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Case Report

Efficacy and Safety of High-Power Diode Laser at 1060 nm for Skin Rejuvenation Treatment

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Abstract

The use of a high-power 1060 nm diode laser, with hundreds of milliseconds scale emission capabilities, is a novel method for skin rejuvenation that could emulate the efficacy and safety of the long-pulse 1064nm Nd: YAG solid-state laser, while keeping the advantages of semiconductor lasers: pulse quality, contact cooling and low maintenance.

The patient was a 43-year-old Caucasian woman with Fitzpatrick Skin Phototype II, presenting facial sagginess and nasogenian fold. A 4 sessions treatment (one every six weeks) was performed by a High Power Diode Laser at 1060 nm. The laser parameters were: 10J/cm^2 fluence and 400ms pulse duration. A 4mm distancer was placed on the hand-piece. An infrared thermometer was used to ensure that the skin reached 42ºC.

The high-power diode laser at 1060 nm is a new and more approachable alternative that has demonstrated to be effective and safe for facial rejuvenation.

Keywords: Facial rejuvenation, High Power Diode Laser, Nd: YAG, non-ablative skin rejuvenation, pulse duration, wavelength, wrinkles, 1064 nm

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Non-ablative laser rejuvenation is a frequent and requested treatment that has a proven track record of safety and efficacy.[1–3] Several wavelengths have been tested in the visible and infrared spectrum.[4–5] Among them, long-pulse 1064 nm Nd: YAG solid-state lasers have been one of the most successful as they have been shown to produce a noticeable rejuvenation effect along with skin texture and pores improvement with no downtime and a good tolerance for all phototypes.[1,2,4–6]

On the other side, semiconductor lasers, despite the advantages they offer related to pulse quality, contact cooling and low maintenance, have had little adoption in the rejuvenation field, mostly because their most representative wavelengths (810 nm, 940 nm and 980 nm) were either unsuitable or insufficient to achieve good-enough results.[5,7] However, the apparition of a novel high power 1060 nm diode laser with emission capabilities in the scale of the hundreds of milliseconds could emulate the solid-state laser results while keeping the semiconductor lasers advantages.

Case Report

The patient is a 43-years-old Caucasian woman with a Fitzpatrick Phototype II skin, presenting some facial sagginess, a deep nasogenian fold and a wrinkle next to it.

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An initial clinical visitation and medical history were performed before proceeding with the treatment with a high power diode laser at 1060 nm and laser spot of 10x10 mm^2, a hand-piece applicator of the Primelase Excellence device (Cocoon Medical, Barcelona-Spain). The treatment protocol consisted of 4 sessions, one every six weeks. The laser parameters were 10J/cm^2 fluence at a pulse duration of 400ms. The energy was applied following a crisscross painting pattern at a slow and steady speed for a span of 3 minutes on each side of the face. A 4 mm distancer was placed over the tip of the hand-piece in order to avoid both contact cooling and heat exchange between the skin and the hand-piece window and an infrared thermometer was used to ensure that a threshold temperature of 42 ºC was reached. This temperature is said to stimulate the collagen synthesis by the thermal fibroblasts that lead to skin rejuvenation.[8] No topical anesthetic was required during the procedures. Evaluation was carried out through clinical photography assessment and 3D fringe projection measurements with the DermaTOP device (Breuckmann, Germany).

Results

The patient experienced no pain or discomfort and even described the procedure as pleasant. Aside from a transient erythema that remained for 20 minutes no side effects occurred.

Photographs showed a progressive improvement of the wrinkles, nasogenian fold depth, skin roughness and appearance (Figs. 1, 2). 3D fringe projection measurements of the wrinkle (Fig. 3) confirmed a 18.8% volume improvement, a 15.5% reduction of the maximum depth and a 22% average depth decrease of the wrinkle. Nasogenian fold 3D measurements (Fig. 4) showed an 18.5% volume improvement, a 34.9% reduction of the maximum depth and a 12.6% average depth decrease, as well as a 9.3% improvement of the skin roughness, as followed in Table 1, 2 and 3 show.

Figure 1. Before (left) and after (right) treatment of the nasogenian fold.

Figure 2. Before (left) and 1 month after 4 treatments (right) of the wrinkle.

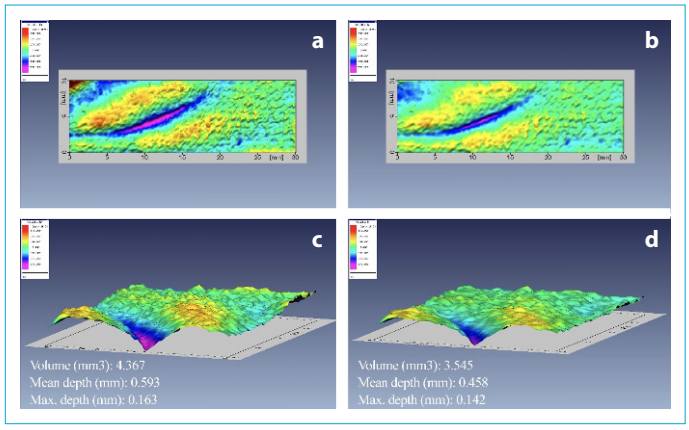

Figure 3. 3D images and fringe projection measurements of the wrinkle. Before: **A** and **C**; after: **B** and **D**.

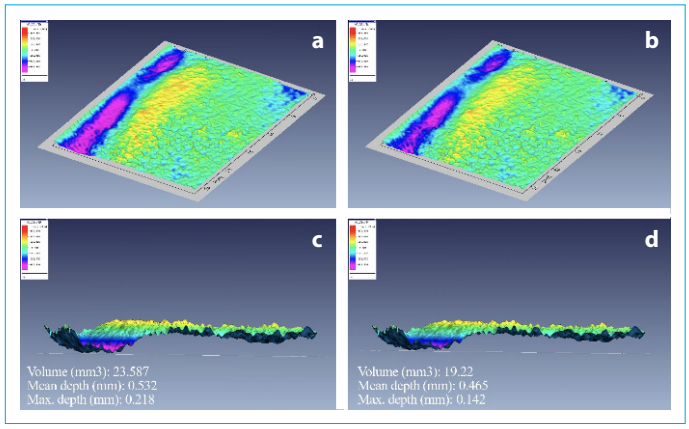

Figure 4. 3D images and fringe projection measurements of the nasogenian fold. Before: **A** and **C**; after: **B** and **D**.

Discussion

Since the inception of facial laser rejuvenation treatments, a demand for non-ablative treatments, where minimal down time and no discomfort take priority over results, has been steadily growing until becoming the current dominant trend. Therefore, the challenge isn't any longer about how to reach the best possible results, where fully ablative

Table 1. Wrinkle 3D measurements

	Day 0	1 month after 4 Tx	Improvement (%)
Volume (mm3)	4.367	3.545	-18.8
Mean Depth (mm)	0.593	0.458	-22.8
Max. Depth (mm)	0.168	0.142	-15.5

Table 2. Nasogenian fold 3D measurements

	Day 0	1 month after 4 Tx	Improvement (%)
Volume (mm3)	23.587	19.22	-18.5
Mean Depth (mm)	0.532	0.465	-12.6
Max. Depth (mm)	0.218	0.142	-34.9

Table 3. Skin roughness 3D measurements

	Day 0	1 month after 4 Tx	Improvement (%)
Roughness (mm)	0.108	0.098	-9.3

resurfacing remains unsurpassed, but how to achieve the best possible results while keeping downtime, pain and risks to a minimum.[2,9] This has led to milder treatments that must be repeated frequently in order to increase and sustain the results, thus turning the choice of technology more complex. Indeed, as the number of treatment sessions increase their now recurring price has to lower, making even more necessary a balance between the wavelengths and energies that can give the better results while remaining as cost-effective as possible.

The 1064 nm wavelength Nd: YAG has long been one of the best choices result-wise, as it has a good depth of penetration into the dermis, can be used on any skin phototype and can be emitted in very long pulses that allow the skin to mild heat up to 39-42 ºC until it reaches the Hsp70 (Heat shock protein 70) temperature trigger threshold at a steady pace, hence being comfortable for the patient.[1,4–6,10,11] It is stated that some days after the treatment Hsp47 is activated, which takes an important role in the collagen production and hence in skin rejuvenation.[12,13]

However, solid-state systems capable of long pulse modulation and high energies emitted on squared pulses are complex, expensive and have a high maintenance cost.[12] The 1060nm high-power diode laser used in the current case obtains results comparable to those of solid-state Nd: YAG while still keeping the advantages of diode laser-based systems. The efficacy, safety and patient comfort combined with the reliability and ease of use of these new technologies could help to make facial laser rejuvenation a more accessible option to many more patients.[2]

Conclusions

The feasibility of achieving facial rejuvenation using a 1060 nm long-pulse high-power diode laser has been demonstrated. It is an effective and safe procedure and marks the appearance of a new, more approachable alternative for this indication.

Disclosures

Informed consent: Written informed consent was obtained from the patient for the publication of the case report and the accompanying images.

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