

Contact Allergy Presenting as Erythroderma

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Case Report

An internist referred a 66-year-old retired businessman with a 7-month history of erythema and fine scaling. The patient suffered from recurrent erythematous, scaly, and pruritic plaques on the face, trunk, arms, and legs; the plaques had become generalized. He had incomplete responses to oral and topical steroids, antihistamines, and emollients.

The patient had diabetes that was maintained on metformin. He also took isosorbide 5-nitrate for angina. He denied having atopic dermatitis, seborrheic dermatitis, or psoriasis. He firmly believed he had a hair dye allergy, as his brother had. Physical examination revealed generalized erythema and scaling, and coalescing scaling plaques were prominent on the face (Fig 1). The dorsal and palmar surfaces of his hands and the dorsal and plantar surfaces of his feet were lichenified (Fig 2).



Figure 1. Photograph of the patient shows fine scaling plaques on erythematous atrophic facial skin.



Figure 2. The patient's lichenified hands, with shedding scales.

What is your diagnosis?

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Diagnosis

Nickel allergy, causing erythroderma.

Discussion

The initial impression was that of erythroderma probably resulting from psoriasis. The persistent itching and scaling prompted referral to a dermatologist, who performed a 3 mm punch biopsy on the left upper arm. The biopsy specimen showed a subacute to chronic eczematous pattern consistent with contact dermatitis or a psoriasiform drug eruption (Fig 3).

The patient was referred for patch testing to rule out contact dermatitis. The St. Luke's Medical Center Environmental Dermatology Unit's 70-allergen patch test series (Chemotechnique Diagnostics, Malmö, Sweden) yielded strongly positive reactions (bullae) to nickel sulfate, cobalt chloride, and potassium dichromate at 48 and 72 hours (Table 1). The patient was not allergic to p-phenylenediamine, contrary to his belief.

After patch-testing, we elicited from the patient a history of his having owned a scrap metal business 10 years previously. Present sources of metal exposure were his dentures, a metal cane, zippers, and buttons. On direct questioning about prosthetics inside his body, he remembered that over 25 years ago, he had been in a vehicular accident that led to the placement of a reduction internal-fixation metal screw in his right elbow.

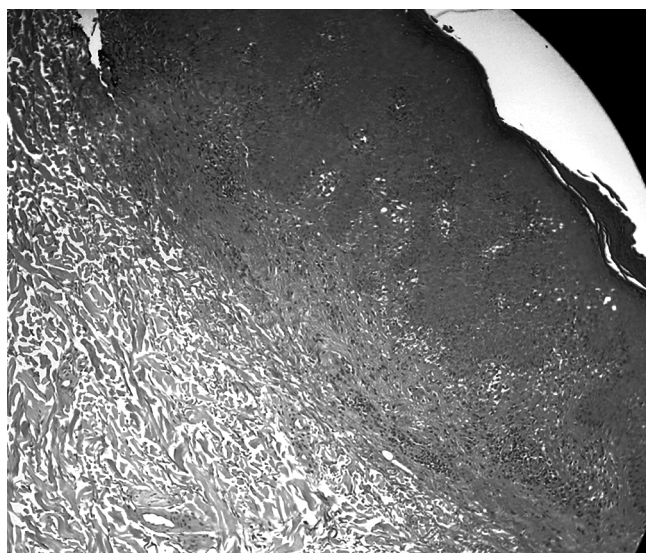


Figure 3. Punch biopsy specimen shows a subacute to chronic eczematous process consistent with contact dermatitis or a psoriasiform drug eruption. (Hematoxylin and eosin staining, $\times 10$ original magnification)

Table 1. Patch-Test Reactions

Allergen	First Reading (Day 3)	Second Reading (Day 4)
Potassium dichromate	+++	+++
Cobalt chloride	+++	+++
Nickel sulfate	+++	+++

The patient sought surgical removal of the screw from his elbow. After the screw's removal, a dimethylglyoxime test showed a pink color change on the cotton tip used to rub the metal (Fig 4), which indicated that nickel was leaking from the screw.

The patient was maintained on bland emollients, compresses, antihistamines, and topical steroids. He was told to avoid nickel-containing products or to substitute them with products that did not contain nickel. He was also advised to use aluminum cookware instead of pots and woks that contain nickel.

He continued to follow up with flares of dermatitis and was constantly reminded of the list of substances and products to avoid. However, the pruritus and scaling decreased, and his skin problem resolved completely within 2 to 3 months.

Dermatitis due to orthopedic implants is rare, and localized dermatitis overlying a metal prosthesis is more common than is a generalized dermatitis.¹



Figure 4. After surgical removal of the metal screw from the patient's elbow, a nickel spot test on the screw produced a pink color change on the cotton tip.

Orthopedic implants may be either static (such as screws) or dynamic. This patient had a static metal screw attached to bone in his right elbow. He denied having a history of pain in the area and was still very functional. In an implant recipient in whom a skin problem develops, the likelihood that the cutaneous problem is allergic in nature is slightly greater if (1) the implant is of the static type, (2) there is a history of metal sensitivity, (3) the cutaneous eruption shows a predilection for the anatomic zone of the implant, and (4) the eruption is eczematous, has developed late, and has persisted.²

Allergic contact dermatitis is reported mostly in patients who have a loosening prosthesis. A metallic change, such as oxidation, causes the allergy. Internal corrosion of orthopedic implants is a well-delineated entity. Barranco and Soloman reported a case of eczematous dermatitis from internal exposure to nickel from a stainless steel screw; patch testing showed a positive reaction to nickel, and the removal of the screw led to clearing in 3 days.³

Cohen and Hammond⁴ and Scales and colleagues⁵ established that corrosion of stainless steel in an implant may lead to rust granulomas and sterile abscesses around the implant site.

Ries and colleagues studied nickel release after implantation of the Amplatzer Occluder (AGA Medical Corporation, Golden Valley, MN), an occluding device for cardiac patients with septal defects such as patent foramen ovale, and showed that there was a significant rise in nickel blood levels up to 3 months after the procedure. The Amplatzer Occluder is made of nitinol-based alloys, which are widely used in orthopedic and orthodontic products, and its composition is 55% nickel.⁶

Surgical stainless steel contains iron, chromium, and nickel. The low carbon content in surgical stainless steel diminishes corrosion and adverse tissue effects. However, stainless steel still has relatively high corrosion fatigue failure rates. These limit its use to screws, plates, and intra-

medullary devices. Nickel is released through the action of sweat, blood, and physiologic saline.

Whether the patient was sensitized from the elbow screw 25 years ago or from his scrap metal business 10 years ago is an issue we cannot resolve. Because he was disease free until just less than a year ago, it is likely that the stainless steel screw in his joint was inert for many years. His scrap metal business may have been the source of his sensitization to metals, and only in the past year or so did the metal pin in his elbow corrode, leading to the building up of minute blood levels that eventually led to erythroderma. Avoidance of metals in his external environment was not sufficient to lower the levels of metal allergens circulating systemically immediately after removal of the screw. Once an individual is sensitized, even minor contact with nickel-containing metals can cause a reaction.⁷ Oral ingestion of nickel may have also aggravated the outbreaks of eczema, particularly on the hands.⁸

References

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