Comparative effectiveness of nonpurpuragenic 595-nm pulsed dye laser and microsecond 1064-nm neodymium:yttrium-aluminum-garnet laser for treatment of diffuse facial erythema: A double-blind randomized controlled trial

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Background: Facial erythema is a common symptom that responds to vascular laser treatment, but there are few comparative studies.

Objective: We sought to compare the effectiveness of microsecond 1064-nm neodymium:yttrium-aluminum-garnet (Nd:YAG) laser with nonpurpuragenic 595-nm pulsed dye laser (PDL) for diffuse facial erythema.

Methods: This was a split-face, double-blind randomized controlled trial. Bilateral cheeks received 4 treatments each at one month intervals with PDL or Nd:YAG. Spectrophotometer measurements, digital photographs, pain scores, and patient preferences were recorded.

Results: Sixteen patients enrolled and 2 dropped out. Fourteen patients, all skin types I to III, 57% women, mean age 42 years, completed the study and were analyzed. Spectrophotometer readings changed after both PDL (8.9%) and Nd:YAG (2.5%), but varied by treatment type, with PDL reducing facial redness 6.4% more from baseline than Nd:YAG (P = .0199; 95% confidence interval −11.6 to −1.2). Pain varied (P = .0028), with Nd:YAG associated with less pain, at 3.07, than PDL at 3.87. Subjects rated redness as improved by 52% as a result of PDL, and 34% as a result of Nd:YAG (P = .031; 95% confidence interval −34.6 to −1.94). No serious adverse events were observed.

Limitations: Lasers settings are not standardized across devices.

Conclusion: Facial erythema is safely and effectively treated with PDL and Nd:YAG. Nonpupuragenic PDL may be more effective for lighter-skinned patients, but microsecond Nd:YAG may be less painful. (J Am Acad Dermatol 2013;69:438-43.)

Key words: comparative effectiveness research; dye; erythema; lasers; rosacea.

Persistent facial redness in the absence of individually resolvable large-caliber telangiectasia, also characterized as diffuse facial redness or erythematotelangiectatic rosacea, is an extremely common condition in adults. Possibly exacerbated by photodamage, facial redness is

Abbreviations used:

CI:	confidence interval
IPL:	intense pulsed light
Nd:YAG:	neodymium:yttrium-aluminum-garnet
PDL:	pulsed dye laser

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more visible in Caucasian patients, typically as confluent erythema of the nose and cheeks, and often of the chin and forehead.

Prior research on the use of lasers and light devices for the vascular manifestations of rosacea and photodamage has focused on the treatment of individually resolvable telangiectasia, rather than diffuse redness.[1-7] But erythema alone is a very common concern, and one that requires slightly different treatment approaches. At present, the 2 laser and light devices most typically used to address facial erythema are pulsed dye laser (PDL) and intense pulsed light (IPL). It has been shown that diffuse redness can be treated with nonpurpuragenic PDL, which is very tolerable to patients[8]; in addition, Neuhaus et al[9] have shown that IPL is approximately as effective as PDL for resolution of diffuse erythema.

CAPSULE SUMMARY

- Vascular lasers can be used to reduce facial erythema in the absence of discernable telangiectasia.
- Under selected conditions, nonpurpuragenic 595-nm pulsed dye laser is more effective for reducing facial redness than microsecond 1064-nm neodymium:yttrium-aluminum-garnet.
- However, neodymium:yttrium-aluminum-garnet is less painful and may have special use for darker-skinned patients.

Recently, other vascular laser devices have become available. Among these are microsecond neodymium:yttrium-aluminum-garnet (Nd:YAG), which are potentially less painful for patients and less risky than traditional millisecond Nd:YAG devices, which are known to be effective for various cutaneous vascular lesions.[10-13] The purpose of this study is to compare the effectiveness of microsecond Nd:YAG with that of nonpurpuragenic PDL, for treatment of diffuse facial erythema.

METHODS

Study design

This was a randomized controlled split-face study with allocation ratio 1:1, using random block size of 2. The unit of randomization was the individual facial side. The study was approved by the Northwestern University Institutional Review Board, and was registered with www.clinicaltrials.gov on February 7, 2012 (NCT01529996).

Subject selection

Subjects were selected from an urban, university-based outpatient center (Department of Dermatology, Northwestern University, Chicago, IL) and the surrounding community. Inclusion criteria included patients aged 18 to 55 years with erythematotelangiectatic rosacea, and in otherwise good health. Those with acute inflammatory papules, pustules, or vesicles of the central aspect of face were excluded, as were those with facial telangiectasis greater than 2 mm in diameter. All subjects provided written informed consent.

Study devices

Two laser devices were used for the 2 arms of the study, respectively. The PDL (595 nm, VBeam, Candela/Syneron, Wayland, MA) settings were: fluence, 7.5 J/cm^2; spot size, 10 mm; pulse duration, 6 milliseconds; dynamic cooling device (DCD), 30 milliseconds/20 milliseconds; and passes, 1 with overlap of 15%. The Nd:YAG laser (Genesis module, 1064 nm, Excel V, Cutera, Brisbane, CA) settings were: fluence, 6 J/cm^2; spot size, 8 mm; pulse duration, 0.3 milliseconds; and each region treated to maintain temperature in 39-to-43°C range for 90 seconds. The settings selected were standard settings, including published guidelines and company-recommended procedures, for the treatment of diffuse erythema with the said devices at the time of the study.[14,15]

Study procedures

Bilateral cheeks were treated, with sides randomized to receive treatment with PDL or Nd:YAG, respectively. Four treatments were delivered per side, at 3- to 4-week intervals, with pain scores recorded. Standard digital photographs and erythema measurements with spectrophotometer were obtained at baseline, and 1 month after the final treatment, when subjects also completed a satisfaction questionnaire and selected their preferred side. Patient-reported adverse events, and events observed by the investigator (N. V.), were recorded at each visit. All data were collected at Department of Dermatology, Northwestern University, Chicago, IL.

Topical skin conditioning

Treatment areas were wiped with 70% isopropyl alcohol before treatment. No topical anesthetic was used. A thin layer of petrolatum was applied post-treatment. All subjects were advised to wash their faces not more than twice a day for 2 days thereafter.

Randomization protocol

A random number generator was used to generate 0s and 1s, which were designated as left or right.