Treatment of Freckles Among Patients with Dark skin Complexions. A Comparison of Intense Pulsed Light, Q-Switched 532 nm Laser and Phenol 80% Spot Peel

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ABSTRACT:

BACKGROUND:

Intense pulsed light (IPL), Q-switched 532 nm laser and phenol peels are useful for pigmentary lesions but with limited comparative studies in dark skin peoples and a presumed pigmentary changes.

OBJECTIVE:

To compare the efficacy and safety of IPL, Q-switched 532 nm laser and phenol 80% peel in the treatment of freckles

METHODS:

Twenty six patients with freckles were enrolled in the study. They had Fitzpatrick skin type III and IV. From each patient, the freckles on the right and left cheeks were treated with a single session of IPL or phenol 80% spot peel respectively. Freckles on the midface were treated with Q-switched 532 nm laser. Patients were seen after 1, 2, 6 and 16 weeks

RESULTS:

Nineteen (73.07%) patients were females and 7 (26.92%) were males, their ages ranged from 19-36 (27.53±5.88) years. Immediate darkening was seen at the IPL treated lesions. Frosting was the result at the laser and phenol ones. Dry scab developed on all lesions and falls after 5-7 days. At 16 weeks of follow up, score 1 was maintained in 18 (69.23%) versus 6 (23.07%) patients at the IPL and phenol sides respectively, while at the laser treated lesions 19 (73.07%) patients were having score 2. No one had score 1. After 16, good satisfaction was obtained in 61.53%, 38.46% and 26.92% on the IPL, phenol and laser sites respectively.

CONCLUSION:

ll 3 modalities are beneficial, but intense pulse light was more effective and safe.

KEY WORDS: intense pulse light, Q-switched 532 nm laser, phenol, freckles, epidermal pigments.

INTRODUCTION:

Freckle is a pale-brown, macular lesion, usually less than3 mm in diameter with a poorly defined lateral margin which appears and darkens on light-exposed skin sites during periods of UV exposure.[1]

Q-switched (QS) pigmented lasers and intense pulsed light (IPL) has been used successfully to treat freckles and lentigines. [2]

Other Treatment modalities for freckles include the use of chemicals like alpha hydroxy acids, trichloracetic acid (TCA), phenol and Jessner's solution. Electrosurgery, cryotherapy and radio frequency ablation are also done. [3]

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SUBJECTS AND METHODS:

This was an open therapeutic study, conducted at a private clinic during the period from December 2010 to October 2014.

A total of 26 patients with freckles were enrolled in the study. They had Fitzpatrick skin type III and IV.

All patients were without any treatment for at least 1yearbefore starting the study.

Full history was taken from each patient regarding age, sex, duration of the disease and previous treatment.

Physical examination was done to evaluate the degree of pigmentation of freckles before and after treatment according to a color chart proposed by the author. In this chart the color of the freckles was graded as dark brown, brown or light brown

Scoring of the lesions before treatment and after 1, 2, 6 and 16weeks was calculated as follows:

Dark brown= 3

Brown= 2
Light brown= 1
Complete disappearance of pigment= 0
A formal consent was obtained from each patient after explanation of the study and the possible side effects of treatment.
Patients excluded from the study were pregnant women and those with history of photosensitivity.
The freckles on the right cheek were treated with a single session of IPL, while those on the left side were treated with phenol80% spot peel. Freckles on the mid face were treated with Q-switched 532 nm laser. Patients were seen after 1, 2, 6, and16 weeks.
The skin was cleansed with ethyl alcohol prior to the treatment.
The IPL parameters comprised a cutoff filter of 540-1200 nm, fluence of 30-35 J/cm^2, with a double or triple pulse numbers and pulse duration of 9 ms. The IPL was tested initially on an area adjacent to the freckles to choose the appropriate setting that resulted in a bright erythema which lasted for more than 10 minutes. On the target area the end point of treatment was darkening of pigment and crinkling of the skin.
The phenol was applied by tooth pick and might be repeated every 2 minutes till the appearance of frosting.
The laser parameters were pulse duration of 10ns, spot size 3mm. The fluence was chosen as the minimum dose that resulted in an immediate frosting of the lesion. It was ranged from 600- 800 mj/cm2.
All patients were instructed to use sunscreen before sun exposure.
The satisfaction of the patients to the treatment was measured according to a 4 point scale:
1- Poor.
2- Fair.
3- Good
3 - Excellent.

Statistical analysis was done by using GraphPad software. Both descriptive and analytic data were used. Fisher's exact test was performed to compare the results. *P*-value equal or less than 0.05 was considered significant.

RESULTS:

All patients completed the study. Nineteen (73.07%) patients were females and 7 (26.92%) were males, their ages ranged from 19-36with a mean ± SD (27.53±5.88) years.
Fifteen (57.69%) patients had Fitzpatrick skin type III and 11(42.30%) had skin type IV. The duration of freckles ranged from 9 to 16 years with a mean ± SD (11.89±2.33) years.
At the end of the IPL, laser and phenol session a dry scab developed and fell after 5-7 days.
All patients had score 3 pigmentation before starting treatment.
After 2 weeks, assessment of IPL treated lesions showed that19 (73.07%) out of 26 were having score1 (figure-1), 3 (11.53%) with score 2 and 4 (15.38%) were having score 3. P-value <0.0001. Those who still having score 3 pigmentation were associated with postinflammatory hyperpigmentation of the skin adjacent to the freckles.
The phenol treated lesions; after 2 weeks showed that 3 (11.53%) out of 26 were having score 1 (figure-1), 6 (23.07) with score 2 and 14 (53.84%) were having score 3. Three (11.53%) patients have post inflammatory hypopigmentation. P-value <0.0001.
Ten (38.46%) patients in these 2 modalities were also having few lesions changed to score 0 in addition to score 1.
After 2 weeks, the laser treated lesions showed that 15 (57.69%) out of 26 were having score 2 and 11(42.30%) with score 3 (figure-1). No patient had score 1. P-value <0.0001. Table-1
At16 weeks of follow up, score 1 was maintained in 18 (69.23%) versus 6 (23.07%) patients at the IPL and phenol sides respectively. The difference was statistically significant.P-value < 0.0001. While at the laser treated lesions 19 (73.07%) patients were having score 2. No one had score 1. Table-2.
IPL has better response than laser. P-value < 0.0001.
Phenol has better response than laser sites. P-value < 0.0061
At 16 weeks of follow up; patients' satisfaction on the IPL side was excellent in 5 (19.23%), good in 16 (61.53%), fair in 2 (7.69%) and poor in 3 (11.53%).
While at the phenol side, it was excellent in 3(11.53%), good in 10 (38.46%), fair in 5(19.23%) and poor in 8 (30.76%) patients
The satisfaction for the laser treated lesions was good in 7 (26.92%), fair in 12 (46.15%) and poor in 7 (26.92%). Table-3

Table 1: The response rate measured by the color chart 2 weeks after the treatment

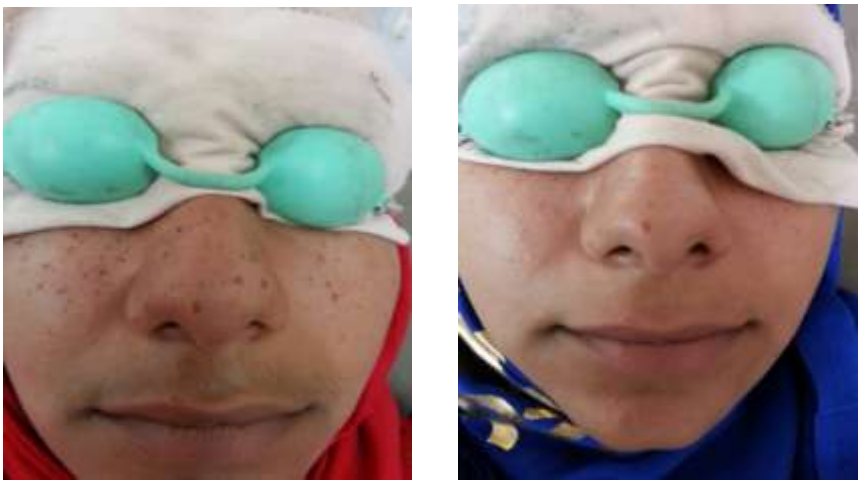
Score	IPL	Phenol	Q-switched 532nm laser
I	19 (73.07%)	3 (11.53%)	0
II	3 (11.53%)	6 (23.07%)	15 (57.69%)
III	4 (15.38%)	14 (53.84%)	11(42.30%)
Post inflammatory hypopigmentation	0	3 (11.53%)	0

Table 2: The response rate measured by the color chart 16 weeks after the treatment.

Score	IPL	Phenol	Q-switched 532nm laser
I	18(69.23%)	6 (23.07%)	0
II	2(7.69%)	4 (15.84%)	19 (73.07%)
III	6 (23.07%)	16 (61.53)	7 (26.92%)
Post inflammatory hypopigmentation	0	0	0

Table 3: Patients' satisfaction after 16 weeks of treatment.

Satisfaction	IPL	Phenol	Q-switched 532nm laser
excellent	5 (19.23%)	3 (11.53%)	0
Good	16 (61.53%)	10 (38.46%)	7 (26.92%)
Fair	2 (7.69%)	5 (19.23%)	12 (46.15%)
Poor	3 (11.53%)	8 (3.765)	7 (26.92%)



A **B**

Fig.1: A nineteen year old lady with skin type IV and score 3 pigmentation of freckles.
A: Before treatment.
B: After 2 weeks. Almost complete disappearance of the freckles (score 0 and 1) at the IPL and phenol sides. Note few freckles on the nose still having score 3, these were treated with laser.

DISCUSSION:

Freckles are ubiquitous, especially in sunny climates. Lasers and similar light sources have been used for their removal, utilizing the principle of selective photothermolysis of endogenous or exogenous chromophores. The target for freckle removal is melanin, allowing the selective targeting of pigment while sparing the surrounding normal skin. [2]

The theory of selective photothermolysis suggests that laser therapy would be the treatment of choice because of its ability to destroy pigment selectively without injuring surrounding tissue. [4]

Reviewing the literatures showed that the results of lasers in the treatment of freckles were conflicting. One study confirmed that the frequency doubled Q-switched Nd:YAG (532nm) laser is the more effective laser treatment regimen (when compared with the long-pulsed laser), with high tolerability and minimal side effects for patients with skin types I to IV using the same energy. [2]However**,** other studies showed contradictory results to the above one. [6]

In one study; comparing the clinical efficacy and complications of Q-switched and long-pulsed lasers indicated that, although both were effective in the removal of lentigines, QS lasers were associated with a higher risk of post-inflammatory hyperpigmentation (PIH). [5]

Other study revealed that both Q-switched and long-pulsed alexandrite laser showed a statistically significant improvement in pigmentation ($P < 0.05$) throughout the study, with no statistical difference found between the groups. Postinflammatory hyperpigmentation was more frequently found after QS treatment (22%), compared to long-pulsed treatment (6%). [6]

The results of the last 2 studies were comparable to those of the present study in terms of more occurrence of PIH at the laser sites 2 weeks after the treatment session; thereafter many of them got lightening at 16 weeks of follow up Phenol has an inhibitory effect on melaninisation, according to a long-term follow-up study conducted by Kligman*et al*., on phenol face peels. [7]

The use of 80% phenol spot peels for treating freckles in patients with skin types III and IV showed that phenol was not effective in the treatment of freckles in darker skin types (type IV) resulting in hyperpigmentation.[8]

This was comparable more or less with the present results which showed that around 70% of patients were still having score 2-3 pigmentation at the end of 16 weeks post treatment.

The present results are in agreement with other study which compared IPL versus Q-switched alexandrite laser (QSAL) in Asian persons. The study revealed that PIH was only developed at the QSAL and no one had PIH at the IPL treated freckles. [9]

Because the above results showed variable response and side effect profile and also used a wide range of skin colors; [2, 5, 6] the present study tried to overcome these limitations in our study by choosing only patients with skin type IV and V and to compare 3 modalities in each patient to omit individual variations.

The results and conclusion of the present study were similar to other studies which revealed that carbon dioxide (CO2) and erbium: yttrium-aluminum-garnet (YAG) (ablative lasers), neodymium-doped yttrium aluminium garnet (Nd: YAG) and alexandrite (non-ablative lasers), and the most recent fractional lasers. All these have not proved to be completely satisfactory in the treatment of freckles and share a common risk of post-inflammatory hyperpigmentation. [9, 10]

Although a temporary hypopigmentation of the freckles observed at few lesions treated with phenol at 2 weeks, there was an increased pigment density thereafter. This can be attributed to PIH or recurrence of freckles.

In the present study a single session of each modality was performed. This was in agreement with most previous studies [2, 6, 8, 11, 12]

CONCLUSION:

All 3 modalities were beneficial but intense pulse light was more effective and safe in dark skin people

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