
Long-Pulsed (6-ms) Pulsed Dye Laser Treatment of Rosacea-Associated Telangiectasia Using Subpurpuric Clinical Threshold

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BACKGROUND. The pulsed dye laser (PDL), especially the 585-nm short-pulse width (450 μ s) laser, has been extensively used in the treatment of facial telangiectasias. However, the resultant posttreatment purpura lasts for days and may not be cosmetically acceptable.

OBJECTIVE. To examine the effect of long-pulsed (6 ms) PDL at subpurpuric clinical threshold in the treatment of rosacea-associated telangiectasia.

METHODS. Twelve patients with rosacea-associated telangiectasia were recruited into the study. We used the 595-nm PDL at a pulse duration of 6 ms and titrated the fluence between 7 and 9 J/cm² to produce immediate purpura lasting only a few seconds. Pretreatment cooling was achieved by cryogen spray. Assessment was made by comparing pretreatment and posttreatment photographs. Patients were evaluated 6 to 8 weeks after one

PDL treatment. Results were reported as the percentage of reduction in the number of telangiectasias. Patients were asked for their own evaluation of improvement after treatment in terms of excellent, moderate, or poor outcome. Side effects such as pigmentary disturbance and scarring were also documented. **RESULTS.** Two of 12 patients had more than 75% improvement. Another two had 50% to 75% improvement, and five had 25% to 50% improvement. Overall, 9 (75%) of 12 patients had more than 25% improvement after a single treatment of PDL. None of the patients reported any lasting posttreatment purpura or complications.

CONCLUSION. The long-pulsed 595-nm PDL using subpurpuric clinical threshold was effective for treatment of rosacea associated telangiectasia.

Z. F. JASIM, MRCP, W. K. WOO, MRCP, AND J. M. HANDLEY, MD, FRCP HAVE INDICATED NO SIGNIFICANT INTEREST WITH COMMERCIAL SUPPORTERS.

ROSACEA IS a chronic inflammatory eruption of the face. It is characterized by erythema, papules, pustules, and telangiectasia.¹

Rosacea-associated telangiectasia and erythema have been successfully treated with pulsed dye laser (PDL).²⁻⁴ In addition to PDL, other lasers, including potassium titanyl phosphate, 532-nm Nd:YAG, 1064-nm Nd:YAG, argon, copper-bromide, and intense pulsed light have been used in treatment of facial telangiectasia.⁴⁻¹⁷

PDLs have been proven safe and effective in the treatment of a variety of vascular lesions. The laser selectively targets vascular structure through selective light absorbed by oxyhemoglobin and pulse duration that prevents damage to the epidermis and surrounding dermis. It has been successfully used in the treatment of port wine stain,^{18,19} spider nevi,²⁰ and generalized essential telangiectasia²¹ with minimal side effects.

The development of purpuric spots after treatment with PDL is a well known side effect.^{7,8,12,21} This side effect might not be cosmetically acceptable to the patients. It usually resolves within 10 to 14 days after treatment. Longer pulse duration PDL may have the same treatment efficacy without producing lasting purpura.

The aim of this study is to examine the effectiveness of PDL in the treatment of rosacea-associated telangiectasia with an energy level and pulse duration that produce transient purpura for a few seconds only.

Methods

Twelve patients, Fitzpatrick skin types I-III, with rosacea were recruited in this study (six males and six females). Their age ranged from 34 to 72 years. All patients had bilateral facial telangiectasia involving the cheeks. Exclusion criteria were active inflammatory components such as papules and pustules, a history of photosensitivity, and patients on anticoagulation therapy. The procedure was explained fully to each patient, and informed consent was obtained.

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In all cases, both cheeks were treated once with variable pulse width 595-nm PDL (Candela V-beam, Wayland, MA). With a pulse duration of 6 ms and a spot size of 7 mm, each patient had a test spot on the cheek starting with a fluence of 9 J/cm² and titrating down to 7 J/cm to find a fluence that will produce a transient purpuric effect for a few seconds only. Pretreatment cooling was achieved by tetrafluoroethane spray 30 ms before each laser pulse followed by a 30-ms laser pulse delay (DCD; Candela). Whenever the highest fluence that produced no lasting purpura was ascertained for the individual patient, treatment was carried out to the entire cheek area affected by telangiectasia aiming to produce 10% overlap of treatment spots (the nasal alar vessels were not treated). Ice pack to treated area was used to provide additional posttreatment cooling. Photographs were taken by the same person using a hand-held Polaroid Macro 5 SLR camera. Every effort was made to ensure that the lighting, exposure, angle, and quality of the photographs were consistent. Two physicians assessed the patients before treatment and 6 to 8 weeks after treatment by comparing pretreatment and posttreatment photographs. Results were reported as the percentage reduction in number of telangiectasias on a quartile scale of 25% gradient, ranging from 0% to 25%, 25% to 50%, 50% to 75%, and 75% to 100%. In addition, patients were asked to report subjective improvement separately from physicians' assessment, using the scale excellent, moderate, or poor outcome. All patients were asked whether they developed any posttreatment complications such as lasting pain, persisting purpura, or purpura requiring time off work or if they developed any crusting. They were also assessed for clinically visible hyperpigmentation, hypopigmentation, and scarring.

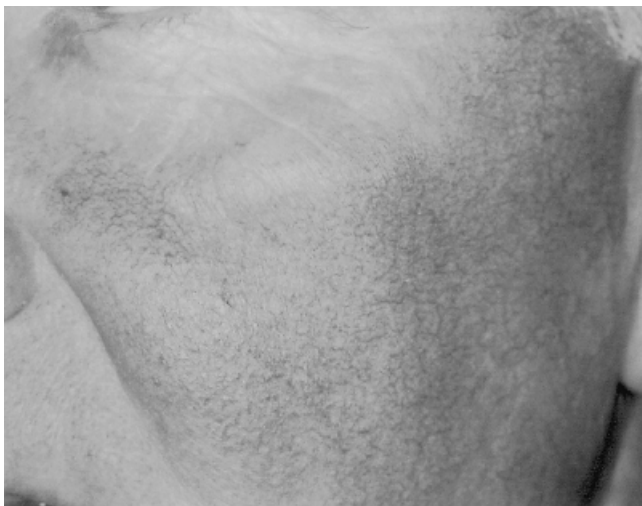


Figure 1. Before treatment.



Figure 2. Immediately after treatment.



Figure 3. Several months after treatment.

Results

Twelve patients completed the study. Patients were followed 6 to 8 weeks after a single PDL treatment. Two of 12 (17%) patients had almost complete clearing of their telangiectasia (more than 75% clearing). Another two patients (17%) had their telangiectasia much improved (50% to 75% clearing). Five patients (41%) had patchy clearance (25% to 50%) of telangiectasia. Only three patients (25%) had no change (less than 25% clearing). Overall, nine (75%) of the patients had at least partial clearing (more than 25%) of their telangiectasia after a single treatment with subpurpuric PDL threshold.

In assessment of their own response, 7 of 12 patients (58%) stated that they had moderate clearance of their telangiectasia. Another three (25%) thought they had excellent results. Only two (17%)

Table 1. Results According to Physician and Patient Assessments

| Patient | Age | Gender | Investigator Response Assessment | Patient's Own Assessment |
|---------|-----|--------|----------------------------------|--------------------------|
| 1 | 54 | F | 25% to 50% | Moderate |
| 2 | 61 | M | > 75% | Excellent |
| 3 | 51 | F | < 25% | Poor |
| 4 | 72 | F | 25% to 50% | Moderate |
| 5 | 38 | M | 50% to 75% | Excellent |
| 6 | 40 | M | 25% to 50% | Moderate |
| 7 | 48 | F | 25% to 50% | Moderate |
| 8 | 49 | M | 25% to 50% | Moderate |
| 9 | 62 | F | < 25% | Poor |
| 10 | 50 | M | > 75% | Excellent |
| 11 | 34 | M | < 25% | Moderate |
| | 46 | F | 50% to 75% | Moderate |

patients assessed their own response as poor after a single PDL treatment (Table 1). No complications such as pigmentation or scarring were noted by either patients or physician evaluators at any time during the posttreatment period.

Discussion

This study shows that a single treatment of rosacea-associated telangiectasia with PDL of low energy and long pulse duration that does not produce lasting purpura has been effective. Seventy-five percent of the patients had visible improvement in their facial telangiectasia without producing lasting side effects (Figures 1–3). Most of the patients felt they had improved after the first treatment. Eighty-three percent of the patients thought that they had moderate to excellent results in their own assessment of response to this treatment. Apart from immediate posttreatment erythema and discomfort, no other side effects were observed.

PDL has been used in the treatment of a wide range of facial vascular lesions, including facial telangiectasia secondary to sun damage and rosacea-associated telangiectasia. Clark et al.² reported a significant reduction in both erythema and telangiectasia of rosacea in all of their patients after treatment with PDL. Nevertheless, there was accompanying immediate posttreatment purpura. They also reported pigmentation and atrophic scarring in a number of their patients. These resolved after few months.² Similar side effects were reported in other studies that used PDL for treatment of telangiectatic lesions.^{6–8} All of these studies used PDL in short pulse duration. Lowe et al.³ used flash-lamp PDL with good improvement of telangiectasia and erythema in almost all of their patients. Apart from immediate posttreatment side

effects as purpura and crusting, no scarring or pigmentation was reported.

The high peak energy of short pulse duration PDL is thought to produce immediate purpura by a photoacoustic shattering of capillary walls with resultant leaking of red blood cells into extravascular tissue. Longer pulse duration PDL achieves a lower peak energy, and the heat is applied to blood vessels more slowly. This slower application of thermal energy in turn eliminates or minimizes any photoacoustic effects to capillary walls with less red blood cells leakage and hence no purpura.

The observed improvement in our patient can be explained by the selective photothermolysis theory by Anderson and Parrish.²² The energy absorbed by the oxyhemoglobin selectively targets the blood vessel wall without damaging the surrounding tissue. The application of this principle during treatment reduced the undesirable side effects. The presence of transient purpuric effect in treatment with long pulse duration PDL might indicate the induction of a photoacoustic effect. Nevertheless, such an effect must be minimal so that no lasting tissue damage is produced. This might explain the absence of long-lasting pigmentary changes.

In our experience, patients when given the choice preferred treatment that does not produce purpura. The reason was mainly to avoid social embarrassment despite reassurances that purpura will resolve within 2 weeks. Similarly Ross et al.⁶ noted that their patients found that the cosmetic morbidity of treatment with PDL (purpura) was so disturbing that nearly half of the patients preferred another laser that did not produce purpura.

The treatment of facial telangiectasia with laser is a cosmetic procedure. In the choice of the type of laser used and their level of energy, it is always important to take short-term cosmetic results into consideration. Our views were shared by other researchers.^{6,8} It is also important to note that the use of a shorter pulse

duration PDL can produce side effects such as scarring and pigmentation.² Although reversible in the majority of cases, this may have more profound cosmetic consequences than facial telangiectasia. PDL treatment using subpurpuric threshold diminishes the photoacoustic effect and hence should theoretically reduce the likelihood of posttreatment hyperpigmentation.

The drawback to purpura-free PDL is the lack of obvious visible end points and the possibility that excessive overlapping might increase the incidence of scarring.⁵ This has not been the experience in our patients. In contrast, the absence of visible end point might have led to less than the required overlapping in some of our cases and hence their poor response.

In conclusion, a single 595-nm PDL treatment of rosacea-associated telangiectasia using subpurpuric clinical threshold is safe, has no lasting side effect, and is effective. Further research is needed to assess the effects of using the same setting repeatedly. A study that is designed to compare the efficacy of purpuric and subpurpuric threshold using PDL to treat the same patient might give us an idea about which setting is to be preferred for future treatment of rosacea-associated telangiectasia.

References

- Odom RB, James WD, Berger TG. *Andrews' Diseases of the Skin*, 9th ed. Philadelphia: W.B. Saunders, 2000:301-3.
- Clark SM, Lanigan SW, Marks R. Laser treatment of erythema and telangiectasia associated with rosacea. *Lasers Med Sci* 2002;17:26-33.
- Lowe NJ, Behr KL, Fitzpatrick R, Goldman M, Ruiz-Esparza J. Flash lamp pumped dye laser for rosacea-associated telangiectasia and erythema. *J Dermatol Surg Oncol* 1991;17:522-5.
- West TB, Alster TS. Comparison of the long-pulse dye (590-595 nm) and KTP (532 nm) lasers in the treatment of facial and leg telangiectasia. *Dermatol Surg* 1998;24:221-6.
- Travelute Ammirati C, Carniol PJ, Hruza GJ. Laser treatment of facial vascular lesions. *Facial Plast Surg* 2001;17:193-201.
- Ross M, Watcher MA, Goodman MM. Comparison of the flash lamp pulsed dye laser with the argon tunable dye laser with robotized hand piece for facial telangiectasia. *Lasers Surg Med* 1993;13:374-8.
- Bernstein EF, Lee J, Lowery J, et al. Treatment of spider veins with the 595 nm pulsed-dye laser. *J Am Acad Dermatol* 1998;39:746-50.
- Broska P, Martinho E, Goodman MM. Comparison of the argon tunable dye laser with the flashlamp pulsed dye laser in treatment of facial telangiectasia. *J Dermatol Surg Oncol* 1994;20:749-53.
- Scheepers JH, Quaba AA. Clinical experience in the treatment of the "red nose" using the flashlamp-pumped pulsed dye laser (585 nm). *Aesthetic Plast Surg* 1994;18:57-60.
- Cassuto DA, Ancona DM, Emanuelli G. Treatment of facial telangiectasias with a diode-pumped Nd:YAG laser at 532 nm. *J Cutan Laser Ther* 2000;2:141-6.
- McCoy SE. Copper bromide laser in treatment of facial telangiectasia: results of patients treated over five years. *Lasers Surg Med* 1997;21:329-40.
- Ruiz-Esparza J, Goldman MP, Fitzpatrick RE, Lowe NJ, Behr KL. Flash lamp-pumped dye laser treatment of telangiectasia. *J Dermatol Surg Oncol* 1993;19:1000-3.
- McCoy S, Hanna M, Anderson P, McLennan G, Repacholi M. An evaluation of the copper-bromide laser for treating telangiectasia. *Dermatol Surg* 1996;22:551-7.
- Angermeier MC. Treatment of facial vascular lesions with intense pulsed light. *J Cutan Laser Ther* 1999;1:95-100.
- Goldberg DJ, Meine J. Treatment of facial telangiectases with a diode laser. *Dermatol Surg* 1998;24:916-8.
- Goldberg DJ, Meine JA. Comparison of four frequency-doubled Nd:YAG (532 nm) laser systems for the treatment of facial telangiectases. *Dermatol Surg* 1999;25:463-7.
- Sarradet DM, Hussain M, Goldberg DJ. Millisecond 1064-nm neodymium:YAG laser treatment of facial telangiectases. *Dermatol Surg* 2003;29:56-8.
- Kelly KM, Nanda VS, Nelson JS. Treatment of port-wine stain birth mark using the 1.5-msec pulsed dye laser at high fluence in conjunction with cryogen spray cooling. *Dermatol Surg* 2002;28:309-13.
- Geronemus RG. High-fluence modified pulsed dye laser photo-coagulation with dynamic cooling of port-wine stain in infancy. *Arch Dermatol* 2000;136:942-3.
- Tan E, Vinciullo C. Pulsed dye laser treatment of spider telangiectasia. *Australas J Dermatol* 1997;38:22-5.
- Buscalgia DA, Conte ET. Successful treatment of generalized essential telangiectasia with 585-nm flashlamp-pumped pulsed dye laser. *Cutis* 2001;67:107-8.
- Anderson RR, Parrish JA. Selective photothermolysis. precise microsurgery by selective absorption of pulsed radiation. *Science* 1983;220:524-7.