Allergic and toxic reaction caused by fragrances – a case report

Reakcja alergiczna i toksyczna wywołana substancjami zapachowymi – opis przypadku

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Abstract

Adverse reactions after applying cosmetics constitute an increasing clinical problem. Fragrances are the principal allergens of cosmetic products and together with preservatives are among the top 5 most frequent contact allergens. The contemporary diagnostics of contact allergy to fragrances is based on patch tests with fragrance mix. The purpose of the study was to report a case of high contact sensitivity with accompanying toxic reaction to fragrance mix I and II and Lyral. Patch tests were performed with the Standard European Set of contact allergens. The first reading after 48 h was positive (+++) with fragrance mix I, whereas within the area with Lyral and fragrance mix II single blisters containing clearly visible light yellow liquid were observed. After 72 h no variation of the test result was recorded.

Key words: Lyral, fragrances, allergy to cosmetics.

Streszczenie

Występowanie reakcji niepożądanych po zastosowaniu kosmetyków stanowi narastający problem kliniczny. Substancje zapachowe są głównym alergenem preparatów kosmetycznych i obok konserwatów należą do 5 najczęstszych alergenów kontaktowych. Współczesna diagnostyka alergii na substancje zapachowe opiera się na wykonaniu naskórkowych testów płatkowych (NTP) z perfume mixture. Celem niniejszej pracy było przedstawienie przypadku wybitnej nadwrażliwości kontaktowej z towarzyszącym odczynem toksycznym w odniesieniu do mieszanki zapachowej I, II oraz Lyralu. W odczycie NTP po 48 godz. stwierdzono kontaktową reakcję ocenioną na trzy plusy w odniesieniu do mieszanki zapachowej I, natomiast w miejscu założonego testu z Lyrala oraz mieszanki zapachowej II obecne były pojedyncze pęcherze z wyraźnie widocznym poziomem jasnożółtego płynu. Po 72 godz. odczyt testu nie zmienił się i pęcherze nadal były obecne.

Słowa kluczowe: Lyral, substancje zapachowe, alergia na kosmetyki.

Introduction

Fragrances are the principal allergens of cosmetic products and together with preservatives are among the top 5 most frequent contact allergens [1, 2]. There are approximately 5000 aromatic compounds currently used in the perfume industry and it is estimated that a single perfume may contain from 50 to 300 molecules, which create characteristic scents [3]. Exposure to perfumed molecules is multiple and practically permanent. Fragrance molecules are found not only in cosmetic products, but also in a wide variety of manufactured products, including household domestic and food products (where they are used as flavours) and even in topical medicaments (where they maintain antiseptic properties) [3, 4]. It is estimated that an average adult uses nine cosmetics daily, while more than 25% of women use 15 or more [5]. Adverse reactions to cosmetics constitute an increasing clinical problem. Although they are observed often, the real frequency is not
exactly known. Most individuals who experience mild reac-
tions, such as erythema or stinging sensations, simply
change to another product. There is agreement about the
percentage of 1 to 2 in terms of sensitization to cosmetics
in the general population, accounting for 6-14% of all cas-
es of allergic contact dermatitis [1, 6].

The contemporary diagnostics of contact allergy to
fragrances is based on patch tests with fragrance mix.
Fragrance mix I (FM I) is a mixture of eight aromatic sub-
stances (one natural compound, oak moss absolute, and
other synthetic fragrances) and identifies 70-80% of fra-
grance allergy cases [6]. According to the recommenda-
tions of the European Society of Contact Dermatitis
(1 March 2008) the European baseline series was enlarged
by adding new substances: fragrance mix II (FM II) and
Lyral (hydroxyisohexyl 3-cyclohexene carboxaldehyde) [7].

Case report
A 66-year-old patient was hospitalized in the Depart-
ment of Dermatology, University of Medical Sciences in
Poznań in order to diagnose and apply treatment of papu-
loerythematous lesions of the skin in the region of the
lower and upper lip. Primary skin lesions (increasing ery-
thema and oedema) and recurrent stinging sensations
had been observed already one month earlier. The patient
complained of “hypersensitivity” to creams for everyday
use and difficulty in proper selection of cosmetics. No
coexisting diseases were detected.

During hospitalization in our clinic all performed lab-
oratory tests were within the normal range. The direct
examination for *Demodex folliculorum* within the skin of
the face was negative. Results of skin prick tests per-
formed with main aeroallergens were negative. Patch tests
were performed with the Standard European Set of con-
tact allergens (Chemotechnique, Sweden). The first read-
ing after 48 h was positive (+++) with FM I, whereas in the
area with Lyral and FM II single blisters containing clear-
ly visible light yellow liquid were observed (fig. 1). After
72 h no variation in the test result was recorded (fig. 2).
Readings were performed according to ICDRG guidelines.

Discussion
Cosmetics, according to their definition, are general-
ly perceived as safe and well tolerated. In fact, even prod-
ucts labelled as hypoallergenic can cause adverse reac-
tions. Murphy *et al* described a 25-year-old woman with
exacerbation of eczema, which was related to the use of
two new skin products promoted as hypoallergenic and
preservative free, ideally suited to atopic individuals.
A detailed study revealed the presence of two preserva-
tives, methyldibromoglutaronitrile and formaldehyde [8].
Preservatives are second to fragrances as a cause of aller-
gic contact dermatitis. The other responsible chemicals
are phenylenediamine, lanolin, and Balsam of Peru.

The range of undesirable effects related to the use of
cosmetics includes contact dermatitis (both allergic and
irritant), photosensitivity, phototoxic dermatitis, contact
urticaria and pigmentary disturbances. Among adverse
reactions to fragrances, the most common clinical mani-
festation seen by dermatologists is allergic contact der-
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Fragrances are usually number 2 after nickel sulfate among patients with positive patch test results [9, 10]. Patch testing with FM I has been widely used as an indicator of fragrance contact allergy since the late 1970s (Larsen 1977) [2, 3, 12]. However, Larsen noted that as much as 33% of fragrance sensitivity may be missed if only those eight recommended substances are tested. Based on European multicentre studies, additional markers of fragrance allergy were added to the European baseline patch series: fragrance mix 2 (FM II) and hydroxyisohexyl 3-cyclohexene carboxaldehyde (HMPCC) or Lyral. Systemic investigation has shown that FM II detects patients sensitive to fragrances missed by FM I [7]. Furthermore, the ability to diagnose fragrance allergy is now increased and can reach 95% [3]. Frosch et al. reported positive results with FM II in 2.9% of tested patients with the concentration of 14%, and additionally he found that approximately 1/3 of the patients reacting to FM I were negative to FM I [13].

FM II contains citral, farnesol, coumarin, Lyral, citronellol and cinnamal at 14.0% in petrolatum. The most common of this set of allergens is Lyral followed by farne- sol [7]. Lyral is the trade name of a mixture of 4-(4-hydroxy-4-methyl-pentyl)-3-cyclohexene carboxaldehyde (70%) and 3-(4-hydroxy-4-methyl-pentyl)-3-cyclohexene carboxaldehyde (30%), manufactured by International Flavors & Fragrances (IFF, New York, USA) [6]. HMPCC as a synthetic fragrance is commonly used in consumer products and has a characteristic sweet scent [6]. Patch test concentration of Lyral in FM II is 2.5%, while as an individual ingredient test concentration is 5%. The prevalence of positive reaction to Lyral in European studies is between 1.5% and 3%, whereas in a USA study it was only 0.4% [1, 14]. This difference is attributed to the presence of Lyral in higher concentrations in deodorants formulated in 16% in petrolatum (2% for each hapten). Because of the frequently observed irritant reactions the concentration of Lyral safe for sensitized people should be in the range of 0.009-0.027% (0.18-0.34%), depending on the product type [17].

To sum up, the current case report was presented due to the frequent occurrence of allergic and toxic contact reaction caused by fragrances observed in recent years. Because of the continuously increasing number of new fragrance molecules (due to developments in the fragrance industry, and changing fashion), there is a need to conduct further investigations on this subject to enlarge the set of tested allergens. It is also worthwhile to study their concentration to select patients with allergic and toxic reactions.

References