Use of Diode Laser System for Hair Reduction: Safety and Efficacy in a Large Series of Treatments

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INTRODUCTION

SEMICONDUCTOR DIODE LASERS are considered the most efficient light sources available and are particularly well suited for clinical applications including hair reduction. This paper reports the use of the LightSheer diode laser system, a high-power, long-pulsed diode laser with a wavelength of 800nm, for laser hair reduction in a large population of patients with a variety of skin and hair types.

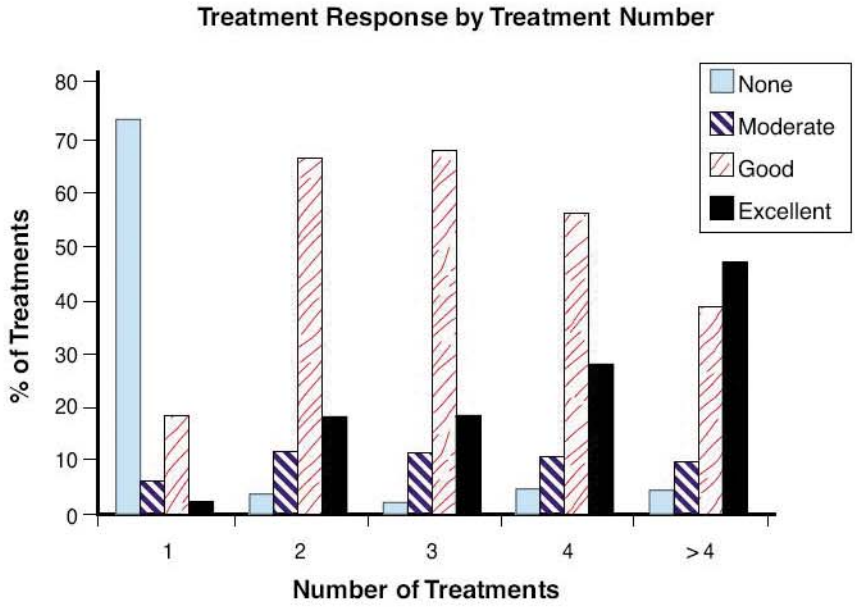
Laser hair reduction operates on the principle of selective photothermolyis. This process combines selective absorption of light energy by the melanin in hair follicles with suitable fluences and pulse durations1. In order to achieve maximum selectivity, the laser energy is applied in a pulse duration that approximately equals the thermal relaxation time of the target. In practice, the appropriate pulse duration maximizes the temperature rise of the hair follicle and minimizes the conduction of heat to the surrounding tissue, thus sparing adjacent structures from damage.

In order to achieve permanent hair reduction, sufficient light energy must be absorbed by the hair follicle. The melanin in the hair follicle absorbs 3-4 times more energy at around 800 nm than at around 1064nm (the wavelength of Nd:YAG lasers).

Over 84% of sites showed a good or excellent response following the second and subsequent treatments. Treatment responses were similar for all skin types treated, with an excellent safety profile. Side effects were noted in only two of the 800 treatments and were transient in nature. Patients were extremely or moderately satisfied with over 96% of their treatments.
reduction in contrast to the much higher fluences required for a 1064 nm laser.

Table 1: Characteristics of Treated Sites

Skin Type	Number (%) of Sites	
II	15	(6.0%)
III	112	(44.8%)
IV	109	(43.6%)
V	14	(5.6%)
Tan		
No	224	(89.6%)
Yes	26	(10.4%)
Treatment Site		
Face/neck	172	(68.6%)
Trunk	27	(10.8%)
Axilla	11	(4.4%)
Bikini/legs	33	(13.2%)
Other	7	(2.8%)
Hair Color		
Light Brown	10	(4.0%)
Dark Brown	96	(38.4%)
Black	144	(57.6%)
Hair Texture		
Fine	31	(12.4%)



The effectiveness of laser hair reduction depends on the patient's skin type. Laser hair reduction is typically more effective in lighter-skinned people (Fitzpatrick skin types I-III)2. The challenge associated with laser treatment for darker-skinned patients is to avoid surface skin (epidermal and upper dermal) injury due to absorption of light in the pigmented epidermis, while still causing selective destruction of the underlying pigmented hair follicles. This study will examine almost equal numbers of treatments of light and dark skin types.

METHODS

This paper reports on the safety and effectiveness of the Diode Laser System in the reduction of pigmented hair in a large patient population with a variety of skin types and hair characteristics. The study monitored 800 hair reduction treatments at 250 sites on 144 patients.

The majority of patients had Fitzpatrick skin type III or IV and medium or coarse dark brown or black hair. Almost 50% of treatments were performed on type IV and V skin. Over two-thirds of treatments were to the face or neck

Over 90% of sites received two or more treatments. The interval between treatments ranged from 2 to 56 weeks, with an average of 10 weeks.

The most frequently used fluence was between 25 and 29 J/cm2. Over 94% of treatments used the OptiPulseTM mode for pulse width, while the remaining treatments used a 30 ms pulse width . The 30 ms pulse width was most commonly used for skin type V (29% of type V treated sites) and skin type IV (7% of type IV treated sites).

Treatment success was based on apparent clearance and was assessed as no response, moderate, good, or excellent response following each treatment. Patient satisfaction with the previous treatment was assessed as dissatisfied, mildly satisfied, moderately satisfied, or very satisfied.

Treatment responses were classified by skin type, hair color, hair texture, and hair density.

Treated areas were visually assessed for skin responses, including edema, erythema, hypopigmentation, hyperpigmentation, and textural changes following each treatment. Patients also noted their level of pain and the use of topical anesthesia was recorded.

RESULTS

Treatment response was rated as good or excellent for approximately 65% of all treatments.
Favorable responses increased substantially after multiple treatments.
Over 84% of sites showed a good or excellent response following the second and subsequent treatments
Multiple treatments are important for the patient to achieve the desired response.

In general, the percentage of treatments that resulted in good or excellent response was similar regardless of skin type or hair color. Treatment responses for second and subsequent treatments by skin type and hair color are shown in adjacent graphs.

The average number of treatments required for good or excellent response was similar for all body areas treated

Treatment satisfaction was similar for patients with different hair colors and skin types, although patients with skin type V were slightly less satisfied than those with skin types II-IV

Overall, patients were moderately or very satisfied with 96% of their treatments

Safety

Any untoward event at the treatment site (e.g., edema, erythema, hypopigmentation, hyperpigmentation, textural changes) that lasted 30 days or more was considered to be a side effect. Side effects were reported for only two out of 800 total treatments (0.25%). These were both cases of responses increased substantially after multiple
One incident of transient hyperpigmentation occurred after the second treatment of a patient with skin type IV. The patient's axilla was treated using a fluence of 28 J/cm2 and a 30 ms pulse duration. This hyperpigmentation lasted slightly over one month. The patient underwent two further treatments at that site and no further hyperpigmentation was noted.