Using long-pulsed KTP (532 nm) VERDE mode for vascular indications

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ABSTRACT

Long-pulsed KTP is a well-known modality for the treatment of superficial vascular lesions due to its high absorption in hemoglobin.

Four cases presented demonstrate a method for the safe and effective use of VERDE long-pulsed KTP (532 nm) laser treatment for superficial vascular indications.

The four cases, male patients aged from 21 to 65 years, received 1–2 sessions of VERDE (StarWalker, Fotona, Slovenia) for telangiectasias and erythema, capillary vascular malformation, and acne with associated erythema on the face or neck. The laser was applied through a glass compression window on moist skin. The effect was monitored through clinical photographs, VISIA (Canfield, USA) photographs and dermatoscopic images.

All four cases showed a reduction of erythema and vascular lesions. Aside from mild transient edema and crusting, no other side effects were observed.

The VERDE KTP modality in combination with glass slide compression is a useful option for treatment of erythema and vascular lesions.

Key words: cutaneous vascular lesions, long-pulsed KTP laser.

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I. INTRODUCTION

Light-based devices have been used to treat cutaneous vascular lesions almost since the original development of the laser [1]. In the case of vascular lesions, the intended chromophore is largely oxyhemoglobin, although deoxyhemoglobin and methemoglobin are additionally targeted. Using the appropriate wavelength of light and energy, the latter is transferred to the hemoglobin and from there to the surrounding vessel wall, thereby irreversibly damaging it [1]. Oxyhemoglobin has multiple absorption peaks in the yellow and green visible light spectrum at 410–429, 541, and 577 nm, and also absorbs in the near-infrared [1]. Several laser wavelengths are therefore available for treatment, including pulsed dye laser (PDL; 585 or 595 nm), potassium-titanyl-phosphate (KTP) laser (532 nm), near-infrared lasers (700–1200 nm) such as Nd:YAG (1064 nm), and intense pulsed light (IPL; 515–1200 nm) [1].

Thermal relaxation time (TRT) is the amount of time needed for a chromophore to dissipate half of the heat absorbed during the laser pulse. The TRT in seconds is proportional to the square of the target's diameter in millimeters. In order to limit damage to surrounding structures, the pulse duration needs to be shorter than the TRT. The ideal pulse duration equals the TRT, as a too short pulse can have decreased efficacy or could cause vessel rupture, leading to visible purpura [1].

A new long-pulsed KTP modality called VERDE (StarWalker, Fotona, Slovenia), with 15–50 ms pulse durations, has recently become available. It is the purpose of these case reports to demonstrate how to use this modality safely and effectively to treat various vascular indications.

II. METHODS

Patients with aesthetic vascular complaints were offered the option of laser treatment. The exclusion criteria were: a history of photosensitivity or the use of photosensitizing medication, recent history of previous laser therapy at the planned treatment site, existing or planned pregnancy, diabetes, autoimmune disease, breastfeeding, acute skin diseases requiring dermatological treatment, or a history of malignant disease in the area to be treated. All patients signed informed consent for the treatment and the use of data and photographs.

Laser protective glasses were worn by patients and personnel. No anesthesia was required. To increase patient comfort and reduce the possibility of side effects, ice cube cooling and Zimmer (Zimmer MedizinSysteme, Germany; level 3) cooling were used before and during the procedure. The laser beam was applied through a glass window compressing the moistened skin (Fig. 1). The VERDE LP KTP (532 nm) mode was used (StarWalker, Fotona, Slovenia, R58 d handpiece) with the parameters reported in Table 1. The treatments were performed by a qualified dermatologist. The patients could return to their daily routine immediately after the treatment. Bepanthen cream (dexpanthenol, Bayer AG, Germany) was applied immediately after treatment and for the first day. Patients were advised to avoid sun exposure and use sun protection with a factor of at least 30. Patients were told to report any adverse effects.

Clinical photographs and dermatoscopic images were taken at baseline, during, and after treatment. Standardized VISIA (Canfield, USA) analysis was performed with different filters.



Fig. 1: The laser beam was applied through glass, compressing the patient's skin.

III. CASES

a) CASE 1: VERDE for telangiectasias and erythema

Case 1 is a 65-year-old Caucasian male with the complaint of facial telangiectasias and erythema on both cheeks (Fig.2).

Two treatment sessions were performed one month apart, with 1–2 passes using the parameters listed in Table 1. Immediately post treatment, a slight edema was observed. The following day fine crusting appeared on some areas and lasted for 2–3 days.



Fig 2: Case 1. Facial telangiectasias and erythema before VERDE KTP treatment.

At the first treatment session half of the right cheek (medial part) was treated with long-pulsed Nd:YAG (SP Dynamis, Fotona, Slovenia) for comparison. There was no difference immediately post treatment between the two areas (Fig. 3). In the second session, both areas were treated with VERDE.



Fig. 3: Case 1. Immediately post treatment. The lateral area (left of the white line) was treated with VERDE and the medial area (right of the white line) was treated with long-pulsed Nd:YAG. Note the darkening of the treated vessels.

	Wavelength	Spot size	Fluence	Pulse duration	Frequency
CASE 1	532 nm	3 mm	12.7 J/cm^2	20 ms	0.7 Hz
	1064 nm	2 mm	240 J/cm ²	10 ms	1.5 Hz
	532 nm	4 mm	13.5 J/cm^2	15 ms	0.6 Hz
CASE 2	532 nm	4 mm	13.5 J/cm^2	15 ms	0.6 Hz
CASE 3	532 nm	3 mm	13.0 J/cm^2	15 ms	0.6 Hz
CASE 4	532 nm	3 mm	13.0 J/cm^2	20 ms	0.7 Hz

Table 1: Treatment parameters:



Fig. 4: Case 1. VISIA images before and 1 month after the first treatment with VERDE and long-pulsed Nd:YAG. The white arrow points to a reference spot. The yellow arrow points to a telangiectatic vessel which is no longer present in the post treatment image.



Fig. 5: Case 1. VISIA images before and 20 days after 2 VERDE treatments. There is no difference between the medial and the lateral part of the cheek.

b) CASE 2: VERDE for capillary vascular malformation

Case 2 is a 52-year-old Caucasian male with the complaint of capillary vascular malformation on the back of the neck (Fig. 6).

A single treatment was performed, with 1–2 passes using the parameters listed in Table 1. The patient reported only a mild stinging sensation during treatment (about 2 on a 0–10 VAS) with residual discomfort after treatment lasting a few hours. Post treatment, a slight edema was observed. Thin crusting that appeared on the second day lasted for a few days. The patient was tanned when treated and hypopigmentation occurred in the treated area (Fig. 6).



Fig. 6: Case 2. Capillary vascular malformation (Stork's bite) immediately after (A) and 25 days after (B) a single session of VERDE KTP. Note the hypopigmentation at the right border of the treated areas on the "after" image. The part of the lesion covered by scalp hair was not treated and can serve as a comparison to how the lesion appeared before treatment.



Fig. 7: Case 2. Dermatoscopy imaging of capillary vascular malformation (Stork's bite) before (A) and 25 days after (B) a single session of VERDE KTP.

c) CASE 3: VERDE for acne and associated erythema

Case 3 is a 21-year-old Caucasian male with the complaint of active acne accompanied with erythema (Fig.8).

A single treatment was performed, with 2 passes using the parameters listed in Table 1. The endpoint was a slight darkening of the lesions. There was no edema or crusting and practically no downtime.

A reduction of erythema was observed at 1 month follow up (Fig. 8) along with a reduction of inflammation and active acne. The patient did not receive any systemic or local therapy for acne or erythema during this period.



Fig. 8: Case 3. VISIA image of acne before and 1 month after a single session of VERDE KTP. The mole can be used for orientation. Note the reduction of erythema and active acne in the "after" photo.

d) CASE 4:

Case 4 is a 56-year-old Caucasian male with facial telangiectasia (Figs. 9, 10), which was our first trial of VERDE.

A single treatment was performed, with 1 pass using the parameters listed in Table 1. The endpoint was a slight darkening of the lesions (Fig. 9A). There was no edema or crusting and practically no downtime.



Fig. 9: Case 4. Clinical image of telangiectasia immediately after (A; by the red V) and 3 weeks after (B; in red circle) treatment with VERDE KTP.



Fig. 10: Case 4. Dermatoscopic image of telangiectasia (in the red circle) before (A), immediately after (B) and 3 weeks after (C) treatment with VERDE KTP. The red V points to a pigmented lesion that may serve for orientation purposes. The bottom right shows the scale.

IV. DISCUSSION

Long pulsed KTP (frequency-doubled Nd:YAG at 532 nm) is a popular laser device for treatment of superficial vascular lesions [1]. It has been found to be effective in treating facial and leg telangiectasias, portwine stains, poikiloderma of Civatte, hemangioma, venous lakes, cherry angioma, and spider telangiectasia [2]. In the three cases presented here it effectively reduced telangiectasias, erythema, and capillary vascular malformation. It even reduced inflammation and active acne, which may be a result of reduced blood flow in the area after VERDE treatment.

Effective clearance of vascular lesions can be achieved with various wavelengths; PDL (585 or 595 nm), KTP (532 nm), Nd:YAG (1064 nm), and IPL (515–1200 nm) [1]. For vessels larger than 1 mm in diameter and located deeper, efficacy is higher when wavelengths with better penetration such as Nd:YAG are used [3]. KTP treatment may require more sessions for clearance than alternatives, but this is offset by a better safety profile [4, 5]. KTP achieved better results than PDL in the treatment of facial telangiectasias and diffuse telangiectatic facial erythema [6]. In our cases notable results were produced in 1–2 sessions. In one case the effect of KTP and Nd:YAG was compared in a split lesion design (Fig. 5), with both lasers proving equally effective.

Various pulse lengths have been used successfully ranging from 2 ms to over 100 ms. Pulse durations of less than 6–10 ms produce a transient purpuric response immediately following laser treatment, but the longer pulse durations allow gradual heating of blood vessels and avoidance of vessel rupture and purpura [2]. This lack of postoperative purpura is the main advantage of using KTP lasers over PDL for the treatment of rosacea and telangiectasias [1].

Another advantage is the relative painlessness of KTP treatment compared to other options. Longpulsed KTP has been found to be more tolerable than Nd:YAG [3, 4] and PDL [5, 6]. The cases presented in this report did not require use of anesthetic. Due to the use of cooling, patients experienced only mild discomfort during treatment. Epidermal cooling is always recommended when using LP KTP laser. In addition to affording increased patient comfort during the procedure, higher energy can be used with reduced epidermal damage [2].

The main disadvantage to the 532 nm wavelength produced by KTP lasers is the high absorption in epidermal melanin with the subsequent risk of pigmentary changes, especially in tanned or darker skin types [1, 2]. This risk is exemplified in Case 2 in this report, in which the treatment of a tanned patient resulted in hypopigmentation. Although such hypopigmentation is usually of a temporary nature, it may be prudent to ask patients to postpone treatment until after their tan has faded [2]. Other potential side effects include transient erythema, edema, and crusting, which were also observed in our cases. Although not noted by us, atrophic scars have also been known to be caused by this laser, particularly while using high fluence to treat small telangiectasias around the nose [1]. Nevertheless, KTP offers a better safety profile than alternatives [4, 5].

In conclusions, the VERDE KTP modality in combination with glass slide compression is an effective option for the treatment of erythema and vascular lesions, with excellent patient tolerance and a good safety profile.

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