A successful use of barrier patches in the management of contact dermatitis to a continuous glucose monitoring device – a case study

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Abstract:
The popularity of continuous glucose monitoring (CGM) devices rises, similar to the prevalence of CGM-related contact dermatitis. There is still a paucity of recommendations for its treatment, and here, we documented the use of barrier patches from adhesive dressing tape. A 25-year-old type I diabetic presented symptoms of contact dermatitis after a month of CGM use. A barrier patch significantly prevented its symptoms. CGM was discontinued for over a year, and after it was reintroduced, the symptoms relapsed. Barrier patches were used again, with good results. We added some data on the management of CGM-related contact dermatitis and materials suitable for barrier patches.

Key words: case report, continuous glucose monitoring, dermatitis, allergy, diabetes mellitus

Introduction

Diabetes mellitus is one of the greatest challenges to public health [1]. As technology advances, new devices appear on the market to facilitate the daily functioning of diabetics. 30–40% of type 1 diabetes patients use continuous glucose monitoring (CGM) systems [1, 2], devices providing real-time glucose measurement, with a result typically available on a smartphone. However, the use of new methods often brings new problems. A contact dermatitis resulting from the use of a Dexcom G6® (EAN-13: 0086270053038; Dexcom, Inc., San Diego, CA, USA) CGM is an example of such a situation.

According to Podwojniak et al. [2], skin problems occurred in 39% of patients using CGM or continuous subcutaneous insulin infusion (CSII, also known as insulin pump infusion sets) devices, of which 22% discontinued use due to dermatologic issues. The most commonly reported problems were erythema, itching, pain, rash, skin lesions, infections, and exacerbation of existing skin conditions [2]. Such symptoms are attributed to contact dermatitis, with isobornyl acrylate (IBOA) and N,N-dimethylacrylamide (DMAA) being the most common culprits [3]. The need for additional patches, infusion sets, topical corticosteroids, and lost earnings results in additional costs, with $175.80 spent annually for a pediatric patient [4].

Despite the prevalence of CGM-related contact dermatitis, the literature on its treatment remains limited. The Dexcom® website provides general advice but lacks specific recommendations regarding the appropriate management of the diverse complaints presented by CGM users [5]. There are few recommendations in the literature on which agents to use, and their cost and availability further limit their use. In this case, we demonstrated the successful use of another material – elastopor E (EAN-13: 5907996809516; ZARYS International Group, Zabrze, Poland), an adhesive non-wo-

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ven dressing tape in the treatment of contact dermatitis associated with Dexcom G6®. This case report was prepared following the CARE guidelines [6].

Case report

The patient is a 25-year-old Caucasian male diagnosed with type I diabetes mellitus at age 7. Previous history of atopic dermatitis in childhood, noted allergy in skin tests to menthol, chamomile, and flour mites. The patient presented no significant allergic contact reactions in the past, despite use of several CSII (MiniMed® Quick-set®, MiniMed® Sure-T® [Medtronic MiniMed, Inc., Northridge, CA, USA], YpsoPump® Orbit® micro, YpsoPump® Orbit® soft [Ypsomed AG, Burgdorf, Switzerland]). Due to the need for glycemic control, a continuous glycemic monitoring system (CGM) using the Dexcom G6® was started in November 2022.

After a month of usage, in December 2022, the first symptoms of contact dermatitis were observed – a patch with signs of weeping, erythema, and desquamation limited in location to the skin surface that was in contact with the original CGM patch. In addition, the patient reported a significant increase in itching in this location. Despite the recurrent sensitization reaction, the use of the device was continued. Topical corticosteroids in ointment were applied periodically, improving and reducing skin lesions. In January 2023, an attempt was made to apply the adhesive barrier patch over the original CGM patch as isolation from the skin surface with good results – a reduction in skin lesions was observed. In February 2023, due to the failure of the insulin pump and the reimbursement inability of the CGM system, it was decided to terminate the CGM.

In March 2024, regular use of the Dexcom G6® began again, followed by mylife® YpsoPump® (Ypsomed AG, Burgdorf, Switzerland) (April 2024), and CamAPS® FX (CamDiab Ltd., Cambridge, United Kingdom) (June 2024) closed loop system. Since then, the patient has taken the following procedure with each application of the CGM and made photographic documentation. The selected skin area was disinfected with alcohol-soaked wipes before each application, according to the manufacturer's recommendations. Then, a shape imitating the original CGM patch was cut from the adhesive roll, exceeding its borders by about 1 mm, without cutting a hole for the insertion. One layer of the cut patch was applied over the original CGM patch contained in the original applicator, then the device was applied at the previously selected site (fig. 1).

With this procedure, the patient did not observe a cutaneous reaction at the site exposed to the CGM adhesive or report a few papules with minimal itching. In April 2024, a single incidental case of CGM application without barrier patch isolation was reported, followed again by a similar skin reaction, confirming the effectiveness of the barrier patch in reducing the patient's reactive lesions.

To accurately represent the allergic reaction after the application of the CGM without the barrier patch, in January 2025, the device was intentionally applied without isolation. The patient observed local itching occurring periodically from day 1 after application and weeping marks on the patch. The complaints worsened as the device was carried. After 10 days, CGM was removed, and the patient documented local erythema, papules, and crust formation (fig. 2).

That day, CGM was applied again, but this time with a barrier patch. After application, slight itching was noted on days 2 and 5, with no signs of weeping on the patch. Recently, after CGM removal, only a few papules were present (fig. 3). We compare skin lesions using different application methods in Figure 2. We also provided report forms, designed for skin reactions due to diabetic devices (fig. 4).

Patient's perspective

I was excited to start using CGM. I even purchased a new cell phone, as my old one was incompatible with the Dexcom® application. It was worth it. CGM and later closed loop were a revolution in my glucose control, but unfortunately, a skin reaction soon emerged. Firstly, I planned to manage it with materials recommended by the Dexcom G6® website. When I came to a pharmacy, I quickly got disappointed, as many of them were unavailable. The change of CGM was the least preferable option, as Dexcom G6® is the only CGM compatible with my closed-loop system. I started my search, and after a few attempts, I was satisfied with elastopor E outcomes. It is cheap, available, and discreet, as it looks similar to Dexcom G6®adhesive. Its main disadvantage is slightly worse adhesion. My symptoms did not disappear completely, but compared to previous ones, they are not a problem anymore. My quality of life improved. The burden of my illness has never been so light.

Discussion

This case study has several limitations. First, due to the nature of a single case study, our results

Figure 1. *Preparing and applying Dexcom G6® with elastopor E barrier patch: I. Adhesive roll prepared for cutting. II. CGM before barrier patch application, cover removed. III. Application of barrier patch on CGM adhesive. IV. Removing the adhesive cover. V, VI. Application with CGM applicator with no further changes.*

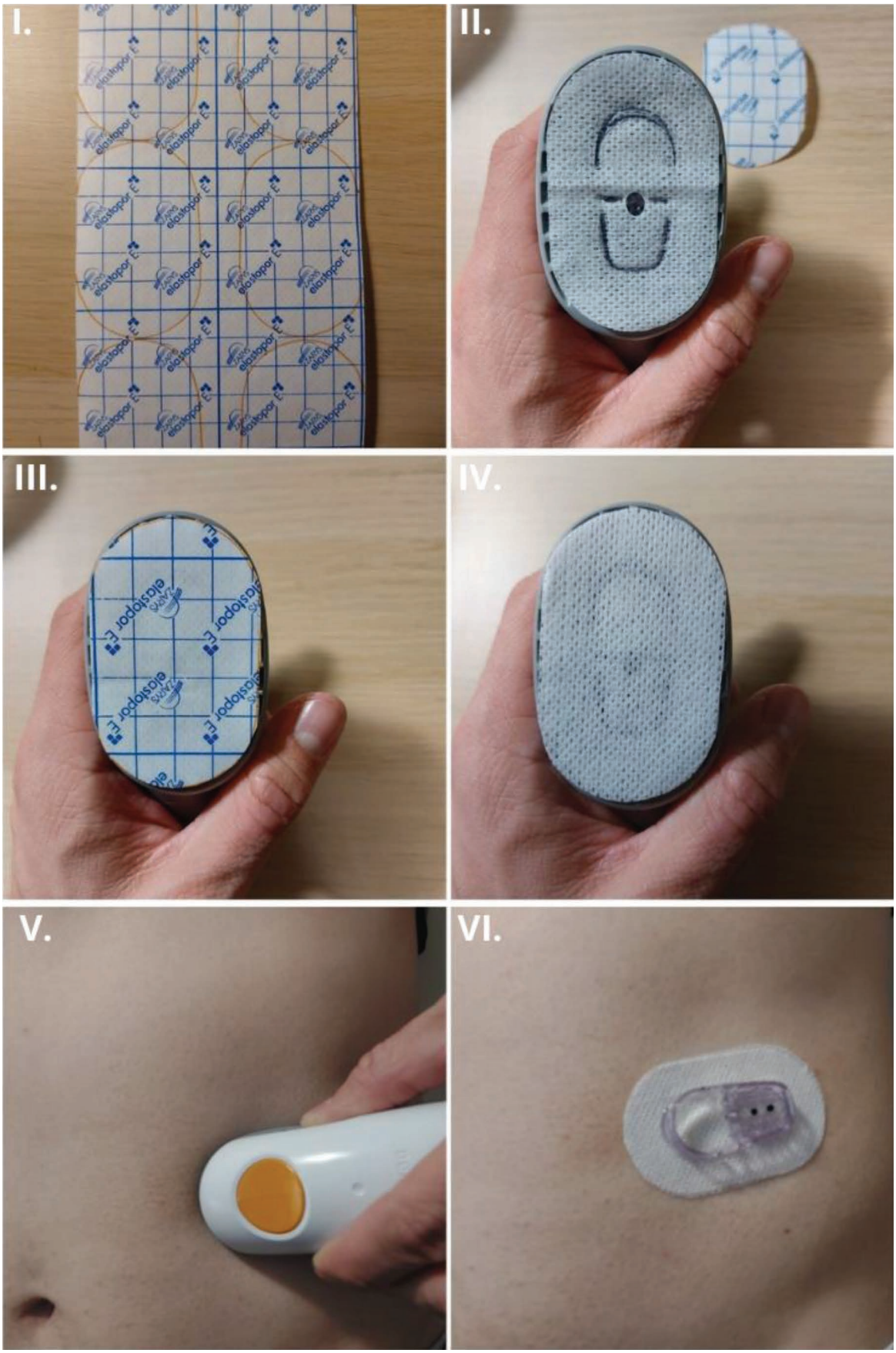


Figure 2. *Skin condition after recently removing Dexcom G6® carried for 10 days. Left side: A I. without an elastopor E barrier patch. A II. Traces of weeping on the original adhesive. Right side: with barrier patch, on the right (B I) and left (B II; B III; B IV) side of the abdomen.*

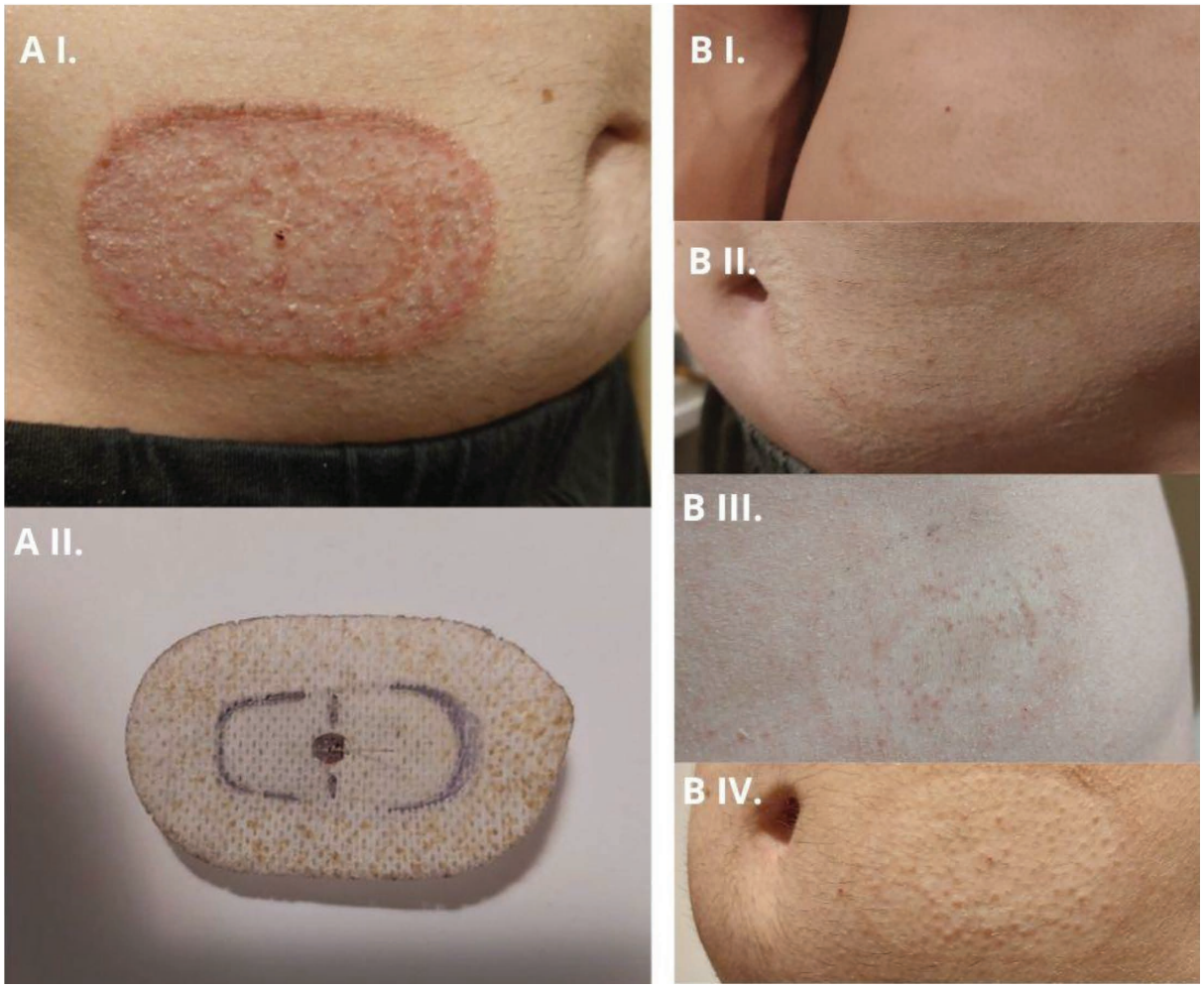
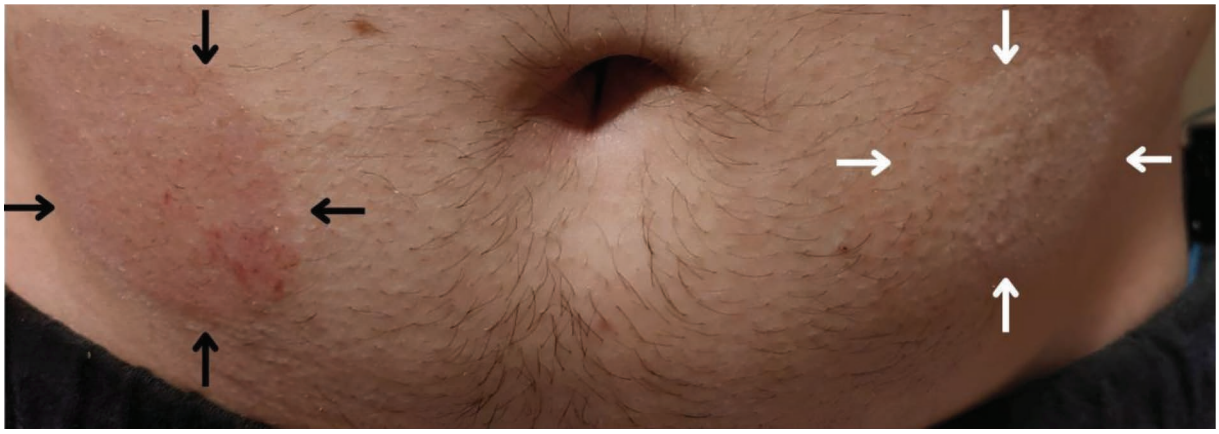


Figure 3. *Comparison of the skin condition in January 2025. Ten days after removing Dexcom G6® without the elastopor E barrier patch (black arrows) and recently after removing CGM with barrier patch (white arrows).*



cannot be extrapolated to the general patient population. The gold standard for allergic contact dermatitis (ACD) diagnosis is patch testing [7, 8]. The process involves placing haptens in separate chambers on a hypoallergenic patch applied to the skin (typically the back). This methodology facilitates differentiation between irritant contact dermatitis (ICD) characterized by skin reactions that closely mirror the shape of the

chamber with sharp lesion angles, and ACD, which presents with rounded lesion edges and blurred angles [7]. We did not perform the patch tests; therefore, we cannot confirm the allergic component of this contact dermatitis, nor indicate a culprit allergen. We also do not know the composition of elastopor E, except for the information that it contains "hypoallergic acrylic glue" [9]. On the other hand, we demonstrated a clear link between (I) the use of CGM and the occurrence of symptoms and (II) the use of barrier patch and its successful prevention. We have also taken steps to report patient's symptoms coherently and objectively, which is reported as a common problem in the literature on contact dermatitis linked to diabetic devices [10, 11]. We are also the first, to our knowledge, to evaluate the effectiveness of an intervention using a reporting form dedicated to diabetic patients [10].

In the literature, despite reports of CSII-related contact dermatitis also existing [12], the CGM-related efflorescences have been described as more common [12] and severe [1]. In line with this observation, our patient developed apparent contact dermatitis to CGM within a month and no similar reaction to several CSII. used for a total of 16 years before CGM sensitization, and 2 years after its onset. The patient, currently using mylife® YpsoPump® CSII was motivated to continue Dexcom G6® use, as it is the only CGM compatible with CamAPS® FX (CamDiab Ltd., Cambridge, United Kingdom) closed loop system to date in Poland [13]. Of note, the global availability of closed loop systems increases over time, with more systems and more devices compatible with existing ones. For example, CamAPS® FX is now compatible with more CGMs (FreeStyle Libre™ 3 and FreeStyle Libre™ 3 Plus [Abbott diabetes care, Alameda, CA, USA]) [14], but this may be limited in some regions, including Poland [13].

Other treatment options mentioned in the Dexcom® guidelines and the literature include hydrocolloid dressings, barrier films, other barrier patches, off-label skin application of intranasal steroids [1, 2, 5, 11, 15], and CGM device change [2, 16, 17]. Indeed, skin complications are a major cause of CGM discontinuation [2], and device change could solve this problem. Unfortunately, this solution is not infallible. Some patients develop allergic reactions to multiple CGMs, with IBOA being the most common cause of such an allergy [1] and achieving the "Allergen of the Year" title in 2020 [18]. According to Cichoń et al. [19], [19] acrylates may play a significant role in the development of ICD and ACD associated with diabetic devices. 20% of 15 patients in the study had a positive strip test reaction to distinct acrylate allergens [19]. In addition, manufacturers are often reluctant to disclose information on medical device chemical composition [1, 3, 18, 20, 21], which delays diagnosis [22] and complicates CGM choice, even if the culprit allergen is detected [3]. As diabetic devices market evolves dynamically, the manufacturers often introduce new products and change the composition of existing ones [21] while the utilization of a higher quantity of CGM devices is correlated with a statistically significant increase in the occurrence of dermatitis [23]. Moreover, barrier materials used to prevent ACD and ICD can also cause them [24], which further complicates avoiding skin reactions. In such circumstances, the important collaboration between diabetologists, allergologists, and dermatologists presents additional significance.

After some time, our patient decided not to cut an oval hole in the center of the barrier patch (contrary to the Dexcom® guidelines [5]) as this promoted dermatitis in the area of insertion. The patient did not notice any changes in CGM function. However, this hypothesis should be viewed with extreme caution, as it is at best single anecdotal evidence.

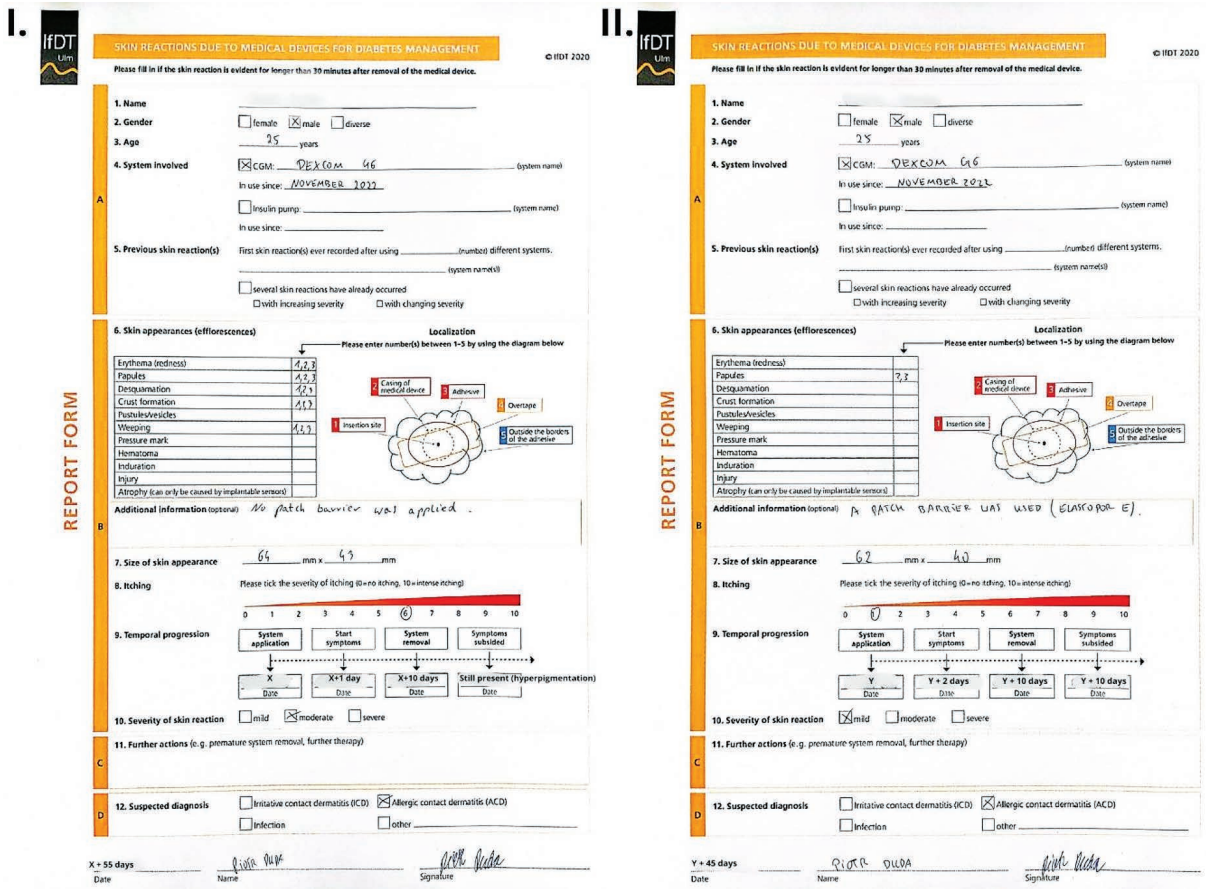
What we strongly believe was not a coincidence was the causative role of CGM, and the efficacy of the barrier patch. We thoroughly documented that the severity of symptoms fluctuated depending on direct contact with the CGM adhesive, including abrupt recurrence after over a year of CGM abstinence. Thereafter, symptoms were repetitively reduced or intensified, depending on the use of a barrier patch. We also considered other causes of skin changes, i.e., skin irritation caused by the alcohol wipes used before CGM application. We deemed this unlikely because we did not observe similar skin changes after their use in (I) the skin outside the adhesives, (II) the skin under the CSII adhesive, and (III) the skin under the CGM with barrier patch. Two main types of contact dermatitis are ICD and ACD [20]. Such selective and persistent hypersensitivity could suggest ACD [10, 16]. However, as ACD and ICD are often clinically indistinguishable [20] and can coexist [20], as acrylates are direct irritants [20] and have been identified in Dexcom G6® [3, 25], and as we did not perform patch tests, the nature of this contact dermatitis remains unclear. Nevertheless, we have demonstrated that its symptoms can be satisfactorily controlled with potential benefit for a significant group of diabetic patients.

Conclusions

In conclusion, we have added some data on the efficacy of barrier patches in preventing symptoms

of contact dermatitis caused by diabetic devices. We showed the efficacy of another barrier patch material, namely elastopor E, and, to our knowledge, first evaluated the intervention with a dedicated reporting form.

Figure 4. *Anonymized skin reaction report forms comparing symptoms of Dexcom G6® used without (I) and with (II) elastopor E barrier patch. The forms correspond to the efflorescences seen in Figure 2 A I., and Figure 2 B IV., respectively.*



X – date of CGM application without patch; Y – date of CGM application with barrier patch; X + 10 days and Y are the same date.

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