

Diagnostic workup of occupational allergic nickel dermatitis in a nurse with multiple nickel exposures

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Allergic nickel dermatitis is frequent and is caused by direct skin contact with nickel-releasing items such as jewellery.¹ However, other exposures, for example, at the workplace, may matter and could easily be overlooked. Here, we report a nurse with chronic hand eczema caused by occupational nickel exposure, verified by dimethylglyoxime (DMG) testing of metallic items at the workplace and nickel deposition on the hands.

CASE REPORT

A 35-year-old surgical nurse presented with vesicular chronic hand eczema and abdominal nummular vesicular eczema. Vesicular hand eczema started 1 month after she began working as a surgical nurse. During the past 3 years, the hand eczema healed only during long-term vacations.

Patch testing was performed with the European baseline series (Allergeaze, SmartPractice, Calgary, Canada) in Finn Chamber discs (8 mm; Epitest, Tuusula, Finland). Patch tests were applied on the upper back and affixed with Scanpor tape (Norgesplaster, Vennesla, Norway) for 2 days, and read on day (D) 2, D4, and D7, in accordance with European Society of Contact Dermatitis recommendations.² A positive reaction was found only to nickel sulfate 5% pet. (++) . The patient had never suffered from atopic dermatitis, and there were no

apparent nickel exposures in her private life, on the basis of her own DMG testing.

Occupational nickel exposure was examined during a workplace visit. All metallic items that the patients had repeated skin contact with during a normal work shift were tested with the DMG test. Of 27 objects tested, 10 were positive and two were uncertain (Table 1). Several objects were DMG-positive on only one surface or on a single component, especially in older equipment on sites subjected to wear and beginning to corrode. Furthermore, to quantify nickel accumulation on the patient's hands, the DMG test was used on her palms and fingers before and after 30 minutes of normal work, as described by Julander et al.³ The test gave positive results on digits 1, 2 and 3 on her dominant hand (Figure 1), and an uncertain result on digit 2 of her non-dominant hand. Active avoidance of the identified occupational nickel exposures led to significant improvement of her hand eczema within 3 months.

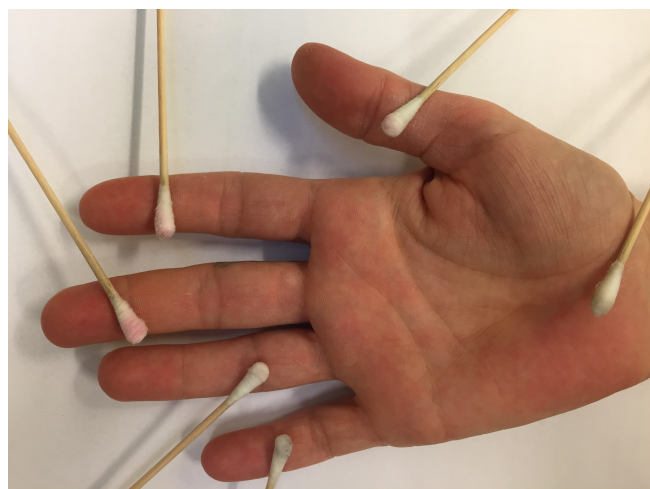
DISCUSSION

DMG testing of the hands has again been shown to be an efficient method for identifying nickel deposited from occupational exposures. The limit of detection is estimated to be 0.13 µg nickel/cm², which is sufficient to elicit allergic contact dermatitis in some nickel-sensitized individuals.³ Furthermore, the case shows that brief and repeated

TABLE 1 Results of dimethylglyoxime (DMG) testing of operating room equipment

	Equipment	DMG test
1	Table (underneath, old)	+
2	Trolley (old)	+
3	Stool (underneath)	+
4	Suction valve	+
5	Suction bell	+
6	Shoulder support (screw)	+
7	Wastebasket (screw)	+
8	Office chair	+
9	Bottle opener	+
10	Wall rack	+
11	Shoulder support	/
12	Small stool	/
13	Surgical table	–
14	Bed metal frame	–
15	Shoulder support element	–
16	Leg support	–
17	Leg support 2	–
18	Small table (new)	–
19	Large table	–
20	Wall table	–
21	Stool (surface)	–
22	Scissors	–
23	Burner	–
24	Wastebasket	–
25	Metal basket	–
26	PVC tripod	–
27	Hand sanitizer	–

+, positive; –, negative; /, uncertain.

**FIGURE 1** Positive dimethylglyoxime test of digits 1, 2 and 3 on the right hand

nickel skin contact at work can lead to nickel skin deposition and chronic hand eczema. The importance of this has recently been highlighted experimentally.^{4,5}

Surgical instruments have very low nickel release and are rarely considered to be allergenic.⁶ Correspondingly, nickel release was found only from operating room equipment, such as trolleys, tables, chairs, racks, and valves. The back of an office chair and an old bottle opener used as an improvised lid opener were strongly positive. It is of note that both items are “non-native” to surgical wards. Exposure to nickel from regularly used objects constitutes an occupational risk of developing nickel allergy and dermatitis. Other reports have also shown nickel release from operating room equipment⁷ and diagnostic tools used in other hospital departments.⁸

Among professionals, healthcare personnel have the highest risk of developing occupational contact dermatitis.⁹ Because of a combination of exposure to wet work and various irritants, including glove occlusion and frequent use of hand cleansers, they are often diagnosed with irritant contact dermatitis. Many women still suffer from nickel allergy,¹⁰ which is often of past relevance, from wearing nickel-

TABLE 2 Standard operating procedure for assessing relevant exposure to nickel occupationally and non-occupationally in nickel-allergic patients with palmar hand eczema

Step	Details
1 DMG testing of objects	- Workplace visit or, if this is not possible, the patient is instructed to list contacts with metallic objects at the workplace and at home - The frequency and duration of contact with objects are listed - Objects are DMG-tested and documented with a photograph of the object and the positive DMG test result
2 DMG testing of hands	- Before a regular workday, the patient's hands are thoroughly cleaned with water and soap, wiped with 1% nitric acid, and washed with deionized water. Absence of nickel deposition is confirmed with a negative DMG test result of the hands³ - The patient is instructed to avoid hand washing during work hours - After at least 30 min as in our case, but preferably 2 h of regular work, the patient's hands are tested with the DMG test. Each finger and the palms of both hands are tested separately - The hands are washed thoroughly after the examination
3 Interpretation	Positive: Indicates accumulation of >0.13 µg nickel/cm², and probably relevant occupational nickel exposure Negative: Does not definitively exclude occupational exposure

Abbreviation: DMG, dimethylglyoxime.

releasing earrings; however, current occupational exposures may not be obvious, and may therefore be overlooked. To improve diagnostic practice, we suggest a “standard operating procedure” for investigating occupational and private exposures to nickel in patients with palmar hand eczema and nickel allergy verified by patch testing (Table 2). Such procedures are rarely followed in routine practice, and our case indicates that occupational allergic contact dermatitis to nickel may be substantially overlooked.

CONFLICTS OF INTEREST

The authors have no conflicts of interest to report.

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REFERENCES

1. Ahlström MG, Thyssen JP, Menné T, Johansen JD. Prevalence of nickel allergy in Europe following the EU Nickel Directive—a review. *Contact Dermatitis*. 2017;77:193-200.
2. Johansen JD, Aalto-Korte K, Agner T, et al. European Society of Contact Dermatitis guideline for diagnostic patch testing—recommendations on best practice. *Contact Dermatitis*. 2015;73:195-221.
3. Julander A, Skare L, Vahter M, Lidén C. Nickel deposited on the skin—visualization by DMG test. *Contact Dermatitis*. 2011;64:151-157.
4. Erfani B, Lidén C, Midander K. Short and frequent skin contact with nickel. *Contact Dermatitis*. 2015;73:222-230.
5. Ahlström MG, Thyssen JP, Menné T, et al. Short contact with nickel causes allergic contact dermatitis: an experimental study. *Br J Dermatol*. 2018;179:1127-1134.
6. Haudrechy P, Foussereau J, Mantout B, Baroux B. Nickel release from nickel-plated metals and stainless steels. *Contact Dermatitis*. 1994;31:249-255.
7. Boyd AH, Hylwa SA. Nickel release from surgical instruments and operating room equipment. *Dermatol Online J*. 2018;24:3.
8. Lei U, Zachariae C, Thyssen JP. Occupational hazards in diagnosing pigmented lesions: nickel release from hand-held tools. *Contact Dermatitis*. 2015;73:194-194.
9. Carøe TK, Ebbelhøj N, Agner T. A survey of exposures related to recognized occupational contact dermatitis in Denmark in 2010. *Contact Dermatitis*. 2014;70:56-62.
10. Schuttelaar MLA, Ofenloch RF, Bruze M, et al. Prevalence of contact allergy to metals in the European general population with a focus on nickel and piercings: the EDEN Fragrance Study. *Contact Dermatitis*. 2018;79:1-9.

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