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Allergic contact dermatitis caused by a glucose monitoring system: an emerging side effect of diabetes medical devices

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Editor

New medical devices for diabetes, such as insulin pumps and glucose sensors, have been introduced in the past few years to improve diagnosis, treatment and follow-up of diabetic patients. In particular, the conventional self-assessment blood glucose measurement by finger pricking significantly worsens the patient's quality of life because of painful hardening of the fingertips. For this reason, glucose sensors for flash and continuous monitoring of interstitial glucose levels are increasingly used. Unfortunately, some cutaneous side effects were described after their introduction.[1] A further case of allergic contact dermatitis (ACD) to isobornyl acrylate (IBOA) contained in a flash glucose monitoring system is reported.

A 65-year-old non-atopic woman with type I diabetes was referred to us because of itchy eczematous dermatitis involving the upper side of the arms, corresponding to the contact sites with the glucose sensor FreeStyle Libre (Abbot Diabetes Care, Witney, Oxfordshire, UK) (Fig.1a,b) that the patient had applied during the last 2 years. Skin lesions appeared 1 month before our observation. The use of FreeStyle Libre was stopped turning back to finger pricks to measure blood glucose and dermatitis disappeared within 2 weeks with clobetasole dipropionate ointment. One month later the patient was patch tested with the SIDAPA (Italian Society of Allergological, Occupational, and Environmental Dermatology) baseline series and acrylate series,[3] supplemented with other allergens according to previous reports of ACD induced by FreeStyle Libre[1-2] and adhesive film of unused FreeStyle Libre (internal and external side) of the same batch as the one that caused eczema (Table 1). The patch tests, read according to SIDAPA guidelines on day (D) 2, D4, and D7,[3] showed positive reactions to IBOA (0.1% pet.) (Chemotechnique® Diagnostics, Vellinge, Sweden) (+++) (Fig.1c) and sesquiterpene lactone mix (++).

ACD caused by medical devices, such as transcutaneous electrical nerve stimulation devices[4] and electrocardiography[5] electrodes, insulin pumps,[6] and glucose sensors,[1,2] represents an emerging public health issue. In diabetic patients, ACD induced by insulin pumps containing IBOA was first described in 1995.[6] This contact sensitizer is an acrylate monomer used for the manufacture of acrylic resins in plastic, coating and sealing components, and ultraviolet-cured inks.[7]

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In recent years IBOA was shown to be the culprit allergen of ACD due to FreeStyle Libre,[1,2,7] a flash glucose monitoring system consisting of a sensor with a central catheter inserted into the subcutaneous fat tissue. It is fixed to the upper part of the arm with an adhesive film and replaced every 2 weeks. Some, but not all, of the patients also react to patch tests with the adhesive part of the glucose sensor.[8] The presence of IBOA was confirmed in the sensor's adhesive as well as, and notably, in its plastic part, by GC-MS.[8] In our patient acrylic acid resulted negative to patch test, even if this acrylic monomer may be contained in the raw material of IBOA. We neither observed a positive patch test reaction to the adhesive film of an unused FreeStyle Libre sensor of the same batch, confirming that IBOA is indeed not primarily contained in the adhesive part. Considering that we did not perform a chemical analysis for IBOA on the plastic part of the unused device, we can only hypothesize that IBOA probably migrates from the upper plastic components to the adhesive components after its application.[1,8]

Regarding the positive patch test reaction to sesquiterpene lactone mix observed in our patient and reported in some patients with contact sensitivity to FreeStyle Libre,[1,8,9] a possible cross-reaction was considered improbable, but the potential presence of a common precursor, such as camphene, could not be ruled out.[9]

In conclusion, we underline the role of IBOA as contact sensitizer of glucose sensors and emphasize the importance of avoiding this allergen in diabetes devices. Moreover, in IBOA-allergic patients it is mandatory to suggest IBOA-free alternative devices to improve self-management and to reduce potential complications of their chronic metabolic disease.[10]

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Table 1 Patch test results (SIDAPA standard series, acrylate series, other allergens, adhesive film of unused FreeStyle Libre)

	D2	D4	D7
SIDAPA standard series	-	-	-
Acrylate series			
Hydroxypropyl methacrylate (2.0%)*	-	-	-
Ethylene glycol dimethacrylate (2.0%)*	-	-	-
Triethylene glycol dimethacrylate (2.0%)*	-	-	-
N,N-dimethylaminoethyl methacrylate (0.2%)*	-	-	-
1,6-Hexanediol diacrylate (0.1%)*	-	-	-
Tetrahydrofurfuryl methacrylate (2.0%)*	-	-	-
Bisphenol A-glycidyl methacrylate (2.0%)*	-	-	-
Urethane dimethacrylate (2.0%)*	-	-	-
Tetraethylene glycol dimethacrylate (2.0%)*	-	-	-
Other allergens			
Isobornyl acrylate (IBOA) (0.1%)*	+++	+++	+++
Compositae mix II (5.0%)*	-	-	-
Sesquiterpene lactone mix (0.1%)*	+	++	++
Acrylic acid (0.1%)**	-	-	-
Adhesive film of FreeStyle Libre (unused)			
Internal side***	-	-	-
External side***	-	-	-

*in pet.; **in saline solution; ***as is.

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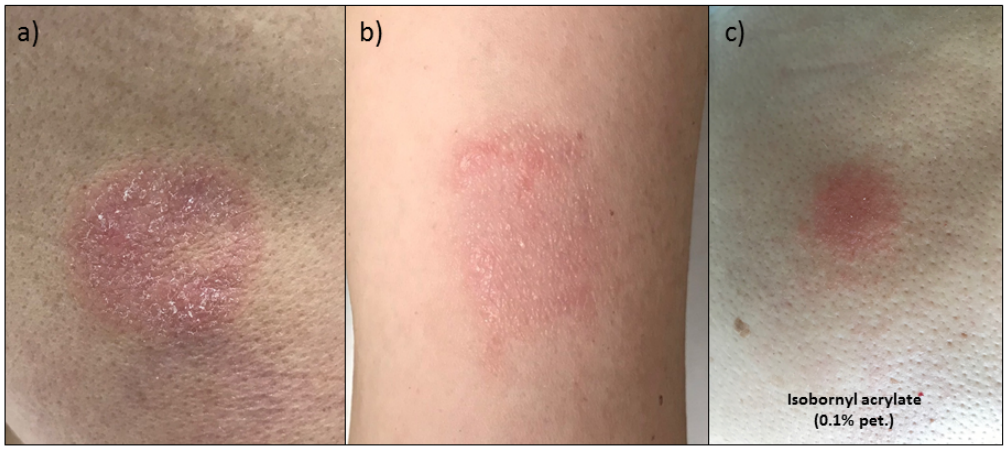

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