International Journal of Clinical Dermatology
2024, Vol. 7, No. 2, pp. 41-47
https://doi.org/10.11648/j.ijcd.20240702.12

Research 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. Many laser treatments have been described without any consensus, however, targeting the vascular component has been gaining popularity daily but the adverse reactions such as transient post inflammatory hyperpigmentation or atrophic scars have been described for treating the superficial and deep vessels. We propose a new laser range in order to treat Melasma. *Methods*: This is an observational study with 20 patients, Fitzpatrick type IV diagnosed with 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 in order 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. This Study was reviewed and approved by the Ethics and Investigation Committee of Dermalaser KPW in Lima, Peru, adhering to the highest ethical standards and following the principles Outlined in the Helsinsky Declaration. Informed Consent was obtained from all participants, who also provided written authorization for the publication of the study results and accompanying images. *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 in order to asses the vascular, pigmentary and basal pictures show significant improvement. No PIH (Post inflammatory Hyperpigmentation) or major adverse reaction were described in this study.

Keywords

Melasma, Laser, Hyperpigmentation, Latin American Patients, Dermoscopy

1. 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 all 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

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Received: 9 August 2024; **Accepted:** 27 September 2024; **Published:** 29 October 2024

endothelial cells, with hormonal and genetic factors and exposure to UVR (Ultraviolet Radiation) contributing to the variability, dynamicity, and the underlying nature of this process [1].

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

Many treatments have emerged to treat melasma, nowadays we acknowledge that melasma treatment must target multiple factors for multiple cells like melanocytes, endothelial cells, senescent fibroblasts, keratinocytes, mast cells, sebocytes but also the importance of treating the strong vascular component in Melasma has gained popularity because there is an increased synthesis of proangiogenic factors such as vascular endothelial growth factor (VEGF) and that results in the proliferation of the dermal vessels. [1]

Targets of the treatments have included hyperactive melanocytes, melanosomal transfer to keratinocytes, defective skin barrier, mast cells. [1] and the vascular component has been recently discovered to play an important role on this pigmentation disorder, one of the most important targets of this skin condition. Therefore, targeting the vascular component may give us a better outcome during the time, specifically for this reason using a laser treatment for the vessels in melasma is very 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 get back to everyday life. Relapses after treatment are frequent and investigators are still seeking for solutions that may give us the final answer for a successful treatment in 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.

2. Materials and Methods

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

Dermoscopy was performed with Dermlite 5 before the treatment in order to observe the presence of multiple vessels and pigmentation to help us determine the Diagnosis of Melasma, pictures were taken on each patient in the melasma compromised area.

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

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

The interval of the laser sessions were ranging from 11 to 30 days.

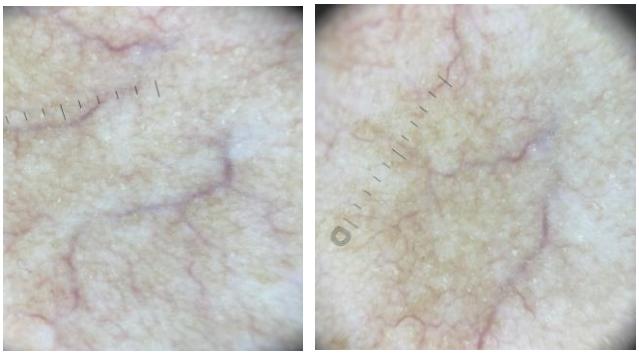

Figure 1. *Dermoscopy before treatment shows multiple vessels and strong pigmentation compatible with the Diagnosis of Melasma with Vascular Component.*

2.1. 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. The endpoint during the shot was whitening of the vessels and darkening of the spots.

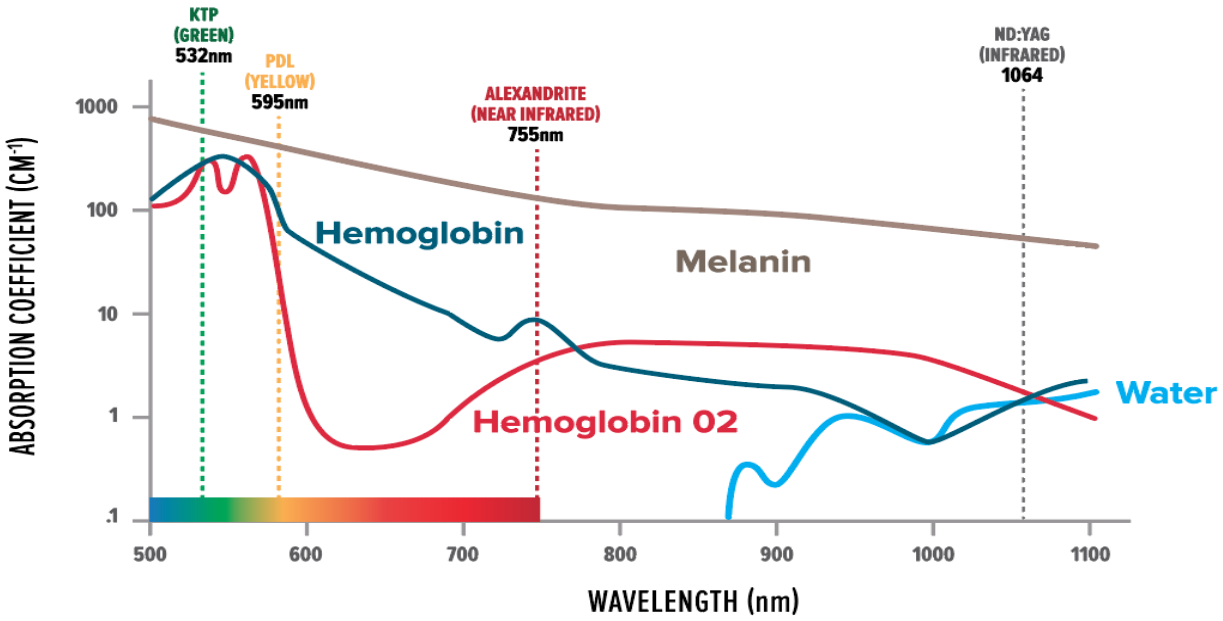

Figure 2. *532 Sub Pulsed shows a high absorption coefficient for Hemoglobin and Melanin.*

2.2. Laser Treatment Protocol

The patient's face was cleaned with a non-detergent facial cleanser prior to treatment. The endpoint during the treatment was whitening of the vessels and darkening of the spots. Overlapping was avoided during the treatment. The following parameters were used for Derma V: Mode Sub Micro (Sub-pulse structure that consists with 0.3ms of pulse duration of each Sub-pulse), 7ms, 6,5 Fluence, single pulse, and the cooling system was programmed with 5 – 5 -10 one pass and another pass with Sub Mili Mode (Sub pulse structure consist with 1.5ms of pulse duration of each of Sub-pulses) 7ms, 6,5 Fluence, single pulse, and the cooling system was programmed with 5–5-10 as well. Treatment applied consisted in two sessions with a 11-to-30-day interval because this wavelength absorbs hemoglobin and melanin at the same time which are two important components in Melasma. Treatment was carried out by passing the handpiece over the interested areas avoiding overlapping. Right after the treatment, cold water cloth was applied.

2.3. Inmediate Post Treatment Care

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

2.4. Long Term Post Treatment

When treating melasma, topical and oral treatment 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 so that we don't interfere with the results.

Long term topical treatment was only indicated to the patient once the patient had completed the 532 nm Sub Pulsed laser sessions (1 or 2 sessions depending on each patient skin condition) so that actual results are exclusively 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 describe that we didn't use hydroquinone or 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 after laser treatment was finished included probiotics containing lactobacillus and Bifidobacterium Daeha), 1 pill before breakfast, and antioxidants L - Gluthatione 250 mg, Dry Polipodium Leucotomos 120 mg, ascorbic acid 40 mg, D – Alpha tocopheryl Acetate 16 mg, niacinamide 8 mg, (Depigma Glocal Cure) 1 pill after breakfast.

3. 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 there has been a sig-

nificant reduction in Modified Masi Score, the mean Masi Score decreased from 10.03 before treatment to 0.91 after treatment, indicating a significant reduction in melasma severity, this represents an average improvement of 90.9 % in melasma severity. Most patients showed substantial changes in melasma, 19 out of 20 patients (95 %) had a reduction in MASI scores, indicating that most patients experienced substantial improvement in melasma severity. None of the patients had an increase in MASI Scores, suggesting that the treatment was effective in preventing worsening of Melasma. The significant reduction in MASI scores suggests that the treatment was highly effective in 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.

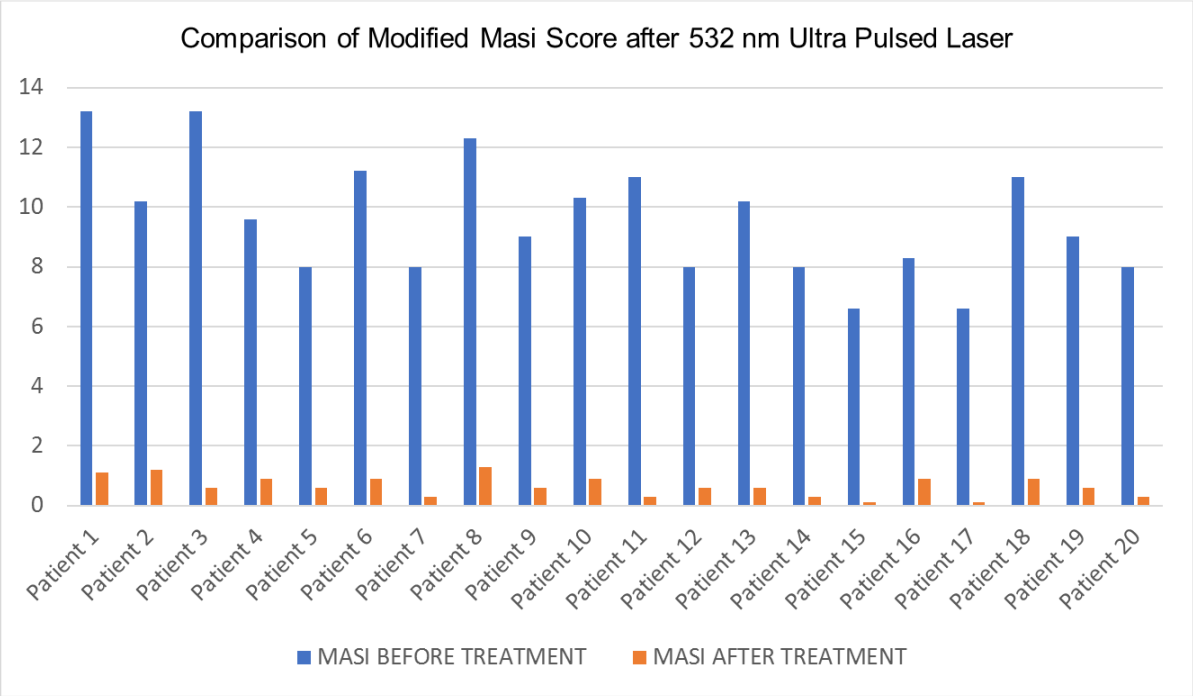

Figure 3. *Graphic of the Results of Modified Masi Score before and after treatment.*

Table 1. *Modified 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

Patient	Age	MASI Score Before treatment	Dermoscopy with Visible Vessels	MASI Score After treatment	Δ MASI Score
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

Erythema, edema and peeling of the skin were described 2 days after the laser procedure. Post Inflammatory hyperpigmentation (PIH) nor Atrophic scars weren't described in 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.

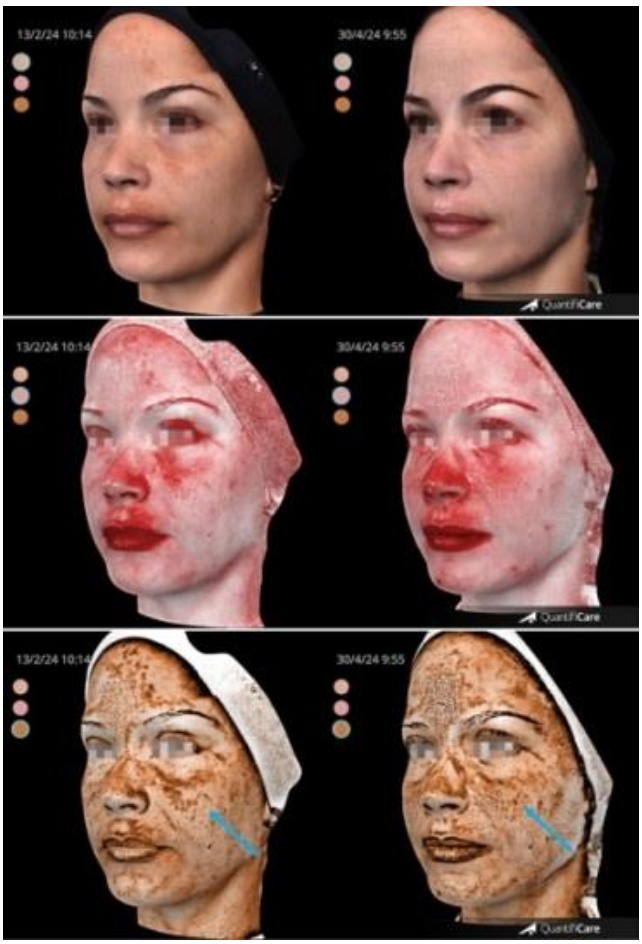

Figure 4. *Patient with 38 years old, before and after pictures show an important clearance of Melasma after 2 laser sessions. Redness and pigmentary component show major improvement.*

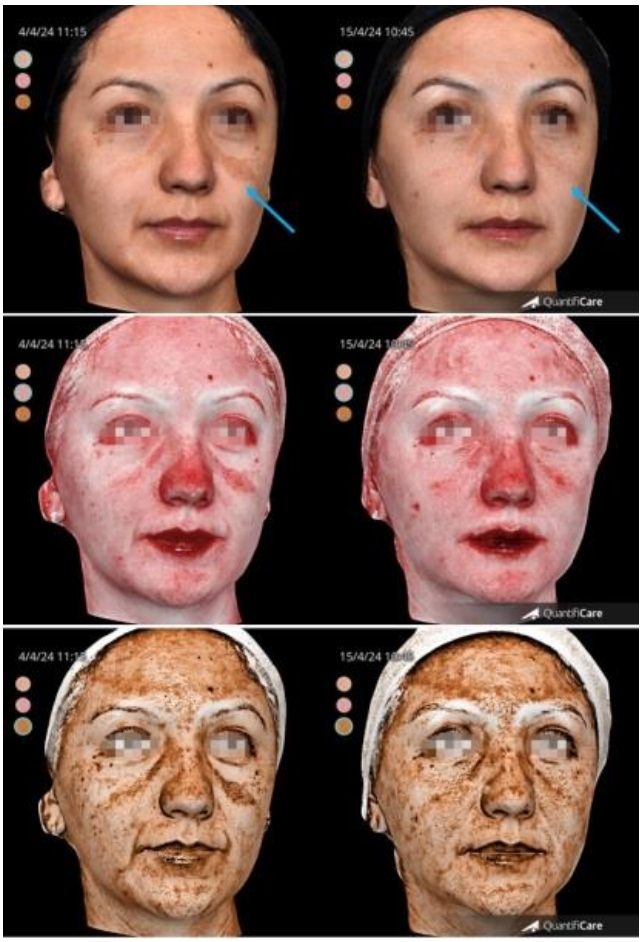

Figure 5. *Patient with the 37 years old, before and after treatment pictures show an impressive Clearance on the melasma compromised areas after 1 laser session. Redness and Pigmentary components are diminished in the before and after pictures.*

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 Lifeviz Quantificare showing promising results.

4. Discussion

Melasma is a complex disease where interaction of cellular and matrix components with hormonal and environmental factors are involved. [2, 3] There are conducted several trials on the use of lasers for melasma, specially the ND-YAG 1064nm Q – switched, but no clear consensus are still available. [3] 532 nm Sub Pulsed Laser (DermaV, Lutronic Inc. South Korea) was approved in year 2020 for the Food and Drug Administration of the United States (FDA) for the treatment of melasma. [4, 13] Effectiveness and safety profile of KTP lasers had been demonstrated in vascular superficial conditions like Port Wine Stain, Facial Telangiectasia and erythematous Rosacea [5] The cooling system attached in the 532 nm Sub Pulsed Laser can reduce inflammation and better recovery outcomes after the sessions [4, 5] ND-YAG and Diode 532 nm lasers are also modern equipment used in the treatment of melasma as they focus on superficial melanin rather than hemoglobin [6] Recent studies have also showed that 590 nm light inhibits microvascular endothelial cell migration and expression of vascular – endothelial growth factor (VEGF). [7]

Melasma has gained popularity in laser treatments and nowadays laser treatments for melasma are not only focused in the pigmentary component but also in the vascular component, however applying a vascular laser in a patient diagnosed with Melasma is a difficult task since there are major side effects described like transient post inflammatory hyperpigmentation. [12] (PIH) or atrophic scars when treating the superficial and deep vessels, especially with Long Pulsed ND-YAG 1064nm, therefore when targeting the vessels we must find a laser range that can target the vessels effectively but avoiding this undesirable side effects and this is one of the most difficult tasks specially when managing Melasma since we are dealing with Hyperexcited melanocytes.

Our Series of cases showed that laser treatment in the range of Sub Pulsed 532 nm targets the superficial and deep vascular component in patients diagnosed with Melasma, therefore Melasma clearance seems to be faster and safer since we didn't observe any case of PIH or atrophic scar after our protocol was applied.

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

5. Conclusion

The Latin-American skin with Fitzpatrick phototypes IV can be treated with the protocol of the 532 nm Sub pulsed laser to achieve promising result. Applying this type of laser (Sub Pulsed 532 nm) targets hemoglobin and melanin chromophores and we also achieve to stimulate collagen treating the senescent fibroblasts that also play a role in Melasma.

Vascular component of melasma has shown to be diminished after the first laser treatment and therefore the pigmentation shows major reduction as seen on the Quantificare Lifeviz pictures.

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

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

While this Observational study suggests promising results with the use of 532 Sub Pulsed Lasers in treating Melasma, we must consider this is a small sample size of 20 patients which limits the generalizability of the findings.

The study's limited skin type (Only Fitzpatrick Type IV) and 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 Sub Pulsed laser therapy for melasma.

Abbreviations

PIH	Post Inflammatory Pigmentation
VEGF	Vascular Endothelial Growth Factor
UVR	Ultraviolet Radiation

Declaration of Patient Consent

An Inform consent was obtained from all the participants in this Observational Study.

Author Contributions

Kateryn Michelle Perez Willis is the sole author. The author read and approved the final manuscript.

Conflicts of Interest

The author declares no conflict of interest.

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