

CONCISE COMMUNICATION

Occupational contact dermatitis in a manicurist

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ABSTRACT

We report a case of a manicurist who developed an allergic skin reaction to acrylates, manifested by itchy erythema, papules, vesicles and fissures on her hands, fingertips, forearm and eyelids. Patch tests showed positive reactions to three nail products used: ethylene glycol dimethacrylate, 2-hydroxyethyl methacrylate, ethyl acrylate and 2-hydroxyethyl acrylate in (meth)acrylate series. By using gel nail products, our patient became sensitized to 2-hydroxyethyl methacrylate. We assume that this had been the trigger, leading to the occurrence of cross-reactions between numerous acrylates including ethylene glycol dimethacrylate, ethyl acrylate and 2-hydroxyethyl acrylate. When handling nail products, it is necessary to prevent airway sensitization, contact sensitization and cross-reaction between various acrylates.

Key words: 2-hydroxyethyl methacrylate, acrylates, cross-reaction, manicurist, occupational contact dermatitis.

INTRODUCTION

Acrylates are a well-known cause of occupational contact dermatitis. Acrylate products are widely used in various industries as glues, nail products, dentistry and cosmetics. Here, we present the case of a manicurist who developed an allergic skin reaction to acrylates.

CASE REPORT

A 41-year-old Japanese woman, who had been working as a manicurist for 2 years, presented with a 1-year history of itchy erythema and papules on her hands, fingertips and forearm. (Fig. 1a). Thereafter, vesicles and fissures appeared in the same location. Similar symptoms were evident on the head, face and neck 4 months after onset of the lesions on her hands, fingertips and forearm.

Her symptoms had appeared after working with sculptured nails and gel nails.

We performed an open patch test using seven kinds of nail products and a (meth)acrylate series in accordance with the International Contact Dermatitis Research Group recommendations. The results of the patch tests are shown in Table 1. Doubtful reactions in the open patch test were seen for acrylic liquid, acrylic powder and nail prep on day 1. Positive reactions in the closed patch test were also seen for ethylene glycol dimethacrylate (EGDMA), 2-hydroxyethyl methacrylate (2-HEMA), ethyl acrylate (EA) and 2-hydroxyethyl acrylate (HEA) on days 2 and 3 (Table 1, Fig. 1b). Negative results were

obtained for tetrahydrofurfuryl methacrylate, triethylene glycol diacrylate, ethyl cyanoacrylate (ECA), methyl methacrylate, triethylene glycol dimethacrylate, butyl acrylate, ethyl methacrylate (EMA), butyl methacrylate, 1,6-hexanediol diacrylate and trimethylolpropane triacrylate. There were no immediate responses after 20–30 min in the open patch test. Doubtful reactions in the open patch test were seen for nail prep on day 1. The main constituent of nail prep is isopropanol, and acrylate is not included. A repeated open application test (ROAT) was performed on the flexor forearm with isopropanol 70% aq. for skin optimum density (application twice a day for 7 days). The result of the ROAT was negative.

DISCUSSION

Artificial nails can be divided into three types: sculptured nails, gel nails and nail tips. First, sculptured nails are artificial nails made by mixing a liquid acrylic monomer and a powdery acrylic monomer, followed by polymerization and hardening; many are composed mainly of EMA. Second, gel nails are artificial nails cured by ultraviolet A irradiation after applying a gel-like acrylic resin. Most gel nails contain 2-HEMA, which is not included in sculptured nails. Nail tips are plastic artificial nails that are glued onto real nails using a cyanoacrylate adhesive.

According to the results of patch testing, we diagnosed the patient as having allergic contact dermatitis due to an acrylate mixture of acrylic liquid and acrylic powder as a preparation for sculptured nails. Because the result of the patch test was negative for EMA (the main component of sculptured nails),

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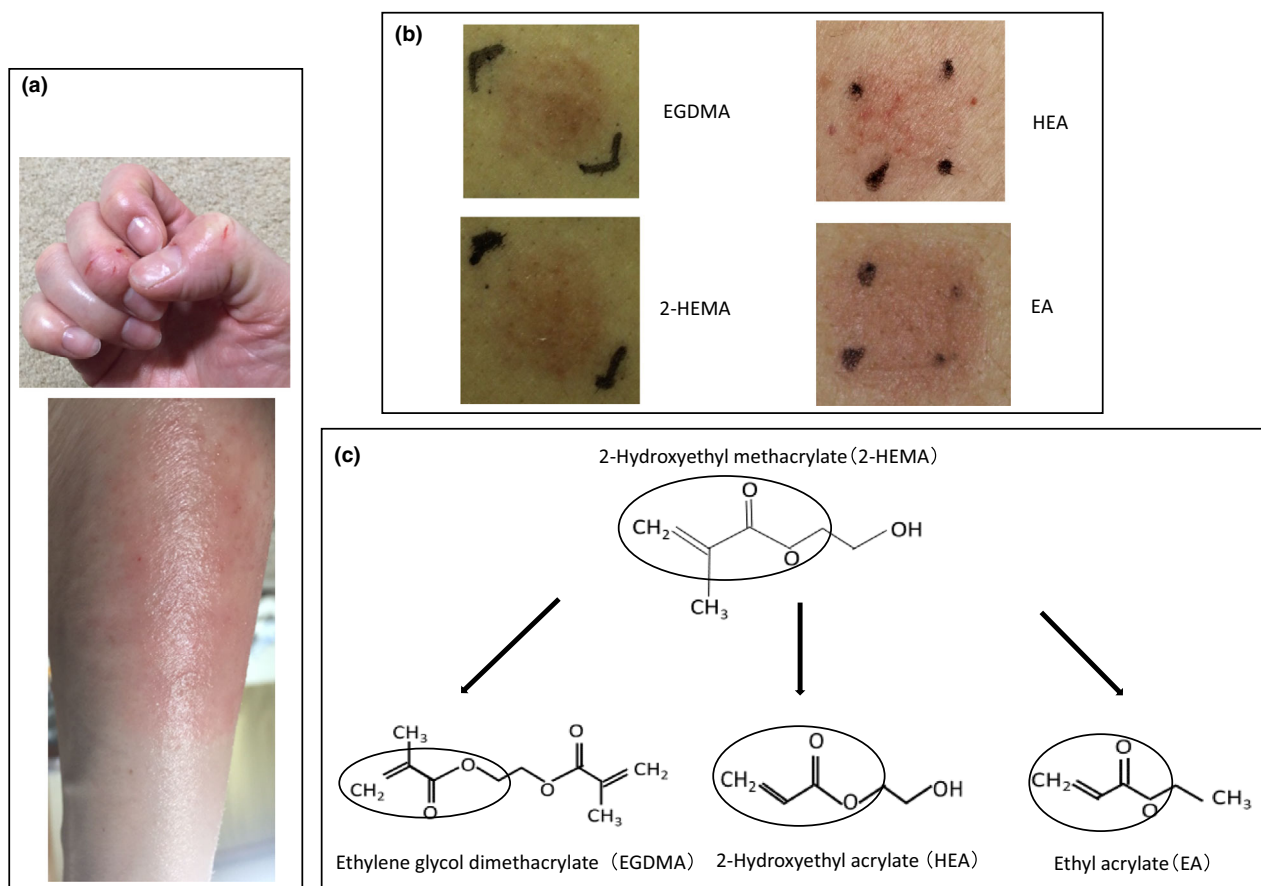


Figure 1. (a) Itchy erythema, papules, vesicles and fissures on the patient's hands, fingertips and forearm. (b) Positive reaction to the (meth)acrylate series. (c) Chemical structures of 2-HEMA, EGDMA, EA and HEA. These structures have a common component, which is enclosed by the circle.

other contaminants might have been the cause. Unfortunately, we were unable to obtain consent for disclosure of the specific ingredients from the acrylic liquid and acrylic powder suppliers. The second diagnosis was allergic contact dermatitis due to 2-HEMA in color gel A. Despite the fact that 2-HEMA was positive in the patch test, the open patch test for color gel A was negative. However, we believe that positive results would have been obtained if a closed patch test had been performed. The third diagnosis was irritant contact dermatitis due to nail prep. Because the main component, isopropanol, was negative in the ROAT, the diagnosis was irritant contact dermatitis rather than allergic contact dermatitis.

By using color gel A, our patient became sensitized to 2-HEMA. We assume that this had been the trigger, leading to the occurrence of cross-reactions between numerous acrylates including EGDMA, EA and HEA. These have common structures, which are enclosed by the circle in Figure 1(c). Cross-reactions between numerous acrylates have been reported.^{1,2}

Gel nails should be contraindicated when a positive reaction for 2-HEMA is made, as was the case in our patient. This is because gel nails often contain 2-HEMA. Recently, 2-HEMA-free gel nails have become commercially available. Because

2-HEMA is often mixed in dental materials, we recommend patients to be definitely informed of the allergy of 2-HEMA when they receive dental treatment. Sculptured nails often have EMA as their main component. Therefore, when EMA is positive in the patch test, sculptured nails should be avoided. However, gel nails and nail tips can be used. When ECA is positive in the patch test, nail tips should be avoided because cyanoacrylate is included in the adhesive. Because ECA does not cross-react with 2-HEMA and EMA, sculptured nails and gel nails can be used.³ Moreover, because ECA is the main component of the glue for eyelash extensions,⁴ we instruct patients to be cautious of this material.

When using artificial nails, patients should pay attention to sensitization through the upper respiratory tract. Acrylates have a risk of inducing airborne contact dermatitis.⁵ Therefore, eruption also appears on the face as well as the fingers in such cases. In particular, as acrylic nails require more than a day to harden, it is necessary to provide adequate ventilation to prevent airway sensitization. Our patient did not open the windows or use ventilators during nail treatment. Second, with regard to contact sensitization, nail art involves fine work, and therefore no manicurist wears gloves because they make it difficult to

Table 1. Constituents of nail products and patch test results

Products	Constituents	Acrylates	15 min	30 min	Day 1
Sculptured nails					
Acrylic liquid	Ethyl methacrylate (>80%)		-	-	+?
Acrylic powder	Acrylic ester polymer (>97%)		-	-	+?
Gel nails					
Color gel A	<u>2-HEMA</u> etc.		-	-	-
Gel off remover	Acetone etc.		-	-	-
Color gel B	Urethan (meth)acrylate oligomer etc.		-	-	-
Gel cleaner	Ethanol etc.		-	-	-
Nail prep	Isopropanol etc.		-	-	+?
(Meth)acrylate series	Days 2	Days 3	Days 7		
Ethylene glycol dimethacrylate	+	+	Pigmentation		
2-HEMA	+	+	Pigmentation		
Ethyl acrylate	+	+	Pigmentation		
2-Hydroxyethyl acrylate	+	+	Pigmentation		
Tetrahydrofurfuryl methacrylate	-	-	-		
Triethylene glycol diacrylate	-	-	-		
Ethyl cyanoacrylate	-	-	-		
Methyl methacrylate	-	-	-		
Triethylene glycol dimethacrylate	-	-	-		
Butyl acrylate	-	-	-		
Ethyl methacrylate	-	-	-		
Butyl methacrylate	-	-	-		
1,6-Hexanediol diacrylate	-	-	-		
Trimethylolpropane triacrylate	-	-	-		

Results are of patch testing using the (meth)acrylate series. Acrylates are underlined. 2-HEMA, 2-Hydroxyethyl methacrylate.

work. Additionally, acrylates can pass through any type of glove.⁶ Although gloves cannot prevent symptoms, once sensitized, it is recommended that gloves must be worn from the initial stage of a manicure. It is more difficult for acrylates to pass through nitrile gloves than through latex.⁶ Therefore, we recommend patients to use two pairs of nitrile gloves. Finally, prevention of cross-reactions is needed. We advise patients to avoid contact lenses, paint, acrylic fibers, eyelash extensions and other items containing acrylate because of possible cross-sensitization.

After she received our advice, her symptoms became less severe. Although no eruption was noted on the scalp, face or neck, erythema still appeared on the fingers. Overall, her symptoms are under control, and the patient can continue her work.

Acrylates are mixed into various items used in daily life, and therefore there are many opportunities for sensitization and cross-reactions with acrylates. Overall, guidance for daily life while carefully taking sensitizing substances into account is required.

CONFLICT OF INTEREST: None declared.

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