Characterization of an Optimized Light Source and Comparison to Pulsed Dye Laser for Superficial and Deep Vessel Clearance

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Background and Objective: An arc lamp-based device providing optimized spectrum and pulse shape was characterized and compared with two pulsed dye laser (PDL) systems using a vascular phantom. Safety and effectiveness for facial telangiectasia are presented in clinical case studies.

Study Design/Materials and Methods: An optimized pulsed light source's (OPL) spectral and power output were characterized and compared with two 595 nm PDL devices. Purpuric threshold fluences were determined for the OPL and PDLs on Fitzpatrick type II normal skin. A vascular phantom comprising blood-filled quartz capillaries beneath porcine skin was treated by the devices at their respective purpuric threshold fluences for 3 ms pulse widths, while vessel temperatures were monitored with an infrared (IR) camera. Patients with Fitzpatrick skin types II–III received a split-face treatment with the OPL and a 595 nm PDL.

Results: The OPL provided a dual-band output spectrum from 500 to 670 nm and 850–1,200 nm, pulse widths from 3 to 100 ms, and fluences to 80 J/cm2. The smooth output power measured during all pulse widths provides unambiguous vessel size selectivity. Percent energy in the near infra-red increased with decreasing output power from 45% to 60% and contributed 15–26% to heating of deep vessels, respectively. At purpuric threshold fluences the ratio of OPL to PDL vessel temperature rise was 1.7–2.8. OPL treatments of facial

telangiectasia were well-tolerated by patients demonstrating significant improvements comparable to PDL with no downtime.

Conclusions: Intense pulsed light (IPL) and PDL output pulse and spectral profiles are important for selective treatment of vessels in vascular lesions. The OPL's margin between purpuric threshold fluence and treatment fluence for deeper, larger vessels was greater than the corresponding margin with PDLs. The results warrant further comparison studies with IPLs and other PDLs. Lasers Surg. Med. 43:92–98, 2011.

Key words: arc lamps; intense pulsed light; photothermolysis; purpura; purpuric threshold fluence; telangiectasia; vascular lesions; vascular phantom