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CASE REPORT OPEN ACCESS

Contact dermatitis from black henna tattoo in child due to paraphenylenediamine

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Abstract
Temporary henna tattoos have become increasingly popular, particularly among children and teenagers. The word "henna" is of Persian origin, and it is prepared from the plant *Lawsonia inermis* belonging to the family *Lythraceae*. Concerning allergic reactions, natural henna paste is rarely responsible for contact dermatitis, which is more frequent if paraphenylenediamine (PPD) is added to the paste. The authors present a case of female child with erythematous exanthems that appeared after the application of black henna tattoo. A diagnosis of contact dermatitis to black henna tattoo was hypothesised. Epicutaneous tests were performed at the Immunoalergology Department of the Coimbra University Hospital using standard European battery and natural henna paste. The tests revealed positive reaction to PPD.
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Introduction

Temporary henna tattoos have become increasingly popular, particularly among children and adolescents.[1] Henna has a Persia origin, and is made from *Lawsonia inermis* plant belonging to the family *Lythraceae*. Henna leaves are processed to produce a reddish-brown pigment called Lawsone (2-hydroxy-1,4-naphthoquinone), also *known* **as** hennotannic acid. This pigment is applied to the skin and hair, where it binds to the keratin.[2] Paraphenylenediamine (PPD) is usually added to the henna paste in order to speed up its processing, achieve a dark colour, and improve the designs' pattern definition (black henna).[2]

Natural henna paste is seldom responsible for hypersensitivity reactions. These reactions usually occur if PPD is added to its composition, which manifests itself as type IV hypersensitivity reaction.[3]

Case report

In Saïdia, Morocco, a 5-year-old Portuguese child, healthy and without any relevant history of atopy, presented to the emergency department for a 7-day evolution of papular and erythematous rashes associated with intense pruritus on the posterior surface of the left forearm and left hand.

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The skin lesions had appeared 4 days after the drawing of black henna tattoo (Figure 1A). The child already had another temporary tattoo but without any reaction. The child's parents also had tattoos created by the same artist and ink but without displaying any reaction.

Physical examination demonstrated erythematous papular rashes on the left forearm and left hand on the path drawn for creating the tattoo, with no other inflammatory manifestations (Figure 1B). Having assumed the diagnosis of contact dermatitis, the patient was prescribed 0.5 mg/g topical clobetasol propionate and 2.5-mg oral desloratadine, once daily, for 7 days. On the third day of treatment, residual erythematous rashes were observed (Figure 1C). The lesion slowly ameliorated with time, leaving only an area of hypopigmentation that persisted for several days.

Patch testing was performed with baseline series and henna paste (Figure 2A) 15 days after resolution of skin lesion. Interpretations were made according to the European Society of Contact Dermatitis (ESCD) guidelines[4] on day 3 and day 7. Positive results (+++) were established on day 3 for PPD (1.0% pet), with no reaction to henna paste (Figure 2B). It was recommended to avoid PPD and thoroughly read labels on all products that contain PPD, namely hair dyes, and dyes and inks used for make-up, temporary tattoos, and some textiles. The child was observed at our consultation; 3 months later, she was stable, with no new lesion.

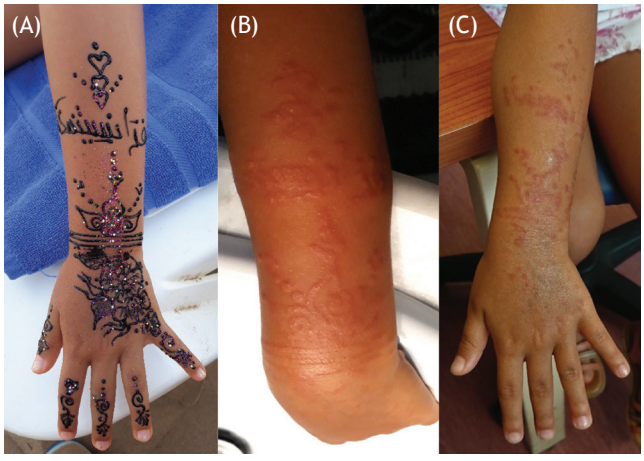

Figure 1 (A) Application of black henna tattoo; (B) erythematous papular rashes on the left forearm and left hand; (C) residual erythematous rashes 3 days after treatment.

Discussion

This case is reported to alert that temporary tattoos are not devoid of risks because of the addition of PPD, which is the main culprit for skin reactions. PPD is a chemical used widely in hair dyes, cosmetics, textile dyes, printing inks, photographic developing chemicals, among others.[5] PPD is added in dyes and inks to achieve intense black colour and increase tattoo's durability In the present case, it was observed that the child's sensitization to PPD was compatible with the described cutaneous reaction. It is noteworthy that the child's parents had the tattoo made from the same artist and ink but without any reaction. This established that, probably, parents were not sensitized to any of the tattoo's compounds, namely PPD, as their daughter.

Nowadays, legislations regulating the amount of PPD added to henna tattoo ink or hair dyes are lacking, especially in the countries where tattoo-making is readily accessible. Use of PPD in topical products is prohibited in the United States and the European Union (EU), although the EU allows PPD in hair dyes in the concentration of 6%.[6] Despite this regulation, frequent cases of allergic contact dermatitis induced by tattoos made with PPD-adulterated henna are still reported.

A type IV hypersensitivity reaction to PPD was confirmed by the positive results attained by patch testing done with standard European battery and natural henna paste. Unfortunately, PPD-induced skin reactions can be grievous, leaving lasting changes to the skin. Therefore, proper diagnosis of contact dermatitis is required to provide a timely and adequate treatment as well as to avoid the cause in the future.

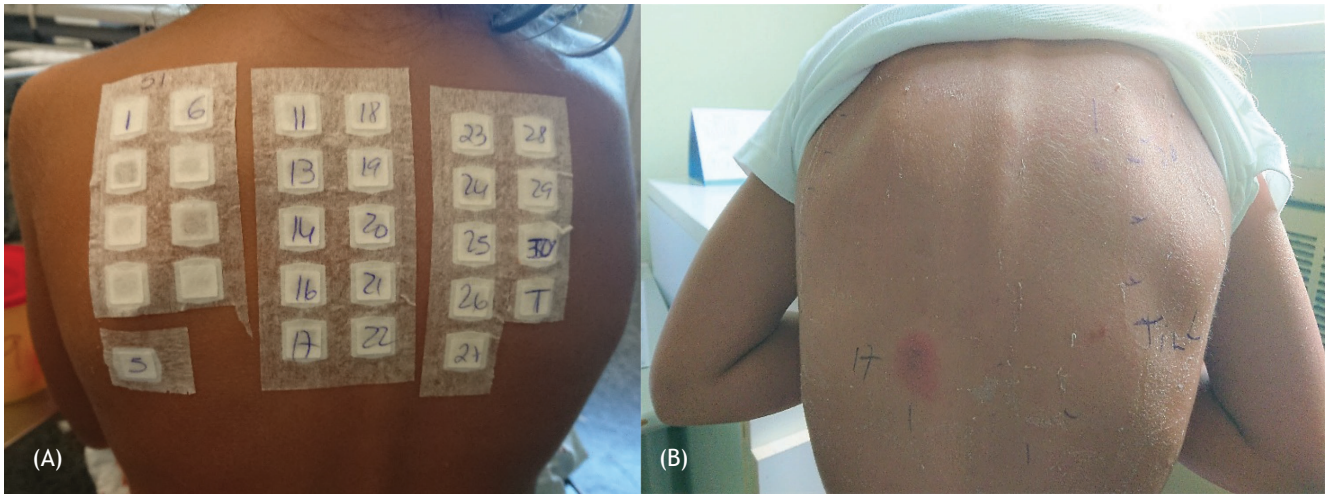

Figure 2 (A) Baseline series and henna paste patch testing; (B) PPD positive result (+++).

Limitations of study

As a possible limitation of this study, the authors want to point out that no additional diagnostic studies were conducted, despite some of them might have been relevant to support diagnosis of the present case.

Conclusion

The purpose of this case report is to draw attention to the fact that temporary tattoos are not devoid of risks. Synthetic dyes are illegally added to the henna paste, particularly PPD, to achieve intense black colour and increase the durability of tattoo, which spurs skin reactions to occur.

Conflict of interest

The authors had no conflicts of interest to declare.

Declaration

The authors declared that the described case was neither published previously nor considered for publication elsewhere. Written and oral informed consent was obtained from the child's parents. The study was approved by the local ethical committee.

References

1. Jovanovic DL, Slavkovic-jovanovic MR. Allergic contact dermatitis from temporary henna tattoo. J Dermatol. 2009 August;36:63–65. https://doi.org/10.1111/j.1346-8138.2008.00588.x
2. Hansen D, Voutsalath M. Contact dermatitis from a presumed allergy to paraphenylenediamine. J Cosmet Dermatol. 2009 July;8:308–11. https://doi.org/10.1111/j.1473-2165.2009.00466.x
3. Johansen JD, Schwensen JF, Friis UF, Menn T. One thousand cases of severe occupational contact dermatitis. Contact Dermat. 2013 November; 68:259–68. https://doi.org/10.1111/cod.12045
4. Johansen JD, Aalto-korte K, Agner T, Andersen KE, Bircher A, Bruze M, et al. European Society of Contact Dermatitis guideline for diagnostic patch testing—Recommendations on best practice. Contact Dermat. 2015 May;73:195–221. https://doi.org/10.1111/cod.12432
5. Ortiz Salvador JM, Esteve MA, Subiabre FD, Victoria Martínez AM, Cuadra Oyanguren J, Zaragoza Ninet V. Dermatitis alérgica de contacto a parafenilendiamina por tatuajes con henna en población pediátrica. Ann Pediatr (Barc). 2017;86(3):122–6. https://doi.org/10.1016/j.anpedi.2016.02.010
6. Diepgen TL, Naldi L, Bruze M, Cazzaniga S, Schuttelaar M. Prevalence of contact allergy to p-phenylenediamine in the European general population. J Invest Dermatol. 2015 September;136:409–15. https://doi.org/10.1016/j.jid.2015.10.064