

Facial Contact Dermatitis and the Irritant Potential of Mobile Phone Screens

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Abstract: A teenager with atopic dermatitis presented with a 12-month history of recurrent, pruritic, round and polygonal patches on her face. Patch tests using the European standard series (including nickel, chromium, and cobalt chloride), a plastic and glue series of allergens, polyester components, and personal and environmental products in contact with the patient were conducted. For the patient and 3 of 14 healthy volunteers, positive reactions were observed to the patient's mobile phone touchscreen (TS), an extract solution from the TS, and a non-TS phone of another brand. Accordingly, the patient's dermatitis disappeared when contact with mobile phone screens was avoided.

CASE REPORT

A 15-year-old girl presented with round and polygonal erythematous patches on her cheeks and chin (Fig. 1) that varied in size from 1 to 5 cm and had been recurring over the past year. She had a history of atopic dermatitis (AD), and some AD lesions were present on other parts of her body. No other cutaneous diseases or photodermatoses were reported. Oral antihistamines and tacrolimus or corticoid creams were used to treat the recurrences of AD. The patient reported using a mobile phone (MP) over the past 6 years that included a touchscreen (TS) phone (an LG GT360 Etna) over the past 2 years. She was not in contact with any other TS devices.

Full blood analysis, antibodies against hepatitis B and C, and nuclear, double-stranded DNA, SSA/Ro, SSB/La, mitochondrial, and lupus anticoagulant anti-

gens were all normal or negative. Patch tests performed with allergens of the European standard series (including nickel, chromium, and cobalt chloride), allergens of a plastic and glue series (Briall Allergen GmbH, Greven, Germany), various components of polyester (Table 1), and more than 90 products or objects that the patient was in contact with, including other parts of the MP such as the plastic case and keyboard, were negative. In addition, the patient's entire MP, as well as a Nokia 3600 slide MP (Nokia, Sao Paulo, Brazil), were secured on the forearm (with the screen in contact with the skin) using hypoallergenic surgical tape. A solution obtained from extracting a 1-cm² piece of the LG MP screen in 10 mL of acetone was also tested. After 48 and 96 hours (Fig. 2), positive pruritic reactions (including erythema, edema, and papules) lasting more than 96 hours were observed for both MP screens and the screen extract. In 3 of 14 healthy volunteers tested, positive reactions to both MP

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Figure 1. Polygonal and round erythematous patches were observed on the face of the patient.

TABLE 1. Components of Polyester That Were Patch Tested

Chemical	Patch test concentration (%)	Vehicle
Maleic anhydride	1	Alcohol
Phthalic anhydride	1	Alcohol
Styrene monomer	2	Petrolatum
Propylene glycol	5	Petrolatum
Diethylene glycol	2	Petrolatum
Hydroquinone	0.5	Petrolatum
Toluhydroquinone	0.5	Petrolatum
Benzoyl peroxide	0.2	Petrolatum
Polyacrylate mix	2	Petrolatum
Fumaric acid	1	Petrolatum
Cobalt octoate	0.25	Petrolatum
Diocetyl phthalate	5	Petrolatum
Silicone	As is	None

screens were also observed. The positive results obtained with both MP screens for the patient and the three healthy volunteers were confirmed when a second test was performed 1 month later with pieces of both MP screens. Flaking associated with facial dermatitis was not observed in any of the positive patch tests. In addition, the patient had not experienced AD or used systemic or topical corticoids on the test areas for at least 2 weeks before completing these patch tests.

DISCUSSION

The unique shape of the lesions observed on the patient was unusual for AD. In addition, despite experiencing 12 months of facial dermatitis, when contact with an MP was avoided, complete and persistent improvement in the patient's skin condition was observed. Moreover, it was not necessary to avoid any other substance, product, food, or activity to maintain this improvement. In combination, these observations suggested a diagnosis of MP contact dermatitis (CD). Positive local skin



Figure 2. Erythema and edema were observed 48 hours after a patch (application) test using an LG mobile phone (LG, Sao Paulo, Brazil).

reactions obtained in the patient and in 3 of 14 volunteers using screens from two different brands of MP and in the patient when exposed to an extract of the LG MP screen further supported this diagnosis. These results also suggested that the causal substance(s) could be an irritant common to both screens. Patch tests performed with almost 170 other allergens, including nickel, chromium, cobalt chloride (previously implicated as causes of MP CD) (1–5), personal products, and objects that our patient was in contact with were negative. Because of the positive evolution observed after exclusively avoiding contact with an MP, we excluded the possibility of a phototoxic or allergic reaction to other products.

We believe that the form and frequency of MP use by our patient (e.g., 2–8 h each day, with the screen of the MP in constant contact with the cheek), in combination with the presence of AD, may have led to the development of CD. Although the lesions observed on the patient's face may represent direct contact with the screen, the patient's fingers could also have transferred screen components from the TS to the face (or other parts of the body).

One of the healthy volunteers reactive to the Nokia 3600 MP slide had been using this type of phone for years, and the other two had used the LG MP for 3 weeks, without reaction. Therefore it seems that an irritative reaction occurs only when the MP screen is applied under occlusion (unusual in real life).

Because of its physical characteristics, polyester is used to make MP screens (6). Therefore components of

polyester and pieces of polyester bottles were tested. Negative results were obtained, suggesting that polyester was not the cause of the dermatitis. Screen manufacturers add scratch-resistant coatings, flame retardants, ultra-violet light absorbers, and other things to improve the properties of MP screens (7,8). One or more of those chemicals that may have acted as skin irritants or may be present in unsafe amounts may have caused the skin reactions observed in our patient and in the healthy volunteers. When MP companies and screen manufacturers were contacted regarding the screen components used, they refused to provide any specifics. Therefore it is possible that not all relevant substance(s) were tested in this study. Patch testing using a thin-layer chromatogram strip method may be another approach to identify causal substances of CD, but we do not have this technique available.

The patient agreed to use a non-TS MP, to cover her new MP with plastic wrap, and to use a stylus pen when needed; 6 months later, she had not had a recurrence of the facial dermatitis.

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