



Allergic Contact Dermatitis Caused by Dexpanthenol Confirmed With Open Application Test: a Case Report

Marijana Smiljić,¹ Đuka Ninković Baroš,^{1,2} Boško Trifunović¹

Abstract

Topical medications and cosmetic products contain many allergens that can trigger allergic contact dermatitis. One of the most frequent ingredients is dexpanthenol (bepanthen, panthenol). A case of a 19-year-old female patient is presented, with a 2-year history of continuous episodes of contact allergic reactions with positive open application test to dexpanthenol, after other dermatoses and allergens were excluded.

Key words: Allergic contact dermatitis; Dexpanthenol; D-panthenol; Allergen; Dermatology.

1. Faculty of Medicine, University of Banja Luka, Banja Luka, the Republic of Srpska, Bosnia and Herzegovina.
2. Department of Dermatovenereology, University Clinical Centre of the Republic of Srpska, Banja Luka, the Republic of Srpska, Bosnia and Herzegovina.

Correspondence:

MARIJANA SMILJIĆ

M: +387 66 318 419

E: majaasmiljic@gmail.com

ARTICLE INFO

Received: 16 April 2022

Revision received: 15 May 2022

Accepted: 18 May 2022

Introduction

Exposure to various materials in our close environment can induce allergic reactions in the form of allergic contact dermatitis (ACD). As a form of a delayed allergic reaction (type 4 hypersensitivity response), it represents a T-cell mediated inflammation of the skin caused by repetitive exposure to allergen which previously led to sensitisation of T-lymphocytes. It consists of two phases - induction and elicitation, with an allergen in the form of hapten which can penetrate the top epidermal layer known as stratum corneum. Considering previous sensitisation, any repeated contact triggers an allergic reaction because of memory T-cells who are also responsible for more serious allergic reaction because of cell division and multiplication. Prevalence of contact dermatitis is about 20 % in Europe,¹ with approximate prevalence of 15 % in 12-16 year old adolescents.² Some forms of ACD are labelled as occupational diseases because of high prevalence in specific population such as hairdressers, cleaners, painters and health care

workers.¹ Also, recent studies show that ACD is found less in people who suffer from psoriasis. Some of the most frequent sensitisers are metals (gold, nickel, mercury, chromium, essential oils, acrylates and food additives, hair dyes, preservatives and textile chemicals). Clinical features of ACD include skin lesions, most commonly 2-3 days after the exposure to the allergen. Description of skin efflorescence usually vary from erythema or a light rash to papules and vesicles that can ooze or drain and are also accompanied by pruritus, swelling or pain. A gold standard for diagnosing ACD is a patch test. Treatment involves strict avoidance of the allergen if it is known, while topical corticosteroids are used in an acute phase with oral antihistamines or systemic corticosteroids and topical immunomodulators in severe cases.² Resolution is expected in 3-4 weeks, without treatment. Sometimes, causes and exacerbating factors are misidentified because of unusual clinical presentation and rare frequency.

Case history

A 19-year-old female patient presented with bilateral erythema on upper and lower eyelids, along with pruritus. She was prescribed topical steroids by her family physician. Information gathered by thorough anamnesis revealed that previously mentioned rash emerged for the first time five months previously, with gradually worsening with every repeated episode. After being examined at our dermatology department, the rash was described as erythematous, pruritic patches with papules and vesicles followed by localised oedema and following lichenification. Eyelid oedema

was severe on several occasions such that the patient was admitted to the emergency room because angioedema was suspected. Systemic corticosteroids and antihistamines were administered. With continuing episodes of resolution and recurrence, detailed tests were carried out. A skin prick test for inhalant and food allergens was negative and total immunoglobulin E – ELISA was in reference range. Tests for systemic and infective diseases also came back as negative. Patch test with European standard series was done and it was negative. The recurrence of rash worsened



Figure 1: Bilateral erythema and oedema after exposure to dexpanthenol

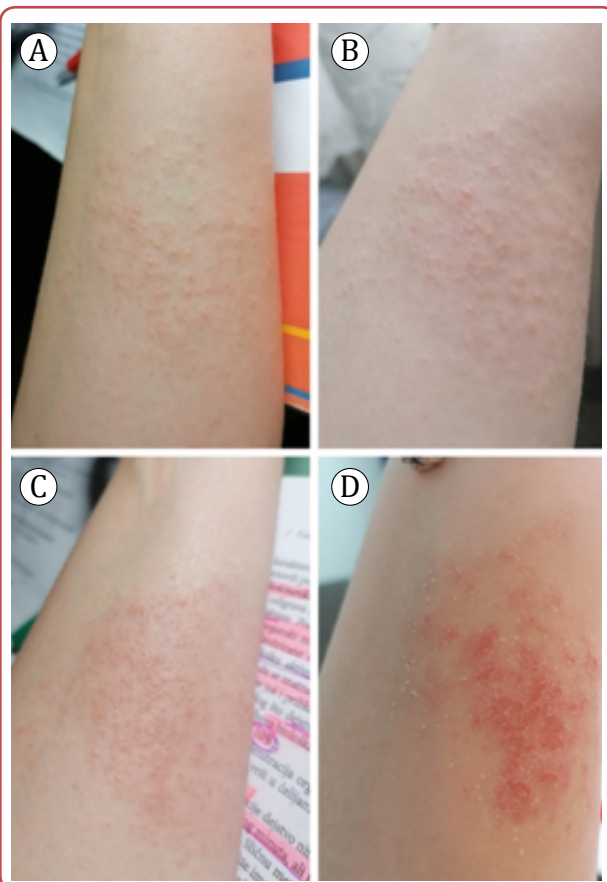


Figure 2: Open application test with dexpanthenol liquid solution: (a) after 48 hours (b) after 72 hours (c) after 96 hours (d) after 15 days

throughout one and half years, spreading from eyelids and affecting cheeks and chin.

Topical steroids were prescribed, such as alclometasone and mometasone, with oral antihistamines and topical immunomodulators (pimecrolimus). The patient responded well, but recurrence was frequent, without any known cause. As a side effect of treatment, she developed steroid rosacea. An important moment was development of rash during the treatment to a prescribed product that contained panthenol. Patient reported that she used homemade hair shampoo, which mostly contained panthenol solution. After quitting the shampoo, the eyelid rash and oedema did not reoccur. Considering the localisation of the rash, it was possible that ACD was caused by dripping shampoo down from the hair, because rinse-off products such as shampoo can cause generalised presentation.

Over a period of two years, it was noticed that every product that contained dexpanthenol caused the same allergic reaction. Our patient reported a rash caused by hand and face cream, lip balm, face masks, wet wipes, body lotion and make-up. It was suggested that an open application test should be performed to confirm the doubts because there were little reported and confirmed

cases. Repeated open application test (ROAT) is indicated in patients where new allergens are involved or they are not thoroughly explored. It is performed by applying the suspected allergen to the volar surface of the forearm two times a day for seven days.³ A 5 % liquid solution of dexpanthenol was applied on the patients' forearm. After 24 hours, a mild erythema began to appear, followed by papular lesion in the next 24 hours. The rash worsened and it was followed by itching. Corticosteroid creams, specifically alclometasone, were applied on the area of evolving dermatitis because it did not resolve spontaneously after the end of the exposure to the allergen.

Discussion

Dexpanthenol is used frequently in moisturisers⁴ and various cosmetics, including hair products, wipes, makeup and facial cleansers.⁵ Even though it is considered to be rare, ACD is reported in adults⁶ and in children⁵ and should be considered as a possible allergen. Because of moisturising effects, it is often prescribed to patients in treatment of dermatitis. Bearing in mind that it has potential to trigger allergic reactions, consideration should be given to advising patients in using products that contain dexpanthenol. If it is not carefully approached to ACD of unidentified cause, the patient could enter in *circulus vicious* with progressive worsening of ACD with every next exposure. This also means that patients with chronic ACD also have certain side effects of treatment with corticosteroids, including thinning and cracking of the skin, skin dryness and steroid-induced rosacea. Impact on mental health should also be mentioned, especially if we are talking about teenagers and young adults with facial dermatitis or other visible parts of the body. Additionally, patient should be given an advice on how to avoid allergen, with recommendations on what to pay attention to such as different names of allergen or even using an online tool such as *SkinSAFE*.⁷

Compared with several other cases, it is concluded that symptoms of exposure include generalised or localised eczema. As it can be noticed in a patient that was treated with creams that contained panthenol because of venous stasis dermatitis⁸ and a patient that underwent radiotherapy for basal cell carcinoma,⁸ where they both developed generalised eczema that resolved after corticosteroid

therapy. In these cases it can be observed that it can often be an iatrogenic condition. It was described even in 1965 in a 56 year-old patient that was using a panthenol ointment because of post thrombotic leg ulcer and dermatitis.⁹

Even one or two episodes of eczema should be an alert for a possible rare cause when other allergens are not positive. Facial wipes that are labelled as "hypoallergenic" can also be the cause, where facial eczema can occur 24 hours after removing make-up with previously mentioned wipes.⁵ It is often disregarded in diagnosing dermatitis, especially when patients enter in chronic phase, where authors have described development of multiple scaly lesions on face and nummular eczema-like lesions on trunk, where the patient used baby cream containing panthenol.¹⁰ Unusual clinical presentation of panthenol-caused dermatitis is pustular form, where pustules all over erythematous and eczematous bases can be described.¹¹

Phases in ACD often take turns, from latency to dermatitis, especially if patients use anti-inflammatory therapy. This means that patients' history of dermatitis are long, years or decades, where intermittent pruritic patches on face, trunk or extremities are often treated symptomatically. With positive patch testing to one allergen or more, patients often use hypoallergenic products where panthenol is one of the main ingredients.¹² That is the main reason why ACD caused by panthenol is hard to diagnose, mainly because cosmetical and pharmaceutical products often contain this allergen, so it is often overlooked.

Conclusion

Documenting and reporting certain allergens is of great importance because of possible misdiagnosis and treatment errors. Considering that dexpanthenol is found in almost every skin and hair products, especially in ones used for skin repairing, healing and calming that are also a part of ACD treatment, it should be noted that it is a potential allergen, especially in chronic dermatitis of unknown cause, where implementation of patch test series that contain panthenol should be considered. Open application test, which was crucial for diagnosis in this case, should be advised to patients when one is not able to identify the cause.

Acknowledgements

None.

Conflict of interest

None.

References

1. Peiser M, Tralau T, Heidler J, Api AM, Arts JH, Basketter DA, et al. Allergic contact dermatitis: epidemiology, molecular mechanisms, in vitro methods and regulatory aspects. Current knowledge assembled at an international workshop at BfR, Germany. *Cell Mol Life Sci* 2012 Mar;69(5):763-81.
2. Mortz CG, Lauritsen JM, Bindslev-Jensen C, Andersen KE. Contact allergy and allergic contact dermatitis in adolescents: prevalence measures and associations. The Odense Adolescence Cohort Study on Atopic Diseases and Dermatitis (TOACS). *Acta Derm Venereol* 2002;82(5):352-8.
3. Hannuksela M, Salo H. The repeated open application test (ROAT). *Contact Dermatitis* 1986;14(4):221-7.
4. Stables GI, Wilkinson SM. Allergic contact dermatitis due to panthenol. *Contact Dermatitis* 1998;38(4):236-7.
5. Chin MF, Hughes TM, Stone NM. Allergic contact dermatitis caused by panthenol in a child: allergic contact dermatitis caused by panthenol. *Contact Dermatitis* 2013;69(5):321-2.
6. Bregnbak D, Johansen JD, Zachariae C. Contact dermatitis caused by panthenol used for aftercare treatment of a new tattoo: contact dermatitis caused by dexpanthenol. *Contact Dermatitis* 2016;75(1):50-2.
7. Nguyen HL, Yiannias JA. Contact dermatitis to medications and skin products. *Clin Rev Allergy Immunol* 2019;56(1):41-59.
8. Fernandes S, Macias V, Cravo M, Amaro C, Santos R, Cardoso J. Allergic contact dermatitis caused by dexpanthenol: report of two cases. *Contact Dermatitis* 2012;66(3):160-1.
9. Keilig W. Contact allergy to dexpanthenol. *Derm Beruf Umwelt* 1987;35(6):206-8.
10. Hemmer W, Bracun R, Wolf-Abdolvahab S, Focke M, Götz M, Jarisch R. Maintenance of hand eczema by oral pantothenic acid in a patient sensitized to dexpanthenol. *Contact Dermatitis* 1997;37(1):51. doi:10.1111/j.1600-0536.1997.tb00389.x.
11. Gulec AI, Albayrak H, Uslu E, Başkan E, Aliagaoglu C. Pustular irritant contact dermatitis caused by dexpanthenol in a child. *Cutan Ocul Toxicol* 2015;34(1):75-6.
12. Han J, Warshaw EM. Allergic contact dermatitis to panthenol in "hypoallergenic" products. *Dermatitis* 2022 Mar 22. doi: 10.1097/DER.0000000000000883..