Systemic contact dermatitis to a surgical implant presenting as red decorative tattoo reaction

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INTRODUCTION

Up to 5% of orthopedic implant patients suffer metal-related cutaneous complications caused by delayed-type hypersensitivity reactions, most commonly to nickel, cobalt, and chromium. Both generalized and remote site dermatitis to orthopedic implants are uncommon.[1-3]

Traditional and decorative tattoos have been given for thousands of years around the world and remain a popular practice in modern times, with as many as 3 in 10 adults reporting having 1 or more tattoos.[4,5] As more people get tattoos, the rate of complications, which may be as high as 2%, is likely to increase.[4] Adverse tattoo reactions are common and predominantly affect red pigmented areas. Although reactions were often caused by an allergy to particular metals within pigments in the past, with the shift toward the use of azo dyes, the mechanism is unclear.[6-8]

We report a case of possible systemic contact dermatitis (SCD) manifesting as inflammation and pruritus at multiple red tattoo sites after surgical insertion of a metal implant and resolving with implant removal.

CASE REPORT

A 57-year-old woman with diabetes mellitus and an unremarkable dermatologic history underwent placement of a first metatarsophalangeal joint hemi implant with cobalt chromium hardware coated with titanium plasma and hydroxyapatite. The patient reported that within 2 weeks of surgery, the red-containing areas of her tattoos, which were previously flat and uninflamed, became raised and pruritic. Oral antihistamines and emollients resulted in only partial symptom relief. Her symptoms temporarily resolved after a combination of intralesional injections with triamcinolone suspension (10 to 40 mg/mL) at intervals of every 1 to 2 months and triamcinolone 0.1% cream only to recur several weeks after each injection.

Abbreviation used:

SCD: systemic contact dermatitis

On examination, several decorative tattoos, remote from her surgical implant (Figs 1-3), had erythematous, indurated papules and plaques limited to red pigmented areas. Additionally, an erythematous and scaly plaque surrounding the surgical site on her foot was present, without signs of soft tissue infection.

There were also scattered erythematous patches and plaques on nontattooed skin on the neck, back, chest, abdomen, and arms. A punch biopsy of an indurated area within red-pigmented ink found spongiotic dermatitis with occasional superficial dermal eosinophils and

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Fig 1. Hummingbird and flower on volar aspect of left wrist with erythema, scaling, hemorrhagic crusting, and lichenification over red pigmented areas.

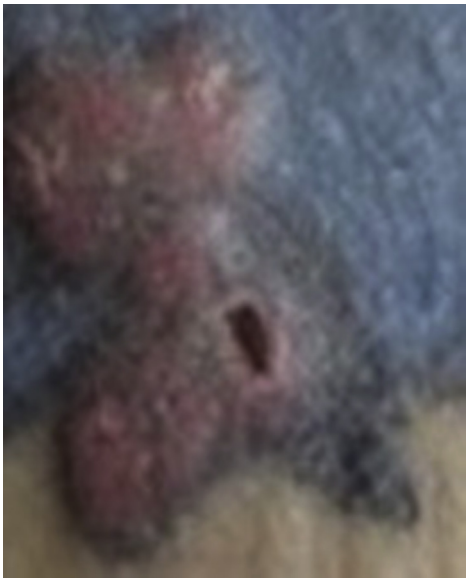

Fig 2. Tattoo on right ankle with edema and scaling localized to red pigment.

tattoo pigment within superficial dermal macrophages. Given the history and physical examination findings, allergy to metals in the orthopedic hardware was suspected, and patch testing was obtained.

The tattoo pigment manufacturer was contacted; however, they did not disclose any ingredients in the pigments. The patient underwent patch testing to metals from an extended North American series and a supplemental metals series. The positive and possible positive patch test results are summarized in Table I.

After patch testing, the patient was seen by the podiatric surgery department for consultation to have the hemi implant removed. She had pain, limited range of motion, tenderness to palpation, and crepitus of the first metatarsophalangeal joint. At the time of surgery, the hemi implant was found to be well fused to the first metatarsal without evidence of implant failure. After the metallic implant removal, her pain and tattoo reaction resolved (Fig 4).

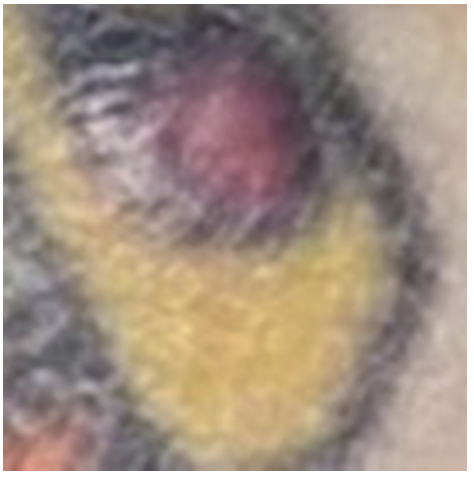

Fig 3. Tattoo with edema limited to the red pigment and minimal scaling throughout.

DISCUSSION

Tattoo reactions can be cutaneous or systemic. Cutaneous complications can occur immediately after tattooing or after weeks, months, or years. Tattoo reactions are commonly described clinically and histologically as eczematous, lichenoid, granulomatous, spongiotic, and pseudolymphomatous reactions. Eczematous and lichenoid reactions are the most common type of red pigment reactions.[6-9] Increased T lymphocytes and Langerhans cells are often found at tattoo reaction sites and are consistent with an allergic pathomechanism.[6]

Metallic allergens are generally believed to contribute to allergic skin reactions; however, patch testing and metal analysis have not been definitive in proving a causal relationship.[4,6,7] Criteria to support a link between metal allergy and metal dermatitis have been proposed: (1) dermatitis beginning weeks to months after implantation; (2) an eruption overlying the implant with erythema, induration, papules, or vesicles; (3) positive patch test results to a metal used in the implant; (4) positive in vitro testing to metals; (5) a dermatitis that is resistant to medical therapy; and (6) complete recovery after removing the implant.[3] Management after diagnosis of metal hypersensitivity is controversial with no clear objective criteria. No intervention is necessary in asymptomatic patients with a positive metal patch test. For symptomatic individuals with refractory dermatitis and for whom device removal is considered reasonable, the device may be removed. In individuals for whom implant removal is not possible, a tapered dose of oral prednisone over 21 days may be helpful.[1-3] For tattoo-related dermatitis, varying

Table I. Scoring of metal sensitivity (patch test appearance codes) on days 2 and 7 after patch application

Metal	D2	D7
Nickel sulfate hexahydrate, 2.5% pet	1+	2+
Palladium chloride, 2% pet	1+	2+
Cobalt dichloride hexahydrate, 1% pet	2+	2+
Potassium dichromate, 0.25% pet	6	4*

A score of 1+ represents non–vesicular-positive reactions with erythema, induration, and possible papules. A score of 2+ represents a strong (edematous or vesicular) reaction. A score of 4 represents macular erythema only. A score of 6 represents a negative reaction.
Pet, Petrolatum.
*Papular erythema involving less than 50% of patch area.

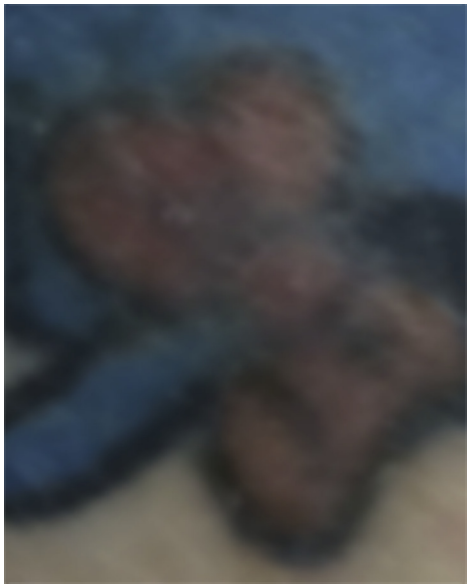

Fig 4. Tattoo from Fig 3 with resolution of scaling and edema.

degrees of success with oral allopurinol, topical and intralesional corticosteroids, antibiotics, surgical excision, and laser have been reported.[4,7-9]

In our patient, the exact, underlying mechanism for her tattoo dermatitis is unclear, but we propose that she suffered from SCD. Other explanations might include presence of the metal implant causing a recall reaction in the tattoo pigment or material in the tattoo pigment that was immunologically cross-reactive to a metal in the implant. We postulate that our patient's condition improved with implant removal, as systemic metal exposure and subsequent degree of activation of reactive T cells decreased. Alternatively, a material in the tattoo may have been chelating metals, and as the amount of circulating metal decreased, the tattoo reaction diminished. SCD occurs when an individual cutaneously sensitized to an allergen subsequently reacts to that allergen systemically. SCD is rare but should be given special consideration in patients with known metal allergies and those who present with postoperative complications such as pain or implant loosening.[1-3] Hallab et al[10] found a weighted mean prevalence of hypersensitivity to nickel, cobalt, or chromium in 25% of patients with well-functioning hip arthroplasties compared with a prevalence of 60% of patients with a failed or poorly functioning hip implant. Common symptoms include dermatitis at the implant site, implant loosening, impaired healing, and joint pain.[1-3,11]

With the frequency of tattooing and surgery involving metallic implants both increasing, it seems inevitable that adverse tattoo reactions possibly related to metallic implants will also increase. This case exemplifies the need for clinicians to be able to recognize and diagnose these cutaneous complications and be aware of treatment options available.

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