Contact allergy to ECG electrodes has rarely been reported (1–5).

Report of a Case

A 45-year-old woman with a long QT-syndrome, which required regular ECG monitoring, developed a skin reaction shortly after electrocardiography ECG electrodes had been in place for 3 days. The eruption was primarily confined to the areas where the electrodes had been and consisted of pruritic papules but she also had scattered papules on the upper arms.

Patch tests with a number of ECG electrodes (3M Health Care®, Neuss, Germany) were performed. The electrodes were placed on the skin for 2 days. Additionally, patch tests to individual parts were separately applied. The central conducting gel was scraped off and applied in a large Finn Chamber®; we cleaned the metal part of the ECG electrode with water and alcohol and applied it with Scanpor tape® after removing the adhesive ring; the latter was taped to the skin separately.

Results

Patch-test results are given in Table 1. In the baseline series of the German Contact Dermatitis Group, the patient found to be allergic to potassium dichromate, cobalt chloride, nickel sulfate and p-tert-butylphenol formaldehyde resin.

At the reading on D3, the central gel-containing part of the electrodes numbered 2239, 2248-50, and 2258-3 showed a positive reaction. Electrode numbered 2223 caused a weak papular reaction confined to the ring-shaped adhesive part; the centre filled with the gel remained normal (Fig. 1). Electrodes 2660-5 and 2560 caused no reaction at all.

The separate testing of the gel, the adhesive ring, and the metal part of the centre showed positive results only for the gel part of electrode 2239 and negative or doubtful results for all other electrode types as well as for the metal and the adhesive parts of electrode 2239.

The manufacturer of the electrodes (3M Health Care®) provided the safety data sheets of the electrodes only after repeated enquiries by the senior author; they did not disclose all constituents in detail and blacked-out all figures regarding quantities.

A comparison of the individual contents of the tested electrodes raised suspicion that guar gum or propylene glycol could be the possible allergens. However, patch tests to these two materials as provided by the manufacturer were negative (Table 1).

Comment

In a review of the current literature, we found propylene glycol as the cause of an allergic contact dermatitis in self-adhesive ECG electrodes in two cases (2, 5). Furthermore, guar gum—largely used in food industry and plastics—could be a possible allergen in the gel part of the ECG electrodes although no case of contact dermatitis to guar gum has been reported so far. Guar gum has caused asthma (6) and contact urticaria (7). The weak reaction of the patient to the adhesive part of electrode 2223 was probably an irritant because...
it was not reproduced when the adhesive ring was tested separately. The manufacturer denied the presence of p-tert-butylphenol formaldehyde resin, which had caused a positive reaction in the patient.

This case is instructive because the main culprit of the dermatitis was found in the centre of the ECG electrode. The allergen has not been identified but due to careful testing two well-tolerated ECG electrodes (2660-5 and 2560) were found.

Regarding the reactions to the central gel-containing part of electrode 2239, a possible explanation could be the release of metal ions, in this case nickel or chromate. The manufacturer declared that the metal part contained nickel-plated brass. The patient is highly allergic to nickel with a positive history to costume jewellery. The electrodes 2223, 2660-5, and 2560, which did not produce a reaction in the centre with the gel, had differences in their chemical constituents. This may have influenced the release of metal ions upon long-term skin exposure. A second possibility is that minor quantitative differences in the gel composition may account for different biological outcomes.

References
2. Connolly M, Buckley D A. Contact dermatitis from propylene glycol in ECG electrodes, complicated by medicament allergy. Contact Dermatitis 2004: 50: 42.

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