

Lights and lasers have received immense attention in the management of acne in the past five years. They have been discovered to be effective in inflammatory acne through two mechanisms, namely: their biological effects on *P. acnes* and thermal effects on sebaceous glands.^[1] Lasers that emit wavelengths in the visible light spectrum (400–700 nm) take therapeutic advantage of the Q-band absorption peaks (500–700 nm) of porphyrins stored within *P. acnes* and the subsequent self-destruction of the bacteria.^[2] In addition, long-wavelength, near- and mid-infrared lasers cause photothermal damage to the sebaceous glands as a result of a deeper penetration.^[3] Conventional UVA and UVB light treatments have little or no acne activity.^[1]

Blue-light has the most effective visible wave-length for photoactivation of *P. acnes* endogenous porphyrin components because the 407–420 nm band has the strongest porphyrin photoexcitation coefficient.^[1] Red-light (660 nm) is less effective at activating porphyrins, but it penetrates deeper into the tissue.^[1] Red-light, on the other hand, may have anti-inflammatory properties by influencing cytokine release from macrophages that stimulate fibroblast proliferation and the production of growth factors, and by influencing the process of inflammation, healing, and wound repair.^[4,5] Phototherapy with mixed red–blue light may act synergistically, improving both inflammatory and comedonal acne by combining antibacterial and anti-inflammatory actions; however, the differences are not statistically significant.^[4,5]

Photodynamic therapy (PDT): PDT is more effective than lights alone. The rationale is based on the knowledge that aminolevulinic acid (ALA) is preferentially taken up by the pilosebaceous units and metabolized in the heme synthesis pathway to produce a buildup of protoporphyrin IX (PpIX), a potent photosensitizer.^[1] Once activated by light, PpIX produces singlet oxygen and free radicals that cause damage to the mitochondria, nuclei, and cell membranes.^[1] ALA-PDT can be done with many light sources. ALA is applied on the areas to be treated as a 20% cream. The light sources can be: red-light from a diode laser (635 nm, 25 mW/cm²), pulse excimer dye laser (634 nm, 5 J/cm²), or a broadband halogen source (600–700 nm, 13 J/cm²).^[1] ALA-PDT

offers a unique way of improving acne by selectively damaging the pilosebaceous units and killing *P. acnes*. There is little damage to the surrounding skin, and it produces prompt and sustained improvement even in nodular and cystic acne.^[6] Side effects of ALA-PDT include discomfort during treatment, transient hyperpigmentation, exfoliative erythema, crust formation, and photosensitivity.^[1] The exfoliative erythema and crust formation are typically severe enough to compromise the patient physically and socially for up to two weeks. Another PDT approach is to combine indocyanine green dye (ICG) which is applied topically and combined with a diode laser in a low- or high-power mode to cause photothermal damage to the sebaceous glands.

Lasers that have been tried in acne include: 532-nm KTP, 585-nm and 595-nm pulse dye (PDL), 810-nm and 980-nm Diode, 1064-nm and 1320-nm Nd:YAG, 1450-nm Diode, 1540-nm Erbium-Glass, and Intense Pulse Light (IPL). Some of these lasers, the long-wave, mid-infrared, were developed for facial rejuvenation and have now found place in acne treatment. In particular, 1450-nm Diode seems more popular compared to other laser options. In a pilot study, 14 of 15 patients who had four sittings at three weeks interval with 1450-nm diode laser (18 J/cm²) had a significant and sustained reduction of lesion counts up to six months following the final treatment.^[7]

Laser irradiation is known to promote collagen remodeling and this effect has been successfully employed in improving acne scars.^[8-10] Fractional thermolysis (Fraxel laser) is a novel concept in treatment of acne scars and appears to be very promising.^[11,12]

LASERS AND LIGHTS IN ACNE THERAPY

- Target porphyrins in *P. acnes* through biological effect and sebaceous glands through thermal effects.
- Moderately effective in inflammatory acne.
- Ineffective in comedonal acne.
- Improve superficial boxcar and ice-pick scars

It will be a while before light and laser treatments for acne become viable, cost effective, and popular in India. And when they do, only then we will know

how suitable they are for our particular skin types, and how they compare with other available treatment options? The early indications are that they are only moderately effective in inflammatory acne, not at all effective in comedonal acne, and at best improve superficial boxcar scars and ice-pick scars.

REFERENCES

1. Nouri K, Villafradez-Diaz LM. Light/ laser therapy in the treatment of acne vulgaris. *J Cosmetic Sci* 2005;4:318-20.
2. Cunliffe WJ, Goulden V. Phototherapy and acne vulgaris. *Br J Dermatol* 2000;142:855-6.
3. Lloyd JR, Mirkov M. Selective photothermolysis of the sebaceous glands for acne treatment. *Lasers Surg Med* 2002;31:115-20.
4. Charakida A, Seaton ED, Charakida M, Mouser P, Avgerinos A, Chu AC. Phototherapy in the treatment of acne vulgaris. *Am J Clin Dermatol* 2004;5:211-6.
5. Fien S, Ballard CJ, Nouri K. Multiple modalities to treat acne: A review of lights, lasers, and radiofrequency. *Cosmetic Dermatol* 2004;17:789-93.
6. Hongcharu W, Taylor CR, Chang Y, Aghassi D, Suthamjariya K, Anderson RR. Topical ALA-photodynamic therapy for the treatment of acne vulgaris. *J Invest Dermatol* 2000;115:183-92.
7. Paithankar D, Ross V, Blair M, Graham B. Acne treatment with a 1450 nm wavelength laser and cryogen spray cooling. *Laser Surg Med* 2002;31:106-14.
8. Sadick N, Schechter A. A preliminary study of utilization of the 1320-nm Nd:YAG laser for the treatment of acne scarring. *Dermatol Surg* 2004;30:995-1000.
9. Rogachefsky AS, Hussain M, Goldberg DJ. Atrophic and a mixed pattern of acne scars improved with a 1320-nm Nd:YAG laser. *Dermatol Surg* 2003;29:904-8.
10. Woo SH, Park JH, Kye YC. Resurfacing of different types of facial acne scar with short-pulsed, variable-pulsed, and dual mode Er:YAG laser. *Dermatol Surg* 2004;30:488-93.
11. Hasegawa T, Matsukura T, Mizuno Y, Suga Y, Ogawa H, Ikeda S. Clinical trial of a laser device called fractional photothermolysis system for acne scars. *J Dermatol* 2006;33:623-7.
12. Alster TS, Tanzi EL, Lazarus M. The use of fractional laser photothermolysis for the treatment of atrophic scars. *Dermatol Surg* 2007;33:295-9.