Temporary hair loss using the long-pulsed alexandrite laser at 20 milliseconds.

Christian Raulin, M.D., Bärbel Greve, M.D.
Center for Dermatologic Laser Therapy - Laserklinik Karlsruhe, Karlsruhe/Germany

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Abstract

Background and Objective: Facial hypertrichosis presents an enormous psychological burden for women. Temporary hair removal (waxing, plucking etc.) and electrolysis are prolonged and unsatisfactory methods of treatment. For a few years several laser systems with varying wavelengths, pulse durations and energy fluences have been used successfully in laser epilation.

Methods: In the retrospective study on hand, we report on results of 30 female patients with hypertrichosis in the facial area treated with the long pulse alexandrite laser at 20 msec (Cynosure PhotoGenica LPIR/Apogee; 755 nm; 20 msec; up to 30 J/cm2; 10 or 12.5 mm beam diameter) over an 18 month treatment period.

Results: After an average of 8 treatments, an average clearance rate of 75% could be achieved. Fair hair (white/blond/red) only showed a clearance rate of 10%. Hypo- and hyperpigmentation did not appear. The most frequent adverse effects were the occasional appearance of scattered crusting (17%), which healed without consequences, and folliculitis (13%). The average post-treatment observation time lasted 3.25 months.

Conclusion: The long-pulsed alexandrite laser at a pulse duration of 20 milliseconds is an effective and safe method of treatment of hypertrichosis in the facial region of women. Black hair responds considerably better to the laser treatment than fair hair. A longer post-treatment observation time is necessary, though, in order to give evidence for the permanence of the success of the method.

Key words: long pulse alexandrite laser - long-term epilation - ruby laser - Epilight® - Photoderm® - hair removal

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Introduction

Hair removal by laser or laser-similar systems has become a major research subject and an economic force in the field of cutaneous laser medicine. Laser-assisted hair removal is attractive because it offers a rapid, relativley painless method for hair removal with minimal risks of scarring or other side effects. The market is overstocked with new lasers, but scientific studies on this subject are rare and the mechanism of action still remains to be proved since it is based on pure theory.

Research currently concentrates on the Q-switched neodymium:yttrium-aluminium-garnet (Nd: YAG), the long-pulsed ruby laser as well as the Epilight®/Photoderm®, an intense pulsed light source. The long-pulsed alexandrite laser and diode laser can be included as new variants. For many years, the removal of tattoos has been a well-known area of application for the alexandrite laser (though in the Q-switched mode) [1].

The long-pulsed alexandrite laser is currently availiable with pulse durations of 2, 5, 10, 20 and 40 milliseconds and utilizes the principle of selective photothermolysis and thermokinetic selectivity [2, 3]. Long and high energetic pulses lead to thermal destruction of large pigmented cutaneous targets such as the follicle. Endogenous melanin-containing cells within the follicle and the hair shaft absorb the 755 nm light and are damaged, resulting in a delay of hair growth. To decrease the risk of epidermal injury resulting from absorption of the alexandrite laser light in superficial melanin-containing epidermal cells, the application of cooling gel is necessary. The assumption that longer pulse durations increase efficacy and decrease the rate of side effects could nevertheless not be confirmed in scientific studies as yet [4, 5].

The objective was to investigate the efficacy and safty of the long-pulsed alexandrite laser with a pulse duration of 20 milliseconds in the treatment of facial hypertrichosis on 30 female patients in a retrospective study.

Fig. 1a: 33 year-old female patient with extensive hypertrichosis of the chin and neck.

Fig. 1b: Same patient as in Fig. 1a four weeks after the sixth treatment.

Materials and Methods

Data from a total of 30 female patients, randomly selected, with facial hypertrichosis (from 09/97 to 02/99) were retrospectively analyzed. They were between 19 and 59 years old with an average age of 37. Except of Fitzpatrick skin type IV and V, no exclusion criteria were made. Also patients with hormonal imbalance were included, to determine the efficacy of the long-pulsed alexandrite laser over a wide and not selected patient population.

The patients were all treated with a long-pulsed alexandrite laser (PhotoGenica LPIR/Apogee, Cynosure Inc., wavelength 755nm, pulse duration 5, 10, 20, 40 msec, energy fluence 1-50 J/cm2, repetition rate up to 1Hz, spot size 5, 10, 12.5 or 16 mm). A beam diameter of 10 or 12.5 mm and a pulse width of 20 msec at a repetition rate of 1 Hz were used for the hair removal. The energy fluence was set according to skin type and hair color. Fitzpatrick skin types I-II with dark hair were treated with increasing fluences from 20 J/cm2 up, and for the same skin type with fair hair, increasing fluences from 23 J/cm2 up were used. From skin type III on, energy fluences between 18 and 20 J/cm2 were selected, regardless of hair color.

Local anesthetics were neither desired nor required in any of the cases. Hair length was not below or above 0.5-1 mm. Ice-cooled sonography gel was applied on the skin directly before treatment as to prevent damage to the epidermis. Immediately after treatment, cool packs were placed on the treated areas for approximately 10-15 minutes to diminish any burning sensations. Laser sessions took place in 4-week intervals. Patients were instructed not to manipulate any crusting which may have developed and to avoid the sun for up to 4 weeks following treatment.

To determine hair removal efficacy, each patient was photographed before starting treatment and before each individual laser session. The clearance rates were compared using the photographs by the patients themselves and two independent doctors and rated according to a scale from 0-100%. Each time the entire treated area was evaluated. Every visit, patients were asked about and examined for side effects.

According to the retrospective study design, a treatment-free post-observation period was not planned. Additionally, the extraction of sample biopsies was not done because of the exposed treatment area of the face. A further study with the long pulse alexandrite laser, which includes biopsies from the axilla, back, and chest after treatment, is currently being put together.

The photo documentation was done with a Canon (Type EOS 100) camera and an Agfa (Type Ctx 100) slide film.

Results

90% of the patients had Fitzpatrick skin type II, 10% skin type III. Before the laser treatment, 83% of the patients had undergone symptomatic hair removal methods (waxing, plucking, shaving, bleaching, hair removal cream), 17% electrolysis/thermolysis. 33% of the patients showed pathological androgen levels while 17% were normal. An endocrinological examination was not carried out before on 50% of the patients. 13% of the patients with a pathological androgen level had a hormone treatment consisting of antiandrogens, which had already been started before laser therapy in all cases. 83% of the patients had black or brown hair, 13% mixed black and fair-haired (white/ blonde), one patient (4%) had black and reddish-blonde hair.

On average, 8 treatments with an average energy fluence of 25.6 J/cm2 were necessary to achieve a clearance rate of 75%. Fair and red hair showed a clearance rate of only 10%. Hyper- and hypopigmentation as well as scarring did not occur. The most frequent side effect was fine, scar-free scattered crusting in 17% of the patients. Folliculitis occasionally developed in 13%, which healed without consequences as well. The average post-treatment observation time was 3.25 months.

43% of the patients indicated that they were very satisfied with the success of the treatment, 47% were satisfied and only 10% of the patients assessed the result as unsatisfactory. A summary of the results shows table 1.

Table 1: Results

Number of Patients:	30 (100%)
Average Age / (Age Range):	37 / 19-59
Pre-treatment: Temorary hair removal methods (waxing, shaving, plucking, etc.)	25 (83%)
Electrolysis, Thermolysis	5 (17%)
Hormone Level: Pathological	10 (33%)
Normal	5 (17%)
Not examined	15 (50%)
Accompanying Hormone Therapy:	4 (13%)

Fitzpatrick Skin Types II:	27 (90%)
III:	3 (10%)
Hair Color: Black:	25 (83%)
Mixed black/fair (white/blonde):	4 (13%)
Mixed black/red:	1 (4%)
Average Number of Treatments:	8
Average Maximum Energy Fluence:	25.6 J/cm^2
Energy Fluence Range	21-27J/cm^2
Clearance Rate: Black hair:	75%
Fair hair:	10%
Side Effects: Folliculitis	4 (13%)
Scattered Crusting	5 (17%)
Patient Satisfaction: Very satisfied	13 (43%)
Satisfied	14 (47%)
Unsatisfied	3 (10%)
Average follow-up time:	3.25 month

Discussion

Many individuals, especially women, seek to reduce their facial hair. Although - in the age of laser medicine - a variety of epilating methods are availiable, patients and physicians ask for improved, effective, safe and long-lasting techniques. At the moment several laser (Q-switched Nd:YAG laser, long-pulsed ruby laser, long-pulsed alexandrite laser, diode laser) and laser-like systems (Photoderm®, Epilight®) with differing wavelengths, pulse durations, and energy densities are examined.

In comparison with the long-pulsed ruby and long-pulsed alexandrite lasers, the Q-switched Nd:YAG makes for the greatest degree of hair regrowth and has at the same time the lowest rate of side effects [6-9]. The long-pulsed ruby and alexandrite laser do not seem to show any significant differences in their results and their side effects [6-9]. The studies with the longest post-treatment observation times are on the ruby laser (wavelenght 694nm) [10-12] and the Epilight® [13-15], an intense pulsed light source (wavelength 500-1.200nm) and, therefore, not actually a laser by definition. Diode lasers (wavelength 800 nm), which have been on the market for a few months, could also prove very interesting in the future. First reports about these lasers announce long-lasting hair removal with a low rate of side effects [16].

The alexandrite laser (wavelength 755nm) is available with a pulse duration from 2 msec to 40 msec, depending on the manufacturer. Finkel et al. [17] could achieve good results in the treatment of hypertrichosis on the entire body in a study with the long-pulsed 2 msec alexandrite laser (Sharplan EpiTouch 5100, energy fluence 25-40 J/cm2, beam diameter 5-7 mm, repetition rate 5 Hz). Fair and dark hair both responded equally to the treatment. Before the second treatment, the mid-number of hairs sank to 65%, and then, three months after the last treatment, to 12%. The total numer of treatments ranged between 3 (sideburns, bikini line, legs, and breast) to 5 (womens´ upper lip). Side effects were minimal and transient.

Our study indicates an average clearance rate of 75% after an average of 8 treatments of facial hypertrichosis (Fig. 1a and 1b) with a larger beam diameter (10-12.5 mm) and longer pulse widths. The rate of side effects was very low. However, we reached an extremely poor clearance rate with fair and red hair, which is contrary to the good results of Finkel et al., although we theoretically had better treatment parameters (pulse duration 20 versus 2 msec, beam diameter 7 versus 10 and 12.5 mm). The poor response of blonde, red and white hair can be explained by their decreased content of eumelanin or by their content of pheomelanin, which differs in its absorption maximum from eumelanin. The patients satisfaction with the success of the treatment was remarkable. A total of 90% of the patients indicated that they were either very satisfied or satisfied with the result of the treatment. In recent studies, the long-pulsed alexandrite laser achieved success rates that were equal to those of the long-pulsed ruby laser; the rate of side effects was quite similar, too [6-9].

Contrary to theoretical considerations, current studies show that a prolongation of the pulse duration on the long-pulsed alexandrite laser does not lead to the expected results. Nanni et al. compared the efficacies of of the long-pulsed alexandrite laser with pulse durations of 5, 10, und 20 milliseconds [5]. They could not find any significant differences in clearance and side effects among the examined groups after 1 week, 1 and 3 months. Boss et al., who used 2 and 20 milliseconds, did not ascertain any differences among the pulse durations after a 6 month post-tretament obersavtion period either [4].

In our study, the long-pulsed alexandrite laser with a pulse duration of 20msec proved to be a good method of treatment for facial hypertrichosis, with very few side effects. To what extent and wether a pulse duration of 40 milliseconds, which is not offered in series, but as an extra, can increase the efficacy of this laser, still remains unclear and rather questionable due to the results of the study of Nanni et al und Boss et al [4, 5].

However, a longer post-treatment observation time is necessary in order to be able to make a reliable statement regarding the permanence of the success of the treatment. In connection with the long-pulsed alexandrite laser, patients and doctors (who are prospective buyers) should be told about long-term epilation and not about permanent epilation until more scientific data is available on its effectiveness, in spite of good results and high patient satisfaction.

(For references please contact the authors)

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