

Lichenoid reaction from a permanent red tattoo: has nickel a possible aetiologic role?

Monica Corazza¹, Maria Rosaria Zampino¹, Alessia Montanari¹, Antonella Pagnoni² and Annarosa Virgili¹

¹Dipartimento di Medicina Clinica e Sperimentale- Sezione Dermatologia, Università di Ferrara, ²Laboratorio di Spettroscopia Atomica, Dipartimento di Chimica, Università di Ferrara, Ferrara, Italy

Key words: allergic contact dermatitis; lichenoid reaction; nickel; red tattoo.

Case Report

A 27-year-old man had been tattooed by a professional tattooist 8 months before presentation. He had a large polychrome tattoo over his right deltoid, in which numerous purplish pruriginous papules had persisted since a few weeks after tattooing, restricted to the red areas of the tattoo (Fig. 1).

Patch tests with the Italian SIDA-PA series showed a +++ D2/+++ D3 reaction to nickel sulfate. A strong ++ D2/+++ D3 reaction was also obtained to the original 'cardinal red' pigment used to tattoo the red areas. Patch tests with cobalt sulfate 2% pet., cadmium sulfate 2% pet., ammoniated mercury 1% pet. and copper sulfate 1% aqueous were all negative.

A skin biopsy of the red papular lesions showed a bandlike dense lymphocytic infiltrate in the superficial dermis, focal liquefaction degeneration in the basal layer, exocytosis and occasional colloid bodies. There were numerous macrophages containing small pigment granules in the infiltrate.

The clinical features, patch tests and biopsy led us to diagnose a chronic lichenoid allergic contact dermatitis due to the red pigment of the tattoo.

The material safety data sheet of the 'cardinal red' dye declared monoazo pigment, cinnabar and

traces of the heavy metals lead, mercury, cadmium, chromium and selenium, but no nickel.

Further investigation was therefore performed. After microwave acid digestion, graphite furnace atomic absorption spectroscopy of the original red dye was performed on 3 parts of the sample, which demonstrated the presence of nickel at 1.90 ± 0.34 ppm in the pigment.

Treatment with a potent topical corticosteroid 2× daily for 2 months only slightly improved the dermatitis.

Discussion

Due to the increasing diffusion of 'permanent body art' (estimated prevalence in the US now 3–5%), irritant and allergic cutaneous reactions to tattoos are increasingly reported (1, 2). Red tattoo pigment is the most frequently responsible for allergic reactions, including granulomatous (3–5), eczematous (6),

pseudolymphomatous (7) and lichenoid reactions (4, 8–12). Such reactions have usually been ascribed to mercury hypersensitivity (cinnabar = mercury sulfide) (4, 8, 12), though patch testing with mercury is not always positive (11), nor is patch testing with the red pigment (3–6, 8, 9, 13). Allergies to azo or other unidentified allergens in the pigment also have to be considered (8, 9, 14). Some have stressed that patch testing is inappropriate in tattoo reactions, intradermal testing being more suitable (4, 6, 13).

In our patient, the findings were essentially similar to such reports previously (4, 5, 8). Patch testing, however, showed strong positivity to the red pigment, as is, and to nickel, with no demonstrable allergy to mercury. Though previous experimental studies, including atomic absorption spectroscopy (9), X-ray microanalysis (4, 8) and energy dispersive X-ray analysis (15), had never detected nickel in tattoo pigments, and the



Fig. 1. Papular lichenoid reaction restricted to the red areas of the tattoo.

material safety data sheet did not declare it, graphite furnace atomic absorption spectroscopy found nickel at 1.90 ± 0.34 ppm, which we propose may be sufficient for dermal sensitization (16, 17).

References

1. Goldstein N. Tattoos today. *Arch Dermatol* 1985; 121: 604–605.
2. Anderson R R. Regarding tattoos. *Arch Dermatol* 2001; 137: 210–212.
3. Verdich J. Granulomatous reaction in a red tattoo. *Acta Derm Venereol* 1980; 61: 176–177.
4. Sowden J M, Byrne J P H, Smith A G, Hiley C, Suarez V, Wagner B, Slater DN. Red tattoo reactions. X-ray microanalysis and patch-test studies. *Br J Dermatol* 1991; 124: 576–580.
5. Schmidt H, Christensen H E. Red poster paint tattoo granuloma. *Arch Dermatol* 1978; 114: 965–966.
6. Pauluzzi P, Giordani M, Guarneri G F, Pascone M. Chronic eczematous reaction to red tattoo. *J Eur Acad Dermatol Venereol* 1998; 11: 187–188.
7. Blumenthal G, Okun M R, Pontich J A. Pseudolymphomatous reaction to tattoos. *J Am Acad Dermatol* 1982; 6: 485–488.
8. Clarke J, Black M M. Lichenoid tattoo reactions. *Br J Dermatol* 1979; 100: 451–454.
9. Bendsoe N, Hansson C, Sterner O. Inflammatory reactions from organic pigments in red tattoos. *Acta Derm Venereol* 1991; 71: 70–73.
10. Hindson C, Foulds I, Cotterill J. Laser therapy of lichenoid red tattoo reaction. *Br J Dermatol* 1995; 133: 665–666.
11. Tresukosol P, Ophaswongse S, Kullavanijaya P. Cutaneous reaction to cosmetic lip tattooing. *Contact Dermatitis* 1997; 36: 176–177.
12. Taaffe A, Knight A G, Marks R. Lichenoid tattoo hypersensitivity. *Br Med J* 1978; 1: 616–618.
13. Abel E A, Silberberg I, Queen D. Studies of chronic inflammation in a red tattoo by electron microscopy and histochemistry. *Acta Derm Venereol* 1972; 52: 453–461.
14. Duke D, Urioste S S, Dover J S, Anderson R R. A reaction to a red lip cosmetic tattoo. *J Am Acad Dermatol* 1998; 39: 488–490.
15. Timko A L, Miller C H, Johnson F B, Ross E V. *In vitro* quantitative chemical analysis of tattoo pigments. *Arch Dermatol* 2001; 137: 143–147.
16. Gawkrödger D. Nickel dermatitis: how much nickel is safe? *Contact Dermatitis* 1996; 35: 267–271.
17. Allenby C F, Basketter D A. An arm immersion model of compromised skin. II. Influence of minimal eliciting patch test concentrations of nickel. *Contact Dermatitis* 1993; 28: 129–133.

Address:

Monica Corazza
Dipartimento di Medicina Clinica e Sperimentale, Università di Ferrara
Via Savonarola 9
44100 Ferrara,
Italy
Phone: +39-0532205825
Fax: +39-0532-206791
E-mail: czm@unife.it