

Efficacy of intense pulsed light in melasma

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Abstract *Objective* To determine the efficacy of intense pulsed light (IPL) in the treatment of melasma in Asian skin types.

Methods Fifty patients who fulfilled the inclusion criteria were selected for this study. Type of melasma was identified with the help of Wood's lamp. Before each session patients were asked to wash the area with bland soap and water. Cooling transparent gel was applied. Fluence and pulse duration of IPL was selected according to the Fitzpatrick skin type. Patients were treated with 560nm-1200nm wavelength. They were advised to use broad spectrum sunscreen with SPF >30 and to avoid heat and sunlight. Topical antibiotic was advised for few days till the crusts cleared. Treatment was carried out with an interval of three weeks for a total of four sessions. Efficacy was assessed four weeks after the last session.

Results The mean age of the patients was 31.8 ± 6.5 years. There were 5 (10%) males and 45 (90%) female patients. 7 (14%) patients had dermal melasma, 20 (40%) epidermal type and 23 (46%) patients had mixed disease. The mean percentage of reduction of MASI score was 29.4 ± 10.9 . In only 2 (4%) patients, IPL was found to be efficacious.

Conclusion Intense pulsed light is non-efficacious treatment for melasma in Asian persons.

Key words

Melasma, intense pulsed light, efficacy, Asian skin type.

Introduction

Melasma is an acquired, irregular, light to dark brown, usually symmetrical facial hypermelanosis, often affecting women, especially those living in areas of intense ultraviolet radiation.¹ Melasma accounts for 4-10% of new dermatology hospital referrals and is more common in people of Hispanic, as well as, Asian origin.²

The precise cause of melasma remains unknown, however, genetic and hormonal influences play a role in combination with ultraviolet (UV)

radiation. Specific precipitants include oral contraceptive pills, estrogen replacement therapy, mild ovarian or thyroid dysfunction, ovarian tumors, cosmetics, malnutrition, phototoxic and photoallergic medications.³ People with darker skin (Fitzpatrick skin types IV-VI) are more frequently affected. There are three major patterns of distribution: centrofacial (forehead, nose, cheeks, upper lip), malar (nose and cheeks) and mandibular (ramus). From its appearance under Wood's lamp, melasma is classified into epidermal, dermal and mixed types.^{3,4}

As sun exposure is one of the most important causative factors, so sun protection by using broad spectrum sunscreen is the first-line management along with hypopigmenting agents such as hydroquinone, tretinoin, azelaic acid,

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rucinol and kojic acid. Combination therapies such as hydroquinone, tretinoin, and a mild topical steroid are thought to increase efficacy as compared with monotherapy.³ Isopropylcatechol, liquiritin, mequinol, N-acetyl-4-S-cysteaminylphenol and flavonoid extracts are other compounds that are under study. Chemical peels, lasers, intense pulsed light (IPL) and fractional skin resurfacing are additional therapeutic modalities that have been used to treat melasma.^{1,4}

IPL devices use flashlamps and bandpass filters to emit polychromatic incoherent high intensity pulsed light of determined wavelength spectrum, fluence and pulse duration that facilitates the treatment of a wide spectrum of skin conditions.⁵ The basic principle of IPL is more or less selective thermal damage of the target. The emission spectrum of IPL ranges from 500-1300nm. With the aid of convertible cut-off filters, IPL can be easily adapted to the desired wavelength range.^{5,6}

Melasma is a common but difficult to treat disorder and it has an adverse psychological impact leading to low self-esteem and depression. Since various studies have shown IPL as an effective mode of therapy, the present study was aimed to evaluate the efficacy of intense pulsed light in the treatment of melasma in our patient population, as limited data is available regarding response of pigmentary disorders to IPL therapy in Asian skin type.

Methods

Fifty patients, having any type of melasma (epidermal, dermal, mixed), age more than 15 years, melasma area severity index (MASI) score ranging from 6-35 and Fitzpatrick's skin type IV and V, presenting in outpatient department of Dermatology Unit-II, Mayo

Hospital Lahore were enrolled for this study. Patients who were pregnant, had keloidal tendencies, photosensitive dermatoses or taking retinoids or other drugs known to cause facial hypermelanosis were excluded from the study. After taking informed consent and recording of demographic data, complete history was taken and examination performed. Type of melasma was identified using Wood's lamp. Baseline MASI scoring was done. Before each session patients were asked to wash the area with bland soap and water. Cooling transparent gel was applied. Fluence and pulse duration of IPL was selected according to the Fitzpatrick skin type. Patients were treated with 560nm-1200nm wavelength. Ice pack was applied after IPL. Patients were advised to use broad spectrum sunscreen with SPF >30 and to avoid heat and sunlight. Topical antibiotic was advised for a few days till the crusts cleared.

Treatment was carried out with an interval of three weeks for a total of four sessions. Efficacy was assessed four weeks after the last session. Results were evaluated according to percentage reduction in MASI score. Patients were examined for any side effects. Digital photographs taken before the start of treatment and at the end of treatment were compared.

Results

In this study the mean age of the patients was 31.8±6.5 years, with the age range of 22-45 years. There were 9 times more females than males.

In the distribution of patients by occupation, maximum number of patients (78%) was housewives, the rest belonging to various other occupations (student, computer professional, laborer, beautician). Regarding type of melasma,

Table 1 Distribution of patients by percentage reduction in MASI score(n=50).

Percentage reduction in MASI score	N (%)
10-20	10 (20)
21-30	18 (36)
31-40	12 (24)
41-50	7 (14)
>50	2 (4)
Mean ± SD	29.4 ± 10.9

Table 2 Distribution of patients by efficacy of treatment (n=50).

Efficacy	N (%)
Excellent	0 (0)
Good	2 (4)
Fair	30 (60)
Poor	18 (36)

Excellent: >75% reduction in MASI score; good: 50-75% reduction in MASI score; fair: 25-50% reduction in MASI score; poor: <25% reduction in MASI score

majority of patients (46%) in this study had mixed melasma.

As per Fitzpatrick's skin type, almost half of the patients (58%) had type IV skin. According to the duration of disease, majority (58%) of the patients had disease duration between 1-5 years. 8% of patients had melasma for >11 years.

The mean baseline MASI score of the patients was 14.5±6.0, with majority of patients (52%) in the MASI score range of 11-20. In this study the mean percentage of reduction of MASI score was 29.4±10.9, with only 4% of patients showing >50% reduction in MASI score (**Table 1**). At the end of this study only 4% of the patients showed good efficacy when treated with IPL (**Table 2**).

Discussion

There is no reported study in Pakistan regarding the treatment of melasma with the IPL device and our study was the first in this context. IPL is being used to treat pigmentary disorders in



Figure 1a Pre-treatment



Figure 1b After four treatment sessions (poor efficacy)

different countries of Asia. Melasma is one of the common acquired pigmentary conditions in Asians and is found an exceptionally taxing condition to treat. The pathogenesis involves an increase in the number of melanocytes and increase activity of melanogenic enzymes overlying the dermal changes caused by solar radiation. The therapeutic effects of IPL are attributed mainly to the photothermolysis of the melanosomes.

In our study the mean age of the patients was 31.8 ± 6.5 years, which is comparable with other international studies. In the study conducted by Li *et al.*⁷ the mean age of the patients was 32.7 years while it was 29.4 ± 11.6 years in the study done by Moreno-Arias and Ferrando.⁸ Mostly young individuals consult for the treatment of melasma because they are more concerned about their looks and feel embarrassed of pigmentation.

In our study 46% patients presented with mixed melasma and 40% patients showed epidermal melasma when examined with the Wood's lamp. As compared with the study of Li *et al.*⁷ in which 80.9% patients had mixed melasma and 19.1% presented with epidermal melasma.

In our study the mean duration of melasma was 5.4 ± 3.5 years while it was 9.4 years in the study conducted by Li *et al.*⁷ The reason for this early presentation could be that 72% patients were <35 years of age as compared to the study by Li *et al.* in which only 42.7% patients presented before 35 years of age. Young individuals are more concerned about their looks so they seek early for the treatment.

There is a great variability in results obtained by IPL in different studies because the results not only depend on IPL's selected parameters but also on the patient's biologic variables.

The mean percentage of reduction of MASI score in our patients was $29.4 \pm 10.9\%$. Li *et al.*⁷ reported a mean percentage of reduction of MASI score of 70.4%, which is much higher as compared to our study. In another study by Wang *et al.*⁹ it was 39.8%. The results of these international studies were better than ours, although the mean total MASI score at the baseline was comparable with our study i.e. 14.5 in ours and 15.2 in the study by Li *et al.*⁷ It may

be because of varied reasons. Wang *et al.*⁹ applied 4% HQ cream along with the IPL sessions, throughout the study to prevent postinflammatory hyperpigmentation. Another reason could be differences in skin types. In our study, patients were of skin type IV and V whereas the studies by Li *et al.*⁷, Negishi *et al.*¹⁰ and Wang *et al.*⁹ were performed on patients with skin type III and IV. 41.6% of patients in the study by Li *et al.*⁷ were of Fitzpatrick skin type III whereas in our study, 42% patients had type V skin which could be the reason of decreased response as dark skin is more resistant to therapy. All the other patients, both in our study and that of Li *et al.*⁷ had type IV skin. In dark skin (type IV and V), there are more chances of postinflammatory hyperpigmentation with IPL therapy. Also multiple treatment sessions are needed to produce satisfactory results.¹¹ Another reason could be the number of sessions for the treatment. We performed 4 sessions at 3 weeks interval whereas Negishi *et al.*¹⁰ did 3 to 6 sessions at 3 weeks interval according to the patient's response. Similarly in a study by Vedamurthy,¹² 6 sessions were performed at 3 weeks interval.

4% patients showed efficacy in our study while in the study by Li *et al.*⁷ 77.5% patients obtained more than 50% reduction in MASI score. Wang *et al.*⁹ found 35% patients to be efficacious with the IPL therapy. This decreased response could be due to the use of different filters in different types of melasma. We used only 560nm filter for all types of melasma because of the limitations of availability of other filters. Li *et al.*⁷ utilized 560/590nm for epidermal and 590/615/640nm filter for the patients with mixed type of melasma. 590nm filter was used by Wang *et al.*⁹ for the epidermal melasma and 615nm filter for the mixed type. The longer wavelengths have better penetration than the shorter wavelengths.

This could be an important reason of decreased efficacy in our study as we used a short wavelength filter. Another reason could be the low fluence (13 to 25 J/cm²) in our patients, because of their low tolerance, as compared to Wang *et al.*⁹ who used higher fluence from 26 to 33 J/cm². Moreno-Arias and Ferrando⁸ applied an energy density of 34J/cm² whereas Negishi *et al.*¹⁰ used 28 to 32 J/cm² according to the tolerability of their patients.

Other factors likely to contribute to the differences in clinical outcome include the geographic conditions of Pakistan i.e. long duration of summer season and excessive UV light exposure. Li *et al.*⁷ conducted his study in North China where summer season lasts for only 3 months and UV exposure is not a major issue. Evaluation of the patients by blind investigators and/or self-assessment of improvement by the patients could have changed the results. The variability in results may be due to the fewer enrollments in the study as 89 patients were enrolled in the study by Li *et al.*⁷ as compared to 50 patients in our study. Use of substandard cosmetics, poverty, poor nutritional status of the patients, illiteracy and non-adherence to the regular use of sunscreen could be important contributory factors.

It is concluded that intense pulsed light with 560nm filter is inefficacious treatment for melasma in our patient population. In addition to the topical and physical therapies for melasma, patient education, sun avoidance and the use of regular sunscreen should be the mainstay of treatment in this difficult and frustrating condition. Further studies are needed to establish the optimal treatment parameters and to determine the biologic mechanisms of the treatment.

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