

On the Horizon: Cosmetic Treatments With Lasers and Intense Pulsed Light

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Numerous advances in the treatment of dermatologic diseases are on the horizon. There also is a crossover in advances in the treatment of dermatologic conditions that are perceived as cosmetic but, similar to medical conditions, directly affect the patient's quality of life. In addition, many "cosmetic" procedures have been demonstrated to help manage medical dermatologic conditions such as morphea, scarring, vascular malformations, pigmented lesions, skin cancer, and venous disease. This commentary will explore the potential advances in cosmetic dermatology made possible by laser and light technologies.

Melasma

Melasma is a widespread acquired hyperpigmentation disorder of unknown etiology that affects the quality of life of millions of women worldwide. There appears to be an increased incidence of melasma in the Asian population and more darkly pigmented patient populations.¹ The mainstay of treatment involves sun avoidance and/or protection as well as a variety of topical medications. More recently, laser and intense pulsed light (IPL) devices have demonstrated efficacy when used as monotherapy or in combination with topical medications^{2,3}; however, the therapeutic challenge remains. Defining the pathogenesis of melasma will aid in its treatment. A recently identified stem cell factor (c-kit), in addition to vascular and neural growth factors (nerve growth factor receptor expression in keratinocytes), may allow the development of targeted therapies for this condition.⁴ I have found that the skin involved with melasma has a higher density and larger diameter of blood vessels compared with

surrounding skin.⁵ Along with complex effects at the level of the molecular pathways, I am exploring, as are other investigators, the use of lasers to target the vascular component, which appears to be activated in melasma.

The optimal role of lasers in the management of melasma is still to be defined. The major problem with lasers and IPL is the notable risk for postinflammatory hyperpigmentation. Future developments point to the use of low-energy pigment-based lasers such as the Q-switched 1064-nm Nd:YAG laser to treat the melanocytic component, combined with long-pulsed vascular-specific lasers and/or IPL to treat the underlying vascular component. The use of these modalities in a fractionated form is still to be defined. Presently, the 1927-nm fractional thulium fiber laser is being evaluated. Also under evaluation is the use of lasers and IPL at lower intensity and increased frequency to minimize the development of postinflammatory hyperpigmentation.

Tattoo Removal

Tattoo removal also is undergoing a resurgence of investigation. Since the development of the first Q-switched lasers nearly 20 years ago for the treatment of pigmented lesions and tattoos, little has advanced except for the increased reliability and decreased operating cost of lasers. Most tattoos require multiple treatments (6–20 treatments) to achieve vaporization without substantial hypopigmentation or scarring. Shortening the pulse duration from nanoseconds to picoseconds was proposed long ago to enhance therapeutic efficacy but was stifled by the excessive cost of building the necessary power supply to generate the therapeutic pulse. At the present time, the cost of this power supply is getting lower while the number of people who are getting older and wiser and who would like their tattoos removed is getting larger. In the near future, laser companies will realize the profit potential of this market and more advanced lasers will be produced. Until then, physicians (myself included) are

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evaluating the use of multiple sequential lasers used in one session to enhance tattoo elimination. These advances also may lead to improved outcomes for the removal of a variety of birthmarks.

Photodamage

Photodamage, and resulting early skin cancers, also are increasing in frequency with the aging population. Continued advancements in photodynamic therapy resulting in enhanced efficacy through the use of multiple sequential lasers and light sources in one setting has been proven to be beneficial. More advanced methods to increase penetration of the photosensitizer are being evaluated to decrease patient wait time and further increase efficacy, especially in the treatment of nonsuperficial skin cancer. In addition, new photosensitizers are being developed that will degrade over a few hours instead of a few days, allowing patients to continue normal daytime activities. Improvements in topical anesthesia and pain control also will decrease treatment pain. All of these advances will result in a practical “magic bullet” that will minimize the need for excising skin cancer with a knife and suturing the skin back together with expensive flaps and grafts, thus saving healthcare costs and minimizing scars.

Scars

Scars from burns and/or trauma presently are being treated with a wide variety of fractionated lasers to both decrease their physical appearance and enhance the return to normal cutaneous function. The 120- μm fractionated CO_2 laser has proven efficacy for the treatment of these scars.⁶ Further enhancements include the use of different laser wavelengths, depths of penetration and pulse durations, and beam diameters. The use of sequential laser pulses with different wavelengths through the same vaporized hole will enhance improvement in both appearance and function. Sequential lasers also will enable the vaporized holes to remain open long enough to allow penetration of

medication. With the unfortunate increase in traumatic wounds from military combat, increased funding for this research to treat our returning veterans also will help countless patients with nonmilitary thermal or traumatic wounds.

Summary

This small commentary underscores that the future is bright regarding lasers and IPL in treating both cosmetic and medical dermatologic conditions. The obvious crossover from cosmetic to medical treatment will occur in a number of diseases of the skin including but not limited to scleroderma, morphea, psoriasis, cutaneous lupus, vitiligo, rosacea, acne, all forms of skin cancer, and vascular malformations. Therefore, cosmetic dermatology should not be thought of as a way for physicians to make money and have “the easy life” but as another exciting aspect of dermatology that will contribute to major therapeutic advances in our specialty.

References

1. Taylor A, Pawaskar M, Taylor SL, et al. Prevalence of pigmentary disorders and their impact on quality of life: a prospective cohort study. *J Cosmet Dermatol*. 2008;7:164-168.
2. Gupta AK, Gover MD, Nouri K, et al. The treatment of melasma: a review of clinical trials [published online ahead of print September 28, 2006]. *J Am Acad Dermatol*. 2006;55:1048-1065.
3. Goldman MP, Gold MH, Palm MD, et al. Sequential treatment with triple combination cream and intense pulsed light is more efficacious than sequential treatment with an inactive (control) cream and intense pulsed light in patients with moderate to severe melasma. *Dermatol Surg*. 2011;37:224-233.
4. Bak H, Lee HJ, Chang SE, et al. Increased expression of nerve growth factor receptor and neutral endopeptidase in the lesional skin of melasma [published online ahead of print May 12, 2009]. *Dermatol Surg*. 2009;35:1244-1250.
5. Li YH, Chen JZ, Wei HC, et al. Efficacy and safety of intense pulsed light in treatment of melasma in Chinese patients [published online ahead of print March 3, 2008]. *Dermatol Surg*. 2008;34:693-701.
6. Lin JY, Warger WC, Izikson L, et al. A prospective, randomized controlled trial on the efficacy of fractional photothermolysis on scar remodeling. *Lasers Surg Med*. 2011;43:265-272. ■



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