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The Treatment of Pigmented Lesions in Taiwan

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Abstract

Combined dyspigmentation such as lentigines intermingled with freckles, or melasma with acquired bilateral nevus of Ota-like macules, are common among women in Taiwan. There are various lasers available, including Q-switched Nd-YAG laser, Q-switched alexandrite laser, Q-switched ruby laser, and pico laser. We conducted a literature review to understand the current practice of treatment for pigmented lesions in Taiwan.

Keywords: Pigment; Tattoo; Leucoderma; Laser; Taiwan

Introduction

Pigmented lesions are always a concern in Asian people. There are many kinds of hyperpigmentation on the face, including freckles, solar lentigines, melasma, acquired bilateral nevus of Ota-like macules (ABNOM), Nevus of Ota, cosmetic tattoos and others. Mixed hyperpigmentations such as lentigines intermingled with freckles, or melasma with ABNOM, are common among women in Taiwan. The treatment for each disease is different. Some may be responsive to topical bleaching agents, like Kligman's triple combination formula (5% hydroquinone, 0.1% tretinoin and 0.1% dexamethasone), while others may be good candidates for light based therapy, like lasers or intense pulsed light (IPL). The treatment plan highly depends on the physicians' experiences and techniques. Currently, there are various lasers available for the treatment of pigmented lesions, including Q-switched Nd-YAG laser, Q-switched alexandrite laser, Q-switched ruby laser, and pico laser. We conducted a literature review to understand the current treatment protocols of pigmented lesions in Taiwan.

Freckles and Letigines

Although freckles and lentigines are not as common as those in the Western countries, many therapeutic modalities have been advocated over the past decades. Li and Yang [1] compared the traditional 35% trichloroacetic acid with the Q-switched Nd-YAG laser for the treatment of lentigines. They found Q-switched Nd-YAG laser (532 nm, 2 mm spot size, 2.4-2.6 J/cm^2) was more effective after one treatment session.

In another study by Huang et al. [2], they investigated on the effect of IPL for the treatment of facial freckles in Asian skin. They used cutoff filters of 550–590 nm, 25–35 J/cm^2, single or double-pulse with intervals of 20.0 or 40.0 ms, and a pulse width of 4.0 ms to treat the lesions for 1-3 sessions in 4 week intervals. Nearly ninety percent of the subjects showed excellent or good results, with similar percentage of patients' satisfaction.

Contrary to previous study, Wang et al. [3] performed a split-face study for the treatment of freckles and lentigines by comparing Q-switched alexandrite laser in one session and IPL in two sessions. They used Q-switched 755 nm alexandrite laser with the parameters of 50 ns, 3 mm spot size, and 6.5-7.5 J/cm^2. As for the IPL, a 560-1,200 nm cutoff filter, double mode, 3.2/6.0 ms pulse width, 40 ms intervals, 26-30 J/cm^2 in session one and 28-32 J/cm^2 in session two were used. Their study results showed Q-switched 755 nm alexandrite laser was superior when treating freckles, while IPL should be used for lentigines.

Melasma

Melasma is commonly observed in Taiwanese middle aged women, especially after pregnancy. In the past, attempts to treat melasma with Q-switched Nd-YAG laser or Q-switched ruby laser yielded disappointing results. Successful treatment of melasma by IPL has been reported previously in studies with small sample in Hispanic and Asian people. Wang et al. [4] performed a study on IPL for the treatment of refractory melasma. They used a 570 nm cut-off filter in the first session, and 590-615 nm filters during subsequent sessions. During four sessions in 4 week intervals, they treated patients by double mode, pulse width of 3-4 and 4-5 ms with an interval of 30-35 ms, and 26-33 J/cm^2. They found about forty percent improvement in relative melanin index, and nearly one third of the patients with more than 50% improvement. Partial repigmentation was noted despite the use of hydroquinone cream and broad-spectrum sunscreens, indicating the importance of long term maintenance sessions when treating melasma with IPL.

Lee et al. [5] tried to combine both 1,064 nm Q-switched Nd-YAG laser and ultrasonic application (1 MHz, 0.5 W/cm^2) of topical vitamin C (5 ml of 20% L-ascorbic acid gel) for patients with melasma. They used 1,064 nm Q-switched Nd-YAG laser with the 8 mm spot size, 2.0 J/cm^2 for one pass then shifted to 6-mm spot size, 3.5 J/cm^2 for a second pass, and ended with 4 mm spot size, 3.2 J/cm^2 scanning mode for the final pass for full face and multiple additional passes for deep pigmented area till the endpoint of mild erythema and swelling. The improvement was noted during second to fourth sessions. The patients' mean improvement after four sessions was 60–80% fading of melasma. Another similar study by Chen et al. [6] used single 1,064 nm wavelength or dual 1,064 nm and 532 nm wave Q-switched Nd-YAG lasers combined with subsequent vitamin C (20% L-ascorbic acid gel) sonophoresis (1 MHz, 1.2 W/cm^2) in 5 sessions at monthly intervals to treat facial dyschromia and melasma. They used either 1,064 nm, 7 mm spot size, 1.6–1.8 J/cm^2 or 532 nm, 3 mm spot size, 0.8–1.0 J/cm^2

during treatment sessions. Over ninety percent of the patients showed an excellent or better outcome. The majority of the patients experienced no post-inflammatory hyperpigmentation (PIH). Few had slight PIH which quickly resolved within 1 week. Combinations of Q-switched Nd-YAG laser with vitamin C sonophoresis seemed to reduce the PIH in melasma patient.

Nevus of Ota

Although various laser systems such as 488 nm and 514 nm argon, 694 nm Q-switched ruby, 755 nm Q-switched alexandrite and 1,064 nm Q-switched Nd-YAG lasers have been used for clinical treatment of Nevus of Ota, complications like hypertrophic scarring or changes in the normal skin pigmentation still happened. Cheng and Kou. [7] compared the effectiveness of Q-switched Nd-YAG laser with that of Q-switched ruby laser for Nevus of Ota. The number of treatments ranged from 1 to 8, which is related to the severity of the lesions. They found that the use of Q-switched 694 nm ruby laser with 25 ns, 3 mm spot size and 7-10 J/cm^2, 1 Hz resulted in better clearing and fading as compared with Q-switched 1,064 nm Nd-YAG laser (20-40 ns, 3 mm spot size, 7-10 J/cm^2, 5-10 Hz). Therefore, the Q-switched ruby laser is favoured when treating deep dermal pigmentation like Nevus of Ota.

Combined Dyspigmentation

Because mixed hyperpigmentation are common in Taiwanese women, Wang and Chen. [8] studied on the effect of spot size and fluence of Q-switched 755 nm alexandrite laser for various pigmentations in Asians. They compared 4 mm spot size and 3.5-5.5 J/cm^2 with 3 mm spot size and 5.5-8 J/cm^2. They found the patients with freckles experienced the highest improvement rate (83–84%), followed by those with lentigines (52%) and ABNOM (35%). PIH developed in 10%, 44% and 75% of the patients with freckles, lentigines, and ABNOM, respectively. The severity of PIH was lower when using the 4 mm spot size with a lower fluence than the 3 mm spot size with a higher fluence. Therefore, treatment of a larger spot size at lower fluence should be considered when using Q-switched alexandrite laser.

Physicians here sometimes tried to use combined wavelength therapies to see if this would bring better outcome. Shen et al. [9] used a low fluence Q-Switched 1,064 nm (5–7 mm spot size, 1.5–2.0 J/cm^2) or dual wavelength 532/1,064 nm Nd-YAG laser (532 nm: 2–3 mm spot size, 0.5–1.5 J/cm^2; 1,064 nm: 5–7 mm spot size, 1.5–2.0 J/cm^2) for facial skin dyspigmentation (including hyperpigmentations, melasma, and dyschromia) in Asian patients. They found no difference between outcomes of low fluence Q-switch 1,064 nm monotherapy and combined 532/1,064 nm therapy in Asian patients after 5 treatment sessions at 4 week intervals. The combination therapies seemed not to bring additional benefits.

Cosmetic Tattoos

Treatment of cosmetic tattoos is challenging. Cosmetic tattoos are traditionally treated by Q-switched lasers without satisfactory results. Since the introduction of fractional laser, Wang et al. [10] studied the effect of a 1,550 nm, erbium-glass fractional laser system to remove cosmetic non-black colored tattoos. They used the energy settings of 17 mJ and 169 MTZ/cm^2, 2 passes (total density of 338 MTZ/cm^2) for five sessions at 1 month intervals on rats. They found this non-ablative fractional laser successfully removed white and flesh-colored cosmetic tattoos by transepidermal elimination of tattoo pigments through the disrupted dermal–epidermal junction. In another similar study, [11] they used carbon dioxide (CO_2) ablative fractional resurfacing (120 μm spot size, 17.5 mJ, 10% density) with same treatment sessions and intervals. Although CO_2 ablative fractional resurfacing is theoretically more effective than non-ablative fractional laser, they found CO_2 ablative fractional resurfacing was as effective as non-ablative fractional laser.

Although traditional Q-switched lasers are very effective for removing black tattoos, other cosmetic tattoos can develop a paradoxical color shift due to reduction of the metallic component in the inks. White ink contains white titanium dioxide, and brown ink contains ferric oxide. These pigments turn dark by a reduction reaction upon laser excitation. Leu et al. [12] studied on the tattoo ink's absorption spectra and effects of particle size when using Q-switched Nd-YAG laser. They used the settings of 532 nm, 3 mm spot size, 2.5 J/cm^2 and 1,064 nm, 3 mm spot size, 6.5 J/cm^2 with two sessions in a 1 month interval. They found black tattoo ink's excellent response to Q-switched lasers was related to its strong absorption and small particle size. In contrast, white tattoo ink's poor response was associated with its poor absorption and large particle size. Physicians should be very careful when dealing with tattoo inks other than black color.

Spotted Leucoderma

Treating a melasma or facial hyperpigmented patient with a high fluence and a too short interval usually results in complications such as spotted hypopigmentation or leucoderma. Hwang et al. [13] once reported a rare case of spotted leucoderma after treatment of facial hyperpigmentation on a hemodialysis patient. This patient was treated by 1,064 nm Q-switched Nd-YAG laser with the settings of 6 mm spot size, 3.9 J/cm^2, 6 sessions at 8 day intervals. Although a significant improvement after three treatment sessions was noted, spotted leucoderma developed at the fourth visit. Neither residual facial hyperpigmentation nor spotted leucoderma improved subsequently after two additional sessions of 1,064-nm Q-switched Nd-YAG laser with a lower fluence (3.0-3.5 J/cm^2), topical hydroquinone and 12 sessions of low-level energy He-Ne laser. It is believed that a fluence of more than 3.0 J/cm^2 is regarded as a high fluence when using the 1,064 nm Q-switched Nd-YAG laser. In such conditions, the treatment interval should be at least 3–4 weeks. The higher the fluence, the longer the treatment interval should be. The total treatment sessions should also be limited if a higher fluence is applied.

Conclusion

The new development of pico-second lasers recently brings the treatment of pigment to another brand new field. Nowadays, they are used to treat various hyperpigmented lesions in Taiwan. Although very popular indeed, there is still no scientific data on Asian people published yet. For epidermal pigmented lesions like freckles and lentigines, the traditional Q-switched Nd-YAG laser, Q-switched alexandrite laser, or IPL work with similar results. For melasma patients, long term maintenance sessions with IPL are suggested. Combinations of Q-switched Nd-YAG laser with vitamin C sonophoresis reduce the incidence of PIH. The Q-switched ruby laser is favored for dermal pigmented lesions like Nevus of Ota. If we treat mixed hyperpigmentation, dual wavelength therapies bring no additional benefits, but a larger spot size at lower fluence should be considered. The higher the fluence, the longer the treatment interval should be. For cosmetic tattoos, CO_2 ablative fractional resurfacing

was as effective as non-ablative fractional laser. However, dealing with tattoo inks other than black color should be very careful.

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