The nickel problem

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Many of the metals commonly used in dentistry are known to be allergenic. The common ones are chromium, cobalt, mercury, and nickel, with the latter being considered the most allergenic.1-2 The cloud of controversy continues to hang over the use of nickel in dentistry. Many of the oral allergic reactions are difficult to distinguish and differentially diagnose from other dental problems. Nickel-containing metallic implants are linked to the production of sensitization dermatitis.2 Nickel is one of the most common causes of allergic contact dermatitis, particularly in women. It is quite common in the earlobes as a result of the presence of this metal in costume jewelry.3-9 Nickel dermatitis can spread symmetrically to secondary sites such as arms, eyelids, and sides of neck and face. How nickel dermatitis spreads to distant sites is not known. However, such spreads may be more apparent than real since the so-called secondary sites may be contaminated by perspiring fingers during the initial eruptive stages.3,4

Despite the fact that nickel sensitivity is an accepted reality, little attention is paid to it in dentistry. This is because nickel has not been present, or if present found only in small amounts, in the alloys used in dentistry.

However, new alloys, many of them containing 60% to 80% nickel, have been developed as alternatives to gold alloys due to the increase in the price of gold. As these alloys become more popular, the frequency of allergic reactions will become more significant and will result in inconvenience and expense for the susceptible patients.

The capacity of nickel to induce a dermatitis appears to be related to its pattern and mode of corrosion. All base metals corrode. In vitro investigations have shown that most nickel-based alloys have relatively high rates of corrosion compared to dental gold alloys. Products that result from this corrosion could produce soft tissue inflammation reaction and thereby initiate a sensitization dermatitis.2 Implants containing nickel and chromium, with the exception of those fabricated from stainless steel, corrode in tissue fluids, thus facilitating the migration of nickel and chromium to its surrounding tissues.13,14

Some manufacturers are including the following warning labels with their products, calling attention to the fact that some patients may develop allergic reactions to nickel: “Caution: As with all nickel-containing alloys, the use of this alloy should be avoided by persons with a known sensitivity” or “The use of this alloy should be avoided by persons having known nickel sensitivity.”

Do patients know that they are allergic to nickel? If they do know that they are allergic, do they realize that they are receiving a restoration containing nickel? Does the dentist know what type of alloy is being used in the construction of his restorations by the commercial laboratory?

A simple patch test can be used in the dental office to determine if the patient is allergic to nickel prior to treatment with a nickel metal alloy restoration. Another test can be used that will show if the casting contains nickel prior to the try-in appointment.

MATERIAL AND METHODS

A standard patch test7,14 consists of applying a small amount of a 5% nickel sulfate solution, or a 5% nickel sulfate on a petrolatum base, in the center portion of a square Band-Aid of good quality (Johnson and Johnson Products Inc., New Brunswick, N.J.). The patch is applied to the medial aspect of the upper arm, which was precleaned with an alcohol swab. This is left in place and undisturbed for 48 hours. The patient is instructed not to moisten the arm or remove the patch during this time. A Band-Aid without any reagent on it is placed next to the other to serve as a control (Fig. 1). After 48 hours, the control Band Aid is removed (Fig. 2). The second Band-Aid is removed, and the skin is cleansed with alcohol or acetone to remove any adhe-
Fig. 1. Band-Aids in position. On left is control Band-Aid.

Fig. 2. One Band-Aid is removed. Region shows erythema and papules (++ reaction). Peripheral reaction is due to migration of allergen.

Fig. 3. Both Band-Aids are removed for comparison. Descriptive residue. The tests are read 20 minutes later (Fig. 3). Signs for recording degrees of patch test reactions are:

- No reaction (0)
- Erythema (+)
- Erythema and papules (++)
- Erythema, papules, and vesicles (+++)
- Marked edema with vesicles (++++)

Fig. 4. Magnified erythema, papules, and vesicles (+++ reaction).

Name of Patient: __________________________ Age: ______ Date: __________

History of Allergies: __________________________

Medication Taken:
- Corticosteroids: ______ Yes ______ No

Name of Drug and Dosage:
- ( ) No Reaction
- ( ) Erythema
- ( ) Erythema and Papules
- ( ) Erythema, Papules, and Vesicles
- ( ) Marked Edema and Vesicles

Valium spray (Scherling Corp., Trenton, N.J.) is efficient for treatment of nickel dermatitis. It may be used on the skin in patients with a marked positive patch test reaction to reduce the inflammation and itch.

Fig. 5. Evaluation record for nickel sensitivity should be kept in patient's chart.

Preparation of a 5% nickel sulfate petrolatum base
Grind nickel sulfate crystals to a powder form using a mortar and pestle. Weigh 1.42 grams of the powder and 26.93 grams of petrolatum, and mix them together. This will produce a 5% nickel sulfate petrolatum base with a total weight of 28.35 grams or 1 avoirdupois ounce.

The dimethylglyoxime test
The dimethylglyoxime (Westwood Pharmaceutical Inc., Buffalo, N.Y.) test for nickel was discovered by
Feigl and Shore. A few drops of 1% alcohol solution of dimethylglyoxime plus a few drops of ammonium hydroxide added to a metallic object, skin, or solution will produce a strawberry red insoluble salt in the presence of nickel. Most nickel alloys, stainless steel being an exception, will give a positive reaction. This spot test will also give a positive reaction in black dermographism produced by a nickel-containing metallic object on the skin. Unpolished ingots of nickel-based dental alloys as well as unpolished castings for crowns and fixed partial dentures fabricated from these alloys will yield a positive test. However, lightly polished ingots and castings will not.

SUMMARY

Clinical use of the new base-metal alloys in restorative dentistry involves a risk for both dentist and patient. It is the responsibility of the dentist to determine if a patient is allergic to nickel prior to treatment with a restoration containing a nickel alloy.

A patch test is recommended for nickel sensitivity in every patient when such a restoration is planned. In addition, the dentist should include in the work authorization order to the dental laboratory the type of alloy he wants for a particular patient. The dentist should be prepared to check for the presence of nickel in a casting suspected of containing it using the dimethylglyoxime test. The evaluation record for nickel sensitivity should include the patient's name, age, history of allergies, medication, name of drug, dosage, and reaction. The record should be kept in the patient's chart (Fig. 5).

REFERENCES


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