CLINICAL BULLETIN

No. 2

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Comprehensive Evaluation of Microsecond Pulse Alexandrite Treatment

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Introduction

In the treatment of lentigines with Q-switched, nanosecond pulse lasers, postinflammatory hyperpigmentation (PIH) is the most common and unwanted adverse effect among Japanese and other ethnic groups with the Asian skin type. Q-switched lasers, which create megawatt ranged peak power, were designed to treat dermal melanocytosis and tattoos by producing photoacoustic damage to chromophores such as melanin or tattoo ink particles. In these treatments, high peak power and extremely short pulse widths are used to fragment the deeper melanocytes and tattoo pigments in the dermis into tiny pieces that can be removed by phagocytosis.

By contrast, when high peak power and extremely short pulse widths are used for the treatment of lentigines, whose target chromophores are within relatively shallow layers above the D-E (dermal-epidermal) junction, unnecessary photoacoustic damage to the D-E junction stimulates melanin production, resulting in transient PIH. It is believed that a nominal 100 µs, non-Q-switched, alexandrite laser pulse can deliver the 755 nm energy necessary for an effective treatment while minimizing the creation of PIH.

Method

In order to evaluate the efficacy of treating with a microsecond pulse alexandrite laser, 50 patients were treated at the Miyata Plastic and Reconstructive Surgery/ Dermatology Clinic over a six month period. The AlexTrivantage® Q-switched 755 nm flash- lamp-pumped alexandrite laser system was modified to deliver 50 ns Q-switched or 100-µs-long pulse widths through a fiber optic delivery system and a 3 mm hand piece. The effectiveness of treating with Q-switched pulse fluences between 6.5 J/cm^2 and 7.5 J/cm^2 was compared to the same size spot with microsecond pulse fluences ranging between 22 J/cm^2 and 26 J/cm^2. Where possible, two different aspects of the same lesion were used for the comparison.

In general, the microsecond pulse mode was a very effective treatment for pigmented lesions such as seborrheic keratoses, moles, or nevus spilus. The most evident advantage of this mode is that it minimizes the severity of post-treatment transient erythema and PIH even when the duration of PIH persistence from either of the two modes is the same (Figure 1).

Discussion

When used to treat small moles, the microsecond pulse alexandrite provides a gentle photothermal effect where the Q-switched mode would be more likely to ablate the epidermis superficially. It continues to be effective in the treatment of larger moles, where the Q-switched alexandrite pulse doesn't work well at all.

For the treatment of nevus spilus, a combination of microsecond pulse AlexTriVantage and millisecond pulse GentleLASE® alexandrite energy seems better able to extend the remission period and reduce the rate of recurrence. This combination compares favorably against the use of the Q-switched AlexTriVantage and

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millisecond pulse GentleLASE alexandrite laser energy. Overall, the microsecond mode seems better able to "cook" the epidermis above the D-E junction, leaving a crust which peels off more rapidly.

Probably the most evident disadvantage of the microsecond pulse is the difficulty finding ambiguous treatment endpoint. Only a slight gray change can be seen on the surface of the lesion immediately after treatment, darkening only after two to three minutes. This is still far better than the millisecond GentleLASE treatment where close observation is needed to see any skin reaction at all. Double-pulsing and pulse overlapping should be avoided. When higher fluences are used there is a possibility of bruising or bleeding, though this should resolve itself within one to two weeks without scarring. In addition, light-colored lentigines do not respond well to the micro-second treatment mode where finding the optimal output level is still difficult. Here the Q-switched mode gives physicians more confidence in the ability to remove the lesion in a single treatment.

Compared to treatment with the Q-switched mode, seborrheic keratoses responded quite well to the microsecond treatment as shown in Figure 2.

Conclusion

After treating 50 patients we are confident that a system like the AlexTriVantage, with its 755 nm alexandrite output and a pulse width </= 100 µs is a very useful tool for the treatment of lentigines and other melanin-related lesions, with minimal PIH.

With this long pulse mode, physicians may move beyond providing simple "dermatological" procedures that provide high efficacy without much attention to adverse effects, toward more "cosmetic" procedures differentiated by a reduced incidence or duration of adverse effects such as edema, erythema, or PIH. To achieve this goal, a microsecond pulse mode is ultimately necessary as a treatment option.

Figure 1. Pretreatment *Immediately post-treatment* *Post-treatment*

Figure 2. Pretreatment *Post one treatment*

Figure 3. Pretreatment *Post one treatment*

Comparison Sheet Between Q-Switched Mode and Normal Mode (755 nm)

	Q-SWITCHED MODE	NORMAL MODE
Typical Laser Setting	6.5–7.5J/cm² at 3mm	22 to 26 J/cm² at 3 mm
Degree of Post-op Erythema	High	Mild
Degree of PIH	High	Mild
Length of PIH Resolution	Same as normal mode	Same as Q-switched mode
Endpoint	Clear, immediate whitening	Not clear, slight gray change
Bleeding	Safe, higher or double-pulsed	Evident if the fluence is set
EFFICACY		
Seborrheic Keratosis	Fair	Excellent
Small Moles	Fair	Excellent
Nevus Spilus	Typically need to treat every two months	Longer clearance period
Dark-colored Brown Spot	Excellent	Excellent
Light-colored Brown Spot	Excellent	Fair

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