

Original Article

Comparison of efficacy and safety of Diode laser versus Intense Pulsed Light in the treatment of idiopathic facial hirsutism: A split-face study

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Abstract

Background Hirsutism is a prevalent issue in dermatology, impacting approximately 5-10% of women during their reproductive years. It causes severe emotional and psychological distress in females and is characterized by excessive terminal hair growth in a male pattern. The objective of the study is to compare the efficacy and safety of diode laser (808nm) and IPL (690nm-1200nm) in patients with idiopathic hirsutism.

Methods The Quasi experimental study was conducted at Dermatology department of KEMU/ Mayo Hospital, Lahore from 4-10-2021 to 3-10-2022. A total of 52 female patients were selected fulfilling the inclusion criteria. A split-face study method was used. Right side of face was treated with diode laser and left side of face was treated with IPL. Reduction in hair density before and after treatment was calculated. After evaluation the patient's hair density was graded on a 4-point scale: excellent >75% reduction, good 50-75% reduction, fair 25-50% reduction, and poor <25% reduction.

Results 52 female patients completed the study. The mean age of patients was 26 years. Mean hair density was recorded before and after the last treatment sessions. It reduced from 9.83 to 2.15 in diode group and from 10.03 to 4.39 in IPL group ($P \leq 0.001$). After two sessions the maximum percentage of hair reduction in the diode laser group was observed to be 25.43% while the IPL group showed a hair reduction of 18.68%. The maximum percentage of hair reduction after six sessions was 78.13% in the diode laser group and 56.23% in the IPL group. The results were statistically significant ($p\text{-value} \leq 0.001$). The side effects were also recorded. Diode laser proved to be a safer modality with less frequent side effects. IPL patients experienced erythema, swelling, pain and hyperpigmentation more frequently than diode laser patients, but the results were statistically insignificant.

Conclusion Diode laser is more efficacious and safer than IPL in reduction of hair density in patient with idiopathic facial hirsutism.

Key words

Efficacy; Safety; Diode laser; Intense Pulsed Light; Idiopathic; Facial hirsutism; Split face.

Introduction

Hirsutism is a prevalent issue in dermatology, impacting approximately 5-10% of women

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during their reproductive years. It causes severe emotional and psychological distress in females and is characterized by excessive terminal hair growth in a male pattern.¹ The most common type is idiopathic hirsutism where normal ovulatory function and serum androgen levels are maintained. This form is attributed by increased peripheral activity of the 5- α reductase enzyme, genetic variations in the androgen

receptor gene, and increased sensitivity of hair follicles to androgens.² Various strategies have been used to address hirsutism, including pharmacological agents that reduce androgen synthesis and receptor impact, as well as mechanical methods that involve hair follicle destruction.³

Laser hair reduction techniques have gained popularity in cosmetic dermatology.⁴ Different laser types with different wavelengths are used to manage hirsutism. These encompass red light lasers like the Ruby laser (694 nm) and infrared lasers like Alexandrite laser (755 nm), Diode laser (808 nm), and Nd: YAG laser (1064 nm).⁵ The Diode laser at 808 nm is a solid-state device with deeper skin penetration, functioning on the principle of selective photothermolysis.⁶ It yields impressive outcomes in individuals with darker or tanned skin. Diode laser has an in-built cooling mechanism for patient safety.⁷

Intense pulsed light (IPL) sources having range of 400-1200 nm along with appropriate filter are useful for the treatment of hirsutism. IPL emits polychromatic, high-intensity pulsed light of specific wavelengths onto the skin through filtered light from a flash lamp.⁸ The targeted dark materials such as hair pigment experience thermal or mechanical damage while sparing surrounding tissue.⁹

In 2015, Puri *et al.* conducted a comparative study on diode laser, Nd:YAG laser and IPL for hirsutism treatment, determining that the diode laser has stood the test of time. While Nd:YAG has fewer side effects than the diode laser, the latter proves more effective.¹⁰ Another study by AL-Hammy *et al.* in 2015 focused on the effectiveness of the diode laser (808 nm) versus IPL (690-1200 nm) for managing unwanted hair. This split-face comparative study found that both methods were equally effective in reducing hair density, diameter, and prolonging regrowth periods after three session's one month apart.⁶

Given the variability in study results, this aim of research was to determine the most effective and safe modality for treating hirsutism within the studied population.

Methods

A Quasi-experimental study was done. The study was conducted at Department of Dermatology of KEMU/ Mayo Hospital, Lahore from 4-10-2021 to 3-10-2022. Non-probability, convenient sampling with sample size of 52 patients was estimated by using 5% level of significance. 95% power of test with expected percentage diode laser as 40% and for IPL as 10%.¹⁰ In Group A, right side of face was treated with diode laser and in Group B, left side of face was treated with IPL.

Female patients between the age of 18-40 years and Fitzpatrick skin type III-IV were included. Patients having active herpes virus infection, bacterial infection or fungal infection on face. Patients with history of photodermatitis and tendency of keloid formation. Pregnant and lactating females. Patients taking steroids, danazole, testosterone, metoclopramide, methyl dopa, phenothiazine, reserpine, waxing, depilation, electrolysis, bleach use or laser session during last 6 weeks. Patients with elevated follicle stimulating hormone, luteinizing hormone, testosterone and pelvic ultrasound scan with evidence of polycystic ovaries and abnormal menstrual cycle were excluded.

After approval from ethical review board and Advanced Studies and Research Board, patients presenting in outdoor department of dermatology with idiopathic facial hirsutism fulfilling the inclusion criteria were included. A total of 52 patients were enrolled in the study and all patients were examined for hirsutism. All selected variables and demographic data were recorded on a predesigned proforma. Two areas

1 cm² on the cheek and chin with maximum hair density, were selected on each side of the face. Area was marked with white eye pencil. On a transparent sheet a square was drawn, having 1 cm² area. This sheet was applied on skin and hair was counted within its parameter. Split face technique was applied. Right side of the face of the patient was treated with diode laser and on left side IPL was used. Under bright light, protective goggles were worn by the patient and doctor. Area was cleaned and gel was applied on both sides of the face. Percentage hair reduction was calculated one month after the sixth session.

A diode laser device producing laser light at 808 nm was used for the laser treatment (Tru Technology The Aesthetic Solution model no. GL009). The device was configured with long pulse duration of 40–50 ms, frequency of 2-4 Hz, and fluence range of 8–12 J/cm². The IPL device (Tru Technology The Aesthetic Solution model no. GL009) was used having filter of wavelength 690–1200 nm range. The pulse duration of 8-10ms, frequency 2-4 HZ and fluence 8-12 J/cm² was used. After completion of treatment ice cold gel packs were used for 10 minutes. The patient was instructed to use sunscreen afterward. Six sessions were conducted, each four weeks apart. Four weeks after the last session a follow up was conducted. Before and after pictures were taken at each visit. Treatment related side effects were observed and treated accordingly, for example burning, itching, erythema, pain, swelling and blister formation, if observed, were recorded on the proforma. At each session, patient was examined about any side effect of previous treatment for example scar formation, hypo or hyper pigmentation, or any other.

The statistical package for social sciences (SPSS) version 26 was used to record and analyze the data. Quantitative variables like age, duration and number of hair was presented as

mean±SD. Qualitative variables like marital status, efficacy, frequencies of side effects were presented as frequency and percentages for comparison of two groups diode laser and intense pulse light (IPL) chi-square test was applied and p-value ≤0.05 was taken as significant.

Results

52 female patients were enrolled in our study. Mean age was 26 years, minimum 18 years and maximum 40 years with standard deviation (SD) of 6.08. Out of 52 patients, 30 patients were unmarried and 22 patients were married.

Mean hair density in selected areas was recorded before and after the last treatment sessions. It reduced from 9.83 to 2.19 in diode group and from 10.03 to 4.39 in IPL group (P≤0.001) (**Table 1**). Percentage reduction in hair density was noted at each follow up visit. The right side of the face where diode laser was used, the reduction in the hair density was 17.4%, 25.42%, 36.27%, 46.39%, 58.80% and 78.13% after first to sixth sessions respectively. On the left side of the face where IPL device was used the reduction in the hair density was 14.46%, 18.68%, 26.63%, 36.69%, 46.55% and 56.23%

Table 1 Hair density in study groups.

Session/ Group		N	Mean	SD	p-value
1 st	Diode Laser	52	9.83	1.73	0.513
	IPL	52	10.03	1.38	
2 nd	Diode Laser	52	8.12	1.58	0.113
	IPL	52	8.58	1.34	
3 rd	Diode Laser	52	7.33	1.58	0.005
	IPL	52	8.16	1.35	
4 th	Diode Laser	52	6.26	1.63	<0.001
	IPL	52	7.36	1.24	
5 th	Diode Laser	52	5.27	1.57	<0.001
	IPL	52	6.35	1.11	
6 th	Diode Laser	52	4.05	1.43	<0.001
	IPL	52	5.36	1.09	
1 month after 6 th Session					
	Diode Laser	52	2.15	1.26	<0.001
	IPL	52	4.39	1.12	

Table 2 Percentage reduction of hair density.

Session	Diode laser	% hair reduction	IPL	% hair reduction
1 st	9.83	-	10.03	-
2 nd	8.12	17.40%	8.58	14.46%
3 rd	7.33	25.43%	8.16	18.68%
4 th	6.26	36.31%	7.36	26.63%
5 th	5.27	46.39%	6.35	36.69%
6 th	4.05	58.80%	5.36	46.55%
1 Month after 6 th session	2.15	78.13%	4.39	56.23%

after the first to sixth sessions respectively showing in **Table 2**.

According to assessment, diode laser had 21 excellent (40.4%), 30 good (57.7%) and 1 fair (1.9%) results and IPL had 3 excellent (5.8%), 28 good (53.8%), 21 fair (40.4%) results (p-value ≤ 0.001) showing in **Figure 1**.

In our study, compared to diode laser, IPL device treatment had more negative effects. IPL caused more pain (N=56) and erythema (N=63) than diode laser [pain (N=34) and erythema (N=33)]. Patients experienced more swelling with IPL (N=19) therapy as compared to diode laser (N=5). The adverse effects of bacterial infection in IPL (N=6) and diode (N=2) and hyper pigmentation in IPL (N=5) and diode (N=2) were also observed. Though more side effects were noted in IPL group, the difference was not statistically significant.

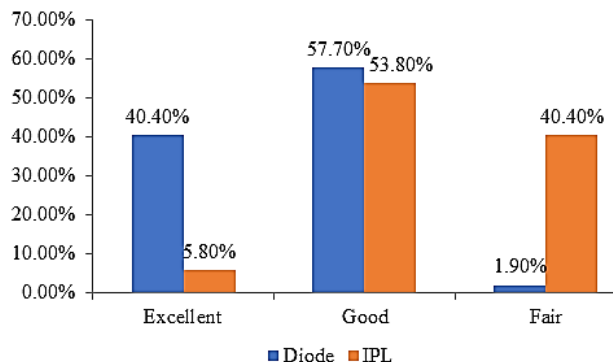


Figure 1 Assessment (p-value ≤ 0.001).

Discussion

Hirsutism is excessive terminal hair growth (in a male pattern) on face (chin, cheek or upper lips) in females. Idiopathic hirsutism is considered with patients having normal prolactin, testosterone, luteinizing hormone, follicle stimulating hormone levels in the blood, regular menstrual cycle and normal pelvic ultrasound findings.¹¹ It has been known that hirsutism causes women great emotional distress as well as social embarrassment. Hirsutism's psychological and cosmetic effects can influence a woman's sense of identity.¹² A treatment option which can improve their psychosocial well-being is needed. Energy based devices are popular options for hair removal. Intense pulse light and diode laser hair reduction procedures depend on the principle of selective photothermolysis.¹³

In our study, 52 female patients were enrolled with a mean age of 26 years, maximum age 40 years and minimum age 18 years. In a study by Al Hamamy *et al.*, the mean age was 30 years. This age group of patients is similar to our study.⁶ Puri N *et al.* enrolled patients with majority being between 21-30 years of age.¹⁰

Hair density before treatment was 9.83 hairs/cm² for diode and 10.03 hairs/cm² for IPL. Hair density one month after sixth session was 2.15 hairs/cm² for diode and 4.39 hairs/cm² for IPL (P= <0.001). One month after 6th session percentage hair reduction was 78.13% for diode laser and 56.23% for IPL (**Figures 2, 3**). Al Hamamy *et al.*; in 2015 conducted a study regarding evaluation of efficacy of diode laser and IPL in management of hirsutism by using split face method. Compared with IPL, which reduced hair density by 49% following the third sessions, diode laser reduced hair density by 58%.⁶



Figure 2 Right side of face with Diode laser / Left side of face with IPL.

Diode laser was found to be more efficacious in this study which concurs with results of the current study. Puri N *et al.* in 2017 conducted a study by comparing diode laser versus IPL versus neodymium yttrium aluminum: garnet laser for hirsutism treatment. Diode laser was proved to be more effective than IPL in treating unwanted hairs.¹⁴ Amin and Goldberg *et al.*; in 2006 found Diode lasers and IPLs to be equally effective.¹⁵ There was no discernible difference across all of the modalities used. Haak *et al.*; in 2010 used split face analysis to compare IPL (525–1200 nm) and Long Pulse Diode Laser (810 nm). 31 hirsute female patients enrolled, six sessions were done, split face method was used. Both IPL and LPDL significantly decreased hair counts.¹⁵ 232 participants in a clinical study conducted by Toosi *et al.*; in 2006 investigated the advantages and disadvantages of three different hair removal techniques diode laser (810 nm), alexandrite (755 nm) and IPL (intense photoluminescence with a cut off filter of 650 nm). Despite the fact that the last was shown to cause more hair loss, there was no

statistically significant difference between alexandrite, IPL and diode when the therapy outcomes were compared.¹⁶ Obaid S *et al.*; in 2022 conducted a study on IPL and diode lasers devices in the treatment of unwanted facial hair.¹⁷ Both modalities were equally effective and tolerable in treatment of hirsute female patients.¹⁷ Studies by Tulpule *et al.* and Lachure *et al.* also showed diode laser to be an effective therapy in hirsutism.^{18,19}

In this study, treatment related side effects were observed more in IPL group than laser group. Similarly in the study by Haak *et al.* the mean pain scores and hyper pigmentation were observed more in patients treated with IPL than long pulse diode laser.¹⁵ Conversely in the study by Amin *et al.* the post treatment adverse effects were more in laser devices than IPL.¹⁴ The incidence of adverse effects with diode laser (28.9%) was higher than that of IPL (15.3%) and alexandrite (9.5%), based on the light sources the difference between the two was statistically significant.¹⁴ The difference could have been



Figure 3 Right side of face with Diode laser / Left side face with IPL.

due to the different types and parameters of machines being used to treat their patients.

The limitations of the current study were smaller sample size and this being a single-center study.

The strengths of this current study were that it was a split-face trial which removed the bias of groups. The study was conducted in the darker skin type which will help the doctors to have an evidence-based study among the patients living in this region where majority of skin type is III-IV.

In future, studies should be done by using larger sample size and other modalities, such as Nd:YAG laser, should be evaluated in treatment of unwanted facial hair in females.

Conclusion

Diode and IPL were both effective in the treatment of idiopathic facial hirsutism in female patients of Fitzpatrick skin type III-IV. The hair

density was decreased by both diode laser and IPL. However diode laser was more efficacious than IPL in reduction of hair density in patient with facial hirsutism. Patients treated with IPL experienced post treatment side effects like erythema, hyperpigmentation and pain more frequently than those treated with diode laser.

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