



Study of Efficacy of Diode Laser in Unwanted Facial Hair: Dynamic Versus Static Mode

**Adarsh Lata Singh^{1*}, Meenakshi Chandak¹, Anugandha Ghatge¹
and Sejal Chandak¹**

¹*Department of Dermatology, Venereology and Leprosy, Jawaharlal Nehru Medical College, Datta Meghe Institute of Medical Sciences, Sawangi (Meghe), Wardha (Maharashtra), India.*

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JPRI/2021/v33i40B32286

Editor(s):

(1) Dr. Syed A. A. Rizvi, Nova Southeastern University, USA.

Reviewers:

(1) Enkhtur Yadamsuren, National University of Medical Sciences (MNUMS), Mongolia.

(2) Shreya Srinivasan, Sree Balaji Medical College & Hospital, Bharath Institute of Higher Education & Research, India.

Complete Peer review History: <https://www.sdiarticle4.com/review-history/71203>

Received 06 June 2021

Accepted 11 August 2021

Published 12 August 2021

Study Protocol

ABSTRACT

Background: Hair forms an important appendage of the body playing a significant role in an individual's psychosocial personality. Hirsutism is the presence of terminal hair at androgen-dependent sites in a female. Hypertrichosis is excessive hair growth all over the body in a non-androgen dependent manner. Increased terminal facial hair growth leads to cosmetic embarrassment, psychological distress and a low self-esteem in women. Currently, the most effective and advanced procedure for unwanted hair removal is laser epilation. Diode laser (800-855nm) are the most frequently used for this purpose and can be used in two different modes FDP (Fast delivery pulse) and DP (delivery pulse). With this study we aim to compare the efficacy of these two modes of diode laser for facial hair reduction.

Objectives: 1.To study the clinical presentation of unwanted facial hair in patients visiting the department. 2. To study the trichoscopic features of facial hair in patients. 3.To study the correlation between the endocrinal abnormalities and clinical presentation in patients with increased facial hair. 4. To study the effectiveness of two different modes of diode laser on facial hair.

Methods: It is a prospective randomized control study with a total of 20 female patients in the age group of 18-50 years with complaints of unwanted facial hair. VIKINI Diode laser of wavelength

*Corresponding author: E-mail: alsingh1969@gmail.com;

808nm will be used for treatment. Post randomization the participants will be divided into two groups, one of them will be treated with FDP (Fast delivery pulse) mode and the other with DP (delivery pulse) mode. A total of six sittings will be performed at an interval of 4 weeks. Baseline trichoscopy findings as well as trichoscopy at follow up visits at one, three and six months will be recorded. Post procedure patient satisfaction and pain assessment will be also be recorded.

Expected Results: The result would be undertaken in SPSS software. This study will help in understanding which technique is superior for laser hair reduction for facial hair.

Conclusion: The conclusion will be based on findings for study protocol.

Keywords: Hair; hirsutism; hypertrichosis; diode laser.

1. INTRODUCTION

Hair forms an important appendage of the body that plays a significant role in an individual's psychosocial personality. Hair growth on the face of a person is normal and essential. However, due to some endocrinal disturbances, there may be visible hair growth changes and also in density and cycling of hair. Various hormones influence the growth and pattern of hair present on our body. These include androgens, estrogen, growth hormone, insulin, prolactin and thyroid hormone.

Hirsutism is the presence of terminal hair at androgen-dependent sites in a female body. These areas include the face, upper chest, abdomen, back, arms and thighs. The prevalence of hirsutism in India is about 10% and it decreases with increasing age [1,2]. It is caused due to increased androgenic action at the hair follicle. 70-80% of patients of hyperandrogenemia show hirsutism, the most common cause being polycystic ovarian syndrome [3].

Another disorder of excessive hair growth all over the body in a non-androgen dependent manner is *hypertrichosis*. It can be caused by various congenital and acquired causes. Acromegaly, hypothyroidism and Cushing's syndrome have been mainly attributed to cause hypertrichosis [4].

Increased terminal facial hair growth can lead to cosmetic embarrassment, psychological distress and a low self-esteem in women. These unwanted hairs can be managed by medical treatment of the underlying ailment along with physical techniques to remove the already present terminal hair [5,6]. Physical methods of hair removal include plucking, shaving, depilation, waxing, electrolysis and lasers.

Currently, the most popular, effective and advanced procedure for unwanted hair removal

is laser epilation. It helps to achieve a permanent to semi-permanent reduction of hair and is also less painful than the other methods. With the absorption of light energy, laser epilation causes selective photo-thermolysis of melanized hair [7]. A particular wavelength is absorbed and delivered at appropriate pulse duration and fluence, destroying the target tissue and causing minimal damage to the surrounding tissues.

For laser hair removal, the desired chromophore is melanin. Hence, light sources for the laser are chosen according to the wavelengths that penetrate up to the melanin in the hair follicle. Several different lasers ranging from 600 nm to 1100 nm can be used for the selective and deep heating of the hair shaft. These include Ruby (694 nm), Alexandrite (755 nm), Diode (800 nm), Nd:YAG (1064 nm) and pulsed light devices (770 – 1100 nm) [8]. Among these, diode lasers are the most frequently used lasers for hair removal. They range from 800 – 855 nm in wavelength. They penetrate into the deeper dermis and cause minimum epidermal and superficial dermal damage. Because of deeper penetration, there is reduced scattering of epidermal light and hence, safer in dark – skinned individuals.

This study aims to compare the efficacy of two modes of diode laser for unwanted facial hair reduction.

2. RATIONALE/NEED FOR THE STUDY

Excessive unwanted facial hair is a common reason for psychosocial embarrassment among young females and the need for laser hair reduction has popularly increased now. Among the variety of lasers available, diode lasers are most frequently used and hence, here we are conducting a study to compare the safety, tolerability and potency of two different modes of diode lasers (808 nm) on facial hair. This will help us to compare the two modes and also their effectiveness on Indian skin and hair type.

3. RESEARCH QUESTION

Whether the dynamic mode of diode laser is more efficacious than static mode in unwanted facial hair removal?

3. AIM

To study the efficacy of dynamic and static mode of diode laser in unwanted facial hair.

4. OBJECTIVES

1. To study the clinical presentation of unwanted facial hair in patients visiting the department
2. To study the trichoscopic features of facial hair in patients
3. To study the correlation between the endocrinal abnormalities and clinical presentation in patients with increased facial hair
4. To study the effectiveness of two different modes of diode laser on facial hair

5. MATERIALS AND METHODS

Place of study: Out Patient Department of Dermatology, Venereology and Leprosy, Acharya Vinobha Bhave Rural Hospital (AVBRH), Sawangi, Wardha, Maharashtra

Study design: Prospective Comparative Study

Period of Study: 2 years

Study setting: All females between the age of 18-50 years, complaining of unwanted facial hair, coming to the department of Dermatology, Venereology and Leprosy in Acharya Vinobha Bhave Rural Hospital, Sawangi, Wardha, Maharashtra

Sample size: Using the method of purposive sampling, we will be including 10 patients in each group.

Sample size for the present study will be 20.

Inclusion criteria:

- Female patients between the age of 18-50 years of age with unwanted facial hair coming to the dermatology OPD
- Females willing to participate in the study with their informed consent

- Females who have not taken any other treatment for unwanted facial hair will be included

Exclusion criteria:

- Females with deranged hormonal profile will be excluded

Normal values of the hormones to be considered as follows –

- Dehydroepiandrosterone (DHEAS): 18 to 332 $\mu\text{g/dL}$
- Free testosterone: 15 to 70 ng/dL
- FSH/LH Ratio
- Thyroid profile (TSH, T3, T4):

TSH – 0.5 TO 5 mIU/L, T3 –0.970 TO 1.69 ng/mL , T4 – 5.53 to 11.0 $\mu\text{g/dL}$

- Females with history of having undergone previous laser treatment for facial hair

5.1 Methodology

Females complaining of unwanted facial hair, between the age of 18-50 years, who will be coming to the department of Dermatology, Venereology and Leprosy, AVBRH, Sawangi, Wardha, will be randomly enrolled.

A detailed history regarding name, age, age of onset, duration, drug intake, menstrual irregularities, symptoms of hyperandrogenemia (acne, seborrhea, alopecia) and that of virilization (deepening of voice, breast atrophy, increased muscularity, clitoromegaly etc.) and family history will be taken. A detailed clinical examination will be done. A hormonal assay of each patient will be done which will include DHEAS, free testosterone, FSH/LH ratio and thyroid hormones. Females with deranged hormonal profile will be excluded from the study.

Baseline values of trichoscopy will be recorded and thereafter at every visit of the patient when she starts to notice hair growth on her face. On trichoscopy, the hair will be evaluated for its density, diameter and growth rate at each visit. Trichoscopic examination will be done for each area of the face individually that includes the side locks, the upper lip and the chin.

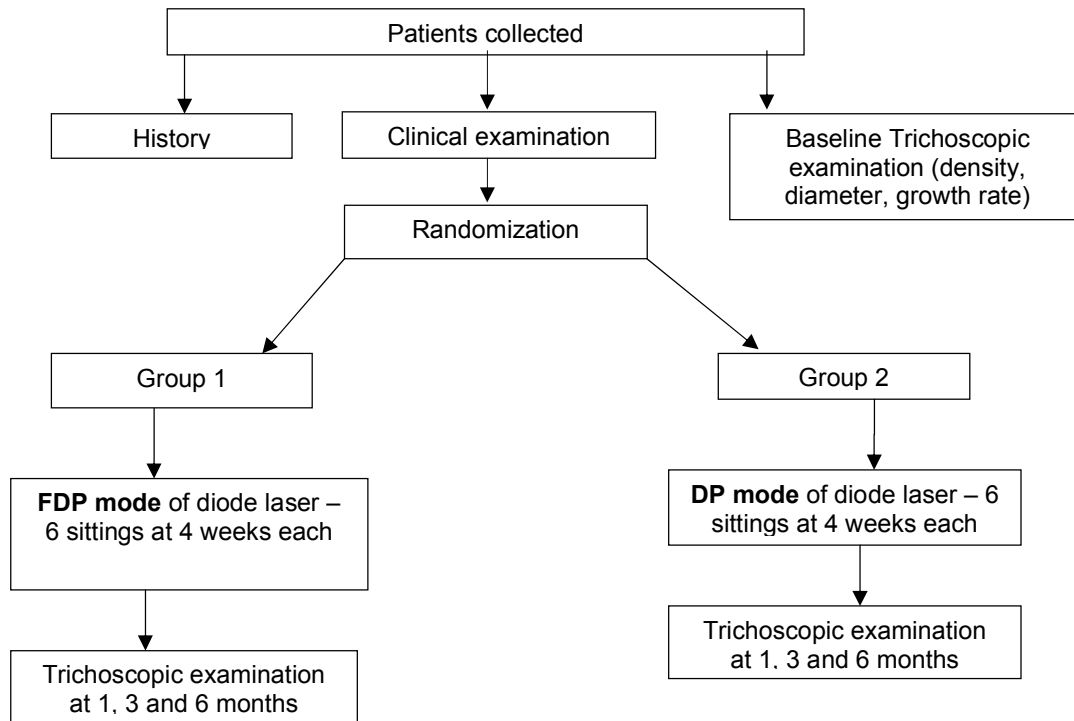


Fig. 1. Study design concept

For randomization of patient selection, a method was devised to divide them into two groups based on the mode of diode laser that will be used for their treatment. This will ensure unbiased selection of the patients. All females having an odd digit at the end of their registration number will be put in group 1 and those having an even digit at the end, will be placed in group 2.

For this study, we will be using VIKINI Diode laser of wavelength 808 nm. Treatments will be performed using contact cooling and gel. The preparation for the laser hair removal will include hair shaving of the area before each sitting. Group 1 patients will be treated with the FDP (fast delivery pulse) mode of the diode laser which is the continuous mode. Group 2 patients will be treated with the DP (delivery pulse) mode of the diode laser which is the static mode. Six sittings of each mode will be performed on every patient at an interval of 4 weeks each. The energy, fluence, pulse repetition rate (PRR)/frequency and pulse duration will be according to the skin and hair type of each individual and will be identical for all 6 sittings in each mode.

A comparison of trichoscopic findings will be made among both the groups at one, three and

six months. After every procedure, the patient satisfaction will be recorded on a linear analog scale (where; 0= extremely dissatisfied; 100= extremely satisfied). Pain assessment will be done using visual analog scale (VAS).

6. STATISTICS

All standard parametric and non-parametric data will be assessed by standard statistical methods. A 'p' value of <0.05 will be considered significant.

7. EXPECTED RESULTS

With this study we expect to understand the two modes of laser hair removal, that is the static mode and the dynamic mode, using the diode laser. We also expect to know the efficacy of the two for Hair removal in Indian population.

8. DISCUSSION

In 2002, Rogachefsky et al, investigated the theory of thermal damage by performing a pilot study evaluating efficacy and safety profile of 810nm diode laser when operated in a super-long pulse mode (170 to 1000msec). 10 female subjects of skin types I-VI were enrolled for the study and they received one to two laser

treatments at eight test sites. They were followed up for six months. The delivered fluences of the super long pulse mode ranged from 23 to 115 J/cm². They concluded that safe hair removal for all skin types was accomplished [9].

Sadick NS and Prieto VG in the year 2003, devised a study to analyze the clinical potency of the 810 nm diode laser for treatment of unwanted hair. 24 female subjects with skin types II-IV were treated three times every four weeks. The study concluded that a mean hair removal efficiency of 74% was noted at 3 months, whereas 79% was reported at 6 months [10].

In the year 2014, B.Koo et al performed a study to compare the relative effectiveness and discomfort associated with hair removal methods between two 810 diode lasers, using an "in-motion" technique and a single pass vacuum assisted technique. A total of five laser treatments were performed at an interval of 6 to 8 weeks. The results reflected that there was a reduction in hair count of 33.5% for single pass technique and 40.7% for in-motion devices at 6 months. The pain rating for single pass treatment was significantly larger than for the in-motion technique [11].

T.Omi (2017) designed a study to compare the efficacy of the two modes of application of diode lasers i.e static and dynamic mode, both clinically and histologically. A total of 25 subjects participated in the study and their baseline hair counts were recorded. The ms-pulsed diode laser with 810nm offered both static and dynamic modes on left and right crura of all subjects respectively. Significantly lower hair counts were observed in follow up in both the groups. However, significant difference was not noted between the two modes in terms of hair counts and pain severity [12].

Y.Bhat et al in 2020 published an article updating the laser treatment in patients with hirsutism. The diode laser system (800-1000 nm) could be used safely in individuals with dark skin owing to its longer wavelength, active cooling and longer pulse widths. It was also being better tolerated by individuals with darker skin types (V-VI) in comparison to ruby laser [13-17].

9. CONCLUSION

The conclusion will be based on findings for study protocol.

CONSENT AND ETHICAL APPROVAL

Institutional Ethical Committee (IEC) clearance will be obtained. Written informed consent in the vernacular language will be taken from all participants for voluntary participation.

SCOPE

This study will help us in managing patients with unwanted hair. It will also help us to compare and understand which mode among the FDP or DP is more suitable and efficacious for facial hair removal in Indian skin and hair type.

LIMITATIONS

This study does not include long term follow up of the patients.

IMPLICATIONS

Diode lasers are most frequently used for unwanted hair removal and it can be used in FDP and DP modes. This study will help us to establish which among the two modes is likely to give better results, patient satisfaction and compliance in the Indian population.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
<https://www.sdiarticle4.com/review-history/71203>