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Original Research

Treatment of facial vascular lesions with intense pulsed light

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BACKGROUND: **Various lasers, particularly the flashlamp-pulsed dye laser, have been proven to be effective in the treatment of facial vascular lesions. Nevertheless, the post-treatment side effects, such as pronounced purpura and changes in pigmentation, have been a matter of concern to patients.**
OBJECTIVE: **To test the efficacy of an alternative treatment option that uses intense pulsed light to provide patients with a more tolerable post-treatment outcome.**
METHODS: **A total of 200 patients were treated with an intense pulsed light source (PhotoDerm® VL) using various treatment parameters. The patients were treated for facial veins (primarily telangiectasia), facial hemangiomas, rosacea and port wine stains.**
RESULTS: **Of the 188 patients who returned for follow-up after 2 months, 174 achieved 75% to 100% clearance in one to four treatment sessions. The post-treatment side effects were minimal and well tolerated by the patients. There were no instances of scarring or other permanent side effects.**
CONCLUSION: **The PhotoDerm® VL provides a highly effective and safe alternative to the laser for treatment of facial vascular lesions. The device may achieve improved results for lesions that are resistant to laser therapy. The rate and degree of cosmetic side effects are considerably less than with laser treatment.**
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Introduction

A vast array of pulsed and continuous lasers such as the argon laser, the pulsed dye laser and the double frequency Nd : YAG laser have been used to treat vascular lesions of the face and extremities. Although laser treatment has been successful to varying degrees, depending on the type of laser being used and the clinical indication, at times patients find the results disappointing and the various side effects, such as pronounced purpura and pigmentary changes, to be disturbing—especially with facial treatment.[1–4]

Several years ago a new device was introduced to the market: an intense pulsed light source (PhotoDerm® VL; ESC Medical Systems, Yokneam, Israel) with a broad wavelength spectrum. The system operates on the principle of selective photothermolysis[5] in which target vessels are selectively damaged with minimal damage to surrounding healthy tissue. The system design includes variable spectral range and multiple pulsing with variable pulse duration, thus allowing the physician to select appropriate parameters to treat vessels of different sizes and at different depths. Moreover, the pulse duration range is equal to that of the thermal relaxation time of smaller cutaneous blood vessels, thus preventing damage to healthy tissue.

This paper addresses the results of 2 years of treatment of facial vascular lesions with PhotoDerm® VL. The efficacy of the treatment and the cosmetically relevant side effects, as reported by the patients, are discussed.

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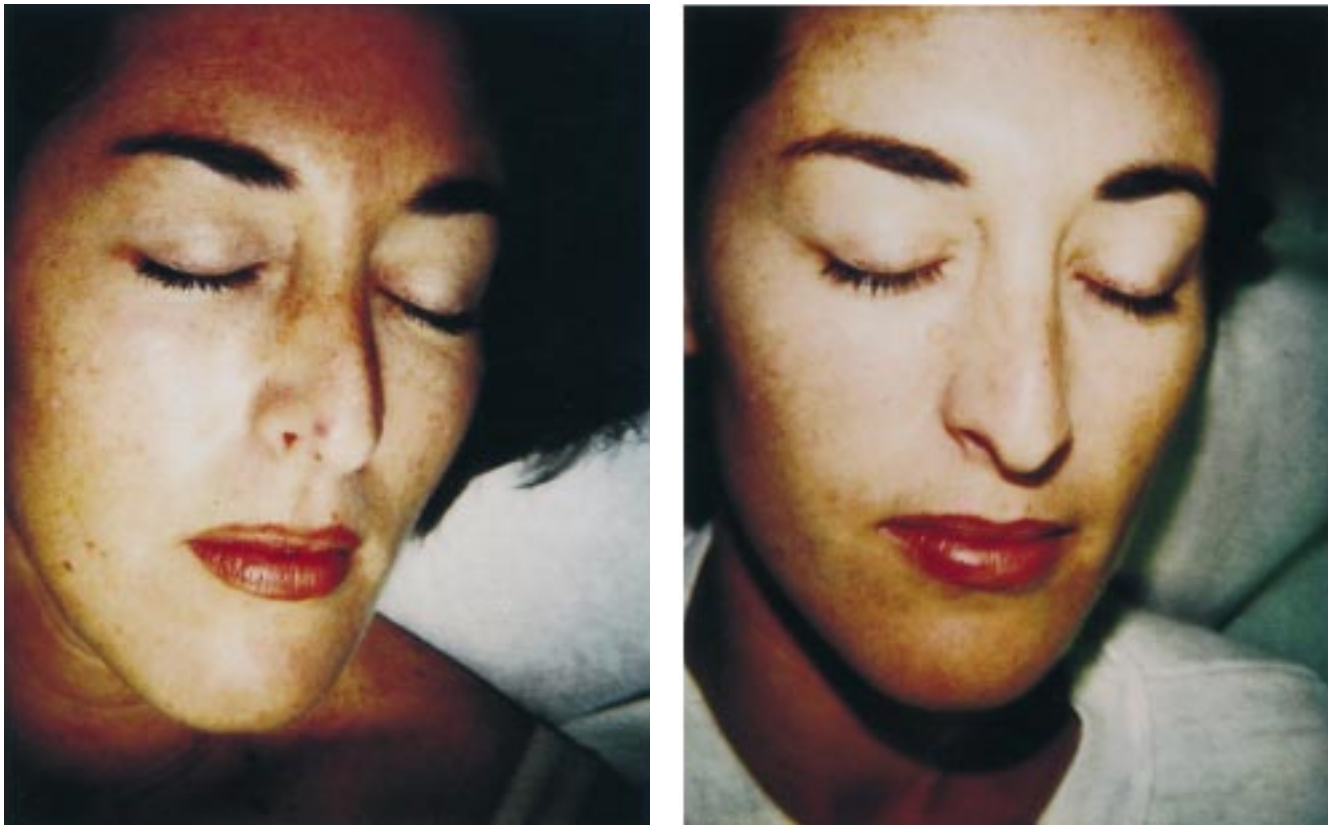

(A) (B)

Figure 1

*A 30-year-old female (skin type II) with a nasal hemangioma. (**A**) Before treatment; (**B**) total clearance after one treatment with a 570-nm cut-off filter, 50-J/cm^2 fluence, and 3.8, 3.1, 2.5-ms triple pulses with pulse delays of 30 ms.*

Patients and methods

A total of 200 patients were treated with PhotoDerm® VL between April 1996 and September 1998. The patients were predominantly female (173 female, 27 male) and ranged in age from 7 to 74 years (median age of 48). The skin types of the patients were as follows: 12.5% (25 patients) were skin type I, 68% (136) were skin type II, and 19.5% (39) were skin type III. A total number of 488 treatments were given to the 200 patients, with a median of two treatments per patient. A total of 79 patients had facial veins alone (generally telangiectasia), 74 had rosacea, 45 had facial hemangiomas with or without additional facial veins and two had port wine stains. Of the 200 patients, eight patients had previously been unsuccessfully treated with vascular lasers (copper or pulsed dye).

All patients underwent treatment with PhotoDerm® VL, a high-intensity, pulsed light system, developed for non-invasive treatment of a wide variety of benign vascular lesions. The selectable broadband wavelength spectrum from 515 nm to 1200 nm allows treatment of vessels located at varying depths. The PhotoDerm® VL delivers high-energy pulses to the tissue, which contains the target chromophores, the erythrocytes and the oxyhemoglobin. As with the pulsed dye laser, PhotoDerm® VL treatment is based upon the theory of selective photothermolysis. The aim is to supply sufficient energy to raise the blood vessel temperature to the point of coagulation without causing damage to the surrounding healthy tissue. To ensure that no epidermal damage occurs, even with higher fluences, the design of PhotoDerm® VL incorporates variable pulse duration and the capability of multiple pulsing with a controlled delivery time so that the epidermis can cool between pulses.

In general, facial veins were treated in the double pulse mode using a 550 nm filter for skin types I and II, and a 570 nm filter for skin type III or tanned skin type II. The energy fluence range applied was 36–45 J/cm^2 with pulses ranging from 2.5 to 6.0 ms and delay times of 20 to 30 ms. Perilesional erythema, blanching or vessel clearance were considered optimal treatment endpoints. The treatments were conducted in an outpatient setting and without the use of anesthesia.

Hemangiomas were usually treated with triple pulses using 550, 570 and 590 nm filters, depending on the perceived depth of the lesion. The higher filter was used first, followed by a lower filter or filters during the same treatment session, depending on the clinical response. An optimal response was defined as coagulation or persistent blanching of the lesion. Common treatment parameters

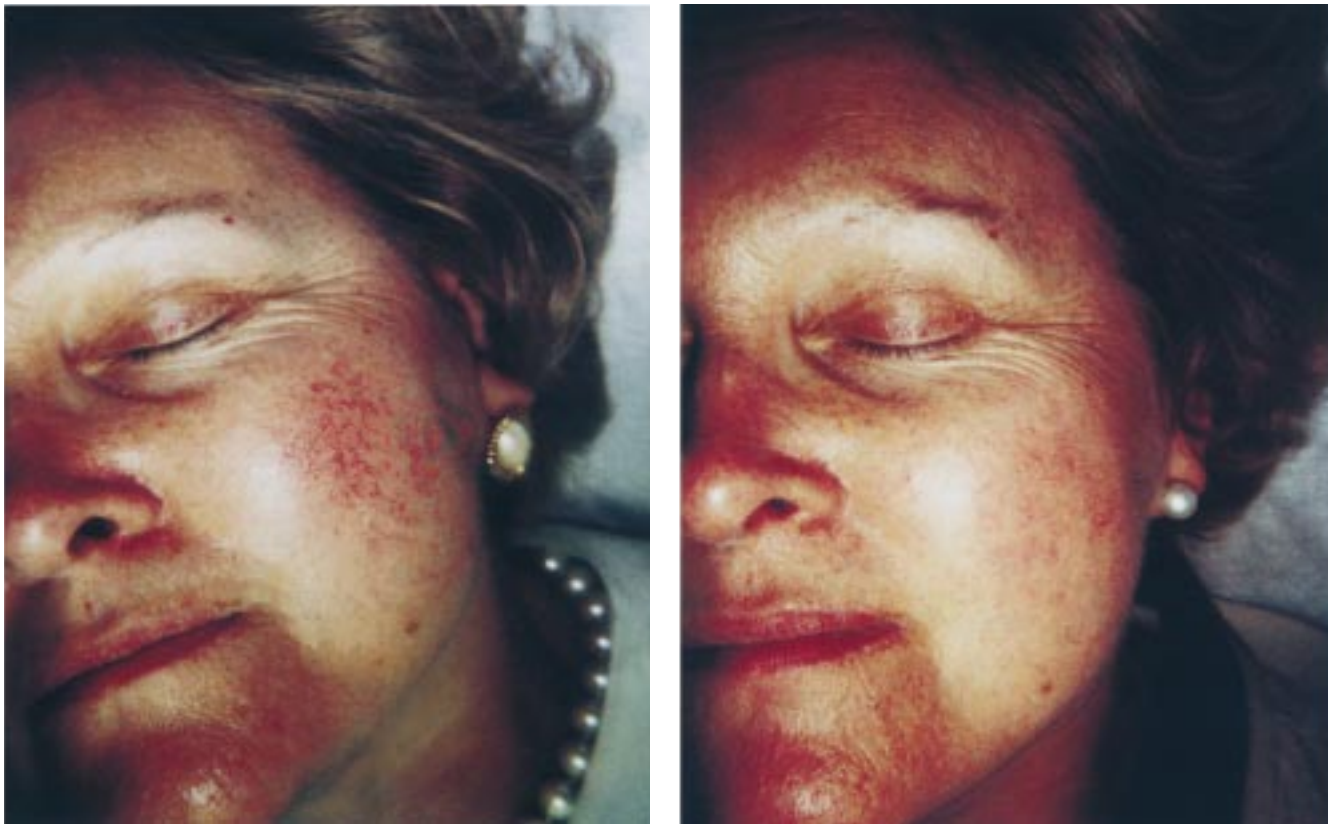

Figure 2
*A 57-year-old female (skin type II) with facial veins on the cheeks and nose, and secondary to moderately severe dermatoheliosis. (**A**) Before treatment; (**B**) 75% to 100% clearance range after a single treatment with a 550-nm cut-off filter, 38.5-J/cm^2 fluence, and 2.9, 4.2-ms double pulses with pulse delays of 30 ms.*

were as follows: energy fluence of 50–60 J/cm^2 with pulses of 3.8, 3.1, and 2.5 or 2.4, 3.8, and 4.2 ms, and interpulse delay times of 20 to 30 ms.

Patients with rosacea were treated with topical sunscreens and topical and/or oral antibiotics. All other patients were instructed to use topical sunscreens daily (minimum SPF 15) and to avoid direct and deliberate sun exposure (the majority of the patients had developed the facial vascular lesions as a result of chronic sun damage). Patients were instructed to return for follow-up at 2 months in most cases. The percentage clearance was assessed by comparing the pretreatment photograph to the clinical outcome at follow-up.

Results

The overall treatment response of the vascular lesions to PhotoDerm® VL therapy was very good. Figures 1–3 demonstrate the clinical results of three patients. A total of 12 patients did not return after their initial treatment. Of the 188 patients examined at follow-up, the majority of the patients (174) demonstrated an overall clearance of 75% to 100%. It is interesting to note both the effect of a single treatment and the number of treatments required to reach the endpoint of 75% to 100% clearance. The number of treatments to achieve clearance in the range of 75% to 100% is as follows: 128 patients required a single treatment, 40 patients required two treatments, four patients required three treatments and two patients required four treatments (Figure 4). In addition, 51 patients had 50% to 75% clearance after a single treatment, eight patients had 25% to 50% clearance after one treatment and one patient had 0% to 25% clearance (Figure 5). Single vascular lesions (spider veins, small hemangiomas) generally cleared completely after a single treatment, while diffuse facial veins (rosacea, severe dermatohelisis) occasionally required a second treatment to obtain full clearance. The port wine stains were the most difficult clinical indication to treat.

The number of treatments required to achieve over 75% clearance was not generally diagnosis-dependent because even extensive facial lesions were often cleared after one treatment. The results also did not appear to be correlated with skin type, although this is difficult to determine due to the predominance of skin type II patients. There did appear to be a trend for patients younger than the median age to require fewer treatment

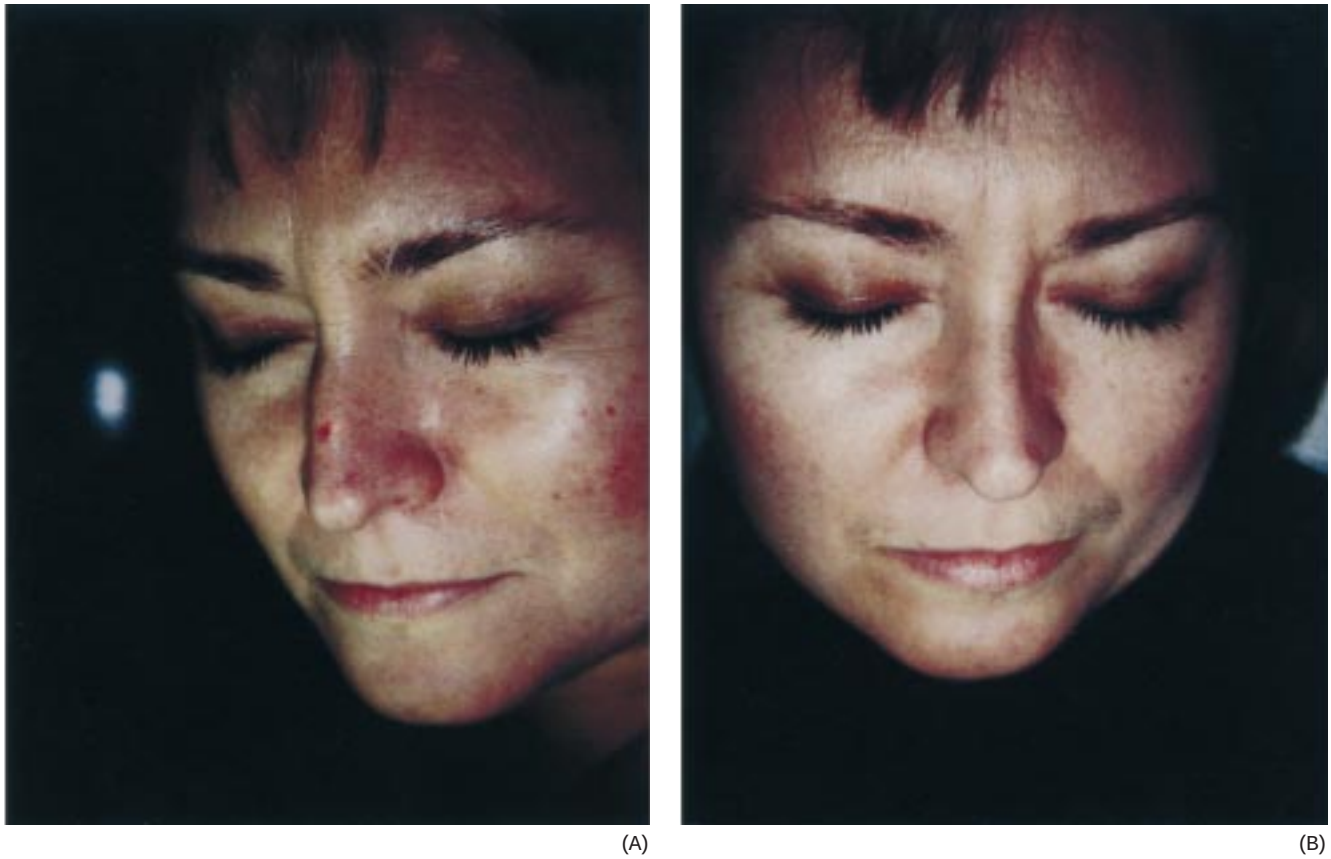

Figure 3
*A 38-year-old female (skin type II) with a nasal hemangioma. (**A**) Before treatment; (**B**) total clearance after one treatment with a 550-nm cut-off filter, 50-J/cm^2 fluence, and 4, 2, 1-ms triple pulses with pulse delays of 30 ms.*

sessions. The most significant determinant of the number of treatments required to achieve 75% to 100% clearance is perhaps the treatment regime itself. Less aggressive parameters were chosen for patients who were treated when the device was initially operated and thus more than one treatment session was necessary to clear the lesion. The device offers many selectable parameters and there is a learning curve to determine which parameters achieve the best results with each particular skin type. As the operator becomes more familiar with the device, more aggressive parameters can be carefully chosen.

It is interesting to note the results of the eight patients who had been previously treated unsuccessfully with a pulsed dye or copper laser. Three patients with rosacea experienced 75% to 100% clearance after only a single treatment. One of these patients had experienced hypo-

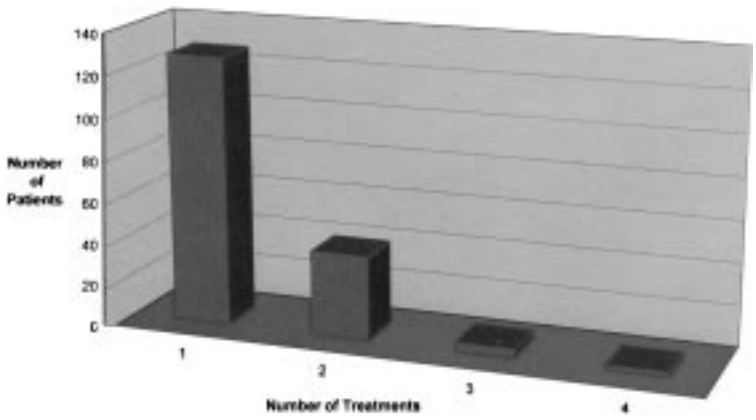

Figure 4
The number of treatments needed to achieve 75% to 100% clearance.

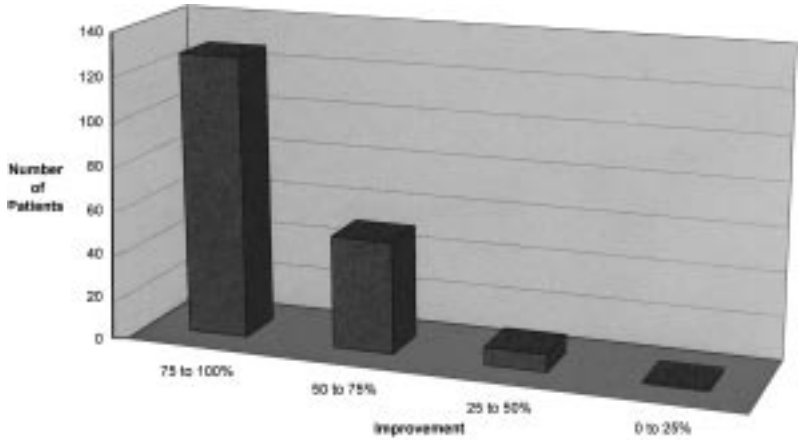

Figure 5
Percentage improvement after one treatment.

pigmented scarring from previous treatment. Two patients with facial veins required three to four treatments to achieve this clearance. The remaining three patients did not return for follow-up.

There were 34 episodes of side effects (excluding erythema and edema lasting less than 2 days). However, since not all patients returned for final follow-up after their last treatment, the number of side effects may be under-reported. The reported side effects were as follows: (1) bruising or fine brown speckles of coagulation (13 patients), reported at one treatment session and lasting up to 1 week; (2) four episodes of edema that persisted for more than 2 days; (3) three episodes of transient hypo-pigmentation, resolved within 4 months; and (4) a single episode of conjunctival injection, resolved within 1 week. Scarring or other permanent side effects were not observed.

Discussion

The intense pulsed light source, PhotoDerm® VL, is an alternative or supplement to the already existing laser devices that are part of the laser surgeon's repertoire. The broad wavelength spectrum and variable pulse duration allow greater penetration depths to be reached without damaging surrounding tissue and thus enhance the versatility of this system. Moreover, the pronounced purpura, lasting for up to several weeks, that has been reported with the pulsed dye laser or the scarring that has occurred with argon laser use were not observed during treatment of the 188 patients in this study. Use of the PhotoDerm® VL device results in a more tolerable post-treatment outcome for the patient.[6–9]

The PhotoDerm® VL device has been reported to be safe and effective in the treatment of facial telangiectasias and benign venous malformations, and may more effectively treat vascular lesions that have not responded to laser therapy, as observed in the five cases in this study and in other cases reported in the literature.[6–9]

The flexibility that the physician is afforded in choosing optimal treatment parameters, however, requires caution when using the device. The system should be employed by a skilled laser surgeon. Although suggested treatment parameters are provided in the software, training and experience are necessary to determine the most effective treatment parameters for each skin type and clinical indication.

Acknowledgements

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