

Effectiveness of Diode Laser versus Intense Pulsed Light in Hirsutism: A Prospective and Comparative Study in Samawa City

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Abstract--- Lasers are widely used for the hair removal. But the choice of the right laser for the right skin type is very important. The aims of this study is to compare the efficacy of Diode laser and intense pulsed light (IPL) on hair removal.

Patients and Methods: Fifty female patients with hirsutism were selected for a randomized controlled study in Samawa city at Al-Muthana government. The patients were divided into two groups, in group I patient's diode laser was used, in group II patients intense pulsed light (IPL) was used. The patients were evaluated at 1st, 3rd and 6th months after the last session was done and medical history, hormonal assay and abdomino-pelvic ultrasonography were performed to differentiate between idiopathic and pathological hirsutism. Hair thickness, rate of hair reduction and regrowth and patient satisfaction questionnaire, were recorded by using hair counts before treatment and during the period of follow up.

Results: It was seen that the percentage of hair reduction after two sessions of treatment was maximum (45%) in the diode laser group, and 30% hair reduction in the IPL group. The percentage of hair reduction after four sessions of treatment was maximum (58%) in the diode laser group, followed by 37% hair reduction in the IPL group. The percentage of hair reduction after six sessions of treatment was maximum (80%) in the diode laser group, followed by 42% hair reduction in the IPL group.

Conclusions: The number of hair follicles and shafts was significantly decreased with the diode laser and IPL, but diode laser was more effective. No dangerous or permanent damage were observed with both methods.

Keywords--- Hirsutism, Diode Laser, IPL.

I. INTRODUCTION

Hirsutism, defined as the growth of male attitude terminal hair, is one of the common problematic of postmenopausal women and less appeared in premenopausal female 4-7% of [1]. The degree evaluation of hirsutism was assessed by the Ferriman-Gallwey score which involves 11 body areas [2]. Later, it was changed to the modified Ferriman-Gallwey score [3]. Since both scoring methods include physical examination and may be considered invasive by many female, a simplified noninvasive method for assessing the degree of hirsutism was studied and validated against the modified Ferriman-Gallwey score. The prevalence of hirsutism has been different among various ethnic groups [4] independent of androgen levels. Permanent hair reduction is defined as a significant

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reduction in the number of terminal hairs at a given body site that is stable for a period of time longer than the follicles' complete growth cycle. The terminal hair is the coarse, long, pigmented hair with a large cross-sectional area whereas intermediate hair is the hair that is intermediate in length and shaft size. During laser hair removal, a laser beam passes through the skin to an individual hair follicle [5]. The intense heat of the laser damages the hair follicle, resulting in reduction of the number of hairs and the quality of hair [6]. Hair will be less noticeable, finer and possibly lighter. The degree of hair reduction depends on the number of treatments. Laser hair removal focuses on the endogenous chromophore melanin, which is mainly found in the hair shaft, with a small amount present in the upper third of the follicular epithelium. When an appropriate energy source such as a laser is directed at the skin, light is primarily absorbed in the hair shaft melanin. Hair removal lasers generally work on the principle of selective photothermolysis, based on selective absorption of laser energy by the components of the hair follicle. The target chromophore is melanin contained by the follicle, which has a broad absorption spectrum. Wavelengths between 700 and 1000 nanometers (nm) are selectively absorbed by melanin; the competing chromophores (oxyhaemoglobin and water) absorb less energy at these wavelengths [7]. The following are the types of lasers for hair reduction [8, 9]. Intense pulsed light (IPL) devices are not lasers but are laser equivalents in the sense that they use the same concept of selective photothermolysis to accomplish hair removal. IPL devices are more difficult to use than lasers and require a very skilled and experienced technician to operate [10, 11].

II. MATERIALS AND METHODS

This study was carried out during the period between 2014-2017 in our patients' clinic in Samawa city at Al-Muthana government. Fifty female patients with hirsutism were included in this randomized controlled study; all of them were Fitzpatrick skin type III and IV their age ranged from 18-50 years. The patients divided into two groups, group I was used diode laser and in group II IPL was used. The laser treatment sessions were performed at 4-weeks interval and a total of six with sessions with a follow up periods at 1,3 and 6 months after the last session was done. The area assessed for comparative evaluation was the beard (chin) area. Detailed history, hormonal assay and abdomino-pelvic ultrasonography were performed to differentiate between idiopathic and pathological hirsutism. Hair thickness, rate of hair reduction and regrowth and patient satisfaction questionnaire, were recorded by using hair counts and photographs before treatment and during the period of follow up. The starting fluence and pulse duration were determined according to skin type and then increased at each session if no side effect noted from previous treatment. The 2 groups were compared for efficacy and safety. All the patients were instructed to leave their hair unshaved one week prior to treatment and to stop hair removed methods like waxing depilatory or bleaching apart shaving or using depilatory cream. Skin cooling was achieved by using thin layer of cooled optical contact transparent gel, topical anesthesia (5% emla) was administered to few patients. If erythema or early edema appear suggest a mild burn, topical steroid was given. Inclusion criteria include skin type III and IV, thick black hair and patient over the age of 18. Exclusion criteria include

- Fine vellus hair
- Any previous laser treatment to the study area
- Any hormonal dysfunction

- History of keloid
- Pregnancy
- Patient who take oral retinoid or photosensitive drugs
- Dermatological disordered such as photosensitivity, inflammatory, premalignant and malignant skin condition.

III. STATISTICAL ANALYSIS

The collected data were analyzed by SPSS-15 statistical software. The collected data were expressed as percentage and Mean±SD. Continuous (quantitative) variables were compared by student t-test or one-way ANOVA (Independent samples). Categorical (qualitative) variables were compared by contingency tables and chi-square test or fisher's exact test. P-value = 0.05 was considered statistically significant.

IV. RESULTS

A 61% of patients were between 18 and 32 years of age, 26% patients were between 33 and 40 years and 13% patients were between 41 and 50 years, respectively. It was seen that there were 10% patients with grade 2 (intermediate) hairs, 30% patients had grade 3 (terminal) hairs and 60% patients had grade 4 (very coarse) hairs. It was observed that the percentage of hair reduction was maximum in the diode laser group were statistically significant ($P < 0.25$). It was seen that the percentage of hair reduction after two sessions of treatment was maximum (45%) in the diode laser group, followed by 30% hair reduction in the IPL group. The percentage of hair reduction after 3rd sessions of treatment was maximum (58%) in the diode laser group, followed by 37% hair reduction in the IPL group (Table 1, 2). While the mean time of regrowth is 58% in in the diode laser group, followed by 30% hair reduction in the IPL group (Figure 1). The percentage of hair reduction after six months follow up was maximum (80%) in the diode laser group, followed by 42% hair reduction in the IPL group (Figure 2).

Table 1: Comparison between Pre-treatment and First Session

<i>System type</i>	<i>Pretreatment (AV ± SD)</i>	<i>First session (AV ± SD)</i>	<i>Difference</i>	<i>*P-value</i>	<i>%Reduction</i>
Diode laser	21.58 ± 11.59	15.04 ± 9.17	6.54	0.00894	38%
IPL	21.73 ± 14.1	13.58 ± 10.63	8.15	0.00584	22%

Table 2: Comparison between Pretreatment and Second Session

<i>System type</i>	<i>Pretreatment (AV ± SD)</i>	<i>Second Session (AV ± SD)</i>	<i>Difference</i>	<i>*P-value</i>	<i>%Reduction</i>
Diode laser	21.58 ± 11.59	11.77 ± 7.55	9.81	0.000172	45%
IPL	21.73 ± 14.1	12.08 ± 9.99	9.65	0.00691	30%

Table 3: Comparison between Pre-treatment and Third Session

<i>System type</i>	<i>Pretreatment (AV ± SD)</i>	<i>Third session (AV ± SD)</i>	<i>Difference</i>	<i>*P-value</i>	<i>%Reduction</i>
Diode laser	21.58 ± 11.59	8.96 ± 6.77	12.62	0.0000214	58%
IPL	21.73 ± 14.1	11.15 ± 10.19	10.58	0.00277	37%

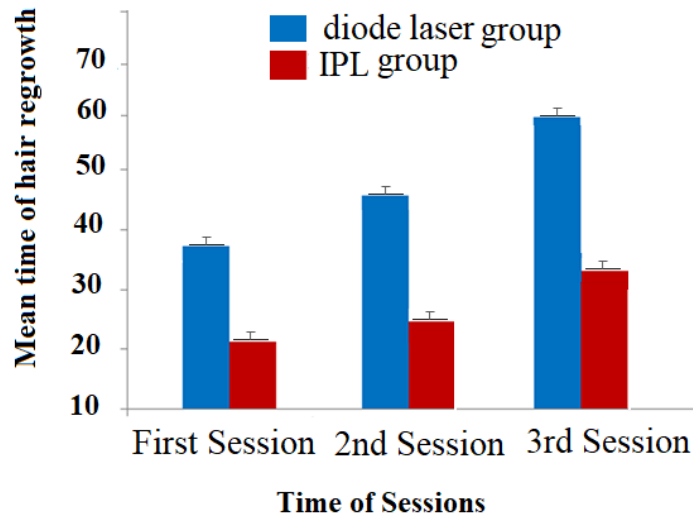


Figure 1: Relation between Session No. and Average of Time of Regrowth the Hair

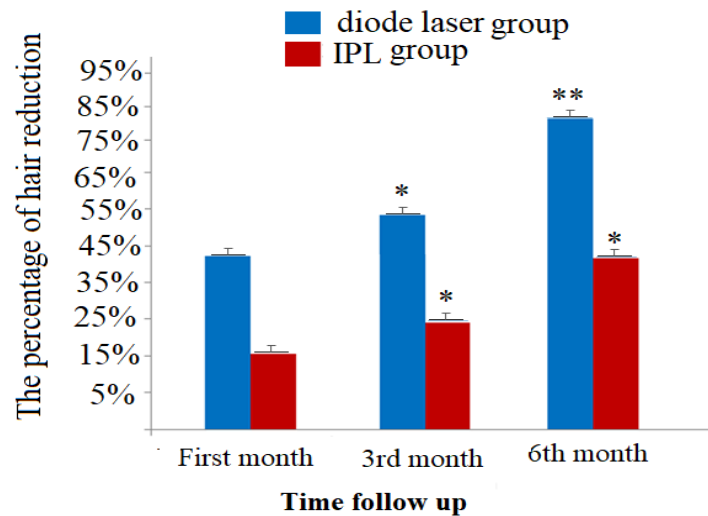


Figure 2: Patient Satisfaction on Follow-up (Month) for Both Diode Laser and IPL

V. DISCUSSION

Hirsutism affects 5-10% of unselected women, depending on definition and ethnicity [12, 13]. Female hirsutism is an embarrassing condition that threatens both a woman's perception of her femininity and her self-esteem [14, 15]. Hirsutism is defined as the excessive growth of thick dark hair in locations where hair growth in women usually is minimal or absent. Such male-pattern growth of terminal body hair usually occurs in androgen-sensitive locations, such as lips, chin, chest, areola, abdomen, back and femoral region [16, 17, 18]. The etiology and the age of the patient when hirsutism occurs vary widely. In hirsutism of gradual onset, hyperprolactinemia, insulin-resistance syndromes, hyperthecosis, polycystic ovary syndrome and idiopathic hirsutism may be responsible [19, 20].

In our study, 81.7% of patients had the skin type III and 18.3% had skin type IV (according the Fitzpatrick skin typing). There was no significant difference between treatment results in both groups. In general, laser hair removal is most successful in patients with lighter skin colors and dark colored hairs [21, 22]. The best candidates for

photothermolysis are patients with lighter skin (Fitzpatrick type I- IV) and dark hairs. While successful hair removal with either laser or IPL has been reported in patients with Fitzpatrick skins type V and VI, the incidence of complications such as burns, scarring and hypo- or hyperpigmentation increases with the degree of skin pigmentation hair (skin types II-IV). Adverse effects are minimal and transient [23, 24]. The successfulness of IPL in our patients with skin type of III and IV is in support of its efficacy of these types of skins especially in this region (a Middle East country).

Multiple sessions undoubtedly yield more effective results in hair reduction in hair reduction because lasers can only target the anagen or active phase of the hair growth cycle.[25]At any given time, only 50-65% of facial hair are in the anagen phase for a duration of 3-4 weeks. Therefore, even if 100% of all anagen hairs are destroyed after each treatment, only a percentage of the total hair would be eliminated. The same holds true for each successive treatment and hence, multiple treatments are required to achieve the best-case scenario.

Although laser and IPL are very popular because of their non-invasive nature and the speed at which they operate, practitioners and patients have to be cautious to avoid permanent side effects instead of permanent hair [26] studied 70 female hirsute patients in the Department of Laser Therapy at the Netherlands. They were subjected to a mean of 8 treatments followed for a mean period of 27.3 months. Using the IPL, 87% hair removal was achieved. Minimal side effects occurred in 10% of the patients. Paradoxical hypertrichosis and terminal hair change is a common complication of IPL photoepilation. The other more commonly seen complications were epidermal burning with blisters, erosion and crust formation followed by post-inflammatory hypo- and/or hyperpigmentation [27, 28]. Other studies used IPL for unwanted hair removal in 341 patients [29]. The treatment took 3-5 procedures, with an interval of over 2 months. There were blister in 3 cases and infection in 1 case. No pigmentation and scarring happened. Following-up of 3-6 months showed steady results with less regeneration of very thin and soft hair [30]. Burning and its sequelae, leukotrichia, paradoxical hypertrichosis and folliculitis are four major side effects of IPL hair removal therapy [31]. Our study showed that the percentage of hair reduction after two sessions of treatment was maximum (45%) in the diode laser group, followed by 30% hair reduction in the IPL group. The percentage of hair reduction after 3rd sessions of treatment was maximum (58%) in the diode laser group, followed by 37% hair reduction in the IPL group. While the mean time of regrowth is 58% in in the diode laser group, followed by 30% hair reduction in the IPL group. The percentage of hair reduction after six months follow up was maximum (80%) in the diode laser group, followed by 42% hair reduction in the IPL group.

The other study compared four different hair removal systems a light source (IPL) used with two filters and two types of lasers, IPL red filter (650 - 1200 nm), 2) IPL yellow filter (525 - 1200 nm), 3) diode laser (810 nm), and 4) alexandrite laser (755 nm) [32]. The hair counts were reduced by almost 50% after 2 sessions compared with initial value. No statistical difference for all modalities used [22].

VI. CONCLUSION

The study concluded that the local society skin, the diode laser still stands the test of time. But, since the diode laser has a narrow margin of safety, proper pre and post-procedure cooling is recommended. Although, the side effects of IPL are less as compared to the diode laser, it is less efficacious as compared to the diode laser. Both diode

laser and IPL are effective modes for hair removal. However, in experienced hands this therapy is cheaper and more cost effective. It was seen that diode laser was the ideal laser affecting coarse thick hairs, whereas IPL laser was not suitable for our people hair as it targeted only fine hairs.

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