Intense Pulsed Light Therapy for Skin Rejuvenation

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KEYWORDS

• Intense pulsed light (IPL) • Vascular lesion treatment • Pigment treatment • Laser hair removal • Skin rejuvenation

KEY POINTS

- Intense pulsed light devices are very versatile systems.
- Intense pulsed light devices are often the first devices recommended to purchase.
- Vascular lesion treatment may be performed with intense pulsed light.
- Unwanted pigment may be removed with intense pulsed light devices.
- Hair removal with intense pulsed light works well in light-skinned patients with dark hair.

INTRODUCTION

Data from the American Society for Aesthetic Plastic Surgery in 2014 shows that intense pulsed light (IPL) is the seventh most popular procedure among plastic surgeons and other core specialists (**Box 1**) making this a very common office procedure. IPL devices are not lasers but rather contain a powerful flashlamp that produces noncoherent, polychromatic light that can be tuned to provide a variety of wavelengths, fluences, and pulse durations. This light acts like a laser in causing selective photothermolysis and treatment of vascular and pigmented lesions, photo damage, acne, and unwanted hair. IPL technology delivers noncoherent light from about 420 nm to the midinfrared spectrum (**Fig. 1**). This light is tuned through cutoff filters or separate handpieces that allow light only above a certain wavelength to be emitted. This spectral adjustment is used to tailor the light to skin type and absorbing chromophore. The filter cuts off the emitted light, so that only wavelengths longer than the used filter value pass to the treated area. For example, a 560-nm filter, allowing emitted wavelengths longer than 560 nm, is used to treat vascular lesions (corresponding to a vascular absorption peak at 585–595 nm) or pigment in darker-skinned individuals, whereas a 515-nm filter allowing wavelengths longer then 515 nm might be used to treat pigment in lighter-skinned people. Some manufacturers have different handpieces with different cutoff filters, whereas others provided one handpiece with interchangeable filters.

Other adjustments include the fluence or energy delivered, the pulse duration, and in some systems a cooling system to protect the skin. Newer systems are significantly improved from earlier systems. The devices calibrate each use and prevent changes with bulb degradation. It was not unusual for older systems to have limited handpiece life, but technological advances have significantly improved bulb life. Current systems are much faster than their predecessors.

The light is usually applied to the skin through a rectangular light guide or crystal. These large rectangular treatment crystals allow treatment of large areas. Step-down adapters for smaller areas are

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Box 1
American Society for Aesthetic Plastic Surgery's top 10 procedures for 2014

1. Botox
2. Filler: hyaluronic acid
3. Laser hair removal
4. Chemical peel
5. Microdermabrasion
6. Laser resurfacing
7. IPL
8. Nonsurgical tightening
9. Liposuction
10. Sclerotherapy

often used. Gel is usually applied to the skin as an optical and thermal coupler.

IPL devices are effective in the treatment of a variety of vascular conditions, including facial telangiectasia, poikiloderma of Civatte, superficial hemangiomas, and port wine stains.[1,2] Photodamage including unwanted pigments is a typical use for these devices both on and off the face.[3,4] Skin rejuvenation is a very common treatment with improvement in texture, fine lines, and wrinkles along with vascular and pigment eradication.[5–9] Hair removal is a very common utilization, although limited to lighter-skinned patients with dark hair because of inadvertent melanin absorption in darker-skinned patients.

IPL systems are similar to lasers in that their use is also based on the principle of selective photothermolysis. The disadvantage relates to the lack of selectivity, possibly leading to inadvertent epidermal melanin absorption and burns.

An IPL device often makes the most sense for an initial device purchase in a plastic surgical practice because of the wide variety of clinical conditions, which may be treated with this device. There are several manufacturers that make excellent IPL devices. As previously mentioned, newer devices have significant advantages over older systems.

PATIENT SELECTION

Patient selection for IPL treatments is critical to successful treatment and is more important than the device and settings used. Patient variables to

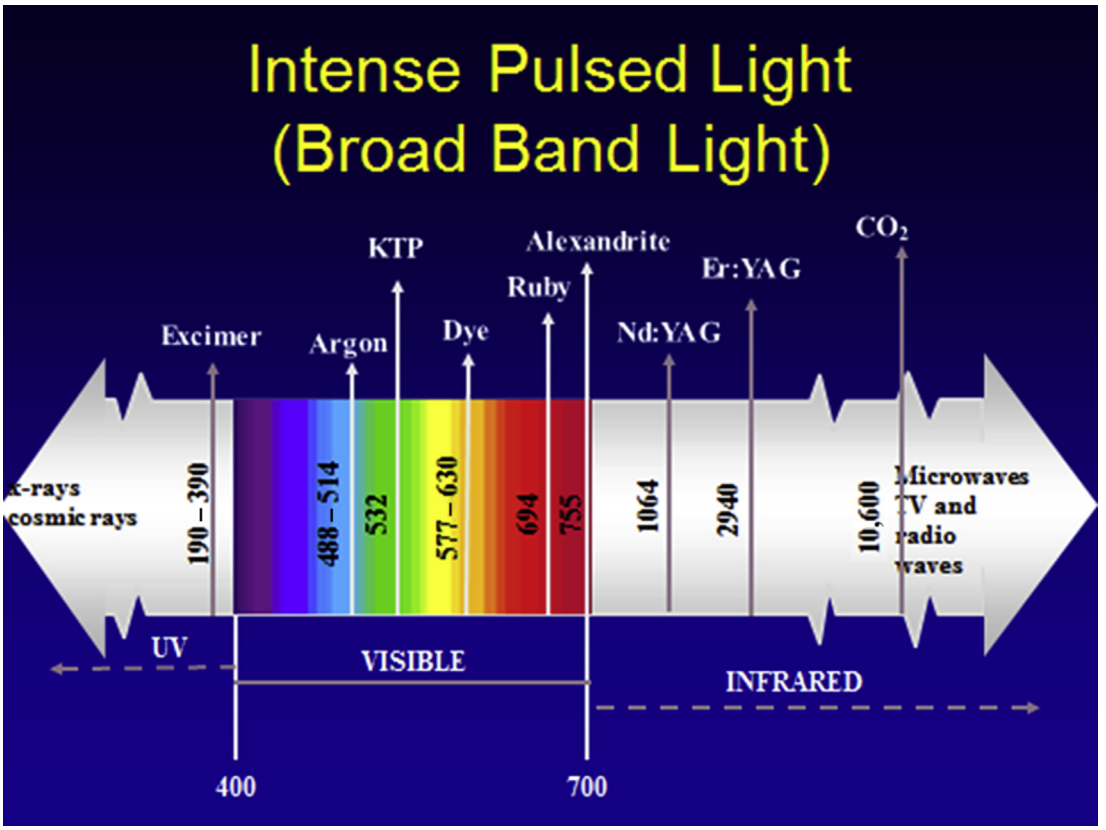

Fig. 1. IPL spectrum. CO_2, carbon dioxide; Er:YAG, erbium:YAG.

Table 1
Fitzpatrick skin type scale

Type I	Always burns, never tans
Type II	Usually burns, then tans
Type III	May burn, tans well
Type IV	Rarely burns, tans well
Type V	Very rarely burns, tans well, brown skin
Type VI	Very rarely burns, tans well, very dark skin

assess include patient skin type and tan, problem to be treated, and ability to comply with the treatment regimen.

The standard for patient skin typing is the Fitzpatrick skin type scale (**Table 1**). This scale provides an assessment of skin type based on genetic disposition, sun exposure, and ability to tan or burn. In addition to the Fitzpatrick scale, the clinician needs to assess the degree of sun exposure and adjust settings or not treat if patients are tanned. It is also important to assess spray tan or other skin coloration agents used.

The problem to be treated is an obvious assessment in patient selection. Alternatives to IPL use need to be evaluated as well; these may include topical skin regimens, laser resurfacing, or other lasers or chemical peels for pigment. Alternatives to vascular treatment with an IPL include pulsed dye or Nd:YAG lasers (1064 nm) or potassium titanyl phosphate (KTP) lasers (532 nm). Hair removal may be performed with a variety of laser wavelengths, some better for darker skin types (Nd:YAG, 1064 nm).

The ability of patients to comply with the treatment regimen is important. This compliance includes avoidance of sun exposure and postcare topicals and series completion. Patients who are unwilling or unable to comply may have complications or become dissatisfied. Informed consent and information packages that explain the procedures given to patients are important.

OVERVIEW OF TREATMENT STRATEGY

Laser Safety

Laser safety is critical to both practitioners and patients. There are excellent published guidelines on laser and IPL safety. The most critical safety issue with IPLs is eye safety, and proper protection must be used for practitioners and patients.

Indications

The indications for IPL are to activate 5-aminolevulinic acid, active acne, photodamage, lentigines and hyperpigmentation, vascular lesions including telangiectasias, port wine stains, rosacea and red scars, as well as for hair removal.

Lower filters, such as 420 nm, are used for treating acne and may be used alone or to activate 5-aminolevulinic acid.[10,11] Some devices combine IPL with suction for acne treatment. 5-aminolevulinic acid may also be used with IPLs in treatment of actinic keratoses.

IPLs are used to treat pigment in any area of the body. Treatment of the face is often called a photofacial or fotofacial in which pigment or vascular filters are used to remove dyschromias or unwanted vasculature. The décolleté is an area that responds very well to IPL treatment and we often perform combination treatment with full field or fractional lasers to concurrently improve texture. Removal of hand dyschromias is also a very common indication (**Figs. 2–4**).

A common indication for IPLs is treatment of unwanted vasculature, including facial flushing, smaller facial and leg vessels, telangiectatic matting, and rosacea. Larger vessels are not routinely treated with IPLs.

Fig. 2. Before and after 3 IPL treatments of décolleté.

Fig. 3. Before and after 3 IPL treatments of hands.

Hair removal with IPL is an extremely common use in all body areas, including facial, axillary, chest, back, groin, and legs. As mentioned previously, modern IPLs have extremely fast cycle times making hair removal of larger areas more efficient. Integrated cooling allows safe treatment with avoidance of unwanted complications. IPL devices are used in patients with Fitzpatrick 1 to 3 skin types with dark hair and are not used in darker-skinned patients or in patients with a tan because of unwanted melanin chromophore competition and risk of epidermal injury. A new device from Sciton (Palo Alto, CA) and marketed under the name Forever Bare uses in-motion technology instead of traditional IPL stamping. Lower fluences and less pain are advantages of this system.

An interesting research project with IPL devices showed that in addition to histologic skin improvement there were youthful changes to the skin DNA. Long-term IPL use has been linked to a retardation of skin aging and is marketed under the Forever Young brand.

Fig. 4. Before and after facial vasculature treatment with IPL.

INTENSE PULSED LIGHT TECHNIQUE

Treatment Protocol

Before IPL treatments patients will sign a consent form, a photograph consent form, a fee schedule, and a postcare instruction form. The skin is cleansed of all makeup. A topical anesthetic may be used and left on for an appropriate time and then washed off. Eye protection is placed on patients and provider as well as all personnel in the room. The door is locked, appropriate signage is placed on the door, and a pair of additional glasses is left on the door for staff to use if they come in the room during treatment. Appropriate filters or handpieces are used and parameters adjusted. The parameters used vary by device, filter, and clinical entity being treated. A clear coupling gel is placed on the treatment area as an optical and thermal coupler. One to 2 device activations are performed on the intended area and skin reaction assessed and parameters adjusted based on response. The treatment is completed and posttreatment sun avoidance and instructions are reinforced. Downtime of IPL treatments is zero to minimal, with short-term mild redness the most common posttreatment issue. Treatment of diffuse redness or dyschromias is usually monthly for 3 to 4 treatments or until the dyschromia or redness is resolved.

Vascular lesions, such as rosacea, telangiectasia, hemangioma, spider veins, and poikiloderma of Civatte, can all be addressed with IPL technology.[1,2] Vascular lesions, such as angiomas and telangiectasia, are often cleared in one treatment session, whereas rosacea, red spider veins, and poikiloderma of Civatte require more treatment sessions. Port wine stains often require the most treatment sessions.

IPL treatment of hair removal is limited to patients with Fitzpatrick skin types 1 to 3 who are not tanned and who have dark hair. Patients are shaved on the day of the procedure and the skin cleaned with alcohol or other skin antiseptic. A topical anesthetic is usually applied. Standard IPL precautions are taken and the procedure performed as with other IPL treatments. End point of hair eruption and follicular swelling may be seen. Posttreatment is with a moisturizer and sunblock. Repeat treatment is indicated in 4 to 6 weeks.

Downtime after IPL treatment is minimal to zero. Postcare is relatively easy and may include ice packs administration to cool the patients' skin immediately after the procedure. A low-potency corticosteroid cream may be used for 2 to 3 days (twice a day) to increase comfort level and shorten healing time. Patients must refrain from direct sun exposure for a period of 1 week. A high-quality sun block (sun protection factor 30+) should be used on a daily basis along with a barrier if outdoor activities are unavoidable.

COMPLICATIONS AND TREATMENT

Complications are relatively rare following IPL treatment; however, problems include hyperpigmentation, burns, checkerboard skin mottling, and hypopigmentation. Hyperpigmentation is usually resolved with sun avoidance and aggressive topical regimens.

Burns may happen when inappropriate filters, energies, pulse duration, or cooling is used. Other causes include poor patient selection (too dark), tan patients, or recent self-tanner or makeup that is not removed. Burns should be treated immediately with treatment cessation and cooling of the affected area. Appropriate care, such as burn gels, occlusion, or topical antibiotic ointment is then used. A patient who has been burned with an IPL device should be followed closely until problem resolution.

The checkerboard mottled skin pattern is a frustrating complication and is usually caused by improper technique. Correction is with additional IPL treatment and use of appropriate topical skin care agents. Sun exposure should be avoided and appropriate sunscreens used until resolution.

Hypopigmentation is a rare complication of IPL treatment but may occur after a burn. Treatment is difficult but may include specific lasers for repigmentation. Treatment responses are generally slow and may never completely resolve.

SUMMARY

Many laser experts agree that the first device to buy is an IPL because of the variety of conditions that may be treated and the efficacy and safety profiles of the treatments. There are several excellent devices now available from reputable manufacturers that will provide many years of service.

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