Journal of Pakistan Association of Dermatologists. 2023;**33(3)**:864-869.

Original Article

The comparative efficacy of Intense Pulsed Light (IPL) and electrofulguration for the treatment of facial freckles

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Abstract

Objective The objective was to assess the efficacy by comparing the percent decrease in FASI (Freckles area and severity index) score in patients of facial freckles treated with Intense pulsed light (IPL) and electrofulguration.

Methods This is a comparative interventional study conducted in Dermatology department Mayo Hospital Lahore. Total 240 patients with clinical diagnosis of freckles fulfilling the inclusion criteria were enrolled. Patients were randomly divided into two equal groups, group A (n=120) and group B (n=120). Group A was treated with IPL and group B was treated with electrofulguration. 1st treatment session was given at baseline and total 6 sessions were given with 4 weeks' interval for both treatment modalities. Photographs were taken and FASI score was calculated at baseline and at the end of 6th session.

Results Out of 240 patients enrolled in the study, females (53%) out-numbered the males (47%). The percent decrease in FASI was 15.73% with IPL while with electrofulguration it was 14.29% with p value <0.05, showing comparable efficacy with both treatment modalities. Both IPL and electrofulguration showed highly significant reduction in freckles and FASI scores with minimal side effects like postinflammatory hyperpigmentation, erythema and mild pain. But post treatment side effects were less reported with IPL. Patients showed an excellent compliance with both treatment modalities.

Conclusion Current study concluded that IPL and electrofulguration are both effective treatment modalities for freckles but post treatment side effects were less reported with IPL. These results have shown that IPL is a safer treatment option than electrofulguration.

Key words
IPL; Electrofulguration; Freckles; FASI; Ephelides; Melanocytes.

Introduction

Facial freckles are defined as pale brown macular lesions, usually less than 3mm in diameter with poorly defined lateral margins. They appear on the skin exposed to ultraviolet light.[1] On histopathological examination, they are composed of clusters of melanosomes and melanophages without an increased number of melanocytes.[2] The melanin synthesis is increased by the stimulation of ultraviolet rays and this process is multi-enzymatic and one of the involved enzyme is Tyrosinase. It is upregulated by α-MSH (α-melanocyte stimulating hormone). Different factors such as diabetes mellitus, advanced ages and increased estrogen levels in pregnancy are involved in this pathway of

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Tyrosinase enzyme upregulation.[3]

They are common in fair skinned individuals and their number can increase in adolescence.[4,5] They have an autosomal dominant inheritance and are common in European races and Asians. The prevalence in different populations' ranges from 16-47.8%.[2] Facial hyperpigmentation can cause cosmetic disfigurement and can cause negative impact on patient's quality of life.[6]

Medical treatments with topical agents and chemical peels, surgical treatments like electrosurgery, cryotherapy and laser and light-based therapies are available to improve freckles.[7,8] The role of light-based therapies in dermatological treatment has expanded dramatically in recent decade.[9] Complete resolution of freckles is possible by use of Q-switched alexandrite laser, Q-switched ruby laser, IPL, Nd:YAG laser, long-pulsed 532 nm and short-pulsed 532 nm.[9,10]

Intense pulsed light is a non-coherent, polychromatic, non-ablative source of light emitting a continuous spectrum of 515-1200nm.[11] Light energy of IPL is more efficiently absorbed by the darker areas of pigmentation in the skin and breakdown the excess melanin that forms the basis of freckles. IPL has been used in freckles treatment in Asian population and has proven effective.[10]

Electrofulguration is a type of electrosurgery, which causes superficial tissue destruction through surface carbonization and dehydration. Sachdeva and Dogra have described the role of electrofulguration in the treatment of freckles.[12,13]

In this study the disease severity and response to both treatment modalities were measured by Freckles Area and Severity Index (FASI).[10] We compared the efficacy of both treatment modalities by comparing the percent decrease in FASI score at the end of 6th session.

Freckles are commonly seen problem of our society. Although these are harmless but greatly affects the quality of life. So, we have planned the present study to determine the effectiveness of both treatment modalities to treat this skin problem in Asians.

Methods

The study was conducted at the Department of Dermatology, KEMU from 03-01-2014 to 02-07-2014 after approval from Institutional review board committee (IRBC).

Total 240 with a clinical diagnosis of freckles were enrolled. Eligible patients were males or females of ages 15 years and above with skin types III, IV, V and patients with baseline FASI equal to or more than 25. Group A, patients were treated with Intense pulsed light and group B, patients treated with electrofulguration. First treatment sessions were given at baseline and total six sessions (each with 4 weeks' interval). For assessment purpose, photographs of the patient were taken at baseline and at the 6th month. FASI was calculated at baseline and at 6th month.

For IPL, parameters were controlled using cut off filters ranging from 550-590 nm, with a pulse width of 4.0 ms and fluence of 25-35 J/ cm^2. A chilled and colorless ultrasonic gel was directly applied to the filter. The filter was kept about 2-3 mm from the skin. Duration of procedure was in range of 5-10 minutes.

Patients were counselled about pain and burning. An alternating current of 10 mA with 6 voltage was passed down through the electrode to desiccate the freckles one by one. Patients were advised to use sun block daily.

Data was assessed by calculating FASI score which was derived using regular photographs under same lighting condition, with the following formulas:

Freckles area and severity index (FASI) = contrast + area + density (CDF)

Mean FASI score was measured by subtracting post-treatment FASI score at 6 months from baseline FASI in each patient. Thus, the efficacy was measured objectively with the percent decrease in FASI score with both treatment modalities after the 6th session.

$$\text{Percent decrease in FASI score} = \frac{\text{FASI Pre Treatment} - \text{FASI Post Treatment}}{\text{FASI Post Treatment}} \times 100$$

Results

A total of 240 cases (120 in each group), fulfilling the inclusion criteria, were enrolled. The frequency of freckles among the female patients was higher (53%) than the male patients (47%).

Gender distribution showed that 53% (n=64) in Group-A and 42% (n=50) in Group-B were males, while remaining 47% (n=56) in Group-A and 58% (n=70) in Group-B were females.

Age distribution of the patients revealed that 11.66% (n=14) in Group-A and 5% (n=6) in Group-B were below 20 years of age, 78.34% (n=94) in Group-A and 76.66% (n=92) in Group-B were between 21-40 years, while 10% (n=12) in Group-A and 18.34% (n=22) in Group-B were above 40 years. FASI score of all the patients in Group–A and Group–B was calculated at baseline and after the 6th treatment session. Data is graphically presented in **Figures 1 & 2**. Mean FASI score, standard deviation, degree of freedom and significance of the treatment were calculated as shown in **Table 1**.

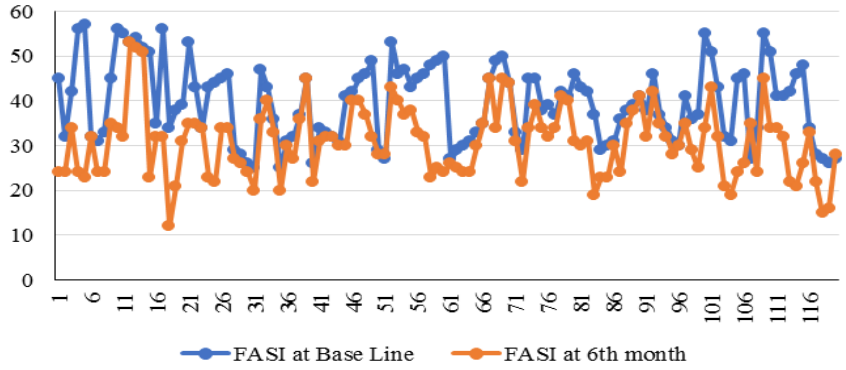

Figure 1 Comparison of FASI score at baseline and at 6th month patients treated with IPL.

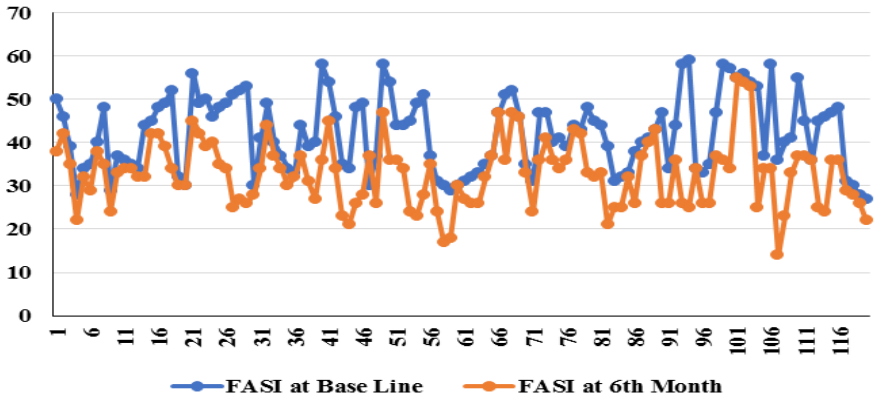

Figure 2 Comparison of FASI score at baseline and at 6th month of patients treated with electrofulguration.

Table 1 Descriptive statistics for the IPL and Electrofulguration before and after treatment.

Treatment modality	*Pre-Treatment FASI Score*	*Post-Treatment FASI Score*	*Df*	*Significance*
IPL	39.70±8.59	33.44±28.64	119	0.021
Electrofulguration	42.20± 8.57	36.17±27.09	119	0.017

P-value< 0.05

Table 2 Mean FASI Score, Mean Decrease in FASI and percent decrease pre- and post-treatment of IPL and electrofulguration.

Treatment modality	*Average baseline FASI score*	*Average FASI score after 6 session of treatment*	*Mean decrease in FASI*	*Percent decrease in FASI score*
Intense pulsed light	39.70	33.44	6.30	15.73
Electrofulguration	42.20	36.17	6.13	14.29

Table 3 Improved cases treated with IPL and Electrofulguration.

Treatment modality	*Improved cases*	*None improved cases*
Intense pulsed light n=120	107 (89.17%)	13 (10.83%)
Electrofulguration n=120	108 (90%)	12 (10%)

Similarly mean FASI Score, mean decrease in FASI and percent decrease pre and post-treatment of IPL and Electrofulguration were calculated as shown in **Table 2**. Comparison of improvement cases with IPL & Electrofulguration was performed **(Table 3)**, which showed that 89.17% (n=107) in Group-A and 90% (n=108) in Group-B were improved cases while 10.83% (n=13) in Group-A and 10% (n=12) in Group-B were non-improved cases **(Table 3)**.

Discussion

Freckles are cutaneous pigmented lesions commonly observed in Asians. They are uniform in colour and size as compared to lentigines. They occur in adolescence and their prevalence decrease with age.[3] History, clinical assessment, histopathology, dermoscopy and wood's lamp examination can be used to diagnose freckles. On dermoscopic examination, freckles appear as oval or round yellow-brown globules and Wood light examination shows deepened colour and a clear boundary with scattered black spots.[14]

Before the advent of lasers in the past decade, treatment modalities of ephelides included ignorance, covering with makeup, peeling, bleaching, dermabrasion, electrodessication and cryosurgery. Different lasers with wavelengths of nanosecond pulse durations and strongly absorbed by melanin have been shown to treat freckles quickly and effectively. These include the Q-switched -Nd:YAG laser, QS alexandrite laser (QSAL), 3,4 QS ruby laser (QSRL), IPL, long-pulsed 532 nm and short-pulsed 532nm.[9,10] However, few side effects like postinflammatory hyperpigmentation are commonly observed in Asian races with laser therapy.[16]

IPL functions on the principle of selective photothermolysis, in which radiation damage is targeted to pigmented epidermal and/ or dermal tissues. It results in an upward transfer of necrotic keratinocytes along with melanosomes, resulting in the formation of micro crusts on the skin surface.[15]

Electrofulguration causes surface carbonization and tissue dehydration and leading to superficial tissue destruction and decreases the pigmentation of freckles.[12,13]

In our study, percent decrease in mean FASI score was recorded as 15.73% and 14.29% with IPL and electrofulguration respectively **(Table 2)**, which is almost similar. Cases showing improvement with both treatment modalities were very high in number, recorded as 89.17% and 90% with IPL and electrofulguration respectively **(Table 3)**. But the treatment with electrofulguration causes pain, erythema and post-inflammatory hyperpigmentation, whereas these side effects are less with IPL. 2 out of 120 patients showed mild erythema, pain and postinflammatory hyperpigmentation with IPL treatment, while 6 out of 120 patients showed mild–moderate pain, erythema and post-inflammatory hyperpigmentation with electrofulguration.

Huang *et al.* have used IPL for the treatment of facial freckles in Asian skin types III and IV. Their study showed mean improvement rate as determined from the difference in mean FASI score of 58% at 6 months.[11] But in our study mean overall improvement in patients treated with IPL in skin types III-V was 89% with no significant side effects. Our results were more efficacious in skin types III-V.

In another study, total 43 patients of freckles with skin type V were treated with Q-switched laser. Study showed complete disappearance of freckles in half of patients but remaining half showed hyper or hypopigmentation after treatment.[1] On the other hand our study proved to be safer with IPL in treating freckles with skin types III-V.

Wang *et al.* have used the Q switched Alexandrite laser and IPL for the treatment of freckles in Asian persons with a sample size of 32 female patients age ranged from 26-57 years with skin types III or IV, all patients achieved obvious improvement with both treatment modalities, but mild post inflammatory hyperpigmentation was observed with IPL in patients with freckles.[16] On the other hand in our study, we took both males and females of 15 years old and above. Both studies are comparable in terms of result outcome.

A lot more data is available in treatment of freckles with laser treatment and IPL, but on electrofulguration, less work has been done in Asian population. Our study provided evidence for the efficacy of IPL and electrofulguration in the treatment of facial freckles on skin types III-V, so our study showed patients could benefit from these modalities to improve their quality of life.

Findings of the study clearly reveal that both treatment modalities (IPL and electrofulguration) showed almost similar efficacy while in term of safety IPL has a better profile than electrofulguration.

Conclusion

Current study concluded that both IPL and electrofulguration are effective treatment modalities for freckles but post treatment side effects like pain, burning, hyperpigmentation and hypopigmentation were less reported with IPL. These results have shown that IPL is safer treatment modality and advocate the preferred use of this novel treatment option in the management of such patients in the future dermatological practice.

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