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Original article

532 nm sub pulsed laser for treating Melasma in Latin American Patients, series of cases

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Abstract. *Objective:* to analyze a series of cases treated with a 532 nm Sub Pulsed laser treatment for Melasma in Latin American Patients with Fitzpatrick type IV. *Background:* melasma is a common, acquired, symmetrical hypermelanosis that presents as light to dark brown macules on the face usually over the forehead and malar areas that negatively impact patient's quality of life. Various laser treatments have been described without any consensus, however targeting the vascular component has been progressively gaining popularity, but adverse reactions such as transient post inflammatory hyperpigmentation or atrophic scars have been described for treating superficial and deep vessels. We propose a new laser range to treat Melasma. *Methods:* this is an observational study with 20 patients, Fitzpatrick type IV diagnosed with mixed type facial melasma that were treated with one to two sessions of a Sub Pulsed 532 nm Laser with an interval of 11 to 30 days. Dermoscopy was performed in the patients before the laser to show the presence of multiple vessels and pigmentation in the patients, before and after pictures were taken with Quantificare Lifeviz to show the results after the laser without any other topical or oral treatment. *Results:* in this series of cases the Modified MASI Score describes an average of 90.9% improvement in Melasma severity after the laser sessions. The pictures taken with Quantificare Lifeviz to assess the vascular, pigmentary and basal pictures show significant improvement. No PIH (Post inflammatory Hyperpigmentation) or major adverse reaction was described in this study.

Key words: melasma, dermoscopy, Sub Pulsed laser, 532 nm, hyperpigmentation

Introduction

Melasma is a common, acquired, symmetrical hypermelanosis that presents as light to dark brown macules on the face, usually over the forehead and malar areas, that negatively impact patient's quality of life[1]. Melasma was earlier classified according to the localization of melanosomes as epidermal, dermal, and mixed. However, *in vivo* reflectance confocal microscopy has revealed that the distribution of melanophages can be heterogeneous, suggesting that melasma is "mixed", with the dermis often showing solar elastosis and increased vascularity as well. Thus, melasma is now thought to be due to a complex interaction between epidermal melanocytes, keratinocytes, dermal fibroblasts, and vascular endothelial cells, with hormonal and genetic factors and exposure to UVR (Ultraviolet Radiation) contributing to the variability, dynamicity, and the unyielding nature of this process[1].

Women with Fitzpatrick skin types III–V living in areas with increased ultraviolet (UV) light are frequently affected[1]. Melasma affects up to 30% of the population in certain regions such as Southeast Asia or Latin America[2]. The pathogenesis of melasma is complex, with many factors influencing the condition, including inflammation, reactive oxygen species, ultraviolet radiation, genetic factors, and hormones[3]. Additionally, abnormal vascular proliferation and activation of endothelial cells may play an important role[4].

Many treatments have emerged for melasma, and it is now recognized that effective treatment must target multiple factors for multiple cells like melanocytes,

endothelial cells, senescent fibroblasts, keratinocytes, mast cells, and sebocytes. Additionally, the importance of addressing the strong vascular component of Melasma has gained recognition because there is an increased synthesis of proangiogenic factors such as the vascular endothelial growth factor (VEGF) which leads to the proliferation of the dermal vessels[1].

Treatment targets have included hyperactive melanocytes, melanosomal transfer to keratinocytes, a defective skin barrier, and mast cells. Recently, the vascular component has been discovered to play a significant role in this pigmentation disorder, making it one of the most important targets for treatment. Therefore, targeting the vascular component may lead to better long-term outcomes. Specifically, using laser treatment to target the vessels in melasma is both important and viable.

The efficacies and side effects of a wide variety of different laser therapies have been examined in numerous clinical trials up to this point. Intense pulsed light (IPL), Q-switched lasers, picosecond lasers[9], non-ablative fractionated resurfacing lasers and ablative fractionated resurfacing lasers are the five main types of lasers and light therapy[5-8-15]. They are proven to be very effective, but downtime is often long, and people cannot immediately return to their everyday life. Relapses after treatment are frequent and investigators are still seeking solutions that may give us the final answer for a successful treatment for this disfiguring skin pigmentation condition.

In this series of cases, we show that treating the vascular and pigmentation component with a 532 nm Sub pulsed Laser in Latin American skin can demonstrate significant clearance from the first session.

Materials and Methods

In this observational study we enrolled 20 female patients diagnosed (Figure 1) with mixed type facial melasma; all patients presented Fitzpatrick phototype IV and all subjects gave their informed consent before the study began.

A Dermoscopy was performed with Dermlite 5, (Dermlite, USA) before treatment to observe the presence of multiple vessels and pigmentation. To help us determine the Diagnosis of Melasma, pictures of the compromised area were taken for each patient.

A modified MASI score was used to determine the severity of Melasma and to compare the before and after Modified MASI punctuation 11 to 30 days after the laser treatment was performed.

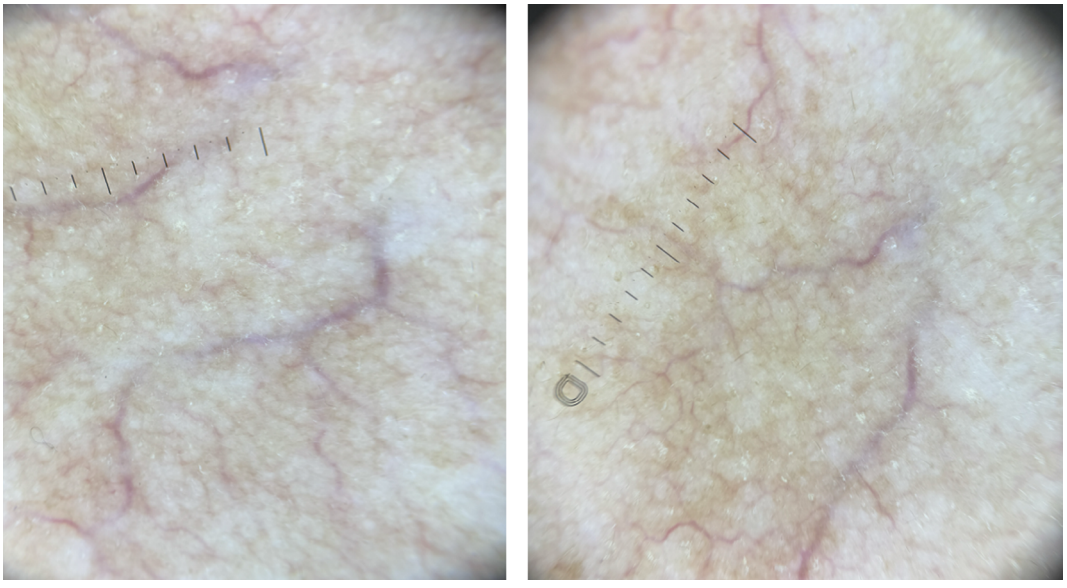

Figure 1. Dermoscopy before treatment shows multiple vessels and strong pigmentation compatible with the Diagnosis of Melasma with Vascular Component.

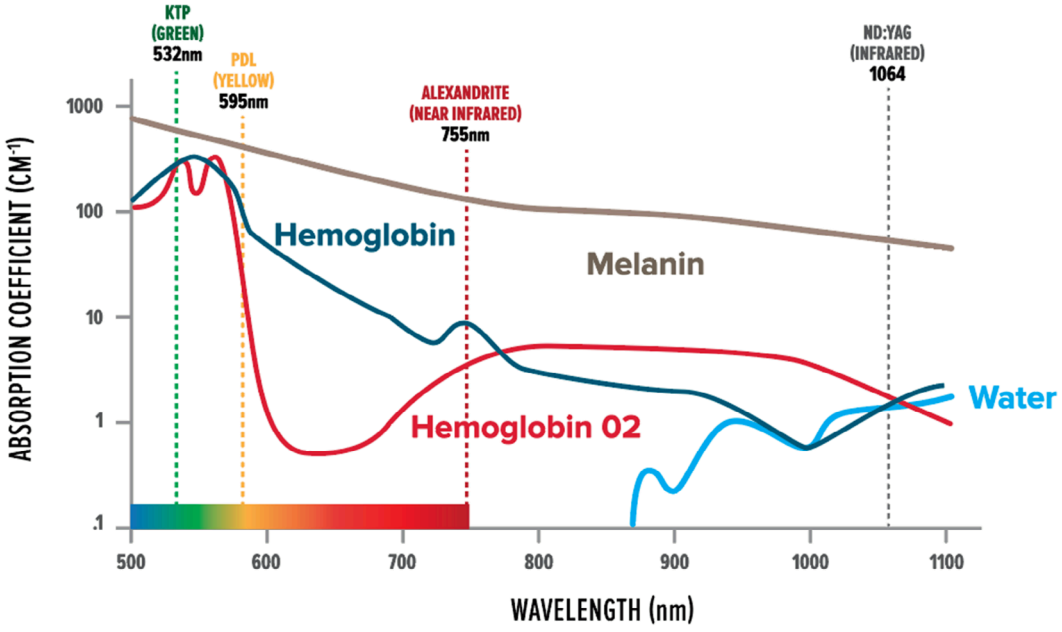

Figure 2. 532 Sub Pulsed shows a high absorption coefficient for Hemoglobin and Melanin.

The Quantificare imaging system LifeViz 3D (QuantifiCare S.A, France) was used to assess the vascular, pigmentary and basal pictures (before and after treatment).

Laser session intervals ranged from 11 to 30 days.

Laser device

Derma V by Lutronic emits a 532 nm Sub Pulsed Laser with 0.3ms of pulse duration of sub-pulse or 1.5ms of pulse duration of sub-pulse, that absorbs hemoglobin and melanin in the same shot (Figure 2), a cooling system is applied at the same time of the shot to diminish pain and to reduce superficial target overheating. The endpoint during the shot was to whiten the vessels and darken the spots.

Laser treatment protocol

The patient's face was cleansed with a non-detergent facial cleanser prior to treatment. The treatment endpoint was the whitening of the vessels and darkening of the spots. Overlapping was avoided during the procedure. The following parameters were used for the Derma V: Mode Sub Micro, Spot size 8 mm (sub-pulse structure with a 0.3 ms pulse duration for each sub-pulse), 7 ms, 6.5 fluence, single pulse. The cooling system was programmed to 5–5–10 for one pass, followed by another pass in Sub Mili Mode, Spot size 8 mm (sub-pulse structure with a 1.5 ms pulse duration for each sub-pulse), 7 ms, 6.5 fluence, single pulse, and the cooling system was programmed to 5–5–10 as well. The treatment consisted of two sessions with an interval of 11 to 30 days, as this wavelength absorbs both hemoglobin and melanin, two key components in melasma. The treatment was performed by passing the handpiece over the targeted areas, avoiding overlapping. Immediately after the treatment, a cold water compress was applied.

Inmediate post treatment care

A hydrating, soothing and calming serum (Oxygenceuticals Rouse Fluid) was applied daily to the treated area to help rebuild the skin barrier, maintain an optimum moisturization level and diminish inflammation. 20 mg of oral Prednisone was prescribed for 2 days after the laser treatment to reduce edema and inflammation.

Long term post treatment

When treating melasma, topical and oral treatments are mandatory to avoid relapses[10,11-14]. However, it is important to mention that the pictures were taken after the laser procedure results without any topical nor oral treatment to not interfere with the results.

A long term topical treatment was only indicated to the patient once they had completed the 532 nm Sub Pulsed laser sessions (1 or 2 sessions depending on each patient's skin condition) so that the actual results are exclusively visible after laser sessions without any other treatment. Long Term Topical Treatment after laser application included a day cream (Meline Ethnic Skin Day) with the following components: Piruvic Acid 10%, tranexamic acid 3%, salicylic acid 2%, phytic acid 10%, Gluthatione 5%, and a night cream (Meline Ethnic Skin Night) with the following components: mandelic acid 10%, ascorbic acid 5%, arbutin 4%, melanostatina-5 5%, niacinamide 5%, magnesium sulphate 3%, tocopheril acetate 3%, cysteamine 0.5%, retinal 0.1%. It is important to mention that we didn't use hydroquinone or topical steroids in this protocol. Sunscreen protection with a SPF 50 with UVB, UVA and HEVL (High energy visible light) protection was mandatory every 4 hours.

Oral treatment following laser therapy included probiotics containing Lactobacillus and Bifidobacterium (Daeha), with 1 pill taken before breakfast, and antioxidants such as L-Glutathione 250 mg, Dry Polypodium Leucotomos 120 mg, Ascorbic Acid 40 mg, D-Alpha Tocopheryl Acetate 16 mg, and Niacinamide 8 mg (Depigma Glocal Cure), with 1 pill taken after breakfast.

Results

The mean age of the patients in this study was 42.55 years. After evaluating the mean Modified Masi Score of this observational study we can conclude that it reduced notably from 10.03 before treatment to 0.91 after treatment, indicating a significant reduction in melasma severity, and an average improvement of 90.9%. None of the patients had an increase in their MASI Score, suggesting that the treatment was effective in preventing the worsening of Melasma and reducing melasma severity. Nevertheless, these conclusions are based on a small sample size with a specific skin type (Fitzpatrick type IV) and might not be generalized to a larger population (Table 1 and Figure 3).

No side effects were noted during or right after any treatment. Erythema, edema and peeling of the skin were described 2 days after the laser procedure. Neither Post Inflammatory hyperpigmentation (PIH) nor Atrophic scars were noted on any of our patients. All patients described melasma clearance and skin improvement after the last treatment with Derma V. In general, there was a noticeable improvement in the pigmentary and vascular components, and all the patients were highly satisfied with the results.

An important clearance of the pigmentary and vascular component was visible in the pictures as well as the measurement of the redness and pigmentary component made with quantificare showing promising results (Figures 4 and 5).

Discussion

Melasma is a complex disease where the interaction of cellular and matrix components with hormonal and environmental factors are involved[2,3]. Several trials were conducted on the use of lasers for melasma, specially the ND-YAG 1064nm Q – switched, yet a lack of clear consensus seems to persist[3]. 532 nm Sub Pulsed Laser (DermaV, Lutronic Inc. South Korea) was approved in the year 2020 for the Food and Drug Administration of the United States (FDA) for the treatment of melasma[4-13].

The effectiveness and safety profile of KTP lasers have been demonstrated in treating superficial vascular conditions such as Port Wine Stain, Facial Telangiectasia, and erythematous Rosacea[5]. The cooling system attached to the 532 nm Sub-Pulsed Laser helps reduce inflammation and promotes better recovery outcomes after sessions[4,5]. ND-YAG and Diode 532 nm lasers are also modern devices used in the treatment of melasma, as they target superficial melanin rather than hemoglobin[6]. Recent studies have also shown that 590 nm light inhibits microvascular endothelial cell migration and the expression of vascular endothelial growth factor (VEGF)[7].

Table 1. Masi Score before and after treatment.

Patient	Age	MASI Score Before treatment	Dermoscopy with Visible Vessels	MASI Score After treatment	Δ MASI Score
1	38	13.2	Yes	1.1	12.1
2	44	10.2	Yes	1.2	9
3	43	13.2	No	0.6	12.6
4	37	9.6	Yes	0.9	8.7
5	43	8	No	0.6	7.4
6	42	11.2	Yes	0.9	10.3
7	36	8	Yes	0.3	7.7
8	45	12.3	Yes	1.3	11
9	52	9	Yes	0.6	8.4
10	49	10.3	No	0.9	9.4
11	39	11	Yes	0.3	10.7
12	42	8	No	0.6	7.4
13	40	10.2	Yes	0.6	9.6
14	40	8	Yes	0.3	7.7
15	37	6.6	No	0.1	6.5
16	27	8.3	Yes	0.9	7.4
17	67	6.6	Yes	0.1	6.5
18	44	11	No	0.9	10.1
19	38	9	Yes	0.6	8.4
20	43	8	Yes	0.3	7.7

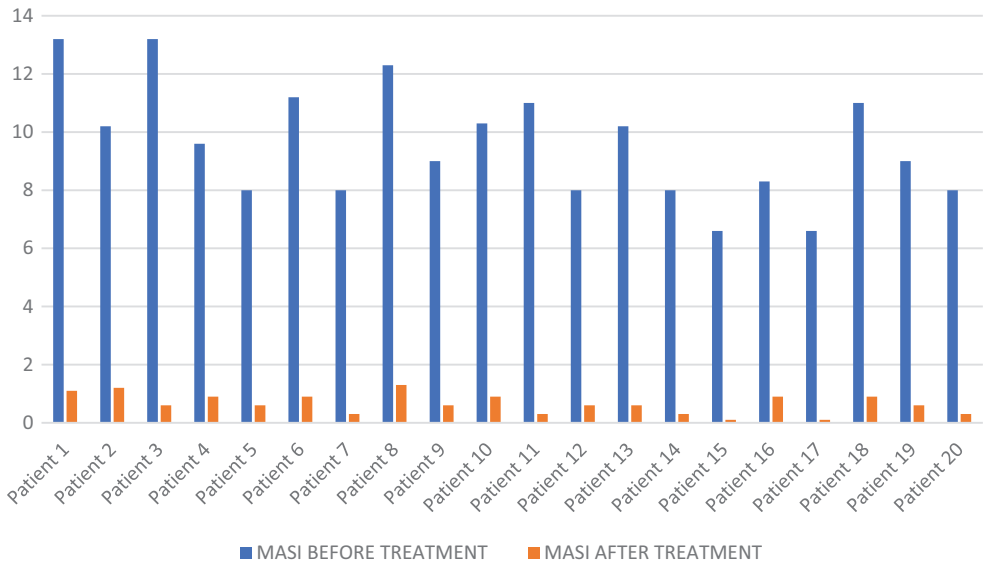

Figure 3. Comparison of Modified Masi Score after 532 nm Ultra Pulsed Laser.

Figure 4. 38 year old patient, before and after pictures show an important clearance of Melasma after 2 laser sessions. Redness and pigmentary component show major improvement.

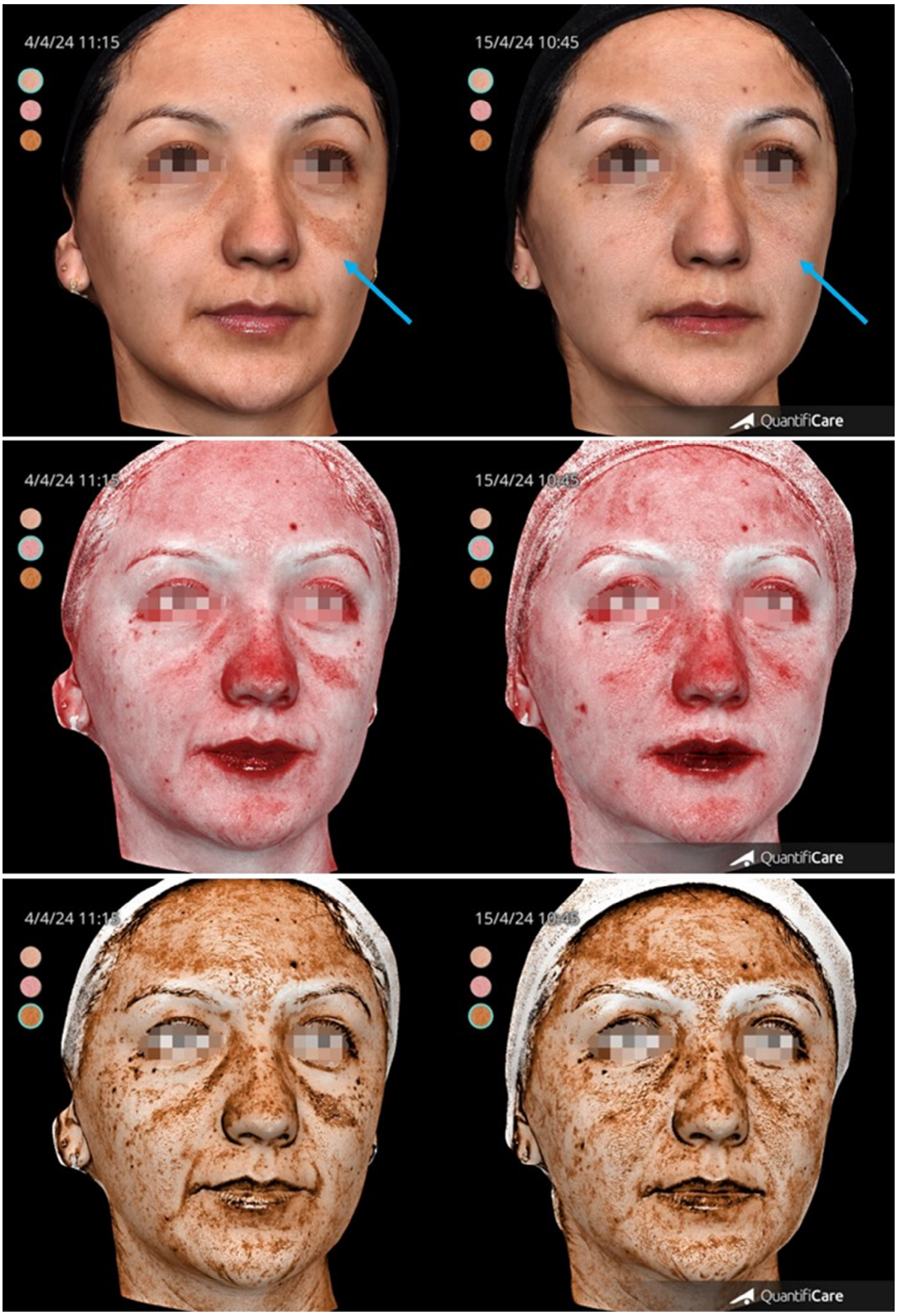

Figure 5. 37 years old patient, before and after treatment pictures show an impressive Clearance on the melasma compromised areas after 1 laser session. Redness and Pigmentary components are diminished in the before and after pictures.

Melasma has become a popular condition for laser treatments, and nowadays, laser therapies for melasma focus not only on the pigmentary component but also on the vascular component. However, applying a vascular laser to a patient diagnosed with melasma can be challenging, as major side effects, such as transient post-inflammatory hyperpigmentation[12] (PIH) or atrophic scars, have been described, particularly when treating both superficial and deep vessels with Long-Pulsed ND-YAG 1064 nm lasers. Therefore, when targeting the vessels, it is crucial to find a laser wavelength that effectively targets the vessels while minimizing these undesirable side effects. This remains one of the most difficult tasks in managing melasma, as we are dealing with hyperexcited melanocytes.

Our Series of cases showed that laser treatments in the range of Sub Pulsed 532 nm target the superficial and deep vascular component in patients diagnosed with Melasma, meaning that its clearance seems to be faster and safer since no case of PIH or atrophic scar was detected after our protocol was applied.

We communicate this series of cases as evidence that a multidisciplinary treatment that includes targeting the vascular component of Melasma with a safer device like a Sub Pulsed 532 nm of Melasma may be the future solution for better and safer outcomes in the treatment of Melasma.

Conclusion

Latin-American skin with Fitzpatrick phototypes IV can be treated with the protocol of the 532 nm Sub pulsed laser to achieve a promising result.

Applying this type of laser (Sub-Pulsed 532 nm) targets both hemoglobin and melanin chromophores, while also stimulating collagen by treating senescent fibroblasts, which play a role in melasma. The vascular component of melasma has been shown to diminish after the first laser treatment, leading to a significant reduction in pigmentation, as observed in the Quantificare Lifeviz images.

The MASI score showed an important decrease after the laser treatment in all our patients.

We must underline that once our patients finished their laser treatments, Oral and Topical treatments are mandatory for long term results, and to avoid relapses. Seeing as these treatments are targeting inflammation, reactive oxygen species and ultraviolet radiation, they were indicated to the patients after the laser sessions were finished for a period of 12 months as to not interfere in the laser study results. The pictures shown in this study only correspond to before and after the laser treatment was performed without any other added treatment (neither topical nor oral treatment).

While this observational study suggests promising results for the use of 532 nm Sub-Pulsed lasers in treating melasma, its small sample size of 20 patients limits the generalizability of the findings. The study's limited focus on only Fitzpatrick Type IV skin and the short follow-up period also restrict the ability to draw conclusions about long-term efficacy. Larger, randomized controlled trials with more diverse skin types and longer follow-up periods are needed to fully understand the safety and effectiveness of 532 nm Sub-Pulsed laser therapy for melasma.

Declaration of Patient Consent: The authors certify that they have obtained all appropriate patient consent forms.

References

1. Ogbechie-Godec OA, Elbuluk N. Melasma: an Up-to-Date Comprehensive Review. Dermatol Ther (Heidelb). 2017; (3):305-318.
2. Nisticò SP, Cannarozzo G, Provenzano E, et al. Nanosecond Q-Switched 1064/532 nm Laser to Treat Hyperpigmentations: A Double Center Retrospective Study. Clin Pract. 2021; 11(4):708-714.
3. Sarkar R, Bansal A, Ailawadi P. Future therapies in melasma: What lies ahead? Indian J Dermatol Venereol Leprol. 2020; 86(1):8-17.
4. Aurangabadkar SJ. Optimizing Q-switched lasers for melasma and acquired dermal melanoses. Indian J Dermatol Venereol Leprol. 2019; 85(1):10-17.
5. Wang JV, Bajaj S, Murgia R, et al. Safety and Efficacy of a Novel, Variable-Sequenced, Long-Pulsed, 532-nm and 1,064-nm Laser With Cryogen Spray Cooling for Pigmented and Vascular Lesions. Dermatol Surg. 2023; 49(7):689-692.
6. Becher GL, Cameron H, Moseley H. Treatment of superficial vascular lesions with the KTP 532-nm laser: experience with 647 patients. Lasers Med Sci. 2014; 29(1):267-71.
7. Dai X, Jin S, Xuan Y, et al. 590 nm LED Irradiation Improved Erythema through Inhibiting Angiogenesis of Human

Microvascular Endothelial Cells and Ameliorated Pigmentation in Melasma. Cells. 2022; 11(24):3949.
8. Lee YS, Lee YJ, Lee JM, Han TY, Lee JH, Choi JE. The Low-Fluence Q-Switched Nd:YAG Laser Treatment for Melasma: A Systematic Review. Medicina (Kaunas). 2022; 58(7):936.
9. Pimentel B, Palmeiro A, Castro C, Silva L, Catorze MG, João AL. Use of Picosecond Laser for Melasma Treatment: A Narrative Review. Photobiomodul Photomed Laser Surg. 2023; 41(12):674-682.
10. Kwon SH, Na JI, Choi JY, Park KC. Melasma: Updates and perspectives. Exp Dermatol. 2019; 28(6):704-708.
11. Mahajan VK, Patil A, Blicharz L, et al. Medical therapies for melasma. J Cosmet Dermatol. 2022; 21(9):3707-3728.
12. Sofen B, Prado G, Emer J. Melasma and Post Inflammatory Hyperpigmentation: Management Update and Expert Opinion. Skin Therapy Lett. 2016; 21(1):1-7.
13. Li JY, Geddes ER, Robinson DM, Friedman PM. A review of melasma treatment focusing on laser and light devices. Semin Cutan Med Surg. 2016; 35(4):223-232.
14. Searle T, Al-Niaimi F, Ali FR. The top 10 cosmeceuticals for facial hyperpigmentation. Dermatol Ther. 2020; 33(6):e14095.
15. Chen J, Yu N, Peng L, et al. Efficacy of low-fluence 1064 nm Q-switched Nd: YAG laser for the treatment of melasma: A meta-analysis and systematic review. J Cosmet Dermatol. 2022; 21(7).

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