

Contact dermatitis from the glucose sensors: more than isobornyl acrylate (IBOA) allergy

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Contact dermatitis is a rare condition in the Spanish pediatric population as reported in *Alergología* 2015 [1]. Allergic contact dermatitis from glucose sensors has been recently described in pediatric diabetic patient population. Isobornyl acrylate (IBOA) is the culprit allergen in most of cases. Other allergens involved are N, N-dimethylacrylamide, colophonium and Abitol® and, also N, N-dimethylacrylate and 2-ethyl-cyanoacrylate [2].

Different acrylates have also been reported as sensitizers in occupational contact allergy [3]. We report two cases of cutaneous sensitization to other different contact allergens which could be relevant in glucose sensors skin reactions.

Case 1

A 12-year-old non atopic, type I diabetic male presented an eczematous plaque in the contact zone of glucose sensor Free Style (Abbot). He has used the sensor for the last 2 years. Free Style sensor was removed and substituted for an IBOA-free sensor (Dexcom G6, Novalab) which was well tolerated.

Patch tests were performed with standard Spanish Contact Dermatitis and Skin Allergy Research Group (*GEIDAC*) and acrylates batteries (Chemotechnique Diagnostics). After 2 days in occlusion, the tests were read at 48 (D2) and 96 h (D4) according to International Contact Dermatitis Research Group.

Case 2

A 17-year-old non atopic, type I diabetic male presented erythematous and vesicular plaque in the contact zone of glucose sensor Free Style® (Abbot). It was removed and substituted for Dexcom G6® (Novalab). One year later, he began with the same skin reaction observed with Free Style® sensor. He tried to insert the sensor through an hydrocolloid barrier film without success. The skin lesion resolved with residual hyperpigmentation after removing the sensor.

Patch test were performed as in patient 1.

Positive reactions were observed at D2 and D4 to IBOA (+++) in both cases and other relevant contact allergens as hydroxyethyl methacrylate, triethyleneglycol methacrylate, benzoyl peroxide, sesquiterpene lactones, colophonium and fragrance mix 1 See results in table I.

IBOA is the most frequently implicated acrylate in allergic contact dermatitis in patients with glucose sensors [4], although other acrylates and related substances may be responsible for sensitization such as Abitol™, N,N-dimethylacrylamide, hydroquinone, N,N-dimethylacrylate, 2-ethyl-cyanoacrylate, 2,6-di-tert-butyl-4-cresol (BHT), hydroxyethylmethacrylate, triethylene glycol methacrylate and sesquiterpene lactones [5]. Therefore, these chemicals should be tested in suspected allergic patients. Previous observations in large patch-testing series showed low cross-reactivity between IBOA and other acrylates, which suggested concomitant reactions to acrylates with different chemical structure [6].

The presence of IBOA in the Free Style® and its relationship with sensitization to this device has been widely demonstrated. In the case of Dexcom® device (Novalab), Oppel et al. did not detect IBOA [7]. By contrast, Svedman et al. have detected IBOA in Dexcom® devices by gas chromatography-mass spectrometry (GC-MS) [8]. Our patient 1 tolerated Dexcom® sensor, which support the absence of IBOA in the device. This

patient was also sensitized to colophonium [2], present in other devices as Enlite® sensor (Medtronic). He has not presented eczematous reaction to dressings or adhesives in the past. In patient 2, the skin reaction could be due to the presence of IBOA, but he was also sensitized to other acrylates, as well as to substances involved in the acrylate polymerization processes as benzoyl peroxide that may be present in the sensor device. This patient had not previously received benzoyl peroxide treatment for acne which explained a possible contact sensitization. Herman et al. found that patients sensitized to IBOA were also sensitized to sesquiterpene lactones (SL) [5]. GC-MS performed did not find SL in Free Style sensor. According to these authors, co-sensitization, rather than cross-reactivity, due to the presence of a common precursor for IBOA and lactones, such as camphene, could be a possible explanation for the simultaneous sensitization.

Recently Mowitz et al [9] have described a new component in Dexcom G 6 (2,2'-Methylebenis (6-tert-Butyl-4-Methylphenol) Monoacrylate) as a contact allergen. This component is not commercially available for patch-testing. Therefore, we could not assess the implication of this substance as a possible cause of sensitization in our patients.

Free Style libre 2 is a new IBOA-free sensor and could be an option for our first patient.

2,6-Di-tert-butyl-4-cresol (BHT) is part of the new adhesive and should be included in the battery of allergens to assess those patients who present with contact dermatitis after use with FreeStyle Libre [2].

Probably, at this time, our patient 2 does not have an alternative glucose sensor, due to sensitization to multiple contact allergens, some of them involved in in acrylate production.

New Eversense® system, inserted subcutaneously into the arm, could be offered [10]. The transmitter is placed just above by a silicone adhesive or it can be placed with an elastic band to avoid adhesives. Currently, these sensors are funded by the Spanish National Health System.

In conclusion, we present two cases of contact dermatitis due to glucose sensors. In the first, the change to an IBOA-free sensor is being well tolerated, while the second, after two reactions to different sensors, is currently pending approval and tolerance testing with Eversense®.

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Conflicts of interest

The authors have declared no conflicts.

References

- 1.- Ojeda P, Ibáñez MD, Olaguibel JM, Sastre J, Chivato T. Alergológica 2015: A National Survey on Allergic Diseases in the Spanish Pediatric Population J Invest Allergol Clin Immunol. 2018;28(5):321-9.
- 2.- Navarro-Triviño FJ. Skin Reactions to Glucose Sensors: Present and Future. Actas Dermosifiliogr. 2021;112(5):389-91
- 3.- Ponce V, Muñoz-Bellido F, González A, Gracia M, Moreno A, Macías E. Occupational Contact Dermatitis to Methacrylates in an Orthopedic Operating Room Nurse J Invest Allergol Clin Immunol. 2013;23(4):281-8.
- 4.- Herman A, Baeck M, de Montjoye L, Bruze M, Giertz E, Goossens A, et al. Allergic contact dermatitis caused by isobornyl acrylate in the Enlite glucose sensor and the Paradigm MiniMed Quickset insulin infusion set. Contact Dermatitis. 2019;81:432–7.
- 5.- Herman A, Mowitz M, Aerts O, Pyl J, de Montjoye L, Goossens A. et al. M. Unexpected Positive Patch Test Reactions to Sesquiterpene Lactones in Patients Sensitized to the FreeStyle Libre Glucose Sensor. Contact Dermatitis. 2019;81(5):354-67.
- 6.- Aerts O, Herman A, Mowitz M, Bruze M, Goossens A. Isobornyl Acrylate. Dermatitis. 2020;31(1):4-12.
- 7.- Oppel E, Kamann S, Reichl FX, Högg C. The Dexcom glucose monitoring system- An isobornyl acrylate-free alternative for diabetic patients Contact Dermatitis. 2019;81(1):32-6.
- 8.- Svedman C, Bruze M, Antelmi A, Hamnerius N, Hauksson I, Ulriksdotter J, et al. Continuous glucose monitoring systems give contact dermatitis in children and adults despite efforts to provide less "allergy-prone" devices. Research and advice hampered by insufficient material to optimize patch test investigations. J Eur Acad Dermatol Venereol. 2021;35(3):730-7.
- 9.- Mowitz M, Lejding T, Ulriksdotter J, Antelmi A, Bruze M, Svedman C. Further Evidence of Allergic Contact Dermatitis Caused by 2,2'-Methylenebis(6-tert-Butyl-4-

Methylphenol) Monoacrylate, a New Sensitizer in the Dexcom G6 Glucose Sensor. Dermatitis. 2021 Jun 11. doi: 10.1097

10.- Oppel E, Kamann S, Heinemann L, Reichl FX, Högg C. The implanted glucose monitoring system Eversense: An alternative for diabetes patients with isobornyl acrylate allergy Contact Dermatitis. 2020;82(2):101-4.

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Table I: Results of the patch tests with contact allergens

Contact Allergens	Case1	Case 2
Isobornyl acrylate (IBOA)	(+++)	(+++)
Hydroxyethylmethacrylate	(-)	(+)
Triethylene glycol methacrylate	(-)	(+++)
Benzoyl peroxide	(-)	(+++)
Sesquiterpene lactone mix	(-)	(+++)
Colophonium	(+)	(-)
Fragrance mix 1	(+)	(-)