Check for updates

PROF. KATHARINA HANSEL (Orcid ID : 0000-0002-6674-4278)
DR. LUCA STINGENI (Orcid ID : 0000-0001-7919-8141)

Article type : Letter to the Editor

Title: Use of self-applied sculptured gel nails may increase the risk of allergy to (meth)acrylates in children and adolescents

Key words: Allergic contact dermatitis; (meth)acrylates; gel nails; children and adolescents

Running head: Allergic contact dermatitis to gel nail (meth)acrylates

Manuscript word count: 678

Table count: 1

Figure count: 1

Authors: M. Tramontana, K. Hansel, L. Bianchi, R. Marietti, L. Stingeni*
Dermatology Section, Department of Medicine and Surgery, University of Perugia, Italy

Correspodence:
Luca Stingeni, Section of Dermatology, Department of Medicine and Surgery, University of Perugia, 06129 Perugia, Italy. Phone: +39 0755783452; fax: +39 0755783498. E-mail: luca.stingeni@unipg.it

Funding sources: None

This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as doi: 10.1111/JDV.17429

This article is protected by copyright. All rights reserved

Accepted Article

Conflict of interest: All authors have no interests to report

The article has not been previously published and is not currently submitted elsewhere

The patient and her parents in this manuscript have given written informed consent to publication of her case details.

Accepted Article

This article is protected by copyright. All rights reserved

Editor

Gel nails are a new type of artificial nails containing UV-curing acrylates and methacrylates, here referred to as (meth)acrylates.[1] They are known to be more fashionable and long lasting than conventional nail polishes. Until a few years ago gel nails were applied only by nail technicians, but recently several and inexpensive home use UV-curing kits have been placed on the market, increasing the risk of complications induced by these nail cosmetics.[1-3] Among complications, allergic contact dermatitis (ACD) due to (meth)acrylates is a well known issue for adults, both beauty technicians and consumers.[4] For the latter, the use of home kits for UV-curing gel nails is most likely worse than aesthetician procedures performed in professional nail salons. During self-application or during application by untrained people, there is a higher risk that the gel containing acrylate monomers overflows from the nail plate and comes in contact with the periungual skin, enhancing sensitisation. ACD to (meth)acrylates is rarely described in childhood and adolescence.[2,3,5-7]

A 14-year-old non atopic girl referred to us with a 1-week-history of itchy eczematous dermatitis of the hands, particularly involving periungual regions of all fingers and some fingertips (Fig. 1a,b,c). Face, mainly eyelids and lips, were also involved (Fig. 1d). The history revealed that for 6 months she was applying gel nails every 20 days to herself utilizing a home UV-curing kit received as a birthday gift. Dermatitis cleared within 2 weeks after removing the gel nail and with mometasone furoate cream (once daily) and cetirizine tablets (10 mg/day). One month later, patient was patch tested with SIDAPA (Società Italiana di Dermatologia Allergologica, Professionale e Ambientale) baseline series and with acrylates series; readings were done on day (D)2, D4, and D7.[8] At D4, we observed positive reactions to 2-hydroxyethyl methacrylate 2% pet. (+++) contained in baseline series and to all tested (meth)acrylates: ethylene glycol dimethacrylate 2.0% pet. (+++), hydroxypropyl methacrylate 2.0% pet. (+++), urethane dimethacrylate 2.0% pet. (++), triethylene glycol dimethacrylate 2.0% pet. (++), methyl methacrylate 2% pet. (++). No new positive reactions at D7 were observed.

(Meth)acrylates are reactive monomers that polymerize spontaneously or on UV-light exposure to form products, such as plastics, glues, textiles, medical devices, and artificial nails.[3-5,9,10] These polymers are normally inert and non sensitizing, and sensitization can occur in case of incomplete curing of the monomers, sometimes present as impurities in the final product.[3]

This article is protected by copyright. All rights reserved

Regarding artificial nails, the availability of UV-light emitting home-curing kits increased this risk. In fact, these cheap kits without any calibration or service advice, may not allow a complete polymerization with the residual monomers able to induce sensitization.[3] Moreover, the (meth)acrylates concentration in gel nails can be higher than 90%[2] and users apply and remove these artificial nails themselves, as our young patient.

Only exceptional cases of ACD due to nail (meth)acrylates were described in children and they are also very rare in adolescents.[2,3,5-7] To the best of our knowledge, 8 females were reported, including ours: 2 children and 6 adolescents (mean age: 13.8; range: 10 -17 years) (Table1).[2,3,5-7] Only in 2 cases the face was also affected, probably due to accidental contact with contaminated hands or to airborne exposure during the gel nail removing phase.[3] Conversely to what observed in adults,[2] in these 8 young patients onycholysis, paronychia, or permanent nail dystrophy were not reported. Occupational exposure was identified only in 1 of them: an English girl employed as beauty technician.[3] Even if the 8 subjects were not homogeneously tested, 2-HEMA resulted the most frequently positive (meth)acrylate. 2-HEMA is the best single patch test allergen to detect ACD from (meth)acrylates in gel nails.[11] Other patch test reactions are frequent, both due to cross-reactions and possible concomitant sensitisation, as gel nails contain many different (meth)acrylates.

In conclusion, the widespread use of gel nails and the recent marketing of home-use UV-curing kits that makes this technique readily available to children and adolescents, expose them to high risk of (meth)acrylates sensitization.[12] The fashion of sculptured gel nails has harmful consequences for these young people in different aspects of their future life in terms of occupation, hobbies, and medical needs.

Accepted Article

This article is protected by copyright. All rights reserved

Accepted Article

References

1. Dinani N, George S. Nail cosmetics: a dermatological perspective. *Clin Exp Dermatol* 2019; **44**: 599-605.
2. Dahlin J, Berne B, Dunér K, *et al.* Several cases of undesirable effects caused by methacrylate ultraviolet-curing nail polish for non-professional use. *Contact Dermatitis.* 2016; **75**: 151-156.
3. Muttardi K, White IR, Banerjee P. The burden of allergic contact dermatitis caused by acrylates. *Contact Dermatitis* 2016; **75**: 180-184.
4. Stingeni L, Tramontana M, Bianchi L, *et al*. Contact sensitivity to 2-hydroxyethyl methacrylate in consecutive patients: a 1-year multicentre SIDAPA study. *Contact Dermatitis* 2019; **81**: 216-218.
5. Spencer A, Gazzani P, Thompson DA. Acrylate and methacrylate contact allergy and allergic contact disease: a 13-year review. *Contact Dermatitis* 2016; **75**: 157-164.
6. Alves F, Morgado F, Ramos L, Gonçalo M. Hand eczema from nail (meth)acrylates in an 11-year-old child. *Contact Dermatitis* 2020; **82**: 315-316.
7. Romita P, Foti C, Barlusconi C, Hansel K, Tramontana M, Stingeni L. Contact allergy to (meth)acrylates in gel nail polish in a child: An emerging risk for children. *Contact Dermatitis* 2020; **83**: 39-40.
8. Stingeni L, Bianchi L, Hansel K, *et al*. Italian guidelines in patch testing - adapted from the European Society of Contact Dermatitis (ESCD). *G Ital Dermatol Venereol* 2019; **154**: 227-253.
9. Hansel K, Tramontana M, Bianchi L, et al. Contact sensitivity to electrocardiogram electrodes due to acrylic acid: A rare cause of medical device allergy. *Contact Dermatitis.* 2020; **82**: 118-121.
10. Tramontana M, Hansel K, Bianchi L, Agostinelli D, Stingeni L. Allergic contact dermatitis caused by a glucose monitoring system: an emerging side-effect of diabetes medical devices. *J Eur Acad Dermatol Venereol*. 2020; **34**: e223-e225.
11. Gonçalo M, Pinho A, Agner T, *et al*. Allergic contact dermatitis caused by nail acrylates in Europe. An EECDRG study. *Contact Dermatitis*. 2018; **78**: 254-260.
12. Gatica-Ortega ME, Pastor-Nieto MA, Mercader-García P, Silvestre-Salvador JF. Allergic contact dermatitis caused by (meth)acrylates in long-lasting nail polish - are we facing a new epidemic in the beauty industry? *Contact Dermatitis* 2017; **77**: 360-366.

This article is protected by copyright. All rights reserved

Accepted Article

Legends

Figure 1 Eczematous dermatitis of the hands (a), particularly involving periungual regions of all fingers (b) and some fingertips (c), and face, mainly eyelids and lips (d)

Table 1 Allergic contact dermatitis due to gel nail (meth)acrylates in the 2 children and 5 adolescents reported in literature and our case

This article is protected by copyright. All rights reserved

Accepted Article

Authors, years	Age, gender	Morphology of skin lesions	Atopy (Y/N)	Localization	Occupational (Y/N)	Positive (meth)acrylates to PT
Dahlin J,[2] 2016	15, F	NS	NS	NS	N	2-HEMA, urethane acrylates Di-HEMA trimethylexylcarbamate, Di-HEMA trimethylexylcarbamate,
	11, F	NS	NS	NS	N	Di-HEMA trimethylexylcarbamate
Muttardi K,[3] 2016	17, F	NS	N	Periungual regions, fingertips	Y	2-HEMA, EGDMA, 2-HPA
Spencer A,[5] 2016	15, F	NS	Y	Hands	N	NS
	17, F	NS	N	Hands, face	N	NS
Alves F,[6] 2020	11, F	Eczematous	Y	Fingers (dorsal aspect)	N	2-HEMA, HPMA, EGDMA, HEA, UDMA
Romita P,[7] 2020	10, F	Eczematous with vesicular and bullous lesions	N	Fingertips, thumb (dorsal aspect)	N	2-HEMA, HPMA, EGDMA
Our case, 2021	14, F	Eczematous	N	Periungual regions, fingertips, hands (dorsal aspect), face	N	2-HEMA, EGDMA, HPMA, UDMA, TREGDMA, MMA

PT, patch test; NS, not specified

2-HEMA: 2-hydroxyethyl methacrylate, HPMA: hydroxypropyl methacrylate, EGDMA: ethyleneglycol dimethacrylate, HEA: hydroxyethylacrylate, UDMA: urethane dimethacrylate, 2-HPA: 2-hydroxypropyl acrylate, TREGDMA: triethylene glycol dimethacrylate, MMA: methyl methacrylate

This article is protected by copyright. All rights reserved

Accepted Article

jdv_17429_f1.jpg

This article is protected by copyright. All rights reserved