

# Photorejuvenation

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## 20.1 Introduction

The concept for rejuvenation of the face by using light sources has been present since the advent of laser technologies. Lasers used to accomplish this goal include the ablative (CO<sub>2</sub> and erbium) and nonablative lasers. However, the sequelae associated with ablative lasers and the lack of compelling efficacy associated with nonablative lasers created a realization that a nonlaser light source might be the best means of accomplishing facial photorejuvenation. These pulsed light sources began to become popular in the cosmetic surgery community in 2004 and have since undergone various refinements.

The benefits of photorejuvenation are numerous and include improvements of the tone and texture of the skin, diminished pigment irregularity, reduction of vascular lesions and improvement in the appearance of fine lines and wrinkles.

Intense pulsed light (IPL) differs from laser light in a number of theoretical and clinical aspects. Whereas laser emissions are coherent beams of the same wavelength and frequency, IPL contains light with a variety of wavelengths. Intense IPL used for photorejuvenation is light between 500 and 1,200 nm [1]. As such, it targets numerous chromophores within the epidermis and dermis, including melanin, vascular structures, collagen and other structures. The use of filters to limit the spectra of light emitted enables one to focus on one particular aspect of the skin when using this device. Since the process of photoaging (and thus of photorejuvenation) affects each of these aspects, it is worthwhile to consider the interaction of IPL with each one.

The actual IPL device consists of a flashlamp light source that produces polychromatic light [2]. Depending on the desired wavelength, filters may be introduced to remove light of a specific wavelength. It is this capability that enables IPL to provide diverse types of treatments with one device and is partially responsible for the popularity of IPL with physician and nonphysician practitioners alike.

One hallmark of aging skin is the pigmentary irregularity frequently seen after photodamage has occurred. The degree of pigment present is a function of

the skin type of the individual in question, the amount of ultraviolet exposure they have sustained, mitigating treatments such as the use of topically applied retinoids, bleaching creams, chemical peels or cosmeceuticals and the capacity for intrinsic rejuvenation that a given individual possesses.

Hypopigmentation associated with photodamage is, at present, not treated with IPL with any degree of success. To date, attempts to stimulate melanocytes to produce pigment once they have undergone apoptosis have not resulted in restoration of a normal complement of pigment-producing cells within the basal layer of the epidermis.

Hyperpigmentation associated with a variety of conditions, including photodamage, pregnancy and postinflammatory hyperpigmentation, has been more effectively treated with photorejuvenation. The absorption spectrum for melanin is continuous and thus IPL is well suited for this indication. Actinic lentigines, melasma and postinflammatory hyperpigmentation may be treated with IPL. When treating hyperpigmentation, it is critical to ensure that patients have not had any significant ultraviolet exposure for the preceding several weeks (2–4), have used either broad-spectrum sunscreen or physical-barrier sunblocks and that they have no planned sun exposure for a few weeks after the procedure. Prior sun exposure will prime the melanocytes to respond to the IPL by making more pigment as does sun exposure following the treatment.

Skin types I, II and III tend to develop telangiectasias with increased sun exposure and aging. In addition, these types of skin are prone to rosacea as the skin ages. IPL can address many of the vascular proliferations seen with both of these problems. Since hemoglobin has a series of absorption peaks, including 585 nm, IPL is readily absorbed. One study evaluating the use of IPL for rosacea-associated telangiectasias found significant improvement after five treatments each 3 weeks apart [3].

The addition of porphyrins to the skin may increase the efficacy of this treatment [4]. This treatment is known as photodynamic therapy, or PDT. The addition of this photosensitizer has increased the energy absorption for IPL, rendering it more effective at treating the various stigmata of photoaging. Various protocols may