

## TEACHING CASE REPORT

### Cellphone contact dermatitis with nickel allergy

**The case:** An 18-year-old male presented with pruritic lichenified dermatitis on his lower abdomen and eczematous dermatitis on his extremities, flanks and face that had lasted several weeks. We suspected his belt buckle had led to allergic contact dermatitis with subsequent autoeczematization. Patch testing using the expanded North American Contact Dermatitis Group allergen battery of 65 allergens<sup>1</sup> disclosed an edematous and papulovesicular reaction to nickel at 72 hours. The patient had no other positive reactions, nor did he react to other metals tested, including gold, cobalt, chromium, copper and palladium.

The patient suspected that his recurrent facial dermatitis was related to contact with the headset of his cellphone. We spot tested both the antenna and the headset for free nickel. The test of the antenna, which was plastic coated with metallic paint, was negative. The test of the headset was strongly positive for free nickel. The patient began using a cellphone that contained no nickel, and his facial dermatitis cleared. He decided to resume using his old cellphone to confirm that it had caused his dermatitis and the eruption recurred (Figure 1).

We performed spot tests for free nickel on 22 different popular models of cellphones from 8 manufacturers and a Bluetooth headset. We used a commercially available kit (Allertest Ni, Allerderm Laboratories, Phoenix, Arizona), in which we applied a drop of dimethylglyoxime and a drop of ammonium hydroxide solution to a cotton-tipped applicator and rubbed it on the part of the equipment being tested (Figure 2, left). A pink colour on the applicator indicates the presence of free nickel. We performed spot tests on the menu button, the headset, the area bordering the screen and any other metallic areas that could come into

contact with the skin (Figure 2, right). The results of the nickel spot testing are summarized in Table 1.

In the last few years, use of wireless devices for basic communication has risen significantly around the world. In

December 2006 the Canadian Residential Telephone Service Survey reported that two-thirds of Canadian households had at least 1 cellphone and that 80% of Alberta households had cellphone service.<sup>2</sup> In the same year, a news report in the United States indicated that 53% of American adolescents aged 12–17 owned cellphones, up from 39% in 2005 and 33% in 2002.<sup>3</sup> Given the widespread use of cellphones, the presence of metal in the



**Figure 1:** Patches of eczematous dermatitis on patient's face (left) in areas that came into contact with the headset of his cellphone (right).



**Figure 2:** Spot tests for free nickel were performed by adding a dimethylglyoxime and ammonium hydroxide solution to a cotton-tipped applicator and then rubbing the applicator on areas of cellphones likely to have skin contact. A pink colour on the applicator tip indicates the presence of free nickel (left). In some models, the area around the screen and the menu button tested positive for free nickel (right).

exterior casing of these phones and the high prevalence of nickel sensitization in the population, it is not surprising that cellphones can cause allergic contact dermatitis. Recently, facial contact dermatitis from exposure to hexavalent chromium plating<sup>4,5</sup> and to nickel<sup>6</sup> in cellphones has been reported.

Although cellphone batteries containing nickel have received much attention as an environmental concern, little has been written about the presence of nickel in cellphone cases.

Nearly half of the phones we spot tested contained some free nickel. The menu buttons, decorative logos on the headsets and the metallic frames around the liquid crystal display (LCD) screens were the most common sites.

There appears to be a relation between cellphone models and nickel content. Cellphones intended for rugged use, such as the Motorola i series (i580 and i870), often have rubber coating and no surface nickel. Those with more fashionable designs often have metallic

accents and are more likely to contain free nickel in their casings.

Cellphone use should be considered in the differential diagnosis of facial and ear contact dermatitis in individuals who are sensitive to nickel. Manufacturers and industrial designers should be aware of the potential for cellphones to cause allergic reactions related to nickel. Before purchasing cellphones, individuals sensitive to nickel should consider spot testing phones for free nickel. Nickel spot-test kits such as the one we used are readily available for consumer use. These tests are sensitive enough to detect the presence of free nickel at a level as low as 10 ppm — a threshold below which only individuals with the most pronounced sensitivity to nickel would experience a reaction. In addition, we recommend that cellphone retailers allow users with a medically documented allergy to metallic parts of their phones to exchange the equipment without penalty.

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This article has been peer reviewed.

**Competing interests:** None declared.

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**Table 1:** Results of nickel spot testing of 23 wireless communication devices

| Device                   | Location of free nickel              |
|--------------------------|--------------------------------------|
| <b>Cellphone model</b>   |                                      |
| BlackBerry 8700c         | Speakerphone (back of phone)         |
| BlackBerry Pearl         | None                                 |
| Kyocera KX444            | None                                 |
| LG Verizon VX8300        | None                                 |
| Motorola L2              | Headset (decorative logo)            |
| Motorola Razr            | Headset (decorative logo)            |
| Motorola SLVR            | Headset (decorative logo)            |
| Motorola Q               | Headset (decorative logo)            |
| Motorola i580            | None                                 |
| Motorola i870            | None                                 |
| Nokia 6061               | None                                 |
| Nokia 6062               | None                                 |
| Nokia 6820               | None                                 |
| Nokia 6230               | None                                 |
| Nokia 6682               | None                                 |
| Palm Treo 650            | None                                 |
| Samsung e105             | Metal around the screen, menu button |
| Samsung d807             | Menu button                          |
| Sony Ericsson W600i      | Menu button                          |
| Sony Ericsson W810i      | Menu button                          |
| Sony Ericsson T610       | Handset (if paint is chipped)        |
| Sony Z520a               | None                                 |
| <b>Bluetooth headset</b> |                                      |
| Plantronics Explorer 320 | None                                 |