

# Long pulsed Nd: YAG laser with inbuilt cool sapphire tip for long term hair reduction on type- IV and V skin: A prospective analysis of 200 patients

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## ABSTRACT

**Background:** Laser hair reduction has become a very popular means to get rid of unwanted hair. **Aims:** We conducted the current study to evaluate the safety and efficacy of Nd: YAG laser on dark skin. We also evaluated the effect of increasing the gap between sessions on the long term efficacy of hair reduction achieved with long pulsed Nd: YAG laser. **Methods:** A prospective study was conducted on 200 consecutive female patients who underwent laser hair reduction for unwanted hair over the face, at Kaya skin clinic Delhi, with long pulsed Nd: YAG laser, from May 2006 to May 2009. The gap between sessions was increased from 2<sup>nd</sup> session itself. Results were evaluated 6 months after 6 sessions. Also a note was made of worsening of hair growth or any side effects experienced the patient during any of the sessions. **Results:** A total of 200 female patients (160 skin type IV and 40 skin type V) were followed up. Of these, 64 enrolled for lower face, 88 for chin or upper neck and 48 for upper lip. 6 months after 6 sessions, more than 50% improvement was seen in 68.7% of lower face, 89.69% cases of chin and 59% of upper lip cases. None of the patients had any worsening. **Conclusions:** The current study shows that long pulsed Nd: YAG is a very safe and effective means of hair reduction in skin types IV and V. Adequate fluences and increasing the gap between sessions from the 2<sup>nd</sup> session could be the key to achieving long term hair reduction with Nd: YAG laser. Adequate cooling and proper shaving are the key factors determining the safety.

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**Key words:** Laser hair reduction, Nd: YAG Laser, hyperpigmentation

## INTRODUCTION

Laser hair reduction has proved to be a safe and effective means of getting rid of unwanted hair. Different laser systems including the Alexandrite, Ruby, Diode, Nd: YAG and now the light system (IPL) have been tried in all skin types. A number of studies have documented the safety of laser as permanent means of hair reduction in white skin,<sup>[1,2]</sup> but the data available regarding the safety and efficacy on dark skin is limited.<sup>[3-5]</sup>

Also long term efficacy of hair reduction with Nd: YAG laser has been questionable. In most of the studies, first 4 laser sessions have been done at 4 weekly intervals so as to target the hair in the early anagen phase, as hair are most responsive to laser in this phase. Since

one prominent effect of laser is to increase the resting phase of the hair, we have tried to see the effect of increasing the gap between laser sessions after the 2<sup>nd</sup> session on long term reduction achieved with Nd: YAG laser. The safety profile of this laser in Indian skin (Type IV and V) was also evaluated.

## METHODS

A prospective study was conducted on 200 consecutive female patients who underwent laser hair reduction, from May 2006 to May 2009, for unwanted facial hair, at Kaya Skin Clinic, Delhi. The patients were treated with long pulsed Nd: YAG laser. A note was made of the skin and hair type for every patient before each session. In all the cases hair scoring was done

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on a scale of 1-4 based on modified Ferriman and Gallwey scoring: Grade 1-Brown, thin, medium/low/high density; Grade 2-Dark, thin, medium/low density; Grade 3-Dark, Coarse, low density; Grade 4-Dark, coarse, high density.

A detailed history was taken in each case before starting the sessions. Exclusion criteria included Grade 1 or 2 hair, history of isotretinoin intake in past 6 months, pregnancy, immunosuppression and keloidal tendency. In case of clinical signs suggestive of polycystic ovarian disease (PCOD) (like abnormal cycles, acne over lower face, obesity and thinning of frontal hair) a hormonal profile was carried out between the 2<sup>nd</sup> to 5<sup>th</sup> day of the cycle and an ultrasound of the lower abdomen was advised. In cases where PCOD was documented, an endocrinological opinion was sought and patients were started on medical and laser treatment simultaneously. Also these patients were aligned regarding the requirement of more number of sessions. Rest of the patients of lower face laser not having any other clinical signs of PCOD were kept under observation for end organ hypersensitivity.

The patients were advised not to do waxing, threading, plucking or bleach 3 weeks before the first session and in between the sessions. The patients were allowed to shave in between the sessions. Use of hair removing creams was discouraged due to the chances of irritant reaction. The patients were advised to use bleach with a 1 month gap before and after the session, when the gap between sessions was more than 3 months and during the maintenance phase. All the patients were advised regular use of sunscreen and use of a moisturizing cream 5 days post any laser session.

The area to be lased was marked with a white pencil under adequate light. Cleansing gel was applied and the area was shaved taking care not to leave any hair behind and at the same time avoid any cuts on the skin due to vigorous shaving. Cooling was done before, during and after the session with ice and inbuilt cool sapphire tip of the area to be lased and the immediate surrounding area. We did not use a topical anaesthetic in any of the cases.

The first sessions was done with 10mm hand piece with a starting fluence of 45/55 J/cm<sup>2</sup> (skin type IV) and 40/50 J/cm<sup>2</sup> (skin type V). The fluence was increased by 5 J/cm<sup>2</sup> at every session if the patient did not complain of any discomfort in the previous session.

From the third session onwards, when the hair texture became finer or the density decreased, we shifted the patient to 5 mm hand piece with fluence of 75/45 J/cm<sup>2</sup> (skin type IV) and 70/40 J/cm<sup>2</sup> (skin type V). In case the patient did not feel any pin prick sensation the fluence was increased by 5 J/cm<sup>2</sup>

First 2 sessions were done at 1 month gap, 2<sup>nd</sup> and 3<sup>rd</sup> session at 6 weeks gap and in the subsequent sessions the gaps were increased depending on the growth. The patients were aligned regarding the requirement of multiple (6-8) sessions followed by maintenance sessions once in 6 to 8 months.

A detailed follow up was done after 3<sup>rd</sup> session and 6 months after the 6<sup>th</sup> session, when the results were evaluated on the basis of photographic evaluation and a VAS (visual analogue score) done both by the patient and the doctor on a score of 1-10. Mean value of doctor and patient VAS was taken and represented as percentage improvement. An improvement of more than 70% was considered as excellent, 50-70% was considered good and less than 50% was considered average. The criteria for non responders was - the patients who showed no improvement in texture and density even at the end of 6 sessions. Also a note was made of worsening of hair growth or any side effects experienced by the patient during any of the sessions.

## RESULTS

A total of 200 female patients (160 skin type IV and 40 Skin type V) were enrolled in the study. Of these, 64 enrolled for lower face, 88 for chin or upper neck and 48 for upper lip. The patients were in the age group of 16- 54 years, with the mean age being 31.08 years. Majority of the patients were in the age group of 20-29 years. The cut off age for starting laser was kept at 16 years.

Of the 88 patients on laser for chin, 31 (34.7%) had excellent (more than 70%) [Figures 1 and 2], 48 (55%) had good (more than 50%), and 9 (10.2%) had less than 50% improvement.

Of the 48 cases undergoing laser for upper lip, 16(33%) showed excellent response (more than 70%) 26 (54.1%) showed good response (more than 50%) and 4 (8.3%) showed less than 50% improvement. There were 2(4.16%) cases which were lost to follow up.



Figure 1 and 2: Chin and neck area showing more than 70% improvement 6 months post 6 laser sessions of upper neck

Of the 64 patients of lower face, 16 (25%) had an excellent (more than 70%) response, 28 (43.7%) had good (more than 50%) response, 20 had less than 50% improvement after 6 sessions. [Graph 1]. There were no non responders or cases of worsening in this study. The laser was found to be equally effective and safe for both skin types IV and V.

Of the total, 28 patients (14%) had PCOD. In patients with PCOD, hormonal treatment (2 mg cyproterone acetate plus 30 micro grams of ethinyl estradiol) was started and continued during the laser sessions. Overall the result in patients with lower face laser was less than that of chin or upper lip alone.

Patients who were obese were advised to loose weight and we observed that this really helped especially in cases with end organ hypersensitivity (cases with normal hormonal profile). The likely explanation

for this would be that testosterone gets converted to dihydrotestosterone (DHT) in fat deposits and hair is more sensitive to DHT levels.

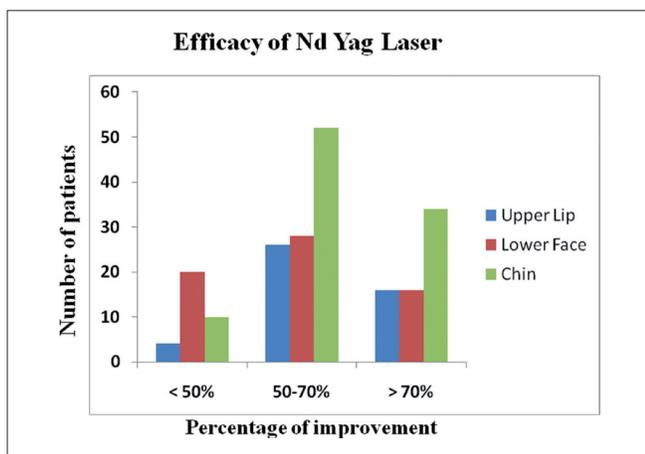
Most of the patients had complaints of long hair when the gaps were increased to more than 3 months, which we handled by decreasing the pulse width and hence giving higher energy levels. Also we explained regarding the long anagen syndrome induced by laser and proactively asked the patients to cut long hair with scissors. This significantly decreased the psychological impact on the patient.

Some of the patients showed a good improvement in the texture but no improvement in density of hair. In such cases we increased the gap between the sessions and gave higher energy levels after doing adequate cooling.

No significant side effects were observed during the study. Mild pain during laser and redness and perifollicular oedema after the session was seen in all the cases. Superficial brown crusts were seen in 4 cases (2%) which healed with topical steroids without leaving any sequeale in 7-10 days time. These were attributed to microscopic abrasions caused due to vigorous shaving leading to epidermal burns due to laser heat. We did not see any cases or laser burns or post inflammatory hyperpigmentation during this study.

**DISCUSSION**

Over the past decade, Laser hair reduction has been established as a safe and effective means to get long term reduction of unwanted hair on any body part. Different types of relatively long pulse width laser



Graph 1: Showing results 6 months after 6 sessions

systems, like the Alexandrite, Ruby, Diode, Nd: YAG and now the IPL have been tried and found to be safe and effective in all skin types. While there are a number of studies which document the safety of laser in white skin,<sup>[1,2]</sup> there is a paucity of data regarding the safety and efficacy of lasers in dark skin. Skin types IV and V by the virtue of having more melanin have higher chances of post inflammatory hyperpigmentation. Hence special care has to be taken in these cases to avoid any side effects. Adequate cooling is a must. We used a long pulsed Nd YAG with sapphire tip cooling.

Previous studies done on similar skin types by Galadari *et al.*,<sup>[3]</sup> Mittal *et al.*<sup>[4]</sup> and Goh *et al.*<sup>[5]</sup> have reported a hair reduction of around 30% after a single session, 60% after 3 sessions and up to 100% after 5-7 sessions. These studies have highlighted the importance of multiple sessions for achieving long term reduction of hair. In these studies the follow up period has varied from 4-12 weeks. In a study where the follow up period was 1 year the improvement after 6 sessions dropped to 35%.<sup>[3]</sup> This led to the question that whether Nd: YAG laser is giving long term reduction of hair or only a temporary delay of growth.

In our study, around 75% of patients of lower face reported more than 50% reduction after 6 sessions with a follow up of 6 months, which proves that Nd YAG gives a long term hair reduction after multiple sessions.

Laser for lower face needs to be supervised and the patient needs to be evaluated for any hormonal imbalance or end organ hypersensitivity and medical treatment needs to be instituted simultaneously. In our study, in patients with PCOD, hormonal treatment and laser treatment was started simultaneously and continued during the laser sessions. Overall the result in patients with lower face laser was less satisfactory than that of chin or upper lip alone

In the study by Galadari *et al.*,<sup>[3]</sup> the side effects seen were redness in 22.8%, superficial burn in 14.2%, scarring in 2.2% and hyperpigmentation in 2.2%.<sup>[3]</sup> Goh<sup>[5]</sup> in 2003 had reported no post inflammatory hyperpigmentation with long pulsed Nd: YAG laser in skin type IV-VI after a single session.<sup>[4]</sup> Studies have shown no pigmentary changes or scarring in skin types I-IV with long pulsed Nd: YAG laser.<sup>[6-8]</sup> In our study, we saw superficial burns in 2%. None of our cases showed scarring or post inflammatory hyperpigmentation. All

these side effects were completely reversible in 1-2 months.

We have not used topical anaesthetic preparations in any of the cases as they have a high potential of causing irritant reactions and subsequently burns with laser. Adequate precooling was done and significant pain was not perceived by any of the patients. Also in our study contact tip cooling with sapphire tip was done which made the session very comfortable and decreased the chances of side effects.

In all these studies the sessions have been done at a 4-6 week interval. In the current study while the first 2 sessions were done at a 4 week interval to target the hair in the early anagen phase, after that the gaps were increased. The resting phase of facial hair is around 4 weeks. One of the most prominent effects of Nd: YAG laser is the prolongation of the resting phase. Hence we recommend that the sessions should be spaced out from the 3<sup>rd</sup> session itself so that we target the hair in the anagen phase and the result stays for a longer time. Doing the sessions too frequently might lead to a temporary suppression rather than destruction of hair follicle. Controlled trials would be required to see the difference in the long term hair reduction achieved when sessions are done at 4 weekly intervals versus increasing the gaps after second session, before we can reach a definite conclusion.

## CONCLUSIONS

The current study with a large sample size of 200 patients and a follow up of 6 months, shows that long pulsed Nd: YAG is a very safe and effective means of hair reduction in skin types IV and V. Comparative studies would be required to evaluate the effect of increasing the gap between the initial laser sessions before a definitive recommendation can be made. There is a need for comparative study with other lasers like diode and light system (Intense pulse light). However, in our set up we had availability of Nd:YAG laser only. Henceforth, a comparative study was not possible.

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