

CONCISE COMMUNICATION

Nickel dental alloys can induce laryngeal edema attacks: A case report

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ABSTRACT

Nickel is a strong immunological sensitizer and may result in contact hypersensitivity. Case reports of allergic reactions to intraoral nickel have occasionally been reported in the published work and these allergic reactions are generally of a delayed type (type IV). Here, we present a case of a nickel allergic patient displaying frequent laryngeal edema attacks which required treatment with epinephrine injections followed by parenteral corticosteroid doses. Her complaints ceased after the removal of the dental bridge and the foods containing nickel. In summary, we propose that in the case of recurrent laryngeal edema attacks without any explainable cause, an allergic reaction due to nickel exposure should be taken into consideration.

Key words: dental alloys allergy, laryngeal edema, nickel allergy.

INTRODUCTION

Nickel is a strong immunological sensitizer and may result in contact hypersensitivity.¹ A nickel allergy may lead to nickel dermatitis at the site of contact and is a risk factor for hand eczema.² If nickel ions are released from a nickel-plated material following direct and prolonged contact with the skin of a sensitized individual, an allergic response can be initiated.³ Subsequent exposures, if sufficiently high, may then result in an allergic reaction.

Nickel is also a constituent of many dental cast alloys.³ Case reports of allergic reactions to intraoral nickel have occasionally been reported in the published work. Generally, allergic reactions to dental alloys are of a delayed type (type IV).⁴ The observed clinical signs and symptoms include oral edema, perioral stomatitis, gingivitis and extraoral manifestations such as eczematous rashes.

Very few cases of type I hypersensitivity to nickel with clinical symptoms consisting of contact urticaria have been reported.⁵ Here, we present a case of a nickel allergic patient displaying frequent laryngeal edema attacks for 4 months until the correct diagnosis was made and the causative factor was eliminated.

CASE REPORT

A 31-year-old female nurse attended our outpatient clinic complaining of frequent attacks over the previous 4 months, which

consisted of hoarsening, difficulty in swallowing and shortness of breath. She had had a history of recurrent urticaria attacks for the 2 months prior to her current complaints. She stated that her attacks had been emerging especially during her night shifts at the hospital and required treatment with epinephrine injections followed by parenteral corticosteroid doses. She had a fear of having her throat swell and was carrying a supply of adrenaline and methylprednisolone ampoules. She denied having a history of any allergic symptoms or other medical problems. However, she had experienced contact dermatitis due to non-precious jewelry before. There was no suspicious drug use, ingestion of allergenic food or exposure to a known trigger preceding her symptoms. The patient was hospitalized and upon the observation that her throat complaints were due to laryngeal edema, a moderate dose of oral methylprednisolone (40 mg/day) and pheniramine maleate 22.7 mg three times per day was initiated. Her other physical as well as laboratory examinations, including routine biochemistry, tryptase, total immunoglobulin (Ig)E, specific IgE tests for inhalant and food allergens and latex, antinuclear antibodies and anti-dsDNA were all within normal limits. Despite the aforementioned regular treatment, she continued to experience frequent throat attacks and required additional adrenaline plus corticosteroid injections. A more detailed exploration revealed that a dental bridge had been placed in her mouth a short time before her symptoms began. Upon this knowledge, the dental bridge was removed. In subsequent days, her throat attacks subsided and

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ceased at the end of a week. The patient was discharged with a diminishing corticosteroid regimen and was asked to come for a control visit 2 weeks later. At the time of the control visit, she was symptom-free except for a moderate attack in her throat after eating a bar of chocolate. However, a week later, she returned to the clinic with a more severe attack that she attributed to a large amount of grape marmalade. Taking into consideration the probability that she had a nickel hypersensitivity, she was advised against the ingestion of foods containing nickel. Certain foods, such as cocoa and chocolate, soya beans, oatmeal, nuts and almonds, fresh and dried legumes which are routinely high in nickel content, were omitted from her diet.⁶ After a symptom-free month, a skin patch test (Chemotechnique Diagnostics, Vellinge, Sweden) for dental alloy metals was applied to her back. She started to complain of hoarsening and difficulty in swallowing after 1 h of the patch test application and the test material was quickly removed. The patch test site of 5% nickel sulfate displayed an edematous erythema, which was considered a positive response (Fig. 1). Although the basophil activation test with nickel was negative, a skin prick test performed with nickel sulfate hexahydrate in 1:10 dilution (10 mg/mL) revealed a 4+ response (Fig. 2).

DISCUSSION

This case report reveals for the first time that dental alloys containing nickel can cause severe throat swelling in nickel-sensitive patients. The lack of similar patient reports in the medical published work is probably the result of dentists avoiding the use of nickel in dental materials in recent years, as this matter has been regulated by laws in Western countries. However, there have been several publications describing systemic reactions against nickel dental cast alloys. These usually consisted of vesicular hand eczema or systemic contact dermatitis.^{7,8} Very few cases of immediate and delayed hypersensitivity, presenting mostly with contact urticaria, have been reported.⁵ Finally, a patient with a systemic nickel allergy presenting as papuloerythroderma-like eruptions was described.⁹ This case benefited from a nickel-free diet and the removal of dental braces was not necessary.

Although systemic allergic reactions to nickel seem to reflect a type I hypersensitivity, the mechanism behind it is not fully understood. Nickel hypersensitivity is an example of hapten-mediated allergic contact dermatitis.¹⁰ Hapten-mediated contact hypersensitivity results from the binding of small molecules, in this case nickel ions (Ni^{2+}), to larger proteins, thereby converting self-antigens into highly immunogenic "foreign" peptides when presented in the context of major histocompatibility complex (MHC) molecules. Haptens penetrating the epidermis bind to the peptide MHC molecules of cutaneous dendritic cells, which migrate to draining lymph nodes and present the antigen to hapten-specific naive T cells. These T cells are then expanded and, on re-exposure, drive an inflammatory reaction within the skin. Both CD4^+ and CD8^+ Ni^{2+} -specific T cells can be detected in the blood of patients with a nickel allergy and these cells secrete high



Figure 1. Positive result at the second day of the nickel sulfate patch test application.



Figure 2. Positive prick test result of the patient.

levels of interferon- γ on exposure to Ni^{2+} *in vitro*. Besides this mechanism, it was shown that Ni^{2+} directly binds to human Toll-like receptor 4 and that this is sufficient for nickel sensitization.^{10,11}

How a delayed-type hypersensitivity reaction turned into an acute reaction, such as with this patient, is unclear. Interestingly, no intraoral allergic signs or symptoms were detected before or at the time of the patient's laryngeal edema. The rarity of a mucosal allergy is attributed to several factors such as saliva constantly washing away potential allergens, which are then swallowed, and the vascularity of

the oral mucosa allowing for rapid dispersion of potential allergens.³ However, the history of the patient revealed that she had been sensitized to nickel long before. She was probably sensitized by earrings or other jewelry, as she had not been able to wear such ornaments for years because they caused eczematous reactions at the contact site. On the other hand, an allergic reaction can also occur in patients with no known prior sensitization. Likewise, it was recently reported that severe signs of eczematous and urticarial reactions appeared in an adult patient with no previous history of nickel allergy during an orthodontic treatment.¹² The patient had been wearing fixed metal upper appliances during orthodontic treatment to assist the eruption of her impacted teeth. The reaction occurred after an intraoral surgical procedure. The authors proposed that the surgical exposure of the impacted teeth acted as an injury and the subsequent bonding of the metal buttons caused the contact with the sensitizing allergen.¹²

In summary, we propose that in the case of recurrent laryngeal edema attacks without any explainable cause, an allergic reaction due to nickel should be taken into consideration, especially if an intraoral exposure exists. A previous history of allergies should be considered as a predictive factor of clinical manifestations of nickel hypersensitivity.

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