

## Case Reports

# Reactions to red pigment

## Reações ao pigmento vermelho

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### ABSTRACT

A great number of agents have been implicated as the cause of skin reactions to tattoos—especially red pigment. Dermatologic reactions are very diverse. The present study is aimed at reviewing the literature and illustrating the treatment performed at the authors' medical facility. Despite treatment with topical or intralesional steroids, most dermatologic reactions persist for a long time. Resistant reactions can be treated through excision, sometimes causing significant scarring. Despite the popularity of tattoos, adverse inflammatory reactions are common and can present a sizeable clinical challenge.

**Keywords:** primary treatment; surgery, plastic; tattooing.

### RESUMO

*Um grande número de agentes causadores de reações cutâneas em tatuagens tem sido implicado, especialmente o pigmento vermelho. As reações dermatológicas são as mais diversas possíveis. O objetivo deste estudo é realizar a revisão da literatura e ilustrar o tratamento realizado em serviço público. Apesar do tratamento com esteroides tópicos ou intralesionais, a maioria das reações dermatológicas persistem por longo tempo. Reações resistentes podem ser tratadas por meio de excisão, deixando algumas cicatrizes pouco aceitáveis. Apesar da popularidade da tatuagem, as reações inflamatórias adversas são comuns e podem apresentar significativo desafio clínico.*

**Palavras-chave:** tratamento primário; cirurgia plástica; tatuagem.

### INTRODUCTION

The practice of tattooing has been performed for thousands of years, and many agents that cause reactions are present in the components of the colors used.<sup>1</sup> With the increasing prevalence of tattoos throughout the world, more care is needed with adverse reactions to techniques of body modification.<sup>2</sup> The way tattoos are performed has changed over time. In the past, the use of heavy metals was common,<sup>3</sup> while more recently, azo dyes are preferred. Green chrome, cobalt-blue, purple manganese, yellow cadmium and red mercury sulfide (cinnabar) have been linked to skin reactions, with the red pigment most commonly causing such reactions.<sup>4</sup> Despite the limited use of pigments containing mercury, reactions to red tattoos continue to occur.

Allergy to the red component of tattoos is a well-known phenomenon, and is related to the cinnabar present in the pigment or in other organic compounds. The allergy can manifest

in various ways, from simple inflammatory reactions to a generalized allergic response.<sup>5-8</sup>

Various treatments may be carried out for the condition, such as laser, excisions, and grafting. The objective of the present study is to review the relevant literature, illustrating with a clinical case treated in a public service department.

## METHODS

A literature review related to the management (from diagnosis to treatment) of patients with reactions to red tattoo pigment was carried out. The retrospective study reviewed English and Portuguese language literature on Pubmed and Embase, illustrating with a case report of a patient cared for at the service.

## CASE REPORT

A 27-year-old male patient with a presentation of a chronic pruriginous inflammatory lesion in the lateral portion of the left leg, for a duration of six weeks, over a tattoo performed four months before, sought medical care. On examination, lichenified plaques were observed with bruises over the red pigment area (Figure 1). Biopsy was carried out, showing hyperparakeratosis, chronic lichenoid inflammatory infiltrate with perivascular involvement and deposition of pigment in the dermis consistent with lichenoid dermatitis. The patient underwent treatment with topical and oral corticosteroids without resolution of the clinical picture, and was resistant to any surgical procedure. After six months, the patient returned to the service with a worsening of the inflammatory reaction (Figure 2) and underwent resection of the lesion and a full thickness skin grafting (Figure 3). The result after one year has proved satisfactory, with an absence of inflammatory phenomena. (Figure 4)

## DISCUSSION

Tattoos have been performed for centuries and are still a common practice in many cultures, being associated with the desire for social inclusion and aesthetic improvement.

Historically, tattoos seem to have arisen as blue marks



FIGURE 1: Inflammatory lesion on red pigmented tattoo



FIGURE 2: Lesion with worsening of the chronic inflammatory reaction, six months after the first medical visit



FIGURE 3: Twentieth post-operative day, with complete tumor removal and skin graft



FIGURE 4: Lesion one year after surgery

under the skin, seen in Egyptian mummies. The practice was spread by sailors in China, India, the Far East, and also Europe.<sup>9</sup>

Cutaneous hypersensitivity reactions to tattoo pigments can be classified histologically as granulomatous or lichenoid.<sup>10-14</sup> The etiology of these reactions is still uncertain, however the most widely accepted theory is that of a delayed hypersensitivity reaction, related to the pigment itself or the carrier solution. Scleroderma is an uncommon reaction that can occur in

tattoos<sup>15</sup> and that complicates a chronic inflammatory reaction to pigments and dyes.<sup>16</sup>

Many pigments can induce allergic responses, including mercury sulfide (red) and cadmium sulfide. Histological studies usually reveal dermal inflammation with pruriginous and nodular alterations and epidermal ulcers, and tissue analysis showing the presence of cadmium.<sup>17-22</sup>

Other skin diseases related to tattoos, such as pyogenic infection, verruca vulgaris, and zygomycosis have been described. Many skin diseases show a predilection for tattooed skin, and can arise as a primary manifestation or even intensify the occurrence of the Koebner phenomenon, as in lichen planus and psoriasis.<sup>23</sup>

The transmission of infectious diseases is certainly of greater significance to public health than the reactions to tattoos described above. Infectious diseases can be local or systemic.<sup>24</sup> Historically, infections such as erysipelas, cellulitis, and gangrene (requiring amputation) by *Staphylococcus sp.* and *Streptococcus sp.* were the most common and alarming infectious complications.<sup>25,26</sup> The reactions are usually diagnosed shortly after the tattoo has been performed or when it is removed with laser. The lesions characteristic of the disease are symmetrical, erythematous, subcutaneous nodules in the legs. Most evidence suggests Type IV hypersensitivity reaction to various antigens.

There are several forms of treatment for reactions to tattoos, including excision with primary closure and laser treatment.<sup>1,18,27,28</sup> Despite the treatment with intralesional or topical steroids, most reactions persist for months or years. Even the use

of systemic corticosteroids might not be sufficient to treat the inflammation in progress. Tattoos can be removed through light-based therapies, including several wavelengths. Those therapies are aimed at reducing the visibility of the reaction to the pigment through the induction of its transepidermal elimination, the removal of the macrophages from the pigment, dispersion of the pigment into smaller particles and alteration of the optics, and refractory properties of the particles. Allergic reactions can manifest in various ways—from simple inflammatory reactions to generalized allergic response.<sup>18,19</sup>

Another treatment option is a CO<sub>2</sub> laser-based ablation in order to induce elimination of the pigment through the skin and thus reduce the pigment load and the allergenic stimuli, limiting the reaction of the tattoo.<sup>25,26,28-30</sup> For certain anatomical regions and tattoo pigments, erbium or carbon dioxide laser ablation can be the treatment of choice.<sup>31</sup> In cases such as a red pigment tattoo on the lips, the treatment with carbon dioxide and erbium can be more problematic due to the lack of dermis. For larger lesions, the treatment of choice is excision, which usually requires grafting.

## CONCLUSION

Despite the popularity of tattoos, adverse inflammatory reactions are common and may present a significant clinical challenge, both for the correct diagnosis and for choosing the effective treatment. Should the topical or systemic treatment fail, total excision may be the only option. The final aesthetic result can be very unsatisfactory depending on the amount of tissue resected. ●

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