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Laser Hair Removal: Comparing Single Wavelength and IPL Technologies

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Introduction

Light-based hair removal systems continue to grow in popularity. With the promise of never having to shave again, a plethora of companies and devices, including lasers and broad-spectrum light devices, are attempting to satisfy this growing demand for permanent hair reduction.

Laser or light-based hair removal is based upon the principles of selective photothermolysis—which states that the light energy must be well absorbed by the targeted chromophore for efficacy and less well absorbed by competing chromophore(s) to prevent collateral thermal damage. In the case of hair reduction, the targeted chromophore is perifollicular melanin and the competing chromophore is epidermal melanin.

Lasers are single wavelength devices with absorption coefficients relatively specific to the chromophores they are intended to target. Intense Pulsed-light (IPL) devices expose the patient to a broader spectrum of light energy defined by cut-off filters, typically in the range of 600-1200 nm. The fact that lasers and IPL devices may target multiple chromophores allow these products to be marketed as being capable of treating a variety of conditions in addition to hair removal, including treatment of vascular and pigmented lesions, warts, wrinkles, and even acne.

Customer demand is also fueling this marketing approach, as every laser purchaser wants one device that "does it all."

Since no two lasers or IPL devices have identical operating parameters (i.e., wavelength, fluence, pulse duration, spot size, or epidermal cooling methodologies), the performance levels of these products differ substantially.

In particular, the comparative results of lasers and IPL devices vary greatly in hair removal. The purpose of this paper is to compare and contrast the efficacy, ease-of-use, and patient satisfaction using two different technologies to provide permanent hair reduction—a single wavelength alexandrite (755 nm) laser and an IPL broad-spectrum light device with cut-off filters.

Method

Patient #1 - The patient (J.H.) was a 24-year-old Arabic female. She complained of excess dark terminal hair on both cheeks, as well as on the nape of her neck. Previous treatments had included waxing and bleaching. Her skin type was Fitzpatrick IV. She routinely used broad-spectrum sun blocks. Her skin pigmentation in the areas of excess hair growth was uniform and even without any blotchiness. She had no history of abnormal scarring or excessive response to mild trauma.

GentleLASE® with DCD

She began on (IPL) therapy. A test session was performed using chilled ultrasound gel on the skin intraoperatively and icing postoperatively and the following settings:

Fluence:	30 J/cm^2
Pulses:	3
Duration:	3.2
Delay:	5
Filter:	645 nm

These settings resulted in mild follicular erythema without blistering.

Follow-up at two weeks revealed no complications.

The patient then underwent three sequential IPL treatment sessions at monthly intervals. Settings were as above. No problems were noted, but response was only fair in terms of hair removal.

Two treatments were then performed with GentleLASE at an interval of one month. Settings were as follows:

Fluence:	10 J/cm^2
Spot size:	15 mm
*DCD™:	70 spray/80 delay.

*Dynamic Cooling Device™

No complications were encountered.

Three months later, an additional IPL treatment was performed. Settings were as follows:

Fluence:	28.5 J/cm^2
Pulses:	3
Duration:	3.0
Delay:	50
Filter:	645 nm

The patient called at 24 hours after that treatment with severe pain and blistering throughout the treated area. She was seen and treated for first and second degree burns. The areas healed without appreciable scarring, but demonstrated irregular hyper- and hypopigmentation.

She was treated with mild bleaching agents to the hyperpigmented areas. These eventually responded, and after six months pigmentation was almost normal. She then continued with GentleLASE treatments without further complication. After a total of four GentleLASE sessions, hair removal was estimated at 80-90%.

Patient #2 - The patient (M.R.) was a 46-year-old white female with a long history of excessive hair growth in many anatomic areas. She had previously undergone electrolysis to her face, abdomen, and upper thighs/bikini areas. She was judged to be skin type Fitzpatrick III, with blue eyes and light brown hair. She presented for hair removal with excess black terminal hair on both legs.

A test session was performed utilizing both an IPL device and the GentleLASE (one on each lower extremity). IPL settings were:

Fluence:	35 J/cm^2
Pulses:	3
Duration:	3.2
Delay:	30
Filter:	645 nm
Cooling:	chilled gel and ice packs.

GentleLASE settings were:

Fluence:	16 J/cm^2
Spot size:	15 mm
DCD:	70 spray/80 delay.

Both test areas responded well immediately with mild erythema. No complications were noted within the two-week follow-up period.

Treatment was then undertaken using one of the devices on each leg. Settings remained as above. No untoward events were noted during the session. However, later that evening, the patient developed significant pain in the leg treated with the IPL device. This was followed by diffusely scattered blisters and some areas of “sloughing.” She was seen the next day and began on a regimen for superficial burns.

The patient declined further IPL therapy but wished to continue with GentleLASE to the opposite extremity. She had four additional treatment sessions with these settings:

Fluence:	20 J/cm^2
Spot size:	18 mm
DCD:	70 spray/80 delay.

No complications were encountered. The IPL-treated leg showed irregular hyperpigmentation and focal textural changes. These were treated with bleaching agents and topical steroids. They resolved in approximately six months.

Hair removal on the GentleLASE-treated side was judged to be approximately 90%. There was no measurable reduction in hair growth on the IPL treated side (one session only).

Results

Two patients of different skin types have been presented. Both had test sessions with IPL devices that showed no problems during or after the test sessions. However, both of them subsequently experienced significant problems during their course of therapy. Without any significant treatment parameter alterations, both experienced painful burns. It is of great importance that in neither case did the patient nor the operator note any unusual tissue response during the treatment which would have indicated a problem. Both patients developed resultant pigmentary alterations which required months of therapy for resolution. Additionally, one of them experienced textural changes in the skin.

No problems were encountered in these same patients with the GentleLASE treatments. Discomfort was minimal during and after all sessions. Pigmentation of the skin in the treated areas was unaffected, and neither patient required any type of additional therapy for complications. Both patients indicated a preference for GentleLASE even before experiencing their IPL-induced burns, mainly due to intraoperative comfort provided by the Dynamic Cooling Device.

Most important, both patients noted significant clearing of excessive hair in the GentleLASE-treated areas. This had not been the case with one of them in regard to IPL-treatment.

Discussion

Lasers and intense pulse-light devices are gaining in popularity not only because of patient demand for permanent hair reduction, but also because of physician demand for increased utility. Unfortunately, these devices vary widely in their ability to deliver on their promoted indications, including hair removal.

Because lasers use single wavelengths of energy, the side-effect profile and dependability of response are superior to IPL devices. This differing performance level is a function of IPL design—IPL subjects the skin to a wider range of light energies of varying absorption coefficients for the chromophores targeted for cosmetic laser procedures.

While IPL devices are marketed for a variety of treatment applications, their performance levels are inferior to lasers, particularly in hair removal. Further, IPL needlessly exposes patients to some unnecessary and/or ineffective wavelengths of radiation and are lacking, by definition, the purity of treatment available with a single-wavelength laser. Specifically, IPL hair removal treatments resulted in an increased frequency of complications and offered overall inferior results when compared to laser hair reduction.

Based on our experience at the Cleveland Clinic, we have ceased using IPL devices in our department due to the inconsistency of response between patients and even between sessions on the same patient. Another reason for the cessation of IPL use was the unacceptably high complication rates. At the Cleveland Clinic, we had far more adverse skin reactions (usually minor and transient, but occasionally serious) from IPLs than from any laser system.

By contrast, the GentleLASE alexandrite (755 nm) laser from Candela is marketed as a hair removal laser, and its performance is exemplary. The large spot, deliverable

fluence, and skin protection afforded by the patented, cryogen-based DCD system available on all Candela lasers make the GentleLASE an especially easy-to-use, safe, and comfortable laser.

Based upon physician feedback and patient satisfaction, the GentleLASE, in our opinion, is the “gold standard” in laser hair removal.

While GentleLASE is also cleared for vascular treatments, and several other clearances are pending with the FDA, this paper does not take a position on alexandrite laser efficacy for any other indication other than hair removal.

The GentleLASE laser is the superior treatment modality when compared to any IPL technology we are aware of for permanent hair reduction.

Reference

Anderson RR, Parrish JA: Selective Photothermolysis: Precise microsurgery by selective absorption of pulse irradiation. *Science* 220:524-527, 1983.

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