

## Original Research Article

# Efficacy and safety of 70% glycolic acid versus Q Switched Nd:YAG laser in the treatment of melasma: a comparative study

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Received: 11 January 2017

Accepted: 30 January 2017

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## ABSTRACT

**Background:** Melasma is an acquired hypermelanosis characterized by light-to-deep brown pigmentation over cheeks, forehead, upper lip, and nose. Treatment of this condition is difficult and associated with high recurrence rates. Among newer therapies, there is interest in the use of glycolic acid peels and Q-switched Nd:YAG laser (QSNYL). The aim of the present study was to compare the therapeutic efficacy and in melasma.

**Methods:** 60 patients of melasma were included. They were randomly divided in two groups (Group A = 30 patients treated with glycolic acid and Group B = 30 patients treated with QSNYL). Out of the 60 patients included, 26 patients in Group A, 24 patients in Group B completed the study. Response to treatment was assessed using MASI scores.

**Results:** The peak incidence of melasma was seen in the age group 31-40 years. Female preponderance was seen in the study (F: M-6.6:1). Sunlight was the common aggravating factor in both the groups (30%). Malar type was the most common (51.7%) observed in both the groups. MASI scores improved from 7.14 to 4.99 with glycolic acid peel and from 6.17 to 4.67 in the laser group at the end of the study. The common adverse effect observed in the study was erythema in both the groups. Postinflammatory hyperpigmentation was frequent in laser treated patients.

**Conclusions:** 70% Glycolic peels were better than Q switched Nd:YAG laser for the treatment of melasma. Among patients treated with laser postinflammatory hyperpigmentation was a significant side effect especially in darker skin types.

**Keywords:** Melasma, 70% glycolic acid, Q switched Nd:YAG laser

## INTRODUCTION

Melasma is a common acquired hypermelanosis characterised by more or less symmetrically distributed, medium to dark brown macules predominantly over sun exposed areas of the face. It commonly affects people of darker skin types.<sup>1,2</sup> In today's modern world, it is a cause of great emotional and psycho-social stress to both men and women, affecting their quality of life.<sup>3</sup>

Sun protection is of paramount importance in the management of melasma. Agents such as hydroquinone,

tretinoin, azelaic acid, rucinol and kojic acid are helpful when used for prolonged periods. Kligman formula referred to as the triple combination comprising of hydroquinone, tretinoin and a mild topical corticosteroid is considered as a standard first line treatment but has its own share of side effects.<sup>4</sup> Chemical peels and laser therapy may be helpful as yet another option in the management of melasma.

Glycolic acid is an alpha hydroxy acid most commonly used as a chemical peel in varying concentration ranging from 20% to 70%. They are effective and safe in individuals with skin types 5 and 6 but the concentration

and peeling time must be titrated with caution in these darker skin types.<sup>5</sup>

Various lasers have been used for melasma, of which Q switched Nd: YAG laser is commonly used.<sup>6</sup> These lasers disrupt the melanin granules in the upper dermis and the tiny melanin granules are engulfed by macrophages.<sup>7</sup> Epidermal melasma responds faster and better than dermal or mixed melasma. Post inflammatory hyperpigmentation and rebound melasma are common and improvement has to be maintained by repeated treatment sessions.<sup>8</sup>

This study was conducted with the aim to compare the efficacy, clinical outcomes and side effects of 70% glycolic acid peels and Q switched Nd:YAG laser in the treatment of melasma as standalone treatments along with sun protection.

## METHODS

60 patients diagnosed as melasma were enrolled in the study at the Department of Dermatology, Venereology and Leprosy at SRM Medical College Hospital and Research Centre, from March 2012 to August 2013. The patients were randomly divided into two groups (Group A: 30 patients of melasma treated with 70% glycolic acid, Group B: 30 patients of melasma treated with Q Switched Nd:YAG laser with 1064nm wave length). Patients on oral contraceptives, hormone replacement therapy, pregnant, and lactating women, patients with any systemic or endocrinological illness or hypersensitivity to the chemical peel, patients with photosensitive dermatoses, recurrent herpetic infections, *Molluscum contagiosum*, viral warts, active bacterial infections, HIV and HBsAg were excluded.

Patients fulfilling the above criteria were asked for a written consent for their participation in the study. Clinical photographs were taken before starting the study.

### **Procedure for treatment with 70% glycolic acid**

Procedure was divided into 3 steps.

#### *Pre peel*

Patients were advised to use 6% glycolic acid cream for 2 weeks at night and to use sunscreen SPF 15 during the day and repeat application if necessary after three hours.

#### *Actual peeling*

#### *Skin preparations before peeling*

The patients were asked to wash the face with soap and water and they were asked to lie down with head elevated to 45 degrees, the eyes closed with eye pads. The skin was degreased with alcohol.

### *Procedure*

The required strength of the peeling agent was poured into a bowl and neutralizing agents were kept ready. Sensitive areas like the inner canthus of the eyes and nasolabial folds were protected with vaseline. The peeling agent was then applied with a brush. The peel was applied on the entire face, beginning from forehead, then the right cheek, nose, left cheek and chin in that order. If required, the perioral, upper and lower lids were treated last. Feathering strokes were applied at the edges to blend with surrounding skin and prevent the demarcation lines. The peel was neutralized after the predetermined duration of 3 minutes. The neutralization was done with 10-15% sodium bicarbonate and then, washed off with water and dapped with ice cubes. In case of erythema or frosting before 3 minutes the peel was neutralized immediately.

#### *Post peel care*

The patient was advised to avoid prolonged exposure to sunlight, to use sunscreen SPF 15 every 3 hourly interval, and avoid any kind of topical therapy on the face. This procedure was done at 2 weekly interval for 6 sittings in a period of 12 weeks. MASCI score was estimated and clinical photographs were taken after every sitting.

### *Laser*

Low fluence Q Switched Nd: YAG Laser (1064 nm) was used in our study. 6 sessions of laser at 2 weekly interval was done for a period of 12 weeks. Topical anaesthesia (mixture of lignocaine and prilocaine) was applied 1 hour prior to laser under occlusion. The procedure was done in a room specially meant for lasers and eyes protected with protective glasses. The patient was made to lie down comfortably over the couch with head elevated to 45 degrees. Laser shots were administered at parameters 6-8 mm spot size, 4-5 Hz, 0.5-1 J/m sq, with 2 passes done at 2 weekly intervals, with an increment of 0.1j/cm sq was done at every session till the energy fluence of 1 J/cm sq is attained at the 6th session. Passes were stopped in case of immediate erythema.

#### *Post procedure*

Patients were advised to use sunscreen SPF 15 during the day and repeat the application at 3 hours interval and avoid any kind of topical therapy.

MASI (melasma area severity index score) was assessed and clinical photographs were taken before and after every sitting.

### *Statistical analysis*

All data collected using a proforma were entered in Microsoft excel 2007 sheet and a master chart was prepared. The data was analysed using statistical package

for social studies software version 17.0. Chi square test was used to evaluate correlations between variables. A p value of <0.05 was considered significant.

## RESULTS

Table 1 presents the demographic data of the patients. Out of 60 patients who were included in the study, there were 52 (86.7%) females and 8(13.3%) males. The female: male ratio was 6.6:1. In the present study, peak incidence (55%) of melasma was in the age group 31-40

years. The mean age of the patients in peel group was  $35.20 \pm 6.84$  and laser group was  $35.80 \pm 7.12$ . Of them 90% were married remaining 10% were unmarried. In both the groups, the duration of the disease ranged from 6 months to more than 5 years. A positive family history was seen in a total of 26 (43.3%) patients in both the groups. Most of them were first degree relatives. History of topical therapy was present in 40 (66.7%) patients. All the two groups are comparable with no statistically significant difference ( $P > 0.05$ ) based on the age, gender, marital status and duration of disease.

**Table 1: Demographic data of the study participants in both the groups.**

Variables	Peel group		Laser group		Total		P value
	No	%	No	%	No	%	
<b>Age in years</b>							
22-30	9	30.0	7	23.3	16	26.7	0.740
31-40	17	56.7	16	53.3	33	55.0	
41-50	3	10.0	6	20.0	9	15.0	
51-60	1	3.3	1	3.3	2	3.3	
<b>Gender</b>							
Male	3	10.0	5	16.7	8	13.3	0.706
Female	27	90.0	25	83.3	52	86.7	
<b>Marital status</b>							
Married	29	96.7	25	83.3	54	90.0	0.195
Unmarried	1	3.3	5	16.7	6	10.0	
<b>Duration of disease</b>							
<6 months	2	6.7	2	6.7	4	6.7	0.944
6-12 months	6	20.0	6	20.0	12	20.0	
1-2 years	8	26.7	7	23.3	15	25.0	
2-5 years	6	20.0	9	30.0	15	25.0	
>5 years	8	26.7	6	20.0	14	23.3	

**Table 2: Aggravating factors.**

Aggravating factors	Peel group(n=30)		Laser group(n=30)		Total (n=60)		P value
	No	%	No	%	No	%	
<b>Sun light</b>	11	36.7	7	23.3	18	30.0	0.260
<b>Cosmetics</b>	4	13.3	10	33.3	14	23.3	0.067
<b>OCPs</b>	5	16.7	3	10.0	8	13.3	0.706
<b>Others</b>	0	0.0	0	0.0	0	0.0	-

**Table 3: Clinical types of melasma.**

Clinical type	Peel group		Laser group		Total		P value
	No	%	No	%	No	%	
<b>Centro Facial</b>	13	43.3	7	23.3	20	33.3	
<b>Malar</b>	13	43.3	18	60.0	31	51.7	
<b>Mandibular</b>	4	13.3	5	16.7	9	15.0	
<b>Total</b>	30	100.0	30	100.0	60	100.0	

Sunlight was found to be an aggravating factor in 18 patients followed by cosmetics in 14 patients and OCPs in 8 patients as given in Table 2.

Malar type was the most common (51.7%), followed by centrofacial melasma (33.3%) and mandibular in 15% patients. The distribution of clinical pattern in each group is given in Table 3.

In our study 4 patients in the peel group and 6 patients in the laser group dropped out of the study before 12 weeks. In the peel group three patients dropped out after the 3rd

sitting and one more after the 4th sitting. In the laser group two patients each dropped out at the end of 2nd, 3rd and 4th sittings respectively as given in Table 4.

**Table 4: Dropouts of both the groups from the study at different time schedules of treatment.**

Lost-to-follow up	Peel group		Laser group		Total	
	No	%	No	%	No	%
Available for study	26	86.7	24	80.0	50	83.3
Lost-to-follow up	4	13.3	6	20.0	10	16.7
Total	30	100.0	30	100.0	60	100.0

**Table 5: Evaluation of MASI scores of the study participants in both the groups.**

MASI score	Peel group	Laser group	P value	All cases
<b>MASI-1</b>	7.14±3.76	6.17±2.73	0.254	6.66±3.29
<b>MASI-2</b>	7.08±3.74	4.82±3.41	0.017*	5.95±3.73
<b>MASI-3</b>	6.34±3.55	4.88±3.33	0.111	5.63±3.49
<b>MASI-4</b>	5.66±3.20	4.87±3.34	0.383	5.26±3.26
<b>MASI-5</b>	5.30±3.22	4.88±3.26	0.646	5.09±3.22
<b>MASI-6</b>	4.99±3.08	4.67±3.24	0.717	4.84±3.12

In the present study melasma area severity index (MASI) score improved from 7.14 to 4.99 with glycolic acid peel and from 6.17 to 4.67 in the laser group at the end of the study. Statistically significant results were seen when the responses were compared after the 2nd sitting with the Laser group showing better result ( $p = 0.017$ ) as seen in Table 5. The response to lasers plateaus out after the 2nd sitting and in fact there is a mild worsening of the MASI scores noted at the end of the 3rd sitting, while the MASI scores continue to decrease till the last sitting in the peel group.

In this study, the mean improvement in peel group was 30.11% and the laser group was 24.31% at the end of 12 weeks as given in Table 6.

**Table 6: Comparison of improvement (%) from baseline in both the groups.**

Follow up	Peel group	Laser group	All cases
<b>MASI-1</b>	-	-	-
<b>MASI-2</b>	0.84	21.88	10.66
<b>MASI-3</b>	11.20	20.91	15.47
<b>MASI-4</b>	20.73	21.07	21.02
<b>MASI-5</b>	25.77	20.91	23.57
<b>MASI-6</b>	30.11	24.31	27.33

In the present study 20% – 50% improvement was seen in maximum number of patients that is 16 patients in peel group and 10 patients in laser group. More than 50% improvement was observed only in one patient of the laser group and 2 patients in the glycolic peel group as tabulated in Table 7.

The adverse effects in each study group are given in Table 8. Most common side effect of peels was erythema

sitting and one more after the 4th sitting. In the laser group two patients each dropped out at the end of 2nd, 3rd and 4th sittings respectively as given in Table 4.

**Table 7: Comparison of response in both groups at the end of 12 weeks.**

Improvement	Peel Group (n=26)		Laser Group (n=24)		Total (n=50)	
	No	%	No	%	No	%
<20%	8	30.8	13	54.2	21	42.0
20-50%	16	61.5	10	41.7	26	52.0
>50%	2	7.7	1	4.2	3	6.0
<b>Inference</b>	Improvement in two groups is statistically similar with $p=0.288$					

**Table 8: Adverse effects of the treatments in both the groups.**

Adverse effects	Peel group (n=26)	Laser group (n=24)
<b>Erythema</b>	13	9
<b>Post inflammatory hyperpigmentation</b>	5	10
<b>Mild pigmentation</b>	-	3
<b>Moderate pigmentation</b>	-	5
<b>Severe pigmentation</b>	-	2
<b>Frosting</b>	2	-
<b>Mild scaling</b>	1	-
<b>Transient burning</b>	-	2
<b>Frosting</b>	-	1

## DISCUSSION

Melasma causes significant social and emotional stress to the patients and although many treatment modalities are available, its management remains a challenge due to its recurrent and refractory nature. In our present study we have compared the efficacy and safety of 70% glycolic acid and Q switched Nd:YAG laser in the treatment of melasma.

In our study the majority of patients were in the age group of 31-40 years akin to studies done by Kar et al and Bansal et al.<sup>3,9</sup> About 86.7% of our study population were females and 90% of the cases were married. In most of the cases the duration of melasma ranged from 6 months to 5 years and a family history was obtained in 43.3% of cases. Goyal et al too observed that the average duration of melasma was 60 months.<sup>10</sup> Exposure to sunlight aggravated melasma in about 30% of our cases, a finding similar to 39% as reported by Hurley et al.<sup>11</sup> Malar pattern was the most common pattern of melasma observed in our study. Bansal et al however observed that centrofacial pattern was the commonest followed by malar and mandibular types.<sup>3</sup>

The overall dropout rate in our study was 13.3% among peel group and 20% in the laser group. The dropout rates are similar to the observations by Goyal et al.<sup>10</sup> The development of post inflammatory hyperpigmentation was the prime reason resulting in dropping out of the study, especially in the laser group.

MASI score based on the area, pigmentation and homogeneity of the patches were assessed at the beginning and at the end of each session. In the glycolic peel group, MASI scores improved from 7.14 to 4.99 and in the laser group from 6.17 to 4.67. On further observation we found that the improvement in laser group is very good with the first 2 sittings after which there is no significant improvement. This observation is likely to be due to the fact that the epidermal component of the melasma responds faster with laser therapy while the dermal component takes a longer time to respond. In the case of 70% glycolic peels, visible and significant improvement was observed after the 3<sup>rd</sup> sitting onwards. Goyal et al found an improvement of 33% in MASI scores with 50% glycolic peel and 47% with 70% glycolic peel.<sup>10</sup> Sachdeva et al too concluded that 35%-70% glycolic acid was effective in the treatment of melasma.<sup>12</sup>

Zhou et al using Q switched Nd:YAG 1064 nm laser observed a mean decrease in MASII by 61.3%.<sup>13</sup> However in our study the mean improvement with Nd:YAG laser treatment at the end of 12 weeks was only 24.31%. More than 50% of study population had less than 20% improvement. These findings seem to suggest that Q switched Nd:YAG laser may not be very effective in people with darker skin tones.

The adverse events associated with 70% glycolic peels included transient and patchy erythema (50%), frosting (7.6%), mild scaling and post inflammatory hyperpigmentation (19.2%). Puri reported burning sensation (6.6%), erythema (10%), post inflammatory hyperpigmentation (13.3%) as the common adverse effects of peels.<sup>14</sup>

We found that worsening of melasma was higher in the group treated with laser with 41.7% of patients developing post inflammatory hyperpigmentation. Transient erythema was observed in 37.5% of cases. Wattanakrai et al reported spotty hypopigmentation (13.6%) and rebound hyperpigmentation (18%) as the main adverse effects with laser treatment of melasma. In their study all patients had recurrence.<sup>15</sup>

Recent reviews on the treatment of melasma with lasers in pigmented skin suggest that it should not be used as a first line treatment but only considered when other treatments have failed.<sup>16</sup> Chemical peels remain popular for the treatment of pigmentation and aesthetic improvement. They are best used in combination with other treatments.



**Figure 1: Clinical photographs showing improvement of melasma with chemical peel treatment on 1st and 6th sitting.**



**Figure 2: Clinical photographs showing improvement of melasma with laser treatment on 1st and 6th sitting.**



**Figure 3: Worsening of pigmentation on 6th laser sitting.**

## CONCLUSION

70% Glycolic peels were better than Q switched Nd:YAG laser for the treatment of melasma. However the results were not statistically significant. Dropout rate and development of post inflammatory hyperpigmentation were higher in the laser treated group. Among patients treated with laser, better results were obtained in the first two sittings. The main drawback of this study was that we were unable to follow up the patients after the end of the treatment phase for recurrence.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the institutional ethics committee*

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**Cite this article as:** Divya KG, Narasimhan M, Rajagopalan V, Parveen B. Efficacy and safety of 70% glycolic acid versus Q Switched Nd:YAG laser in the treatment of melasma: a comparative study. *Int J Res Dermatol* 2017;3:1-6.