



Methods to Overcome Poor Response and Challenges of Facial Laser Hair Reduction

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Unwanted facial hair is a relatively common problem that can be emotionally distressing. Laser hair reduction has become the treatment of choice for removal of facial hair, replacing more traditional methods of hair removal. To achieve maximum treatment efficacy while minimizing side effects, clinicians must practice proper patient selection and counseling, proper laser procedure, and posttreatment care. The treatment parameters should be individualized for each patient depending on various factors. A favorable treatment outcome depends on three major factors: proper patient selection, use of a suitable laser system, and an experienced laser operator. The aim of this article is to review the factors responsible for possible poor outcomes of laser hair reduction in the facial area and to describe steps that should be followed to minimize side effects and enhance results following facial hair reduction by laser. **KEYWORDS:** Laser hair reduction, facial hair

Unwanted facial hair is a relatively common problem with the potential to affect a person emotionally and socially.^{1,2} In the past decade, demand for laser hair reduction has increased. Laser hair reduction has largely replaced more traditional methods of hair removal, such as threading, waxing, plucking, and bleaching, achieving superior results with long-term hair reduction.³

As advancements in laser technology continue to improve outcomes, lasers have now become the treatment of choice for the removal of unwanted facial hair.^{1,4} However, treatment parameters vary among individuals. In order to achieve maximum efficacy and safety while using lasers, these parameters must be individualized.⁵ In spite of ensuring appropriate selection of candidates and adequate parameters while using lasers, there are various patient-related and technological factors that can lead to unpredictable, variable, or poor responses to treatment.³ The identification of these factors and the development of step-by-step guidelines with their consideration is the way forward to reduce the number of possible complications and side effects in practice.⁶

Since its introduction in the late 1990s, laser hair reduction has been able to successfully reduce unwanted hair with minimal side effects.^{7,8} Laser hair reduction works on the principle of selective photothermolysis.⁹

To achieve selective thermal damage of a pigmented target structure, sufficient fluence must be delivered at a wavelength that is preferentially absorbed by the target, for a time equal to or less than the thermal relaxation time of the target.^{10,11} The target chromophore is melanin. Melanin absorbs the light energy, converts it into heat, and then diffuses it, resulting in collateral damage to the bulge cells.⁷

The commercially available laser hair removal devices most widely

studied are long-pulsed ruby (694 nm), long-pulsed alexandrite (755nm), diode (800–980 nm), and long-pulsed Nd:YAG (1064nm).¹²

Patient counseling, patient selection, proper treatment procedure, and posttreatment care are essential for desired results with minimal side effects. A favorable treatment outcome depends on three major factors: proper patient selection, use of a suitable laser system, and an experienced operator.¹⁰ The aim of this article is to review the factors responsible for possible poor outcomes of facial laser hair reduction and to discuss steps that should be followed to minimize side effects and enhance results following facial hair reduction by laser.

PATIENT FACTORS

Skin type. Laser hair reduction is most successful in patients with Fitzpatrick Skin Types I to IV with dark terminal hair.¹¹

In patients with Fitzpatrick Skin Types V to VI, the epidermal melanin competes with the target chromophore that can lead to undesirable skin pigmentation changes and adverse effects, such as scarring.^{7,8} However, these patients can be effectively treated using longer wavelengths, longer pulse durations, conservative fluences, and an efficient cooling system.^{7,8,11} Melanin in the epidermis absorbs longer wavelength lasers such as the Nd:YAG less efficiently, making them less damaging. Therefore, Nd:YAG is the best laser system to use for patients with darker skin types.⁷

Hair type and color. Lasers target the terminal hair and not the vellus hair. Vellus hair are resistant to removal due to the absence of melanin.¹³ Generally, facial hair is finer and lighter compared to the hair on the rest of the body, making it one of the most challenging areas to treat. Therefore, multiple treatment sessions, more than the usual may be necessary.¹⁴

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Hair color depends upon the melanin content of the hair shaft. Melanocytes in the follicles produce two types of melanin: eumelanin and pheomelanin. Follicular melanocytes differ largely from the epidermal melanocytes. They contain more melanosomes, synthesize larger melanosomes and are only active only during anagen stages.¹⁵

For facial hair, it is important to identify the treatment area based on the quality of hair. Inappropriate selection results in an unpredictable patient response which may induce paradoxical hair growth on treated skin areas.

Hair cycle. The stage of hair growth also plays an important factor for laser hair reduction. The ideal stage for laser treatment is the active anagen phase, as there is an abundance of melanin and the follicles are located deep within the skin and are still attached to the papilla for nourishment.¹⁶

The percentage of hair follicles in the anagen phase may vary among different parts of the body. At a given time, approximately 56 to 76 percent of the facial hair are in the anagen phase.⁴ It is estimated that an approximately 20-percent reduction can be observed with each treatment if done in anagen phase with the use of correct laser/light parameters.¹⁶

Presence of tan. It is important to evaluate every patient for the presence of a tan. If present, laser treatment should be delayed until the tan has faded.¹³ Treatment in the presence of tan may result in absorption of laser energy by both hair and epidermal melanin and photon accumulation near the skin surface, leading to epidermal burns.^{3,17} Some physicians might use suboptimal fluencies to reduce chances of burn, which lowers the efficacy of the procedure.³

Optimal endpoint. The optimal endpoint of laser therapy is perifollicular edema and erythema. An adjustment of fluence or pulse duration might be indicated if this is not achieved. Presence of confluent erythema, greying, blistering, or extreme pain are signs of epidermal injury. In such situations, fluences should be reduced by 10 to 20 percent.¹⁸

TECHNOLOGICAL FACTORS

Pulse duration. Pulse duration is generally guided by the thermal relaxation time (TRT).¹⁹ For laser to be effective, the pulse duration should be shorter than equal to the thermal relaxation time of the hair follicle.⁴ If the pulse

duration exceeds TRT, along with damage to the target, heat energy will also dissipate to the adjacent tissue resulting in injury to the surrounding areas.¹⁶ TRT is also dependant on the size of the target structure. TRT of a thicker hair follicle will be longer than that of a thinner hair.⁴ For human terminal hair follicles TRT varies between 10 ms and 50 ms.⁴

Fluence. Fluence is the energy delivered per unit area.¹⁹ Use of suboptimal fluence is one of the most common cause of a poor response to laser hair removal.³ When treating high-density areas on the face, such as the beard, more conservative fluence should be used. Higher fluences can cause thermal damage because of the pooling and accumulation of heat resulting from diffusion of heat in the closely situated adjacent hairs.¹⁴

Wavelength. Wavelengths in the optical range of 600 to 1100 nm are absorbed by melanin and are poorly absorbed by competing chromophores such as hemoglobin and water.^{7,20}

For dark hair and light skin, the low range of wavelength (650 to 700 nm) can be used without a risk of serious damage to the epidermis and subsequent hypopigmentation or hyperpigmentation. Whereas, for lighter hair and darker skin, longer wavelengths (800nm and greater) are advisable.¹⁵

Spot size. Spot size is the size of the laser probe or head. If a small spot size is used, more light is likely to get scattered outside the treatment zone, while with a larger spot size scattering of light is lessened, leading to greater depth of penetration.^{3,21}

OPERATOR PROFICIENCY

Though laser hair reduction depends on various factors, a trained operator with a thorough knowledge of the laser mechanisms, techniques, and potential complications is required to perform these procedures. It is important to individualize the treatment parameters for each patient depending upon the skin type and hair growth. Most complications can be prevented by taking adequate precautions during the procedure with adjustment of fluence, spot size, wavelength, and the use of appropriate cooling methods.²²

OPTIMIZING TREATMENT

Optimizing pretreatment procedure. Before starting any laser treatment, a detailed clinical history must be taken. Various hormonal

assays should be done to evaluate the patients, as these might influence the response to laser therapy. Polycystic ovary syndrome (PCOS), thyroid dysfunctions, adrenal hyperplasias, and hyperprolactinemia can influence hair regrowth following laser hair reduction.²³

The patient should be counselled to set realistic expectations. It is important to stress that lasers provide permanent hair reduction and not removal.²³ The clinician must explain that maintenance sessions are required after treatment. These can vary from patient to patient, from 2 to 4 sessions per year. It is important to explain that finer hair will be more difficult to treat. Patients with PCOS should be informed that they might require a greater number of sessions than the average. For patients with PCOS, approximately 10 to 15 sessions might be required.

Informed, written consent should be collected before starting the treatment. Patients must cease waxing, tweezing, and chemical epilation at least three weeks prior to starting the treatment. Patients who are sunburnt or have a tan should wait for two weeks before laser treatment to avoid additional skin damage. Chemical peels and other laser procedures should be avoided on the face for two weeks before and after laser treatment. Patients should avoid all alpha hydroxy and beta hydroxy acids (AHA/BHA), hydroquinone, and retinols or retinoids for three days before treatment. If a patient is prone to acne, oral antibiotics can be started three days before treatment to avoid a flare up. Full growth should be present on the day of the procedure.

During the procedure. The face should be cleaned and all cosmetics should be removed. The treatment area should be marked. It is important to avoid treating the vellus hair to prevent paradoxical hair growth on the face

Facial hair should be shaved before starting the treatment. The hair length should not be more than 1 to 5mm. A moisturizer should be applied before shaving the area to be treated. Always shave in the direction of the hair follicle to avoid folliculitis.

The parameters for treatment need to be individualized for each patient based on their skin type, growth, quality of hair and the area of face to be treated. A treatment record with the parameters used in each session must be maintained for every individual. Fitzpatrick Skin Types I and II require higher fluences and

TABLE 1. Management of side effects following laser treatments of the face

| SIDE EFFECT | MANAGEMENT |
|----------------------------------|---|
| Erythema and inflammation | Patients should be assured that this is normal sequelae Mild steroid ointment can be given if erythema/inflammation persists |
| Pain and discomfort | For persistent pain, mild oral analgesics can be given. |
| Acne | Patient should apply ice to the area at home Avoid steam and facial massage Fucidin ointment, Clindamycin gel, 10% Azederm can be administered Oral antibiotics |
| Burns, blisters, and/or crusting | Ice the affected area. Steroid ointment and antibiotics Scratching of the area should be avoided. If any blisters occur, do not puncture For post-burn hypopigmentation, topical tacrolimus ointment can be applied |
| Infection | Extremely rare; can be treated with antibiotics |
| Hyperpigmentation | Topical application of hydroquinone, kojic acid, retinoic, azelaic, ascorbic, and glycolic acid Daily sunscreen use Mild glycolic acid peels (30 to 40%) can be repeated at 2- to 4-week interval. ²⁶ |
| Paradoxical Hypertrichosis | Further laser sessions giving high fluence and short-pulse duration with increased cooling and icing of the adjacent areas of the face. ¹ |
| Folliculitis | The area should be kept clean using gentle facial cleansers and clean cloths Topical steroids and oral antibiotics can be given |

short pulse duration. Darker skin types (IV, V, VI) require less fluences and longer pulse duration.^{24,25}

Cooling is essential before and after laser treatment. Some laser systems may have built-in cooling devices. While treating the face, ice can be applied on the adjacent areas to prevent dissipation of heat, which can lead to paradoxical hair growth. A cooling gel should be used during the treatment. Protective eyewear should be worn by both the patient and the operator to avoid risk of ocular injuries.

If no epidermal side-effects occur from the previous treatment, the fluence can be increased or the same parameters can be used in the subsequent session. One should apply caution when increasing the fluence, since small increases can also tip the scale beyond the patient's epidermal thermal damage threshold. If no adverse effects were present, but the perifollicular edema and erythema lasted for a longer time, the fluence should be slightly decreased. If there was an unfortunate epidermal side effects, the fluence should be reduced and longer pulse durations should be used.¹⁴

The hand piece should be placed perpendicular to the skin surface gently

maintain complete contact with skin. 10% overlapping of hand pieces in treating adjacent areas is generally accepted.

While treating areas around the mouth or when orthodontic braces are present, a rolled up wet gauze should be placed between the lips and teeth to avoid any discomfort.

After the entire procedure is complete, ice packs can be used on the face to minimize discomfort. Proper sunscreen with adequate coverage should be applied. A minimum gap of 4 to 6 weeks must be maintained between two face laser sessions.

Posttreatment care. The patient must avoid extended sun exposure for seven days following treatment. It is mandatory to use a broad spectrum sunscreen after laser treatments. Ice packs can be applied to alleviate discomfort and minimize swelling as a result of heat. A gentle skin cleanser should be used. Make up should be avoided for at least 24 hours after treatment. Patients should be informed that mild redness and inflammation is normal following treatment. However, if it persists or worsens, they should consult the treating doctor for further management (Table 1). Efnornithine topical application can be advised as a combination therapy with laser to promote

hair reduction.^{2,27} The damaged hair shafts on the face are usually shed within the first week of laser treatment. Patients should be assured that this is a shedding phase and not a new hair growth.²⁸ Additional laser treatments or chemical procedures should be avoided on the treated area for at least two weeks posttreatment or until skin is completely healed.

CONCLUSION

The success of laser hair reduction of the face depends upon several patient, technological, and operator-dependant parameters. Understanding of these factors helps to reduce poor outcomes and overcome potential challenges of laser hair reduction. With proper patient selection, counseling, laser procedure, treatment parameters, and posttreatment care, it is possible to effectively and safely treat patients with all skin types and hair color.

REFERENCES

- Desai S, Mahmoud BH, Bhatia AC, et al. Paradoxical hypertrichosis after laser therapy: a review. *Dermatologic surgery*. 2010 Mar;36(3):291–298.
- Smith SR, Piacquadro DJ, Beger B, et al. Eflornithine cream combined with laser therapy in the management of unwanted facial hair growth in women: a randomized trial. *Dermatologic surgery*. 2006 Oct;32(10):1237–1243.
- Arsiwala S, Majid I. Methods to overcome poor responses and challenges of laser hair removal in dark skin. *Indian journal of dermatology, venereology and leprology*. 2019;85(1):3.
- Casey AS, Goldberg D. Guidelines for laser hair removal. *Journal of Cosmetic and Laser Therapy*. 2008 Jan 1;10(1):24–33.
- Eremia S, Li C, Newman N. Laser hair removal with alexandrite versus diode laser using four treatment sessions: 1-year results. *Dermatologic surgery*. 2001 Nov;27(11):925–930.
- Kalashnikova NG, Jafferany M, Lotti T. Management and prevention of laser complications in aesthetic medicine: An analysis of the etiological factors. *Dermatologic Therapy*. 2021 Jan;34(1):e14373.
- Gan SD, Graber EM. Laser hair removal: a review. *Dermatologic Surgery*. 2013 Jun;39(6):823–838.
- Fayne RA, Perper M, Eber AE, et al. Laser and light treatments for hair reduction in Fitzpatrick

LITERATURE REVIEW

- skin types IV–VI: A comprehensive review of the literature. *American Journal of Clinical Dermatology*. 2018 Apr;19(2):237–252.
9. Anderson RR, Parrish JA. Selective photothermolysis: precise microsurgery by selective absorption of pulsed radiation. *Science*. 1983 Apr 29;220(4596):524–527.
 10. Liew SH. Laser hair removal. *American Journal of Clinical Dermatology*. 2002 Apr;3(2):107–115.
 11. Lapidoth M, Dierickx C, Lanigan S, et al. Best practice options for hair removal in patients with unwanted facial hair using combination therapy with laser: guidelines drawn up by an expert working group. *Dermatology*. 2010;221(1):34–42.
 12. Lee CM. Laser-assisted hair removal for facial hirsutism in women: A review of evidence. *Journal of Cosmetic and Laser Therapy*. 2018 Apr 3;20(3):140–144.
 13. Ibrahim OA, Avram MM, Hanke CW, et al. Laser hair removal. *Dermatologic therapy*. 2011 Jan;24(1):94–107.
 14. Battle Jr EF, Hobbs LM. Laser-assisted hair removal for darker skin types. *Dermatologic Therapy*. 2004 Jun;17(2):177–183.
 15. Ross EV, Ladin Z, Kreindel M, et al. Theoretical considerations in laser hair removal. *Dermatologic Clinics*. 1999 Apr 1;17(2):333–355.
 16. Thomas, M.M., Houreld, N.N., 2019. The “in’s and out’s” of laser hair removal: a mini review. *Journal of Cosmetic and Laser Therapy*, 21(6), pp.316–322.
 17. Hussain M, Polnikorn N, Goldberg DJ. Laser-assisted hair removal in Asian skin: efficacy, complications, and the effect of single versus multiple treatments. *Dermatologic surgery*. 2003 Mar;29(3):249–254.
 18. Sadick NS. Laser hair removal. *Facial Plastic Surgery Clinics*. 2004 May 1;12(2):191–200.
 19. Uddhav A, Dhani PL. Overview of lasers. *Indian J Plast Surg*. 2008;41:S101–113
 20. Lepselter J, Elman M. Biological and clinical aspects in laser hair removal. *Journal of Dermatological Treatment*. 2004 Apr 1;15(2):7–83.
 21. Goldberg DJ. Laser hair removal. *Dermatologic Clinics*. 2002 Jul 1;20(3):561–567.
 22. Vaidya T, Kumar DD. *Laser Hair Removal*.
 23. Bhat YJ, Bashir S, Nabi N, et al. Treatment in hirsutism: an update. *Dermatology Practical and Conceptual*. 2020;10(2).
 24. Shirkavand A, Ataie-Fashtami L, Sarkar S, et al. Thermal damage patterns of diode hair-removal lasers according to various skin types and hair densities and colors: A simulation study. *Photomedicine and Laser Surgery*. 2012 Jul 1;30(7):374–380.
 25. Gupta G. Diode laser: Permanent hair" Reduction" Not" Removal". *International Journal of Trichology*. 2014;6(1):34.
 26. Alster TS, Khoury RR. Treatment of laser complications. *Facial Plastic Surgery*. 2009 Dec;25(05):316–323.
 27. Buddhadev RM. Standard guidelines of care: Laser and IPL hair reduction. *Indian Journal of Dermatology, Venereology and Leprology*. 2008.
 28. Dierickx C. Laser-assisted hair removal: state of the art. *Dermatologic therapy*. 2000 Jan;13(1):80–89. **JCAD**