

Induction of allergic contact dermatitis and pervasive face edema due to Brazilian keratin treatment

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Abstract

Brazilian keratin treatment (BKT) is a prevalent hair straightening method widely used by women in the world. The degree of concentration of formaldehyde safe for sensitive patients is still obscure. Report claims that these products contain intolerably high levels of formaldehyde. Yet, hair straightening products may lead to severe allergic contact dermatitis, by means of the responsible allergens such as formaldehyde and its releasers. This case report presents the case of a 37-year-old female patient developing extensive edema of the face and acute inflammatory changes in the scalp from chemical-induced irritation, on the day following the application of BKT to straighten her hair.

KEYWORDS

allergic contact dermatitis, Brazilian keratin hair treatment, formaldehyde

1 | INTRODUCTION

A number of adverse effects that could be either allergic or irritant may occur through the contact of skin with external agents. ~20% of all contact dermatitis are caused by allergic contact dermatitis (ACD). Allergic contact dermatitis is a delayed-type hypersensitivity reaction that is evoked through the contact of the skin with a chemical to which an individual has previously been sensitized. The chemicals causing contact dermatitis may be found in personal care products.¹ Brazilian keratin treatments (BKT) are extensively obtainable products that are consumed by women in a large proportion of world to make straight hair.² Yet, hair straightening products may cause severe ACD by means of responsible allergens such as formaldehyde and its releasers in particular. Moreover, formaldehyde can cause various types of reactions including irritant contact dermatitis (ICD), contact urticaria, and mucous membrane irritation, especially of the conjunctiva and respiratory tract.¹ The purpose of this study is to present a case of allergic contact dermatitis concerning extensive scalp, face, and periorbital edema after using Brazilian keratin hair treatment.

2 | CASE REPORT

Female patient aged 37 was admitted to the outpatient clinic with pain, burning, and itching sensation on her head and unable to open

her eyes due to excessive edema. In her anamnesis, it was realized that the patient applied BKT to straighten her hair 24 hours ago. In her dermatological examination severe edematous face and bilateral eyelid swelling, a yellow fluid draining from mild erythematous, and inflamed and fissured edematous scalp were observed (Figures 1 and 2). The patient did not have a medical history of ACD or ICD after the use of previous BKT. There was no previous history of allergies, infection, or medication. For treatment, the patient was administered prednisolone (1 mg/kg/day, 5 days), intramuscular, oral antihistamine, systemic antibiotic, wet dressing, topical antibiotic, and diflucortolone valerate + chlorquinaldol cream. Besides, the patient did not accept the application of patch test.

3 | DISCUSSION

Allergic contact dermatitis is a kind of delayed-type hypersensitivity reaction induced in the case of the contact of the skin with a chemical. The chemicals causing contact dermatitis may be found in personal care products.¹ The Brazilian keratin hair treatment is a method for hair straightening, and it has become popular since it makes curly hair straight and makes hair bright for a few months.² The BKT formulations include keratin and formaldehyde. Formaldehyde is an organic, pale composite that is a well-known contact sensitizer and



FIGURE 1 Bilateral eyelid and face edema related to Brazilian Keratin Hair Treatment



FIGURE 2 A yellow fluid draining from mild erythematous and edematous fissured scalp

used in chemical industry.² In the market, there are cosmetic products that are labeled “formaldehyde-free.” The composition of some of them contains derivatives of formaldehyde (formalin, methanal, methylene glycol, etc) or formaldehyde releases/donors (quaternium-15, diazolidinyl urea, imidazolidinyl urea, DMDM hydantoin, 2-bromo-2-nitropropane-1,3-diol, etc) (Table 1).^{3,4} Products involving formaldehyde releases discharge formaldehyde when heated as in the process of BKT application. These products are widely used as preservatives in cosmetic industry.

Brazilian keratin treatment and similar straightening products involve formaldehyde or its derivatives, applied by salon owners and hair professionals and are being advertised as safe. In addition, the application and heating of the formaldehyde-containing keratin treatments leads to the release of formaldehyde gas into the air.⁵ It is known that exposure to formaldehyde induces burning of the throat and eye irritation in air concentrations above 0.1 parts per million.⁶ When the product releases formaldehyde into the air above 0.5 ppm, there is the potential risk of cancer.⁷ The Occupational and Safety Health Administration reports that the limit of short-term exposure (15 minutes) to formaldehyde is 2 ppm. Objectionably, high levels of formaldehyde have been detected in hair salon products.⁶ In the USA and the EU, cosmetics containing a minimum of 0.05% (500 ppm) free formaldehyde have to be tagged “contains formaldehyde” since this substance is potentially allergenic.⁸ However, it has been determined that even contact with lower quantity of formaldehyde can lead to allergic contact dermatitis.⁹ On the other hand, if a product is alleged to comprise formaldehyde releaser or a formaldehyde, it does not signify that its detrimental to those who are sensitive to formaldehyde. It may be that the concentration of free formaldehyde may be much lower than the induction threshold for the certain patient. The nontoxic levels of formaldehyde levels for sensitive patients are still vague. It was found that lower levels of (>200 ppm) free formaldehyde in cosmetic products demonstrated initiation of dermatitis even in the short-term application on typical

Quaternium-15	2-Bromo-2-nitropropane-1,3-diol
DMDM hydantoin	5-Bromo-5-nitro-1,3-dioxane
Imidazolidinyl urea	1,6-Dihydroxy-2,5-dioxahexane
Diazolidinyl urea	Dimethylol urea/dmethylurea
Benzylhemiformal	Methenamine/hexamine/urotropine
Melamine/formaldehyde resin	5-Methyloxazolidine
Methylal/dimethoxymethane/formal	N-Methylolchloracetamide
4,4'-Methylenedimorpholine	Paraformaldehyde
N-Methylolethanolamine	2,4-Imidazolidinedione/hydantoin
Polyoxymethylene urea	Tetramethylol acetylene diurea
Sodium hydroxymethylglycinate	Tris(N-hydroxyethyl) hexahydrotriazine
Tris(hydroxymethyl)-nitromethane	Methylene oxide
Methylene glycol/methanediol	Formalin/methanal
Methyl siloxane	Bioban CS-1246
Timonac acid	Bioban P-1487

TABLE 1 Formaldehyde releasers and derivatives of formaldehyde^{3,4}

skin.⁹ It was also projected that absorptions containing higher than 30 ppm formaldehyde results in eczema. This means that the mandatory level for the labeling needs to be lower.⁸ There is a similar case reported in the literature.¹⁰ Patch testing remains the best measure of correct diagnosis. However, we could not apply patch testing to our patient. Patch testing with formaldehyde is debatable as the concentration of the standard for patch testing, which is 1% aqua, is accepted to be quite low and leads to numerous false-negative findings.⁹ Patients who are vulnerable to formaldehyde are usually recommended not to use cosmetics involving formaldehyde releaser.⁴ It should be noted that formaldehyde absorptions in BKT products might be higher than the endorsed parameters. Moreover, even the products tagged not including formaldehyde may possibly include formaldehyde releases.

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We are grateful to the patient for her cooperation.

CONFLICT OF INTEREST

The authors have no conflict of interest to declare.

CONSENT

The patient agreed the doctors could use and publish her disease-related article with personal information deleted. The signed photograph release form taken from the patient was added to the upload file.

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