

Efficacy of Q-switched Nd:YAG Laser 1,064nm for the treatment of melasma

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Abstract

Objective To evaluate the efficacy of Q-Switched Nd:YAG laser 1,064nm for the treatment of melasma.

Methods A total of 100 patients were included in this study. Treatment area was cleansed and Q-Switched Nd:YAG laser 1,064nm, was delivered with settings of 3mm spot size, energy fluence ranging from 500-700 joules and repeated frequency at 6 Hz. Clinical response was assessed by MASI score.

Results A total of 100 patients were included in the study. Mean age of the patients was 31.18±5.51 years. There were 13 males (13%) and 87 females (87%). Mean duration of disease was 1.99±0.88 years. Type of melasma was as follows: epidermal 47 (47%), dermal 31 (31%) and mixed 22 (22%). Q-Switched Nd:YAG laser 1,064nm for the treatment of melasma was effective in 59 patients (59%).

Conclusion 1064nm Nd:YAG laser was safe, effective and well-tolerated by all patients.

Key words

Melasma, Q-Switched Nd:YAG Laser 1,064nm, efficacy.

Introduction

Melasma is an acquired hyperpigmentary disorder characterized by development of blotchy, light-to-dark brown macules on sun-exposed skin.¹ It occurs most commonly in women, especially those living in areas of intense sunlight.² It is also common among Asian women.³ About 10% cases occur in men.⁴ On the basis of Wood's lamp examination, melasma is classified into epidermal, dermal, and mixed.⁵

The melasma area and severity index (MASI) is the scoring system used to quantify the severity

of melasma.⁶ The exact etiology of melasma and statistical data about its incidence is not known. However, various contributing factors include exposure to ultraviolet light, genetic predisposition, pregnancy, oral contraceptives, hormone replacement therapy, thyroid autoimmunity, cosmetics ingredients and phototoxic drugs.⁷ All common treatments of melasma fall into four broad categories: the reduction of melanin synthesis (often through the inhibition of tyrosinase), the increase of melanin transfer & shedding, skin resurfacing, and pigment selective lasers.⁸ Current first line therapies include topicals such as hydroquinone alpha arbutin, tretinoin, licorice and alpha hydroxyl acid.⁹⁻¹⁰

Some investigators have found sub-thermolytic

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	0	1	2	3	4	5	6
Darkness of pigment (D): Severity scale (scale 0-4)	None	Slight	Moderate	Marked	Very marked		
Homogeneity of pigment (H): (scale 0-4)	No pigment	Specks	<2 cm patches	>2 cm patches	Homogenous		
Surface area involved (A)		<10%	10%–29%	30%–49%	50–69%	70-89%	90-100%
Site involved	Forehead	Rt. malar	Lt. malar	Chin			
MELASMA AREA (scale 1-6) MA							
Multiplication factors (MF)	0.3	0.3	0.3	0.1			
MA × MF							Total area (A)

MASI: Melasma area and severity index

Q-Switched Nd:YAG laser therapy to be safe and effective in the treatment of melasma.⁹⁻¹⁰ Q-Switched laser induce high local temperature gradients between melanosomes and their surrounding structures, causing melanosomes to rupture. High pressure acoustic waves from this interaction leads to melanocyte cell death.¹¹

Melasma is a common disease and has negative impact on quality of life due to cosmetic disfigurement. Number of treatment modalities has been used but the disease is recalcitrant in terms of its clearance and recurrence.¹² This study was conducted to determine a better treatment option like Q-Switched Nd:YAG laser for the treatment of melasma in our setup.

Methods

Data was collected from 100 patients aged 18-40 years, with Fitzpatrick skin type III-V, suffering from epidermal, dermal or mixed type melasma with 6-20 baseline MASI score presenting in OPD of Dermatology Department, Mayo Hospital, Lahore. Patients who were pregnant, taking oral contraceptives, thyroid dysfunction and those with herpes simplex infection and keloid or hypertrophic scars at the site of melasma were excluded. After approval from the ethical committee of the hospital, an informed consent was obtained to include their data in the study. Complete history and physical examination was done. Type of melasma was identified using Wood's lamp. Baseline MASI

score was calculated. Treatment area was cleansed and Q-Switched Nd:YAG laser 1,064nm, was delivered with a settings of 3mm spot size, energy fluence ranging from 500-700 joules and repeated frequency at 6 Hz. The hand piece was moved slowly to allow the laser to be scanned over the lesions for approximately 2-3 passes. Patient was instructed to apply sunscreen during day time. Clinical response was assessed by MASI score. Baseline photographs were taken. Twelve sessions were carried out at weekly intervals. Monthly follow up was done for 3 months. At the end of the study, photographs were taken again to compare with baseline photographs, and the efficacy was calculated by decrease area of hyperpigmentation, objectively calculated by $\geq 50\%$ reduction in MASI score after 6 months.

Data entry and analysis was done by using SPSS 12. Quantitative data like age was presented by using mean and SD. Qualitative data like genders efficacy was presented by using frequency and percentages. Data was stratified for type of Melasma (dermal, epidermal, mixed), duration of disease and Fitzpatrick's skin type to deal with effect modifier. Post stratification chi-square test was applied keeping a p-value ≤ 0.05 as significant.

Results

Demographics of 100 patients were as under:

Table1 Distribution of cases by efficacy of Q-Switched Nd:YAG laser 1,064nm for the treatment of melasma.

<i>Efficacy(> 50% reduction in baseline MASI score)</i>	<i>Number</i>	<i>Percentage</i>
Yes	59	59.0
No	41	41.0
Total	100	100.0



Figure 1 Stratification with regard to type of melasma, duration of disease and Fitzpatrick's skin type was carried out

Mean age of the patients was 31.18±5.51 years. Mean duration of disease was 1.99±0.88 years. There were 13 males (13%) and 87 females (87%). Type of melasma was as follows: epidermal 47 (47%), dermal 31 (31%) and mixed 22 (22%). Fitzpatrick's skin type III were having 6 patients (6%), type IV 68 patients (68%) and type V 56 patients (56%). Q-

Switched Nd:YAG laser 1,064nm for the treatment of melasma was effective in 59 patients (59%).

Discussion

Treatment of pigmented skin lesions is possible nowadays using various laser systems. As melanin has a broad absorption spectrum, Q-switched Nd:YAG, ruby and alexandrite lasers have all been evaluated for the treatment of such lesions. Q-switched lasers create a very short pulse (5-100 nanoseconds) together with an extremely high power. Also, Nd:YAG laser at 1064 nm has deep dermal penetration and does not target epidermal melanin much, hence post treatment hyperpigmentation is not that common¹⁴.

The Q-switched laser, works on the principle of selective photothermolysis which deliver bursts of wavelength specific energy that can be absorbed by dermal melanosomes without producing inflammation or epidermal damage¹⁹.

Present study demonstrated marked improvement in melasma after Q-switched Nd:YAG laser therapy. Twelve sessions were carried out at weekly intervals. Monthly follow up was done for 3 months after the last session. Therapeutic satisfaction was statistically increased at 4 weeks and continued until 3 months after the last treatment.

Table 2 Stratification of results of 100 patients based upon clinical type of melasma, duration of disease and Fitzpatrick's skin type

	<i>Clinical Type of Melasma</i>			<i>Duration Of Disease(years)</i>		<i>Fitzpatrick's Skin Type</i>		
	<i>Epidermal</i>	<i>Dermal</i>	<i>Mixed</i>	<i>1 - 2</i>	<i>3 - 4</i>	<i>III</i>	<i>IV</i>	<i>V</i>
Efficacy								
(> 50% reduction in MASI Score)	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
% Of Patients	41/6	9/22	9/13	49/27	10/14	4/2	26 12	29/27
Total no of patients	47	31	22	76	24	6	38	56
P Value	< 0.001			0.048		0.253		
Chi square	29.974			3.922		2.745		

In our study, 59% of the patients had 50% decreases in their baseline MASI score. These results are comparable with some of the local and international studies

In the study by Zhou *et al*¹² fifty patients aged 28-53 years were enrolled in the study (47 female; 3 male). All were treated using the 1064-nm Q-Switched Nd:YAG laser with 6mm spot size, and a fluence of 2.5 to 3.4 j/cm² weekly for nine sessions. Follow-up was done 3 months after the last laser session, 70% of patients had more than a 50% decrease in their MASI score, and 10% had 100% clearance.

In the study by Sim *et al*¹⁴ total of 50 patients aged 36–52 years with melasma were enrolled in the study. The patients underwent 15 weeks of weekly treatments using a Q-switched Nd:YAG 1,064nm laser with 8mm spot size, and a fluence of 2.8 j/cm². The level of improvement was subjectively evaluated by three investigators by comparing before and after photographs of the patients, and found 50–74% improvement.

In a study by Tahir kamal¹⁵ conducted in the Lahore General Hospital/ Skin Life Clinic, Cavalry Ground Lahore from January to October 2016. 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, after four sessions there was 75% improvement in MASI score in 65% of patients.

Results of these studies may not be exactly comparable to our study due to different total number of treatment sessions performed. We evaluated the responses in relation to clinical type of melasma, duration of disease, and Fitzpatrick's skin type in our population but to the best of our knowledge, no existing research has such evaluation.

Conclusion

In conclusion, using the 1064nm Nd:YAG laser was safe and effective, and well-tolerated by all patients. Larger controlled studies are merited with more objective measurement techniques to confirm the results of this study.

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