

Microneedling With Bimatoprost to Treat Hypopigmented Skin Caused by Burn Scars

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PRACTICE POINTS

- Microneedling is a percutaneous collagen induction therapy that also may be used in drug delivery.
- Hypopigmentation can cause considerable distress for patients with skin of color.
- Percutaneous drug delivery of bimatoprost may be helpful in skin repigmentation.

To the Editor:

Microneedling is a percutaneous collagen induction therapy frequently used in cosmetic dermatology to promote skin rejuvenation and hair growth and to treat scars by taking advantage of the body's natural wound-healing cascade.¹ The procedure works by generating thousands of microscopic wounds in the dermis with minimal damage to the epidermis, thus initiating the wound-healing cascade and subsequently promoting collagen production in a manner safe for all Fitzpatrick classification skin types.¹⁻³ This therapy effectively treats scars by breaking down scarred collagen and replacing it with new healthy collagen. Microneedling also has application in drug delivery by increasing the permeability of the skin; the microwounds generated can serve as a portal for drug delivery.⁴

Bimatoprost is a prostaglandin analogue typically used to treat hypotrichosis and open-angle glaucoma.⁵⁻⁷

A known side effect of bimatoprost is hyperpigmentation of surrounding skin; the drug increases melanogenesis, melanocyte proliferation, and melanocyte dendricity, resulting in activation of the inflammatory response and subsequent prostaglandin release, which stimulates melanogenesis. This effect is similar to UV radiation-induced inflammation and hyperpigmentation.^{6,8}

Capitalizing on this effect, a novel application of bimatoprost has been proposed—treating vitiligo, in which hypopigmentation results from destruction of melanocytes in certain areas of the skin. Bimatoprost ophthalmic solution 0.3% utilized as an off-label treatment for vitiligo has been shown to notably increase melanogenesis and return pigmentation to hypopigmented areas.⁸⁻¹⁰

A 32-year-old Black woman presented to our clinic with a 40×15-cm scar that was marked by postinflammatory hypopigmentation from a second-degree burn on the right proximal arm. The patient had been burned 5 months prior by boiling water that was spilled on the arm while cooking. She had immediately sought treatment at an emergency department and subsequently in a burn unit, where the burn was debrided twice; medication was not prescribed to continue treatment. The patient reported that the scarring and hypopigmentation had taken a psychological toll; her hope was to have pigmentation restored to the affected area to boost her confidence.

Physical examination revealed that the burn wound had healed but visible scarring and severe hyperpigmentation

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due to destroyed melanocytes remained (Figure 1). To inhibit inflammation and stimulate repigmentation, we prescribed the calcineurin inhibitor tacrolimus ointment 0.1% to be applied daily to the affected area. The patient returned to the clinic 1 month later. Perifollicular hyperpigmentation was noted at the site of the scar.

Monthly microneedling sessions with bimatoprost ophthalmic solution 0.3% were started. To avoid damaging any potentially remaining unhealed hypodermis and vasculature, the first microneedling session was performed with 9 needles set at minimal needle depth and frequency. The number of needles and their



FIGURE 1. A hypopigmented burn scar on the arm after 1 month of daily application of tacrolimus ointment 0.1%.

depth and frequency gradually were increased with each subsequent treatment. The patient continued tacrolimus ointment 0.1% throughout the course of treatment.

For each microneedling procedure, a handheld motorized microneedling device was applied to the skin at a depth of 0.25 mm, which was gradually increased until pinpoint petechiae were achieved. Bimatoprost ophthalmic solution 0.3% was then painted on the skin and allowed to absorb. Microneedling was performed again, ensuring that bimatoprost entered the skin in the area of the burn scar.

Microneedling procedures were performed monthly for 6 months, then once 3 months later, and once more 3 months later—8 treatments in total over the course of 1 year. Improvement in skin pigmentation was noted at each visit (Figure 2). Repigmentation was first noticed surrounding hair follicles; after later visits, it was observed that pigmentation began to spread from hair follicles to fill in remaining skin. The darkest areas of pigmentation were first noted around hair follicles; over time, melanocytes appeared to spontaneously regenerate and fill in surrounding areas as the scar continued to heal. The patient continued use of tacrolimus during the entire course of microneedling treatments and for the following 4 months. Sixteen months after initiation of treatment, the appearance of the skin was texturally smooth and returned to almost its original pigmentation (Figure 3).

We report a successful outcome in a patient with a hypopigmented burn scar who was treated with bimatoprost administered with traditional microneedling and alongside a tacrolimus regimen. Tacrolimus ointment inhibited the inflammatory response to allow melanocytes to heal and regenerate; bimatoprost and



FIGURE 2. A, A hypopigmented burn scar after tacrolimus ointment 0.1% was applied daily and 1 microneedling treatment with bimatoprost ophthalmic solution 0.3%. B, After 3 microneedling treatments with bimatoprost ophthalmic solution 0.3%, perifollicular hyperpigmentation was noted at the site of the burn scar. The patient continued to apply tacrolimus ointment 0.1% daily. C, Six months after presentation to clinic. Repigmentation continued to progress after 4 microneedling treatments with bimatoprost ophthalmic solution 0.3%. D, After 5 treatment sessions, diffuse repigmentation was noted. However, some mild textural irregularities persisted.



FIGURE 3. Four months after completion of 8 microneedling treatments with bimatoprost ophthalmic solution 0.3% over 1 year (17 months after initial presentation to clinic). Restored pigment at the site of a hypopigmented burn scar was noted. The patient reported improvement in scar texture. Tacrolimus was discontinued.

microneedling promoted hyperpigmentation of hair follicles in the affected area, eventually restoring pigmentation to the entire area. Our patient was extremely satisfied with the results of this combination treatment. She has

reported feeling more confident going out and wearing short-sleeved clothing. Percutaneous drug delivery of bimatoprost ophthalmic solution 0.3% combined with topical tacrolimus may be an effective treatment for skin repigmentation. Further investigation of this regimen is needed to develop standardized treatment protocols.

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