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BRIEF REPORTS

The rising trend in allergic contact dermatitis to acrylic nail products

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ABSTRACT

Shellac is a newly available type of long-wearing nail polish, which is becoming increasingly popular. We describe four cases of allergic contact dermatitis (ACD) to acrylates found in Shellac nail products, involving three beauticians and one consumer who purchased the product over the internet. Increasing use of these new acrylic nail products means that dermatologists need to be aware of the possibility of ACD occurring. Testing with hydroxyethyl methacrylate alone, which is included in the Australian Baseline Series, is adequate for screening for acrylate allergy.

INTRODUCTION

Acrylates have been in use since the 1930s[1] and allergic contact dermatitis (ACD) to artificial nail components was first reported in 1955.[2] ACD to acrylic products used in artificial nails is uncommon but well recognised.[3–5] Four patients were assessed in our occupational dermatology clinic over consecutive months and all were diagnosed with ACD to acrylic nail products.

MAIN TEXT

A 23-year-old beautician presented with a 6-month history of dermatitis affecting all fingers of both hands. Her past history included hay fever and atopic eczema. Her work required the application of nail treatments, including Shellac products, after-wax creams and facial moisturizers. The patient was patch-tested to the Australian baseline series,[6] the acrylate series, relevant cosmetic ingredients, and her own samples, appropriately diluted. Patch-testing was performed using Allerg-EAZE patch test chambers (SmartPractice, Phoenix, AZ, USA). Patch test results were read at 48 and 96 h. The patient reacted to hydroxyethyl methacrylate (2+), methyl methacrylate (2+), hydroxypropyl methacrylate (2+), a diluted sample of her own acrylic nail gel (2+), methylchloroisothiazolinone/methylisothiazolinone (MCI/MI) (1+), MI (2+), nickel (1+), Aspect Advanced Moisturiser (1+) and Aspect B17 serum (2+) (Aspect Skincare International, Melbourne, Australia. The diagnoses made were:

1 ACD to acrylates in nail products including Shellac
2 ACD to Aspect Extreme B17 serum
3 ACD to Aspect Advanced moisturiser
4 allergy to MCI/MI and MI, unknown relevance
5 allergy to nickel, past relevance

A 35-year-old beautician, who had worked as a nail technician for the previous 18 months, presented with a 12-month history of dermatitis involving the fingers and palms of both hands with painful fissuring of her fingers. She had recently been trained in applying biosculpt acrylic gels and Shellac nail polish. She had no history of atopy but reported itchiness of her hands when using powdered latex gloves. She was patch-tested to the Australian baseline series,[6] the acrylate series, relevant cosmetic ingredients and many of her own appropriately diluted samples. She did not react to latex on radioallergosorbent (RAST) testing. The patient reacted to hydroxyethyl methacrylate (2+), nickel (2+) and formaldehyde (1+). The diagnoses made were:

1 ACD to acrylates in nail products including Shellac
2 allergy to nickel, unknown relevance
3 allergy to formaldehyde, unknown relevance

Interestingly, this patient thought that acrylates were present in only nail powder products and not gels.

Abbreviations:

ACD	allergic contact dermatitis
MCI	methylchloroisothiazolinone
MI	methylisothiazolinone
RAST	radioallergosorbent

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A 20-year-old beauty therapist, who had 4 years' experience in nail treatments and waxing, presented with a 6-week history of dermatitis affecting the thumb, index and middle fingers of her right hand and the index finger of her left hand. She also reported rashes affecting her thigh, foot and chest. She had started working with a new brand of Shellac products 3 months prior to presentation and also wore non-powdered latex gloves at work. There was no history of atopy. Patch-testing to the Australian baseline series,[6] rubber series, acrylate series and the patient's own samples, diluted appropriately, including her nail polishes, showed positive reactions to hydroxyethyl methacrylate (3+), ethylene glycol dimethacrylate (3+), Blue Sky shellac topcoat (3+) (Guangzhou Bluesky Chemical Technology, Zhongluotan, Guangzhou, China) and nail polish (3+). A latex RAST was negative. The diagnosis made was ACD to acrylates in nail products, including Shellac.

Unfortunately, a trial of wearing two pairs of nitrile gloves did not provide her with adequate skin protection, resulting in her resignation from work and lodging an application for workers' compensation.

The final patient was a 24-year-old nurse who presented with a 4-week history of dermatitis of her fingers and feet and paraesthesia of her fingertips 3 days after applying Shellac gel nails from a kit she had purchased online. She has past history of childhood eczema and mild hand dermatitis to alcohol rubs. Patch-testing to the Australian baseline series,[6] the acrylate series and the patient's own samples, appropriately diluted, revealed positive reactions to hydroxyethyl methacrylate (2+) hydroxypropyl methacrylate (1+), ethylene glycol dimethacrylate (1+) and butanediol diacrylate (1+). The diagnosis made was ACD to acrylates in nail products, including Shellac.

Table 1 Number of positive reactions in our 14 beauticians patch-tested to the acrylate series

Allergen	Abbreviations	Number of positive results to tested allergen (of 14 cases)
Hydroxyethyl methacrylate	HEMA	14
Ethylene glycol dimethacrylate	EGDMA	11
2-hydroxyethyl acrylate	2-HEA	10
2-hydroxypropyl methacrylate	2-HPMA	9
Triethylene glycol diacrylate	TREGDA	8
Triethylene glycol dimethacrylate	TREGDMA	8
Ethyl acrylate	EA	6
Tetrahydrofurfuryl methacrylate	THFMA	4
Ethyl methacrylate	EMA	4
Methyl methacrylate	MMA	3
1,6-hexanediol diacrylate	1,6-HDDA	2
Trimethylolpropane triacrylate	TMPTA	2
Butyl acrylate	BA	1

DISCUSSION

Although it has been recognized for more than 50 years that acrylates can cause ACD, they are still relatively uncommon allergens. Over a 20-year period (1993–2013), 1320 of a total of 8334 patients were patch-tested at the Skin and Cancer Foundation Victoria to acrylates, and only 57 (4.3%) had positive reactions, of whom 14 were beauticians. Patients with positive reactions to hydroxyethyl methacrylate were found to also react to ethylene glycol dimethacrylate, 2 hydroxyethyl acrylate, 2 hydroxypropyl methacrylate, trithylene glycol diacrylate and triethylene glycol dimethacrylate (Table 1). On the basis of our results, we believe that patch-testing to hydroxyethyl methacrylate, which is now included in the Australian baseline series,[6] is sufficient to diagnose acrylate allergy. This reduces the number of uncomfortable cross-reactions that are often encountered when patch-testing acrylates. A rising trend in ACD to acrylic nail products has also been reported in Spain recently.[7]

It is the acrylic monomers, not polymers, that are associated with sensitization.[8] Use of UV light for curing is indicative that acrylic monomers are being used. None of our patients, all of whom were exposed to acrylate chemicals, had any idea that allergy to acrylates could occur. A list of currently marketed nail products containing acrylates is shown in Table 2. The use of safety masks, suitable clothing and protective gloves needs to be promoted in this

Table 2 Lists of ingredients/allergens of marketed nail products

Nail products	Ingredients/allergens
Acrylic nails Artificial nail enhancement created from a mixture of liquid and powder acrylates No light for curing required	Consist of liquid acrylate monomers (including hydroxyethyl methacrylate), powder polymers (polymethyl methacrylate) and resin modifiers (ethylene glycol dimethacrylate) ± initiator (benzoyl peroxide)
Gel nails Artificial nail enhancement created from a mixture of acrylate monomers Required UV light for curing	Consist of hydroxyethyl methacrylate, hydroxypropyl methacrylate, polyurethane acrylate oligomer (resin)
Crystalline nails Artificial nail enhancement done with clear acrylic or gels overlay with clear tips	As per gel or acrylic nails
Porcelain nails Artificial nail enhancement done with gels or acrylic ± UV gel top coat	As per gel or acrylic nails
Diamond nails Artificial nail enhancement with acrylic	As per acrylic nails
Shellac nails Artificial nail enhancement with gel nails registered to the trademark of Creative Nail design	As per gel nails

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occupational group. 4H gloves offer the greatest protection against acrylates; however, they are too bulky for salon use.[9] Wearing two pairs of disposable gloves, including at least one pair of nitrile gloves, has been recommended.[10] Misperceptions regarding the presence or absence of acrylates in gels or other UV-curing nail products need to be clarified, particularly in the industry publications that reach the target audience of nail technicians and beauty therapists. We have produced educational material targeted at the industry on our website (http://www.occderm.asn.au) in order to raise awareness of this issue among beauty therapists and also dermatologists. Finally, we highlight our particular concerns over the last case, where ACD to acrylates from Shellac products occurred in a consumer who purchased these products over the internet.

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