Single Case

Original Method to Repigment Achromic Laser Tattoo Removal Scars

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Keywords

Achromic scar · Laser tattoo removal · MMP · Drug delivery · Surgical techniques

Abstract

Laser tattoo removal is expensive, painful, and time-consuming. Even with the use of the right laser equipment, it is often impossible to eliminate all pigments. Incomplete tattoo removal, one of the undesired effects of laser treatment, is widely disseminated in the media and accepted by most patients. However, few patients know that laser tattoo removal can cause permanent scars. Some patients who develop achromic scars can feel disappointed with the results of laser tattoo removal and take legal action against the physician responsible for the treatment. This paper describes our experience with a drug delivery treatment called MMP® (“Microinfusão de Medicamentos na Pele,” Portuguese acronym for “Microinfusion of Drugs in the Skin”) that repigments and improves the final esthetic results of achromic laser tattoo removal scars.

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Introduction

The use of lasers to remove tattoos was an important advance in dermatology. Quality-switched lasers emit short pulses of light (nanoseconds) to fragment pigments through selective photothermolysis [1–4]. They are considered the gold standard for tattoo removal [3]. Skin hypopigmentation is one of the potential side effects of laser tattoo removal. This is more common in tanned skins or with the use of lasers with wave lengths of 532 or 694 nm [2]. Hypopigmentation, which is thought to be caused by the destruction of melanin in the basal cell layer, is usually transient and repigmentation can occur spontaneously over time [1]. However, achromic areas can improve with sun exposure or phototherapy [2]. Scars can also appear in laser-treated areas and it may be difficult to make a clinical distinction between achromic patches and achromic scars [1, 2]. Achromic scars are caused by the use of high-energy lasers in intensely pigmented areas or by multiple laser treatments in the same area [1, 3, 4]. Achromic scars can appear after the first laser sessions or develop only after the complete removal of the tattoo pigment [2]. As with any scar, these lesions are difficult to treat because they do not repigment over time or with phototherapy. Moreover, since these scars are very superficial, intralesional infiltration is technically difficult.

We present a simple and original solution to repigment achromic laser tattoo removal scars. In 2004, Fulton et al. [5] reported the successful repigmentation of hypochromic scars using a multi-step technique to remove areas of hypopigmentation associated with dermal fibrosis. This led us to search for a simpler and less invasive method to remove this type of fibrosis. We propose the delivery of anti-fibrotic agents into the superficial dermis using MMP® (“Microinfusão de Medicamentos na Pele,” Portuguese acronym for “Microinfusion of Drugs in the Skin”) [6], a recently described microinfusion drug delivery technique that uses needling and a tattoo machine. Tattoos are undeniable proof that this is an effective method to “inject” chemical substances into the dermis. MMP® has been successfully used to repigment idiopathic guttate hypomelanosis [7].

Case Report

In April 2014, a 49-year-old man, Fitzpatrick skin phototype III, complained of achromic scars in his left deltoid region (Fig. 1a) after 18 laser tattoo removal sessions (with Q-Switched 755 and 1064). We injected an endovenous solution (50 mg/mL) of 5-fluorouracil (5-FU) in the achromic scars using the MMP® drug delivery technique. During the procedures, in the area adjacent to the injection site, we noticed the accumulation of a white powder compatible with 5-FU drug delivery [8]. After five MMP® sessions (with 1-month intervals), the scars were completely repigmented (Fig. 1 and 2). Appearance remained unchanged 3 years after the last session.

Discussion

This case shows the successful use of a novel, simple, and inexpensive method to repigment achromic laser tattoo removal scars.

Patients who seek laser treatment to eliminate their tattoos expect a near perfect result. They usually arrive knowing (from information available in the media) that it will take several sessions to remove the tattoo and that laser treatment may not eliminate all the pigments.

However, most are unaware that laser treatments can have permanent side effects, even when the dermatologist uses the best available technique and equipment [1–4]. Despite this information, most patients react negatively and demand a solution when achromic scars appear during or soon after laser tattoo removal treatment. Delivery of 5-FU into achromic scars using the MMP® technique is an easily available, effective, and inexpensive solution for these cases. The area submitted to drug delivery was 2 cm², so we estimated [9] that 2,350 µg of 5-FU was injected per session, a dose considered safe and far lower than that used for intravenous chemotherapy [10]. The esthetic results of the procedure can help to reduce patients' frustrations and complaints about one of the side effects of laser tattoo removal treatment. We have been successfully using this drug delivery technique in our daily practice to repigment achromic scars over the last 3 years.

We hypothesize that the anti-fibrotic properties of 5-FU reduce fibrosis in the papillary dermis and stimulate melanogenesis. Moreover, 5-FU may also have a direct effect on melanocytes and stimulate repigmentation [11].

Other drugs, such as corticosteroids, bleomycin, or mitomycin C [12], could be tested to repigment scars using this drug delivery technique.

Statement of Ethics

This study was reviewed and approved by the Institutional Review Board (IRB) of São Paulo Federal University/UNIFESP, São Paulo, SP, Brazil (CAAE 89661218.7.0000.5505). This IRB is registered in the United States Department of Health and Human Services – The Office for Human Research Protections (OHRP); IRB number 00001889, valid until 10/31/2018 and FWA 000023673, valid until 11/27/2020.

Disclosure Statement

Conflicts of interest of the main author were discussed in this journal [8]. Since tattooing is an ancient technique under public domain done mainly by tattoo artists, we have chosen to copyright the acronym “MMP” in Brazil and the USA and grant free use exclusively to dermatologists who are members of the Brazilian Society of Dermatology (Sociedade Brasileira de Dermatologia – SBD) and equivalent entities around the world. The first author's commercial involvement in this investigation was required in order to obtain approval of the equipment for medical use under Brazilian health legislation (as enforced by ANVISA) and to render this investigation acceptable for the relevant ethics committee. We inform that the clinical results described and documented herein can be achieved using any available tattoo machine. The machine, its cartridges, and the medicines used in this study were supplied by Traderm (São José dos Campos, Brazil). The first author is part of a team that trains Brazilian dermatologists in the use of this technique.

Conflicts of Interest

The first author is the owner of Traderm, a profit-oriented company that sells tattoo machines and cartridges for tattoo machines to be used by medical doctors. He is also the owner of Sempre Bella, a medical education company. Tattooing is an ancient technique under public domain done mainly by tattoo artists. We have copyrights to the acronym MMP® in Brazil, United States, and Europe and grant free use exclusively to dermatologists who are members

of the Brazilian Society of Dermatology and equivalent entities around the world. Dr Arbache's commercial involvement in this investigation was required in order to obtain approval of the equipment for medical use under Brazilian health legislation (as enforced by Agência Nacional de Vigilância Sanitária) and to have this study submitted to the IRB committee. We inform that the clinical results described and documented herein can be achieved using any available tattoo machine. Dr Arbache is part of a team that trains Brazilian dermatologists in the use of this technique.

Funding Sources

The tattooing machine, cartridges, and drug used in this study were supplied by Traderm (São José dos Campos, Brazil).

Author Contributions

Samir Arbache, main author. Dirlene Roth, participated in generating and gathering the data for the study. Samia Trigo Arbache, writing the draft and the paper. Sergio Henrique Hirata, writing the draft and the paper.

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Fig. 1. Achromic laser tattoo scars. **a** Baseline achromic scars in left deltoid region after 18 laser tattoo removal treatment sessions. Note: The patient was suntanned. **b** Same area after five MMP® sessions with 5-FU.

Fig. 2. Achromic laser tattoo scars. **a, b** Images using the Antera 3D® colorimetry system at baseline (**a**), and after three MMP® sessions with 5-FU (**b**). The areas outlined in black correspond to where we assessed melanin levels using the Antera 3D® software (**c**). **c** Average melanin level in **a** (red bar) and **b** (blue bar) using the Antera 3D® software.