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Research Article

Face and body laser hair removal with the 810nm wavelength laser diode

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Abstract

Background/Aim: Hair removal has been one of the most popular aesthetic treatments in recent years. Due to the rapidity and efficacy of treatment, this study aimed to evaluate the acceptability of the diode 810 nm used for hair removal in men and women with different skin phototypes.

Materials and Methods: 19 subjects were considered for this research study. They were treated for hair removal in different body areas (groin, legs, trunk) and face (cheeks and upper neck). A 5-point (0-4) scale - Global Aesthetic International Score was used to assess the improvement in the treated area.

Results: Patients underwent 5.1±2.8 treatments on the face and 6.2±5.1 on the body. The ses-sions were performed every 64.5±14.2 days and every 58.3±5 days, respectively. When GAIS data for the face area are considered, an excellent improvement with a hair reduction of 75-100% was registered in 42% of the patients.

Conclusions: The diode laser handpiece with an 810nm emission wavelength was confirmed to be a valid solution for the removal of unwanted hair in the face and body areas regardless of the skin phototype of the patient.

Keywords: laser hair removal; 810nm wavelength; face; body

1.Introduction

Hair removal has been one of the most popular aesthetic treatments in recent years, particularly among women. Nevertheless, even if it is less common, the demand among males has increased in response to the shift in societal and aesthetic trends, leading to the inclusion of new and even more expanded body parts during treatments. [1]

Targeting of melanin in the hair bulb represents the basis for Laser Hair Removal (LHR). It is one of the most popular non-surgical aesthetic procedures.[2] It consists of the emission of a specific laser light wavelength normally absorbed by melanin. The heat produced by this energy causes the hair bulb to be destroyed. The core principle of "selective photothermolysis," outlined as the laser damage that is restricted to a particular tissue by a certain laser parameter, underpins the technical foundation of LHR. It generally works within milliseconds and thermal damage prevents the growth of new hair because melanin absorbs light with wavelengths between 600 and 1100 nm, turns it into heat locally, and then damages the surrounding stem cells in the hair bulge. [3], [4]

The intense pulsed light (IPL), Nd:YAG (neodymium-doped yttrium aluminium garnet) (1064 nm) laser, ruby (694 nm), diode (810 nm), and alexandrite (755 nm) [5] laser are the most often used hair removal tools offering a variety of levels of absorption and depths of penetration.[6] In general, these are very effective techniques to eliminate unwanted hair regardless of the patient skin phototype. Nevertheless, treating large sections of thick hair or treating patients with darker skin tones needs extra attention because too much melanin could be targeted in the nearby epidermis and result in epidermal injury or absorptive interference and less efficient hair destruction. [3], [4] Indeed, modified parameters, such as a longer pulse duration, a longer wavelength, and optimal cooling, are required to effectively treat patients with darker skin. [7] Small targets, like the pigmented cells in the epidermis, are protected from thermal injury at longer pulse durations, but bigger pigmented structures, such as the pigmented regions of the hair bulb, are thermally irreversibly harmed. Moreover, longer wavelengths are less well absorbed by melanin, protecting dark skin from damage, but they continue to be sufficiently absorbed in pigmented hair follicles to cause hair damage. [8] The frequency of repetition is an important parameter to define the speed of the treatment, especially in extended body areas. [9]

Due to the rapidity and efficacy of treatment, this study aimed to evaluate the acceptability of the diode 810 nm use for hair removal on different body and face areas in men and women with different skin phototypes.

2. Materials and Methods

Study Population

19 subjects were considered for this research study. There were 17 females and 2 males with darker Fitzpatrick phototypes (63% phototype III, 21% phototype IV, 16% phototype II) (Table 1). The population's mean age was 36.4 ± 14.1. They were treated for hair removal in different body areas (groin, legs, trunk) (47%) and face (cheeks and upper neck) (53%). A 5-point (0-4) scale - Global Aesthetic International Score, GAIS (No change/Worsening; 0-25% – Mild improvement; 25-50% – Moderate improvement; 50-75% – Good improvement; 75-100% – Excellent improvement) was used to assess the general improvement in the treated area.

Number of patients	19	
Average age (mean ± SD)	36.7 ± 14.4	
Sex(%)	Male	Female
	11%	89%
Treatment area*	Body	Face
	55%	50%

*One patient was treated on the body and face areas

Table 1. General information on the study population

Study Device and Protocol

The device (Vivid, Luxea, Deka M.E.L.A., Calenzano, Italy) employed in this study has a diode laser handpiece with an 810nm emission wavelength, a maximal frequency of 10 Hz, impulse of 200ms, and a spot size of 10x12mm. Moreover, the device is provided with a contact sensor to maximize the treatment efficacy.

It is an effective laser for hair removal because of its high melanin absorption. For hair removal treatments in any area of the human body, including extended areas like the chest, back, abdomen, and thighs, two distinct procedures (stationary and motion) can be used: first, traditional stationary (single pass) hair removal methods emit between 20 and 35 J/cm2 of energy while second, the motion methods emit between 6 and 10 J/cm2 of energy reducing patient's pain (see Figure 1 and 2).

In the second method, the user must continually move the handpiece in a slow linear/circular motion to create a 150 cm2 area (10 x 15 cm) and to perform multiple back-and-forth passes up to a specific energy (between 7000 and 10,000 J). Perifollicular erythema, a moderate reddening around the hair follicle that may occasionally be accompanied by a slight odour of burnt hair and a mild heat sensation that should dissipate in a few minutes, is the clinical endpoint in both situations. The Motion technique was used for wide-body areas while the Stationary for smaller areas and finishing.

The "Motion" method provides for a gradual increase in the desired temperature while monitoring cutaneous reactions and allowing for treatment interruptions or modifications at any time, minimising the adverse effects common to the conventional approach. Between the skin and the handpiece, a thin coating of translucent, watery gel was applied.

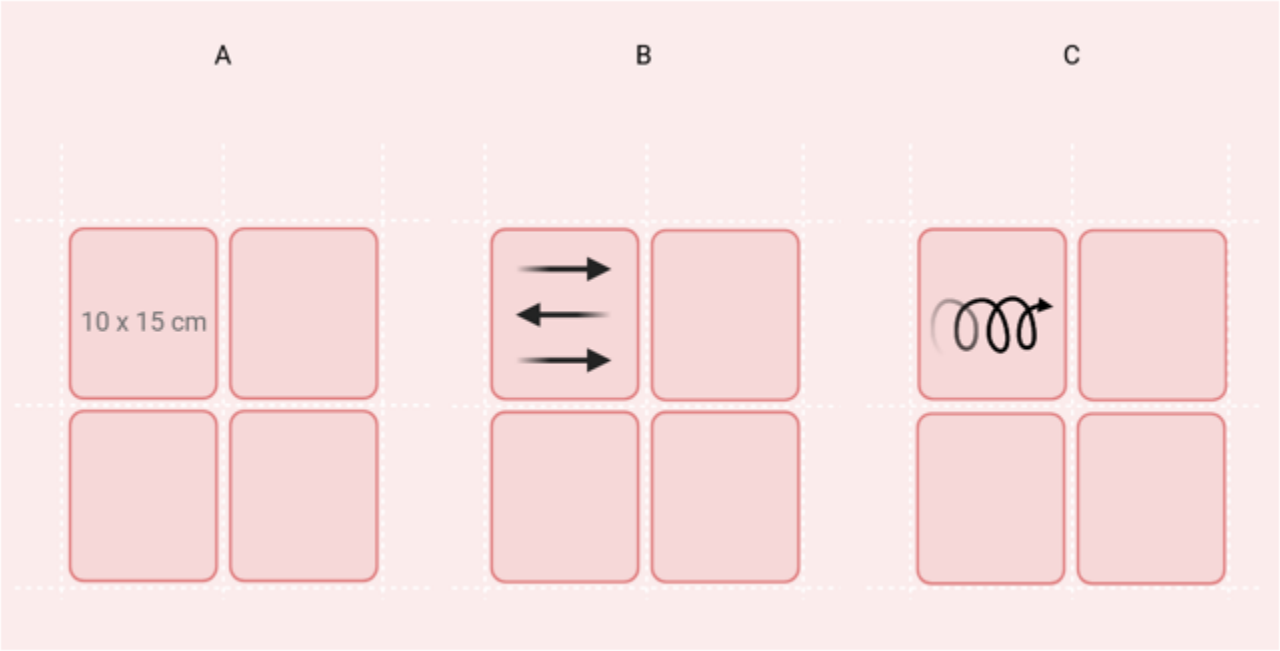

Figure 1: Hair removal treatment workflow representation. First, (A) the body area is divided into sections of 10 x 15 cm. Then, a thin coating of translucent, watery gel is applied and the diode laser handpiece with an 810nm emission wavelength is used in a single-pass mode (B) or a multi-pass and "in motion" technique (C).

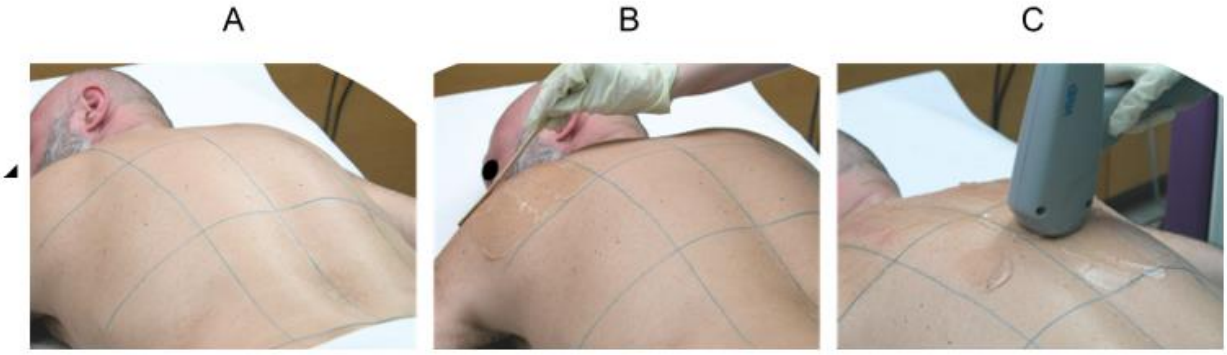

Figure 2: An example of hair removal treatment of a man's back is shown. First, (A) the body area is divided into sections of 10 x 15 cm. Then, (B) a thin coating of translucent, watery gel is applied. Lastly, (C) the diode laser handpiece with an 810nm emission wavelength is used.

3. Results

Generally, patients underwent 5.1±2.8 treatments on the face and 6.2±5.1 treatments on the body. The sessions were performed every 64.5±14.2 days and every 58.3±5 days, re-spectively.

When GAIS data for the face area are considered, an excellent improvement with a hair reduction of 75-100% was registered in 42% of the patients. A similar result was ob-tained for the body area with 37% of treated subjects with an excellent improvement (see Figure 3).

No side effects but a slight transient erythema disappearing after a few hours (max 1 day), were registered.

In Figure 4 the treatment duration per body area (trunk, legs, groin, face) is shown. The range of time treatment is influenced by the technique used for hair removal. As pre-dictable, the wider the area treated, the longer the duration of the treatment.

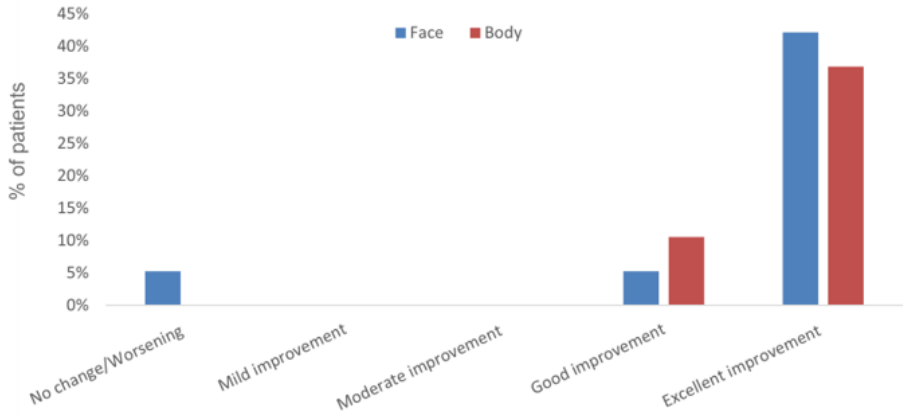

Figure 3: Global Aesthetic International Score, GAIS (No change/Worsening; 0-25% – Mild improvement; 25-50% – Moderate improvement; 50-75% – Good improvement; 75-100% – Ex-cellent improvement) results are shown. The score was used to assess the general improvement in the treated areas.

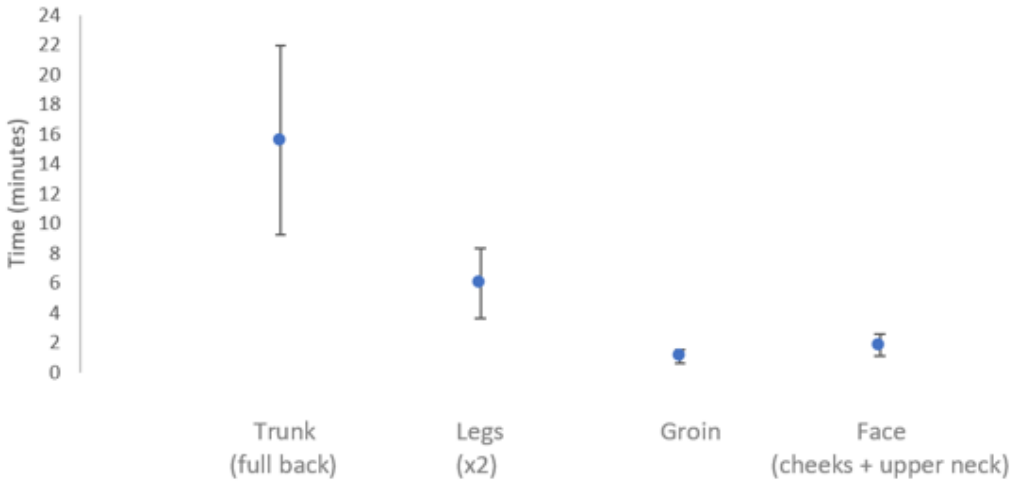

Figure 4: Treatment duration is shown per body area (trunk, legs, groin, face). The range of time treatment is influenced by the technique used for hair removal.

4. Discussion

In medical practice, the number of patients seeking hair removal is constantly growing since the abundance of hair is considered a common cosmetic problem. LHR technology's efficacy and safety have been extensively investigated during the last few years. [8] Specif-ically, LHR in men has been tested in many recent research investigations targeting body parts such as the pubic, axillary, extremities, and wider areas such as the chest and back. For example, Ross et al. (2018) addressed the chest region, but they did not specifically concentrate on it. While recently, Cannarozzo et al. (2023) [10] treated the chest and back area of a whole male population. They utilized the same device we used obtaining admi-rable results.

Over the years, different strategies have been developed to sensibly reduce unwanted ef-fects after LHR and obtain the best results in due time but not all of them revealed to be the best solution. For example, when used for epilation, IPL devices are not immune from consequences like burns and changes in skin colour. On the contrary, Nisticò et al (2022) demonstrated that different Nd:YAG techniques have similar outcomes for hair removal, assessing that the "in motion" technology seems to guarantee a better safety profile com-pared with the "static" traditional methods. [9], [11]

Something similar can be said for the 810nm diode laser technique. Royo et al. (2011) [12] performed a six-month follow-up multicenter prospective study of patients with III to V Fitzpatrick phototypes, on epilation efficacy using an 810-nm diode laser at low fluence. They demonstrated that effective heat induction of hair follicles by low-level laser fluences results in cytopathic alterations as well as vacuole development in the basal layer. In clas-sical epilation, the likelihood of violent saturation of the melanin-hair follicles is increased by a low rate of short-width pulses delivered at high fluence. This results in discomfort and burns, which are not experienced during epilation using the laser approach described here. In addition, the laser method creates tolerable pain and heat sensation symptoms while also alerting the therapist not to burn the skin. Since armpits, pubis, and extremities are parts of the body that primarily are targeted for hair removal, we focused on treating extended areas in this research rather than those that are more frequently involved.

The study has some limitations. Indeed, the use of diode 810 nm for hair removal may need to be tested on a larger population, males especially. This way, a better assessment of long-term side effects after treatment would be possible.

Our results confirmed remarkable results both for the face and body areas with an excel-lent improvement and reduction of hair using the diode laser handpiece with an 810nm emission wavelength. Even after a few sessions, remarkable results were visible since the treatment proved to be quick and effective. No side effect was noticed, and the technique was then considered safe, almost painless, and effective. No differences in the number of treatments or efficacy were noticed between the skin phototypes since positive outcomes were reached in all patients.

5. Conclusions

The diode laser handpiece with an 810nm emission wavelength was confirmed to be a valid solution for the removal of unwanted hair in the face and body areas regardless of the skin phototype of the patient.

6. Patents

Funding: This research received no external funding

Conflicts of Interest: BMP and TZ are employed at El.En. Group. The authors declare that the re-search was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Informed consent: Informed consent was obtained from all subjects involved in the study.

Author Contributions: Conceptualization, BD; methodology, BD; validation, formal analysis, BD, TZ; investigation, BD, TZ; resources, BD; data curation, BMP, TZ; writing—original draft prepa-ration: BMP; writing—review and editing, BMP, BD, TZ; visualization, BMP, TZ; supervision, BD; project administration, BD. All authors have read and agreed to the published version of the manuscript.

Institutional Review Board Statement: All the authors declare that the procedures followed were in accordance with the Declaration of Helsinki. No review board approval was needed since the device used for this study was CE-marked since 2018.

Data Availability Statement: Data that support the study findings are available on request from the corresponding author (BMP).

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