
Transdermal Laser Treatment of Facial Telangiectasia - Comparison of the 532 nm KTP to the 940 nm Diode Wavelength

Asad Shamma, Faud Ramadan & Kimberly Vonderlieth

Authors:

Asad R. Shamma, MD

Faud M. Ramadan, MD

Kimberly Vonderlieth, PA-C

*Artery and Vein Institute
Melbourne, Florida*

OBJECTIVE: To compare the response of facial telangiectasia to treatment with 532 nm and 940 nm wavelengths as a function of vessel size.

MATERIALS AND METHODS: In a prospective, randomized, masked clinical study, seventeen patients presenting with bilateral facial telangiectasia received 532 nm and 940 nm treatments on opposite sides of the face. High resolution photography was used to identify and follow specific vessel response.

RESULTS: Vessels of all sizes were successfully treated with both wavelengths. Vessels smaller in diameter than 200 microns were more responsive to 532 nm treatment, vessels larger than 350 microns were more responsive to 940 nm treatment, and vessel between 200 and 350 microns

responded equally to both wavelengths. Average vessel clearance was better for 4 patients on the 940 nm treatment side, better for 3 patients on the 532 nm side, and equal for 10 patients. Higher treatment energy densities (15x) were required for 940 nm treatment than for 532 nm treatment, and correspondingly more discomfort was reported. Treatment with both wavelengths was well tolerated.

CONCLUSION: Effective treatment of facial telangiectasia was achieved with both the 532 nm and 940 nm wavelengths. Larger vessels were more responsive to 940 nm and smaller vessels were more responsive to 532 nm. The wavelengths are complementary and additive in optimizing treatment for the variety of vessels sizes presenting with facial telangiectasia.

Introduction

Lasers emitting wavelengths with high oxyhemoglobin absorption (532 nm, 585 nm and 595 nm) have been a treatment standard for facial vascular lesions (Figure 1). These wavelengths achieve predictable high-efficacy outcome with relatively low treatment fluence. Longer wavelength devices, with

substantially lower oxyhemoglobin absorption, have found success in the treatment of larger and deeper vessels in the legs. It has been suggested that the lower absorption of these longer wavelengths allows deeper penetration, making these vessels accessible and allowing more uniform heating through these larger vessels. High treatment energy densities are used to compensate for the lower absorption.

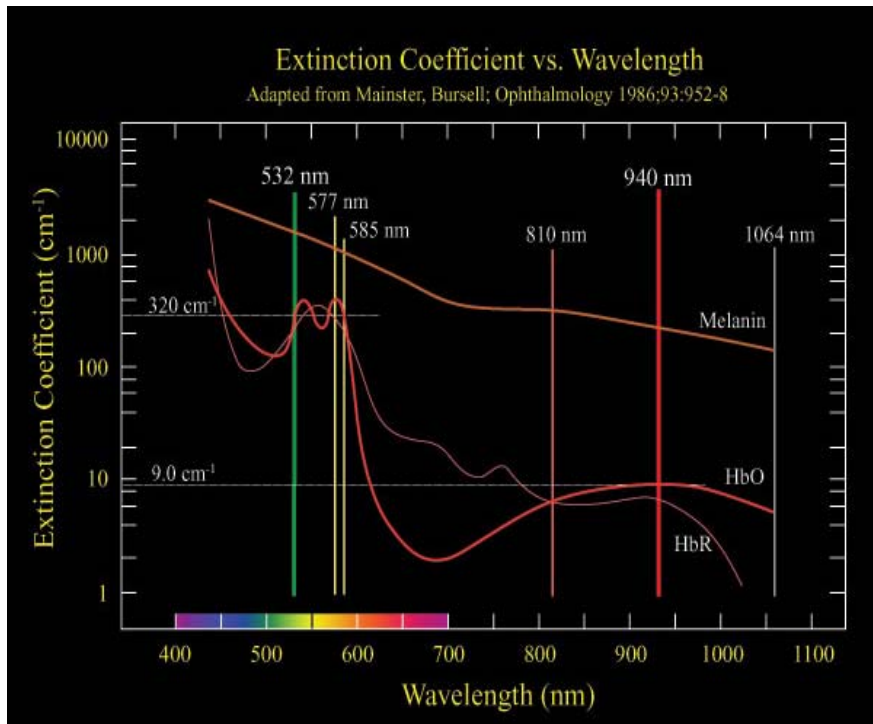


Figure 1. Oxyhemoglobin, de-oxyhemoglobin and melanin extinction coefficients as a function of wavelength.²

Objective

A new dual wavelength laser allowing the selection of 532 nm and 940 nm output is now commercially available (VariLite™ by IRIDEX Corporation, Mountain View, CA, Figure 2). Both the 532 nm and 940 nm wavelengths are indicated for the treatment of vascular lesions. The objective of this study was to compare vessel response to treatment with both wavelengths as a function of vessel size.



Figure 2. The VariLite offers 532 nm and 940 nm wavelengths in one integrated unit. Handpieces are available to deliver treatment spot sizes of 0.7, 1.0, 1.4, 2.0 and 2.8 mm.

Methods

Seventeen patients (Fitzpatrick skin types I to III) presenting with bilateral facial telangiectasia were enrolled into this prospective, randomized, masked clinical study. Patients received 532 nm and 940 nm treatments on opposite sides of the face. The immediate and short-term response of facial telangiectasia was compared as a function of vessel size to treatment with both 532 nm and 940 nm laser light. The order of treatment and side treated with each wavelength were randomized. Patients were masked to the treatment wavelength and were asked by detailed questionnaire to document, by side of the face, their treatment impressions, healing sequence, degree of improvement, and treatment preference. High-resolution cross-

polarization digital photographs were taken prior to, immediately after, and 1 month after treatment. Photographs were evaluated by the treatment provider and an observer masked to the wavelength. Individual vessels were categorized by size using a scale included in the photographs (Figure 3) and graded for response. All vessels were treated with a 0.7 mm spot. Treatments were to protocol. The fluence for each wavelength, once chosen for a patient, was not changed during treatment. Protocol dictated single pulse, no overlap, and single pass. Topical 4% lidocaine was used around the nose for both wavelengths.



Figure 3. High-resolution digital photographs included a scale showing lines of 125, 200, 350, 500, 700, and 1000 microns in size to allow measurement of the size of specific vessel.

Results

Vessels with diameters from 50 to 700 microns were treated. Treatment energy densities were 17-22 J/cm² for 532 nm and 290-390 J/cm² with 940 nm. Once chosen for a given patient, all vessels were treated with that energy density. Sixty percent of patients achieved better than 60% average improvement for both wavelengths (Table 1). The average improvement for both modalities was 3.6 on a 5-point scale.

Scale	1	2	3	4	5
Vessel Clearance	<20%	20-40%	40-60%	60-80%	>80%
532 nm	7%	13%	20%	33%	27%
940 nm	13%	7%	20%	27%	33%

Table 1: Average vessel clearance

Four patients had better self-assessed vessel clearance on the 940 nm treatment side, 3 patients had better self-assessed clearance on the 532 nm side, and 10 patients judged average vessel clearance on each side as equal (Table 2). Treatment discomfort was noticeably less on the 532 nm side, most likely due to the lower treatment energy density. Nine patients preferred 532 nm treatment, due to equal or better outcome with less discomfort. Two patients preferred 940 nm treatment, due to better clearance of prominent larger vessels. Six patients judged both wavelength treatments as equal.

	532 nm	Equal	940 nm
Better Vessel Clearance	3	10	4
Treatment Preference	9	6	2

Table 2: Self-assessed vessel response comparison and treatment modality preference

Vessels treated were categorized by size as small (less than 200 microns), medium (200 to 500 microns) and large (greater than 500 microns). Vessel response to treatment was graded on a 5 point scale as a function of size category (Table 3). Small diameter vessels responded strongly to 532 nm treatment (4.9) and less strongly to 940 nm treatment (2.9). The difference was most noticeable for vessels smaller than 125 microns where little or no response was achieved with 940 nm at the energy densities used. Medium diameter vessels responded strongly to 940 nm treatment (4.6), and

Vessel Size	532 nm	940 nm	Response Scale
Small	4.9	2.9	5 Instantaneous
<200 µm	(n 17)	(n 17)	4 Fast
Medium	3.8	4.6	3 Moderate
200 – 500 µm	(n 16)	(n 17)	2 Slow
Large	2.3	3.6	1 None
>500 µm	(n 3)	(n 5)	

Table 3: Vessel Response (n indicates the number of patients with vessels in the size category)

slightly less strongly to 532 nm treatment (3.8). The difference was most apparent for vessels from 350 to 500 microns diameter where 532 nm response fell. Vessels larger than 500 microns diameter responded well to 940 nm treatment (3.6), and less well to 532 nm treatment (2.3).

Undesired effects and complications were minor (Table 4). Mild postoperative swelling, which resolved in less than 30 hours, was reported by 4 patients on the 532 nm side and by 6 patients on the 940 nm side. Spot crusting, which resolved in 5 to 7 days, was reported by 8 patients on the 532 nm side and by 7 patients on the 940 nm treatment side. One patient developed localized blistering following 940 nm treatment and was treated with triple antibiotic ointment.

Adverse effect	532 nm	940 nm
Erythema (> 3 hours)	4	7
Swelling	4	6
Spot crusting	8	7
Blister and/or infection	0	1
Hyperpigmentation	0	0
Hypopigmentation	0	0
Scarring	0	0

Table 4: Incidence of observed adverse effects

Discussion

Good improvement in vessels with diameters ranging from 50 microns to 700 microns was achieved with both treatment wavelengths. Patients with predominately small vessels reported better self-assessed outcome from 532 nm treatment and patients with prominent larger vessels reported better self-assessed outcome from 940 nm treatment. These self-assessed results correlated well with physician assessment of immediate vessel response and one month follow-up analysis.

Strict adherence to the study protocol established that treatment was limited to a single pass with no overlap. The objective was accentuation of characteristic differences between wavelength/vessel interactions. The fluence for each wavelength was chosen to optimally treat the average size vessel on each side, and was not adjusted to improve clearance of larger or smaller vessels. It was noted that a higher fluence with 532 nm may have improved the response of larger vessels, and a higher fluence with 940 nm may have improved the response of smaller vessels. Counterintuitively, more energy density is required to treat smaller diameter vessels with 940 nm than is required to treat larger diameter vessels. Large vessels have more oxyhemoglobin to absorb energy and retain heat longer, while small vessels are largely transparent to the 940 nm wavelength (Figure 4).

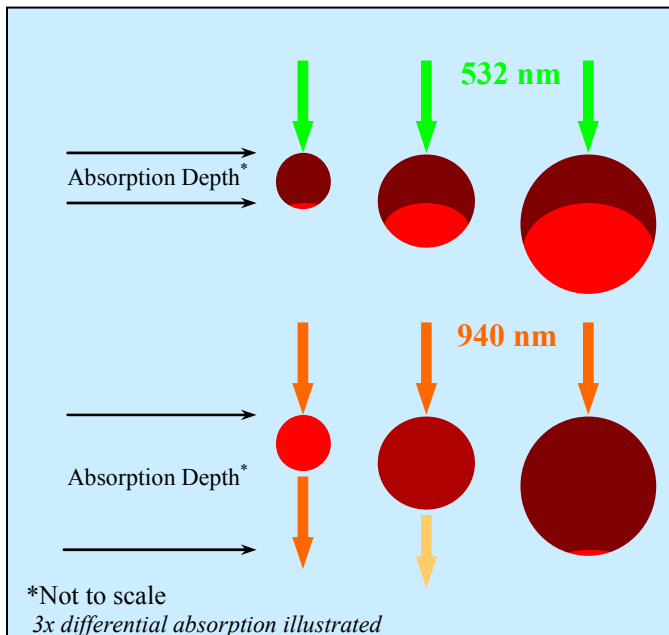


Figure 4. The effect of absorption depth and vessel size on vessel heating

In contrast, higher energy density is required to treat larger diameter vessels than smaller vessels with 532 nm. For large vessels, the high absorption can result in preferential heating of a crescent on the leading side of the vessel and the need for energy to then conduct through the vessel.

The results of this preliminary study indicate that the characteristic differences of wavelength/oxy-hemoglobin interaction can be exploited to optimally treat vessels of different sizes. The convenience of changing wavelength during treatment based upon specific vessel size and immediate vessel response is a new and important concept in the treatment of facial vascular lesions.

Study Conclusions

Both the 532 nm and 940 nm wavelengths are effective in the treatment of facial telangiectasia. The wavelengths are complementary and additive in optimizing treatment for the variety of vessels sizes typically presenting. In this study, vessels smaller than 200 microns in diameter responded better to 532 nm treatment, vessel larger than 350 microns responded better to 940 nm, and vessels between 200 microns and 350 microns responded equally to both wavelengths. Given equal outcome, patients generally preferred 532 nm treatment due to improved treatment comfort. The treatments are both safe and effective.

References

1. Shamma AR, Ramadan FM, Vonderlieth K: Transdermal Laser Treatment of Facial Telangiectasia - Comparison of the 532 nm KTP to the 940 nm Diode Wavelength, *Proceedings of the International Vein Congress*, 2004
2. Mainster MA: Wavelength Selection in Macular Photocoagulation, *Ophthalmology*, 1986; 93(7):952-958

LT0229-E Rev A



IRIDEX

© January, 2005

IRIDEX Corporation

1212 Terra Bella Avenue • Mountain View, CA 94043

Tel: (800) 388-4747 (US) • (650) 962-8100 (Int.) • Fax: (650) 962-0486

www.iridex.com