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Letter to the Editor

Contact dermatitis with concomitant contact urticaria syndrome due to multiple ingredients of oxidative hair dye

Dear Editor,

While contact dermatitis (CD) due to oxidative hair dyes is relatively common, contact urticaria (CU) is not. CU rarely develops concomitantly with CD in response to exposure to the same ingredient in a hair dye in a patient.^{1,2} Herein, we report a case of CD with concomitant CU due to multiple ingredients of oxidative hair dye.

A 58-year-old woman was referred to our hospital after experiencing three anaphylactic reactions following application of a hair dye at a hair salon. She had gotten her hair dyed once every few months at the same hair salon since 48 years of age. At 55 years of age, she began experiencing a mild itching sensation over the scalp during the process of hair dyeing. Two years later, she developed flushing over the face, neck, and arms immediately after the hair dyeing, followed by dyspnea, nasal congestion, abdominal cramps, and diarrhea. After these symptoms nearly disappeared in 30 min, itchy erythema over the scalp appeared and continued for a few weeks. Thereafter, two similar episodes occurred at one and nine months after the first episode. To investigate the causative product in allergic reactions, a closed-patch test with the suspected hair dye was performed at the hair salon one day prior to the first visit to our clinic. She developed flushing at the test site after 5 h. Thirteen hours later, she felt severe itchiness at the site and removed the test patch. When she visited our clinic, the reaction was read in accordance with the International Contact Dermatitis Research Group (ICDRG) criteria, which was positive (++) on Day 1. We suspected contact urticarial syndrome (CUS) and CD due to the hair dye.

To examine the relevance of type I and IV allergies due to hair dye and its ingredients, additional skin tests were performed. Skin prick testing (SPT) was performed with all six ingredients of the hair dye at the same concentration and at a 10-fold dilution of the product concentration. The results of the SPT were positive for para-phenylenediamine (PPD) (11.0 mm × 9.6 mm wheal and 8.6 mm × 6.5 mm wheal) and para-aminophenol (PAP) (19.7 mm × 11.8 mm wheal and 10.4 mm × 5.8 mm wheal) (Fig. 1a). One week later, infiltrative erythema was observed at the SPT sites for PPD and 2,4-diaminophenoxyethanol-HCl (DPE) (Fig. 1b). In addition, an open test was performed with all six ingredients of the hair dye at the same concentration as the product. The ingredients were applied directly to a round of diameter 20 mm on the skin.³ The site is evaluated after 20 min and re-evaluated after one week. The test showed no reaction for all the ingredients at

20 min. Unfortunately, the patient could not visit our clinic at 48 h and 72 h because of her private reasons, even though she felt strong itches on her back. However, on Day 7, the test exhibited a positive reaction (++) for PPD in accordance with the ICDRG criteria (Fig. 2). Therefore, she was diagnosed with CUS due to PPD and PAP, and subsequent CD due to PPD in the coloring oxidative hair dye.

Discussion

Until now, there have been only five cases of women,^{4–7} including our case, in which concomitant CU and CD developed due to exposure to oxidative hair dyes.

In these five cases, the causative ingredients for CU were PPD in three cases,^{4,5} PAP in two cases,⁶ and DPE in one case.⁷ Meanwhile, the ingredients causing CD were PPD in five cases,^{4–7} and toluene-2,5-diamine in one case.⁷ Finally, PPD caused concomitant CU and CD in three cases.^{4,5}

In four of the five cases,^{5–7} CD was suspected of having preceded CU, thereby indicating that CD might precede CU. Meanwhile, animal studies in which contact sensitizing agents were repeatedly applied epicutaneously demonstrated that the time-course of antigen-specific hypersensitivity responses shift from a delayed-type hypersensitivity to an immediate-type response that is ultimately followed by a late reaction.⁸

In previous cases, the amount of time between the first dye applications to the onset of CD ranged from two to seven years. In addition, the time duration from the onset of CD to the onset of CU was one month in one case,⁵ two years in our case, and five years in another case.⁶

In 1981, von Krogh and Maibach proposed that CUS should be classified into four stages according to severity.⁹ Stage 1 involves localized contact urticaria and symptoms such as itching or burning sensation. Stage 2 refers to the development of generalized urticaria. Stage 3 may include bronchial asthma, rhinoconjunctivitis or gastrointestinal dysfunctions. Finally, in stage 4, anaphylactic or anaphylactoid reactions may occur as the most severe type of CUS manifestation. One case⁴ was classified as stage 1; one was classified as stage 2⁵; and three, including our case, were classified as stage 4.^{6,7} These results indicated that CUS concomitant with CD might be severe, although the number of cases was limited.

In our case, PPD in the hair-dyeing product was used for the open test, but PPD in the Japanese standard allergens was not, as we prioritized the identification of the causative ingredient in the all components of the hair-dyeing product.

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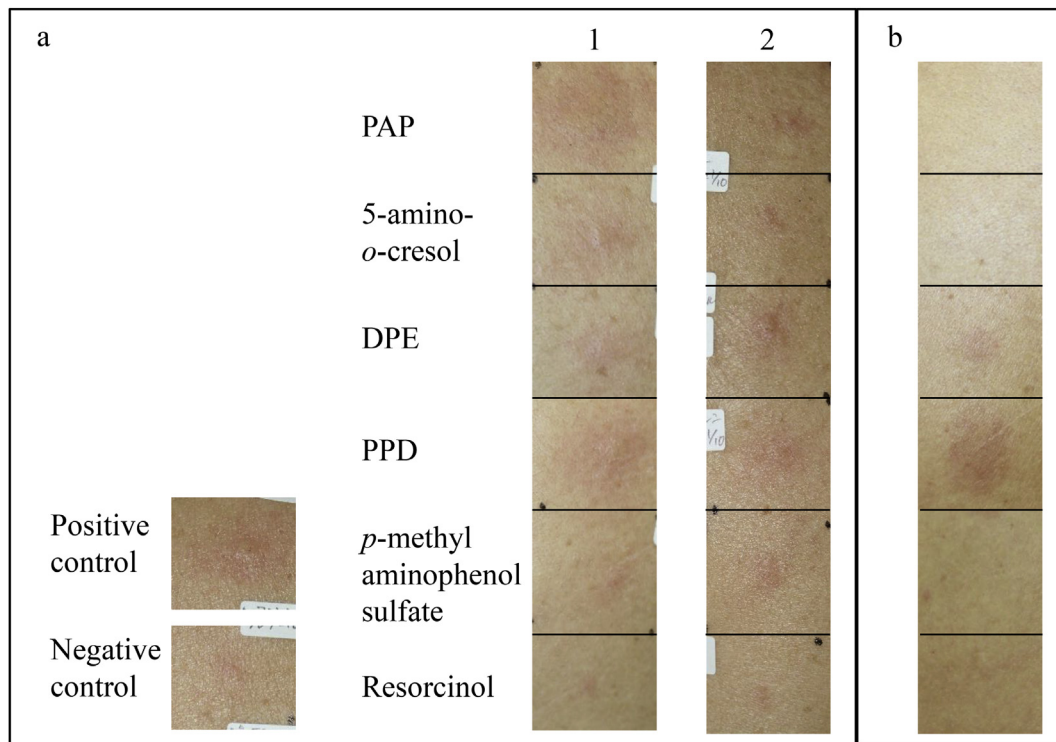


Fig. 1. The results of skin prick testing with ingredients of the hair dye. (a) The skin testing showed positive reactions for PPD and PAP at the same concentration as the product (lane 1) and a 10 fold dilution of the product concentration (lane 2). Histamine dihydrochloride (10 mg/ml) and Allergen Scratch Extract Torii Control Solution, an aqueous solution containing 50% glycerol and 5% NaCl (Torii Pharmaceutical, Tokyo, Japan) were used as positive and negative controls, respectively. (b) Allergic reactions one week after skin prick testing. One week later, infiltrative erythema was observed at the sites after pricking with PPD and DPE. PAP: para-aminophenol; DPE: 2,4-diaminophenoxyethanol-HCl; PPD: para-phenylenediamine.



Fig. 2. Allergic reactions after the open test with ingredients of oxidative hair dye. There was a positive reaction to PPD (D7, ++), but not to the other ingredients.

Although we observed an infiltrative erythema with papules at the SPT site for DPE on Day 7 (Fig. 1b), we didn't consider DPE as the causative agent of contact dermatitis. It's because the open test exhibited a negative reaction for DPE in accordance with the ICDRG

criteria on Day 7 (Fig. 2), and because we didn't have a chance to observe the result of the open test for DPE at 48 h and 72 h due to our patient's wish.

In this report, we describe the case of CUS and CD concomitantly induced by sensitization to multiple ingredients of oxidative hair dye. When hair dye allergy is suspected, we should be aware that both CUS and CD can occur in the same patient.

Conflict of interest

The authors have no conflict of interest to declare.

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