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**Original Research Article**

# A prospective, randomised, split-face comparative study of 50% glycolic acid peel versus laser toning in the treatment of melasma in Asian skin

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## ABSTRACT

**Background:** Although various treatment options are available for the management of melasma, still it is challenging disorder to treat. Apart from topical therapies, newer modalities like laser toning and chemical peeling are being explored to manage this notorious dermatosis. To evaluate and compare the efficacy and side effects of laser toning versus 50% glycolic acid peel in the management of melasma.
**Methods:** A split face comparative study was done in 30 female patients with melasma. Over the right half of patient's face laser toning was done whereas other half was treated with 50% glycolic acid peel. 4 such sessions were given at an interval of 15 days. Response to treatment was assessed using melasma area and severity index (MASI) score.
**Results:** Baseline mean MASI score on right and left half of patient's face was 7.85±3.34 and 6.25±1.56 respectively. After completion of 4 treatment sessions, it was reduced to 4.23±1.45 and 3.71±1.10 respectively with statistically insignificant difference between two halves (p=0.08). Recurrence rate of melasma was higher (46.66%) with laser toning in comparison to glycolic acid peel (26.6% patients).
**Conclusions:** Glycolic acid peel and laser toning were comparable in terms of outcome with laser toning showing slightly better results. In comparison to peels recurrence rate and complications like hypopigmentation in Asian patients were higher with laser toning.

**Keywords:** Hyperpigmentation, Chemical peeling, Nd-YAG laser

## INTRODUCTION

Melasma is a chronic and relapsing disorder of pigmentation, treatment of which remains annoying both to the patient and the treating dermatologist.[1] Dark skin types (Fitzpatrick types IV to VI) are especially arduous to treat because of increased risk of post-inflammatory hyperpigmentation (PIH).[2] The treatment ranges from wide variety of topical agents to chemical peels and advanced light based devices like lasers. Laser toning commonly involves the use of Q-switched Nd: YAG laser with large spot size and low fluence.[3] During each session, the laser beam is passed multiple times over the concerned area until a clinical endpoint is reached. On the other hand, chemical peels form the second-line of treatment in the management of melasma after topical therapy.[4] Present study was conducted to evaluate and compare the efficacy and side effects of laser toning versus 50% glycolic acid peel in the management of melasma.

## METHODS

This was a prospective split-face comparative study was done in 30 female patients between the age group 20-45

years having moderate to severe bilaterally symmetrical or asymmetrical distribution of melasma**.** The recruitment period was from March, 2018 to April 2019 and the study was conducted at tertiary care centre in Amritsar. Written informed consent from the patients and ethical committee clearance for the study was obtained from the institution. In this split face study, on right half of each patient's face Q-switched 1064 nm Nd: YAG laser toning was done with following laser parameters-spot size - 6 mm, fluence-3J/cm$^2$, repetition rate-10 Hz, end point - multiple number of passes over the melasma until mild erythema was seen. On contralateral half i.e., on left side chemical peeling was done with 50% glycolic acid for duration ranging from 2-8 minutes.

Pre peel regimen with daily application of 12% GA cream for 2 weeks before starting treatment was advised. Total number of 4 such treatment sessions were given at an interval of 15 days. Follow up was done to document recurrence and any delayed side effects after 1 month and 3 months after the last treatment session.

***Exclusion criteria***

Pregnancy. Use of hormonal contraceptives. Pre-existing inflammatory dermatoses - atopic dermatitis, systemic lupus erythematosus, photo dermatoses. History of (H/O) contact dermatitis to glycolic acid products. H/O intake of drugs with photosensitizing potential. Patients with keloidal tendencies. Patient's with unrealistic expectations. H/O application of any depigmenting agent in the last one month.

Following investigations were done at the time of enrollment and before each session- Wood's lamp examination, dermoscopic examination. Melasma area and severity index (MASI) score calculations is calculated based on the area (A) of involvement, the darkness (D), and the homogeneity (H) of hyperpigmentation. The right fore head, right malar region and right chin correspond to 15, 30, and 5% of the total face respectively, photographic documentation. Post procedure - no depigmenting topical agent was advised to the patient apart from routine use of sunscreen.

***Statistical analysis***

The statistical analysis was done by SPSS for windows software (SPSS Inc., USA, version 24.0) by using repeated measures ANOVA, chi-square and independent t-test analysis. The significance level was set at p value of less than 0.05.

## RESULTS

In present study total of 30 female patients were enrolled with mean duration of melasma 5.2±1.8 years. Most of the patients belonged to Fitzpatrick skin type IV (86.66%). The mean age of study population was 28.4±6.79 years. The most common pattern of melasma found was centro facial pattern seen in 80% patients. On wood's lamp examination, epidermal type of melasma was seen in 43.3% patients followed by mixed type (40% patients). (Table 1). Baseline mean MASI score on right and left half of patient's face was 7.85±3.34 and 6.25±1.56 respectively. After completion of 4 treatment sessions, it was reduced to 4.23±1.45 and 3.71±1.10 respectively with statistically insignificant difference between two halves (p=0.08). Percentage of reduction in MASI after 4 sessions was 46.11% on right side where laser toning was done whereas on left side percentage of reduction in MASI was 40.64%. Reduction in MASI was statistically significant on both sides of face (p=0.001). However, on follow up MASI was increased to 6.22±3.12 and 4.25±2.01 on right and left half respectively with statistically significant difference between two halves (p=0.01) (Table 2 and 3).

**Table 1: Demographic profile of patients (n=30).**

| **Number of patients** | |
|---|---|
| **Mean age of study participants** | 28.4±6.79 years |
| **Mean duration of melasma** | 5.2±1.8 years |
| **Fitzpatrick skin type** | **N (%)** |
| IV | 26 (86.66) |
| V | 4 (13.33) |
| **Pattern of melasma** | |
| Centro facial | 24 (80) |
| Malar | 6 (20) |
| **Type of melasma** | |
| Epidermal | 13 (43.33) |
| Dermal | 5 (16.6) |
| Mixed | 12 (40) |

**Table 2: Mean MASI score at baseline and all reassessment visits after treatment.**

| Time | Right half (laser toning) | Left half (50% glycolic acid peel) | P value |
|---|---|---|---|
| **Baseline** | 7.85±3.34 | 6.25±1.56 | 0.15 |
| **After 1$^{st}$ session** | 6.08±2.56 | 6.01±2.12 | 0.25 |
| **After 2$^{nd}$ session** | 5.67±2.15 | 5.24±2.02 | 0.71 |
| **After 3$^{rd}$ session** | 5.10±1.56 | 4.56±1.45 | 0.34 |
| **After 4$^{th}$ session** | 4.23±1.45 | 3.71±1.10 | 0.08 |
| **1$^{st}$ follow up** | 5.34±2.89 | 4.05±1.45 | 0.12 |
| **2$^{nd}$ follow up** | 6.22±3.12 | 4.25±2.01 | 0.01* |

*p value <0.05=significant.

Immediate side effects like erythema and burning sensation was reported in 70% and 16.7% patients respectively after laser toning.

Delayed complications like mottled hypopigmentation and post inflammatory hyperpigmentation was seen in 30% and 20% patients respectively after laser toning. None of patients reported confetti like hypopigmentation

over the left half of the face where glycolic acid peel was done whereas post inflammatory hyperpigmentation was reported in 26.6% patients. Recurrence rate of melasma was higher (46.66%) with laser toning in comparison to glycolic acid peel (26.6% patients) (Table 4).

**Table 3: Statistical assessment of mean MASI score for right and left half before and after 4 sessions of treatment.**

| Side of face | Pre-treatment MASI | Post 4th session MASI | Percentage of improvement | P value |
|---|---|---|---|---|
| **Right half** | 7.85±1.34 | 4.23±1.45 | 46.11 | 0.001* |
| **Left half** | 6.25±1.56 | 3.71±2.10 | 40.64 | 0.001* |

*p value <0.05=significant.

**Table 4: Comparison of side effects between right and left half.**

| Side effects | | Laser toning side | 50% glycolic acid peel side | P value |
|---|---|---|---|---|
| | | N (%) | N (%) | |
| **Erythema** | Present (+) | 21 (70) | 24 (80) | 0.34 |
| | Absent (-) | 9 (30) | 6 (20) | |
| **Transient burning** | + | 5 (16.7) | 19 (63.3) | 0.03* |
| | - | 25 (83.3) | 11 (36.7) | |
| **Confetti like hypopigmentation** | + | 9 (30) | - | 0.000* |
| | - | 21 (70) | 30 (100) | |
| **Post inflammatory hyperpigmentation** | + | 6 (20) | 8 (26.66) | 0.34 |
| | - | 24 (80) | 22 (73.44) | |
| **Recurrence** | + | 14 (46.66) | 8 (26.6) | 0.001* |
| | - | 16 (53.34) | 22 (73.4) | |

*p value <0.05=significant.

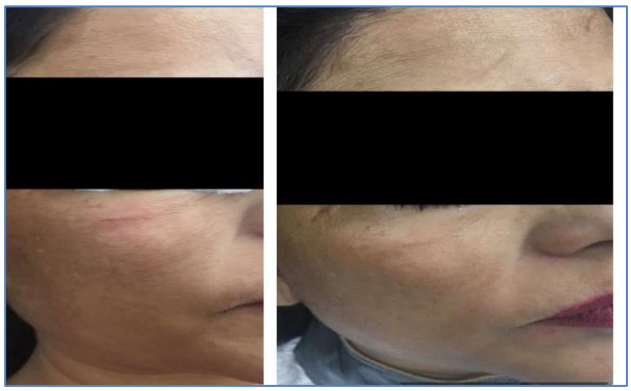

**Figure 1: Pre and post 4th session result after laser toning (right half).**

**Figure 2: Pre and post 4th session result after glycolic acid peel (left half).**

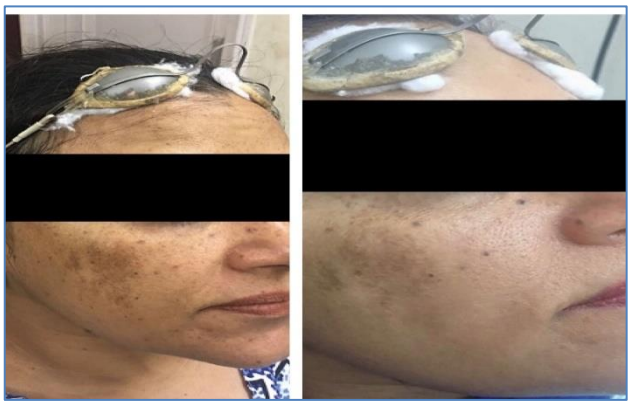

**Figure 3: Pre and post 4th session result after laser toning (right half).**

**Figure 4: Pre and post 4th session result after glycolic acid peel (left half).**

**Figure 5: Complications after laser toning - persistent erythema and confetti like hypopigmentation.**

## DISCUSSION

While time tested modalities like topical therapies in the form of dual or triple combinations remain the first line therapy, chemical peels and lasers are emerging newer therapies in the management of melasma, particularly in refractory cases. Treatment of melasma often requires multimodality approach. Alpha hydroxyl acids like 50% glycolic acid have the ability to cause controlled epiderma decohesion and removal of epidermal melanin. Dermal component of melasma is tackled by the process of phagocytosis of melanin initiated due to proinflammatory cytokines released after peeling.[5] There are various studies conducted so far in dark skinned patients to prove the role of glycolic acid peel in melasma. In a study conducted by Sarkar et al glycolic acid peel showed greater and rapid improvement in melasma in comparison to triple combination.[6] On the other hand laser toning works on the principle of subcellular selective photo thermolysis which results in destruction of melanin chromophore in the target cell.[3] Study conducted by Suh et al in Asian patients with melasma using 1064 Q switched Nd-YAG laser showed that it is an effective modality for the management of melasma.[7] The mean age of our study population was 28.4±6.79 years which corroborates with other Indian studies.[8,9] The most common pattern of melasma found was Centro facial pattern seen in 80% patients followed by malar pattern (20%) akin to study done by Bansal et al whereas in a study done by Manjunath et al malar distribution was most commonly observed (90% patients).[9,10] On wood's lamp examination, epidermal type of melasma was seen in 43.3% patients followed by mixed type( 40% patients) similar to study done by Kar et al where epidermal type was reported in 46.6% patients.[11] Baseline mean MASI score on right and left half of patient's face was 7.85±3.34 and 6.25±1.56 respectively. After completion of 4 treatment sessions, it was reduced to 4.23±1.45 and 3.71±1.10 respectively with statistically insignificant difference between two halves (p=0.08) whereas in a study done by Divya et al MASI scores improved from 7.14 to 4.99 in the glycolic acid peel group and in the laser group from 6.17 to 4.67.[12] In the present study there is consistent reduction in MASI after laser toning sessions whereas in a study done by Divya et al MASI did not show any significant change after 2nd session.[12] In present study mean percentage improvement in MASI after laser toning was 46.11% whereas on left side it was 40.64% where glycolic acid peel was done. Hence on both sides there is significant reduction in MASI from baseline after 4 sessions. Similar findings were reported in a split face study done by Kar et al which showed slightly more reduction in MASI score with laser toning (47.9%) in comparison to glycolic acid peel (40.4%).[11] Zhou et al using Q switched Nd: YAG 1064 nm laser observed a mean decrease in MASI by 61.3% whereas Divya et al reported only 24.31% change in mean MASI at the end of 12 weeks with Nd: YAG laser treatment.[12,13] On follow up done 3 months after the last session there is significant increase in MASI over right side in comparison to left side indicating that results of laser toning were short lasting in comparison to peels hence maintenance sessions are required to prevent recurrence of melasma. Similar worsening of MASI score was reported in other studies done by Kar et al and Hofbauer Parra.[11,14] In present study recurrence rate observed after laser toning was 46.6% whereas it was only reported in 26.6% patients after glycolic acid peel. Relapse rate as high as 81% has been reported in literature after laser toning.[14] Serious complications like mottled hypopigmentation and post inflammatory hyperpigmentation was seen in 30% and 20% of the patients after laser toning. Wattanakrai et al reported spotty hypopigmentation (13.6%) and rebound hyperpigmentation (18%) as the main adverse effects with laser toning in melasma.[15] Divya et al reported incidence of PIH in 41.7% of patients after laser toning.[12]

In present study none of patients reported confetti like hypopigmentation after glycolic acid peel whereas incidence of PIH was reported in 26.6% of the patients after peeling. Divya et al reported incidence of PIH in 19.2% patients after peeling with 70% glycolic acid.[12,16] To conclude, glycolic acid peel and laser toning were comparable in terms of outcome with laser toning showing slightly better results than peel. In comparison to glycolic acid peel, recurrence rate was higher on right half where laser toning was done hence counselling of patient regarding recurrent nature of melasma is of utmost importance. Both the modalities were generally well tolerated among patients. Confetti like hypo pigmentation and recurrence of melasma were the main adverse effects after laser toning in Asian skin.

## CONCLUSION

Glycolic acid peel and laser toning were comparable in terms of outcome with laser toning showing slightly better results. In comparison to peels recurrence rate and complications like hypopigmentation in Asian patients were higher with laser toning.

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