Efficacy and Safety of Yellow Light Diode Laser 577nm for Treatment of Melasma Patients in Sulaymaniyah City.

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ABSTRACT:

BACKGROUND:

Recent evidence suggests that angiogenetic factor involved in the pathogenesis of melasma. Yellow light laser which emits 577 nm may has effect on dermal vasculature and may be of benefit in the treatment of melasma.

OBJECTIVE:

To evaluate the efficacy and safety of yellow light laser 577 nm for the treatment of melasma in Fitzpatrick skin types II-IV in both male and female patients.

METHODS:

Thirty three patients with melasma were enrolled, from which 30 patients completed the study (5 males, 25 females), age range of (20-40) years, duration of melasma between (2-10) years. They all are either dermal or mixed according to Wood's light examination, Each patient received 2 sessions of yellow light laser 577 nm treatments to the face at 4 weeks interval. The treatment fluency ranged from 10-15 J/cm2, with the pulse duration of 100 ms for skin type II, III, and 120 ms for skin type IV.

Clinical parameters included patient self assessment of changes in the pigmentations after each treatment session and 8 weeks after the last session and two investigators independently evaluated Melasma Area and Severity Index (MASI) score before each session and 8 weeks after the last session.

RESULT:

Mean MASI score decreased dramatically after treatment from 18.6 ± 7.5 before treatment to 7.6 ± 4.5; eight weeks after the last treatment, with a P-value < 0.001 which is statistically significant. Patient´s self assessment revealed that 14 of the patients were experienced excellent improved, 10 of the patients moderately improved, 4 of the patients mildly improved, no patients had no changes and 2 of the patients develop post inflammatory hyperpigmentation.

CONCLUSION:

The use of yellow light diode laser 577nm is an effective and safe treatment option for the demal and mixed type of melasma in both males and female patients with Fitzpatrick skin types II-IV..

KEY WARD: yellow light , laser ,melasma.

INTRODUCTION:

Melasma is an acquired pigmentary disorder characterized by brownish hyperpigmented macules usually on the face. Majority of the cases are seen in women, although 10% of the cases are males [1, 2].

The etiopathogenesis of melasma involves interplay of various factors such as sun exposure, hormonal. factors (pregnancy and oral contraceptive pills), genetic predisposition, and phototoxic drugs Association has also been found with ovarian dysfunction, thyroid autoimmune disease, liver disease, and cosmetics [3,4].

Recently, it has been suggested that dermal inflammation induced by accumulation of UV irradiation may be associated with activation of fibroblasts, which result in the up- regulation of stem cell factor in melasma dermal skin leading to increased melanogenesis [5]. In addition to increased pigmentation, data suggest that increased vascularity is one of the major findings in melasma. Vascular endothelial growth factor (VEGF) may be a major angiogenic factor for altered vessels in melasma [6].

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Melasma can be classified based on the site of the lesions (craniofacial, malar, andibular), histological depth of pigmentation (epidermal, dermal, mixed), and appearance under the Wood's lamp (epidermal, dermal, mixed, indeterminate) [7].

The MASI score (Melasma Area and Severity Index) is an index used to quantify the severity of melasma and changes during therapy. The maximum value of MASI is 48 and means severe hyperpigmentation [8].

Treatment options of melasma includes: General measures (mostly sunscreen), topical depigmenting agents ,chemical peels (superficial, medium and deep) dermabrasion , Intense pulsed light (ILP) therapy and laser therapy [9 ,10 11].

Yellow light diode laser (577 nm) is absorbed well by blood vessels (red and pink is coloration of the skin) and it corresponds perfectly with absorption peak of hemoglobin[12].

This study was done to evaluate the efficacy and safety of yellow light laser 577 nm for the treatment of melasma in Fitzpatrick skin types II-IV in both male and female patients.

PATIENTS AND METHODS:

Patients: This is a clinical therapeutic trial for treatment of patients with melasma, using yellow light laser, in which thirty three patients (5 males and 28 females; age range 20- 40 years; Fitzpatrick skin types II - IV) with long standing melasma of duration between (2-10 years) were enrolled. 3 out of 33 patients were lost follow up for unknown reasons , therefore they were excluded from the study.

The diagnosis of the melasma is based upon the clinical appearance of melasma and on the basis of Wood's light examination, epidermal, dermal and mixed type were identified, which uses ultraviolet light (320-400 nm).

All of the patients had previously undergone a variety of treatments, such as topical bleaching agents, chemical peelings and even laser therapy other than yellow light laser with little or no improvement.

Exclusion criteria were:

1. Refusal to give informed consent.
2. Pregnant women.
3. Patients with excessive photosensitivity to normal sunlight.
4. Inflammatory disease of the skin in the area of treatment.
5. Open wounds in the area of treatment.
6. Active herpes simplex.
7. Facial congenital nevi.
8. Patients with connective tissue diseases and other autoimmune diseases.
9. Use of topical agents for melasma treatment for last 2 weeks.
10. Use of oral isotretinoin in the last 2 months.
11. Use of oral contraceptive pills.
12. Use of lasers for melasma treatment less than 3 months before enrollment.

The patients were recruited from Teaching center of dermatology and Dermatology Laser Specialty Center in Sulaymaniyah city-Iraq, which took place between April 2014 and September 2014. Risks, benefits, and potential complications were communicated with the patients and written informed consent was obtained.

2.2 Treatment Protocols

All the patients were asked to wash their face by tap water and soap, the photographs were taken and no topical or local anesthetic was used in any of the patients, and the eyes were always protected.

We used a laser device (QuadroStar PRO. Asclepion Laser Technologies,Germany) with a wavelength of 577 nm, which is the first solid-state diode laser operating at the 577 nm wavelength and includes a novel scanning delivery device for treating vascular and pigmented lesions.

The device has several different operation modes: BASIC, EXPERT, BURST, SCAN, CW (continuous wave) and VARIX.

The treatment parameters were as follows: The scan mode is selected, inwhich the spot size is automatically fixed to (1mm), with the use of spot-by -spot application technique, the coverage area density of 60% is selected with the scan interval (time needed to set the scanner to the next area) of 2.0seconds is used. The scanner was provided with the skin cooler and cooling glass window.

When the device is ready, the lesion is covered with a single pass totally, then the probe (Scanner) was moved parallel to nearby second area from the first square- shaped exposure area.

The treatment fluency ranged from 10-15 J/cm2, with the pulse duration of 100 ms for skin type II, III, and 120 ms for skin type IV. During the procedure, the skin cooling occurred to protect the epidermis and to relieve pain, and all the patients were instructed to apply ice packs to the treated areas right after the laser treatment for the same reason. Two sessions of treatment were performed at 4- weeks intervals, and no other treatments were administered. Patients were advised to apply mometasone furoate cream at night optionally for 3 successive nights.

All subjects were instructed to avoid the use of bleaching agents during the 2 months course of the treatment and for 2 months of follow-up period. They were also instructed on proper sun protection and the use of broad spectrum sunscreen (sun protection factor 50+) every two hours during the period of treatment and for 2 months of follow up after treatment course.

2.3 Assessment

Evaluation of skin lesions was performed before each treatment session and 8 weeks after the final treatment. The clinical assessment after treatment consisted of the patient self-assessment of the extent of the melasma using a five point grading system of worse, no change, mild improvement, moderate improvement, and excellent improvement of the pigmented lesions.

Two dermatologists evaluated Melasma Area and Severity Index (MASI) scores before each session and 8 weeks after the final session.

Photographs of each patients face in 2 views were taken using a digitalcamera (16.2 megapixels, SONY cyber-shot, DSC-HX100V, CHINA) before each treatment session and 8 weeks after the final treatment.

2.4 Statistical analysis

All patients' data entered using computerized statistical software; Statistical Package for Social Sciences (SPSS) version 17 was used. Descriptive statistics presented as (mean ± standard deviation), frequencies and percentages. Multiple contingency tables conducted and appropriate statistical tests performed, analysis of variance (ANOVA) was used to demonstrate the difference between different means. In all statistical analysis, level of significance (p value) set as <0.05 and the results presented as tables and or graphs.

RESULTS:

A total 30 patients with melasma were treated with yellow light laser, Mean age of patients was 32 ± 6 years, 56.7% of melasma patients were ≥ 30 years age and 43.3% of them were <30 years age. Most of studied melasma patients 25 (83.3%) were females and 5 (16.7%) were males, as shown in table 1

Table 1:**Demographic characteristics of melasma patients.**

Variable	No.	%
Age mean±SD (32±6 years)		
<30years	13	43.3
≥ 30years	17	56.7
Total	30	100.0

Melasma was classified by Wood's light according to its depth into dermal among 20 (66.6%) patients and mixed among 10 (33.4%) patients. Sixteen (53.4%) melasma patients had Fitzpatrick's skin type IV, 7 (23.3%) patients had Fitzpatrick's skin type III and 7 (23.3%) patients had Fitzpatrick's skin type II, as shown in table 2

Table 2: Clinical characteristics of melasma.

Variable	No.	%
Melasma types		
Dermal	20	66.6
Mixed	10	33.4
Total	30	100.0
Fitzpatrick s skin types		
Type I	7	23.3
Type II	7	23.3
Type IV	16	53.4
Total	30	100.0

The decline in MASI scores was significant for males and females patients with time from week 0 (before treatment) until 8 weeks after the last laser treatment (follow up session) as it is demonstrated below, (p = 0.05) as shown in table 3

Table 3: ANOVA analysis of MASI scores according to visits for male and female melasma patients.

Visit	MASI scoring (mean±SD)	
	Male	Female
Week 0	18±7.7	18.5±7.6
Week 4	14±6.2	12±5.8
Week 8	9.7±4.5	9.5±5.1
Week 16	3.9±1.7	7.5±4.7
ANOVA test (p-value)	<0.001	<0.001

Mean MASI scores was significantly declined after 2 treatment sessions with yellow light laser for both dermal or mixed type of melasma (p<0.001),table - 4

Table 4 : ANOVA analysis of MASI scores according to visits of patients With different melasma types.

Visit	MASI scoring (mean ±SD)	
	Dermal	Mixed
Week 0	18.5±7.1	18.3±8.07
Week 4	12.9±5.7	11.1± 6
Week 8	10.2±5.07	8.3± 4.8
Week 16	8.2±4.6	6.5± 4.2
ANOVA test (P – value)	<0.001	<0.001

Table 5: Decline in MASI scores for melasma patients with Fitzpatrick's skin types after 2 session of treatments and 8 weeks of follow up.

Visit	MASI scoring (mean±SD)		
	Type II	Type III	Type IV
Week 0	19±9.1	16.3±8.6	19±6.4
Week 4	13.3±6.5	12.4±5.4	11.9±5.9
Week 8	11.3±5.9	9.9±4.6	8.6±4.7
Week 16	9.7±5.5	7.7±4.2	6.7±4.1
ANOVA test (p- value)	0.056	0.06	<0.001

It was noticed that the side effects were mild and no serious adverse events occurred during the treatment period. All patients experienced a mild erythema at the laser treated sites, mild prickling sensation during treatment which is tolerated by the patients.There was no incidence of postinflammatory hypopigmentation, no scarring and no facial edema in any of the patients. We observed 2 cases of post inflammatory hyper pigmentation who was of Fitzpatrick skin type IV. All patients returned to their work or normal daily activity immediately and no patient needed to take time off from work.

Patients self-assessment for both hyper pigmentation and erythema revealed that 14 patients were significantly improved, 10 patients

moderately improved, 4 patients mildly improved, no patients had no changes and 2 patients had worse results, as shown in figure :1

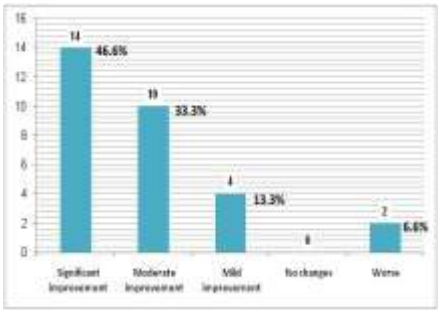

Figure 1: Patients self-assessment.

Figure 2:(A)28years –old male before treatment . (B) after treatment.

Figure 3: (A) 25years –old female before treatment . (B) after treatment.

DISCUSSION:

Among the 30 patients with melasma included in the study, mean age of melasma patients in this study was 32 ± 6 years; more than half of them were ≥30 year's age. This finding is close to results of Lynde et al study in Canada [13]

Females in our study were more than males. Many literatures as Shweta et al study in USA[14] and Leeyaphan et al study in Thailand [15], reported that majority of melasma patients were females.

According to its depth, more than half of the studied patients had dermal melasma. These findings are inconsistent with results of Elethawi et al study [16], and Tamega et al study in Brazil that reported predominance of epidermal melasma type. This inconsistency might be attributed to difference in age and sample size between studies.

More than half of melasma patients in our study had Fitzpatrick's skin type IV. This finding is consistent with results of Elethawi et al study [16], that reported 64.4% of melasma patients were with Fitzpatrick's skin type IV.

There were significant improvement of melasma (decline in MASI scores) ($p<0.001$) after two sessions of treatment with yellow light laser 577 nm therapy for both dermal and mixed types. This finding is agreed with results of Jang et al study in Korea [17], they treated patients with dermal/mixed melasma types with six sessions of low-dose fractional QSRL (694 nm) treatment at 2-4 week intervals respectively, with mild erythema, edema and 1-2 cases of post inflammatory hyper pigmentation respectively.

The mean MASI scores significantly declined for melasma patients with Fitzpatrick's skin type IV after 2 visits with yellow laser 577 nm therapy ($p<0.001$). This finding is consistent with results of Li et al study in China [18] on 89 Chinese women that resulted significant decline in MASI scores of melasma patients with Fitzpatrick's skin type IV after laser therapy.

Zoccali et al study in Italy [19],51 results are close to our results, they were treated 38 patients with melasma using four sessions of IPL laser, their result was significantly improved in 47.37% of the patients, moderately improved in 28.95% of the patients, mildly improved in 13.6% of the patients, while in our study on 30 melasma patients the 46.6%14 of the patients was significantly improved, 33.3%10 of the patients moderately improved and mild improvement occurred in 13.3%4 of the patients, and there was a recurrence of hyper pigmentation within 2 and 4 months of post IPL treatment.

The study of Eimpunth and collegues [20], 52 that used Copper Bromide (CuBr) laser for the melasma treatment in 24 women with skin phototype III-IV, they received six session of CuBr laser treatments, 2 weeks apart. At the 3 month follow up visit, they concluded that there was no improvement as measured by clinical evaluation or Mean melanin Index (MI), Mild transient erythema, burning sensation, scaling, hyperpigmentation and crusting were noted.

CONCLUSION:

1. Yellow light laser 577 nm therapy is safe and effective treatment for dermal and mixed type of melasma and patient's satisfaction was more than previous studies.
2. There is no evidence of long term side effects like scarring, post inflammatory hypopigmentation and no pain were recorded during therapy, so no need for anesthesia during yellow light laser 577 nm therapy.

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