Evaluating the therapeutic efficacy of the 595 nm pulsed dye laser system for treating capillary malformations

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Abstract

Capillary malformations are the most prevalent low-flow vascular abnormalities. We present the case of a 30-year-old woman with a lateral capillary malformation. Dermoscopy showed an erythematous background and rare telangiectatic vessels for less than 5-10% of the entire area examined. The patient underwent a single treatment session with a 595 nm pulsed dye laser (PDL). An excellent immediate response was observed at the end of the session, with a noticeable reduction in the capillary malformation confirmed at clinical follow-up two months later. Dermatoscopic and 3D photographic evaluation before and after laser treatment also documented the disappearance of the erythematous background and telangiectatic vessels.

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Ethics approval and consent to participate: the study was conducted in accordance with the Declaration of Helsinki on Ethical Principles for Medical Research Involving Human Subjects. Ethical approval was not required, as the study device has been CE-marked since 28/03/2013.

Consent for publication: the patient gave her written consent to use her personal data for the publication of this case report and any accompanying images.

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Introduction

Capillary malformations (CMs) represent the most common low-flow vascular anomalies; they may be isolated or associated with other congenital anomalies as part of complex malformation syndromes.[1] Most CMs are found in the cephalic extremity; 85% are unilateral, and two main groups can be distinguished: medial and lateral congenital capillary malformations.

The morphologic features and site of the malformation, together with the presence of associated signs, are important to differentiate isolated forms of capillary malformation and complex malformative syndromes; dermatoscopic examination is a useful diagnostic aid that highlights vertically oriented punctiform or globular vessels in superficial capillary malformations (or papillary dermis) or horizontally oriented linear vessels of deep capillary malformations (or subpapillary dermis).[2,3] Beyond the role of dermoscopy for the diagnosis of CMs, the technique helps physicians evaluate the response to vascular laser treatment and select the best parameters according to patients' characteristics.

Case Report

We present a case of a 30-year-old woman with a lateral capillary malformation present since birth. She had undergone instrumental investigations (cephalic district MRI) during the first years of life to rule out malformative syndromes. Over the years, she received a single CO_2 ablative laser treatment to reduce the capillary malformation, but the procedure caused scarring on the inferior medial area near the nasal dorsum (Figure 1a).

The patient came to our clinic to permanently treat the vascular malformation, as it was causing significant cosmetic discomfort. The lesion clinically appeared as a mildly erythematous-reddish patch starting from the left lacrimal groove to the left cheekbone and cheek (Figure 1a). A pulsed dye laser (PDL) was selected from the available laser therapies since, nowadays, it targets hemoglobin more effectively and produces good results.[4] A single treatment with 595 nm PDL (SynchroVasQ, Deka Mela Srl, Florence, Italy) was performed with the following parameters: fluence 9.0 J/cm^2, 10 mm spot size, and 0.50 ms pulse width. An excellent response was achieved at the end of the session, along with a clear reduction of the capillary malformation observed at the clinical follow-up two months later (Figure 1b). Dermoscopic examination (DermLite3G, 20×) showed a shaded erythematous background and rare telangiectasic vessels for less than 5-10% of the entire area examined (Figure 1c). Also, it documented the disappearance of the erythematous background and telangiectatic

vessels (Figure 1d). For a better and more objective evaluation of the patient in terms of vascularity and tissue texture changes, the clinical images before (Figure 1e) and after laser treatment (Figure 1f) were acquired also using a 3D digital camera (Vectra H2, Canfield, USA), which reconfirms a visible reduction of the patient's capillary malformation.

Discussion

Standard therapies for vascular malformations include 577, 585, or 595 nm PDL[5,6] by setting fluences from a minimum of 7 J/cm^2 to a maximum of 11 J/cm^2.

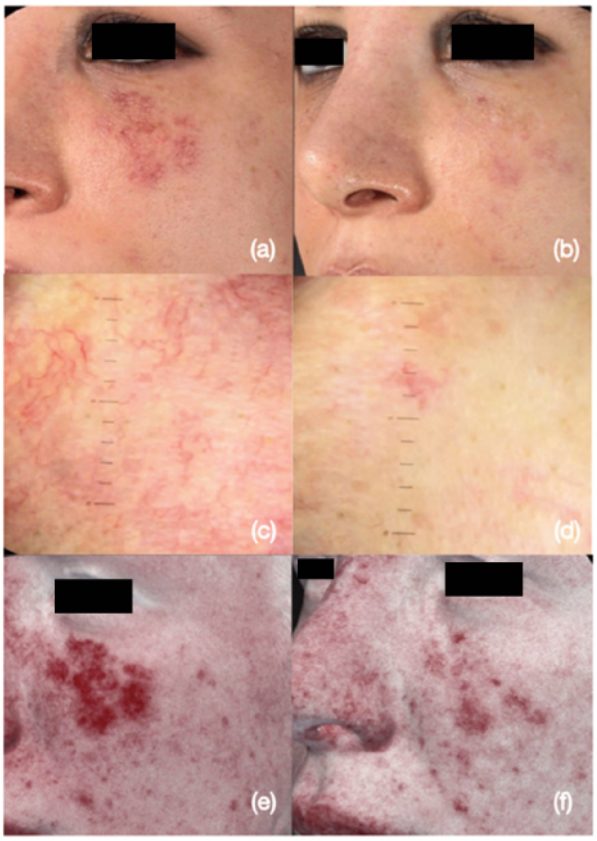

Figure 1. (**a**) Clinical appearance before laser treatment of the capillary malformation as an erythematous plaque of several centimeters in diameter; (**b**) capillary malformation's clinical appearance after laser treatment; (**c**) dermoscopy features reveal shaded erythematous background and rare telangiectasic vessels; (**d**) dermoscopy features after laser treatment show the disappearance of the erythema and telangiectasic vessels; clinical images acquired before (**e**) and after laser treatment (**f**) using the Vectra H2 digital camera.

To date, there are no precise algorithms in the literature on how to set up the PDL to achieve the best response without side effects. A detailed dermatoscopic analysis of the capillary malformation is useful for selecting the proper laser parameters. In fact, based on the erythema observed upon dermoscopy and the percentage of skin affected by the flat capillary malformation, higher or lower fluences and larger or smaller spot sizes can be chosen.

Based on our experience, we recommend using low fluences (7-8 J/cm^2) and larger spots if, at dermoscopic analysis, an intense red-purple background and obvious telangiectasias are found and also if the area involved by CMs at dermoscopy is greater than 30%; instead, as in the case of our patient, if the area affected by the capillary malformation at dermoscopy examination is lower than 5-10%, the background is faintly erythematous, and telangiectasias are not particularly evident, we recommend using higher fluences up to 10-11 J/cm^2 and spots of smaller diameter as the hemoglobin target is less evident.

In conclusion, dermoscopy is a non-invasive and helpful tool not only for the diagnosis of melanocytic lesions and inflammatory conditions, but it also has new applications in laser treatment. Its role is crucial in selecting the correct laser parameters, evaluating the response to treatment, and avoiding laser-related side effects. Further studies involving larger sample sizes are necessary to validate our findings and to develop specific algorithms for PDL treatment.

Conclusions

For the management of capillary malformations, PDL treatment with the study device at a wavelength of 595 nm has proven to be an effective, safe, and tolerated therapeutic procedure.

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