

# *Evaluation of the Aura 532nm laser and the Lyra 1064nm laser for non-invasive skin rejuvenation and toning*

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## **Background**

Non-invasive techniques for skin rejuvenation are being quickly established as a new standard in the treatment of mild rhytids and overall skin toning. Multiple laser wavelengths and modalities have been tried for this procedure with varying degrees of success. These lasers include 532nm, 585nm, 1064nm and 1320nm wavelengths.

## **Objective**

The goal of this clinical trial was to evaluate a long pulse KTP laser and a long pulse Nd:YAG laser both separately and combined, for non-invasive skin rejuvenation and toning and to establish efficacy and degree of success.

## **Method**

A total of 150 patients were treated with the Aura and the Lyra lasers both separately and combined. Patients included skin types I through IV. The fluences varied between 7 and 15 J/cm<sup>2</sup> at 7 to 20 msec pulse duration with a 2mm handpiece and 6 to 9 J/cm<sup>2</sup> and 30 msec with a 4mm handpiece for KTP. The Lyra fluences were set at 24 J/cm<sup>2</sup> for a 10mm handpiece and 30 J/cm<sup>2</sup> for a SmartScan Plus scanner. These energies were delivered at 30 msec pulse durations. All subjects were treated at least 3 times and at most 6 times and were observed between 3 and 6 months following the last treatment.

## **Results**

All 150 patients exhibited a mild to moderate degree of improvement in the appearance of rhytids, moderate degree of improvement in skin toning and texture and great improvement in redness and pigmentation at the last follow-up observation.

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## **Background**

Laser skin resurfacing procedures are divided into two categories – invasive and non-invasive.

Invasive procedures are being done with laser wavelengths whose primary chromophore is water – Carbon Dioxide (CO<sub>2</sub> @ 10600nm) and Erbium:Yttrium-Aluminum-Garnet (Er:YAG @ 2940nm). Since human skin consists of 70% water, laser energy applied to the skin immediately vaporizes the epidermis and papillary dermis. Based on the wavelength (CO<sub>2</sub> vs. Er:YAG), pulse duration (microseconds vs. several milliseconds), amount of applied energy and number of passes, the depth of penetration and consecutive thermal damage into the dermis vary. The final result

varies as well and is intricately dependent on the aggressiveness of the treatment. The healing process triggered by the amount of injury inflicted results in remodeled smoother collagen and a newer, rejuvenated epidermis. The major drawback of the invasive procedure is a long downtime for the patients which may last anywhere between 2 weeks and 2 months. In spite of the great results, the number of invasive skin resurfacing procedures have dropped in the past four years from 70% of total laser procedures in 1996 to 33% in 1998 according to the AAFPRS.

An Erbium:YAG laser procedure may also be performed in a much lighter technique. The shallow tissue penetration and very low

applied to the skin simply slough off the stratum corneum inflicting no additional damage to the rest of the epidermis or dermis. Certain new generation Er:YAG lasers can achieve similar results to the CO<sub>2</sub> laser. Most conventional Er:YAG lasers, however, are capable of only very superficial laser abrasion. It has typically been used to achieve a more even look of the skin with correction of fine wrinkles in younger patients.

Non-invasive procedures also inflict thermal damage to the papillary dermis; however, the mechanism involves the laser passing through the epidermis without any significant or damaging impact, with energy deposition in the lower layers of dermis. Wavelengths utilized for this procedure include those whose main chromophore is water (Nd:YAG @ 1320nm), hemoglobin (KTP @ 532nm, Dye @ 585nm), and oxyhemoglobin (Nd:YAG @ 1064nm) but whose depth of penetration is much deeper than that of either CO<sub>2</sub> or Er:YAG. In addition to the depth of penetration difference, the upper layers of skin are generally protected with superficial cooling. Each laser has its own modality and its own method of application but, as stated above, the general idea is to impact the lower layers of skin inducing injury and thus encouraging the healing process of the collagen, which results in tighter skin.

The ultimate solution for this treatment is yet to be found. Although the non-invasive treatments do not have the downtime of the invasive technique, they are not as effective either. The main drawbacks include multiple treatments, comparatively minor improvement of wrinkles and overall skin quality.

## Objective

The goal of this study was to evaluate two different wavelengths for non-invasive skin rejuvenation, both separately and in combination and compare all three types of treatments. The theory behind using two wavelengths is to insure both epidermal quality changes as well as the changes to papillary dermal collagen. In order to achieve this, shorter (532nm) and longer (1064nm) wavelengths were utilized.

## Materials and Methods

The lasers used for these procedures were the Aura KTP/532nm and the Lyra d:YAG/1064nm from Laserscope (San Jose, CA). A total of 150 patients were treated and the group was divided into equal parts, where 50 patients were treated with the 532nm alone, 50 patients were treated with 1064nm alone, and 50 patients were treated with both lasers together. Patients of Fitzpatrick skin types I through IV were enrolled in this evaluation for the first and third groups and I through V for the second group. The limitation in



Patient before the treatment



Typical result following just one treatment

skin types in the first and third groups was mainly due to the KTP laser, which is well absorbed in melanin and cannot be used in darker skin types. The longer wavelength – Nd:YAG – alone could safely be applied to skin types V and VI.

There were three to six treatments applied in each group with 4-6 weeks between individual treatments. The number of treatments was based on the patient satisfaction level. All patients were asked to fill out a 'Severity Scale' on which redness, pigmentation, rhytids, skin tone/tightness, texture and patient satisfaction were noted before the treatment and after the last treatment. Redness, pigmentation and rhytids were also evaluated using the same scale by the physician and another observer.

*The first group* of patients treated with the KTP laser alone was first evaluated for sun damage, telangiectatic vessels and other skin inconsistencies. There were 25 patients with skin types I and II and 25 patients with skin types III and IV. The laser was first used for "clearing up the skin", i.e., erasing any obvious blemishes such as lentigos and telangiectasias, using a 2mm handpiece. The laser parameters were set at 15-20 msec and 10-15 J/cm<sup>2</sup> for telangiectasia and 7-10 msec and 7-10 J/cm<sup>2</sup> for lentigos. Once individual discolorations were cleared to satisfaction, a 4mm handpiece with contact cooling was used at 30 msec and 6-9 J/cm<sup>2</sup> in a "brushing" or "sweeping" manner over the entire face. This was done to even out the skin color of the entire face. Immediately following the treatment Elocon ointment was applied to the treated areas followed by ice packs placed on these areas for 15 to 20 minutes.

The final follow up took place at 3 months following the last treatment. Several patients were followed up to 6 months.

*The second group* of patients was treated with the Nd:YAG wavelength alone. Patients in this group had little to no obvious skin discolorations and were mainly interested in skin toning and tightening. This group included 25 patients of skin types I and II, 20 patients of skin types III and IV, and 5 patients of skin type V. The first several patients were

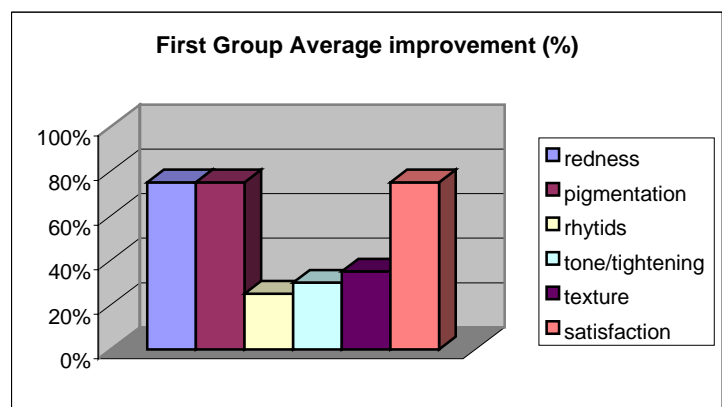
treated with the SmartScan Plus scanner which is based on a 5mm spot applied to the skin in a zigzag manner. The laser was set at 30 msec and 30 J/cm<sup>2</sup>. The laser energy was deposited through a contact cooling window set at 5°C. Later a 10mm spot size handpiece became available and the rest of the patients received the treatment with the 10mm handpiece delivering 30 msec and 24 J/cm<sup>2</sup>. Both the scanner and the handpiece were used over the entire face in a "brush stroke" manner.

*The third group* was treated with the combination of the two lasers. This group included 25 patients of skin types I and II and 25 patients of skin types III and IV. Patients with skin type V or VI were excluded. First all patients were treated with KTP exactly per the protocol of the first group, immediately followed by treatment with the Lyra as described in the protocol for the second group.

## Results

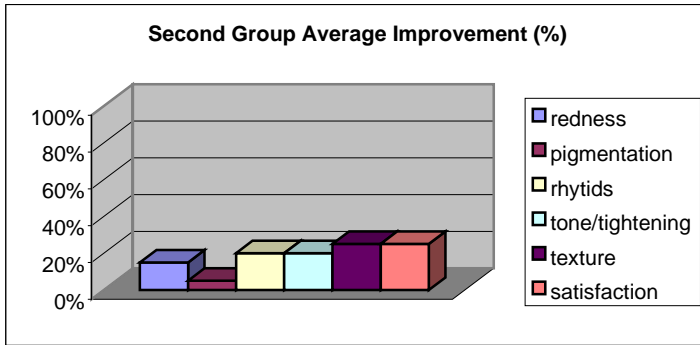
All patients filled out the "Severity Scale" form where on a scale of 0 to 10 they had to evaluate redness, pigmentation, rhytids, skin tone/tightening, skin texture and overall patient satisfaction before the first treatment and at the 3-6 months follow up after the final treatment.

The results for the first group were as follows:

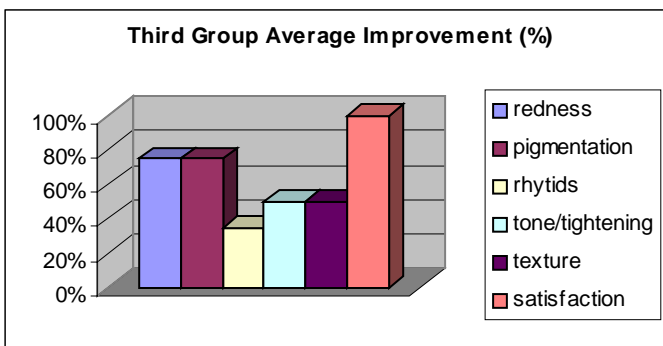


Patients treated with KTP had minimal erythema and scabbing of lentigos, which sloughed off after 5 days. These patients could wear make up immediately after treatments.

The results for the second group are depicted in the following chart:



The results for the third group are exhibited in the chart below:



## Discussion and Conclusion

It was rather obvious that the best results have been achieved with the third group. As predicted before the clinical trial, the treatment with the combination of the two lasers delivered the best clinical outcome. Both lasers are absorbed in micro-vasculature within the dermal papillae and dermis, with KTP mainly targeting more superficial and smaller vessels and Nd:YAG absorbed in deeper layers. This absorption in blood increases the temperature around the vessels transferring thermal damage to the surrounding tissue, and in turn inducing a healing effect to the collagen within the skin. There is also some non-specific thermal damage from the scattering effect from both lasers which has been seen in several biopsies taken during this evaluation. Patient satisfaction was much higher with the KTP laser due to the more visual effects of the skin changes, such as more even coloration or

loss of telangiectatic vessels. However, it is rather obvious that the application of the longer wavelength brought its benefits as well as it increased skin tightening and improved toning and appearance of mild rhytids.

Although this treatment has not yet overcome one of the drawbacks of non-invasive skin rejuvenation – multiple treatments – the overall skin improvements were very impressive. Both lasers could be used for this procedure separately, however, much more impressive results were observed with the combination treatment. It was also very impressive to have observed no side effects or discomfort during or after any of the treatments, except for minor erythema and sloughing off of lentigos after KTP treatment.

Longer follow up will be needed to observe any additional changes to the skin and any further improvement. Additional biopsy studies will need to be done to confirm the results reported by the patients.

## References

- Goldberg DJ. Non-ablative subsurface remodeling: Clinical and histologic evaluation of a 1320nm Nd:YAG laser. *J. Cutan Laser Ther* 1999; 1: 153-7
- Zelickson BD, Kilmer SL, et al. Pulsed Dye Laser Therapy for Sun Damaged Skin. *Lasers in Surgery and Medicine* 1999; 25:229-236
- Sumian C, et al: Laser Skin Resurfacing Using a Frequency Doubled Nd:YAG laser after Topical Application of an Exogenous Chromophore. *Lasers in Surgery and Medicine* 1999; 25:43-50.
- Goldberg DJ. New Collagen Formation After Dermal Remodeling With an Intense Pulsed Light Source. *J. Cutan Laser Ther* 2000; 2: 59-61