its part for cleansing, beautifying, promoting attractiveness, or altering the appearance” which may not affect skin structure or its function [13]. Adverse reactions associated with the use of cosmetics usually refer to eczema caused by skin irritation connected with the influence of some chemical substances in the cosmetics. However, it can also be a symptom of contact allergy. The place of application plays an important role in the development of allergic contact dermatitis. Eyelids, armpits and groin are the most vulnerable because the skin in these locations is thin and chemicals can easily penetrate into the deeper layers. Moreover, disruption of the skin increases the risk of hypersensitivity reactions. Cosmetic ingredients that are responsible for the largest number of allergies are mainly: fragrances, preservatives, antioxidants, and chemical sunscreens [13-16].

Natural plant substances

Natural plant substances also tend to be perpetrators of hypersensitivity reactions. It may seem quite surprising that chamomile, arnica, and aloe can be allergenic. Aloe vera extract is a viscous liquid that contains thousands of chemicals and, therefore, is sometimes responsible for an allergic type IV reaction. It can also occur while using sandalwood oil, widely used in dandruff shampoos.

Curcumin

Curcumin is added to creams to protect the ceramides they contain, designed to reinforce the cutaneous barrier. Curcumin is an antioxidant that prevents the colour change of the cosmetic and the oxidation of its nutrients [8, 11, 12, 14, 15].

Flavours

Flavours are components of many cosmetic ingredients, household products and food products. Natural flavouring substances cause fewer hypersensitivity reactions than their synthetic counterparts [8, 13-15].

Balsam of Peru

Due to its very pleasant aroma balsam of Peru is present in many cosmetic products. Since it has disinfectant properties, it is also used as a medicine. It is a component of many pharmaceutical products intended for external use in case of burns, eczema on the lower legs or for treating haemorrhoids. Apart from the possibility of causing contact dermatitis, balsam of Peru may also be responsible for gastrointestinal symptoms since it is added to food products such as honey, chocolate, marmalade, ice cream, and chewing gum. It can also be found in the skins of citrus fruit, flavoured teas, tobacco leaves and spices (cinnamon, cloves, curry, pepper). Some alcoholic drinks

such as vermouth contain large quantities of this component as well [8, 14-16].

Preservatives

Preservatives are other important allergens. They are added to cosmetics in order to protect them against the growth of bacteria and to prevent oxidation of the ingredients and to extend the durability of the products. The most common preservatives are hydroxybenzoic acid esters, known as parabens or nipagins formaldehyde, and compounds that release them: quaternium 15 and chloromethylisothiazolinone [8, 13, 15].

Lanolin

It is a mixture of fatty acids, esters and sterols (including cholesterol). It is animal wax obtained during the purification of sheep wool. The main substances that cause allergic reactions are aliphatic alcohols, containing several carbon atoms, included in it. In the past it was thought that there were two groups of people predisposed to allergies: young women and older people of both sexes. Recently the term “lanolin paradox”, indicating the complexity of the problem of contact allergy to allergens present in sheep wool, has been introduced. This issue remains a subject widely discussed in the literature. The most common form of lanolin paradox refers to those patients who suffer from venous ulcers on the lower legs and still can apply cosmetics including lanolin, without any signs of hypersensitivity, on healthy parts of skin, even though they are said to be allergic to lanolin being an ingredient in drugs [8, 14-16]. Moreover, there is a risk of false positive or negative patch test (PT) results with 30% sheep wool alcohols among those patients diagnosed with hypersensitivity to lanolin. It results both from the complex composition of lanolin, which is a mixture of chemicals, as well as from the difficulty in indicating the relevant allergens. Therefore, in cases of suspected allergic contact reaction to lanolin, it is important to carry out expanded allergy diagnostics in the direction of hypersensitivity to the components of sheep wool [8, 16].

Paraphenylenediamine

The popular “artificial henna”, paraphenylenediamine (PPD), is one of the strongest allergens. In cosmetics, it is mainly used for dyeing hair and so-called “washable tattoos”. Moreover, it is also used to dye fabrics and leather. Cross reactions are a large problem. Paraphenylenediamine reacts with many chemicals, causing allergic contact dermatitis among those who have hypersensitive skin [8, 12, 14, 15].

Glucocorticosteroids

In recent years, glucocorticosteroids (GC) have become one of the most frequently used compounds in external dermatological therapy. Paradoxically, topical steroid

preparations may be the cause of allergic contact dermatitis. As anti-inflammatory, anti-itch and anti-allergic drugs they are rarely suspected of inducing allergy. Unfortunately, the aforementioned properties can mask the symptoms of developing hypersensitivity reactions [8, 17].

Due to the variety of contact allergens and their source of origin, as well as the prevalence of their use, it is often extremely difficult to determine the nature of allergy exposure, thereby to avoid it. However, knowledge about the sources of allergens is an essential element in the preventive treatment of allergic contact dermatitis [8].

Aim

The main objective of this study was to assess the relevance of exposure to contact allergens among patients with allergic contact dermatitis. In addition, special attention was drawn to the characteristics of sensitizing contact allergens in the study population.

Material and methods

Patients from the Department of Dermatology at Poznan University of Medical Sciences suffering from allergic contact dermatitis took part in the study.

The study group consisted of 50 adult patients (25 women and 25 men). All patients were tested with the European series of contact allergens (Chemotechnique, Sweden) (Tab. 1). In the diagnosis Finn Chambers were used (Epitest, Finland). According to ICDRG (International Contact Dermatitis Research Group), skin reactions evaluated as ++ and +++ and ++++ were considered positive reactions evaluated as + as doubtful. Results were recorded at 48 and 72 h time points. Skin reactions evaluated as ++ and +++ and ++++ were considered positive, reactions evaluated as + as doubtful. Only positive reactions were taken into consideration in further analysis and questionnaires [18, 19].

Subsequently, all patients admitted to the study took part in the survey. In order to assess the relevance between PT and everyday observations made by the patients, questionnaires were prepared for each allergen. Table 2 presents a sample questionnaire on nickel sulphate. In addition, particular attention was paid to the problem of identifying the barriers faced by patients with allergic contact dermatitis, both in their professional work and in everyday life.

To carry out these studies, approval of the Ethics Committee of the University of Medical Sciences was gained (Resolution No. 142/09), and all the people involved in the study gave their written consent.

Results

The study population consisted of 50 patients with allergic contact dermatitis: 25 women aged from 19 to

76 years (average age: 50.83 years) and 25 men aged from 26 to 80 (average age 51.85 years).

The average duration of the disease in the study group among women was 9.4 years, while among men it was 8.2 years.

The most common location of skin lesions of allergic contact dermatitis was the dorsal surface of hands (60% of cases). In addition, skin lesions occurred on the face (34%), forearms, lower legs and feet (32%), followed by neck (20%), lower parts of the neck (14%), back (6%), as well as elbows and knee bends (4%). In individual cases skin lesions appeared on the belly, thighs, buttocks, the area between the shoulders and on the scalp.

The most common contact allergen in the study population of 50 patients was nickel sulphate (42%). Detailed results of the PT, including gender differences, are shown in Table 3. In addition, 27 patients (54%), including 16 women (59.26%) and 11 men (40.74%), suffered from polyvalent allergy.

Thanks to the survey detailed information about the impact of household chores, professional duties and environmental conditions on the severity of skin lesions was obtained. Moreover, attempts to identify the sources of individual allergens were made.

The relationship between the positive results of the PT in relation to particular contact allergens and the actual exposure was confirmed in 33 cases (66%). Much more often the source of the allergen identification was possible for women (92%) than for men (20%).

The influence of environmental conditions on the severity of skin lesions was observed in 44% of cases (22 patients). In the remaining cases lesions of similar intensity were present throughout the year. The negative impact of low temperature, both in relation to the severity of skin lesions, as well as the intensity of pruritus, was reported by 5 patients (22.72%). There was an interesting observation made concerning the impact of ultraviolet radiation on the severity or mitigation of skin lesions. The size of these two groups was virtually the same. Eight patients (36.36%) reported severe skin lesions under the influence of sunlight, and 9 (40.9%) noted an improvement of skin condition during periods of sunshine.

The population of women confirmed the presence of eczema after having contact with items containing allergens such as nickel sulfate (13 patients – 56.52%), cobalt chloride (6 patients – 26.08%), potassium dichromate (3 patients – 13.04%), and after exposure to allergens that are in both aromatic compounds (9 patients – 39.13%) and to Lyral and balsam of Peru (2 patients – 8.69%). Furthermore, in 2 cases (8.69%) the occurrence of skin lesions after having contact with items containing thiuram mix, formaldehyde and PPD was confirmed. Furthermore, 1 patient (4.5%) observed skin lesions after exposure to such allergens as resin, methylthiomethylglutaronitrile and chloromethylisothiazolinone.

Tab. 1. Set of allergens being a part of “European standard series of contact allergens” as used in the Department of Dermatology at Poznan University of Medical Sciences

Allergen	Test substance
Benzocaine	Benzocaine 5.0% vas.
Cobalt	Cobalt chloride (II) × 6 H ₂ O 1.0% vas.
Sesquiterpene lactone	Sesquiterpene lactone mix 0.1% vas.
Colophony	Colophony 0.1% vas.
Epoxy resin	Epoxy resin 1.0% vas.
Fragrance mixture I	Fragrance mixture I and 8.0% vas.
Formaldehyde	Formaldehyde 1.0% aqua
IPPD	<i>n</i> -Isopropyl- <i>n</i> -pentyl-4-phenylenediamine 0.1% vas.
Mercaptobenzothiazol	2-Mercaptobenzothiazol (mbt) 2.0% vas.
Mercapto	Mercapto mixture 2.0% vas.
Chloromethylisothiazolinone	5-Chlorine-2-methyl-4-isothiazolin-3-one 0.01 vas.
Neomycin	Neomycin sulfate 20.0% vas.
Nickel	Nickel sulfate × 6 H ₂ O 5.0% vas.
Paraphenylenediamine	4-Phenylenediamine 1.0% vas.
Chromium	Potassium dichromate 0.5% vas.
Balsam of Peru	Balsam of Peru 25.0% vas.
4-Tert-butylphenol formaldehyde resin	4-Tert-butylphenol formaldehyde resin 1.0% vas.
Parabens	Paraben mixture 16.0% vas.
Thiuram	Thiuram mixture 1.0% vas.
Primin	2-Methoxy-6- <i>n</i> -pentyl-4-benzoquinone 0.01% vas
Wool alcohols	Wool alcohols 30.0% vas.
Clioquinol	Clioquinol 5.0% vas.
Lyrall	Lyrall 5.0% vas.
Quaternium 15	Quaternium 15 1.0% vas.
Budesonide	Budesonide 0.01% vas.
Tixocortol pivalate	21-Pivalate tixocortol 0.1% vas.
Methyldibromoglutaronitrile	Methyldibromoglutaronitrile 0.5% vas.
Fragrance mixture II	Fragrance mixture II 14.0% vas.

Among men, a relationship between the occurrence of skin lesions and contact with items containing nickel sulphate and allergens from groups of fragrance compounds was observed (3 patients, 30%). In 2 cases (20%) a relationship between skin lesions and contact with such allergens as potassium dichromate, neomycin and balsam of Peru was found. In addition, in 1 case a relationship between the occurrence of skin lesions and cobalt chloride, formaldehyde, and IPPD was also observed.

Detailed identification of sources of allergens in the group of women and men is shown in Tables 4 and 5.

Discussion

The prevalence of allergic contact dermatitis depends significantly on the level of civilization of a country. Technological progress, trade development, easy access to many goods, and even fashion may have contributed to the increased frequency of contact allergy [8].

There is a wide variety of researchers' opinions on the prevalence of allergic contact dermatitis among women and men. Some studies do not indicate the diversity of eczema depending on sex, while others report that women are more likely to suffer from allergic contact dermatitis

Tab. 2. The sample survey on contact allergy to nickel sulphate

For patients with a positive reaction to nickel sulphate	
1. Have you noticed the appearance of lesions on healthy skin or the intensification of symptoms on lesional skin, after contact with:	
Jewellery (chain, necklace, beads, bracelet, earrings, rings)	Yes/no
Watch strap	Yes/no
Belt buckle of trousers	Yes/no
Buttons	Yes/no
Bra metal parts	Yes/no
Pocket mirror	Yes/no
Pens, ballpens	Yes/no
Lighter	Yes/no
Scissors	Yes/no
Keys	Yes/no
Hair clasp	Yes/no
Cutlery	Yes/no
Cookware	Yes/no
Nedles, pins	Yes/no
Torch	Yes/no
Paper clips	Yes/no
Metal tools	Yes/no
Screwdriver	Yes/no
Silver coins	Yes/no
After food intake	Yes/no
2. What was the nature of the changes observed by you? Was/were it/they the following?	
Erythema	
Itch	
Lumps	
Bubbles	
3. Were these changes in the same place before and after contact with those substances?	Yes/no
4. In what place were they found?	
Dorsal surfaces of hand	
Forearms	
Feet	
Lower leg	
Face	
Neck	
Décolletage	
Other	

then men [8, 20]. Studies conducted in the Department of Dermatology at Poznan University of Medical Sciences in 2003-2005 confirm this relationship [21].

In the present study, the largest group of patients consisted of subjects over 40 years of age. In the study population the average age for women was 50.8, while for men it was 51.8, which confirms the tendency for allergic contact dermatitis to occur among middle-aged people.

Tab. 3. Comparison of men and women's patch test results in the study group

Allergen	Number of people in group (%)		
	Total	Women	Men
Benzocaine	1 (2.0%)	1 (4.0%)	0
Cobalt chloride	11 (22.0%)	6 (24.0%)	5 (20.0%)
Sesquiterpene lactone	0	0	0
Colophony	2 (4.0%)	1 (4.0%)	1 (4.0%)
Epoxy resin	1 (2.0%)	0	1 (4.0%)
Fragrance mixture I	7 (14.0%)	4 (16.0%)	3 (12.0%)
Formaldehyde	5 (10.0%)	3 (12.0%)	2 (8.0%)
IPPD	1 (2.0%)	0	1 (4.0%)
Mercaptobenzothiazol	0	0	0
Mercapto mix	1 (2.0%)	0	1 (4.0%)
Chloromethylisothiazolinone	1 (2.0%)	1 (4.0%)	0
Neomycin	4 (8.0%)	1 (4.0%)	3 (12.0%)
Nickel sulfate	21 (42.0%)	13 (52.0%)	8 (32.0%)
Paraphenylenediamine	3 (6.0%)	3 (12.0%)	0
Potassium dichromate	10 (20.0%)	3 (12.0%)	7 (28.0%)
Balsam of Peru	4 (8.0%)	2 (8.0%)	2 (8.0%)
4-Tert-butylphenol formaldehyde resin	1 (2.0%)	0	1 (4.0%)
Paraben mix	0	0	0
Thiurams	2 (4.0%)	2 (8.0%)	0
Primin	0	0	0
Wool alcohols	1 (2.0%)	1 (4.0%)	0
Clioquinol	1 (2.0%)	1 (4.0%)	0
Lyril	2 (4.0%)	2 (8.0%)	0
Quaternium 15	0	0	0
Budesonide	0	0	0
Tixocortol pivalate	0	0	0
Methyl dibromoglutaronitrile	5 (10.0%)	1 (4.0%)	4 (16.0%)
Fragrance mixture II	6 (12.0%)	5 (20.0%)	1 (4.0%)

Tab. 4. The correlation between the source of the allergen and the appearance of eczema in relation to metal allergens in the study population

Allergen	Source	Number of patients	Proportion of patients (%)
Nickel	Belt buckle of trousers	7	53.8
	Earrings	6	46.1
	Chain	6	46.1
	Zip	6	46.1
	Trouser buttons	6	46.1
	Rings	5	38.4
	Cutlery	3	23.0
	Watch	3	23.0
	Coins	3	23.0
	Keys	2	15.4
	Pins/needles	2	15.4
	Bra metal parts	2	15.4
	Hairpins	1	7.7
	Mirror	1	7.7
	Metal tools	1	7.7
	Cobalt	Watch	3
Detergents		2	33.3
Bleach		2	33.3
Plant protection products		1	16.7
Perfume		1	16.7
Glasses frames		1	16.7
Chromium	Detergents	3	100.0
	Bleach	3	100.0
	Paint	1	33.3
	Mascara	1	33.3
	Eye shadow	1	33.3

It is known that skin inflammation, associated with harmful environmental conditions or improper skin care, makes the penetration of allergens into the skin much easier and may induce contact allergy in the future [10, 22].

Nowadays about 3,000 compounds are likely to cause contact allergy. Common allergens include: nickel sulphate, potassium dichromate, cobalt chloride, fragrance mixtures, rubber chemicals (thiurams, mercaptobenzothiazole, IPPD), and epoxy resins [8, 10, 12, 21]. Nickel sulphate causes hypersensitivity reactions, particularly among women. Allergy to nickel sulphate was observed

Tab. 5. The correlation between the source of the allergen and the appearance of eczema in relation to the fragrance allergens in the study population

Allergen	Source	Number of patients	Proportion of patients (%)
Fragrance mixture I and II	Washing powder	4	44.4
	Fabric softener	4	44.4
	Cream	3	33.3
	Body lotion	3	33.3
	Perfume	3	33.3
	Deodorants	3	33.3
Lyrál	Perfume	2	100.0
	Soap	1	50.0
	Cream	1	50.0
	Body lotion	1	50.0
	Washing powder	1	50.0
	Dish soap	1	50.0
Balsam of Peru	Cream	1	50.0
	Body lotion	1	50.0
	Ointment for the treatment of leg eczema	1	50.0

among 52.0% of patients. Such a large number of cases might be associated with the fact that more and more women wear artificial jewellery consisting of nickel compounds. During spring and summer months there were both an increase and an intensification of already existing eczematous lesions caused by contact allergy to nickel sulphate. This is probably associated with increased release of the metal from the objects under the influence of sweat and rubbing the skin [12].

Among men, as well as women, nickel sulphate was found to be the main allergen causing allergic contact dermatitis. It resulted in the occurrence of hypersensitivity reactions among 32.0% of respondents. Potassium dichromate was responsible for the occurrence of hypersensitivity reactions among 28.0% of men participating in the survey and only among 12.0% of women surveyed. Most patients allergic to potassium dichromate presented eczematous lesions on the dorsal surface of hands, which usually have been associated with their occupation (builder, tanner, textile worker).

An important group of contact allergens consists of fragrance mixtures, balsam of Peru and Lyrál. Fragrances are nowadays common ingredients of skin-care products, everyday essentials (toilet paper, tissues), and also foods and medications [16]. Research conducted in 1999 by

Goossens *et al.* confirms that fragrance compounds are strong contact allergens. The study shows that they induce sensitivity among 30.3% of patients with contact allergy to cosmetics. In our research 26.0% of patients were found to have hypersensitivity reactions to fragrances. Comparing the occurrence of hypersensitivity reactions in both sexes, it can be concluded that women (36.0%) are significantly more likely to suffer from contact allergy to this group of allergens than men (16.0%) [8].

However, rubber components which include thiuram, mercaptobenzothiazole and IPPD are significant allergens as well. Among those mentioned above, thiuram is considered the most allergenic. It caused hypersensitivity reactions among 4.0% of all patients and caused a slight increase compared with previous results [21], which may be associated with greater use of disposable latex gloves.

Surprisingly enough, epoxy resin, which was defined as an allergen often causing hypersensitivity reactions, induced contact allergy only in the case of one patient (2.0%). In Poland, the occurrence of delayed allergic reaction to epoxy resin is mainly related to professional work, which may explain the low percentage of positive results of PT to that allergen in the study population. Workers of the electrical industry (equipment insulation), and car and flight industries (varnishes, lubricants) are the most vulnerable because the allergenic strength of epoxy resin is the highest before and immediately after its curing [8].

Some patients are perfectly able to describe the situation or to identify objects that cause skin lesions in the form of eczema. Others may recall the situation in which skin lesions occurred only after a detailed analysis of allergenic substances and their source. With such knowledge it becomes possible to eliminate or reduce, at least partially, exposure to the objects that affect the occurrence and severity of skin lesions. A large group of patients, despite positive results of the PT and having knowledge of the occurrence of contact allergens, cannot or simply do not want to change their existing habits, and do not avoid contact with substances that cause skin lesions. Many women who are allergic to base metals do not stop wearing cheap jewellery, which unfortunately may later result in the development of polyvalent contact allergy.

Despite the positive results of the PT some patients do not attribute the occurrence of skin lesions to any factors which may have affected the appearance of contact dermatitis and cannot determine the relationship between the appearance of lesions on the skin and the specific factors causing them.

Conclusions

The research indicates the need for proper education of patients regarding exposure to contact allergens

as an important element of prevention, both in terms of everyday life and their professional work. Proper health education of patients in relation to exposure to contact allergens associated with objects of everyday use, occupational exposure, or hobbies is extremely important. The knowledge, which is such an important part of prevention, may contribute both to reducing the risk of developing polyvalent allergies and symptoms of allergic contact dermatitis which are so troublesome for the patient.

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