Pakistan Journal of Intensive Care Medicine
eISSN: 2708-2261; pISSN: 2958-4728
www.pjicm.com
DOI: https://doi.org/10.54112/pjicm.v5i02.100
*Pak. J. Inten. Care Med., volume 5(2), **2025**: 100*
Original Research Article

COMPARISON OF EFFICACY OF GLYCOLIC ACID 60% PEEL VERSUS Q-SWITCHED Nd: YAG LASER IN THE TREATMENT OF MELASMA AT TERTIARY CARE HOSPITAL OF BAHAWALPUR

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(Received, 01st April 2025, Revised, 15th May 2025, Accepted, 06th June 2025, Published, 14th July 2025)

ABSTRACT

Background: *Melasma is a common acquired pigmentary disorder, especially among individuals with darker skin types. Various therapeutic modalities, including chemical peels and lasers, are used to manage melasma; however, their comparative effectiveness remains a subject of ongoing clinical investigation.* ***Objective:*** *To compare the therapeutic efficacy and safety profile of low-fluence Q-switched Nd: YAG laser with topical 60% glycolic acid peel in the treatment of melasma.* ***Study Design:*** *Quasi-experimental, non-randomized controlled study.* ***Setting:*** *Department of Dermatology, Combined Military Hospital (CMH), Bahawalpur, Pakistan.* ***Duration of Study:*** *From 15 April to 14 September 2024.* ***Methods:*** *Eighty patients clinically diagnosed with melasma were enrolled and divided into two groups: Group A (n=40) received 60% glycolic acid peels and Group B (n=40) received low-fluence Q-switched Nd: YAG laser therapy. Each patient received treatment for a period of three months. Treatment efficacy was assessed using the Melasma Area and Severity Index (MASI) at baseline and 8 weeks. Statistical analysis included a median score comparison and a chi-square test for categorical data, with $p < 0.05$ considered statistically significant.* ***Results:*** *The peak incidence of melasma was observed in the 29–32-year age group, with a female-to-male ratio of 4:1. Sunlight exposure was the most common aggravating factor. Epidermal melasma was predominant in both groups (33.7% in Group A vs. 23.8% in Group B; $p < 0.05$). MASI scores showed a significant reduction in both groups: from 7.20 to 4.20 in Group A and from 5.40 to 4.10 in Group B by week 8 ($p < 0.005$ for both). Erythema was more frequent in Group A (18.7%) compared to Group B (2.5%, $p < 0.05$). However, post-inflammatory hyperpigmentation (PIH) was more common in Group B (10%) than in Group A (1.3%, $p < 0.05$).* ***Conclusion:*** *Topical 60% glycolic acid peel demonstrated greater therapeutic efficacy and a better safety profile than low-fluence Q-switched Nd: YAG laser in the treatment of melasma. PIH was notably more frequent in patients treated with laser, particularly those with darker skin types. Glycolic acid peel remains a favorable first-line treatment in such populations.*

Keywords: Glycolic 60%, Laser Q-switched Nd: YAG, Melasma

INTRODUCTION

Melasma, also known as chloasma faciei, is a common, acquired hypermelanosis characterized by dark brown macules on sun-exposed areas, especially in people with darker skin (1). It can affect all ethnic groups and is more common in Blacks, Asians, and Latin Americans; pregnant females and females on hormone therapy are more affected. The female-to-male ratio is 9:1 (1, 2).

The contributing factors of melasma include pregnancy, genetic predisposition, endocrine factors, and increased UV exposure (3). The UV light promotes melanogenesis by activating nitric oxide, inducing the production of reactive oxygen species, stimulating the secretion of stem cell factor, and increasing the expression of Wnt genes (4). Family history is a significant risk factor for developing melasma, due to the increased presence of progesterone receptors in the epidermis of affected skin (4, 5).

Histologically, melasma is classified into three variants: epidermal, dermal, and mixed. In the epidermal type, there is increased melanin pigment in large melanocytes, accentuated with Wood's lamp. The dermal type features Melanophages with increased melanin in the superficial and deep dermis, whereas the mixed melasma exhibits combined histologic features of the epidermal and dermal subtypes (6, 7).

In the management of melasma, sun protection, azelaic acid, hydroquinone, and kojic acid are helpful, but the Kligman formula is the standard first-line treatment (8). Glycolic acid (20% to 70%) is an effective and safe chemical peel due to its exfoliative properties and ability to stimulate cell turnover. At the same time, the non-invasive Q-switched Nd: YAG laser disrupts the melanin granules of epidermal and dermal melasma, which are later phagocytosed by macrophages (9, 10).

This study aims to compare the outcomes of 60% glycolic acid peels and Q-switched Nd: YAG laser treatments in the management of melasma, informing treatment plans that impact the quality of life and psychosocial well-being of patients.

METHODOLOGY

This Quasi-Experimental, non-randomized study was conducted at the Department of Dermatology, CMH, Bahawalpur, from April 15 to September 14, 2024. The sample size was calculated using the WHO sample size calculator, taking a 95% confidence interval, a 5% margin of error, and a mean value of 6.98 ± 2.39 for patients treated with glycolic peel and 5.55 ± 2.45 for those treated with laser. The estimated sample size was 80 patients. (40 in each group)

The included patients were between 18 and 60 years of either gender, of skin types III and VI, suffering from melasma with baseline MASI scores of 6-20.

Patients with any systemic or endocrinological illness, on hormone therapy, known hypersensitivity to the chemical peel, pregnant and lactating women, and patients with bacterial or viral infections were excluded from the study.

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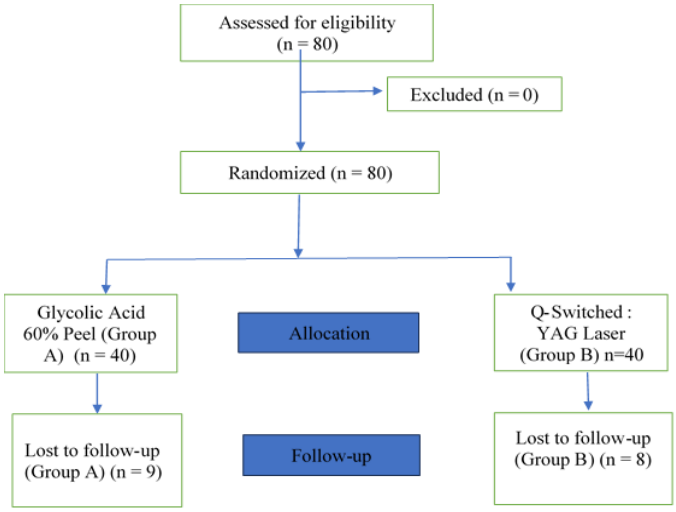
Permission from the institutional ethics review committee (reference number 15, dated April 10, 2024) was obtained before the study's conduct, and written informed consent was obtained from each patient. A brief demographic history (age, gender, skin type), an examination of the skin lesion, and the baseline MASI score were considered. The included patients were equally divided into group A and group B. The patients in group A (n = 40) were treated with 60% glycolic acid peeling for 2 minutes, starting at the forehead and continuing to the cheeks, chin, and nose, every 2 weeks for 12 weeks. The peeling was terminated by washing with cold water.



Patient Consort Flow:

The patients in group B (n = 40) were treated with a Q-switched Nd: YAG laser of a 1064 nm wavelength, manufactured by BVLASER Company, China. The treatment area was cleaned, and a Q-switched Nd: YAG laser was delivered with a 3mm spot size, an energy fluence ranging from 500 to 700 joules, and a repetition frequency of 6 Hz. The handpiece was moved slowly to allow the laser to scan over the lesions for approximately 2-3 passes. After that, the patients were instructed to apply sunscreen during the daytime. The outcome was assessed at 2 weeks, 4, 6, 8, 10, and 12 weeks.

Data were analyzed using the Statistical Package for the Social Sciences, Version 26. Mean and standard deviations were calculated for the quantitative variables, such as age, baseline MASI score, and post-treatment MASI score, using the Mann-Whitney U test. Frequencies and percentages were calculated using the chi-square test. A p-value of ≤ 0.05 was considered significant.

RESULTS

Out of 80 patients, 40 were in Group A, treated with an acid peel, and 40 in Group B, treated with Laser. Out of 80 patients, 20 (25%) were male and 60 (75%) were female. In group A, 9 (11.3%) were male and 31 (38.7%) were female, compared to 11 (13.7%) males and 29 (36.3%) females in group B. The mean age was 32.9 ± 4.8 years (range, 25-42 years at the time of inclusion). The most common melasma pattern was the centrofacial type (70%), followed by the malar (26%) and mandibular types (4%). (Results are not shown in the table.) Based on clinical and Wood's lamp examination, epidermal melasma was found in 46 (57.5%) patients, mixed in 28 (35%), and dermal in 6 (7.5%) patients from both groups. The duration of melasma ranged from 1 to 15 years. In both groups, 35 (43.7%) patients had melasma for less than 3 years, 19 (23.8%) for 3-5 years, and 26 (32.5%) had melasma for more than 5 years' duration. The exposure to sunlight was from 30 minutes to 2 hours daily; 64 had exposure for less than 2 hours, and 16 patients had exposure for more than 2 hours daily.

All patients were treated either by acid peel (group A, n=40) or Laser (group B, n=40) for 12 weeks. During the treatment period, 27 (33.7%) patients showed no adverse effects from any treatment type, while 17 (21.2%) experienced erythema from both groups. Eight (10%) reported burning, 9 (10.3%) complained of hyperpigmentation, and 19 (23.8%) reported itching. The erythema and burning were more common adverse effects associated with acid peels, while itching and hyperpigmentation were more common with laser treatments.

The U statistic represents the statistical significance of the median values between two independent groups. The p-value showed a significant statistical difference ($p < 0.05$) at weeks 0, 2, 4, 6, and 8 of treatment, while from the 10th and 12th weeks showed a non-significant difference ($p > 0.05$).

Table 1: Demographic Representation of Melasma Patients (N=80)

Variable	Group A (acid peel) n=40	Group B (laser) n=40	p - value
Age in years	33.15 ± 4.90	32.70 ± 4.75	
Sex			
Male	09 (11.3%)	11 (13.7%)	
Female	31 (38.7%)	29 (36.3%)	0.797
Duration of Melasma			
<3 years	15 (18.7%)	20 (25%)	
3-5 years	13 (16.3%)	06 (7.5%)	0.178
>5 years	12 (15.0%)	14 (17.5%)	
Type of melasma			
Epidermal	27 (33.7%)	19 (23.8%)	
Mix	13 (16.2%)	15 (18.7%)	
Dermal	0 (0%)	06 (7.5%)	0.03
Exposure to sunlight			
< 2 hours	33 (41.2%)	31 (38.8%)	
> 2 hours	07 (8.8%)	09 11.2%)	0.781
Adverse effects			
Nil	16 (20%)	11 (13.7%)	
Erythema	15 (18.7%)	02 (2.5%)	0.000
Burning	08 (10%)	00 (0%)	

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Hyperpigmentation	01 (1.3%)	08 (10%)	
Itching & worsening	00 (0%)	19 (23.8%)	

MASI - Melasma area and severity index score; IQR – Interquartile ratio

Table 2: The Mann-Whitney U Test

Parameters	Study Groups		p Value
	Group A (n=40) Median (IQR)	Group B (n=40) Median (IQR)	
MASI – 0 base	7.20 (4.20)	5.40 (3.75)	0.000
MASI – 2 weeks	7.20 (4.05)	5.40 (2.40)	0.000
MASI – 4 weeks	5.55 (2.80)	4.50 (4.10)	0.000
MASI – 6 weeks	4.80 (2.35)	4.45 (4.20)	0.003
MASI – 8 weeks	4.20 (2.65)	4.10 (2.27)	0.005
MASI – 10 weeks	3.60 (2.35)	3.60 (3.40)	1.00
MASI – 12 weeks	3.00 (2.30)	3.00 (3.30)	1.00

DISCUSSION

Melasma is a hyperpigmented challenging disease due to its social and emotional stresses, its recurrence, and its refractory nature. We compared the efficacy of 60% glycolic acid and Q-switched Nd: YAG laser for melasma treatment. Most of the patients in our study were females in the middle age group, aged 29-32 years (36%, with a mean age of 32 years), with a duration of melasma ranging from 6 months to 18 years, primarily following exposure to sunlight. Our results are inconsistent with those of Lingjia et al. (5) and Syder et al. (11) regarding age, sex, and disease duration. The dento-facial type of melasma (76%) was most commonly observed in our study, followed by the malar (20%) and mandibular (4%) types; these results corroborate those of other studies (12).

The epidermal melasma type (46, 57.5%) was the most common type found in our study, followed by the mixed type (28, 34.9%) and the dermal type (6, 7.5%), which agrees with other studies (13, 14).

The MASI was scored based on pigmentation, patch homogeneity, and the area of involvement, and was assessed at the beginning and the end of 4, 8, and 12 weeks of treatment. In patients of group A, treated with 60% glycolic acid peel, the median MASI scores from a baseline of 7.20 decreased to 5.55 at the end of 4 weeks with 22.9% improvement, from 7.20 to 4.20 by the end of 8 weeks with improvement of 41.6% and from 7.20 to 3.00 in 12 weeks with improvement of 58.3%. The mean improvement was 40.6% after 12 weeks of treatment. These results are consistent with those of Naheed et al. (15) and Sachdeva et al. (16), who found an 18% to 55% improvement in MASI scores with a 70% glycolic peel in 12 weeks.

Glycolic acid functions by weakening the intercellular material of the stratum corneum (SC), resulting in uniform exfoliation of its outermost layers and compromising the skin's barrier function. The glycolic acid also has a "targeted" desmosomal action without disturbing the skin barrier structures (17).

Further observation revealed that improvement in the laser group from baseline median MASI score decreased from 5.40 to 4.50 at the end of 04 weeks with an improvement of 16.6%, score from 5.40 to 4.10 at the end of 08 weeks with 24.1% improvement and from 5.40 to 3.00 after 12 weeks of treatment with an improvement of 44.5%. The mean improvement was 25.7%. The response to the epidermal component of melasma was better with glycolic therapy, while the dermal component took a long time to respond. However, the difference was statistically nonsignificant between glycolic acid and laser treatment. Our results agreed with Ertam et al. (18), *who showed that a 1064 nm Q-switched NY Laser of low pulse energy (2.5 J/cm2, 6 mm) used at two weekly intervals for 12 weeks, compared to chemical peel,* was non-significant but an effective treatment for melasma.

The Q-switched Nd: YAG, a pigment-specific laser, plays a crucial role in pigmentary disorders by emitting energy at 1064 nm, which ruptures dermal and epidermal melanosomes in melanocytes through selective photothermolysis (<5 J/cm²). Dermal melanophage destruction and fragmentation of melanin granules without cellular destruction are also considered prime functions of lasers. Sahu et al. (19) demonstrated that using a 1064 nm Laser at 1-week intervals for 10 weeks is a safe and effective treatment for melasma in dark-skinned patients. Similar results were observed by Kar et al. (20), who treated 25 patients with laser therapy for 12 weeks, resulting in an average improvement of 47.93%.

Recent reviews have shown that lasers should not be used as a first-line treatment for pigmented skin, but rather should be considered when other treatments have failed. Chemical peels remain a popular treatment for improving pigmentation and aesthetics (3).

In our results, the adverse effects associated with 60% glycolic peels included transient and patchy erythema (18.7%) and burning (10%), as noticed by Randon et al. (21), who reported erythema (10%) and burning sensation (6.6%) as the common adverse effects of peels. We found that the worsening of melasma and itching (23.8%) and post-inflammatory hyperpigmentation (10%) in patients treated with laser were similar to results published by Puri et al. (22) and Bansal et al. (23), who reported hyperpigmentation (13.3%) as the main adverse effect of laser therapy.

CONCLUSION

60% Glycolic peels were better, though not significantly, than Q-switched Nd: YAG laser for the treatment of melasma. Hyperpigmentation was a harmful adverse effect of laser treatment.

DECLARATIONS

Data Availability Statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department Concerned. (Ref#15 dated 10th April 2024)

Consent for publication

Approved

Funding

Not applicable

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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Study Design, Review of manuscript,Data Collection, Data Analysis, Data Entry, Manuscript Drafting, and Revision of Manuscript
***AAMIR HABIB** (Consultant)*
Conception of Study, Development of Research Methodology Design, and Critical Input.
***SHAHID MAJEED** (Principal AHS)*
Literature Search, and Critical Input.
***MISBAH HAFEEZ** (Postgraduate Trainee)*
Review of Literature.
***FARAH JABEEN** (Postgraduate Trainee)*
Literature Review
***TAHIR AHMAD MUNIR** (Professor)*
Critical Input

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