

CONTACT POINT

Nail dystrophy mimicking psoriatic disease caused by contact allergy to nail varnish allergens including copolymers

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CASE REPORT

A 60-year-old lady, who worked as a receptionist in a beauty salon, was referred for consideration of patch testing. She had a 4-year history of fingernail dystrophy and finger-tip dermatosis, affecting multiple digits on both hands. A nail bed biopsy was suggestive of psoriasis. She had subsequently been treated with intralesional steroid injections, topical psoralen+UVA, acitretin, methotrexate, apremilast, and adalimumab without improvement. She denied recent personal use of acrylic nails, having last applied gel and glue-on nails 2 years previously when advised to stop; however, she had been regularly applying other nail varnish to disguise the appearance of the nails.

Patch testing was undertaken using IQ-Ultra patch test chambers (Chemotechnique Diagnostics, Vellinge, Sweden) to our local baseline, anti-infective, excipient, rubber, finger-tip, acrylate nail, cosmetic, and fragrance series. The results are summarised in Table 1. Positive reactions (+ or greater) were also found to diallyl disulphide 1% pet. and several fragrances (linalool hydroperoxide 1% pet., limonene hydroperoxide 1% and 0.5% pet., *Melaleuca alternifolia* extract 5% pet. and *Myroxylon pereirae* 25% pet.), but these were not felt to be of current relevance.

The patient reported significant improvement after 2 months of avoidance of all nail products.

DISCUSSION

Nail cosmetics have been reported as the most common source of acrylates causing allergic contact dermatitis.¹ Usual clinical manifestations include facial and finger dermatitis. Nail dystrophy is a less common presentation and so there may be a delay in patch testing. This case adds to existing reports of formaldehyde in a nail hardener² and methacrylate in acrylic nail,^{3,4} that induced nail dystrophy, mimicking

psoriasis and dystrophy due to cyanoacrylate⁵ use. In an attempt to hide dystrophic nails, patients may continue to apply nail cosmetics and inadvertently exacerbate and prolong the problem.⁶ Our patient had been advised to avoid the use of acrylate chemicals but continued to use other nail products.

Historically, tosylamide formaldehyde resin (TSFR) was the most common cause in nail varnish but, with the change in consumer habits and exposure, it is now rare⁷ as a contact allergen. Copolymers, formed from the combination of different monomers, have been reported to cause contact allergy due to their presence in cosmetics,⁸ despite their high molecular weight. Such molecules have been used in some nail products as alternatives to TSFR; however, they have themselves been recognised as potential contact allergens.⁹ Adipic acid-neopentyl glycol-trimellitic anhydride copolymer (AA) and phthalic anhydride-trimellitic anhydride-glycols copolymer (PA) are such synthetic copolymers that increase viscosity and form a film in nail polish and varnishes. An audit testing with manufacturer-supplied AA 1% pet. and PA 1% pet. showed rates of contact allergy of AA 0.43% and PA 0.56% compared with TSFR 0.26% when tested in a cosmetic/face series.⁷ Given the relatively high rate of contact allergy to AA and PA and lack of availability of a commercial allergen, we now routinely test with nail varnish "as is" (Super Stay 3D Gel-effect plumping top coat [Maybelline L'Oreal, USA] and Spotlight Shine nail polish top and base coat [Collection Cosmetics UK], respectively) containing them, to avoid missing relevant allergy to these nail varnish copolymers. These products were specifically chosen as they do not contain other common sensitizers found in nail varnish. Although a reaction to another excipient cannot be completely excluded, we believe reactions to them indicate allergy to the known allergenic copolymer within them.

In conclusion, nail dystrophy including isolated presumed psoriatic disease is an important, but sometimes overlooked, presentation of contact allergy. This case highlights the need to consider the diagnosis

TABLE 1 Positive results of testing to nail varnish related allergens

Allergens	Vehicle and dilution	D2	D4
2-Hydroxyethyl methacrylate	2% pet.	++	++
Methyl methacrylate	2% pet.	+	+
2-Hydroxypropyl methacrylate	2% pet.	+	+
Ethyleneglycol dimethacrylate	2% pet.	+	+
Triethyleneglycol dimethacrylate	2% pet.		+
1,4-Butanediol diacrylate	2% pet.	?+	+
Urethane methacrylate	2% pet.	?+	+
1,6-Hexanediol diacrylate	0.1% pet.	+	+
Tetrahydrofurfuryl methacrylate	2% pet.	?+	+
Tetraethylene glycol dimethacrylate	2% pet.	?+	+
N-butyl acrylate	0.1% pet.	+	+
Ethyl methacrylate	2% pet.	+	+
Ethyl acrylate	0.1% pet.	+	+
2-Hydroxyethyl acrylate	0.1% pet.	+	+
Triethyleneglycol diacrylate	0.1% pet.	+	+
Isobornyl acrylate	0.1% pet.		+
Ethyl cyanoacrylate	10% pet.	?+	+
Tosylamide formaldehyde resin	10% pet.	+	+
Adipic acid/neopentyl glycol/trimellitic anhydride copolymer	Nail varnish ^a (as is)	+	+
Phthalic anhydride/trimellitic anhydride/glycols copolymer	Nail varnish ^b (as is)	+	+

Note: Six other acrylates tested were negative.

^aSuper Stay 3D Gel-effect plumping top coat, (Maybelline, L'Oreal, USA).

^bSpotlight shine nail polish top and base coat, (Collection Cosmetics, UK), both applied to IQ-Ultra patch test chambers, allowed to dry, then occluded.

in patients with a history of nail varnish exposure, to prevent unnecessary investigation and systemic treatment. It also provides further evidence that copolymers found in nail products are important sensitising agents and should be screened for routinely in relevant patients.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

James Coe: Project administration; writing - original draft; writing-review & editing. **Rachael Robinson:** Project administration; writing-review & editing. **Stephen Wilkinson:** Supervision; writing - original draft; writing-review & editing.

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