



A case of allergic contact dermatitis to (meth)acrylates in ECG electrodes

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Contact dermatitis to acrylates in ECG electrodes

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Allergic contact dermatitis (ACD) due to electrocardiogram (ECG) electrodes has been described in literature, but only in a few cases (meth)acrylates were recognized as causative allergens.¹⁻⁵ Acrylates and methacrylates are esters of acrylic and methacrylic acid, respectively. They are widely used in the industrial field, in nail reconstruction, in orthopedic and dental prostheses.⁶ They are also used as adhesives in medical devices which require application on the body surface, such as ECG electrodes and blood glucose sensors.

CASE REPORT

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An 82-year-old male patient with heart problems was referred to us for itchy eczematous patches at the sites of application of Ambu WhiteSensor 4831Q electrodes (Ambu, Agrate Brianza, Milan, Italy) for ECG Holter monitoring (Figure 1). Electrodes had been applied 1 week earlier and, on removal of the electrodes, the cardiologist noticed the skin reaction. The lesions healed in one week with systemic and topical corticosteroids. The patient denied exposure to (meth)acrylates and orthopedic or dental implants. However, he reported numerous previous ECGs and one previous ECG Holter monitoring (with unknown electrodes) without any skin reaction.

Three weeks after resolution of dermatitis, patch tests with the Società Italiana di Dermatologia Allergologica Professionale e Ambientale (SIDAPA) baseline series (F.I.R.M.A. Diagent, Florence, Italy) containing 2-hydroxyethylmethacrylate (2-HEMA) 2% pet., were performed. Individual components of the patient's ECG electrodes (inner adhesive side, outer adhesive side and metallic central part, all "as is") were also patch tested (Figure 2). Patch test chambers (Van der Bend, Brielle, The Netherlands) were applied on the upper part of the patient's back. The readings on day (D)2, D4, and D7⁷ showed positive reactions to 2-HEMA (+/+) and to the inner adhesive side of the electrodes (+/++). An acrylates series (F.I.R.M.A. and Sigma-Aldrich, Steinheim, Germany) was subsequently patch tested; positive reactions to ethyl acrylate (EA) 1% pet. (++/+++), acrylic acid 0.1% pet. (++/+++), and isobornyl acrylate (IBOA) 0.1% pet. (++/++) were observed. The technical data sheet from the manufacturer of patient's electrodes revealed "acrylic" as a component of the "adhesive backing material", without specifying which ones/ which acrylates.

DISCUSSION

Several allergens in ECG electrodes can cause ACD, such as nickel, propylene glycol, *p-tert*-butylphenol formaldehyde resin.³ ACD to (meth)acrylates is uncommon but must be considered in patients who develop skin reactions to ECG electrodes. (Meth)acrylates may be present also as impurities in the hydrogel of electrodes. Some reports have identified

ethyl acrylate as the allergen responsible for ACD^{1,2} while more recently acrylic acid was considered the culprit allergen of ACD to electrodes.³⁻⁵

Our patient showed positive reaction to acrylic acid, a possible component in the electrode adhesive, and to other (meth)acrylates (2-HEMA, EA, IBOA). The positive reaction to acrylic acid could be due to it cross-reacting with (meth)acrylates, even though Bruze et al recently excluded this hypothesis.⁸ Nevertheless, in rare cases of ACD due to electrodes, patch tests have revealed sensitivity to acrylic acid alone. This suggests addition of acrylic acid to a (meth)acrylate series could be useful to avoid false negative results in subjects with eczematous lesions at sites of contact with electrodes.^{4,9}

In the cases of electrode ADC by acrylic acid reported in literature, acrylic acid was demonstrated in the electrode hydrogel part.³⁻⁵ Conversely, in the Ambu WhiteSensor 4831Q electrodes used by our patient there is no hydrogel part and acrylates are contained in the inner adhesive side, confirming the need for precise technical product data sheets, that include impurities as well.⁵

Finally, we would like to point to the positive reaction also to IBOA, the major culprit contact allergen in glucose sensors and insulin pumps, which only occasionally shows cross-reactivity with other acrylates.¹⁰

In the glucose sensors, IBOA is usually present in a glue used to join different parts of the sensor housing and it may migrate to the adhesive patches. This mechanism could also be hypothesized in the case of electrodes glued together from different parts.

CONFLICTS OF INTEREST

None to report.

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FIGURE LEGEND

FIGURE 1 Circular eczematous patches on the chest (a), ankle (b) and wrist (c) corresponding to the site of contact with Holter ECG electrodes

FIGURE 2 Ambu® WhiteSensor 4831Q electrode: outer adhesive side (a), inner adhesive side (b) and metallic central part (c)



COD_13570_Fig 1.tiff

b)

c)



COD_13570_Fig 2.tiff