
Infrared, Programmable Wavelength Light Source for Permanent Hair Reduction in Skin Types I – V

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BACKGROUND

A novel flashlamp emitting infrared light is posited to combine the safety and efficacy of infrared lasers in treating a range of skin types, with the efficiency of an 'intense pulsed light (IPL)' flashlamp. While traditional IPL flashlamp technology offers a lower cost and more rapid coverage than lasers, there are limitations in breadth of application associated with the visible light wavelengths. Thus, a system with preset programs primarily based on skin type that shift to appropriate wavelengths within the infrared spectrum, while maintaining safe and effective energy levels, would be a significant advance.

PURPOSE

This purpose of this study is to evaluate a programmable wavelength infrared light handpiece (ProWave 770, Cutera, Inc.) for hair removal in patients with skin types I through V.

METHODS AND MATERIALS

Forty-four patients ranging in age from 16 to 50 and with Fitzpatrick skin types I through V (as seen in Table 1) were treated with the ProWave 770 handpiece.

Table 1: Patients by Skin Type

| <i>Skin Type</i> | <i>No. of Patients</i> |
|------------------|------------------------|
| Type I - II | 18 |
| Type III | 8 |
| Type IV - V | 18 |

Depending on skin type, one of three preset treatment modes was selected via touch-screen, and fluences were set between 10 and 30 J/cm² (see Table 2).

Table 2: Treatment Mode Options

| <i>Skin Type</i> | <i>Mode</i> | <i>J/cm²</i> |
|------------------|-------------|-------------------------|
| Type I - II | A | 25 - 30 |
| Type III - IV | B | 15 |
| Type V | C | 10 |

The spectrum of available wavelengths with the handpiece extends from 770nm to 1100nm. As the mode is changed from A to B to C, the range shifts within this spectrum to longer wavelengths, the pulse

width increases and the cooling is enhanced. In this way, treatment of each particular skin type is automatically optimized to destroy the hair follicle while sparing the surrounding tissue.

Hair thickness ranged from medium to coarse across all skin types, and hair color ranged from light brown (in Type I-II) to brown, dark brown and/or black in all skin types.

Three treatments, spaced four to six weeks apart, were delivered either to the bikini area, axillae, lower legs, upper lip, or chin. No anesthesia was used.

Efficacy was evaluated by global assessment of photographs taken immediately before each treatment session and six months following the final treatment (see Figures 1 and 2).

RESULTS

Hair reduction six months after completing the treatment series averaged 83%. Results were similar across skin types, as shown in Table 3.

Table 3: Hair Reduction by Skin Type

| <i>Skin Type</i> | <i>Mean</i> | <i>Range</i> |
|------------------|-------------|--------------|
| Type I - II | 83 % | 65 - 95 % |
| Type III | 93 % | 90 - 98 % |
| Type IV - V | 73 % | 30 - 95 % |

Assessment by body region revealed the highest response to be in the bikini area, axillae and chin, followed by the upper lip and lower leg (see Table 4).

Table 4: Hair Reduction by Region

| <i>Region</i> | <i>Mean</i> | <i>Range</i> |
|---------------|-------------|--------------|
| Axillae | 88 % | 80 - 98 % |
| Bikini | 85 % | 80 - 90 % |
| Chin | 84 % | 80 - 90 % |
| Upper lip | 74 % | 70 - 80 % |
| Lower legs | 50 % | 30 - 70 % |

The procedure was well tolerated by all patients, and side effects were limited to transient erythema.

CONCLUSIONS

The ProWave 770 handpiece provides the optimal light spectrum, and the flexibility within that spectrum, to treat skin types I through V -- without compromising safety or efficacy.



Figure 1: Pre-treatment and 6 months post 3 treatments of axillae

DISCUSSION

My team has been doing light-based hair removal since 1999 and has treated patients with the Lumenis LightSheer, Syneron Aurora, LaserScope Lyra, Candela GentleLase; also the Lumenis Quantum IPL, Palomar MediLux and Palomar EpiLaser.

Based on this experience, six-month follow-up results would be considered 'excellent' if, after five to six treatments, at least 80% hair reduction in the axillae, bikini, upper lip and chin in patients with black or dark hair were achieved. With ProWave, we achieved an average of 86% hair reduction after just three treatments. Hair reduction of 50-60% would be excellent for the legs especially for brown or dark brown hair; ProWave averaged 57%. Anything above 40-50% reduction would be excellent for lighter colored hairs on any region; ProWave averaged 85% in the four patients with brown or light brown hair (there were no patients with blonde hair).

To lend further perspective, a previous study¹ revealed two treatments with an 800 nm diode laser to have resulted in an average hair reduction of 37% by hair count at six months, while three treatments with ProWave have been shown here by global assessment at six months to have resulted in an average of 50% reduction in lower legs, and 74-88% reduction in the balance of sites.

Safety is evaluated by the incidence of burns, blisters, scarring, keloid formation, post-inflammatory hyperpigmentation or hypopigmentation. With ProWave, side effects were limited to mild, transient erythema.

Therefore, the ProWave 770 should become a staple for any practice: it combines the safety, efficacy and efficiency of multiple technologies into a single handpiece with skin-specific programs.

PROWAVE TECHNOLOGICAL ADVANCES

The ProWave 770 infrared handpiece is neither a laser nor a traditional 'intense pulsed light' flashlamp, but rather a third category refining the best of both. It is innovative in three key ways:

- It emits infrared light not visible light. This access to longer wavelengths affords greater safety and efficacy in darker skin types.
- It delivers the longer wavelengths of lasers via a large 10 x 30 mm spot size to treat even sizeable areas both effectively and efficiently. Its ability to maintain a high repetition rate at effective treatment fluences combined with its large spot size makes ProWave one of the fastest hair removal devices available.
- It offers three preset programs tailored to a patient's skin and hair. In this way, treatment parameters are automatically optimized to destroy the hair follicle while sparing the surrounding tissue.

Table 5: Parameters of the Programmable Handpiece

| Program Mode | A | B | C |
|--------------|--------|---------|----------|
| Peak | 810 nm | 845 nm | 880 nm |
| PulseWidths | 9 – 39 | 11 – 71 | 48 – 153 |
| Temperature | Cool | Cooler | Coldest |



Figure 2: Pre-treatment and 6 months post 3 treatments of chin

1. Dierickx CC, Anderson RR, Campos VB, Grossman MC. Effective, Long-term Hair Removal Using a Pulsed, High-Power Diode Laser. Coherent Medical Group, 1999.