Case Study Utilizing RevLite™ for the Treatment of Pigmentation and Skin Tone

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OBJECTIVE
Skin aging occurs through a dual effect of chronological progression as well as extrinsic environmental exposure. The cutaneous manifestations present as loss of collagen and elastin, appearance of rhytides and telangiectasia, and pigmentation alterations. The objective of this study is to evaluate the effects of combination treatment with a Q-Switched 1064nm and frequency-doubled 532nm Nd:YAG laser on pore size, skin texture and pigmentation.

INTRODUCTION
Q-Switched laser technology affects pigmentation of the skin through selective photothermolysis. Anderson et al described how both the 532nm and 1064nm wavelengths, delivered via nanosecond pulsations, effectively rupture melanosomes within keratinocytes and melanocytes causing both cytoplasmic and nuclear alterations. The short pulse durations are less than the thermal relaxation time of the melanosome, thereby confining heat to the epidermal pigmented lesion. This allows Q-Switched technology to be utilized to treat pigmented lesions common to photo-aged skin. The first published reports came from Goldberg who reported on the efficacy of correcting inhomogeneity in the pigmentation of the skin. The primary wavelength employed for this indication is 1064nm, which has an advantage over 532nm wavelength in its ability to penetrate more deeply into the dermis (up to 4-6mm), thus allowing fragmentation of deep melanin and the stimulation of collagen. The 1064nm wavelength is capable of bypassing the epidermal melanin, thereby allowing for treatments in patients with darker skin type. More superficial epidermal pigmentation is targeted with the 532nm wavelength due to its greater coefficient of absorption by melanin.

Combining the wavelengths, 1064nm followed by 532nm, allows for fragmentation of pigment in the mid- to deep dermis, followed by superficial targeting of melanin in the dermo-epidermal junction (DEJ).
METHODS
All subjects provided written informed consent to participate in this clinical study. Inclusion criteria were Fitzpatrick skin types I-IV with moderate pigmentation, including solar lentigines, ephelides or generalized dyschromia, presence of enlarged pores and age greater than 18. Exclusion criteria included isotretinoin use in the past six months, pregnancy, presence of localized or systemic infection, inflammation, tendency to keloid, and patients with photosensitivity disorders.

Prior to treatment, patients were assessed based on pore size, degree of pigmentation and Fitzpatrick skin type. Baseline digital photographs were taken of full face with 45 degree photos of either side. Parameters were selected based on the patient’s Fitzpatrick skin type and the amount of cutaneous pigmentation present. Fluence was adjusted based on the patient’s immediate skin reaction. With the 1064nm wavelength, the goal was to achieve slight erythema with two passes. The end point with the 532nm wavelength was a superficial ash color to the lentigo, with darkening of the base and perilesional erythema. With excessive fluence, mild petechiae would be induced with diffuse erythema.

External ocular shields were placed on the patient prior to treatment. Study patients received a total of six treatments every 2-3 weeks with the RevLite laser (Cynosure ConBio, Westford, MA). Laser treatment was initiated at the lower, lateral cheek area and continued to cover the entire face with two passes of each wavelength. A “facial painting” technique, in which the hand piece was moved quickly over the skin while maintaining contact between the hand piece tip and the skin, was performed over one facial region at a time with each wavelength. No anesthetic was utilized, only cool air delivered at a low setting of 3 (Smartcool, Cynosure, Westford, MA). Subject tolerability was assessed by the visual analogue scale (0 [no pain] to 10 [intolerable pain]).

SUBJECT 1
A 61-year-old female with Fitzpatrick skin type III had a “deep peel” 10 years prior that left her with areas of hypopigmentation. Solar lentigines and generalized dyschromia were present, which visually appeared augmented next to the areas of iatrogenic hypopigmentation. Treatment parameters were initiated with a 6mm spot size for the 1064nm wavelength at 3.5 J/cm² and a 10 Hz repetition rate. Two passes were performed and the resultant skin was slightly erythematous. Two passes of frequency-doubled Nd:YAG (532nm) were then performed with starting parameters of 6mm spot size, 0.6 J/cm² and 10 Hz.

As pigment was cleared, the fluence was gradually increased at each subsequent visit. The final settings were 4.3 J/cm² for the 1064nm and 0.8 J/cm² for 532nm.

The patient was instructed to wear a broad spectrum sunscreen with SPF greater than 30. No additional creams were recommended.

RESULTS
Immediately post-laser treatment, an erythematous response was noted which persisted from 1-3 days (higher fluences affected the length of response). No blistering, ulceration or post inflammatory hyperpigmentation was noted. Pain was graded as 1 to 2 out of 10 for the Nd:YAG (1064nm) laser and 3 out of 10 for the frequency doubled Nd:YAG (532nm).

At the conclusion of the six treatments, pore size was assessed subjectively (per patient and physician) and photographically, and was determined to be reduced in the malar and mental area. Pigmentation on the sides of the face and by the mandibular angle was diminished, allowing for a more homogenous cutaneous appearance.

The patient was highly satisfied with her results and would recommend this procedure to friends and family.
Subject 1: Before (left) and one month post-six Tx (right). Two passes of 1064nm, 6mm spot size, 3.5-4.3 J/cm² at 10 Hz followed by two passes of 532nm, 6mm spot size and 0.6-0.8 J/cm² at 10 Hz.
SUBJECT 2
A 48-year-old Caucasian female with Fitzpatrick skin type II who enjoys spending time with her children outdoors, presented with pigmentation, which she felt had been worsening over the past several years. Although the patient reported using sun protection, she wanted to address the development of solar lentigines and minimize them with a treatment modality offering minimal downtime.

Due to the dense amount of pigmentation on the cheek and forehead area, starting parameters were 1064nm, 6mm spot size and 3.5 J/cm² at 10 Hz, followed by 532nm, 6mm spot size and 0.6 J/cm² at 10 Hz. The greater the superficial pigmentation, the lower the initial fluence necessary for the frequency doubled Nd:YAG. As the superficial pigmentation gradually cleared on subsequent visits, the fluence was then increased accordingly. The final parameters on the last treatment were 4.3 J/cm² for the 1064nm wavelength and 0.8 J/cm² for the 532nm wavelength.

The patient described the laser sensation as 2 out of 10 for the 1064nm wavelength, and 4 out of 10 for the 532nm wavelength. The entire laser treatment duration (both wavelengths), was less than 15 minutes.

RESULTS
Immediately post-treatment with the 532nm wavelength, the pigmented areas turned an ash white, which typically persisted for 30 minutes. Resultant erythema was present for 2-3 days post laser treatment.

The patient was able to wear make-up immediately after the irradiation and return to normal activities. Pigmentation initially appeared darker for the first week prior to lightening.

The dyschromia on her side cheek area was greatly improved post six treatments. Pore size appeared reduced and the general texture of the skin was smoother. The patient was very pleased with her results and indicated on a questionnaire that she would recommend this treatment to family and friends.
Subject 2: Before (left) and one month post-six Tx (right). Two passes at 1064nm, 6mm spot size, 3.5-4.3 J/cm² at 10 Hz followed by two passes at 532nm, 6mm spot size and 0.6-0.8 J/cm² at 10 Hz.
A 51-year-old Caucasian female with Fitzpatrick skin type II presented with dispersed dyschromia. The patient was interested in a treatment to “even out her skin tone.”

Parameters were initiated at two passes each of 1064nm wavelength, 6mm spot size, and 3.5 J/cm² at 10 Hz, followed by 532nm wavelength, 6mm spot size, and 0.6 J/cm² at 10 Hz. Treatment parameters were increased at subsequent visits to a final setting of 6mm spot size, 4.3 J/cm² and 10 Hz for 1064nm wavelength followed by 6mm spot size, 0.8 J/cm² and 10 Hz for 532nm wavelength.

Air cooling was used with the SmartCool® system (Cynosure, Westford, MA) and the patient described her level of discomfort as 1 out of 10 for the 1064nm wavelength and 3 out of 10 for the 532nm wavelength using the visual analogue grading system.

RESULTS
Improvement was noted globally in skin texture, with a minimization of pigmentation and pore size. The patient was highly satisfied with her results and would recommend this treatment to friends and family.

DISCUSSION
Solar lentigines and generalized dyschromia of the face are common problems that plague sun-exposed individuals. There are many treatment modalities to target the unwanted pigmentation from sun exposure, as well as from chemical peels, topical prescriptions and varying laser and light sources. Some treatments target only the easily attainable superficial epithelial pigment while leaving the dermal pigmentation unaffected.

The RevLite laser allows the clinician to utilize two different wavelengths (1064nm and 532nm) and thereby combine the benefits of both into one treatment. The longer 1064nm wavelength can be used to target the dermal pigmentation and stimulate neocollagenesis while the shorter, melanin-focused 532nm wavelength targets the superficial epithelial pigment. The combination of these two wavelengths leads to a cosmetically pleasing result where reduction in pore size and pigmentation are appreciated.
Subject 3: Before (left) and one month post-six Tx (right). Two passes at 1064nm, 6mm spot size, 3.5 - 4.3 J/cm² at 10 Hz followed by two passes at 532nm, 6mm spot size, 0.6-0.8 J/cm² at 10 Hz.
REFERENCES


* RevLite is FDA-cleared for the treatment of acne scarring but not for the treatment of active acne.