

Low-fluence Q-switched neodymium-doped yttrium aluminum garnet (1064nm) laser for the treatment of facial melasma in local population

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Abstract

Objective To determine the efficacy and safety of Q-switched Nd:YAG 1064nm laser for melasma treatment.

Methods Thirty patients with melasma were treated with Qs-Nd:YAG laser 1064nm, 6mm spot size with 2.5-3.2J/cm² for four sessions 2 weeks apart. Pigmentation was assessed objectively with photographic evaluation and by decrease in the MASI score and subjectively by decrease in pigmentation assessed by grades of improvement. Patients were assessed 8 weeks after the last session. Adverse effects were recorded at each visit.

Results After four sessions, 20 (65%) of patients showed marked improvement, 6 (20%) showed moderate improvement and 4 (13%) showed poor response after 14 weeks of treatment. No significant side effects were noted. A decreased MASI score was significant at the end of 14 week's evaluation ($p<0.05$). Recurrence occurred in only 10% of patients who were advised to wear sunblock afterwards.

Conclusion Q-switched Nd:YAG 1064nm laser is an effective and safe treatment of melasma in our local population.

Key words

Melasma, pigmentation, Q-switched Nd:YAG laser, MASI score.

Introduction

Melasma is an acquired hyperpigmentation characterized by ill-defined dark brown macules and patches on the malar areas of the face which is commonly observed in the Asian population.¹

It occurs in all ethnic and population groups. However, epidemiological studies have reported

higher prevalence among more pigmented phenotypes, such as East Asians (Japanese, Korean and Chinese), Indian, Pakistani, Middle Eastern and Mediterranean African.² The three common clinical patterns of melasma are: centrofacial, malar and mandibular. Histologically, it is classified as epidermal, dermal and mixed type. Wood's lamp examination helps to distinguish between epidermal and dermal types of melasma.

Commonly used treatments for melasma include broad spectrum (ultraviolet A plus ultraviolet B) sunscreens and topical hydroquinone (HQ).³ Topical agents include retinoic acid, azelaic acid

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and kojic acid, while physical therapies include chemical peels, dermabrasion, lasers and intense pulsed light.

Different lasers including Q-switched ruby, Q-switched alexandrite and intense pulsed light have been used with varying degrees of success.¹ Recent studies have shown the efficacy of fractional lasers in treating melasma.⁴

In QS-Nd:YAG laser, melanin particles present within melanocytes, keratinocytes and dermal melanophages are targeted. The technique of repetitive subthreshold pulsed QS-Nd:YAG 1,064nm laser is effective treatment for melasma.⁵ Keeping in view the efficacy of the previous treatments, this study was designed to evaluate the efficacy and safety of low-fluence QS-ND:YAG 1064nm laser to treat melasma in our local population.

As melasma is a prevalent problem in our population,⁶ it is important to address it by latest techniques.

Methods

Thirty patients aged 21-52 years, with Fitzpatrick skin IV and V, suffering from epidermal, dermal and mixed type melasma were enrolled after written informed consent. It was an open-labelled interventional study carried out at the Lahore General Hospital/ Skin Life Clinic, Cavalry Ground Lahore from January to October 2016. Patients who were pregnant, taking oral contraceptives or on hormonal therapy, liver dysfunction and those who had used any bleaching or laser treatment during the past two months were excluded. Patients were instructed not to use any other forms of treatment during the study period.

After informed consent, all selected patients were registered using a predesigned proforma.

Their demographic data, history and clinical features were recorded. All patients were diagnosed clinically after history, thorough clinical and Wood's lamp examination.

Efficacy was evaluated by lightening of the pre-existing lesions, determined by the reduction in the melasma area severity index (MASI).⁷ Improvement was graded as no improvement, (no change), mild (<25% improvement), moderate (25-50%), and marked (51-75%).

Components include percentage of the total area involved (A), darkness (D) and homogeneity (H) assessed at each visit.

For area, face was divided into four parts: forehead (F), right malar region (RMR), left malar region (LMR) and chin (C) corresponding to 30%, 30%, 30% and 10%. Calculation of area (A) is based upon the following: Each area is given a numerical value with 0= minimal or no involvement, 1 =10% involvement, 2 (mild) = 10-29% involvement, 3 = 30-49% involvement and 4= 50-69% improvement, 5= 70-89% and 6 =100%. Darkness of the pigment was calculated by D=0-4, where 0=absent/ no pigmentation, 1=slight visible hyperpigmentation, 2=mild, 3=marked, 4=severe), homogeneity or density of hyperpigmentation (number of pigmented lesions per unit facial area), (H=0-4: 0=minimal, 1=slight, 2=mild, 3=marked, 4=severe).

MASI was calculated as follows:⁷ MASI score = 0.3 (D+H)A + 0.3 (D+H)A + 0.3 (D+H) A + 0.1 (D+H)A, corresponding to the forehead, right malar, left malar, and chin, respectively.

Starting point was score at baseline and primary endpoint was reduction in MASI at 14 weeks follow-up at the end of treatment.

Q-switched Nd:YAG 1064nm laser was used to deliver 2-4 J/cm² at 6 mm spot sizes, with a

pulse duration of 5-7 nanoseconds and a repetitive rate of 10 Hz for treating melasma. Patients were assessed fortnightly for improvement, as well as, for further sessions 2 weeks apart. Reduction in MASI score from baseline was noted. Any side effect was noticed and treated accordingly.

Data were entered into SPSS version 15. All quantitative data was expressed as percentages. Reduction in MASI before and after was evaluated by independent sample t test. A *p* value of <0.05 was considered statistically significant.

Results

Demographics of the 30 patients were as under:

Age range was 21-52 years with a mean age of 28.90 ± 7.18 years. Mean MASI score was 27.47 ± 6.093 .

The most common type was centrofacial melasma in 18 (60%), seconded by malar 10 (33%) and mandibular in 2 (6.6%).

Examination on Wood's lamp revealed epidermal to be the most common type 12 (40%), closely followed by mixed in 9 (30%), and dermal in 9 (30%) patients.

Twenty patients showed marked improvement, 6 moderate and 4 did not show any improvement at all (**Table 1**).

There was a decrease in MASI over a period of 6 weeks (**Figure 1**) where the initial MASI score decreased from 27.47 ± 6.093 at week 0 to 25.92 ± 4.547 at 2 weeks, 19.63 ± 3.42 at 4 weeks to 14.28 ± 2.54 at 6 weeks. There was a slight increase in MASI over a 14-week period to 16.06 ± 2.43 with a decrease of 41.5% from the baseline with a *p* value of < 0.05.

Figure 2 and **3** show improvement at 14 weeks of Qs-Nd: YAG laser therapy.

Mild erythema, edema were seen in 40% of patients. Edema disappeared within 2-3 days after treatment. Erythema, however persisted in 7 patients for 1 week which resolved later after application of sunblock and cooling techniques. Hyperpigmentation was seen in 3 patients and itching was seen in 2 patients, but this was not statistically significant.

Table 1 Degree of melasma improvement (n=30).

Improvement	N = 30
Marked	20 (65)
Moderate	6 (20)
Not improved	4 (15)

mild if there was <25% improvement, good with 51-75% and marked with >75% improvement

Table 2 Adverse events seen in study population (n=30).

Adverse events	N (%)
Erythema	7 (23.3)
Hyperpigmentation	3 (10)
Itching	2 (6.7)

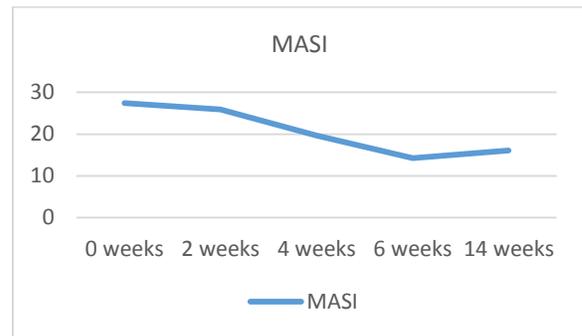


Figure 1 Decrease in melasma area severity index (MASI) with treatment, 41.6% reduction in the MASI scoring from baseline (*p*< 0.05).



Figure 2 Patient of melasma at baseline (0 weeks).



Figure 3 Patient at 14 weeks with moderate improvements

Discussion

Melasma is a very common problem in the Asian population, which is difficult to treat.⁸ Different treatments have been tried over time, but most of them have not been successful. Lasers have been evaluated recently for these treatments, but the results have been varied in this regard.⁸

Qs-Nd:YAG lasers follow the principle of selective photothermolysis⁴ which limits the tissue damage around the cells.

The age group of patients in the study was 21-52 years, which is similar to a study by Kumar *et al.*⁸ where the age range was 21-40 years and Javaheri *et al.*⁹, in which, a mean age group of 27.4 years was affected.

Centrofacial melasma was the most common type observed in other studies.^{7,8}

In the present study, the mean MASI score at baseline was 27.47 ± 6.093 , more than that in the study by Suh *et al.*¹ where the initial MASI score at baseline was 14.5 ± 1.47 and in the study by Wattanakrai *et al.*³ where the initial MASI score was 22.3 ± 1.8 .

In the study by Tomar *et al.*² 12.47 ± 5.093 was the initial MASI score. In contrast, in the study by Bansal *et al.*¹⁰, the initial MASI score was 21.11 ± 6.91 , closer to our study. The difference in the baseline MASI could be due to racial and ethnic differences. Also, a lower score in these studies could be due to prior use of skin-lightening creams that is a common practice.

In this study, there was a decrease of 41.6% from the baseline MASI scoring. A similar trend was noted in the study by Suh *et al.*¹, where there was a difference of 35% from the baseline score. Statistically significant improvement was seen at 7 and 10 weeks of treatment. Similarly, in the study by Wattanakrai *et al.*³, there was an improvement of 65% from the baseline. In the study by Zhou *et al.*¹¹, in melasma, after treatment with Q-switched Nd:YAG laser, mean MASI decreased from 10.6 ± 5.6 to 4.1 ± 3.9 (61.3%) at the end of the study.

Despite the improvement, some side effects were seen in this treatment. In the study by Wattanakrai *et al.*³, there were side effects like mottled hyperpigmentation. The patients had to go through an additional 10 weekly intervals to treat recurrent melasma confetti-like

hyperpigmentation. Post-inflammatory hyperpigmentation in Asian skin is a problem.

In the study by Zhou *et al.*¹⁰, adverse effects seen were frosting, erythema, edema and scarring. Other studies have found hypopigmentation and depigmentation with this treatment.¹²

Side effects seen in this treatment were mild edema, disappearing 2-3 days after treatment. Erythema persisted in 7 patients and persistent hyperpigmentation seen in 3 patients.

Conclusion

Q-switched Nd:YAG laser is a safe and effective treatment for melasma in the Pakistani population. However, it has to be supplemented with long-term use of sunblock.

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