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Research Article

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Comparison of MASI Score Between Intense Pulsed Light Versus Intradermal Tranexamic Acid to Treat Melasma

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Abstract

Background

Melasma, which is a pretty common acquired pigmentary disturbance, tends to show up on sun-exposed facial patches, especially in women. From what's known, it happens because melanogenesis is increased, mostly from ultraviolet radiation, and also because hormones add to the picture, plus there's a genetic predisposition that makes some people more prone. There are established treatment plans for it, using both pharmaceutical agents and energy-based approaches. For instance, Intense Pulsed Light and intradermal tranexamic acid are now considered workable choices. However, there are only limited comparative data about how well they do versus each other for lowering the Melasma Area and Severity Index, often just called the MASI score.

Objective

To compare how much the Melasma Area and Severity Index, MASI, drops after treatment done with intense pulsed light IPL and intradermal tranexamic acid TXA.

Methods

So, this study was done as a prospective cohort study; it was at the Department of Dermatology, Ibn-e-Siena Hospital, Multan, from 6th May 2025 to 6th November 2025. In total, sixty patients with a clinical diagnosis of melasma were picked, then split into two groups of 30 each. Intense pulsed light therapy was given to Group A, and tranexamic acid was given as injections in the skin to Group B. Pre-treatment and post-therapy assessments of the MASI baseline MASI scores were taken. The data was analyzed using SPSS version 26, and the mean score decrease in MASI was checked between the two groups. The p-value was less than 0.05, so it was treated as significant in a kind of particular way.

Results

In both groups, we saw a real drop in MASI scores after treatment. The mean amount of change was notably higher for the IPL group, compared with the TXA group (9.03±3.11 vs 6.46±2.88, p=0.003), which suggests IPL might be more effective. Overall, the findings point to a clear decrease in MASI in both arms once the treatment period ended, as the numbers themselves kind of confirm. Also, the average gap in MASI reduction stayed higher with intense pulsed light (9.03±3.11) than with intradermal tranexamic acid (6.46±2.88), and this difference is statistically significant ($p<0.05$).

Conclusion

Intense pulsed light, together with intradermal tranexamic acid, both seemed to work pretty well in bringing MASI scores down for patients with melasma. But if you take a closer look, the intense pulsed light method seems to show this more visible drop in MASI scores, especially when it comes to pigmentation severity. When I compared it with

intradermal tranexamic acid, it was still helpful but not quite as much; the other approach seemed to have the stronger kind of effect, you know, almost similar, but weaker overall.

Keywords: Melasma, Intense Pulsed Light, Tranexamic Acid, MASI Score, Hyperpigmentation, Dermatology

1. Introduction

Melasma is kinda a long term acquired pigmentary disorder, so it's not just a quick thing. It shows up as symmetrical brown to grayish macules, patches, or little spots, and all of that tends to look kind of steady over time. And it mostly appears on skin that gets the most sun exposure. Usually it shows on the cheeks, forehead, nose, and also around the upper lip; sometimes it feels like it "settles in" there. It seems to show up more in women during their reproductive years, and also among people with deeper skin phototypes, mostly Fitzpatrick III– V, specifically those who live in Asian, Middle Eastern, or tropical places. Because it is chronic and it keeps coming back, melasma can really mess with daily life, self-esteem, and overall psychological well-being. Several epidemiological studies show a higher prevalence of melasma in places with strong ultraviolet (UV) radiation exposure, so it sorts of points to the fact that surroundings and environmental factors play a key role in how the disease develops [1].

Melasma pathogenesis is kinda multifactorial, and it includes tricky interactions between ultraviolet radiation, hormonal shifts, genetic predisposition, vascular modifications, and inflammatory mediators. Ultraviolet radiation pushes melanogenic enzymes, for example, tyrosinase, and then you get a rise in melanin synthesis, with melanin deposition both in the epidermis and also in the dermis. Hormonal influences, especially pregnancy, use of oral contraceptives, and hormone replacement therapy, add an extra signal for melanocytes and pigment buildup. On top of that, melanocyte hyperactivity, abnormal melanin transfer to keratinocytes, changes in dermal microcirculation, plus inflammatory cytokines that keratinocytes and fibroblasts release are thought to keep the condition going and make it return. Melasma is often kind of grouped into epidermal, dermal, and mixed types, depending on how deep the melanin actually sits, which can then change the way treatment works a bit, plus it may influence overall prognosis [2,3].

Different ways of dealing with melasma have been tried already, for example, using topical depigmenting agents, chemical peels, oral meds, and procedural therapies. Even if hydroquinone, retinoids, and corticosteroids are still pretty much treated as first-line choices, using them for too long can set off unwanted effects, like irritation, erythema, and later on, post-inflammatory hyperpigmentation. Because of that, folks keep searching for other treatment routes that might feel more effective, be safer, and stay dependable in the long run. Still, even with many available choices, nobody has settled on one universally accepted standard treatment for melasma, mainly because the results vary a lot and the recurrence rates can be high [4].

Tranexamic acid (TXA) has been seen as a pretty promising therapeutic choice for melasma, as it has actually shown up in the conversation more and more lately. TXA is an antifibrinolytic agent, so it blocks the plasminogen to plasmin conversion. In turn, this reduces the ultraviolet- driven plasmin activity, inflammatory mediator release, angiogenesis, and melanocyte activation as well. People have used TXA in multiple ways, oral, topical, and even intradermal injections, and the reported clinical outcomes look favorable. Now the intradermal route seems especially useful because it brings more "direct" drug delivery to the site, leading to stronger local drug concentrations, while the systemic exposure stays lower, plus the adverse effects are minimized. A few clinical trials, systematic reviews, and meta-analyses have all pointed to meaningful decreases in pigmentation severity and also improvements in Melasma Area and Severity Index (MASI) scores after intradermal TXA treatment [5-8].

Intense pulsed light (IPL), an energy-based therapeutic thing, has been getting a lot of attention for melasma treatment as well. It delivers non-coherent, broad-spectrum light that targets melanin chromophores using the whole idea of selective photothermolysis. Basically, that mechanism breaks apart the melanin granules, then they're cleared away through normal epidermal turnover. Beyond just pigment reduction, IPL also nudges dermal collagen remodeling along, which helps with skin rejuvenation overall, not only the surface tone. Some earlier investigations showed clear gains in pigmentation severity, skin look, and MASI score changes after IPL sessions. On the safety side, IPL is usually considered pretty safe, but short-lived erythema can happen, and post-inflammatory hyperpigmentation may show up in more susceptible people [9,10].

Recent studies have explored the use of TXA in combination with lasers and other energy-based devices to enhance treatment outcomes. Such multimodal approaches target different pathogenic mechanisms involved in melasma and may result in greater pigment reduction and improved clinical outcomes compared with monotherapy. However, treatment responses vary according to patient characteristics, skin phototype, disease severity, and treatment protocols. Comparative studies and meta-analyses have reported variable efficacy among available treatment modalities, highlighting the need for direct comparative studies to identify the most effective and safe treatment strategies for melasma management [11-17].

Despite growing evidence supporting the efficacy of both IPL and intradermal TXA, direct comparative studies evaluating these treatment modalities using standardized outcome measures such as MASI scores remain scarce, particularly in South Asian populations. Therefore, this study was conducted to compare the reduction in Melasma Area and Severity Index (MASI) scores

following treatment with IPL and intradermal TXA in patients with melasma presenting to a tertiary care dermatology clinic.

2. Objective

To figure out the hole in how much the Melasma Area and Severity Index score is brought down between intensive pulsed light therapy and intradermal tranexamic acid, among melasma patients who come to a tertiary level dermatology clinic, or something.

3. Materials and Methods

- Study Design: This prospective cohort study
- Study Setting: Department of Dermatology, Ibn-e-Siena Hospital, Multan.
- Duration of Study: The duration of the study was six months, from 6th May 2025 to 6th November 2025.
- Sample Size: The sample size was estimated with the help of the OpenEpi software using the formula for the mean difference. The sample size of 60 patients with 30 patients per group was estimated by taking the percentage change of MASI score in intensive pulse light as 57.1±19.7 and that of tranexamic acid as 42.2±18.8, with 80% power of the study and 95% confidence level.
- Sampling Technique: Non-probability consecutive sampling technique.
- Inclusion Criteria: In this study, the participants were patients who had a clinically diagnosed epidermal or mixed melasma, with ages ranging from 18 to 45 years. People were recruited if they had been given a clinical diagnosis of epidermal or mixed melasma for no less than 6 months, and if they were agreeable to take part in a sequence of follow-up visits. They included only the patients who agreed to take part and were not subjected to any procedural treatment of melasma within the last three months.
- Exclusion Criteria: In this study, we excluded people who were pregnant or lactating, you know. Also, patients with bleeding disorders, hypersensitivity to tranexamic acid, or photosensitivity disorders were left out. Keloidal tendency, active facial infections, and significant systemic illness, like some related complications, were also excluded.

No participants were using oral contraceptives, hormonal therapy, anticoagulants, or any other coexisting melasma treatments. On top of that, we also avoided participants whose assumptions seemed unrealistic or who were not that compliant with the follow-ups.

4. Methods

After approval from the institutional ethical committee, 60 patients fulfilling the inclusion criteria were enrolled and divided into two equal groups of 30 patients each. Group A got intense pulsed light therapy, while Group B got intradermal tranexamic acid injections. Before treatment, we noted the baseline demographic details together with clinical history and also had the MASI score calculated. Then, everything was tracked from there. In the intense pulsed light group, treatment sessions were performed at defined intervals using standard dermatological parameters. In the intradermal tranexamic acid group, tranexamic acid was given intradermally into the affected zones at planned sessions. Each patient was also told to apply sunscreen regularly throughout the study period, you know. Near the end of treatment, the final MASI score ended up being recorded, and then the average drop in the MASI score was kinda matched between the two groups. All of it was worked up in SPSS version 26, and if the p-value came out as ≤0.05, it was handled as statistically significant.

5. Results

So overall, 60 patients who really met the inclusion criteria were pulled in for the study, and they were divided into two therapy groups, 30 each, which was pretty even, I think. Group A got intense pulsed light (IPL) treatment, while Group B received intradermal tranexamic acid injections (TXA). Everyone finished the full prescribed treatment course and the subsequent clinical checkups. At the start, baseline demographic details and clinical features were compared between the two arms to make sure they were similarly matched before any treatment began.

The overall average age of the participants was 31.48 ± 6.72 years, and most patients actually sat in the 26–35-year range. Also, melasma seemed to show up a lot more in females than in males, across both treatment groups. When I look a bit closer, the mean age in the IPL arm was 32.10 ± 6.41 years, while in the TXA arm it was 30.86 ± 6.98 years. There wasn't any statistically meaningful difference in the average age between the groups ($p > 0.05$), so basically the two arms looked kind of comparable at baseline.

Variable	Group A (IPL) n=30	Group B (TXA) n=30	Total	Variable
Mean Age (years)	32.10 ± 6.41	30.86 ± 6.98	31.48 ± 6.72	Mean Age (years)
Gender (Male)	6 (20%)	7 (23.3%)	13 (21.7%)	Gender (Male)
Gender (Female)	24 (80%)	23 (76.7%)	47 (78.3%)	Gender (Female)

Table 1: Baseline Demographic Characteristics of Patients (n=60)

At the start of the therapy, the area and severity index MASI was measured and basically used as a way to judge how severe the melasma was at baseline. The mean MASI value at baseline in Group A (IPL) was 15.82 ± 3.64, while in Group B (TXA) it was around 15.37 ± 3.41. When these two treatment groups were put side by side, the statistical outcome stayed non-significant ($p > 0.05$), so it kinda looks like the overall severity of the condition was pretty much similar in both groups right from the beginning.

Variable	Group A (IPL) n=30	Group B (TXA) n=30	p-value
Baseline MASI Score	15.82 ± 3.64	15.37 ± 3.41	0.62

Table 2: Comparison of Baseline MASI Score Between Groups

All patients were retested on MASI scores following the completion of treatment sessions. The treatment groups showed a great decrease in the MASI score. The mean MASI score got lower from 15.82 ± 3.64 down to 6.79 ± 2.71, with an average drop of 9.03 ± 3.11.

This must be corrected. So, the mean intradermal tranexamic acid group MASI score kind of dropped, from 15.37 ± 3.41 to 8.91 ± 2.95, and the average change was about 6.46 ± 2.88. The statistical analysis kinda showed that this reduction in MASI score was clearly more pronounced in the IPL group rather than the TXA group, with $p < 0.05$.

Variable	Group A (IPL) n=30	Group B (TXA) n=30	p-value
Baseline MASI	15.82 ± 3.64	15.37 ± 3.41	0.62
Final MASI	6.79 ± 2.71	8.91 ± 2.95	0.01
Mean Reduction	9.03 ± 3.11	6.46 ± 2.88	0.003

Table 3: Comparison of MASI Score Reduction After Treatment

The graphical comparison of the MASI score reduction also kind of shows the difference between the two modes of treatment. The high-intensity pulse light group had a greater reduction in MASI score than the intradermal tranexamic acid group, and this seems to point to the relative effectiveness of IPL therapy in lowering how severe melasma looks.

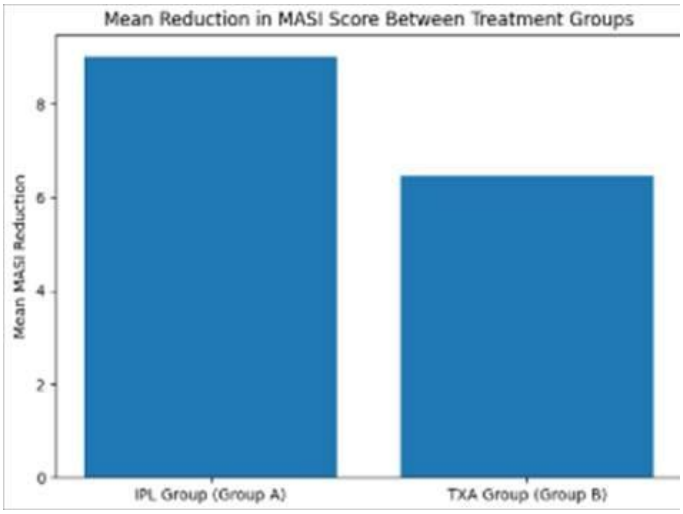

Figure 1: Comparison of Mean Reduction in MASI Score Between Groups

In general, these two treatment modalities demonstrated a significant clinical response to melasma severity. Nevertheless, intense pulsed light therapy showed a higher decrease in the MASI score than intradermal injection of tranexamic acid. These results indicate that IPL can offer a better treatment alternative for the severity of the pigmentation condition in patients with melasma in controlled clinical conditions.

6. Discussion

This present study kinda compared how well intense pulsed light (IPL) and intradermal tranexamic acid (TXA) work at lowering Melasma Area and Severity Index (MASI) scores in patients dealing with melasma. Both options basically helped a lot and showed meaningful improvements in how strong the pigmentation looked. Still, the drop in MASI scores was much more noticeable in the IPL group than in the intradermal TXA group, so it seems IPL has better performance for treating melasma overall.

The findings of this study kind of line up with earlier research showing how TXA seems to work well in melasma treatment. Tranexamic acid gives its beneficial effect mostly by blocking the plasminogen plasmin pathway, which in turn can lower melanocyte activity and melanin production. A few clinical trials, systematic reviews, and meta analyses have also described clear decreases in how strong the pigmentation looks and in the MASI scores after intradermal TXA use (4, 5). So, the positive results we saw here basically add weight to TXA being a practical, fairly reliable treatment option for melasma.

Similarly, we saw that the superior efficacy of IPL in this study lines up with earlier findings that looked at energy-based therapies for melasma. IPL works by selective photothermolysis; it goes after melanin chromophores and helps pigment clearance, and at the same time, it also pushes dermal remodeling a bit. In older reports, they found clear improvements in pigmentation severity, overall skin appearance, and MASI scores after IPL treatment (6–8). The bigger drop in MASI scores in the IPL group might be because IPL has a more direct action on melanin deposition, plus it can cope with several factors at once that take part in melasma pathogenesis.

Comparative studies looking at different treatment modalities for melasma have shown kinda mixed results depending on which intervention is used. On one hand, pharmacological therapies can give a longer-lasting suppression of melanogenesis, but on the other, energy-based modalities tend to bring faster visible changes in clinical appearance, or so the reports suggest. In this context, the results from the present study kinda back up the idea that IPL is an effective choice for patients who want greater short-term improvement in pigmentation severity. Still, treatment selection really should be tailored to match the individual situation, like how severe the melasma is, the patient's skin phototype, what the patient prefers, and what is available locally, plus the possible adverse effects.

This study has a few limitations, kinda. It was carried out at just one center, with a sample that was somewhat small, and that might cap how broadly these results can be applied. Also, the follow-up window was rather short, so it did not really let us look at long-term efficacy or the recurrence rates. For that reason, future multicenter work, with larger sample sets and extended observation periods, is really advisable to verify what we found and to also gauge the durability of treatment outcomes over time.

In conclusion, both IPL and intradermal TXA were effective for dialing down MASI scores in patients with melasma. Still, the IPL approach showed a notably larger reduction in MASI scores than intradermal TXA, sort of more persuasive in the end, even if it feels close at first. These results hint that IPL could be a more effective treatment choice for bettering melasma severity, though additional studies are needed to really pin down its long-term efficacy and safety.

6.1. Limitations

- Single-center study
- Small sample size
- Short follow-up duration
- No recurrence assessment
- Lack of blinding

7. Conclusion

Melasma is a chronic pigmentary problem that really tends to need quite good treatment choices, so you can end up with decent clinical results. In the study we looked at, it was shown that intradermal tranexamic acid and intense pulsed light (IPL) therapy both helped in lowering the Melasma Area and Severity Index, also known as MASI, in people who had facial melasma. Still, when you compare them, the drop in MASI score seemed much more noticeable in the IPL group, compared with the group that used intradermal tranexamic acid. So, these outcomes point toward IPL maybe giving a slightly better improvement in pigmentation severity and more favorable overall clinical outcomes for patients with melasma.

Even though intradermal tranexamic acid led to meaningful clinical improvement and still feels like a valuable treatment choice, the IPL results seemed better in the current study. So, IPL could be thought of as an effective treatment approach for certain patients who are properly selected for melasma. Still, the whole decision should be personalized based on the patient's own traits, how intense the disease is, skin phototype, what treatments are actually available, plus the risk of potential adverse effects.

More multicenter investigations, with a larger number of participants and longer follow-up windows, are still needed to really validate what we saw and to also properly examine the long-term benefits, the safety profile, and the recurrence rates linked to both ways of treating.

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