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Original Article

Adjunctive press-needle surrounding needling associated with lower lesion scores and lower recurrence rate after Q-switched laser treatment for melasma: a retrospective cohort study

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Abstract: Objective: To evaluate whether adjunctive press-needle surrounding needling was associated with improved outcomes in women receiving Q-switched laser treatment for melasma. Methods: This single-center retrospective cohort included 84 women treated between January 2022 and July 2024. According to routine treatment records, 39 received Q-switched laser alone and 45 received the same laser regimen plus auricular and perilesional press-needle therapy. The primary outcome was the overall response rate after three treatment courses. Secondary outcomes included summed regional Melasma Area and Severity Index (MASI) scores at baseline, treatment completion, and 12-month follow-up; serum microphthalmia-associated transcription factor (MITF) and tyrosinase (TYR) concentrations; Dermatology Life Quality Index (DLQI) scores; satisfaction; adverse events; and recurrence. Prespecified covariates were considered in multivariable regression. Results: Overall response occurred in 51.28% of the laser-only group and 68.89% of the combined-treatment group (χ^2=2.715, P=0.099); the adjusted odds ratio was 2.29 (95% CI 0.88-5.95, P=0.089). Summed regional MASI scores were 17.05±2.33, 9.15±1.58, and 9.13±1.84 at the three time points in the laser-only group and 17.20±1.74, 4.07±1.10, and 4.07±1.34 in the combined-treatment group, respectively; the group-by-time interaction was significant (Greenhouse-Geisser-corrected F(1.52, 124.53)=65.11, P<0.001). Combined treatment was independently associated with a lower post-treatment score (β=-5.04, 95% CI -5.63 to -4.46, P<0.001). Baseline-adjusted post-treatment MITF, TYR, and total DLQI values did not differ between groups (P=0.307, P=0.973, and P=0.283, respectively). Recurrence was documented in 20.51% and 4.44% of patients, respectively (Fisher's exact P=0.039). Satisfaction was higher with combined treatment (88.89% vs. 69.23%, P=0.025), whereas adverse-event rates were similar (22.22% vs. 30.77%, P=0.374). Conclusion: Adjunctive press-needle surrounding needling was associated with lower lesion scores and a lower documented recurrence rate, although overall response and between-group differences in MITF, TYR, and DLQI were not statistically significant. Prospective controlled studies are warranted.

Keywords: Melasma, press-needle surrounding needling, Q-switched laser, microphthalmia-associated transcription factor, tyrosinase, recurrence

Introduction

Melasma (MEL) is a common acquired pigmentary skin disorder seen in clinical practice. It is mainly characterized by symmetrically distributed light-brown to dark-brown patches on the face [1]. The disease occurs predominantly in women of childbearing age. Its prevalence in the general population exceeds 10%, and among women aged 20-50 years it may be as high as 40%. In recent years, the incidence has continued to rise [2]. MEL often follows a prolonged course and recurs easily. Beyond the visible changes in facial appearance, it frequently gives rise to anxiety, low self-esteem, and other negative emotions, seriously affecting social functioning and quality of life. It is therefore regarded as a chronic dermatologic disorder with high clinical demand and considerable therapeutic difficulty [3, 4].

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The central pathological mechanism of MEL is abnormal hyperactivity of epidermal melanocytes. Tyrosinase (TYR) is the key rate-limiting enzyme in melanin synthesis [5], whereas microphthalmia-associated transcription factor (MITF) is the principal upstream regulator of TYR transcription and expression [6]. Abnormally increased expression of both molecules is a pivotal event in the development and progression of hyperpigmentation, and they are also considered important therapeutic targets in this disease [7]. At present, physical modalities represented by Q-switched laser remain the mainstay of treatment in clinical practice. This approach can selectively disrupt melanin granules through a photothermal effect. Although its short-term response rate has been reported to exceed 70%, laser treatment alone merely removes melanin that has already formed and does not address abnormal melanocyte activation at its origin [8]. Reported data indicate that the 1-year recurrence rate after Q-switched laser exceeds 50%, and some patients may also develop post-inflammatory hyperpigmentation, skin barrier injury, and other adverse effects, which limits its usefulness in long-term management [9].

According to the traditional Chinese medicine theory of collateral disease, the chronic and refractory nature of MEL is rooted in deficiency of healthy qi, together with endogenous phlegm-dampness and blood stasis. As the disease persists, it enters the collaterals, leading to obstruction of the vascular network, making the pigmentation difficult to resolve. This understanding corresponds closely to the chronic and lingering nature of MEL [10]. Press needles belong to the category of intradermal needles in traditional Chinese medicine and originated from the ancient methods of “floating needling” and “hair needling” described in the Lingshu. Their defining feature is quiet retention with sustained stimulation. Through mild but continuous acupoint stimulation, they are thought to regulate qi and blood and disperse stasis, which accords well with the therapeutic principles for chronic collateral disease [11]. In the surrounding-needling technique, multiple shallow needles are placed circumferentially around the lesion, allowing direct action on the superficial and fine collaterals at the affected site; thereby improving local qi-blood circulation [12]. Recent clinical studies and evidence syntheses suggest that acupuncture-based therapies may improve melasma severity; however, treatment protocols, comparators, and follow-up durations have varied [13]. Evidence specifically concerning retained press-needle surrounding needling as an adjunct to a standardized Q-switched laser regimen remains limited, and previous studies have rarely evaluated longitudinal lesion scores, serum MITF and TYR concentrations, and 12-month recurrence within the same cohort. Consequently, whether this combined approach provides additional and durable clinical benefit over laser treatment alone remains uncertain.

To address this evidence gap, we retrospectively compared women with melasma who had received Q-switched laser alone with those who had received the same laser regimen plus auricular and perilesional press-needle therapy. We examined clinical response, longitudinal lesion scores, serum MITF and TYR concentrations, patient-reported outcomes, safety, and 12-month recurrence. We hypothesized that adjunctive press-needle therapy would be associated with better lesion control without an increase in treatment-related adverse events; clarification of this association may provide a basis for the prospective evaluation of multimodal treatment strategies for melasma.

Materials and methods

Patient selection

This study was a single-center retrospective cohort study. The study population consisted of patients with facial MEL who attended the Department of Dermatology and the Department of Acupuncture at the Affiliated Hospital of Tianjin Academy of Traditional Chinese Medicine from January 2022 to July 2024. Their diagnostic, treatment, and follow-up data were fully retrieved through the hospital electronic medical record system. All enrolled patients had completed standardized treatment in our hospital, and outpatient follow-up after the last treatment lasted no less than 12 months. The electronic medical record search initially identified 246 potentially eligible patients. After application of the prespecified eligibility criteria, 162 were excluded because of an unconfirmed diagnosis or another pigmentary disorder (n=28), recent melasma-directed treatment (n=34), pregnancy or lactation (n=8),

severe systemic disease or treatment contraindications (n=9), incomplete or changed treatment (n=27), incomplete core data (n=31), or unavailable 12-month follow-up data (n=25). The remaining 84 patients were included (patients were not allocated to treatment by the investigators, they were retrospectively classified according to the treatment actually documented in the medical records), comprising 39 patients who received Q-switched laser alone and 45 who received Q-switched laser plus press-needle therapy. No random allocation was performed, treatment selection occurred during routine clinical care before the present study was conceived. The attending physician recommended an appropriate regimen after considering the lesion characteristics, contraindications, treatment burden, and patient preference, and the final treatment decision was made after discussion with the patient; the retrospective investigators did not influence this decision. All included patients were adults, and guardian-based treatment selection was therefore not applicable. The expected benefits, limitations, treatment schedule, and foreseeable adverse effects of the selected regimen were explained before treatment, and routine treatment consent was documented. This study was conducted in strict accordance with the ethical principles of the Declaration of Helsinki. The study protocol was reviewed and approved by the Ethics Committee of the Affiliated Hospital of Tianjin Academy of Traditional Chinese Medicine. Because this was a retrospective analysis and did not impose any intervention on patients' clinical diagnosis or treatment, written informed consent was waived.

Inclusion and exclusion criteria

Inclusion criteria: (1) female patients aged 18 years or older with a documented clinical diagnosis of facial melasma according to the cited diagnostic criteria [14]; (2) completion of three courses of either Q-switched laser alone or the same laser regimen combined with auricular and perilesional press-needle therapy, without crossover between regimens; (3) no documented systemic, topical, laser, acupuncture, or other melasma-directed treatment within the 6 months preceding the index treatment; (4) availability of standardized lesion images and MASI assessments at baseline, treatment completion, and 12-month follow-up; (5) availability of baseline and post-treatment MITF, TYR, and DLQI data; and (6) complete and traceable treatment, safety, satisfaction, and follow-up records. Exclusion criteria: (1) another facial pigmentary disorder that could not be reliably distinguished from melasma, including acquired bilateral nevus of Ota-like macules, Riehl melanosis, or lichen planus pigmentosus; (2) pregnancy or lactation during treatment; (3) severe cardiovascular, cerebrovascular, hepatic, renal, hematologic, or autoimmune disease; (4) a history of hypertrophic scarring or an active infection involving the treatment area; (5) concomitant use of another melasma-directed treatment, crossover between the two study regimens, or failure to complete the prescribed treatment; and (6) missing core assessment data or unavailable 12-month follow-up records.

Data extraction

The electronic medical record system was searched for patients with a diagnosis of facial melasma who attended the Departments of Dermatology or Acupuncture between January 2022 and July 2024. Duplicate records were removed before eligibility screening. Two investigators independently reviewed the full medical records and extracted demographic characteristics, disease characteristics, treatment records, regional MASI scores, laboratory results, DLQI scores, satisfaction, adverse events, and follow-up outcomes using a prespecified form. Disagreements were resolved by rechecking the source records and, when necessary, consultation with a third investigator. Because completeness of the core outcomes was an eligibility criterion, no missing outcome values were imputed.

Treatment classification

Both groups completed 3 courses of standardized treatment. During treatment, all patients received unified health education and were instructed to practice strict sun protection and skin moisturization, discontinue other depigmenting drugs or functional skincare products, and maintain regular daily habits. Q-switched laser treatment: a Q-switched laser device manufactured by Chongqing Jingyu was used, with a wavelength of 532 nm. Before treatment, patients with poor pain tolerance received topical anesthesia with compound lidocaine cream applied under occlusion for 1-2 h.

During the procedure, treatment parameters were adjusted according to lesion location, color depth, skin type, and individual photoreactivity. The spot diameter was 2-3 mm, pulse frequency was 1-2 Hz, and energy density was 1.5-3 J/cm^2. The treatment endpoint was the immediate appearance of a gray-white change in the lesion after irradiation. In thinner skin areas, such as the periorbital and perioral regions, the energy density was reduced as appropriate. After treatment, an ice pack was applied for 15 min. Treatment was administered once every 4 weeks, for a total of 3 sessions.

On the basis of the same Q-switched laser regimen used in the laser-only group, the combined-treatment group additionally received press-needle surrounding needling, which included auricular press-needle therapy and facial perilesional surrounding needling. Qinglingbrand press needles were used throughout, and needle lengths of 0.6-1.5 mm were selected according to the patient's skin thickness. Auricular points included the cheek, spleen, lung, and endocrine points. Intradermal embedding was performed, with the left and right ears treated alternately. The needles were removed after 3 d, and treatment was given once weekly. For facial surrounding needling, press needles were embedded circumferentially along the margin of the MEL lesion. Needle density was adjusted according to lesion size so that the adhesive strips formed a continuous ring around the lesion edge. The needles were removed after 3 d, and treatment was given once weekly. During treatment, patients were instructed to press the needle handle for 3-5 s each in the morning, at noon, and in the evening every day, with a slight sensation of soreness, numbness, and distension regarded as appropriate. Four weeks constituted 1 course, and the intervention continued for 3 consecutive courses.

Outcome measures

Assessment time points were defined as T0, immediately before the first treatment; T1, after completion of the three treatment courses; and T2, 12 months after T1. The primary outcome was the overall clinical response rate at T1. Secondary outcomes included summed and regional MASI scores at T0, T1 and T2; serum MITF and TYR concentrations and DLQI scores at T0 and T1; treatment satisfaction at T1; adverse events recorded throughout the treatment period; and recurrence documented between T1 and T2.

All data in this study were retrospectively retrieved from the hospital electronic medical record system, laboratory information system, lesion image archiving system, and outpatient follow-up records. All lesion assessments, laboratory tests, and scale scoring had already been completed during routine clinical practice by designated senior physicians and laboratory technicians in our hospital. The procedures were standardized and consistent, and the data were fully traceable.

The core data collected in this study included baseline patient information, covering demographic and clinical characteristics such as age, sex, disease duration, clinical type, etiological type, and history of underlying disease. Assessment of lesion severity: facial lesion photographs were obtained with a Canon 750D digital camera under fixed parameters, and the Melasma Area and Severity Index (MASI) [15] was used to evaluate lesion area and color depth in 4 regions, namely the forehead, cheeks, jaw, and perioral area. The total score and score reduction rate were then calculated. Assessments were carried out at 3 predefined time points: before treatment (baseline), after completion of 3 treatment courses, and at the 12-month follow-up visit. Laboratory indicators: fasting peripheral venous blood results for MITF and TYR before treatment and after treatment were retrieved. Both MITF and TYR were measured by ELISA, with the kits purchased from Wuhan Feiyue Biotechnology Co., Ltd. and Beijing Liweining Biotechnology Co., Ltd., respectively. Patient-reported outcomes: these included Dermatology Life Quality Index (DLQI) [16] scores, which were used to assess changes in quality of life across 6 domains, namely symptoms and feelings, daily activities, leisure, work and study, interpersonal relationships, and treatment impact; treatment satisfaction scale results completed by the patients after treatment were also retrieved. Clinical efficacy and safety indicators: these included clinical efficacy determined according to the reduction rate in MASI score, recurrence within 12 months of follow-up, and records of adverse reactions during treatment, such as local ery-

thema, edema, tingling, and post-inflammatory hyperpigmentation.

Using the reduction rate in MASI score after completion of 3 treatment courses as the main basis, clinical efficacy was classified into 4 grades: basically cured, MASI score reduction ≥80%; markedly effective, reduction of 50%-79%; effective, reduction of 30%-49%; ineffective, reduction <30%. The overall response rate was calculated as (number of basically cured cases + number of markedly effective cases)/ total number of cases ×100%. Overall response was defined as a reduction of at least 50% in the MASI score and therefore included patients classified as basically cured or markedly effective. Recurrence was defined as reappearance or clinically documented worsening of pigmentation in the original lesion area after improvement at T1 during the 12-month follow-up. Recurrence was evaluated in the full cohort.

Statistical analysis

Statistical analyses were performed using SPSS version 26.0. The distribution of continuous variables was assessed using the Shapiro-Wilk test and Q-Q plots, and homogeneity of variance was evaluated using Levene's test. Normally distributed variables are presented as mean ± standard deviation, nonnormally distributed variables as median and interquartile range, and categorical variables as number and percentage. Baseline continuous variables were compared using the independent-samples t test or Mann-Whitney U test, as appropriate, whereas categorical variables were compared using Pearson's χ^2 test or Fisher's exact test.

The summed regional MASI score at T0, T1 and T2 was analyzed using a mixed-design repeated-measures analysis of variance, with treatment group as the between-subject factor and time as the within-subject factor. Mauchly's test was used to assess sphericity, and the Greenhouse-Geisser correction was applied when the assumption was violated. Post hoc comparisons were adjusted using the Holm procedure. Post-treatment MITF, TYR, and DLQI values were compared using analysis of covariance with the corresponding baseline value as a covariate. Overall response, satisfaction, the occurrence of at least one adverse event, and 12-month recurrence were compared using Pearson's χ^2 test or Fisher's exact test, as appropriate.

A multivariable logistic regression model was used to examine the association between treatment group and overall response, whereas a multivariable linear regression model was used for the post-treatment summed regional MASI score. To limit overfitting, covariates were selected a priori and restricted to age, disease duration, baseline summed regional MASI score, and etiological type. Adjusted odds ratios or regression coefficients, 95% confidence intervals, and *P* values were reported. All tests were two-sided, and P<0.05 was considered statistically significant. No outcome values were imputed.

Results

Comparison of baseline characteristics

There were no statistically significant differences between the two groups in age, sex composition, disease duration, clinical type, or etiological type (P>0.05), which describes the measured baseline characteristics and supports subsequent efficacy comparisons between the two nonrandomized groups (**Table 1**).

Comparison of clinical efficacy

After completion of 3 treatment courses, the overall response rate in the combined-treatment group was 73.33%, higher than the 51.28% in the laser-only group (P=0.037). In terms of efficacy distribution, the basically cured rate in the combined-treatment group reached 31.11%, whereas the ineffective rate was only 6.67%, suggesting a more favorable overall therapeutic effect (**Figure 1** and **Table 2**).

Changes in MASI scores across facial regions

The summed regional MASI score was 17.05± 2.33 at T0, 9.15±1.58 at T1, and 9.13±1.84 at T2 in the laser-only group; the corresponding values in the combined-treatment group were 17.20±1.74, 4.07±1.10, and 4.07±1.34. Mauchly's test indicated that the sphericity assumption was violated (W=0.683, P<0.001); therefore, Greenhouse-Geisser-corrected re-

Table 1. Comparison of baseline characteristics between the two groups

Item	Laser-only group (n=39)	Combined-treatment group (n=45)	t or χ^2	P
Age	35.74±5.21	35.78±4.31	0.033	0.974
Disease duration (years)	3.97±1.77	4.71±2.11	1.720	0.089
Clinical type			1.730	0.630
Butterfly type	14	17		
Upper facial type	11	13		
Lower facial type	8	5		
Generalized type	6	10		
Etiological type			0.294	0.588
Idiopathic type	22	28		
Secondary type	17	17		

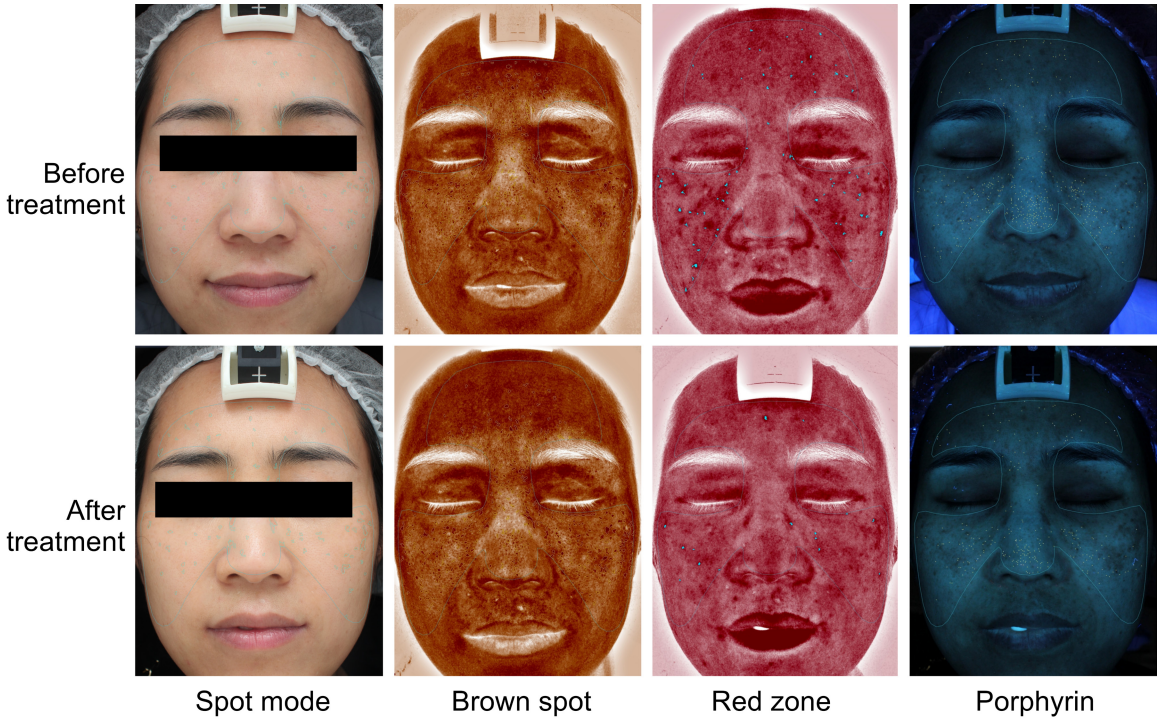


Figure 1. Representative multimodal facial images of a patient with melasma before and after treatment. The upper row presents facial images obtained before treatment, whereas the lower row presents images obtained after completion of three treatment courses. From left to right, the images were acquired using spot, brown-spot, red-zone, and porphyrin imaging modes. The spot-mode images show the visible distribution of facial pigmentation under standard illumination. The brown-spot mode enhances melanin-associated pigmentation and delineates the extent and intensity of brown lesions, particularly over the bilateral malar, nasal, and perioral regions. The red-zone mode highlights erythematous and vascular-associated signals within the facial skin, whereas the porphyrin mode displays porphyrin-associated fluorescence and surface fluorescence patterns. Compared with the pretreatment images, the post-treatment images show a visible reduction in the intensity and extent of facial pigmentation, particularly in the bilateral malar regions, together with a less prominent red-zone signal. The images are presented as a representative clinical example; treatment response was evaluated quantitatively using MASI scores rather than by visual assessment alone. The eye regions were masked to protect patient privacy.

sults are reported. Significant effects were observed for time ($F_{(1.52, 124.53)}=1100.26$, $P<0.001$), treatment group ($F_{(1, 82)}=264.93$, $P<0.001$), and the group-by-time interaction ($F_{(1.52, 124.53)}=65.11$, $P<0.001$). The groups did not differ at T0 (P=0.739), whereas scores were lower in the combined-treatment group at both T1 and T2 (both Holm-adjusted P<0.001). Scores at T1 and T2 did not differ within either the laser-only group (P=0.950) or the com-

Table 2. Comparison of clinical efficacy between the two groups

Groups	Basically cured	Markedly effective	Improved	Ineffective	Overall response rate
Laser-only group (n=39)	8 (20.51)	12 (30.77)	13 (33.33)	6 (15.38)	51.28%
Combined-treatment group (n=45)	14 (31.11)	19 (42.22)	9 (20.00)	3 (6.67)	73.33%
χ^2					4.363
P					0.037

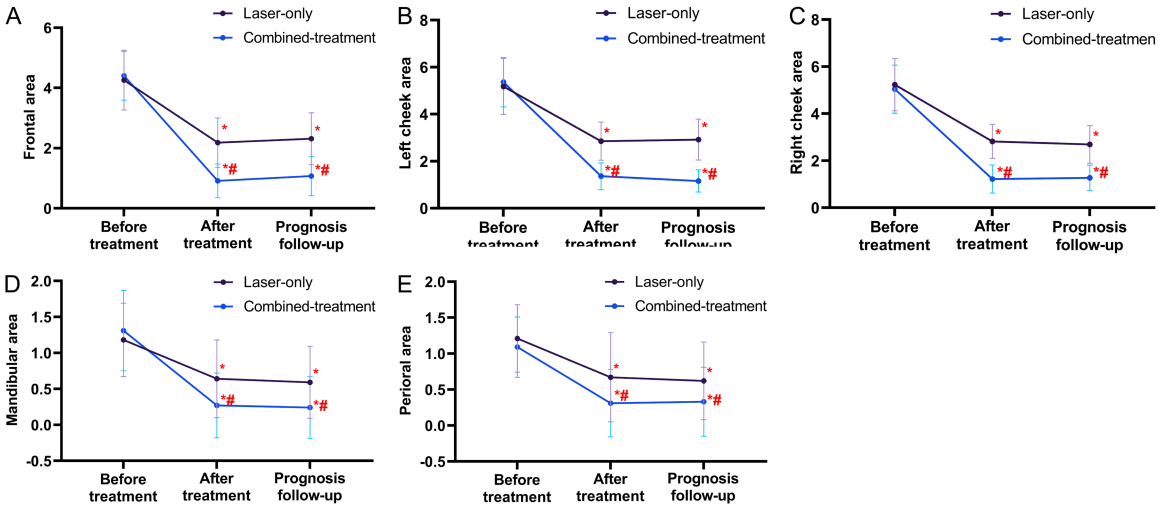


Figure 2. Changes in MASI scores in different facial regions before treatment, after treatment, and at 12-month follow-up in the two groups. A. Frontal area. B. Left cheek area. C. Right cheek area. D. Mandibular area. E. Perioral area. * indicates P<0.05 compared with that before treatment, and # indicates P<0.05 compared with the laser-only group.

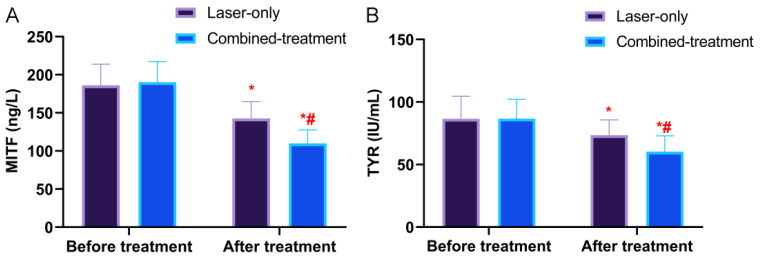


Figure 3. Changes in serum MITF and TYR levels before and after treatment in the two groups. A. Serum MITF level. B. Serum TYR level. * indicates P<0.05 compared with that before treatment, and # indicates P<0.05 compared with the laser-only group.

bined-treatment group (P=1.000) (**Figure 2** and Supplementary Table 1).

Changes in serum MITF and TYR levels before and after treatment

Serum MITF concentrations decreased from 185.76±27.51 to 127.86±22.83 ng/L in the laser-only group and from 190.67±26.96 to 122.60±28.21 ng/L in the combined-treatment group (both within-group P<0.001). After adjustment for baseline MITF, the post-treatment between-group difference was not statistically significant (adjusted mean difference -5.79 ng/L, 95% CI -16.90 to 5.32, P= 0.307). Serum TYR concentrations decreased from 83.00±17.35 to 66.56±13.86 IU/mL in the laser-only group and from 89.71±15.51 to 66.21±14.38 IU/mL in the combined-treatment group (both within-group P<0.001); the baseline-adjusted between-group difference was also nonsignificant (adjusted mean difference 0.11 IU/mL, 95% CI -6.47 to 6.70, P=0.973) (**Figure 3** and Supplementary Table 1).

Improvement in quality of life before and after treatment

The total DLQI score decreased from 14.38±1.82 to 6.44±2.56 in the laser-only group and from 14.62±2.22 to 5.89±2.34 in the com-

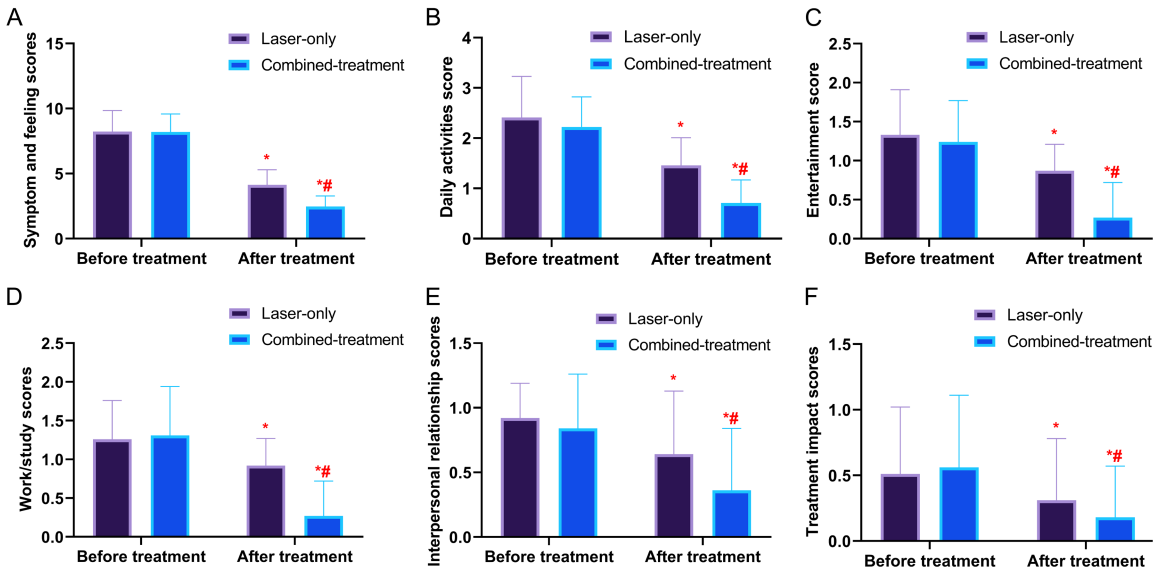


Figure 4. Changes in DLQI domain scores before and after treatment in the two groups. A. Symptoms and feelings score. B. Daily activities score. C. Leisure/entertainment score. D. Work/study score. E. Interpersonal relationship score. F. Treatment impact score. * indicates P<0.05 compared with that before treatment, and # indicates P<0.05 compared with the laser-only group.

Table 3. Comparison of adverse reactions during treatment

Groups	Local erythema	Mild edema	Transient tingling	Post-inflammatory hyperpigmentation	Tenderness at press-needle site	Patients with ≥1 adverse event
Laser-only group (n=39)	6 (15.38)	4 (10.26)	5 (12.82)	3 (7.69)	0 (0.00)	12 (30.77)
Combined-treatment group (n=45)	5 (11.11)	3 (6.67)	4 (8.89)	1 (2.22)	1 (2.22)	10 (22.22)
χ^2						0.790
P						0.374

Note: Individual event categories were not mutually exclusive; the overall rate represents the number of patients with at least one adverse event.

bined-treatment group (both within-group P< 0.001). After adjustment for the baseline score, the post-treatment between-group difference was not statistically significant (adjusted mean difference -0.58, 95% CI -1.64 to 0.49, P= 0.283). None of the six domain-specific between-group comparisons remained statistically significant after Holm correction (**Figure 4** and Supplementary Table 1).

Safety analysis during treatment

During treatment, 12 of 39 patients (30.77%) in the laser-only group and 10 of 45 patients (22.22%) in the combined-treatment group experienced at least one documented adverse event. The overall incidence did not differ significantly between the two groups (χ^2=0.790, P=0.374), indicating that the addition of press-needle surrounding needling did not significantly increase the risk of treatment-related adverse reactions. Adverse reactions in both groups mainly consisted of mild to moderate local erythema, slight edema, and transient tingling. All resolved spontaneously without special treatment, indicating that the overall safety profile was acceptable (**Table 3**).

Comparison of treatment satisfaction

The patient satisfaction survey conducted after treatment showed that the overall satisfaction rate in the combined-treatment group reached 88.89%, which was higher than that in the laser-only group (P=0.025). There were no cases of very dissatisfied patients in the combined-treatment group, and the dissatisfaction rate was only 2.22%. By contrast, the dissatisfaction rate in the laser-only group was 10.26%, and 5.13% of patients were very dissatisfied. These results suggest that press-needle surrounding needling combined with

Table 4. Comparison of treatment satisfaction between the two groups

Groups	Very satisfied	Satisfied	Fair	Dissatisfied	Very dissatisfied	Overall satisfaction rate
Laser-only group (n=39)	10 (25.64)	17 (43.59)	6 (15.38)	4 (10.26)	2 (5.13)	69.23%
Combined-treatment group (n=45)	22 (48.89)	18 (40.00)	4 (8.89)	1 (2.22)	0 (0.00)	88.89%
χ^2						5.002
P						0.025

Table 5. Comparison of recurrence within 12 months of follow-up between the two groups

Groups	Recurrence within 12 months
Laser-only group (n=39)	8 (20.51)
Combined-treatment group (n=45)	2 (4.44)
Odds ratio	0.18 (95% CI 0.04-0.91)
Fisher's exact P	0.039

Q-switched laser was better accepted by patients in routine clinical practice (**Table 4**).

Comparison of 12-month recurrence during follow-up

During the 12-month follow-up, recurrence was documented in 8 of 39 patients (20.51%) in the laser-only group and 2 of 45 patients (4.44%) in the combined-treatment group. The recurrence rate was lower in the combined-treatment group (odds ratio 0.18, 95% CI 0.04-0.91; Fisher's exact P=0.039). Because only 10 recurrence events were recorded, this finding should be interpreted cautiously (**Table 5**).

Multivariable analyses

In the multivariable logistic regression model adjusted for age, disease duration, baseline summed regional MASI score, and etiological type, combined treatment was associated with higher odds of overall response, although the association did not reach statistical significance (aOR=2.29, 95% CI 0.88-5.95, P= 0.089). In the multivariable linear regression model using the same covariates, combined treatment was independently associated with a lower post-treatment summed regional MASI score (β=-5.04, 95% CI -5.63 to -4.46, P<0.001) (**Table 6**).

Discussion

A major difficulty in the clinical management of MEL is its high recurrence rate and the limited durability of treatment response. Existing photoelectric therapies can remove epidermal melanin rapidly, but they still do not correct the underlying pathological basis of disease development [17]. In this retrospective cohort, patients who received adjunctive press-needle therapy had lower summed regional MASI scores at treatment completion and 12-month follow-up, a lower documented recurrence rate, and higher treatment satisfaction than patients who received Q-switched laser alone. However, the difference in overall clinical response did not reach statistical significance after either unadjusted or adjusted analysis, and no significant between-group differences were observed in post-treatment MITF, TYR, total DLQI, or adverse-event rates. These findings therefore suggest an association between the combined regimen and improved lesion control rather than demonstrating broad or causal superiority over laser treatment alone.

From the clinical results, the overall response rate in the combined-treatment group reached 73.33% after 3 treatment courses, which was higher than the 51.28% in the laser-only group. In addition, lesion scores in all facial regions remained at relatively low levels at the 12-month follow-up, with no obvious rebound. The difference between the two regimens may be related to their distinct therapeutic logic. Q-switched laser mainly destroys already formed melanin granules through selective photothermal effects and therefore functions largely as symptomatic treatment [18]; it cannot intervene in the core pathogenesis of MEL described in traditional Chinese medicine as prolonged illness entering the collaterals, obstruction of the network vessels, and disharmony of the zang-fu organs. By contrast, the combined regimen, guided by collateral disease theory, acts directly on the superficial and fine collaterals around the lesion through facial

Table 6. Multivariable analyses of overall clinical response and post-treatment summed regional MASI score

Logistic regression for overall response				Linear regression for post-treatment score			
Variable	Adjusted OR	95% CI	P	Variable	β	95% CI	P
Combined treatment	2.29	0.88-5.95	0.089	Combined treatment	-5.04	-5.63 to -4.46	<0.001
Age, per year	0.95	0.86-1.05	0.296	Baseline summed regional MASI score	0.03	-0.12 to 0.17	0.713
Disease duration, per year	1.09	0.86-1.39	0.489	Age, per year	0.03	-0.04 to 0.09	0.421
Baseline summed regional MASI score	0.82	0.64-1.05	0.119	Disease duration, per year	-0.11	-0.26 to 0.04	0.159
Secondary etiological type	2.53	0.93-6.92	0.071	Secondary etiological type	-0.55	-1.14 to 0.05	0.071

surrounding needling, thereby promoting local circulation and relieving stasis in the affected area. Auricular press-needle therapy, meanwhile, is intended to regulate spleen-lung function and the endocrine axis, promote the movement of qi and blood, strengthen healthy qi, and dispel pathogenic factors, thus addressing both symptoms and underlying imbalance [19]. This interpretation is consistent with previous clinical observations, and the reduction in lesion scores is directionally consistent with previous clinical and synthesized evidence suggesting that acupuncture-based interventions may improve melasma severity [20]. Direct numerical comparison remains difficult, however, because previous studies used different needling techniques, co-interventions, response definitions, and follow-up durations. The present study extends this evidence by examining retained press-needle therapy as an adjunct to a standardized laser regimen and by including a 12-month assessment.

Serum MITF and TYR concentrations decreased significantly after treatment in both groups, which is compatible with an overall reduction in melanogenic activity. Nevertheless, the baseline-adjusted post-treatment concentrations did not differ significantly between groups; consequently, the present data do not support the conclusion that adjunctive press-needle therapy produced a greater inhibition of the MITF/TYR pathway than laser treatment alone. MITF is the key upstream transcription factor in the melanin synthesis pathway and can directly bind to the promoter region of the TYR gene to regulate its transcription [21]. TYR, the critical rate-limiting enzyme in melanin synthesis [22], together with MITF, constitutes a central driver of melanocyte hyperfunction in MEL when abnormally overexpressed [23]. Q-switched laser alone does not substantially inhibit the abnormal activation state of melanocytes, and its regulatory effect on the MITF/TYR pathway is therefore limited [24, 25]. Press-needle surrounding needling may improve local microcirculation and reduce chronic cutaneous inflammatory responses [26], while it may also regulate the neuro-endocrine-immune network [27], thereby suppressing abnormal MITF transcription and interrupting the melanin synthesis cascade at an upstream level. The lower lesion scores observed in the combined-treatment group may involve effects on local circulation, inflammatory responses, treatment adherence, or other unmeasured factors, but these explanations remain speculative because no lesional tissue or pathway-specific functional experiments were performed.

In the follow-up analysis, the 12-month recurrence rate was lower in the combined-treatment group, and this difference may be related to the different degree of regulation of the melanin synthesis pathway between the two groups. The high recurrence rate of MEL essentially reflects the persistent abnormal activation state of melanocytes that has not been corrected [28]. By regulating the MITF/TYR pathway, the combined treatment suppresses melanocyte hyperfunction at its source while also adjusting the overall internal environment of the patient and targeting intrinsic factors involved in disease onset; this may explain its better long-term stability. In addition, the minimally invasive and painless nature of press needles, together with their role in alleviating post-laser inflammatory reactions and reducing the risk of post-inflammatory hyperpigmentation, may further improve the treatment experience [29]. Although total DLQI scores improved substantially in both groups, the adjusted between-group difference was not statistically significant. The higher satisfaction rate in the combined-treatment group may reflect greater acceptance of the treatment experience, but it should not be interpreted as evidence of superior quality-of-life improvement. At the same time, no additional increase in adverse-reaction risk was observed throughout treatment, indicating good overall safety.

This study has several limitations. First, treatment was selected during routine clinical care rather than randomly assigned, and confounding by indication, clinician recommendation, treatment burden, cost, or patient preference may remain despite multivariable adjustment. Second, this was a single-center study with a relatively small sample of women who completed treatment and 12-month follow-up, which may have introduced selection bias and limits generalizability. Third, recurrence was derived from routine follow-up documentation, and only 10 recurrence events were recorded; the recurrence estimate is therefore imprecise and did not support a reliable multivariable recurrence model. Fourth, MITF and TYR were measured only in peripheral serum at baseline and

treatment completion, without assessment of lesional tissue, mRNA expression, inflammatory mediators, or skin-barrier indicators; a direct molecular mechanism cannot therefore be established. Finally, potentially relevant factors such as cumulative ultraviolet exposure, adherence to photoprotection, hormonal status, and previous treatment history were not consistently available for adjustment. These limitations require cautious interpretation and prospective multicenter confirmation.

Conclusion

Among the women included in this single-center retrospective cohort, adjunctive press-needle surrounding needling was associated with lower lesion scores at treatment completion and 12-month follow-up, a lower documented recurrence rate, and higher treatment satisfaction. Overall response, serum MITF and TYR concentrations, total DLQI scores, and adverse-event rates did not differ significantly between groups. These findings support further prospective evaluation of the combined regimen but should not be interpreted as evidence of causality.

Disclosure of conflict of interest

None.

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References

[1] Ocampo-Candiani J, Alas-Carbajal R, Bonifaz-Araujo JF, Marín-Castro H, Valenzuela-Ahumada F, Véliz-Barandiarán JL, Vila Echague A, Zepeda-Reyes DE and Miot HA. Latin American consensus on the treatment of melasma. Int J Dermatol 2025; 64: 499-512.

[2] Neagu N, Conforti C, Agozzino M, Marangi GF, Morariu SH, Pellacani G, Persichetti P, Piccolo D, Segreto F, Zalaudek I and Dianzani C. Melasma treatment: a systematic review. J Dermatolog Treat 2022; 33: 1816-1837.

[3] Gan C and Rodrigues M. An update on new and existing treatments for the management of melasma. Am J Clin Dermatol 2024; 25: 717-733.

[4] Chen W, Wan Y, Sun Y, Gao C and Li J. Prevalence of depression in melasma: a systematic review and meta-analysis. Front Psychiatry 2024; 14: 1276906.

[5] Ali L and Al Niaimi F. Pathogenesis of melasma explained. Int J Dermatol 2025; 64: 1201-1212.

[6] Bae YJ, Lee EJ, Kim JY, Park S, Hwang S, Kwon IJ, Alqahtani JM and Oh SH. Tranexamic acid inhibits 17β-estradiol-induced melanogenesis through PKA-CREB-MITF pathway. Exp Dermatol 2025; 34: e70194.

[7] Zhou S, Zeng H, Huang J, Lei L, Tong X, Li S, Zhou Y, Guo H, Khan M, Luo L, Xiao R, Chen J and Zeng Q. Epigenetic regulation of melanogenesis. Ageing Res Rev 2021; 69: 101349.

[8] Liu Z. Treatment of melasma with Q-switched laser in combination with tranexamic acid. Dermatol Res Pract 2025; 2025: 1883760.

[9] Ridha Z, Kamrani P, Firsowicz M, Zarbafian M, Darji K and Goldman MP. Laser and light-based therapies for treating melasma: an in-depth review. Dermatol Surg 2025; 52: 355-362.

[10] Lv MY, Yang Y, Fei WT, Liu JL, Zhang R, Zhou LH, Zhang FH, Wang C, Wang LY and Zhang JJ. A real-world study to observe the efficacy and safety of Lutai Danshen Baishao Granules for improving melasma. Medicine (Baltimore) 2025; 104: e41394.

[11] Supasiri T, Salakshna N and Pongpirul K. Short practical regimen of acupuncture for melasma: a prospective cohort study in a tertiary hospital in Thailand. Front Public Health 2021; 9: 761017.

[12] Sun Z, Chen G, Gu X, Tang M, Sun J, Huang J and Chen Z. *Tongdu Jieyu* acupuncture combined with local surrounding needling for 34 cases of melasma with liver *qi* stagnation. Zhongguo Zhen Jiu 2026; 46: 367-371.

[13] Su J, Quan T, Liao T, Luo Y, Fan X, Pan M and Tang H. Effectiveness and safety of acupuncture for melasma: a meta-analysis of randomized controlled trials. Explore (NY) 2025; 21: 103108.

[14] Philipp-Dormston WG. Melasma: a step-by-step approach towards a multimodal combination therapy. Clin Cosmet Investig Dermatol 2024; 17: 1203-1216.

[15] Zhu Y, Zeng X, Ying J, Cai Y, Qiu Y and Xiang W. Evaluating the quality of life among melasma patients using the MELASQoL scale: a systematic review and meta-analysis. PLoS One 2022; 17: e0262833.

[16] Paudel S, Acharya Poudel I, Upadhyay P, Kumar Shah M, Pokharel S and Sharma R. Quality of life in nepalese patients with melasma: an observational cross-sectional study at a tertiary center. J Nepal Health Res Counc 2022; 20: 316-320.

[17] Mahajan VK, Patil A, Blicharz L, Kassir M, Konnikov N, Gold MH, Goldman MP, Galadari H and Goldust M. Medical therapies for melasma. J Cosmet Dermatol 2022; 21: 3707-3728.
[18] Ke C, Huang Y, Chen C, Chen X and Ke Y. Comparative observation of the efficacy of Q-switched Nd: YAG laser with PhotoAcoustic Technology Pulse vs. traditional mode in treating melasma. J Dermatolog Treat 2025; 36: 2477257.
[19] Guo K, Lu Y, Wang X, Duan Y, Li H, Gao F and Wang J. Multi-level exploration of auricular acupuncture: from traditional Chinese medicine theory to modern medical application. Front Neurosci 2024; 18: 1426618.
[20] Tang L, Xian J, Zhang Y, Zhang C, Yu H, Tan Q and Zhang X. Efficacy of acupuncture for melasma: a protocol of systematic review and meta-analysis. Medicine (Baltimore) 2021; 100: e28298.
[21] Hushcha Y, Blo I, Oton-Gonzalez L, Mauro GD, Martini F, Tognon M and Mattei M. microRNAs in the regulation of melanogenesis. Int J Mol Sci 2021; 22: 6104.
[22] Wang F, Ma W, Fan D, Hu J, An X and Wang Z. The biochemistry of melanogenesis: an insight into the function and mechanism of melanogenesis-related proteins. Front Mol Biosci 2024; 11: 1440187.
[23] Liu W, Chen Q and Xia Y. New mechanistic insights of melasma. Clin Cosmet Investig Dermatol 2023; 16: 429-442.
[24] Ma W, Gao Q, Liu J, Zhong X, Xu T, Wu Q, Cheng Z, Luo N and Hao P. Efficacy and safety of laser-related therapy for melasma: a systematic review and network meta-analysis. J Cosmet Dermatol 2023; 22: 2910-2924.
[25] Chen J, Yu N, Peng L, Li H, Tang Y, Ou S and Zhu H. Efficacy of low-fluence 1064 nm Q-switched Nd: YAG laser for the treatment of melasma: a meta-analysis and systematic review. J Cosmet Dermatol 2022; 21.
[26] Han R and Hu J. Acupuncture: an overview on its functions, meridian pathways and molecular mechanisms. Am J Chin Med 2024; 52: 1215-1244.
[27] Zhang L, Luo Y, Wei T, Wang D, He Z, Lan L and Zeng F. Acupuncture's multisystem neuroimmunomodulation: central-peripheral interactions in gastroenteric, psychiatric, and chronic pain disorders. CNS Neurosci Ther 2025; 31: e70625.
[28] Artzi O, Horovitz T, Bar-Ilan E, Shehadeh W, Koren A, Zusmanovitch L, Mehrabi JN, Salameh F, Isman Nelkenbaum G, Zur E, Sprecher E and Mashiah J. The pathogenesis of melasma and implications for treatment. J Cosmet Dermatol 2021; 20: 3432-3445.
[29] Oh JE and Kim SN. Anti-inflammatory effects of acupuncture at ST36 point: a literature review in animal studies. Front Immunol 2021; 12: 813748.

Supplementary Table 1. Descriptive values and between-group comparisons of the principal continuous outcomes

Outcome	Time	Laser-only group	Combined-treatment group	Adjusted difference or P
Summed regional MASI	T0	17.05±2.33	17.20±1.74	P=0.739
	T1	9.15±1.58	4.07±1.10	β=-5.04, 95% CI -5.63 to -4.46; P<0.001
	T2	9.13±1.84	4.07±1.34	β=-5.18, 95% CI -5.89 to -4.47; P<0.001
MITF, ng/L	T0	185.76±27.51	190.67±26.96	P=0.412
	T1	127.86±22.83	122.60±28.21	Adjusted difference -5.79; P=0.307
TYR, IU/mL	T0	83.00±17.35	89.71±15.51	P=0.065
	T1	66.56±13.86	66.21±14.38	Adjusted difference 0.11; P=0.973
Total DLQI	T0	14.38±1.82	14.62±2.22	P=0.596
	T1	6.44±2.56	5.89±2.34	Adjusted difference -0.58; P=0.283