Allergic Contact Dermatitis Caused by Skin Painting (Pseudotattooing) With Black Henna, a Mixture of Henna and p-Phenylenediamine and Its Derivatives

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Background: Skin painting (pseudotattooing) with henna is traditionally performed mainly in Muslim or Hindu persons. Recently, transient artists have begun using black henna mixtures to temporarily paint the skin. Emergence of allergic contact dermatitis after application indicates the presence of a skin sensitizer in such preparations and poses future risks.

Observations: Four patients developed allergic contact dermatitis after skin painting with black henna performed in France, Egypt, and the United States. The delay of symptoms suggested previous sensitization in 1 patient and active sensitization in 3 patients. Of 3 patients who underwent patch testing, the results were positive for p-phenylenediamine in 3 patients and for p-toluylenediamine in 1 patient. These sensitizers are found in hair dye preparations.

Conclusions: The mixtures used by the artists possibly contained natural henna, a rare and weak skin sensitizer, and likely contained chemical coloring agents, diaminobenzenes, such as p-phenylenediamine and/or diaminotoluenes. The long duration of skin contact, the high concentrations of sensitizing materials, and the lack of a neutralizing agent dramatically increase the risk of skin sensitization, which is why such substances are prohibited for direct skin application. Because of the worldwide vogue of skin painting, future cases of sensitization to p-phenylenediamine and diaminobenzenes or diaminotoluenes are expected.

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A 25-year-old man was treated for an itchy lesion on his left arm. The inflammatory edema strictly outlined a black tattoo, which had been applied 11 days before by a transient artist who used henna. The patient had previously used permanent hair dye 3 times without any symptoms. The cutaneous lesions resolved with residual pigmentation with the use of topical betamethasone dipropionate. The patient underwent patch testing 3 weeks later with the same technique and similar allergens described for patient 1. We observed strongly positive reactions (erythema, edema, and vesicles) to p-phenylenediamine but not to p-aminophenol, p-aminobenzene, p-toluylenediamine, or other tested allergens.

CASE 2

A 7-year-old boy was treated in September 1999 for an acute dorsal eczema on the area of skin painted with a scorpion. His mother reported the appearance of slight eczema within 15 days after he had had a labile tattoo on his right arm 5 months before. The second tattoo had been stained in Egypt with a black henna powder, and the eczema occurred within 24 hours. The eczematous lesions were bullous, spread on the right side of the back, and led to an infiltrated and depigmented scar. The lesions spontaneously recurred in November 1999 and were treated with topical betamethasone dipropionate. Patch tests were then performed with the technique described for patient 1, and the results observed at 48 and 72 hours were extremely positive (erythema, edema, bullae, and/or necrosis) for p-phenylenediamine, p-toluylenediamine, p-aminophenol, and p-aminobenzene and strongly positive (erythema, edema, and vesicles) for o-nitro-p-phenylenediamine, disperse orange 3, and tixocortol pivalate. There were no reactions to other allergens and m-aminophenol.

CASE 3

An 8-year-old boy was treated in January 2000 for an eczematous skin painting of a spider on its web. The lesions appeared 14 days after a mixture of black henna hair dye was applied to the skin. The lesions progressively increased, and 1 month after the skin painting, the lesions were vesiculouis, with crusting and scaling. They resolved after the use of topical betamethasone dipropionate; however, the child’s mother did not want patch testing.

Skin painting (pseudotattooing) is traditionally performed with henna or other labile vegetal substances mainly in Muslim and Hindu persons. The painting is traditionally performed on the hair and nails with henna. Henna gives a temporary aurum to red color, and admixture of other vegetal extracts, like dried powder of indigo plant leaves, gives a henna a darker shade. Addition of p-phenylenediamine (black powder), which is sometimes used to speed up the process of hair dyeing and to give a darker brown to black color, to henna yields the so-called black henna mixture. Decorating the skin with temporary paint has recently become popular in many countries. It is often performed in tourist areas by transient artists who use black henna preparations.

In the patients we describe herein, skin painting was due to skin painting with a black henna mixture. In the first case, we diagnosed allergic contact dermatitis in a patient previously sensitized to hair dyes since the dermatitis occurred within 5 days after skin painting. In the 3 other cases, since the delay between the skin painting and the onset of contact dermatitis was around 2 weeks, we think that the dermatitis was caused by active sensitization to the preparation.

In the patients tested, the patch test results positive for p-phenylenediamine strongly suggest the role of this component. Diaminobenzenes and particularly p-phenylenediamine are components of dark and permanent hair dyes, like that used to paint the patients’ skin. However, the possibility remains that the exact responsible allergen was not p-phenylenediamine but other component(s) of the mixture that could not be tested. p-Phenylenediamine can induce allergy per se or be a marker of allergy to other diaminobenzenes present in the black henna mixture. Other diaminobenzenes often show cross-reactivity with p-phenylenediamine. Concomitant sensitizations are possible; for example, the results of patch testing in patient 3 were positive for p-toluenediamine. Henna and vegetal extracts that are commonly used to dye hair naturally are usually not responsible for allergic contact dermatitis. They would likely not account for such successive observations, although a concomitant sensitization is possible.

In the patients we describe herein, skin painting was performed for entertainment at beaches on the Riviera and in Los Angeles, Calif, at a scenic area in Strasbourg, France, or in Egypt. The transient painters used misappropriated hair dye preparations they called henna or black henna. Such commercialized dyes very likely contained p-phenylenediamine, diaminobenzenes, and/or diamnotoluenes. Skin painting seems to be popular, and the patients reported that the artists were numerous. Skin painting has been recently reported as a cause of skin allergy in women who used such preparations. A pos-

Figure -toluenediamine, or other tested allergens.

Comment

(p-phenylenediamine after second application of skin paint.)
sible consequence is the future occurrence of allergic contact dermatitis after new contact with $p$-phenylenediamine or its derivatives. Castelain\textsuperscript{9} reported allergic contact dermatitis caused by hair dye after sensitization to substances used to paint the skin or suspected by strong reactions to derivatives like $N$-phenyl-$p$-phenylenediamine or toluene-2,5-diamine ($p$-toluylenediamine) in the results of patch testing.\textsuperscript{7,9}

The use of $p$-phenylenediamine and other diamino benzenes ($o$-diaminobenzenes, $m$-diaminobenzenes, and $p$-diaminobenzenes) are allowed in the European Union for hair dyes (a maximum concentration of 6\% free base in the final reconstituted product and 10\% diaminotoluenes).\textsuperscript{10} The same directive forbids the use of $p$-phenylenediamine and its derivatives for dying lashes, eyebrows, or skin. In addition, the concentration of $p$-phenylenediamine in patch tests has been decreased from 2\% to 1\%; however, this concentration can induce skin sensitization.\textsuperscript{11} In skin painting, not only is the use of $p$-phenylenediamine and derivatives prohibited, but also the concentrations of diaminobenzenes are much higher than allowed. Moreover, the lack of an oxidizing agent, like hydrogen peroxide, into the mixture leads to a prolonged contact with $p$-phenylenediamine that dramatically increases the risk of active skin sensitization and of subsequent allergic reactions. Lodging complaints against such artists seems impossible or vain.

**CONCLUSIONS**

Patients and practitioners need to be aware of sensitization to $p$-phenylenediamine and its derivatives due to a misappropriated use of hair dye preparations as skin paint by transient artists. Long-term consequences include dyschromic scars and contact dermatitis after hair coloring with dyes based on diaminobenzenes, like $p$-phenylenediamine or diaminotoluenes.

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