SAFETY AND EFFECTIVENESS OF FRACTIONAL ERBIUM-YAG (2940 nm) LASER IN THE TREATMENT OF MELASMA IN SULAIMANIA CITY

Kazhan A. Tofiq [a]

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ABSTRACT

Background

Melasma is acquired pigmentary disorder, characterized by brownish symmetrical patches, mostly in the sun-exposed areas of the skin. Many treatment modalities have been used, one of the advanced technologies attempted is Lasers.

Objectives

To assess the safety and effectiveness of Fractional Erbium(Er) -Yag laser treatment for Melasma, in addition to, determining the demographic and clinical criteria of the study group.

Patients and Methods

Thirty (30) patients diagnosed as Melasma, were included in our study. All patients interviewed and treated by Fractional Er-Yag Laser, which ranged from 1to 4 sessions. The demographic and clinical data, degree of patients' satisfaction, and side effects were recorded and analyzed.

Results

Out of 30 patients, included in our study, 28 were females, their mean age was 33.7 years, 17 women were housewives, parity ranged between 0-4 children, only 3 patients were outdoor workers. Twenty (66.7%) patients were married, 9 were single. Daily sun exposure was more than 4hrs in 5 patients. Illness duration ranged from 6moths to 16 (mean 5.15) years. About 60% were previously treated. Two-thirds of the cases had one or more associated conditions like polycystic ovarian disease PCOD, Anemia, thyroid diseases, or were on oral contraceptive pills OCP. Areas affected were in 50% of all the three: Centro-facial, malar and mandibular. Fitzpatrick skin type of patients was type III in 18 (60%), 11 patients were type IV, and one was type II. One or more immediate side effects reported in all 30 (100%) patients. Long term side effects like hyperpigmentation happened only in one patient. Patients' satisfaction about laser treatment was very good in 8 (26.7%) patients, good in 12 (40%), seven patients mentioned little improvement and one patient said that laser made his condition worse.

Conclusion

Fractional Erbium-Yag Laser in the treatment of Melasma is a safe and effective therapeutic approach.

Keywords: *Laser safety, Melasma, Fractional Laser.*

[a] Department of Medicine, College of Medicine, University of Sulaimani, Kurdistan Region, Iraq.
Correspondence: kazhan.tofiq@univsul.edu.iq

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INTRODUCTION

Melasma (Chloasma, the mask of pregnancy) is a common dermatological condition that primarily affects female patients. This disorder is defined as acquired symmetrical hyperpigmentation that is often recurrent and refractory [1].

There is currently no definite etiology but multiple factors including ultraviolet radiation, hormonal alterations within the estrogen or progesterone pathways, genetic predisposition[2]. Estrogen, associated with pregnancy or oral contraceptive pills, induces the release of melanocyte-stimulating hormone (MSH), stimulating tyrosinase; is a reason the majority of cases are seen in females versus males [3]. The correlation between melasma and Haemoglobin (Hb) percentage was found to be insignificant with the p-value 0.243, and all of the p-values remained at <0.05[4]. Although women are predominantly affected, men are not excluded from melasma, representing approximately10% of the cases [5].

Melasma is classified by location:

Centro-facial: Involvement of the forehead, cheeks, chin, and upper lip.

Malar: Involvement of cheeks and nose.

Mandibular: Involvement of rami of the mandible.

Melasma can be also classified according to the depth of lesions: epidermal, dermal, or mixed [6].

Diagnosis is mainly clinical; however, wood's light and dermoscopy can be used to detect the depth of the lesions [7].

Treatment is challenging and focused on a variety of mechanisms to stop, hinder, and/or prevent steps in pigment production. The treatment regimen of patients with melasma typically starts with the management or elimination of risk factors, strict ultraviolet sun protection, and topical lightening formulations [8].

Topical therapy takes at least three months or longer to see skin lightening [9]. Topical medications modify various stages of melanogenesis, with the most common mode of action being inhibition of the enzyme tyrosinase [10].

Pretreatment and post-treatment topical regimens in conjunction with laser and light treatment help reduce the risk for rebound hyperpigmentation. Laser and light therapy for the treatment of melasma is best suited for patients with refractory melasma who failed with topical treatment or seek rapid improvement or cure [9].

A variety of lasers and light devices have been used with varying degrees of success in melasma. The vast array of devices and combination protocols that have been tried in melasma indicate that no single modality is singularly effective. Q-switched lasers (QSL), fractional lasers, ablative lasers, intense pulsed lights (IPLs), copper bromide laser, thulium laser, and their combinations have all been used, but the response is unpredictable, and the pigmentation frequently recurs [11].

Another need for laser therapy recently shown by studies is that melasma lesions have, besides increased pigmentation, more vascularization, and elastosis than perilesional skin, which is the area that laser and light energy can help[9].

Again, laser therapy is an alternative approach to treat patients with recalcitrant melasma and recurrent cases. Fractional resurfacing affords a new modality for the treatment of melasma that combines decreased risk and downtime with significant efficacy. This treatment modality deserves further exploration to maximize benefits [12]. Ablative fractionated resurfacing lasers (AFL) such as CO**2** lasers and Erbium-Yag lasers have been reported for the treatment of patients with melasma [9].

PATIENTS AND METHODS

This study accepted by the ethical committee of the University of Sulaimani. A total of 30 patients were included in the study over 6 months from November 2018 through May 2019. All patients were examined and diagnosed clinically as cases of Melasma. Each patient was interviewed and the questionnaire form designed for the study was filled for him/her. First laser session conducted by Fractional Er-Yag (2940nm) laser, at parameters: Fluence 180 J/cm^2, Frequency 0.6 ms, and spot size 1.2 x1.2 cm, Pretreatment topical anesthesia. Epidermal cooling used during all sessions and post-treatment soothing creams applied. Strict sun avoidance for 5-7 days, and not to wet treated area for 12-24 hours, has been advised. Subsequent session has been scheduled. The immediate side effects, after each session, were recorded. Long term side effects were investigated in the subsequent sessions. After data collection and entry, the variables were analyzed by using the SPSS program.

RESULTS

Socio-Demographic characteristics of the study group are as in below: Their ages ranged from 23-49 years (mean 33.7 years). The patients were divided into 28 (93.3%) females and 2 (6.6%) males. The marital status of the study group recorded, two-third of them was married, and 30% were single while one was divorced. Parity of the women subjects ranged from 0-4 children. Seventeen women were housewives, 12 were working and one was a student. Three patients in the study were outdoor workers. Daily sun exposure was more than 4hs in 5 patients, (Table1).

Clinical data collected in this study were as in the following figures: The duration of illness ranged from 6 moths to 16 years, (mean 5.1 years), Figure 1.

Eighteen patients (60%) were previously treated for melasma, 15(50%) of them by topical medications ,Figure 2, 3..

About two-thirds of the cases had one or more associated conditions like polycystic ovarian disease (PCOD), Anemia, Thyroid disease or took Oral Contraceptive Pills, Figure 4.

Areas affected by Melasma macules and patches are seen in Figure 5, which varied between the involvement of both mandibular and cento-facial areas of the face (50%), or only Centro-facial (36.7%) and to a lesser extent in Centro-facial with malar areas(13.3 %).

Fitzpatrick skin type of the patients is as follows, 18 (60%) were type III, 11 were type IV, and one was type II, Figure 6.

Number of sessions done for the patients participated in this study ranged from 1-4, Figure7.

One or more immediate side effects like redness, pain, or swelling occurred in all the 30 (100%) patients that subsided within hours (Figure 8). While long term side effects like hyperpigmentation happened only in one patient, while no scarring or hypopigmentation has been occurred in this study group (Figure 9).

Patients' satisfaction with laser treatment was very good in 8 (26.7%), good in 12 (40%), while 7 patients mention little improvement and one patient said that laser made his condition worse , Figure10.

Table 1. Demographic characteristics of the study group.

Mean Age:	33.7 years	
Sex (F:M)	28:2	
Parity* :		
	0 (No children)	1 (4.8%)
	1 child	6 (28.6%)
	2 children	10 (47.6%)
	3 children	3 (14.3%)
	4 children	1 (4.7%)
*Men and single women were excluded, here total was 21 women		
Occupation:		
	House wife	17 (56.7%)
	Employed	12 (40%)
	Student	1 (3.3%)
Our Door Work:		
	Yes	3 (10%)
	No	27 (90%)
Daily sun exposure more than 4 hours:		
	Yes	5 (16.7%)
	No	25 (83.3%)
Marital Status:		
	Married	20(66.7%)
	Single	9(30%)
	Divorced	1(3.3%)

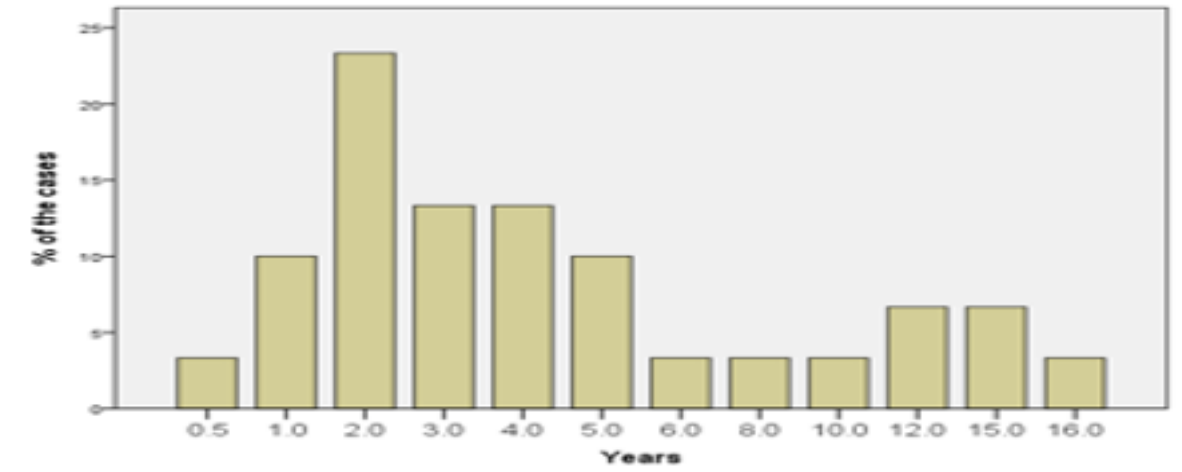

Figure 1. Duration of the condition.

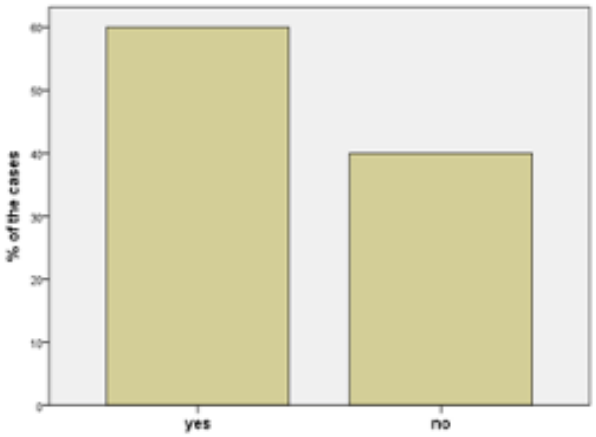

Figure 2. Previous treatments.

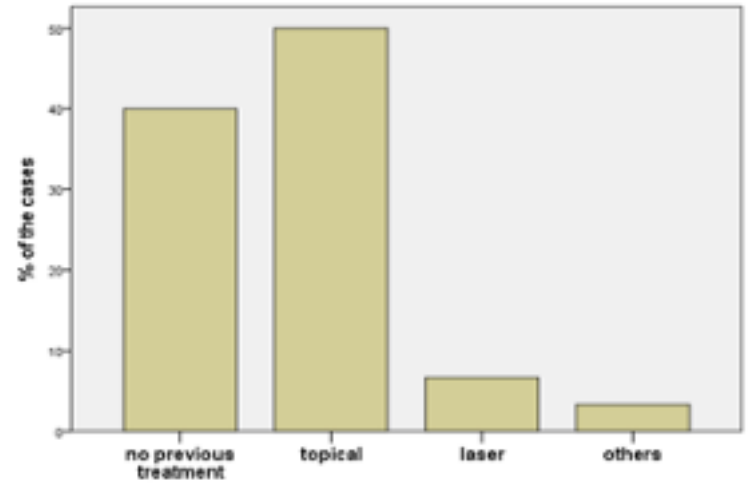

Figure 3. Types of previous treatments.

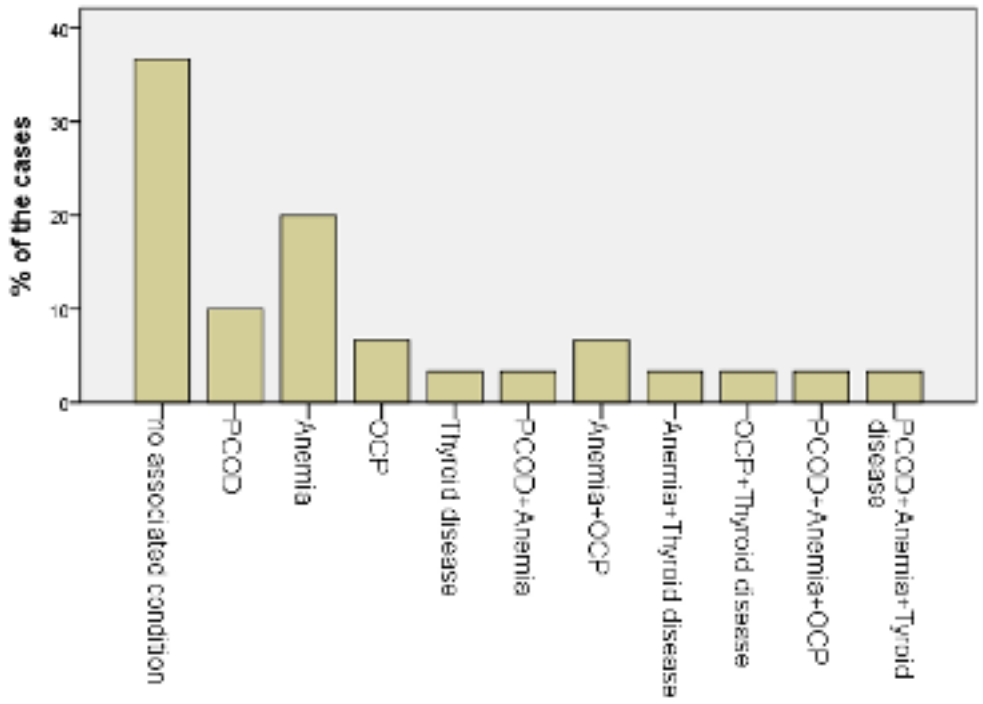

Figure 4. Associated medical conditions.

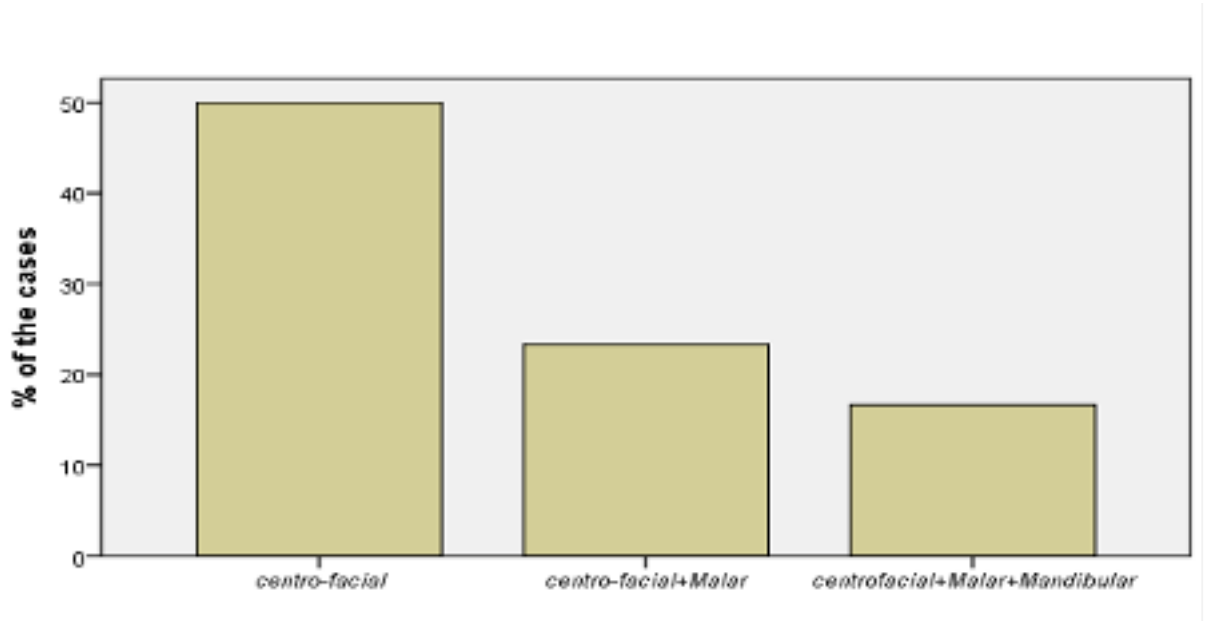

Figure 5. Areas affected by Melasma.

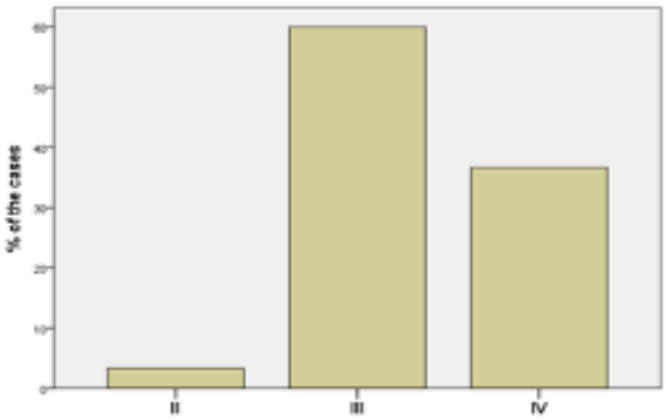

Figure 6. Fitzpatrick skin types.

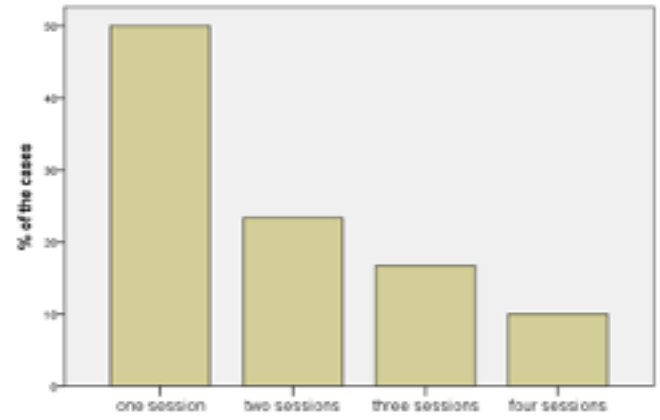

Figure 7. Number of Laser sessions.

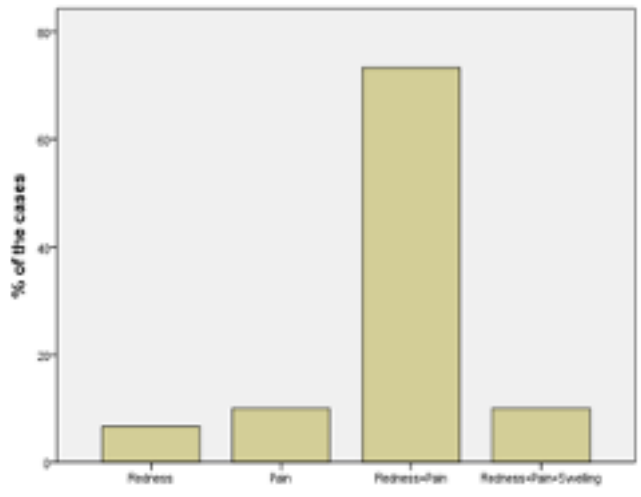

Figure 5. Immediate side effects

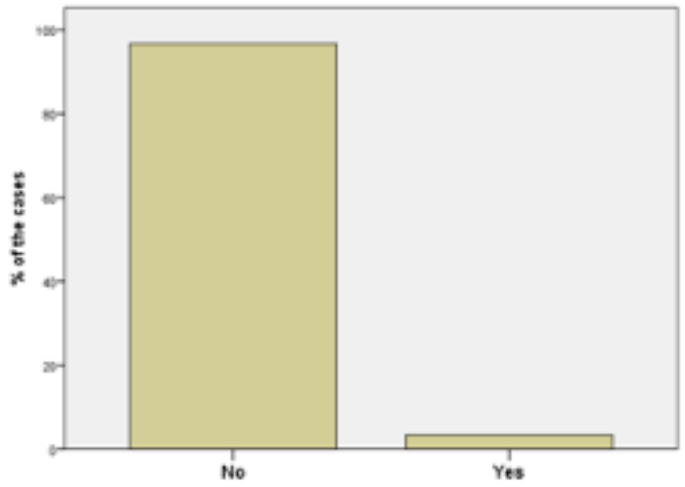

Figure 9. Long term side effects.

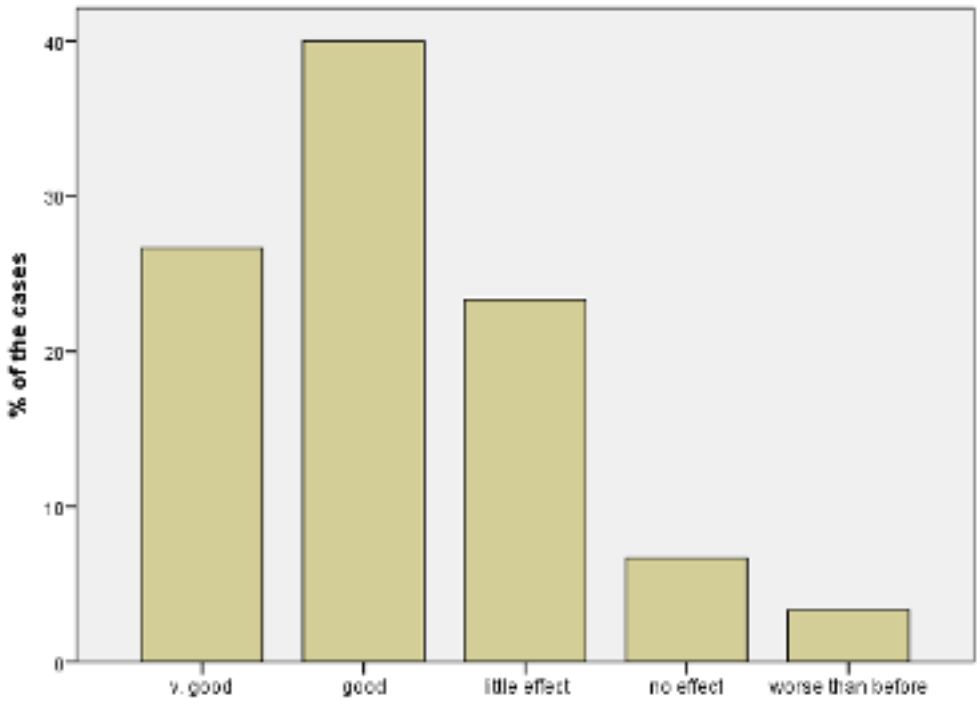

Figure 10. Overall patients' satisfaction.

DISCUSSION

Melasma is a common hyperpigmented disorder in our daily dermatology practice. It is characterized by irregular light- to gray-brown macules and patches involving sun-exposed areas of skin [13].

Females are affected more commonly during their late third decade of life [6], and similar results have been obtained in our study as the mean age was 33.7 years, Although women are predominantly affected, men are not excluded from melasma, representing approximately 10% of the cases[5]. In our study, nearly similar ratio was observed (2 males out of 30 cases). For more accurate gender-wise prevalence a bigger sample size may be needed.

Other demographic criteria of the patients in our study included: parity, occupation, and marital status. Parity was found to be between (0-4) children, and most of the women subjects were housewives (56.7%). Marital status of the study group recorded, two-third of them were married, 30% were single while one was divorced, a similar result has been found in a study carried out on 312 cases [6].

Sun-exposure, pregnancy, and taking of oral contraceptive pills could precipitate or exacerbate the melasma and some of our patient's disease was associated with autoimmune disease, mainly thyroid dysfunction [6]. In our study, 10% of the cases had outdoor jobs and 16.7% had a history of more than 4 hours of sun exposure.

The population incidence of melasma is not precisely known. Changes occurred in recent decades due to the increase in sun exposure time spent by the population during leisure and daily activities were not substantiated in studies [14]. Our findings are not compatible with the results of previous studies, which stress on the role of parity and sun exposure may be due to our limited number of study subjects.

In another study, patients consulted the doctor after 3.59 years of their disease [15]. The cases in our study visited us after the development of the disease by 6 months to 16 years, the average time or duration of the disease was around 5 years. Sixty percent of our cases were treated previously, either by topical medication in 50% or by laser treatment and other methods like chemical peeling, microdermabrasion, or mesotherapy for the remaining10% of them.

The exact causes of melasma are unknown. However, multiple factors are implicated in its etiopathogenesis, mainly sunlight, genetic predisposition, and the role of female hormonal activity. Exacerbation of melasma is almost inevitably seen after uncontrolled sun exposure and conversely, melasma gradually fades during sun avoidance [2, 16& 17].

We tried in our study to detect the above-associated factors like PCOD, thyroid diseases, anemia, or history of taking drugs like Oral contraceptive pills. About 36.7% of our study subjects had no associated conditions mentioned above, 20% had anemia, 10% had PCOD, and the rest has more than one of the mentioned medical conditions, our results are similar to previous studies [4, 13].

The Centro-facial pattern is the most common and involves the forehead, cheeks, upper lip, nose, and chin. The malar pattern involves the cheeks and nose. The mandibular pattern involves the ramus of the mandible [3, 18]. In the present study, Centro-facial involvement was in all patients. Either alone in (36.7%), or with malar area involvement in (13.3%), while all the three areas involvement were seen in 50% of our study group.

Since melasma results from a local change in pigmentation, it preferably affects more strongly melanized phenotypes, and is mainly present in intermediate skin types III-V (Fitzpatrick classification), but rare in extreme skin types [19]. Similarly, most of our study subjects were skin type III &IV (60% & 36.7%) respectively.

Although the incidence of undesirable postoperative sequelae has decreased with the development of advanced laser technology and individualized treatment parameters, these risks may never be eliminated. In the future, as more refined laser techniques evolve, the ability to safely and effectively treat these patients will improve [20]. We tried, in our study, to minimize the above risks by preoperative counseling and educating on post-treatment sun avoidance, use of soothing creams, and scheduling subsequent visits for following up the cases, detecting and treating any side effects, and conducting next laser session if needed.

The number of treatments that are required for a benefit with non-ablative fractional laser (NAFL) seems comparable with those that are reported for IPL (approximately four)[9]. The number of sessions during the period of our study ranged between 1-4 sessions, half of the cases had only one session.

Although topical therapies are the mainstay treatment, lasers are being used increasingly to treat pigmented lesions. Laser treatment of melasma is however still controversial [21]. Yet our patients are increasingly encouraged to do it either for rapid action when compared to topical medication or due responsiveness to other treatment modalities.

Lasers have demonstrated significant efficacy in the treatment of a variety of hyperpigmentay disorders, their precise efficacy, and place in the therapy of melasma have yet to be established [2].In our study, the efficacy of laser treatment was detected through direct questioning of the patient in each subsequent session or visit and most of them was satisfied, regardless the number of sessions, as 26.7% expressed that the treatment outcome was very good, 40% said that it was good, about 23.3% of them mentioned that laser did little effect. No effect mentioned by 6.7% and 3.3% said that their lesions become worse after laser treatment.

Treatment with high energy pigment specific lasers, ablative laser resurfacing, and fractional lasers can result in high rates of post-inflammatory hyper and hypopigmentation with significant rebound melasma [22]. While in our study the rate was very low and occurred only in one out of 30 patients (3.3%).

Fractional resurfacing, which was introduced in 2004, creates selective columns of microthermal damage in which treated areas are intermixed with untreated ones. Thus, recovery is more rapid and theoretically, the resulting inflammation is lower, which lessens the risk for scarring or dyspigmentation [9]. This fact was obvious in our study.

Fractional resurfacing lasers showed early promise in treating melasma but long-term follow-up studies have suggested that there is a high incidence of rebound melasma and post-inflammatory hyperpigmentation [11]. In our study both immediate and long term side effects were investigated. The incidence of immediate side effects, were high, but temporary, while long term side effects were minimal. Yet, longer duration studies are needed with bigger sample sizes to detect rebound phenomena and to prove our conclusion regarding the safety and effectiveness of Fractional ablative laser in the treatment of Melasma.

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