

## Efficacy of Lasers on Pigmentary Lesions

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### Abstract

Our purpose is to study the efficacy of the alexandrite laser (755 nm) and the fractional laser when treating pigmentary lesions. We use the data of our private office of the last five years (2011-2015). We treated 1000 patients with freckles with alexandrite laser, 200 patients with melasma with fractional laser, 100 patients with post-inflammatory hyperpigmentation with alexandrite laser and 60 patients with post-inflammatory hyperpigmentation with fractional laser. We also studied the side effects of the therapies. Alexandrite laser has excellent results for freckles, while the combination of chemical peelings and fractional laser is good for the treatment of melasma. Post-inflammatory hyperpigmentation has an intermediate response. The recurrence rates are higher in melasma and the side effects are generally minimal.

**Keywords:** Melasma; Therapy; Laser; Hyperpigmentation

### Introduction

Our purpose is to study the efficacy of the alexandrite laser (755 nm) and the fractional laser when treating pigmentary lesions. We use the data of our private office of the last five years (2011-2015). We treated 1000 patients with freckles with alexandrite laser, 200 patients with melasma with fractional laser, 100 patients with post-inflammatory hyperpigmentation with alexandrite laser and 60 patients with post-inflammatory hyperpigmentation with fractional laser. We also studied the side effects of the therapies. We did not treat melanocytic nevi because there is frequent recurrence of the lesions and because laser irradiation on the cells' biological behaviour can cause potential future mutagenesis (Figure 1 and Figure 2).



Figure 1: Pigmentary lesions that need to be treated.



Figure 2: A freckle on the right hand which disappeared in 2 monthly sessions of alexandrite laser 20 J and 0.5 ms.

### Materials and Methods

**Alexandrite laser (755 nm):** We used energies ranging from 18-25 J and duration of 0.5 ms.

**Fractional lasers:** We used ultra-pulse laser mode, frequency 500 Hz, duration 200–300  $\mu$ s and density of micro spots 9  $\times$  9.

### Melasma

We used fractional lasers. We used ultra-pulse laser mode, frequency 500 Hz, duration 200–300  $\mu$ s and density of micro spots 9  $\times$  9. We did 5 monthly sessions.

We additionally did 5 glycolic acid (50–70%) chemical peels in monthly sessions. Each chemical peel session was 2 weeks apart from the session of the fractional laser. All the sessions were held in the autumn and winter when the sun exposure is less. Next year the sessions will be continued if needed (Figure 3).

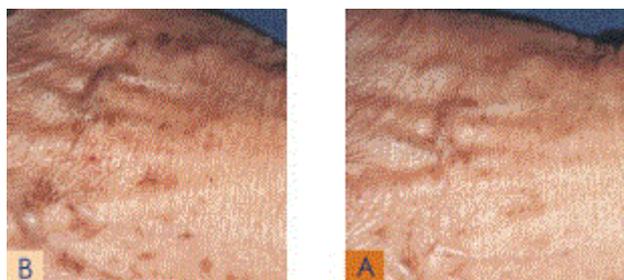


**Figure 3:** Pictures before (B) and after (A) of melasma (face) using a combination of fractional laser and chemical peels, 5 monthly sessions of fractional laser and 5 monthly sessions of chemical peels -glycolic acid formulation 70%.

### Post Inflammatory Hyperpigmentation (PIH)

We used Fractional lasers. We used ultra-pulse laser mode, frequency 500 Hz, duration 200–300  $\mu$ s and density of micro spots  $9 \times 9$ . We did 5 monthly sessions.

Topical treatment included hydroquinone, TCAs, kojic acid, retinoids, corticosteroids and vitamin C and was applied daily for months. Chemical peeling has also been used in 5 monthly sessions. Each chemical peel session was 2 weeks apart from the session of the fractional laser. We did also 3 sessions of dermabrasion at least 2 weeks apart from the sessions of chemical peels and fractional lasers. All the sessions were held in the autumn and winter when the sun exposure is less. Next year the sessions will be continued if needed (Figures 4).



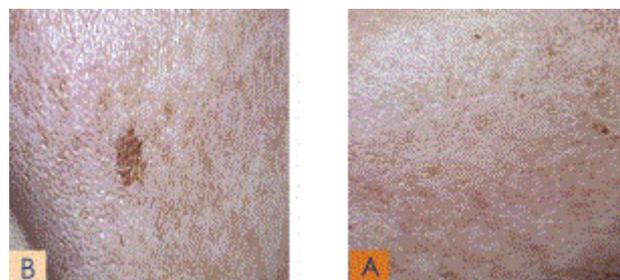
**Figure 4:** picture before (B) and after (A) of PIH (Post Inflammatory Hyperpigmentation-lichen planus hand) using alexandrite laser in 4 monthly sessions of alexandrite laser 22 J and 0.5 ms and combination of chemical peels (4 monthly sessions of glycolic acid 50%).

### Freckles

We used Alexandrite laser (755 nm): We used energies ranging from 18-25 J according to the phototype of the skin. Higher energies in the phototype I and II and lower energies for the phototype III and IV. The duration of the pulse was 0.5 ms.

Topical treatment included hydroquinone, TCAs, kojic acid, retinoids, corticosteroids, and vitamin C and was applied daily for months. Chemical peeling has also been used in a few cases in 5 monthly sessions. Each chemical peel session was 2 weeks apart from

the session of the alexandrite laser. We also did in a few cases 3 sessions of dermabrasion at least 2 weeks apart from the sessions of chemical peels and alexandrite laser. All the sessions were held in the autumn and winter when the sun exposure is less. Next year the sessions will be continued if needed (Figure 5).



**Figure 5:** Before (B) and after (A) picture of a freckle (trunk) using alexandrite laser in 3 monthly sessions 23 J and 0.5 ms.

### Results

#### Melasma

With this combination of therapies 60% of our patients had 70-90% clearance, while 30% experienced only 20-40% clearance. The rest 10% showed unfortunately no improvement.

#### Post inflammatory hyperpigmentation (PIH)

The average clearance of 50-60% in 40% of our patients, while 40-50% showed no improvement.

#### Freckles

The average clearance was 70-80% in 80% of the patients, while the 15-20% experienced an average clearance of 60%. The rest 5-10% showed no improvement.

Melasma recurrence rates were higher than those of freckles 40% in melasma instead of 10% in freckles.

The recurrence of the post inflammatory hyperpigmentation depended on the underlying disease. Lichen planus and folliculitis had higher rates of recurrence (40% in lichen planus and 30% in folliculitis) compared to those of eczema (20%) and trauma (10%).

Hypopigmentation occurred in 10 patients treated for freckles with alexandrite laser.

Hyperpigmentation occurred in 2 patients treated for freckles with alexandrite laser.

Only one case of hyperpigmentation occurred in a patient treated for melasma with fractional laser.

### Discussion

Lasers (Light Amplification by Stimulated Emission of Radiation) are sources of high-intensity monochromatic coherent light that can be used for the treatment of various dermatologic conditions depending on the wavelength, pulse, and influence of the laser being used and the nature of the condition being treated.

The mechanism of action of laser alexandrite on pigmentary lesions has to do with selective photothermolysis [1]. Melanin, the main chromophore in most epidermal and dermal pigmented lesions, has a broad absorption spectrum extending from the UV range through the visible and infrared spectra. The selective range of wavelengths for targeting melanin lies between 630–1100 nm, where there is good skin penetration and preferential absorption by melanin over other skin chromophore such as oxyhaemoglobin and water [2].

Fractional photothermolysis involves emission of light into microscopic treatment zones, hence creating small columns of injury to the skin and sparing the surrounding untreated skin. The side effects are less with these fractional lasers [3].

Melasma is an acquired pigmentary disorder characterized by brownish hyper pigmented macules usually on the face. Majority of the cases are seen in women. Various factors such as sun exposure, hormonal factors (pregnancy and oral contraceptive pills), genetic predisposition, and phototoxic drugs induce it. Ovarian dysfunction, thyroid autoimmune disease, liver disease, and cosmetics play also a role [4-6].

We did not use alexandrite laser due to its poor efficacy mentioned in the literature. Another reason is that the spot of alexandrite laser is only 5mm and this has a disappointing “spotty” result when treating large diffused areas.

According to the literature the best results are obtained with chemical peelings [7]. So we used the fractional laser as an additional therapy for melasma. Greater depths of penetration can be achieved using fractional laser as entire skin surface is not ablated. Hence, dermal melasma can be targeted [8,9].

Fractional laser improved the results of the chemical peelings in Melasma.

PIH is an acquired pigmentary disorder of skin that occurs as a result of inflammation induced by various cutaneous diseases and therapy. Various conditions that are associated with PIH include acne, folliculitis, lichen planus, herpes zoster and eczema. It can occur as sequelae to trauma, medications and as a complication of laser therapy.

All these conditions cause damage to the basal cell layer leading to accumulation of melanophages in upper dermis that remain there for some time. Also, arachidonic acid, prostaglandins and leukotrienes released as a result of inflammation stimulate the epidermal melanocytes leading to increase in melanin synthesis. PIH occurs with equal incidence in males and females but is more common in darker skin types [10].

The underlying disorder causing the hyperpigmentation should be treated. Patients should be advised daily use of sunscreens. Topical treatment includes hydroquinone, TCAs, kojic acid, retinoids, corticosteroids and vitamin C. Chemical peeling and dermabrasion have also been used.

Again we used fractional laser as an additional therapy.

We used alexandrite laser only as a combination therapy for “spotty” lesions. Several monthly sessions were needed for better results.

According to the freckles, we used alexandrite laser, which was the treatment of choice for us with quick and impressive results. Due to the great superiority of the alexandrite laser treatment, we did not use fractional laser. Chemical peelings were used only in a few cases as an additional therapy.

In all cases of all pigmentary lesions, we shared our experience with other colleagues in my country and abroad who used the same combinations of therapies. All the patients were advised to use sun creams, to avoid sun exposure and to use whitening creams at night. Thus the recurrence rates can be reduced.

## Conclusion

The treatment of pigmentary lesions with lasers is well documented in the literature and quite satisfactory.

The combinations of the therapies with chemical peelings are better than immunotherapy [11].

Several monthly sessions have better results.

The correct selection of the patients and a friendly discussion with them focusing on the efficacy and the side effects of the therapies is essential.

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