Laser Treatment of Port Wine Stains: A Study Comparing Therapeutic Outcome with Morphologic Characteristics of the Lesions

Preliminary Results

Sir,

Port wine stains and other forms of benign dermal superficial vascular ectasis are now treated with flash lamp-pumped dye lasers. Depending on the morphology of the lesions, there are great variations in clinical response.

Telangiectatic lesions achieve complete resolution after 2 to 4 treatments (1), while port wine stains in general need an average of 6.5 treatments to obtain complete remission (2). This study was designed to obtain information about possible correlations between treatment outcome and lesional morphology.

METHODS

Thirteen patients aged 15 to 52 years (average age 34.2 years), with pink to purple macular port wine stains, were included. Two of the lesions were located on the neck, two on the upper arm and nine on the trunk. Prior to admission of laser light, 3-mm punch biopsies were taken from lesional and peri-lesional skin. The biopsies were analyzed by a data-assisted program (Kontron image analysis systems, Videoplan), measuring vessel number and diameter. A Cynosure LPDL-5 flash lamp-pumped dye laser emitting at a wavelength of 585 nm (yellow light) with a pulse duration of 450 μs was used. Test areas with three different energy fluences (5.25, 6.50, 7.75 J/cm^2) were given to each lesion. The energy fluence was calculated from the energies registered on Ophir energy meter model DGX, energy monitor model F150-APH. The test areas were located close to the site of the biopsy. Two months after laser irradiation the percentage of lightening of the test areas was evaluated by photographs and clinical judging with Pantone color system as reference. The lesions were grouped into non-responders (less than 25% clearance), moderate responders (25–75% clearance) and excellent responders (more than 75% clearance). The test areas were then retreated 2–4 times with the test dose that gave the highest degree of lightening.

RESULTS

An increased vessel number was observed in the upper 0.5 mm of dermis for all lesions.

Four patients aged 23–52 years (average age 40 years) achieved excellent lightening at one or more of the test areas. The lesions of the excellent responders were red to purple. One was located on the neck, one on the arm and two on the trunk. Histologically (Fig. 1a), these lesions were characterized by

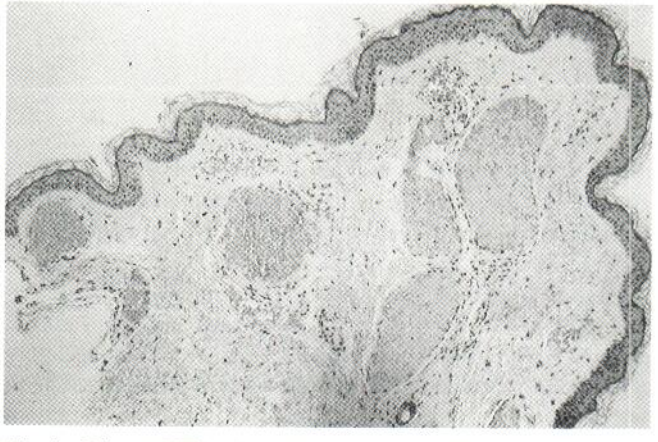

Fig. 1a. Biopsy (HES, original magnification ×26) from an excellent responder.

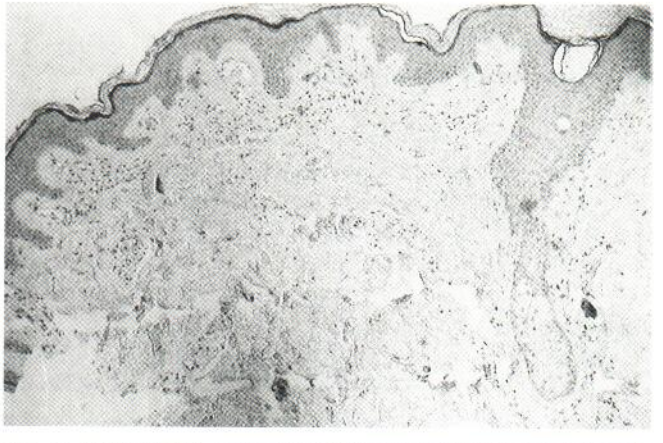

Fig. 1b. Biopsy (HES, original magnification ×65) from a non-responder.

vessels having a considerably larger diameter than the diameter of vessels in peri-lesional skin (1.6–3.4 times). The average vessel diameter for the excellent responders was 0.088 mm (0.056–0.102 mm).

Four patients aged 15–43 years (average age 25.3 years), all with lesions located on the trunk, three pink and one purple, achieved poor lesional lightening and were classified as non-responders. These lesions (Fig. 1b) consisted of smaller vessels with an average diameter of 0.035 mm (0.031–0.046 mm), and the ratio of vessel diameter in lesional and peri-lesional skin was 1–1.5 on average. The non-responders did not benefit from repeated treatments.

The five moderate responders aged 26–52 years (average age 35.8 years) had red to purple lesions, one located on the neck, one on the arm and three on the trunk. The lesional vessel diameter was 0.083 mm on average. These vessels generally had considerably thicker walls than the vessels in the excellent responder group, based on qualitative judging.

DISCUSSION

In general the vessels of the non-responding lesions were small, with a lesional/peri-lesional vessel diameter ratio of less than 1.6. In the treatment of port wine stains it is shown that the ectatic vessels are replaced by vessels of normal size (3). Hypothetically the new vessels may shield deeper layers of slightly ectatic vessels. This could explain the lack of additional lightening after repeated treatments.

The results indicate that the thickness of the vessel wall is essential to therapeutic outcome. Lesions with an average vessel diameter of 0.056 to 0.102 mm respond better than vessels with approximately the same diameter and thicker walls. Possibly the whole vessel wall and not only the endothelial lining has to be destroyed to obtain permanent vessel occlusion. We plan to measure the vessel wall diameter by using a more advanced image-analyzing system. This study will be continued until we have sufficient data to verify the results by statistic analysis.

REFERENCES

1. Morelli JG, Huff JC, et al. Treatment of congenital teleangiectatic vascular malformations with the pulsed-dye laser (585 nm). Pediatrics 1993; 603–606.
2. Tan OT, Sherwood K, Gilchrest BA. Treatment of children with port wine stains using the flashlamp pulsed tunable dye laser. N Engl J Med 1989; 320: 416–421.
3. Tan OT, Carney M, Margolis R, et al. Histologic responses of port-wine stains treated by argon, carbon dioxide, and tunable dye lasers. Arch Dermatol 1986; 122: 1016–1022.

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Eli Janne Fiskerstrand[1], Morten Dalaker[2] and Lill Tove Norvang[3], Departments of [1]Dermatology and [2]Pathology, University Hospital of Trondheim, and [3]Department of Physical Electronics, The Norwegian Institute of Technology, University of Trondheim, N-7006 Trondheim, Norway.