

# A case of delayed anaphylaxis after laser tattoo removal

Brian P. Hibler, BS, and Anthony M. Rossi, MD  
*New York, New York*

**Key words:** anaphylaxis; laser; tattoo.

## INTRODUCTION

It is estimated that nearly a quarter of all persons aged 18 to 50 in the United States have a tattoo.<sup>1</sup> Demand for tattoo removal has increased, with an estimated 1 in 5 persons considering tattoo removal.<sup>1</sup> American Society for Dermatologic Surgery physicians reported about 100,000 laser tattoo removal procedures in 2013, up more than 50% from 2012.<sup>2</sup> Motives for removal include aesthetic reasons, poor tattoo result, and professional or social stigma.

Laser-assisted tattoo removal remains the gold standard treatment. With increasing demand for tattoo removal, it is important to be cognizant of adverse events that may occur.

We report the novel case of a woman who had an allergic cutaneous reaction at a distant, untreated tattoo site, and subsequently had a delayed anaphylactic reaction after laser tattoo removal.

## CASE REPORT

A 20-year-old woman with a history of mood disorder stable on lithium, topiramate, and aripiprazole for multiple years without any medication changes and no history of drug or seasonal allergies presented for elective laser removal of a large tattoo encompassing her right lower leg and ankle. The tattoo was heavily colored black, with areas of red, yellow, and white (Fig 1). On the first visit, a 755-nm picosecond alexandrite laser (Cynosure, Westford, MA) was used with a spot size of 3 mm, fluence of 2.83 J/cm<sup>2</sup>, frequency of 10 Hz, and one pass. The patient tolerated this well with no immediate adverse effects. One month later, the tattoo had noticeable lightening. However, the patient mentioned that her nontreated tattoo at a distant site on the left wrist became pruritic and slightly raised after the first

treatment. This subsided without further intervention during the interim.

The second laser treatment was performed at this 1-month follow-up using a 2.5-mm spot size, 2.83 J/cm<sup>2</sup>, 10 Hz, and one pass. Immediately after treatment, the patient reported no complaints. Three days later, the patient had diffuse urticarial lesions associated with malaise and went to a local emergency room where she was given a 3-day course of oral prednisone. She had no changes or gaps in her medication regimen, recent illnesses or symptoms, travel, or exposures to new substances. Initially, the steroids improved the urticarial lesions; however, after finishing this short corticosteroid taper, the patient experienced a rebound anaphylaxis consisting of sudden-onset shortness of breath and a flare of urticaria (Fig 2). She was taken to the emergency room, and laboratory testing found no peripheral eosinophilia and no hepatic or renal function test abnormalities. She received epinephrine and intravenous corticosteroids, which alleviated her symptoms. No subsequent allergy testing was done on this patient, and no further laser treatments were performed.

## DISCUSSION

There are 2 particularly intriguing facets to this case. The first is that the patient reportedly experienced a cutaneous eruption that occurred at a distant, untreated tattoo site, a possible harbinger of what was to come. There are numerous reports of adverse reactions to tattoo ink after laser removal, including eczematous reactions and generalized urticaria.<sup>3-5</sup> Our patient denied any cutaneous reactions after her tattoos were placed initially. One other case in the literature outlined a local cutaneous eruption at a distant, untreated tattoo site similar to the reaction purported by our patient.<sup>6</sup> As suggested

From Dermatology Service, Memorial Sloan Kettering Cancer Center.

Funding sources: None.

Conflicts of interest: None declared.

Correspondence to: Anthony M. Rossi, MD, 16 E. 60<sup>th</sup> Street 4<sup>th</sup> Floor, New York, NY 10022. E-mail: [anthonymrossi@gmail.com](mailto:anthonymrossi@gmail.com).

JAAD Case Reports 2015;1:80-1.  
 2352-5126

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<http://dx.doi.org/10.1016/j.jdcrr.2015.01.005>



**Fig 1.** Tattoo pretreatment.



**Fig 2.** Cutaneous manifestation of anaphylactic reaction. Patient's arm shows the red, raised, itchy urticarial eruption that appeared diffusely throughout the body.

by these observations, the development of a localized skin reaction at a distant tattoo site lends credence to the idea that the mechanism for immunologic reactions after laser tattoo removal is not the creation of a unique neoantigen, but rather extracellular tattoo ink particles eliciting an immunologic response.<sup>6</sup> This theory was also supported by the report of a systemic reaction after laser tattoo removal with a CO<sub>2</sub> laser, the energy of which is not absorbed by the pigment particles and therefore should not result in modification of the allergen.<sup>4</sup>

Second, although an anaphylactic reaction has been documented after placement of a tattoo,<sup>7</sup> this has not been documented in the English-language literature after laser tattoo removal. The mechanism by which tattoo pigment is removed from the body is currently unknown, but suspected lymphatic clearance has been purported. Cases of tattoo ink being found in regional lymph nodes after laser tattoo removal indicate lymphatic uptake and clearance to be one mechanism by which pigment is removed.<sup>8</sup> Because of the presence of generalized reactions after laser treatment, there is presumably release of ink particles into the systemic circulation.

The exact mechanism behind the delayed hypersensitivity seen here is unknown. The patient did not experience any reaction when the tattoo was placed, either because she did not have adequate prior sensitization to that exact dye or because the ink was predominantly intracellular. This observation has been seen elsewhere in patients who did not experience a reaction to tattoo placement but only on laser removal, resulting in rapid thermal expansion and extracellular release of pigment fragments into the vasculature did they experience allergic

sequelae.<sup>5</sup> We hypothesize that this urticarial reaction and systemic anaphylaxis resulted from an immunologic response to the ink particles. There are reports of nonimmediate anaphylaxis to radiocontrast media with systemic symptoms after radiologic examinations, including biphasic reactions.<sup>9</sup> This mechanism may be similar to what occurred in our case, as our patient did not have an immediate type I hypersensitivity rather the occurrence of urticarial lesions 3 days after treatment and then anaphylactic symptoms after a short corticosteroid taper. Whether this rate corresponds to the rate of lymphatic clearance has not been studied, although cases of regional lymphadenopathy occurring several days after laser tattoo treatment have been reported.<sup>10</sup>

This case reiterates the importance of adequate counseling of patients before laser treatment. Although rare, it is important to be cognizant of the specific reaction described. In individuals who have experienced an allergic reaction after laser tattoo treatment, pretreatment with antihistamines and topical and oral corticosteroids has been successful in suppressing allergic sequelae.<sup>3,5</sup> It is also important to note that reactions may be delayed before manifesting.<sup>4,6</sup> Clinicians should be aware of the adverse reactions that may occur when using lasers for tattoo removal to ensure safe treatment.

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