

Patch Test Result in Patient with Allergic Contact Dermatitis to Toothpaste: A Case Report

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Abstract

Background: Allergic contact dermatitis (ACD) is a common diagnosis resulting from exposure to a chemical or chemicals in a patient's personal care products, home, or work environment. It is a delayed type of hypersensitivity reaction caused by contact with allergens in the environment. Patch testing is a gold standard to establish the diagnosis. After the causative allergens have been identified, patient education is needed to the proper treatment and management of the patient.

Case: Herewith, we report A 23-year-old woman with suspected ACD due to lipstick and was planned to perform patch test. She complained about dry lips that appear after she used new lipstick for about 3 months and there was not history of applying another agent. After recovery, the patch test was performed with allergens that might contact with her lips and the result was positive one in toothpaste allergen while negative in lipstick allergen.

Conclusion: The allergen which is suspected to the patient from history-taking might be different with the result of patch test, so that performing patch testing is needed to investigate the cause of ACD.

Keywords: patch test; allergic contact dermatitis; toothpaste allergen

1. Introduction

Contact dermatitis involves two main groups: irritant (ICD) and allergic (ACD) contact dermatitis. It could present as acute, subacute, or chronic eczema. It is difficult to differentiate ICD from ACD because both diseases can have very similar clinical, histological, and molecular presentations. The mechanisms at the origin of the eczema are different in the two types of dermatitis. ICD is a nonspecific inflammatory response, on the skin cells which is there is no sensitization and caused by contact with chemicals, physical, or biologic substances which triggers inflammation by activation of the skin innate immune system. ACD, is a delayed-type hypersensitivity response, and the skin inflammation is mediated by antigen-specific T cells. Thus, ICD and ACD can be differentiated on the basis of the presence (ACD) or absence (ICD) of antigen-specific effector

T cells in the eczema lesions. The current pathophysiological knowledge of contact dermatitis allows providing diagnostic tests to formally differentiate ACD from ICD (Nosbaum, 2012).

Toothpaste are known to contain contact allergen. The most common side-effects of toothpastes are local effects, irritation and allergic reactions (Sainiyo & Kanerya, 1995). Toothpastes are containing complex formulations with often more than 20 ingredients. The chemical composition of toothpastes is now different than the composition many years ago in order to development of innovation and competition (Groot, 2017). We reported the case of ACD due to toothpaste. This case aims to differentiate ACD and ICD, and also performing patch testing as an important additional examination to establish diagnosis of ACD and to identify the allergen.

2. Case presentation

A 23-year-old woman, was referred from Universitas Airlangga Dental Hospital to Allergy and Immunology Outpatient Clinic at Soetomo General Hospital, for patch test because since three months ago she had a complaint of her lips that felt dry and pain (Fig 1). Initially, the patient complained about peeling off of her lips, which appeared 3 months after using of new lipstick. There is not history of applying another agent on her lips. Later, the patient was diagnosed with allergic contact dermatitis suspected due to lipstick.



Fig 1. There are erythematous macules, with desquamation and minimal bleeding

Differential diagnoses for this patient were Irritant Contact Dermatitis which possibly caused by cosmetics. The patient was treated with dexamethasone 0,5 mg three times a day, cetirizine 10mg once a day and vaseline album applied on her lips for 1 week. The patient was planned for patch test. We advised the patient to stop using suspected lipstick.

The patient then was being performed a closed patch test with standard allergen and also suspected

agent that had been applied on her lips in daily basis (including lipstick and toothpaste) and patch testing chambers. Patch test results were performed in accordance with the International Contact Dermatitis Research Group (ICDRG). The first reading was done after 48 hours and the result was still negative in all allergen. After 72 hours, we found erythema on toothpaste allergen. The reading then was followed until 96 hours and day-7, the result was positive on toothpaste allergen (no 14) otherwise negative on another allergen including lipstick allergen.

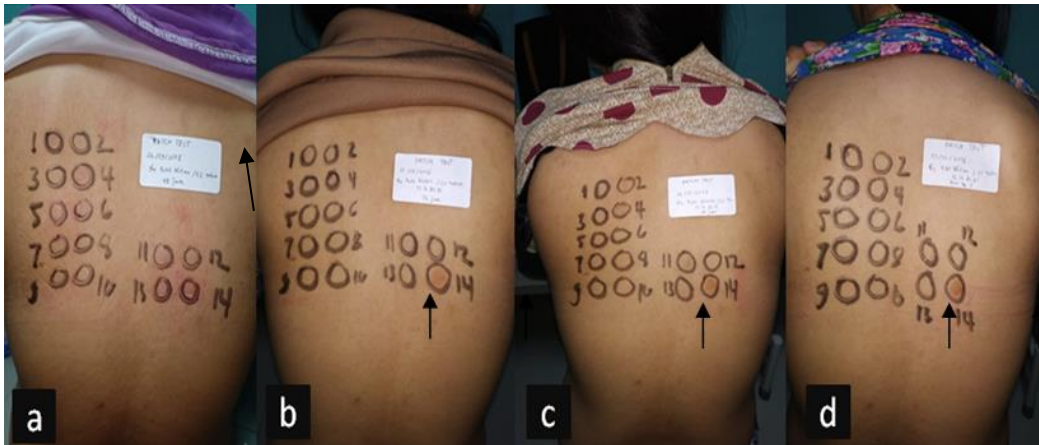


Fig 2. The reading after 48 hours (a), 72 hours (b), 96 hours (c) and day-7 (d). There were erythema macule that appeared on allergen no 14 from 72 hours and still persisted until day-7, giving a *crescendo phenomenon*.



Fig 3. The patient after stopping to use suspected lipstick and toothpaste.

3. Discussion

ACD is a type IV hypersensitivity reaction immunologic reaction that results in a delayed presentation. This immune response is characterized by two main phases, sensitization and elicitation. An individual may become sensitized to a particular substance when his or her skin barrier is impaired, allowing for the entry of exogenous allergens into the epidermis. Because this process is delayed, patients may have difficulty discovering the initial source of their dermatitis, consequently, patch test with an appropriate base panel is important in an ACD case (Jacob & Hero, 2013). Patients with suspected contact dermatitis, ideally should be performing patch test with all the medicaments or agents they have applied. The information obtained in the history may be incomplete, and commonly used medicaments should also be routinely tested (Brasch, *et al.* 2014; Nguyen & Yiannias, 2019; Wilkinson & Orton, 2016).

Toothpastes, also called dentifrices, are complex formulations with ingredients includes mild abrasives, fluoride, humectants, flavoring agents, sweeteners, thickening agents, colouring agents, and detergent that may become the allergen of ACD. Flavoring agent and colouring agent are often as a cause of ACD (Sainiyo & Kanerya, 1995).

According to International Contact Dermatitis Research Group (ICDRG), the result of patch test can be classified into: (-) negative reaction; (?+) doubtful reaction (erythematous macules with diffuse border); (+) weak positive reaction (erythema, infiltration, papule); (++) strong positive reaction (erythema, infiltration, papule, and vesicle); (+++) extreme positive reaction (reaction with bullae); (IR) irritant reactions. In this patient, the patch test was done after two years and we found extreme positive reaction (+++) (Reduta, *et al.* 2013). A positive patch test may be clinically relevant depending on current or past exposures. History and physical examination must be correlated with the patch test result to establish clinical relevance (Fonacier & Noor, 2018; Pacheco, 2018).

The patch test was being performed in this patient due to her clinical history to confirm agents that caused mucosal lesion. Based on literature, patient that suspected get allergy from certain agents or materials had to be confirmed with patch test to identify the cause. Ideally, a patient with contact allergy to toothpaste has a positive patch test reaction to the toothpaste; next, the patch test reaction is validated as allergic by a repeat patch test and/or a serial dilution test and/or negative reactions in 20 control patients and/or a positive ROAT (Sainiyo & Kanerya, 1995). Unfortunately, this patch test allergen did not mention the ingredients of the toothpaste.

Differential diagnoses in this patient are ACD and ICD, due to ingredients of the toothpaste. The differences between ACD and ICD is, in ACD, is a type IV mediated hypersensitivity reaction occurring in response to a specific allergen, on the other hand, ICD is a nonspecific inflammatory dermatosis, on the skin

cells without sensitization and caused by contact with substances which triggers inflammation (Nosbaum, 2012). The diagnosis of ACD can be established by history-taking with clinical examination. Skin testing, including patch testing can be done to further elucidate the offending allergens (Fonacier & Noor, 2018).

Working diagnosis in this case is ACD that possibly caused by ingredients of toothpaste. There are no data on the frequency of toothpaste allergy in the general population or in patients with dermatitis seen for routine patch testing. It had been reported 34 case reports and small series published between 1940 and 2016 describing more than 50 patients allergic to toothpastes, which clinical manifestation varies among ACD due to toothpaste, such as lip swelling, cheilitis, dry mouth, stomatitis, gingivitis and erythema and desquamation of oral mucosa (Groot, 2017). Patch test result had showed crescendo phenomenon whereby lesions slowly increase in severity over days and then slowly resolve (Nosbaum, 2012).

4. Conclusion

This patient was diagnosed with ACD due to ingredients contained in a toothpaste based on patch testing that had been performed, but it was still unknown whether the flavor or the color of the toothpaste that might be the allergen of this case. Patch test result showed crescendo phenomenon which the result was negative in early reading and gradually positive in the next reading. This patient then was advised not to use certain brand of suspected toothpaste.

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