



# Laser and Light Treatments for Rosacea

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Rosacea is a chronic cutaneous disorder characterized by a remitting and relapsing clinical course. Clinical symptoms of rosacea include facial erythema, telangiectasia, flushing, papule and pustule formation, and, rarely, rhinophyma. Although pharmacologic agents have remained the mainstay of treatment, laser and light sources have a key role in the management of telangiectatic and erythematous components of rosacea. This article reviews current treatments for managing specific rosacea symptoms using lasers and light.

A disorder of unknown etiology, rosacea can manifest in both the eyes and skin. Although there is overlap with the clinical presentation of acne, rosacea is a disorder with its own clinically distinct spectrum of cutaneous disease. Rosacea results from dysfunction of inflammatory, vascular, and immunomodulatory origins, which sets the stage for a clinical constellation of symptoms, including facial flushing, the appearance of telangiectatic blood vessels with persistent redness of the face, and the development of inflammatory papules and pustules.<sup>1</sup>

Because each type of rosacea responds differently to treatment, it is useful to subdivide the disorder based on clinical findings, which include any combination of facial erythema; prominent telangiectases; papules and pustules; and the late, rare finding of rhinophyma. Rosacea is characterized uniquely by episodic flushing of affected areas, which may be associated with stress, sun exposure, menstrual cycles, alcohol ingestion, temperature change, or the consumption of spicy foods. Occasionally, ocular manifestations may precede skin involvement thereby delaying diagnosis. Ocular disease is present in as many as 50% of patients clinically diagnosed with rosacea.<sup>2</sup>

Rosacea occurs most commonly in patients aged 30 to 50 years.<sup>3</sup> Skin involvement in rosacea is characterized by blotchy or diffuse erythema; the formation of telangiectases, papules, and pustules; and sebaceous gland hypertrophy.<sup>4</sup> The lesions typically are most pronounced on the

central face but may appear on the neck and chest. The course of rosacea typically is chronic, with remissions and relapses punctuated by episodes of acute inflammation. Rosacea is distinguished from acne by the absence of comedones and its confinement to flush areas of the body. Acne vulgaris commonly involves the back and chest, as well as the face, while rosacea usually is limited to the face. In addition, the hypertrophic changes seen in patients with rosacea are not features of acne vulgaris.<sup>4</sup> Rhinophyma, an irregular thickening of the skin on the nose with follicular dilation, may be a complication of long-standing rosacea involvement and is more common in men than in women.

Despite multiple theories, the cause of rosacea remains unknown. Proposed etiologies include gastrointestinal, psychological, infectious, and environmental causes.<sup>5</sup> Berg and Linden<sup>6</sup> in their epidemiology review, have not demonstrated consistent gastrointestinal symptoms in patients with rosacea.<sup>6</sup> Similarly, neither a distinct psychological abnormality nor a pharmacological mechanism has been isolated in patients with rosacea. In the past, *Demodex folliculorum* has been considered a causative agent of rosacea. This organism feeds on sebum and, in some cases, treatment of *Demodex* infestation has been correlated with improvement in rosacea.<sup>7</sup> A bacterial cause for the disease has been hypothesized, but no consistent single causative bacterium has been identified.<sup>8</sup>

Successful management of rosacea involves a close physician-patient dialogue. Patients must be advised that control rather than cure is the goal of therapy. Identification and avoidance of known triggers is critical. In individual cases, this may include avoiding exposure to extreme heat/cold and excessive sunlight, as well as avoiding consumption of hot beverages, alcohol, caffeine, and spicy foods.

Patients with a principally papulopustular presentation can benefit greatly from both topical and oral antibiotic therapy. Topical metronidazole can be effective in substantially reducing inflammatory lesions.<sup>9</sup> For more severe presentations of rosacea, the mainstays of treatment are oral tetracyclines, though the mechanism of action is not understood entirely.<sup>10</sup> Patients that are

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## AESTHETIC TECHNOLOGY

unable to take tetracycline may benefit from erythromycin. Oral isotretinoin in doses similar to those used for acne vulgaris also has been effective for treating inflammatory lesions, erythema, and rhinophyma.<sup>11</sup> Clonidine also may reduce facial flushing.<sup>12</sup> For patients with discrete telangiectatic lesions with persistent erythema, laser- and light-based therapies offer good cosmetic improvement; however, it is important to inform patients that while their appearance will improve with laser treatments, the underlying disorder persists.

The precise treatment of vascular lesions by the destruction of target chromophores is described by Anderson and Parrish's<sup>13</sup> theory of selective photothermolysis. By targeting a pigmented chromophore in the skin with the use of precise laser wavelengths at specific pulse durations, the object can be ablated precisely without damage to bystander tissue. This theory was implicated initially in the treatment of port-wine stains in children. The technology was adapted thereafter for the treatment of cosmetic vascular lesions.<sup>13</sup>

In one of the initial articles on laser treatment of rosacea, Lowe et al<sup>14</sup> reported a study of 27 patients who received 1 to 3 treatments with a flashlamp-pumped pulsed dye laser (PDL) tuned at 585 nm for telangiectases and erythema. Laser treatment resulted in good or excellent overall appearance and reduction of telangiectases and erythema in 89% (24/27) of patients. The authors noted that patients with the most severe pretreatment activity had the most improvement.<sup>14</sup> Other studies using the 595-nm laser at purpuragenic fluences for telangiectases and erythema proved to be equally efficacious and safe.<sup>15</sup>

The development of substantial posttreatment purpura was one of the first major issues associated with using the 585-nm PDL for the treatment of facial telangiectases. Alam et al<sup>16</sup> reported a prospective, randomized, controlled, nonblinded trial in which 11 patients received variable-pulse PDL treatment with and without the induction of purpura. Treatment parameters were a 7-mm spot size and 10-millisecond pulse duration. Purpura-free treatment entailed a fluence 1.0 J/cm<sup>2</sup> less than the purpura threshold and purpura-level treatment entailed a fluence 0.5 J/cm<sup>2</sup> greater than the purpura threshold. Each of the 11 subjects had 2 areas on either side of the facial midline with equivalent telangiectasis density ratings randomized to the purpura and purpura-free treatment groups. In 82% (9/11) of the treated patients, both investigators and patients rated the purpura side as undergoing a greater reduction in telangiectasia density. The authors concluded the following: "Although

facial telangiectasia [sic] do improve after a single purpura-free treatment with the variable-pulse PDL [used abbreviation], they improve more after purpura is induced."<sup>16</sup>

Clark et al<sup>17</sup> also reported on laser treatment of rosacea with a PDL. Twelve patients with erythema and telangiectases received 1 to 6 treatments with a 585-nm PDL at fluences of 5.5 to 6.5 J/cm<sup>2</sup>. The result was substantial improvement in the appearance of erythema and telangiectases.<sup>17</sup> Jasim and colleagues<sup>18</sup> conducted a study of 12 patients with rosacea-associated telangiectases treated with a long-pulsed PDL at 595 nm at subpurpuric thresholds, with fluences ranging from 7 to 9 J/cm<sup>2</sup>. Of the 12 patients treated, 75% (9/12) reported more than 25% improvement in their appearance after a single treatment.<sup>18</sup> Although efficacy may be reduced slightly with treatment at purpuric dosing regimens, patient compliance at subpurpuric fluences is improved.

Currently, monochromatic (single wavelength) lasers in the visible spectrum that target oxyhemoglobin include the long-pulsed potassium-titanyl-phosphate device, which utilizes green light in the 532-nm range, and the PDL, which utilizes yellow light at wavelengths of 585 to 595 nm. Available polychromatic (multiple wavelength) light devices are intense pulsed light sources.

Mark et al<sup>19</sup> reported on the degree of improvement in 4 patients with rosacea-associated erythema and telangiectases who received treatment 5 times at 3-week intervals with the PhotoDerm<sup>®</sup> VL. The device was used with a 515-nm filter, a single pulse duration of 3 milliseconds, and assorted fluences. The study objectively measured 3 main parameters: blood flow, telangiectases, and erythema. Blood flow was measured by the scanning laser Doppler, while telangiectases and erythema were measured with close-up photography and computer image analysis. Measurements were taken at baseline and 1 month after the last treatment. The scanning laser Doppler demonstrated a 30% decrease in blood flow ( $P < .05$ ), a 29% decrease in area of the cheek affected by telangiectasia ( $P < .05$ ), and a 21% decrease in erythema intensity ( $P < .05$ ).<sup>19</sup>

In the rare end-stage disease state of rhinophymatous rosacea, ablative laser therapy remains a mainstay of treatment.<sup>20</sup> Various techniques, including electrocautery, CO<sub>2</sub> laser ablation, and dermabrasion, have been used with good results. Each of these therapies can provide improved cosmetic results. The final result depends mostly on the laser surgeon rather than the specific technology.

Despite many theories and speculations on the etiology of rosacea, it remains a poorly understood, chronic disorder that affects a large population. Although the

identification and avoidance of triggers, as well as pharmacologic treatments, remain the mainstays of treatment, the judicious use of laser and light can offer patients substantial cosmetic improvement.

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