

Itching for nail fashion: chronic urticaria and chronic hand dermatitis secondary to acrylate and methacrylate allergy in gel nail varnish

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Summary

Allergic contact dermatitis (ACD) secondary to acrylates and methacrylates is a well-described occurrence, particularly in those who wear or handle gel nail varnish. Management involves avoidance of the identified allergen. The cause of chronic urticaria (CU) is often not identified, and CU is not known to be associated with acrylates or methacrylates. We report a case of a 50-year-old woman who initially presented with hand dermatitis exacerbated by gel nail varnish on a background of CU. Avoiding all nail varnishes because of her ACD also resulted in improvement of her CU. To our knowledge, this is the first documented case of CU secondary to the acrylates and methacrylates found in nail cosmetics.

Contact dermatitis has a prevalence of approximately 20%,¹ and hand dermatitis has a prevalence¹ of 2%. Allergic contact dermatitis (ACD) is known to be less common than irritant contact dermatitis, but it has a worse prognosis. Investigations and management for ACD focus on identifying and avoiding the causative agent.¹ Chronic urticaria (CU) is defined as urticaria that has been present continuously or intermittently for at least 6 weeks.² It has an estimated incidence of 1.4%. Contrary to ACD, investigations for CU typically focus on excluding underlying diseases.² We report a patient with ACD secondary to nail varnish, whose CU also improved after avoidance of nail cosmetics.

Report

A 50-year-old woman presented with a 6-month history of erythema and tenderness on her fingers and other areas on her hands. The symptoms were

primarily adjacent to her fingernails, which were lifting from the nail bed. The patient had been using gel nails for over 2 years, but the nails had only recently become symptomatic. She reported that the symptoms improved when she removed her nail varnish and worsened when it was reapplied; she was now using it to hide her thickened nails. Her general practitioner had ordered analysis of her nail clippings, which did not show any evidence of fungal infection. The patient also had an 18-month history of chronic urticaria (CU) of unknown cause, for which she was being managed by an immunologist. The patient's CU had initially been treated with high-dose antihistamines with no effect, and she had subsequently been commenced on hydroxychloroquine. This was then changed to mycophenolate with only moderate improvement. She had no personal or family history of psoriasis.

At the initial physical examination, bilateral erythema was seen on the patient's hands, with mild swelling of most fingertips (Fig. 1a). She also had splits on several fingers. Her fingernails appeared thickened beneath the gel nail varnish (Fig. 1b). The patient had evidence of urticaria on examination and demonstrated dermographism on testing. There was no clinical evidence of psoriasis.

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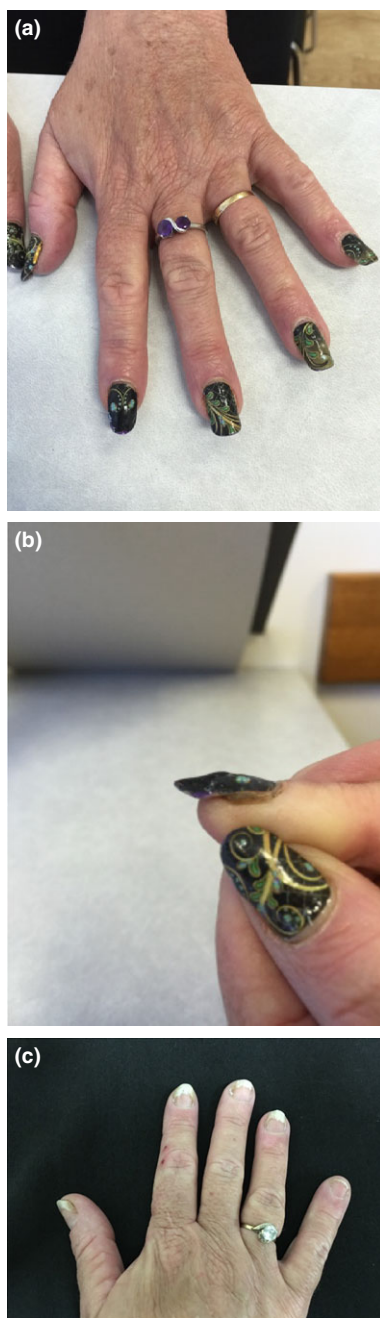


Figure 1 (a) Erythema and swelling of the distal portion of all fingers of the left hand; (b) thickening of the fingernails beneath the gel nail varnish; (c) dystrophic and discoloured nails with surrounding erythema on the right hand.

On subsequent examination of the patient wearing no nail varnish, all of the fingernails appeared significantly dystrophic and discoloured, with associated erythema and oedema around the nail bed and cuticle (Fig. 1c).

The provisional diagnosis was ACD. The differential diagnoses included irritant contact dermatitis;

Table 1 Patch testing results for nail allergens.

Testing allergen	Day 3	Day 5
Butyl acrylate	+	+
Ethyl methacrylate	+	+
<i>n</i> -Butyl methacrylate	+	+
2-Hydroxypropyl methacrylate	+	+
Ethyleneglycol dimethacrylate	+	+
Triethyleneglycol dimethacrylate	—	+
1,6-Hexanediol diacrylate	+	+
Trimethylolpropane triacrylate	—	—
Tetrahydrofurfuryl methacrylate	+	+
Ethyl acrylate	—	—
2-Hydroxyethyl acrylate	+	+
Triethyleneglycol diacrylate	+	+
Methyl methacrylate	+	+
Ethyl cyanoacrylate	—	—

acrodermatitis continua of Hallopeau, lupus erythematosus and dermatomyositis.

Patch testing was performed on the patient using the Australian Baseline Series (ABS) and the acrylate and methacrylate series for nails. The patient was advised to cease her mycophenolate treatment 4 weeks before testing. The ABS demonstrated strong reactions to benzocaine, tea tree oil, dipentene and methylisothiazolinone (MI), and significant reactions to all but three nail allergens (Table 1; Fig. 2).

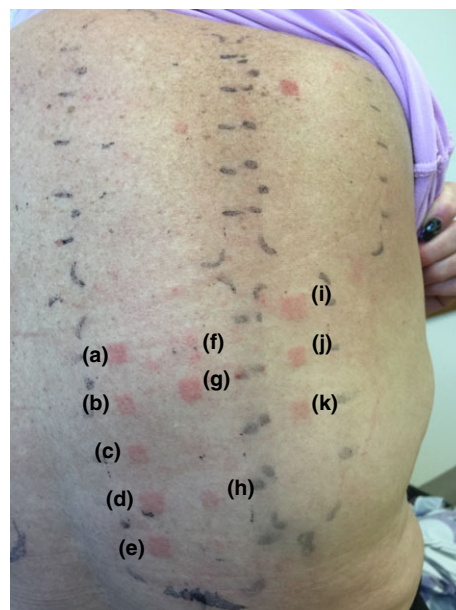


Figure 2 Positive reactions on Day 5 of patch testing to (a) butyl acrylate, (b) ethyl methacrylate, (c) *n*-butyl methacrylate, (d) 2-hydroxypropyl methacrylate, (e) ethyleneglycol dimethacrylate, (f) triethyleneglycol dimethacrylate, (g) 1,6-hexanediol diacrylate, (h) tetrahydrofurfuryl methacrylate, (i) 2-hydroxyethyl acrylate, (j) triethyleneglycol diacrylate and (k) methyl methacrylate.

The patient was diagnosed with ACD secondary to the acrylates and methacrylate monomers that were positive on patch testing. She was advised to stop using any nail varnish and to avoid other allergens to which she demonstrated a strong reaction. She was also given information about avoiding MI, which is found in many cosmetic and household items, particularly wet wipes, detergents and hair-care products.³

At the follow-up examination, 8 weeks after stopping use of the gel nails, the patient's own nails were growing normally and the erythema of her fingers had completely subsided. Additionally, there was no evidence of CU, and the patient reported that the CU had completely resolved approximately 4 weeks after ceasing the use of gel nails. She also stated that in retrospect, she had noticed that her CU worsened when she applied gel nails.

The timeline of the patient's gel nail use and development of her CU, coupled with the benefit of hindsight, indicates that the gel nails were contributory. Although the patient did not report eliminating any other products from her environment, it is possible that the avoidance of MI and other allergens could have contributed to the resolution of symptoms. It is also possible that the patient's CU could have resolved spontaneously. However, we believe that it is more likely that the patient's CU was secondary to recurrent and prolonged exposure to acrylates and methacrylates.

Gel nail varnishes, such as Shellac™, have become increasingly popular in the past 5 years as they are odourless and resistant to chipping. Gel nails use a base that contains ultraviolet (UV)-curable methacrylate or acrylate monomers.⁴ ACD secondary to the acrylates and methacrylates in gel nails is well-known to occur in consumers and nail technicians.⁵ Acrylates and methacrylates are also present in paints, dental prostheses and the cement used in orthopaedic procedures, and cases of ACD have also been described in dental technicians, dental patients and theatre nurses.⁵

The most common acrylates and methacrylates that generate a positive reaction on patch testing in the nail series are 2-hydroxyethyl methacrylate, 2-hydroxypropyl methacrylate and hydroxyethyl acrylate.⁶ Although our patient was not tested for 2-hydroxyethyl methacrylate, evidence suggests significant cross-reactivity between 2-hydroxyethyl and 2-hydroxypropyl methacrylates.

Although there have been many cases of ACD associated with acrylates and methacrylates, these chemicals are not known to cause CU.⁵ There is one

reported case of CU secondary to methyl methacrylate in a dental prosthesis,⁷ and six patients were described as having contact urticaria secondary to acrylates.^{8,9} Another report described a 15-day course of urticaria due to a methyl methacrylate allergy.¹⁰

CU occurs secondary to the release of histamine from skin mast cells. Studies have demonstrated that 30–50% of patients with CU produce antibodies against the high-affinity IgE receptor.² The aetiological and prognostic implications of this finding remain unclear. Most commonly the underlying cause is not identified.² CU is very rarely the result of an IgE-mediated allergy (Type 1 hypersensitivity) to food, drugs or other allergens; this rare form of IgE mediated CU may be better classified as 'recurrent acute urticaria'.²

Despite knowledge of the pathogenesis, investigations for CU are not routinely recommended unless history or examination suggest underlying systemic processes or a specific environmental allergen.² If an IgE-mediated response to a certain allergen is suspected, IgE or skin-prick testing may be performed. Symptomatic management with antihistamines is the first-line treatment.

To our knowledge, this is the first reported case of CU secondary to acrylates and methacrylates in gel nails. The immunological pathogenesis of this case cannot be stated for certain without skin-prick testing, which would involve re-exposure to the allergen. However, this case shows that such allergens should also be considered as a compounding factor for CU if the timeline corresponds with possible exposure.

Learning points

- ACD secondary to acrylates and methacrylates is well documented.
- People who apply or wear acrylic or gel nails constitute the most likely population to have ACD secondary to acrylates or methacrylate.
- Allergy to acrylates or methacrylates can be diagnosed by patch testing.
- CU is typically idiopathic, and no causative allergen is identified.
- CU may possibly result from allergy to acrylates or methacrylates.
- Diagnosis of acrylate or methacrylate allergies can play a role in CU in certain patients.

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