

Comparison between Peeling with Focal Trichloroacetic Acid and Quasi-Continuous Frequency-Doubled Nd:YAG (532 nm) Laser in the Treatment of Freckles

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Abstract

Background: Benign pigmented lesions, including freckles, are common and various treatment modalities including lasers and peeling have been evaluated for their effectiveness in their treatment.

Objective: To compare the clinical effects of focal peeling with Trichloroacetic Acid (TCA) and Nd:YAG (532 nm) laser on freckles.

Methods: Twenty patients with freckles were treated with focal peeling with TCA 25% on their left-sided lesions and Nd:YAG (532 nm, Fluence 9.5 J/cm², spot size 1.5 mm) on their right-sided lesions. Photographs were taken prior to treatment and at follow-up visits and were evaluated by three dermatologists and the results were analyzed.

Results: Eighteen out of the 20 patients (90%) with freckles manifested more than 50% improvement in laser treated areas whereas clinical improvement in focal peeling treated areas was observed in 15 out of 20 (75%). The mean improvement rate for laser and focal peeling was 66.50±12% and 58.3±15%, respectively. No significant difference was observed in the treatment results between these modalities.

Conclusion: Focal peeling with TCA 25% could be as effective as frequency-doubled Nd:YAG (532 nm) laser in the treatment of freckles. (*Iran J Dermatol* 2010;13: 82-86)

Key Words: freckles, ephelides, laser, peeling, Trichloroacetic Acid, Nd:YAG laser

Introduction

Freckles, or ephelides, are light-brown macules most frequently observed in fair and red-haired individuals. However, they are also common in Asian population¹. Histopathologically, freckles reveal epidermal melanosis². Treatment may be requested for cosmetic reasons. Before the advent of lasers, traditional treatment and preventive modalities for freckles included sun protection, covering the skin with camouflage, chemical bleaching and peeling, dermabrasion, and electrodesiccation / fulguration³. More recently, it has been reported that freckles completely and quickly respond to the Q-switched 532 nm Nd:YAG⁴, Q-switched alexandrite⁵, and Q-switched ruby lasers⁶; however, they are expensive and recurrence is common.

Trichloroacetic Acid (TCA) has been widely used as a peeling agent for freckles⁷. It is used at concentrations ranging from 10% to 70%, most frequently for mild peeling at the concentrations of 15%, 20%, 25%, and 35%. Because peeling with TCA is not expensive and can be frequently applied for patients with freckles, we compared the effect of focal peeling with TCA 25% and 532 nm Nd:YAG laser in patients with freckles.

Patients and Methods

Twenty patients with freckles who were visited at our dermatology clinic were enrolled in this study. Seventeen of these subjects were women with a mean age of 29.1 years (range: 16 to 60 years), and 3 were men with a mean age of 20.3 years old (range: 17 to 23). The skin phototypes were II, III, and IV in 12, 4, and 4 patients, respectively.

None of the patients had undergone other laser treatments or used any chemical bleaching or peeling products before; however, sun screen had been used on a regular basis. Patients were evaluated carefully before treatment. Important factors included patients' general health, Fitzpatrick skin type, degree of actinic or age damage, current and likely future sun exposure, any history of herpes simplex infection, and susceptibility to keloid formation. All patients were informed of the risk of the procedure and written informed consents were obtained before the procedure.

Quasi-Continuous 532 nm Nd:YAG laser (with a fluency of 9.5 J/cm² and a spot size of 1.5 mm) was used on lesions on the right side of the face and focal peeling with TCA 25 % (focal application of TCA by using a wooden applicator on the pigmented areas only) was used on lesions on the left side of the face.

Local anesthetics or sedations were not used. The face was cleansed with gauze pads soaked in alcohol to remove the sebum thoroughly. TCA 25% was applied to focal pigmented areas on the left side of the face by firmly pressing with a sharp ended applicator. A frosted appearance was the result of the coagulation of the epidermal and dermal proteins and was mainly used to monitor the peeling depth. Focal application of TCA produced evenly frosted spots on each pigmented lesion. Dry ice compress was helpful to soothe any discomfort, and the patients tolerated the procedure well.

In the same session, the right side of the face was treated with Q-switched Nd: YAG (532 nm) laser at a fluency of 9.5 J/cm² using a 1.5 mm spot size. Zinc oxide ointment was used topically after each treatment. All patients received acyclovir (400 mg three times a day) for 5 days after treatment. Furthermore, patients were instructed to avoid direct sunlight and to apply a sunscreen before any sun exposure. Color photographs were taken prior to the treatment and in two-week intervals for a total follow-up period of 2-8 weeks. Evaluations were performed by three dermatologists, who were blinded to treatment strategy, to assess any

significant improvement or deterioration at the treatment sites. The criteria for physicians' evaluation were as follows; Excellent: 76-100% clearance of the lesions, Good: 51-75% clearance, Fair: 26-50% clearance, and Poor: <25% clearance of lesions.

The statistical significance was assessed by χ^2 and t-test analysis. P-value less than 0.05 considered as significant.

Results

A total of 20 subjects completed the treatment course and dermatologists assessed and rated the outcomes. Good to excellent resolution was found in 90% and 75% of the patients at laser and peeling treated sites, respectively (table 1 and 2). The mean percentage of clearance was 66.5±12% and 58.3±15% at laser and peeling treated sites, respectively. The percentage of resolution at laser treated sites was higher than the peeling treated sites in 13 patients, equal in 2 patients, and less in 5 patients (Figure 1,2). No significant difference was observed in treatment results between the two modalities. No significant relationship was seen between lesion clearance, age and skin type of the patients ($p>0.05$). Scarring or permanent pigmentary or textural changes were not seen in laser and peeling treated sites.

Discussion

Benign pigmented lesions, including freckles, are common. They cause considerable cosmetic disfigurement and have a tendency to recur. A variety of therapeutic options are available^{1, 8}. Many lasers have been used to treat epidermal pigmented lesions. Continuous wave lasers including the CO₂ and Argon lasers, although effective for the removal of the pigmented lesions, may cause non-specific damages leading to scarring, permanent textural changes and pigmentary alterations⁹. Q-switched lasers including the Ruby and frequency-doubled Nd:YAG (532 nm), designed on the basis of selective photothermolysis,

Table 1. Effectiveness of Nd:YAG (532 nm) laser and focal peeling with TCA on the treatment of freckles

Treatment Effect	Nd:YAG(532 nm) laser	Focal peeling with TCA25%
Excellent	6 (30%)	3 (15%)
Good	12 (60%)	12 (60%)
Fair	2 (10%)	4 (20%)
Poor	0	1 (5%)
Total	20	20

Table 2. Demographic data of the patients and their response to Nd:YAG (532 nm) laser and focal peeling with TCA

Patient No.	Age(years)	Sex	Skin Type	Improvement Laser	grade peeling
1	24	F	II	Excellent	Excellent
2	26	F	II	Good	Good
3	39	F	IV	Good	Good
4	21	M	II	Good	Good
5	40	F	II	Good	Fair
6	16	F	II	Excellent	Good
7	60	F	IV	Good	Fair
8	21	F	II	Fair	Good
9	23	M	II	Good	Good
10	28	F	IV	Good	Fair
11	42	F	IV	Good	Fair
12	24	F	III	Good	Poor
13	32	F	III	Good	Good
14	30	F	III	Good	Good
15	17	M	III	Excellent	Good
16	20	F	II	Excellent	Good
17	26	F	II	Excellent	Excellent
18	32	F	II	Excellent	Excellent
19	13	F	II	Fair	Good
20	22	F	II	Good	Good

treat epidermal pigmented lesions most specifically with the lowest scarring potential^{10,11}. But they are expensive and not suitable for some patients; and recurrence is also common².

Peeling with low concentration TCA (15% to 25%) treats freckles safely and inexpensively. To our knowledge, this is the first report to compare the efficacy and safety of frequency-doubled Nd:YAG (532 nm) laser and focal peeling with TCA 25% in the treatment of freckles.

In our study, 90% and 75% of the patients manifested more than 50% improvement after one session of treatment at laser and peeling sites, respectively. The mean percentage of clearing was $66.5 \pm 12\%$ and $58.3 \pm 15\%$ for laser and peeling sites, respectively. Data analysis showed no significant difference between the two treatment methods. Furthermore, no significant relationship was found between age or skin type and the removal of freckles. None of the patients developed any significant complications such as persistent erythema, permanent hyperpigmentation, hypopigmentation, scarring or keloid.

Chun et al, used focal peeling with TCA on 14 patients with freckles using 50% to 65% TCA. Eight out of 14 (58%) patients showed a good clinical response⁷. Successful removal of freckles in the Asian skin type with Q-switched Alexandrite laser was reported by Jang et al. After one treatment

session, all irradiated freckles were graded as excellent in 126 out of 197 patients (64%)⁵.

Rashid et al, reported laser therapy of freckles and lentigines with quasi-continuous frequency-doubled Nd:YAG (532 nm) laser in Fitzpatrick skin type IV using a wave length of 532 nm, pulse duration of 1.6 μ s, frequency of 14 KHz, power of 0.1-4.5w, exposure time of 0.01 s – continuous, and spot size of 2 mm. Of 20 patients (freckles, n=14; lentigines, n=6), 16 (80%) (freckles, n=10; lentigines, n=6) manifested more than 50% (grade 3 and 4) improvement¹².

Combination of chemical peeling and pigmented laser has been used effectively in the treatment of recalcitrant pigmentary disorders, without significant complications¹³. Some studies have reported remarkable clinical improvement of solar lentigines and ephelides by intense pulsed light source (IPL)^{14,15}. About 71% of the subjects with ephelides who were treated with IPL showed more than 50% improvement in a study by Kawada et al¹⁴. Another study reported that versapulse QS Nd:YAG 532nm was more effective than conventional QS Nd:YAG 532 nm in the treatment of facial lentigines in oriental patients. Comparing these different types of lasers has showed more efficacy and fewer complications for versapulse QS Nd:YAG 532nm¹⁶. Small melanocytic nevi have been effectively treated by normal mode alexandrite laser¹⁷. Other lasers, such as Nd:YAG



Figure 1. a) a patient with freckles on the right side of the face before treatment; b) after treatment with Nd:YAG laser.

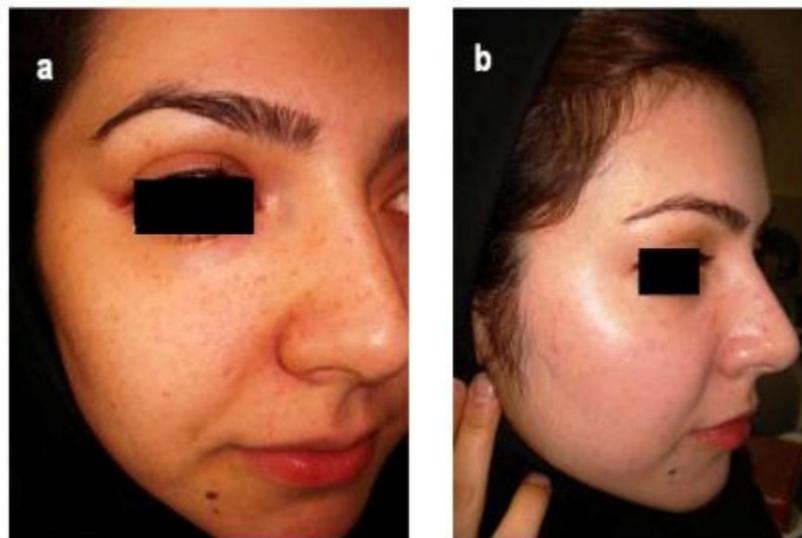


Figure 2. a) a patient with freckles on the left side of the face before treatment; b) after treatment with Trichloroacetic Acid peeling.

and Erbium:YAG have been used to treat congenital nevus, as well ¹⁸. However, further studies are required to assess the long-term recurrence rate and malignant transformation risk.

We found that focal peeling with TCA was as effective as Nd:YAG (532 nm) laser in the treatment of freckles. In addition, it is more cost-effective than laser.

We believe that focal peeling with TCA 25% is a safe and effective modality for the treatment of freckles. Although it is almost as effective as Nd:YAG (532 nm) laser, peeling has a lower cost compared to laser and can be used more

frequently to clear freckles and treat their subsequent recurrences.

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