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Alexandrite and Nd:YAG Laser vs. IPL in the Management of Facial Hirsutism: A Retrospective Study

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Abstract: Background and objectives: Hirsutism is characterized by the abnormal presence of hair in women, which occurs in typically male areas. The causes of this symptom can be many; however, it is often associated with PCOS. Among the most effective procedures that can be used for hair removal are lasers such as the Alex laser, Nd: YAG, and IPL. Materials and Methods: This study analyzed a total of 71 patients who were treated for hirsutism caused mainly by PCOS; the remaining cases were idiopathic. The patients were divided into two groups: the first group was treated with laser sources, specifically Alex and Nd: YAG, and the second group underwent treatment with IPL. The results were evaluated six months after the last treatment. Results: Out of 71 treated patients, all patients experienced good or excellent hair reduction with greater efficacy in laser-treated patients. The incidence of side effects was low, particularly in the IPL group. Conclusions: Both laser and IPL are efficient, safe, and tolerable procedures in treating PCOS-related and idiopathic facial hirsutism, and both have been shown to have a low rate of side effects. However, the Alex and Nd: YAG lasers guaranteed better hair removal results. A more extensive clinical study will be necessary to confirm our study's results.

Keywords: hair removal; hirsutism; PCOS; Alex laser; Nd: YAG laser; IPL

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1. Introduction

Hirsutism is defined as excessive terminal hair growth in male-androgen-dependent areas of women. Hirsutism affects 5−10% of women in different parts of the world. The presence of hirsutism is a distressing symptom with a negative impact on psychosocial aspects and quality of life (QOL) [1]. The underlying causes of hirsutism may be congenital adrenal hyperplasia, polycystic ovary syndrome, ovarian and adrenal tumors, or pharmacological agents, or it may be idiopathic. It is essential to determine the underlying causes [2]. Polycystic ovarian syndrome (PCOS) is defined as a combination of signs and symptoms of androgen excess and ovarian dysfunction in the absence of other specific diagnoses, and it is the most common cause of hirsutism in women. This syndrome, first described by Stein and Leventhal in 1935, is characterized by three major features (Rotterdam criteria): oligo or anovulatory cycles, clinical or biochemical signs of hyperandrogenism, and ultrasonographic evidence of polycystic ovaries. A small group of women is diagnosed with idiopathic hirsutism (IH). These women have no detectable hormonal abnormalities, regular menses, normal ovarian appearance, and no evidence of adrenal or ovarian tumors. The causes of IH are genetic or ethnic polymorphism in the androgen receptor, increased peripheral activity of 5-alpha reductase in the air follicles, or mild to moderate abnormalities in the genesis of steroids [3]. This study aims to evaluate the safety and effectiveness of IPL, Alex, and Nd: YAG lasers in treating idiopathic and PCOS-related facial hirsutism, dividing patients into two groups depending on the device used, and not only on the cause of the condition.

2. Materials and Methods

This study retrospectively analyzed and compared two groups of female patients treated for facial hirsutism: the first group of fifty women underwent laser treatment, while the second group of twenty-one patients was treated with IPL. Most subjects (fifty-six out of seventy-one) had polycystic ovaries.

Exclusion criteria included patients having performed any laser or light treatment in the last three months, reporting the use of topical medications such as retinoids, salicylic/glycolic acid, antibiotics, being pregnant or breastfeeding, and reporting hypersensitivity to light or with malignant tumors. All patients provided signed informed consent on the risks of the procedure.

- Patients of the first group with Fitzpatrick skin type I-II were treated with a 755 nm Alexandrite laser (Motus AY, DEKA M.E.L.A., Calenzano, Italy) (fluence: 11–19 J/cm^2, pulse duration: 10–20 ms, spot: 10–14 mm), while a 1064 nm Nd: YAG laser was used for women of the same group with Fitzpatrick skin type III-IV (Motus AY, DEKA M.E.L.A., Calenzano, Italy) (fluence: 30–40 J/cm^2, pulse duration: 10–20 ms, spot: 10–15 mm). Darker phototypes were treated with the YAG laser due to the longer wavelength of this laser compared to the Alexandrite laser. Longer wavelengths reduce the absorption of laser light by epidermal melanin, and as in darker skin types epidermal melanin competes as a significant chromophore and may lead to excessive heating of the surrounding tissue, and so a better margin of safety was ensured with the YAG laser.

External skin cooling was coupled with the Nd: YAG laser handpiece (Zimmer Cryo 6).

The second group of patients was treated with a traditional IPL therapy for hair removal with an optimized emission at 755 nm (Genus AX, DEKA M.E.L.A., Calenzano, Italy) (fluence: 8–12 J/cm^2, spot: 8.3 cm^2), using a transparent gel. Regardless of their group, all subjects received six treatments with an interval between sessions of 6 weeks. Immediately after each session, the appearance of side effects such as burnings, vesiculations, or folliculitis was monitored. Response to each treatment was assessed six months after the last treatment session. Statistica14.0 (TIBCO Software, Palo Alto, CA, USA) software was used for data analysis (mean, standard deviations, and rate calculations).

3. Results

Seventy-one patients with facial hirsutism were enrolled in the study, and six treatments were performed with a 6 week interval between sessions.

3.1. Laser Group

The sample treated with the Alexandrite and Nd: YAG laser consisted of 50 female patients with a mean age of 30.0 $\pm$ 6.9. Based on Fitzpatrick skin type, patients were classified as follows: 6 (12%) patients were skin type I, 22 (44%) patients were skin type II, 15 (30%) patients were skin type III, and 7 (14%) patients were skin type IV.

Therefore, the 28 (56%) patients with phototype I-II of the laser group were treated with the Alexandrite laser procedure, while the 22 (44%) patients with phototype III-IV were treated with the YAG laser.

In 10 (20%) patients facial hirsutism was idiopathic; in the remaining 40 (80%) it was determined by Polycystic Ovarian Syndrome (PCOS). The face areas treated in the laser group are shown in Table 1 as a percentage.

Table 1. Face areas treated in the laser group.

Area	Number of Patients	Percentage
Cheek	11	22%
Parotid	12	24%
Mentum	14	28%
Submental	13	26%

The effectiveness of the treatment was evaluated according to a four-point visual scale based on the percentage of hair reduction compared to the baseline: poor (<25%), fair (25–50%), good (50–75%), and excellent (>75%).

A total of 16 (32%) patients achieved an excellent long-term reduction of unwanted hair growth (between 51 and 75%) compared to T0, in particular, nine treated with the Alexandrite laser and seven treated with the Nd:YAG laser. A total of 34 (68%) patients achieved excellent reduction (>75%) as shown in Figures 1–4; 19 were treated with the Alexandrite laser and 15 were treated with the Nd:YAG laser. No patient achieved poor (<25%) or fair (25–50%) reduction as a result.

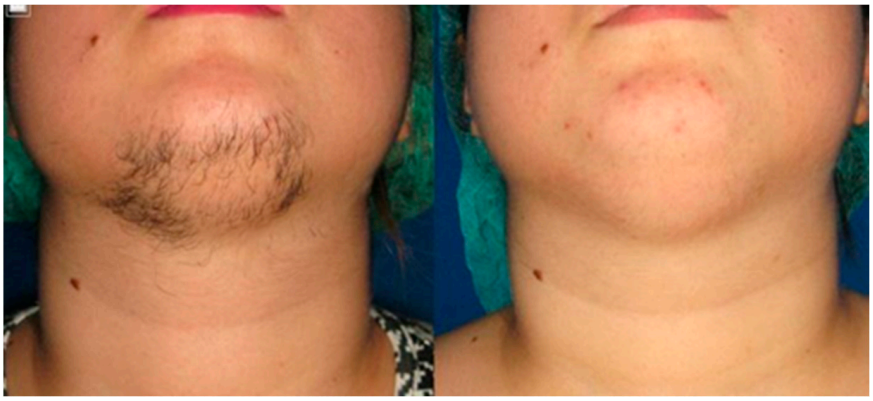

Figure 1. Effect of laser treatment on mental, submental, parotid, and cheek hirsutism. Comparison between baseline and six months after the last treatment session.

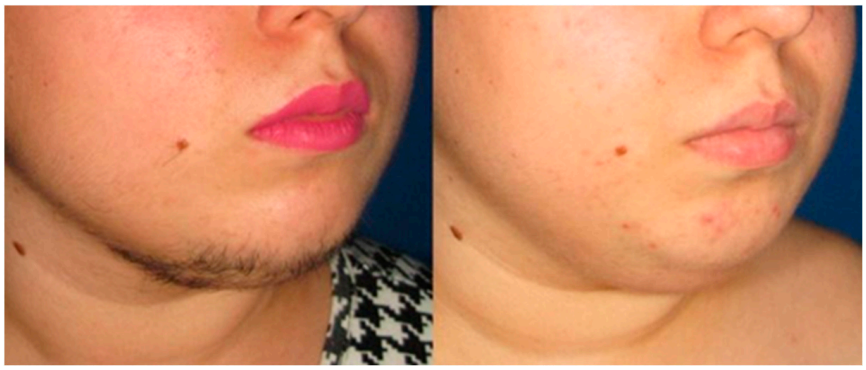

Figure 2. Effect of laser treatment on mental, submental, parotid, and cheek hirsutism. Comparison between baseline and six months after the last treatment session.

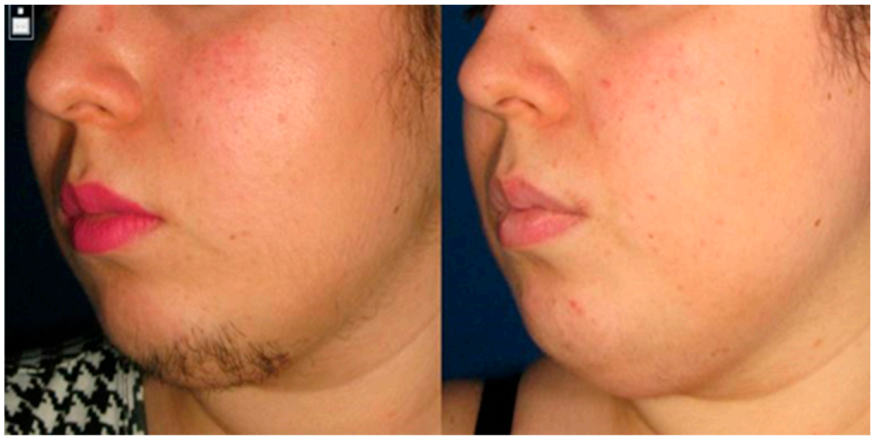

Figure 3. Effect of laser treatment on mental, submental, parotid, and cheek hirsutism. Comparison between baseline and six months after the last treatment session.

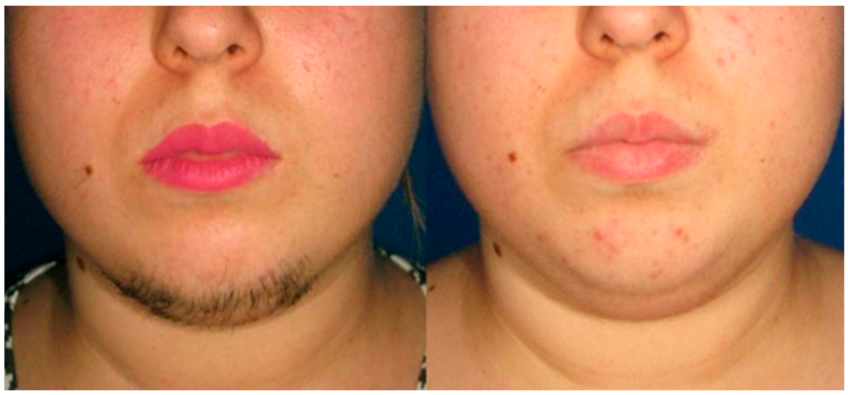

Figure 4. Effect of laser treatment on mental, submental, parotid, and cheek hirsutism. Comparison between baseline and six months after the last treatment session.

The side effects were low: burning occurred in 4% of cases, folliculitis in 4%, and no vesiculation occurred.

3.2. IPL Group

The sample of patients treated with IPL consisted of 21 women with a mean age of 29.2 ± 6.4 years. Of these, 5 (24%) were phototype I according to the Fitzpatrick scale, 12 (57%) were phototype II, and 4 (19%) were phototype III.

In 5 (24%) patients, the facial hirsutism was idiopathic; in 16 (76%) patients, it was determined by Polycystic Ovarian Syndrome (PCOS). The face areas treated in the IPL group as a percentage are shown in Table 2.

Table 2. Face areas treated in the IPL group.

Area	Number of Patients	Percentage
Cheek	4	19%
Parotid	4	19%
Mentum	7	33%
Submental	6	29%

In this case, 16 (76%) patients achieved a good reduction in long-term unwanted hair growth compared to T0 (51–75%), while 5 (24%) patients achieved an excellent reduction (>75%). Again, no patient achieved poor (<25%) or fair reduction.

Regarding the incidence of side effects, in this case it was lower than in the laser group: burning occurred in 5% of cases, while no case of vesiculation and folliculitis occurred. No differences were statistically relevant among groups.

4. Discussion

Several types of lasers are available for hair removal along with intense pulse light (IPL) epilators, but choosing among many options according to the skin and hair type of the patient took a lot of work. Patients should be evaluated for hirsutism by doing various hormonal assays, especially for testosterone levels, as these may influence the response to laser therapy. The hormonal dysfunction caused by Polycystic Ovarian Syndrome influences hair regrowth following laser hair removal [4]. The technology used in hair removal by lasers is based on the principle of selective photothermolysis. According to this principle, the selective thermal destruction of a target will occur if sufficient energy is delivered at a wavelength well absorbed by the target within a period less than or equal to the thermal relaxation time of the target. The thermal relaxation time is the time it takes for the target to cool (half of its baseline temperature) and transfer the heat to the surrounding structures. Under these conditions, it is possible to target structures while sparing the surrounding structures or tissues selectively. Light skin (Fitzpatrick skin type I-IV) and dark hair are ideal for effective hair removal. The absorption is more at the level of follicular melanin rather than epidermal melanin, thus reducing the chances of epidermal damage. For this reason, lasers targeting melanin, such as the 755 nm laser, in fair phototypes selectively destroy hair follicles, sparing the surrounding skin. The long-pulsed Nd: YAG laser remains the recommended choice in very dark individuals and tanned patients because of its longer wavelength. The safety of patients with type V-VI skin is challenging for laser hair removal because of the high density of competing chromophores in the epidermis. A wavelength less absorbed by melanin may be less effective clinically, as the target chromophore for hair removal laser is melanin in the hair bulb and bulge. The Alexandrite laser has been proven to be at least as effective and safe in hair reduction. The superficial penetration of a 755 nm wavelength targets the bulge of the hair follicle. It has thus been found to be more effective for superficially embedded hair in areas such as the eyebrows and upper lip [5]. In contrast to lasers, IPL systems are broadband flashlamps that emit polychromatic incoherent light ranging from visible to infrared (500–1300 nm). Optical filters are used to tailor the polychromatic light to specific needs [6]. The side effects, such as sensitivity, erythema, hyperpigmentation, and burns, depend on the patient's skin phototype, on the device, and on the operator's expertise. It is well-known that laser hair reduction causes no long-term adverse effects [7] and currently underway studies are highlighting how the "in motion" use of laser sources such as long-pulsed Nd: YAG, albeit with the same efficacy compared to its standard use, has fewer side effects [8].

5. Conclusions

Both laser and IPL are efficient, safe, and tolerable procedures in treating idiopathic and PCOS-related facial hirsutism with a low rate of side effects. However, Alex and Nd: YAG laser procedures achieved better results in terms of the percentage reduction of unwanted facial hair, despite the fact that the incidence of side effects was lower in the IPL group than in the laser groups. Further study with long-term evaluation is needed to confirm this result.

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Data Availability Statement: Data available from the Corresponding Author upon reasonable request.

Conflicts of Interest: The authors declare no conflict of interest.

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