

ORIGINAL ARTICLE

Allergic contact dermatitis caused by acrylic-based medical dressings and adhesives

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Background: Acrylates and methacrylates are acrylic resin monomers that are known to induce skin sensitization as a result of their presence in different materials, such as nail cosmetics, dental materials, printing inks, and adhesives. Allergic contact dermatitis resulting from the use of modern wound dressings containing them has only rarely been reported.

Objectives: To describe 2 patients who developed allergic contact dermatitis caused by acrylic-based modern medical dressings and/or adhesives.

Methods: The medical charts of patients observed since 1990 were retrospectively reviewed for (meth)acrylate allergy resulting from contact with such materials, and their demographic characteristics and patch test results were analysed.

Results: Two patients were observed in 2014 and 2016 who had presented with positive patch test reactions to several acrylic-based dressings and/or adhesive materials, and to several (meth)acrylates, that is, hydroxyethyl acrylate, hydroxyethyl methacrylate, ethyleneglycol dimethacrylate, bisphenol A-glycidyl methacrylate/epoxy-acrylate, urethane diacrylate, and/or pentaerythritol acrylate.

Conclusions: Allergic contact dermatitis needs to be considered in patients with eczematous reactions or delayed healing following the use of acrylic-based modern dressings or adhesives. However, identification of the culprit allergen is hampered by poor cooperation from the producers, so adequate labelling of medical devices is an urgent necessity.

KEYWORDS

acrylates, adhesive, allergic contact dermatitis, medical device, methacrylates, monomers, wound dressings

1 | INTRODUCTION

Acrylates and methacrylates, henceforth referred to as (meth)acrylates, are used in skin adhesives and also in wound dressings that absorb wound fluids, keeping the wound bed dry, which are often commercialized as “hypoallergenic”, non-latex-containing or non-colophonium-containing materials. However, they have become more recent sources of (meth)acrylate contact dermatitis.^{1,2} We here describe 2 such cases.

2 | METHODS

The medical charts of patients observed in our department since 1990 were retrospectively reviewed for (meth)acrylate allergy resulting from

contact with such materials. The patients were tested with the European baseline series, with ingredients of topical products used, and with a (meth)acrylate series, as shown in Table 1; subject 1 was also tested with carba-mix, diphenylthiourea, and hydroquinone monobenzyl ether, which are also potential allergens in adhesives, and subject 2 was also tested with pentaerythritol triacrylate. Moreover, testing “as is” was also performed with available pieces of the adhesives used.

Test substances were obtained from Trolab Allergens (previously Almirall Hermal, Reinbeck, Germany; now SmartPractice Europe, Barsbüttel, Germany) and/or Chemotechnique Diagnostics (Vellinge, Sweden). The patch tests were applied on the patient's back with IQ Ultra Chambers (Chemotechnique Diagnostics), and fixed with Mefix (Mölnlycke Health Care, Göteborg, Sweden). Patch test readings were performed according to the international guidelines of the ESCD³ on day (D) 2 and D4, and, if possible, also later.

TABLE 1 (Meth)acrylate series tested in our department

1	Methyl methacrylate	2%	pet.
2	2-Hydroxyethyl methacrylate	2%	pet.
3	Ethyleneglycol dimethacrylate	2%	pet.
4	Bisphenol A-glycidyl methacrylate	2%	pet.
5	Urethane dimethacrylate (aromatic)	2%	pet.
6	Ethyl cyanoacrylate	2%	pet.
7	2-Hydroxyethyl acrylate	0.1%	pet.
8	Ethyl acrylate ^a	1%	pet.
9	2-Hydroxypropyl methacrylate ^a	2%	pet.
10	Triethyleneglycol diacrylate ^a	0.1%	pet.

^aNumbers 8-10 have only been included since January 2017.

3 | CASE REPORTS

Data regarding sex, age, atopy, lesion location, the acrylic-based materials to which the subjects had been exposed and positive test results are summarized in Table 2.

3.1 | Case 1

A 62-year-old man presented in February 2014 with a persistent itchy rash on the right side of the thorax with a duration of >1 year (Figure 1). His skin lesions had started a few months following the placement of a Hickman catheter for administration of chemotherapy for a non-Hodgkin lymphoma. Later, similar but smaller lesions had also developed on both arms. The patients had applied different adhesive tapes and bandages to secure his catheter, some of which gave positive test reactions. He also had positive reactions to 2 acrylate allergens, as well as other contact allergens, for which the relevance could not be established.

**FIGURE 1** Allergic contact dermatitis caused by adhesives used to fix a Hickman catheter (Case 1)

3.2 | Case 2

A 32-year-old woman consulted us in August 2016 because of itching, erythematous and squamous dermatitis on the left side of the sternum with a duration of 2 months, located where she had also secured a Hickman catheter (Figure 2). Positive patch test reactions were

TABLE 2 Patient characteristics, and patch tests performed, and their results

Case	Sex	Age (years)	Atopy	Site of contact allergy	Exposure to (meth)acrylate	Relevant positive patch test result	D2	D4	D8	Other non-relevant positive patch test results (reading on D4)
1	M	62	No	Thorax	• Micropore (3M Health care, Borken, Germany) • Mepitac safetac and • Mepilex border lite (Mölnlycke Health care, Gothenburg, Sweden) • Cosmopor E (Hartmann group, Heidenheim, Germany) • Opsite (Smith & Nephew, London, UK) • Tegaderm (3M Health care, Borken, Germany)	• Urethane diacrylate • Pentaerythritol triacrylate • Micropore tape • Mepitac safetac • Cosmopor E	+	++	NR	• Linalool HP + • Limonene HP + • MI 0.05% +, 0.2% ++
2	F	32	No	Thorax	• Tegaderm (see above) • Mepilex border (lite) (Mölnlycke Health care (see above))	• 2-HEA • 2-HEMA • EGDMA • Bis-GMA • Mepilex border lite • Chlorhexidine digluconate • Chlorhexidine acetate	+	+++	+	• MI/MCI +

Abbreviations: Bis-GMA, bisphenol A-glycidyl methacrylate; EGDMA, ethyleneglycol dimethacrylate; F, female; 2-HEA, 2-hydroxyethyl acrylate; 2-HEMA, 2-hydroxyethyl methacrylate; HP, hydroperoxides; M, male; MCI, methylchloroisothiazolinone; MI, methylisothiazolinone; NR, not read.



FIGURE 2 Allergic contact dermatitis caused by the adhesive used for the placement of a Hickman catheter (Case 2)

observed to 2-hydroxyethyl acrylate (2-HEA) and 3 methacrylate compounds, as well as to Mepilex border lite (Figure 3), for which the manufacturer confirmed the presence of “polyacrylates”. In contrast to the reactions to isothiazolinones, the reaction to chlorhexidine was relevant, as it had been used to disinfect the skin around the catheter.

4 | DISCUSSION

We here describe 2 patients who suffered from allergic contact dermatitis caused by acrylic-based adhesives and/or medical dressings, both of which had been used because of the application of a Hickman catheter. Contact sensitization caused by such materials, which are occlusive and applied on a damaged skin barrier for prolonged periods, is probably not a rare phenomenon, and seems to be an emerging problem. Our database records go back to 1990, but the first cases have only appeared more recently.

Spencer et al, in a retrospective study, performed between 2002 and 2015, reported 7 cases of (meth)acrylate contact dermatitis,¹ with Mepilex border lite being the most frequent cause in 4 of them; 2 of of these 4 had positive patch test reactions to butyl acrylate, which is the main acrylate compound in Mepilex border lite. Another



FIGURE 3 Positive eczematous reaction to Mepilex border lite (Mölnlycke Healthcare, Gothenburg, Sweden) (Case 2)

patient reacted to Micropore Surgical Tape (3M Health Care, Borken, Germany). In a study by Valois et al in 2015, in which 354 patients with chronic leg ulcers were patch tested, 19.2% had positive reactions; 1.3% reacted to Mepilex border lite, and 0.6% of them also reacted to ethyleneglycol dimethacrylate,² similarly to our second case.

Unfortunately, the exact nature of the culprit compounds in the “polyacrylate” materials could not be identified, as information on the qualitative composition of these medical devices is lacking. The respective companies often do not provide such information, even when asked for in specific contact dermatitis cases. We only obtained reactions to the materials used, and to certain (meth)acrylate compounds. Another shortcoming of our study is that not all possible (meth)acrylates were tested; indeed, a series of 10 is relatively small in comparison with the number of compounds tested in recent studies (eg, in the study by Spencer et al). However, there is substantial heterogeneity in the current literature regarding which substances to use as screening allergens. Indeed, (meth)acrylates are well known for their cross-reactivity patterns, being apt to cause multiple positive reactions, which is why patch testing with an extended series is often considered to be unnecessary, and the use of carefully selected screening allergens is preferred. For example, in the study by Spencer et al comprising 47 subjects,¹ the conclusion was that ~90.4% of their patients would have been identified by screening with a combination of 2-HEA, 2-hydroxypropyl methacrylate, bisphenol A-glycidyl methacrylate, and ethyl acrylate, all of which are present in our series.

5 | CONCLUSIONS

The frequency of allergic contact dermatitis caused by acrylic-based adhesives and modern medical dressings is probably underestimated, given the difficulties in obtaining information from the manufacturers regarding the actual compounds present, and therefore the inability to test with the sensitizing culprits. However, allergic contact dermatitis should be considered in patients with chronic use of acrylic adhesives, and/or chronic wounds, which are conditions likely to give rise to skin sensitization. Patients with positive patch test reactions to (meth)acrylates should be able to avoid future contact, so, once again, we strongly encourage the authorities to require labelling of all ingredients on the packaging of medical devices. Not only the detection of potential allergens but also the advice given to the sensitized patient depends on this. Furthermore, because of potential cross-reactivity, patients reacting to (meth)acrylates should be informed about other products containing them, such as artificial nails, dental products, glucose sensors, and surgical glues.⁴

Conflict of interest

All authors declare no conflict of interest.

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