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CASE REPORT

Clinical Improvement of Long-Standing Nevus of Ota and Freckles with Combined 1064 nm Nd:YAG Toning and 660 nm Ruby Laser-like: A Single-Patient Longitudinal Study

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ABSTRACT: Nevus of Ota and freckles are common pigmentary disorders that may coexist; however, their differing depths of pigmentation present a therapeutic challenge. Nevus of Ota is a dermal melanocytic hamartoma requiring deeply penetrating wavelengths, whereas freckles (ephelides) are superficial epidermal lesions that respond best to low-fluence visible-light therapy. A combination of a 1064 nm Q-switched Nd:YAG (QSNY) laser and a 660 nm ruby laser-like, targeting pigment at different skin depths, may provide a complementary approach for simultaneously addressing both conditions. This report describes a 54-year-old woman diagnosed with type II unilateral nevus of Ota and freckles. The patient underwent 23 treatment sessions using a 1064 nm QSNY laser and a 660 nm ruby laser-like over two years. Progressive improvement of both nevus of Ota and freckles was observed from the 8th session onward compared with baseline. The nevus of Ota showed significant lightening, while freckles demonstrated marked superficial clearance by the 23rd session. No recurrence of pigmentation was observed at the 6-month follow-up after the last treatment. Adverse effects were minimal and limited to transient erythema and frosting after each session, which resolved spontaneously. The patient reported high satisfaction with the treatment outcome. The combination of 1064 nm Q-switched Nd:YAG and 660 nm ruby laser-likes may offer a safe and effective treatment approach for patients with concurrent nevus of Ota and freckles. Further studies with larger patient cohorts are required to validate these findings and optimize treatment parameters.

Keywords: Nevus of Ota, Freckles, 1064 nm Nd:YAG, 660 nm ruby laser-like

INTRODUCTION

Nevus of Ota and freckles are distinct pigmentary disorders that may coexist; however therapeutic strategies that address both lesions simultaneously remain limited. Nevus of Ota, also known as oculodermal melanocytosis, is a benign dermal melanocytic hamartoma characterized by blue-gray hyperpigmentation affecting areas of the skin and eyes innervated by the ophthalmic and maxillary branches of the trigeminal nerve, including the periorbital region, sclera, and adjacent facial skin [1,2]. It is typically unilateral. Asian populations are more frequently affected, with an estimated prevalence of 0.014% to 0.034%, often appearing at birth or during adolescence and potentially darkening progressively throughout adulthood [3]. The condition is more common in females and can cause significant cosmetic concern.

Freckles (ephelides), in contrast, are superficial epidermal macules caused by ultraviolet (UV)-induced melanin overproduction in genetically predisposed individuals [4]. When both conditions coexist, differences in pigment depth pose therapeutic challenges, as no single laser wavelength is ideal for treating both dermal and epidermal pigmentation.

Advancements in laser technology, in nanosecond pulse durations, have enhanced the ability to selectively target melanin-containing structures like melanosomes with effective tissue breakdown and minimal collateral thermal damage [5]. 1064 nm Q-Switched Nd:YAG (QSNY) laser are well established for the treatment of dermal melanocytosis with varying success, potentially due to their deeper penetration and selective photothermolysis of melanocytes [6]. Meanwhile, shorter wavelengths such as 660 nm ruby laser-like may be more effective for epidermal pigment [7], making them suitable for freckles.

Although nevus of Ota and freckles have been extensively studied individually, their coexistence in the same anatomical region is rarely addressed. This case report highlights the simultaneous management of mixed-depth pigmentation, including dermal nevus of Ota and epidermal freckles, using a dual-wavelength laser strategy, providing an alternative approach in treating overlapping pigmentary disorders.

CASE PRESENTATION

A 54-year-old postmenopausal woman with Fitzpatrick skin type IV and no known medical illness presented to our clinic with left-sided unilateral blue-gray hyperpigmentation distributed over the first and second divisions of the trigeminal nerve, namely the ophthalmic and maxillary branches involving the temple, periorbital region, zygomatic (cheek) region, and buccal area with concurrent freckles. She reported that the pigmentation began at the age of 15 and had progressively worsened over the decades.

She was currently unemployed but had previously worked as a hawker, with prolonged sun exposure during working hours. There was no family history of similar pigmentation. She had undergone ablative laser treatment at a beauty salon 20 years prior, with no improvement. The patient reported feeling insecure and having low self-esteem due to the noticeable facial pigmentation. She also perceived that others focused on her pigmentation when looking at her, which affected her confidence and led her to avoid social interactions.

On physical examination, a patch of bluish-gray hyperpigmentation was observed on the left side of the face, involving the temple, upper cheek, mid-cheek, and buccal region, with small, round, dark brown spots overlying the pigmented patch (**Figure 1**). Based on photographic assessment and clinical judgment, she was diagnosed with type II nevus of Ota according to Tanino's classification (**Table 1**), with concurrent freckles.

Table 1. Tanino's classification for nevus of Ota

Type	Subtypes	Areas involved
Type I	IA	Distribution over the upper and lower eyelids, periocular and temple region
	IB	Infrapalpebral fold, nasolabial fold and zygomatic regions are affected
	IC	Forehead only
	ID	Nasal only
Type II		Moderate type - The lesions affect upper and lower eyelids, periocular, zygomatic, cheek and temple
Type III		Scalp, forehead, eyebrow and nose.
Type IV		Bilateral

MANAGEMENT AND OUTCOME

The patient underwent depigmentation treatment in our clinic using the 1064 nm QSNY laser (Spectra XT, Lutronic Corp., Goyang, Korea) with a fixed pulse duration of 5–10 ns, and the 660 nm ruby laser-like (Ruby-like Versatile YAG, RuVY; Spectra XT, Lutronic Corp., Goyang, Korea), without any additional topical or oral medications. A total of 23 laser sessions combining both lasers were completed at 1-month intervals over 2 years.

For nevus of Ota, the 1064 nm QSNY laser was applied with a fluence of 5.6–6.0 J/cm^2, a spot size of 4 mm, and a frequency of 5 Hz, delivered in a single pass over the lesion. The 660 nm ruby laser-like was subsequently applied to freckles overlying the nevus of Ota, using a spot size of 3 mm, frequency of 1 Hz, and fluence of 0.75–1.0 J/cm^2, adjusted to achieve the endpoint of frosting. The endpoint for 1064 nm QSNY laser of the nevus of Ota was erythema to mild petechiae, whereas the

endpoint for the 660 nm ruby laser-like was whitening of the freckles, with fluence adjusted according to the tissue response. After each session, the patient underwent an oxyinfusion facial as a cooling method. Patient improvement was assessed through clinical photographs and patient satisfaction using the Global Aesthetic Improvement Scale (GAIS).

Figure 1. Left-sided facial photograph of the patient at the first presentation. Nevus of Ota (⇦); Freckles (←)

Patients was asked to subjectively report their satisfaction with the treatment course. The GAIS employs a 5-point scale ranging from 1 = very much improved to 5 = worse to rate overall cosmetic improvement.

Progressive improvement of both nevus of Ota and freckles was observed starting from the 8th session (**Figure 2**) compared to baseline. The nevus of Ota lightened significantly while the freckles showed superficial clearing by the 23rd session. The patient reported high satisfaction, with a GAIS score of 1. Adverse effects were limited to transient erythema and frosting of the spots after each session, which resolved spontaneously. At 6 months after the last treatment session, there was no recurrence of pigmentation, and the patient remained highly satisfied with the results (**Figure 3**).

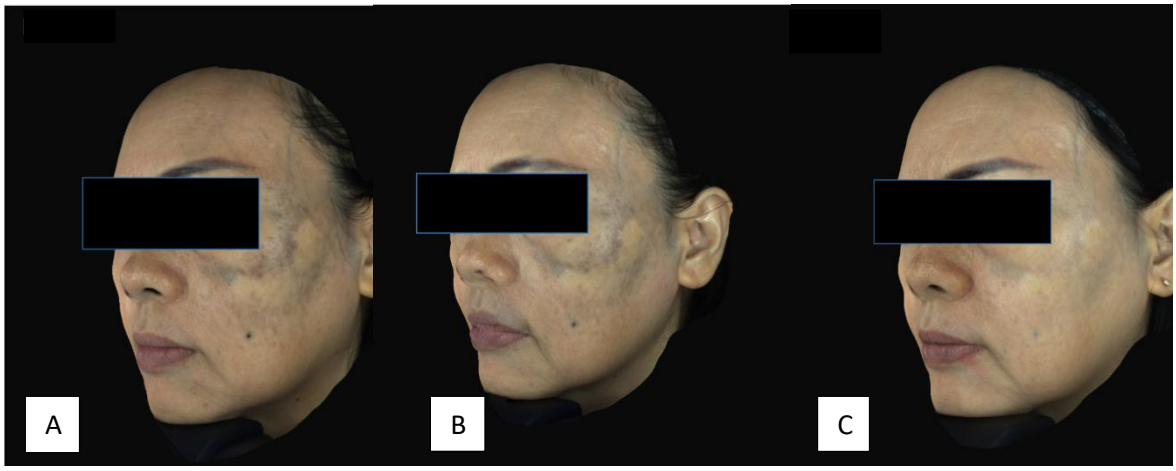

Figure 2. Left facial view of the patient captured using the Isemeco 3D imaging system at the 8th session (A), the 11th session (B), and the 23rd session (C) of treatment. A progressive improvement in nevus of Ota and freckles was observed. The baseline image is unavailable.

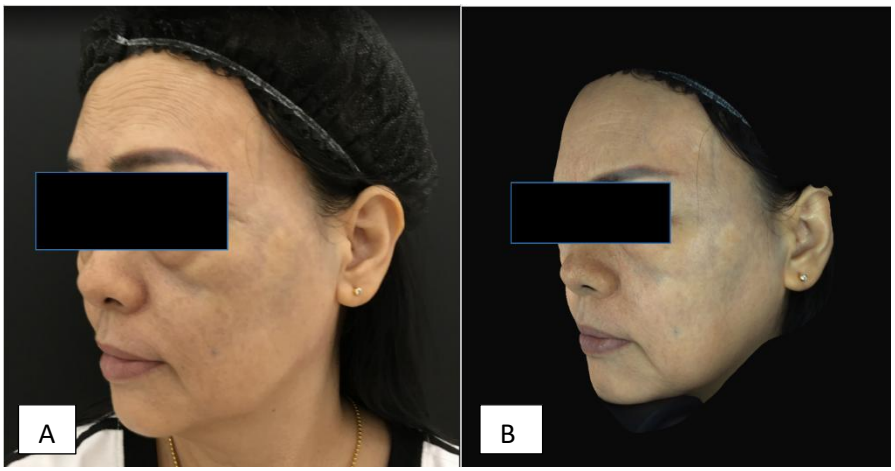

Figure 3. Left facial view of the patient at 6-month follow-up. (A) Standard clinical photograph; (B) Isemeco 3D imaging system. No recurrence of pigmentation was observed during follow-up.

DISCUSSION

Nevus of Ota and freckles are two distinct pigmentary disorders with fundamentally different histopathological characteristics and depths of melanin deposition, which makes their simultaneous treatment challenging. Nevus of Ota is a dermal melanocytosis in which melanocytes are located deep within the dermis, whereas freckles are epidermal lesions resulting from increased melanin production without an increase in melanocyte number [8]. Consequently, no single laser wavelength can optimally target both conditions.

In this case report, a combined treatment approach using a 1064 nm QSNY laser and a 660 nm ruby laser-like was employed in a patient with concomitant nevus of Ota and freckles. Over 23 treatment sessions spanning two years, the patient demonstrated progressive and sustained improvement in both conditions without significant adverse effects. Observed adverse effects were limited to transient, expected post-laser reactions.

The 1064 nm QSNY laser is regarded as the gold standard treatment for nevus of Ota by the European Society for Laser Dermatology [9]. QSNY lasers have been extensively studied, with substantial evidence supporting their efficacy in nevus of Ota, including in patients with darker skin phototypes (Fitzpatrick skin types V and VI) [10-14]. Additionally, QSNY lasers have demonstrated a superior safety profile compared with other laser modalities. This is attributed to their 1064 nm wavelength, which allows deeper dermal penetration and more selective targeting of dermal melanocytes while minimizing epidermal melanin absorption, thereby reducing the risk of adverse pigmentary changes. This safety advantage is particularly relevant in individuals with darker skin types, in whom increased epidermal melanin content heightens the risk of treatment-related dyspigmentation [15].

In the present study, laser fluence was adjusted according to the patient's clinical response. Choi et al. [10] demonstrated that a low-fluence QSNY laser approach is associated with fewer adverse effects and reduced downtime in the treatment of nevus of Ota. This modality is particularly advantageous in Asian patients, who are at higher risk of post-inflammatory hyperpigmentation [10]. In darker skin phototypes, fluence should be maintained at the lowest effective level to reduce the risk of post-inflammatory hyperpigmentation [16]. This is because darker skin type (VI) can absorb up to 40% more energy than lighter skin types (I–II), and exceeding clinical thresholds may increase the risk of complications [17]. Therefore, careful titration of laser fluence is essential for each patient.

Freckles have been treated using various laser modalities. Among these, 694 nm Q-switched ruby lasers have demonstrated efficacy in the treatment of solar lentigines and freckles, likely due to their wavelength and short pulse duration of 25–40 nanoseconds [18], which are well suited for targeting epidermal pigment. Similarly, a 660 nm ruby laser-like has been reported to achieve near-complete resolution of freckles after a single treatment session without significant adverse effects [7]. Consistently, in the present patient, treatment with the 660 nm ruby laser-like resulted in clinical improvement of freckles with minimal adverse events.

The present case suggests that pigmentary lesions at different skin depths may be addressed through the strategic combination of laser wavelengths with different penetration profiles. No recurrence was observed at the 6-month follow-up; however, further studies in larger populations are required to validate these findings.

CONCLUSION

The combined use of a 1064 nm QSNY laser and 660 nm ruby laser-like therapy may provide a safe and effective approach for patients with concurrent nevus of Ota and freckles, particularly in those with darker skin types. This dual-wavelength strategy, utilizing lasers with different penetration depths, enables simultaneous targeting of superficial epidermal pigmentation and dermal melanocytosis. Further studies in larger populations are required to optimize treatment parameters and protocols, as well as to evaluate long-term outcomes and recurrence rates.

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CONFLICT OF INTEREST

The author declares no potential conflicts of interest.

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