

Immediate and delayed allergy to nickel with contact urticaria, rhinitis, asthma and contact dermatitis

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Summary

A 27-year-old woman had for 2 years performed manual grinding of metal castings that contained nickel. She had previously had allergic contact dermatitis from nickel but started to get contact urticaria, rhinitis and asthmatic attacks at work. The symptoms disappeared at weekends and on holiday. Scratch chamber tests, open tests, specific IgE determinations (RAST), and RAST-inhibition test indicated that she had developed an IgE-mediated allergy to nickel; the bronchial provocation reaction with NiSO₄ was, however, a late one. Patch tests confirmed her allergic contact dermatitis to be caused by nickel. This is the first patient, to the best of our knowledge, reported to have developed allergic contact dermatitis, allergic contact urticaria, rhinitis and asthma from nickel.

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Introduction

Delayed allergy from nickel is common, but very few cases of immediate allergy have been reported. The reports are summarized in Table 1. We present a patient who had contact urticaria, rhinitis, asthma, and allergic contact dermatitis caused by nickel. To the best of our knowledge, this is the first report where the same patient had allergic contact dermatitis, contact urticaria, and respiratory symptoms with both immediate and delayed allergy to nickel.

Case report and results

A 27-year-old woman was referred to us in 1982 because occupational nickel or chromate asthma was suspected. For 2 years she had daily performed manual grinding of metal castings without using any wetting agent. The castings contained 9% nickel and 17% chromium. She had used short gloves made of cotton or leather and a mask with a disposable paper filter. She had been smoking 15 cigarettes a day for 10 years. Neither she nor her family was atopic according to the criteria of Hanifin and Rajka [10]. Inexpensive jewellery had caused dermatitis since she was 14 years old, suggesting allergic contact dermatitis from nickel.

After 2 months of employment, she developed sneezing, cough and paroxysmal dyspnoea at work, followed by occasional urticarial eruptions on both arms. At weekends and on holiday she was symptomless. During her second year of employment, her cough and dyspnoea worsened markedly. She was investigated for suspected asthma in a local hospital. Her spirometric values were normal. She had neither non-specific bronchial hyper-reactivity nor strain-induced asthma. Her chest symptoms, however, were relieved with salbutamol inhalations and per-oral theophylline. On examination at our Institute, her physical status was normal and her skin was symptomless. She had no variation in diurnal peak expiratory flow (PEF). Her spirometric values were normal, and the bronchodilatation test was negative. She had no bronchial hyperreactivity in the histamine challenge test. A short PEF surveillance (PEF every other hour during daytime) pointed to occupational asthma: during 5 working days the PEF values of the early morning hours fell from 480 to 400 l/min. The chest and paranasal sinus X-ray examinations were negative. Total IgE was normal (19 kU/l).

Skin tests

Patch tests were performed as previously described [11]. The ICDRG (International Contact Dermatitis Research Group) standard patch test series confirmed her allergic

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immediate allergy from nickel very rare, continuous contact with nickel can probably not be considered as a risk factor for asthma. Continuous occupational exposure to a sensitizer such as epoxy resin in two patients with allergic contact dermatitis from epoxy resin [18], may eventually result in the development of asthma.

We have performed scratch chamber or prick tests with cobalt, chromium and nickel salts (concentrations above) for more than 15 years on about 50 patients per year. The main indication for the tests has been a suspected occupational asthma from metallic compounds, e.g. in fumes. No other patients have been skin test positive, even though the patients have been shown to have asthma using provocation tests. Accordingly, a skin test may not be very valuable in diagnosing chromate-, cobalt-, or nickel-induced rhinitis or asthma. Rhinitis or asthma caused by the above metals may not have been of the conventional IgE-mediated type and the skin tests with substances mixed in water do not detect the allergic patients. On the other hand, asthma, e.g. from nickel is very rare, and so far only eight cases have been published (Table 1). Of these eight cases two were shown to have antibodies to nickel [2,4]. In addition, Shirakawa *et al.* [19] showed that seven out of eight patients with cobalt asthma had a positive bronchoprovocation test with nickel sulphate. Davies [6] reported three cases of occupational asthma probably induced by exposure to nickel salts. Sunderman and Sunderman [20] reported nickel-related asthma in a patient with Löfller's syndrome. Stoddart [21] had two patients with generalized infusion reactions, probably caused by nickel. Niordson [22] reported nickel sensitivity as a cause of rhinitis. Patch testing was positive but prick testing negative.

Immediate nickel skin allergy has often been associated with allergic contact dermatitis caused by nickel (Table 1). Davies 1986 [6] reported three cases of probable nickel asthma, but no specific tests were made. In the previous cases the patch test substance, nickel sulphate in petrolatum, has been used to demonstrate the immediate skin reaction [7-9,21,23] but it is probable that in most cases hapten-HSA conjugates [18,24-26] or hapten-water solutions are better for skin-prick testing. Nickel sulphate-HSA has been used in one study with success [2] but we had difficulties in developing a good nickel-HSA conjugate although conjugates with many other small molecular weight chemicals such as phthalic anhydrides, diisocyanates and epoxy resins have been prepared and tested with success [18,26].

In the previous cases with contact urticaria a RAST was not performed and it was thus not clarified whether the reaction was IgE-mediated. In the present patient the RAST indicated that the nickel reaction was IgE-mediated although the titre was relatively low. However,

this is the only patient at our Institute during 15 years that has shown a positive RAST to nickel and the clinical signs have been in good agreement with the *in vitro* tests. The patient's serum has since then been used as a reference serum but no new cases of immediate nickel allergy or positive RASTs have been detected.

The patient changed her job to kitchen work. When seen 3 years later she had no dermatitis and had no non-specific bronchial hyperreactivity. She still had some respiratory symptoms but she had continued to smoke.

Part of the data of the present patient has previously been communicated to an international and a Finnish conference [27-28].

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