

## White Paper

# Treatment Approaches for Multiple Skin and Hair Types with the Elite MPX™

**Ofelia Melley MD, FAAFP, Alicia Deece, Licensed Medical Aesthetician**

The Laser Institute of Pinehurst  
Pinehurst, N.C.

### INTRODUCTION

Laser hair removal (LHR) is one of the most common cosmetic procedures practiced in the world today. It is based on the theory of selective photothermolysis which was first discovered by Anderson and colleagues.<sup>1</sup> It stipulates that the pulse duration should be shorter than the thermal relaxation time of the targeted chromophore, which in the case of LHR is melanin. This ensures that the energy delivered to the melanin in the hair follicle has insufficient time to extend to the surrounding tissue. Since melanin is contained in the skin as well as the hair follicle, the appropriate balance of wavelength and energy must be made to minimize energy to the skin and maximize energy to the hair melanin to destroy the follicle.<sup>2</sup>

The use of 755nm Alexandrite and 1064nm Nd:YAG wavelengths have been shown to be highly effective wavelengths for LHR and multiple studies have been published on the use of these two wavelengths on multiple skin types.<sup>3, 4, 5, 6</sup>

### MULTIPLEX TECHNOLOGY

The ideal phase for effective laser hair removal is during the anagen or growth phase. During this phase melanin concentration is the greatest and makes an ideal target for the 755nm wavelength. The depth of the bulb during the anagen phase starts as superficial but quickly moves deep in the tissue to the level of subcutaneous fat. The longer wavelength of the 1064nm wavelength has the ability to penetrate the tissue and deliver energy to the deep seated follicle. During the anagen phase the hair follicle is well vascularized and therefore provides an additional target for the 1064nm wavelength.

For these three reasons (melanin content, depth of penetration and vascularization) it has been hypothesized that the most effective laser treatment to destroy the follicle would be a combination of two wavelengths. The wavelengths could be selectively titrated, based on the patient's underlying skin type to maximize melanin

absorption (Alexandrite) and minimize patient discomfort, while also ensuring that adequate energy is delivered to the depth of the bulb (Nd:YAG). Towards this end, Cynosure developed Multiplex technology to allow the sequential emission of the 755nm and 1064nm wavelengths with a fixed 10ms separation.

A recent study by Bernstein and colleagues<sup>7</sup>, compared the efficacy, safety, and side effect profile of single wavelength for LHR versus multiplexed wavelengths. Twenty subjects received four laser treatments at 4-6 week intervals. Efficacy was evaluated through blinded hair counts taken at two and six months following the final treatment. The mean hair clearance rate was highest for multiplexed YAG/Alexandrite sequence (86%), while multiplexed Alexandrite/YAG had a clearance rate of 81% and 755nm Alexandrite alone had a clearance rate of 83%. Side effects were minimal and did not differ by treatment and there were no signs of hypo or hyperpigmentation.

In another study by Ribe<sup>8</sup>, eight subjects with Fitzpatrick skin type II to IV were treated for unwanted hair of the forearm comparing the efficacy of a single wavelength to five multiplexed combinations of Alexandrite and YAG blends. In that study, subjects received two treatments with 3 month intervals. Efficacy was measured through both hair counts and histologic results at six months following the second treatment and compared to baseline. Hair count analysis showed a reduction of 76.74% for Nd:YAG/Alexandrite, 62.5% for Alexandrite alone, and 59.6% for Nd:YAG alone. Histologically, blending of the Nd:YAG and Alexandrite demonstrated wider destruction deep in the hair follicle involving vessels in the connective tissue in comparison to a single wavelength of the Alexandrite or Nd:YAG. The highest percentage

CYNOSURE®

of hair removal (78.74%) was observed with the blend of Nd:YAG/Alexandrite 75/25 and was supported by histology demonstrating the greatest fragmentation of the connective tissue surrounding the hair bulb.

## TREATMENT METHODS IN MY PRACTICE

For each end of the skin type spectrum, the use of the Alexandrite is highly effective in the treatment of lighter skin types, while the Nd:YAG is the most effective wavelength for darker skin types. In the case of skin types that fall in the middle (some II, III, IV), the simultaneous blending of Nd:YAG/Alexandrite appears to be the most effective choice.

For multiplexed treatments, standard pre-treatment work-up protocols are followed. Patients also undergo Fitzpatrick Skin typing and medical history, including current medications that may cause sensitivity to light therapy. Parameter settings are determined based on the patients Fitzpatrick skin type, area to be treated, hair type, and if necessary-clinical response to a test spots. Treatment approach is typically:

- FST I** Alexandrite
- FST II** Typically Alexandrite, although use multiplexing for certain treatment areas
- FST III** Multiplexed Nd:YAG/Alexandrite, although for some patients or treatment areas may start with Alexandrite and progress to blended wavelengths
- FST IV** Multiplexed Nd:YAG/Alexandrite
- FST V** Typically Nd:YAG, with multiplex employed for fine vellus hair
- FST VI** Nd:YAG

Specific settings used for Multiplex by treatment area based on a retrospective chart review are shown in Table 1.

**Table 1 – Typical Multiplex Treatment Parameters\***

Fitzpatrick Skin Type	Area	YAG Fluence (J/cm <sup>2</sup> )	YAG PW (ms)	Alex Fluence (J/cm <sup>2</sup> )	Alex PW (ms)	Typ Tx Interval
2-3	Back	16	10	14	20	8 wks
3	Upper Lip	16	20	13	10	4 wks
	Bikini- Navel	17	10	7	10	4-8 wks
4	Face	13-17	10-20	5-12	10-20	6 wks
	Brazilian	17	10	7-12	10	6-8 wks
5	Chin	16-20	10-20	7-9	10	8 wks
	Men's Back	22	20	5	20	6 wks

\*Zimmer Cooler set to 7-9

Treatment approaches are uniform for each area and consistent amongst staff providers. Each pass is completed with a 10% overlap.

For post treatment care, patients may apply an aloe-based gel or equivalent to smooth and moisturize the

skin. Current practice protocol is to suggest a titanium dioxide sunscreen with an SPF of 30 or greater. Patients may apply ice to the area treated for 10 minutes on/off, or as needed for edema and erythema. Patients are instructed to avoid heat induced mechanisms (hot-tubs, etc.) for 24 hours. Normal skin regiment (makeup, moisturizers) may be resumed after 1-3 hours provided there are no signs of a break in the skin. Occasionally a patient may experience post laser induced urticaria. This can be treated with an over the counter anti-histamine.

## Case Report 1

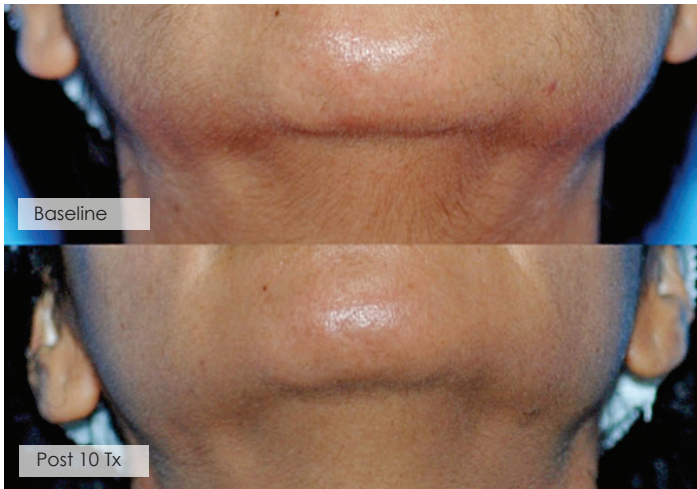


**Subject 1**

A 34-year-old female with skin type III presented for hair removal of the upper lip. Prior hair removal methods tried by this patient included plucking and waxing. Initial treatments were conservative and started with the Nd:YAG.

Clinical results were seen but patient sensitivity to the laser limited the ability to increase fluence. At this point Multiplexing was employed by blending Alexandrite with the Nd:YAG. This allowed an increase in fluence for improved outcomes and improved patient tolerability.

Tx Session	Spot Size (mm)	Tx Type	Fluence (J/cm <sup>2</sup> )		Pulse Width (ms)		Rep Rate (Hz)	Tx Interval (wks)
			YAG	Alex	YAG	Alex		
1	12	YAG	20	--	30	--	1.5	
2	12	YAG	20	--	30	--	1.5	4
3	15	MPX	14	5	10	20	1.5	5
4	15	MPX	20	7	10	10	1.5	7
5	15	MPX	20	7	10	10	1.5	6
6	15	MPX	17	7	10	10	1.5	5
7	15	MPX	17	8	10	10	1.5	6
8	15	MPX	17	8	10	10	1.5	8
9	15	MPX	17	10	10	10	1.5	5
10	15	MPX	17	12	10	10	1.5	6



**Subject 2**

### Case Report 2

A 43-year-old female with skin type IV presented for hair removal of the upper lip, neck and face. Initial treatments were conservative and started with the Nd:YAG at a pulse width of 40ms. Pulse width was incrementally reduced to 10ms over the course of treatment.

The client left the country for about 10 months during which no significant hair growth occurred. However, the client had some fine vellus hair, which can be clinically challenging to treat.

At this point, multiplexing was introduced, combining Nd:YAG with Alexandrite. The intention was to use the Multiplexing to add Alexandrite and improve the efficacy of treating the fine hairs. Excellent results were seen. The table below shows the treatment parameters that were used:

Tx Session	Spot Size (mm)	Tx Type	Fluence (J/cm <sup>2</sup> )		Pulse Width (ms)		Rep Rate (Hz)	Tx Interval (wks)
			YAG	Alex	YAG	Alex		
1	12	YAG	30	--	40	--	1.5	
2	12	YAG	30	--	35	--	1.5	4
3	12	YAG	30	--	30	--	1.5	8
4	12	YAG	30	--	25	--	1.5	6
5	12	YAG	30	--	25	--	1.5	4
6	12	YAG	30	--	20	--	1.5	6
7	12	YAG	30	--	20	--	1.5	6
8	12	YAG	30	--	15	--	1.5	6
9	12	YAG	25	--	15	--	1.5	40*
10	15	MPX	14	6	10	10	1.5	6

\* - Client out of the country during this time period



**Subject 3**

### Case Report 3

A 27-year-old female with skin type III presented for hair removal of the sideburn area. She had tried a number of home treatments which had produced unacceptable results.

Traditionally Nd:YAG would be used on a darker III-IV skin type. However, as we have gained more based on clinical experience, treatment was initiated with the Multiplexing technology, to maximize treatment outcomes and patient comfort. Treatments used a blend of Alexandrite/Nd:YAG as shown in the table below. Fluence was increased as the treatment sessions progressed.

Tx Session	Spot Size (mm)	Tx Type	Fluence (J/cm <sup>2</sup> )		Pulse Width (ms)		Rep Rate (Hz)	Tx Interval (wks)
			YAG	Alex	YAG	Alex		
1	12	MPX	13	5	20	20	1.5	
2	12	MPX	13	5	20	20	1.5	5
3	12	MPX	13	5	20	20	1.5	4
4	12	MPX	13	6	20	20	1.5	5
5	12	MPX	14	6	20	20	1.5	8
6	12	MPX	18	6	20	20	1.5	10

### DISCUSSION

The recent studies by Bernstein and Ribe demonstrated the safety and efficacy of multiplexing with a slight advantage to the blending of the Nd:YAG /Alexandrite mode. These findings did not report on the efficacy of the various blends by skin type, which is where this technology most advantageous.

In practice, combining simultaneous wavelengths has allowed for customized treatment parameters to patients that tend to be in the Fitzpatrick III & IV skin types,

especially those that have difficult to treat hair or have seen a plateau in treatment outcomes. For these patients the MPX technology is most effective. Using Nd:YAG 10ms prior to administering Alexandrite appears to be more productive than using the Alexandrite setting initially.

## CONCLUSION

In addition to providing both gold standard wavelengths (Alexandrite and Nd:YAG) for laser hair removal, the Elite MPX also provides the unique capability of sequentially firing these wavelengths which provides some significant clinical advantages. Three different cases were presented that demonstrate the ability of multiplexing to 1) increase fluence for improved outcomes, while at the same time decreasing pain, and 2) improving the efficacy of treating difficult targets (fine vellus hairs).

Multiplexed wavelengths are highly effective and safe modalities for the treatment both light and dark skin types. Blending these two wavelengths provides excellent clinical results in patients where single wavelengths are ineffective or where there has been a treatment plateau at patient acceptable fluence levels. It has been a great addition to my practice and has allowed me to provide superior results to my client base.

## REFERENCES

- 1 Anderson R, Parish J. "Selective Photothermolysis: Precise microsurgery by selective absorption of pulsed radiation." *Science*. 1983; 220: 524-7.
- 2 Anderson R, Parish J. "The optics of human skin." *J Invest Dermatol*. 1981; 77: 13-19.
- 3 Lloyd JR, Mirkov M. "Long-term evaluation of the long pulsed alexandrite laser for the removal of bikini hair at shortened treatment intervals." *Dermatol Surg*. 2000; 26(7): 633-7.
- 4 Tanzi, E, Alster, T. "Long -pulsed 1064-nm Nd:YAG laser-assisted hair removal in all skin types." *Dermatol Surg*. 2004; 30: 13-17.
- 5 Alster T, Bryan H, Williams C. "Long-Pulsed Nd:YAG laser assisted hair removal in pigmented skin." *Arch Dermatol*. 2001; 137: 885-889.
- 6 Tierney, E, Goldberg, D. "Laser hair removal pearls." *J Cosmet Laser Ther*. 2008; 10: 17-23.
- 7 Bernstein E, Basilavecchio L, Plugis J. "Bilateral axilla hair removal comparing a single wavelength alexandrite laser with combined multiplexed alexandrite and Nd:YAG laser treatment from a single laser platform." *J Drugs Dermatol*. 2012; 11: 185-190.
- 8 Ribe A. "A comparison of a single and dual wavelength laser (755nm and 1064) treatments in hair removal: 6 months follow-up and correlation of clinical and histology results." *ASLMS 2014 Poster*.



[www.cynosure.com](http://www.cynosure.com)

CYNOSURE®