

Laser Therapy in Black Skin

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KEYWORDS

- Laser therapy • Melanin • Laser complications in black skin
- Hyperpigmentation

Patients of African descent often require special consideration when it comes to receiving cosmetic procedures, specifically with laser, light, and energy-based procedures. They are particularly vulnerable because any kind of significant trauma, be it from a laser or other device, can cause permanent pigmentary changes and scarring. For the clinician, cosmetic procedures in patients with skin of color can therefore be challenging. Because of enhanced technology and scientific advances, the demand to seek procedures to address these patients' cosmetic concerns has reached new heights. Patients with skin of color have various motivations and goals including attaining an even skin tone, removing unwanted hair, and/or reducing the signs of aging. The American Society of Plastic and Reconstructive Surgery revealed that cosmetic procedures among minority patients increased from 12% of all cosmetically treated patients in 1992 to 20% in 1998. Of the 11,000,000 esthetic procedures performed in the United States in 2005, 6% were African American (up from 4%), 8% were Hispanic (up from 5%), and 4% were Asian (up from 3%).^{1,2}

This article provides a systematic overview of laser, light, and other energy devices for patients of African descent. It also reviews complications in skin of color and some treatment options for these adverse events.

MELANIN, UV REACTIVITY, AND PHOTOPROTECTION

Dermal melanin is produced by melanocytes in the basal layer of the epidermis; however, there is no difference in melanocyte number among races. Instead, skin color is determined by the size and distribution of melanosomes.³ Melanin absorbs and scatters energy from UV light and visible light to protect epidermal cells from UV damage. The photoprotection offered by melanin in darkly pigmented skin greatly influences the UV-induced differences seen in black and white skin. After long-term exposure to sunlight, the epidermis of black skin displays only minor changes, in contrast to the enlarged, cellular stratum lucidum layer that is observed in sun-exposed white skin.⁴ Photoprotection is a definite advantage for those with skin of color.

ADVANTAGES AND DISADVANTAGES

Along with the advantage of photoprotection, dark-skinned individuals also present with a delay in photoaging. In a survey of age-matched white and black women, with a mean age of 43, 65% of black women reported that their skin was not wrinkled compared with only 20% of white women,⁵ revealing a marked distinction in perceived photoaging.

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At the same time, there are other unique cosmetic concerns for those with skin of color. Inflammation or injury to the skin is almost immediately accompanied by alteration in pigmentation, namely hyperpigmentation or hypopigmentation. As follows, patients are most concerned with post-inflammatory pigment changes. In a survey of the cosmetic concerns in women of color (81 African, 16 Hispanic, 3 Asian), with a mean age of 41, 86% reported hyperpigmentation or dark spots, and 80% reported blotchy or uneven skin as their greatest concern.⁵

ACNE SCARS

Ablative Devices

CO₂ lasers have been used for the treatment of acne scars in ethnic skin; however, the laser's usefulness has been limited by the risk of hyperpigmentation and scarring. For this reason, other modalities have been investigated for optimum acne scar treatment in ethnic skin.⁶

Fractional Devices

Nonablative fractional resurfacing is used for photorejuvenation in all skin types and is especially useful for the treatment of acneiform scarring in ethnic skin.⁷ Nonablative fractional resurfacing is performed using a midinfrared laser, which creates microscopic zones of thermal injury, called microthermal zones (MTZs), with an energy-dependent diameter ranging from 100 to 160 μm . At the energies commonly used for facial rejuvenation (8–12 mJ/MTZ), the depth of penetration ranges from 300 to 700 μm .⁸ Relative epidermal and follicular structure sparing account for rapid recovery without prolonged downtime. Melanin is not at risk of selective, targeted destruction; therefore, fractional resurfacing has been used successfully in patients with skin of color.

There are several fractional devices available, with the most extensively studied being 1550-nm erbium-doped fiber laser (Fraxel, Reliant Technologies Inc, San Diego, CA, USA). In a study of the efficacy of this laser in Japanese patients with acne scars, one treatment consisted of 4 passes of the device to attain a final microscopic treatment zone of thermal injury with a density of 1000 to 1500/cm². The fluence was 6 mJ per microscopic treatment zone. The treatment was repeated up to 3 times at 2-week to 3-week intervals and clinical improvement was achieved in all the patients. Rare adverse events included mild transient erythema, whereas no patients showed scarring or hyperpigmentation as a result of treatment.⁹

Another study evaluated the Fraxel for the treatment of acne scars in 27 Korean patients with

skin types IV and V. Patient self-assessments demonstrated excellent improvement in 30%, significant improvement in 59%, and moderate improvement in 11% of patients. No patients developed hyperpigmentation.¹⁰

Although the safe and effective use of nonablative fractional resurfacing in Asian patients is well documented, there are few published studies in skin types VI or in African American patients. In one retrospective review of 961 treatments in patients of all skin types, the rate of hyperpigmentation was 11.6% in skin type IV (n = 8) and 33% in skin type V (n = 3). The ethnicities of these patients were not specified.¹¹

Nonablative fractional resurfacing represents a relatively safe and effective option for Asian patients with skin of color for the treatment of acne scars and photoaging. Patients of African descent have been less extensively studied; however, in these patients conservative settings (low densities) are necessary to minimize the risk of hyperpigmentation.¹²

Nonablative Devices

In a study comparing the 1320-nm Nd:YAG and the 1450-nm diode laser in the treatment of atrophic scars of patients with skin types I to V, both devices led to clinical improvement without significant side effects.¹³

A short-pulsed nonablative Nd:YAG (Laser Genesis, Cutera, Inc, Brisbane, CA, USA) has been studied in skin types I to V for the treatment of acne scars. Settings were 14 J/cm², 0.3 milliseconds, 7 Hz, with a 5-mm spot size. The study included 9 patients who were treated every 2 weeks for a series of 8 treatments. Each side of the face was treated with a total of 2000 pulses. Three blinded physician observers used a grid on pictures of the patients to count scars at baseline and after the final treatment. They found a 29% improvement in the scar severity score. Eight of 9 patients reported improvement in their acne scars ranging from 10% to 50% improvement. This nonablative Nd:YAG laser offers another safe and well-tolerated option to treat acne scars in patients of African descent.¹⁴ It is important to note that a series of 8 or more treatments are required to achieve improvement. This device has an excellent safety profile in all patients, including skin type VI, and is most effective in shallow acne scars. Deep ice-pick acne scars remain a challenge with all laser modalities in skin of color.

PHOTOREJUVENATION

As mentioned previously, in patients with skin types IV to VI, photoaging is delayed and less

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