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REPORT



Efficacy & safety of intense pulsed light therapy for unwanted facial hair: a retrospective analysis in skin of color

Ajay Deshpande

ABSTRACT

Unwanted facial hair growth is a common esthetic problem. Laser hair removal has emerged as a leading treatment option for long-term depilation. The theory of selective photothermolysis has revolutionized laser hair removal in that it is effective and safe, when operated by sufficiently trained and experienced professionals. Long-pulsed ruby (694 nm), long-pulsed alexandrite (755 nm), diode (800–980 nm), and long-pulsed Nd: YAG (1064) are commercially available laser devices for hair removal most widely studied. The authors wish to share the efficacy and safety of intense pulse light therapy for permanent facial hair reduction in Indian population.

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KEYWORDS

Unwanted facial hair; intense pulsed light; skin of color

Background

Laser hair reduction has proved to be a safe and effective means of getting rid of unwanted facial hair (1). Various laser devices like Alexandrite, Ruby, Diode, and intense pulsed light (IPL) have been successfully tried in all skin types (1). Laser-assisted hair removal is the most efficient method of long-term hair removal currently available. Several hair removal systems have been shown to be effective in this setting: ruby laser (694 nm), alexandrite laser (755 nm) (2), diode laser (800 nm) (3), intense pulsed light source (590 to 1200 nm) (4), and the neodymium: yttrium-aluminum-garnet (Nd: YAG) laser (1064 nm), with or without the application of carbon suspension (4). The parameters used with each laser system vary considerably. All these lasers work on the principle of selective photothermolysis, with melanin in the hair follicles as the chromophore (1). Regardless of the type of laser used, multiple treatments are necessary to achieve satisfactory results. Hair clearance, after repeated treatments, of 30 to 50% is generally reported 6 months after the last treatment. Patients with dark colored skin (Fitzpatrick IV and V) can be treated effectively with comparable morbidity to those with lighter colored skin (5). Although there is no obvious advantage of one laser system over another in terms of treatment outcome (except the Nd: YAG laser, which is found to be less efficacious, but more suited to patients with darker colored skin), laser parameters may be important when choosing the ideal laser for a patient (5). Adverse effects reported after laser-assisted hair removal include erythema and perifollicular edema, which are common, crusting and vesiculation of the treatment site, and hypopigmentation and hyperpigmentation (depending on skin color and other factors). Most complications are generally temporary (6). The occurrence of hypopigmentation after laser irradiation is thought to be related to the suppression of melanogenesis in the epidermis (which is reversible), rather than the destruction of melanocytes. Methods to reduce the incidence of adverse effects include lightening of the skin and sun avoidance prior to laser treatment, cooling of the skin during treatment, and sun avoidance and protection after treatment (1). Proper patient

selection and tailoring of the fluence used to the patient's skin type remain the most important factors in efficacious and well-tolerated laser treatment (1). Although it is generally believed that hair follicles are more responsive to treatment while they are in the growing (anagen) phase, conflicting results have also been reported. There is also no consensus on the most favorable treatment sites (6). A large number of studies have documented the safety and efficacy of IPL in permanent hair reduction in white skin, but the data available regarding its safety on dark skin are limited (7).

This study is the retrospective study to evaluate the safety and efficacy of IPL for permanent unwanted facial hair in Indian population.

Materials and method

A retrospective analysis was conducted on 650 female patients who underwent laser hair reduction, from February 2015 to February 2018 at a private dermatological clinic setup with an IPL device (FormaTk Magma of Israel). A note was made of the skin and hair type of every patient before each session. Since this was the retrospective analysis, ethical committee permission was not sought.

A detailed history was taken in each case before starting the sessions. Individuals with underlying hormonal disorders like polycystic ovarian disease and having history keloidal tendencies were excluded from this analysis. The patients were advised not to do waxing, threading, plucking, or bleach 3 weeks before the first session and in between the sessions. The patients were allowed to shave in between the sessions. The use of hair removing cream was discouraged due to chances of irritant reaction.

The area to be treated was marked with a white pencil under adequate light. Cleansing gel was applied, and the area was shaved taking care not to leave any hair behind and, at the same time, avoid any cuts on the skin due to vigorous shaving. Cooling was

done before and after the session with ice and inbuilt cool sapphire tip on the area to be treated and immediate surrounding area. No surface anesthesia was used.

The treatment was performed using 660–1100 nm cutoff filter with a fluence of 21.7 J/cm^2 in double pulse mode with a pulse duration of 46.5 milliseconds.

A 6-week gap was kept between the sessions. The results were evaluated on the basis of photographic evaluation (Figures 1-6) and visual analogue score (VAS) done by both the patient and the treating doctor. An improvement of more than 70% was considered as excellent, 50–70% was considered good, and less than 50% was considered average. The patients who showed no improvement in texture and density even at the end of 6 sessions were labeled as nonresponders. Also, a note of any adverse effects experienced by the patient and paradoxical hypertrichosis was made during any of the sessions.

Maintenance sessions once in 3 to 6 months were performed in patients with average and good responders. Patients were regularly followed up after 6th sessions, and results were documented photographically and compared with baseline photographs.

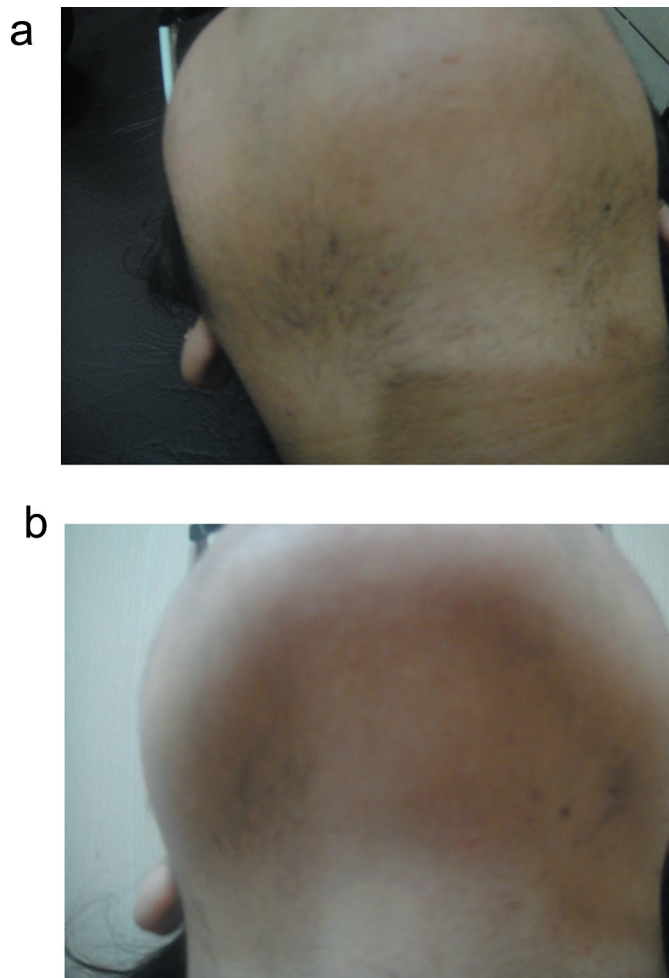


Figure 1. (a) Case 1 before treatment and (b) case 1 after treatment.

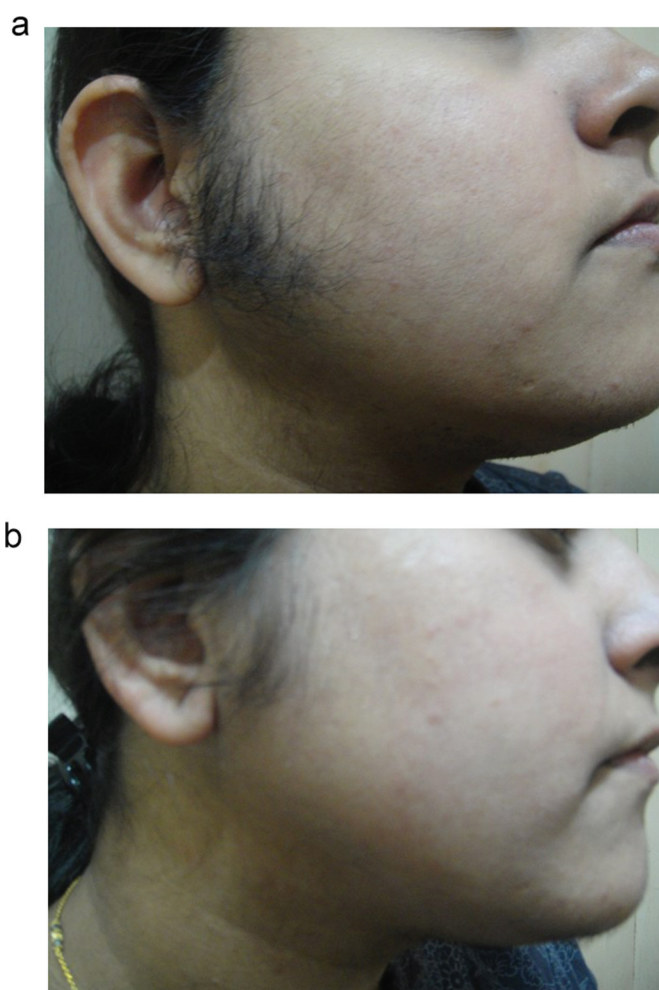


Figure 2. (a) Case 2 right side before treatment and (b) case 2 right side after treatment.

Results

A total of 650 female patients (427 skin type IV and 223 skin type V) were analyzed retrospectively. Of these, 69 were for chin and upper neck, 310 for upper lip, and 271 for lower face hair removal (Table 1). The patients were in the age group of 19 to 44 years, with the mean age being 28.07 years. A majority of patients were in the age group of 21 to 28 years.

Of the 69 patients of chin and upper neck, 44 (64%) had an excellent response, 16 (23%) showed good response, and 9 (13%) had showed average response.

Of the 310 patients of upper lip hair removal treatment, 194 (63%) showed excellent response, while 86 (28%) patients showed good response and 28 (7%) patients showed average response. Twelve patients lost to follow-up. Six patients of this group developed postinflammatory reaction due to burns, which was treated with kojic acid dipalmitate cream and broad spectrum sunscreen within 8 weeks.

Of the 271 patients of lower face group, 182 (67%) showed excellent response, while 71 (26%) showed good response and 12 (7%) showed average response. Six patients



Figure 3. (a) Case 3 right side before treatment and (b) case 3 right side after treatment.



Figure 4. (a) Case 3 left side before treatment and (b) case 3 left side after treatment.

lost to follow-up. There were no nonresponders or cases showing distant hypertrichosis in this study. The IPL treatment is found to be effective and safe for both skin types IV and V. Overall, the result in patients with lower face was slightly better compared with the upper lip group and chin and upper neck group.

All the group of cases started showing reduction in hair density from the second session of IPL treatment, especially the lower face and chin group compared to the upper lip hair group. Upper lip hair reduction took little longer (around 4 sessions) to show visible effects.

Adverse effects like postinflammatory hyperpigmentation due to burns was not seen in any group. Mild pain or pricking sensation during the treatment and erythema and perifollicular edema after the session was seen in all the cases (Figure 7a,b)

Discussion

As in laser systems, the mechanism of action of IPL hair removal is based on the principle of selective photothermolysis. The light is absorbed by the target endogenous chromophore (melanin) in

hair bulb and shaft, outer root sheath of the infundibulum, and matrix area of anagen hair follicles, which, in turn, produces thermal energy, destroying hair-producing papilla with sparing epidermal melanin (8,9). Melanin absorbs light in the range of 690–1000 nm, and light sources in this range of wavelength can be effectively used for hair removal (10). Most literature studies report on IPL hair removal with skin types I–IV. Dark-skinned people have a high content of melanin within the epidermis, which absorbs energy, resulting in possible heating and damage of the surrounding skin. So extra care needs to be taken when treating patients with Fitzpatrick's skin type V and VI.

To avoid epidermal damage due to the light absorption by epidermal melanocytes, the interfollicular epidermis needs to be cooled down (11), which was achieved by breaking the pulse in two or three subpulses. Furthermore, the optimal pulse duration for selective photothermolysis was kept less, thus minimizing the damage to surrounding tissues, thereby reducing chances of burns.

Paradoxical hypertrichosis is a significant side effect encountered with IPL hair removal especially when using devices with low fluences (12). Hypertrichosis is the result of suboptimal rays that are too low to stimulate thermolysis and

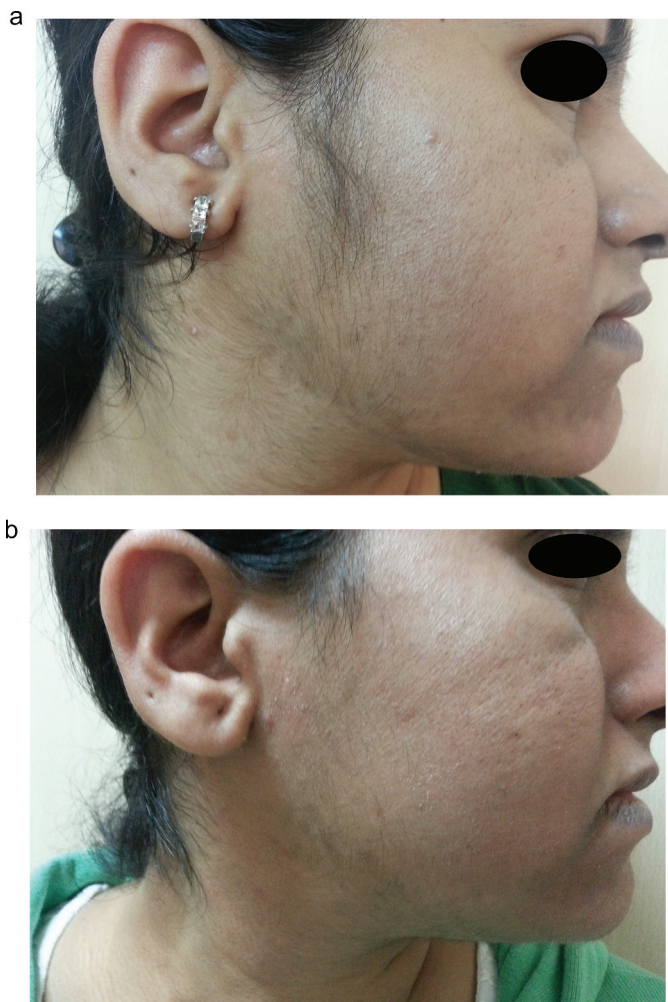


Figure 5. (a) Case 4 right side before treatment and (b) case 4 right side after treatment.

Table 1. Distribution of cases according to the anatomical site and Fitzpatrick skin type.

Group	Fitzpatrick skin type		Total
	IV	V	
Upper lip	223	87	310
Chin and upper neck	34	35	69
Lower face	170	101	271
Total	427	223	610

high enough to induce follicular growth and convert follicles from the telogen to anagen phase or transform vascular follicles into terminal follicles. It is more common with darker skin and coarse hair with hormonal imbalances (13,14).

To overcome this side effect, the author, in this study, used a higher fluence of around 21.7 j/cm^2 in double pulse mode with a pulse duration of 46.5 millisecond. Also, in our study, individuals with hormonal imbalance were excluded. The combined result of this precaution helped us to minimize the occurrence of paradoxical hypertrichosis in this study.

The existing literature identifies longer wavelengths as a key element of the treatment protocol and indicates neodymium-doped yttrium aluminum garnet (Nd: YAG), diode, alexandrite, and ruby lasers as well as certain intense pulsed light

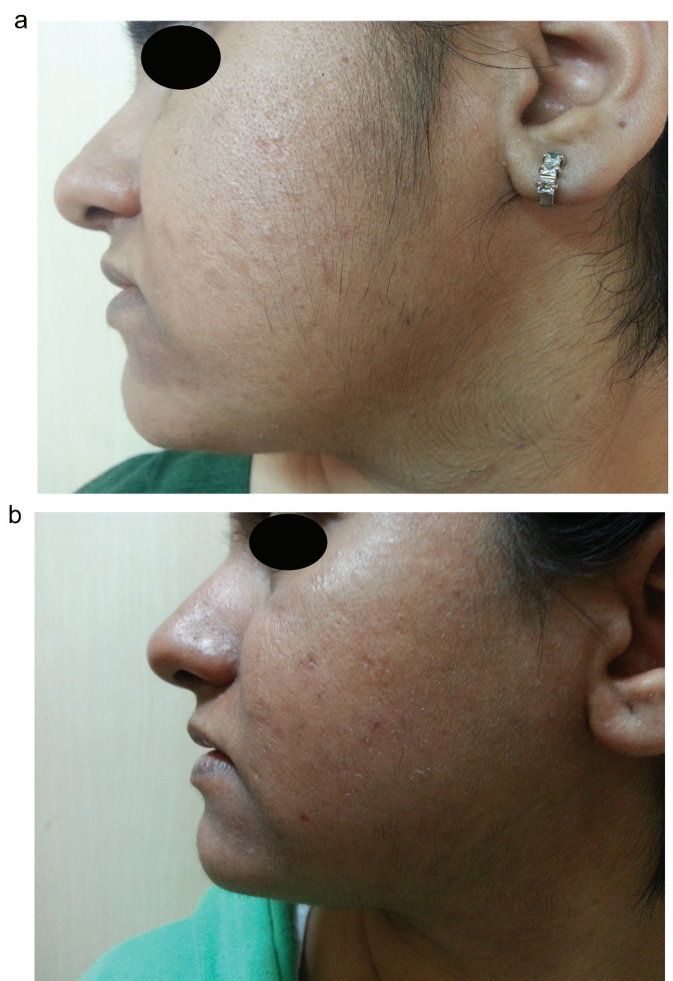


Figure 6. (a) Case 4 left side before treatment and (b) case 4 left side after treatment.

sources for safe hair reduction with minimal side effects in patients with Fitzpatrick skin type IV–VI, as long as energy settings and wavelengths are appropriate (15).

The clearance rate after IPL hair removal varies widely from 20 to 92%. Various cutoff filters and a wide range of fluences are used by different authors. Performing two treatments with fluences of $40\text{--}42 \text{ J/cm}^2$, Weiss noticed a 33% reduction in hair count at 6 months (16). Troilius reported 80.2% hair clearance at 8 months post-treatment with 600 nm cutoff filter and a fluence of 19.3 J/cm^2 with a pulse duration of 44.5 millisecond (11). Sadick reported 76% hair removal after a mean of 3.7 treatments with a cutoff of 695 nm and a fluence of $38\text{--}40 \text{ J/cm}^2$ for skin type V (17). The maximal benefit of photoepilation was achieved from the initial 1–3 treatments (18). Goh in his comparative study between long pulse Nd:YAG and IPL found prolonged burning sensation in IPL treatment (5), which is overcome in our study by splitting the pulse into two subpulses. In our study, we found that good to excellent response in hair clearance was seen in around 85–90%, which is comparable to other studies on skin type I–IV using various cutoff filters with various fluences. In our study, we also observed that the clearance was seen from session 2 onward, which was maintained and improved gradually over a period of time. These results

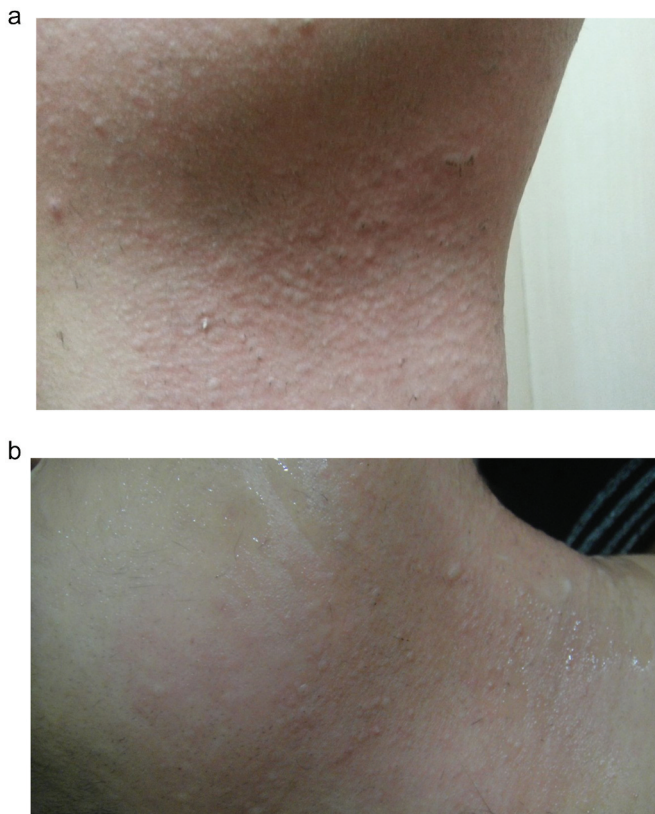


Figure 7. (a) Perfollicular edema and erythema, suggesting the end point of treatment session and (b) popping up off hair immediately after treatment, suggesting the end point of treatment session.

were comparable with various studies performed on individuals with skin type I–IV. In a randomized controlled trial between long pulsed Nd:YAG (LPND) and intense pulsed light for hair removal in dark skin, the decrease in the hair count is slower with IPL as compared to LPND at 6 months and adverse effects were temporary with both devices (19). In another study comparing adverse events of laser- and light-assisted hair removal in skin types IV–VI, it is found that longer wave lengths are safer (20) so as to minimize adverse events such as dyspigmentation, blistering, crusting, and subsequent scarring (21).

Also, the chances of burns leading to postinflammatory pigmentary changes and scarring were found to be almost negligible due to splitting the pulse and cooling the area in between the pulses. Overall IPL hair reduction treatment was found to be safe and effective in darker skin types, making certain modifications in standard guidelines.

Disclosure statement

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