

Shedding Light: Nonablative Lasers -- Fountain of Youth or High-tech Snake Oil?

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Without a doubt, nonablative lasers have become outrageously popular over the past 2-3 years, with both laser practitioners and consumers clamoring to try out the next latest thing in cosmetic skin care. Laser companies have popularized them as a new fountain of youth, capable of erasing wrinkles without the lengthy recovery time and painful side effects seen with conventional ablative laser skin resurfacing. But does nonablative photorejuvenation really work? And what exactly *is* photorejuvenation in the first place? The efficacy (or lack thereof) of nonablative lasers and IPLs became one of the hottest topics of the conference -- a theme that was revisited time and again.

Robert A. Weiss, MD,^[2] of the Maryland Laser, Skin, and Vein Institute, Hunt Valley, Maryland, and his expert panel of colleagues defined nonablative photorejuvenation as consisting of 2 major components: (1) removal of the epidermal signs of photodamage such as mottled pigmentation (lentiginos, ephelides) and telangiectases; and (2) nonablative dermal remodeling.

The former component is hardly new, since lasers have been used to lighten epidermal pigment and vascular lesions for decades. Lasers such as the pulsed-dye, 532-nm Nd:YAG and IPLs are well absorbed by both melanin and hemoglobin, and can therefore significantly improve the epidermal components of photoaging. This improvement should be distinguished from the dermal remodeling and wrinkle flattening seen with ablative lasers such as the CO₂ and erbium.

In contrast, the more recent concept of nonablative dermal remodeling was first characterized in the late 1990s, when Zelickson, Kilmer, and colleagues^[3] incidentally noted the subtle softening of wrinkles in areas treated with conventional pulsed-dye laser therapy for telangiectases. This skin tightening is thought to result from laser-induced collagen neosynthesis and remodeling, and can be achieved with a variety of visible light (eg, pulsed dye, IPLs) and nonpurpura-inducing infrared lasers. Nonablative lasers currently marketed for nonablative dermal remodeling include the pulsed-dye laser (585-600 nm), 1064-nm and 1320-nm neodymium:YAGs, 1450-nm diode, and 1540-nm erbium:glass.^[4-6] These lasers all use a combination of cryogen or contact cooling and beam focusing to achieve selective dermal heating while sparing the epidermis.

As outlined by Brian Zelickson, MD, Professor, Department of Dermatology, University of Minnesota, Minneapolis, nonablative photorejuvenation lasers and IPLs should target 3 main components of the skin: dermal collagen and ground substance; ectatic blood vessels; and irregular pigmentation. Despite initial controversy, these lasers do indeed appear to alter dermal collagen structure, increasing dermal collagen density in a durable fashion. This is mediated, at least in part, by thermal induction of collagen neosynthesis and remodeling, as evidenced by posttreatment histology and increased dermal levels of collagen N-terminal propeptide (PIIINP), collagen types I and II, elastin, and collagenase (MMP-1).^[7]

Unfortunately, clinical data in support of nonablative lasers and light sources for wrinkle and acne scar treatment remain unimpressive. Despite a series of lectures and dozens of research presentations dedicated to the subject, results at this year's ASLMS often failed to impress the audience. Some before-and-after slides elicited puzzled expressions, while others triggered sporadic laughter. As one attendee murmured during a presentation, "I can't tell any of the before from the after." Popular infrared nonablative lasers such as the 1320-nm Nd:YAG (*CoolTouch*; ICN Pharmaceuticals Inc; Costa Mesa, California) and 1450-nm diode (*Smoothbeam*; Candela Corporation; Wayland, Massachusetts) were analyzed for indications including the treatment of perioral and periorbital rhytides, acne scarring, and even neck creases, yet results were uniformly modest at best. Study results were often limited by small sample size, lack of controls, and lack of objective measurement.

In an attempt to address this latter limitation, Paul Friedman, MD, Director of Laser Surgery, DermSurgery Associates, Houston, Texas; Roy Geronemus, MD, Director, Laser and Skin Surgery Center of New York, and Clinical Professor of Dermatology, New York University; and colleagues^[8] presented study results incorporating a recently developed 3-dimensional topographical imaging technique. The *Primos* imaging system (GFM; Tetlow, Germany) can be used to generate 3-D virtual models of the skin surface at variable time points, allowing investigators to compare surface microtopography in an objective, quantifiable manner.

Dr. Friedman presented *Primos* data^[9] from 2 patients (1 with acne scarring, 1 with rhytides) who had been treated with a 1064-nm Q-switched Nd:YAG laser (5 treatment sessions, spaced at monthly intervals). At 6-month follow-up, objective skin roughness had decreased 26% in the patient with rhytides and 33% in the patient with acne scarring. In a related presentation, Drs. Tanzi and Alster^[10] used the *Primos* system to demonstrate modest improvement in facial acne scars treated with either the 1450-nm diode or 1320-nm Nd:YAG lasers.

Such attempts to quantify subtle differences in skin texture are important, because they provide an objective means for analyzing treatment efficacy. Nevertheless, one has to wonder: If nonablative laser treatment of rhytides and scars can be validated only with the *Primos* imaging technique, how good can the results be?

Despite a fair share of cynicism, nonablative lasers still managed to generate the expected conference buzz, in large part due to a novel treatment idea. E.V. Ross, MD, and M.A. Blair, MD,^[11] Dermatology Department, Naval Medical Center, San Diego, California, presented impressive preliminary results from a small pilot study^[12] in which they used a 1450-nm diode laser (*Smoothbeam*; Candela) to treat active papular and pustular acne. Twenty-four volunteers with acne on their backs received 4 treatments, given at 3- to 4-week intervals. Patients experienced a statistically significant reduction in acne lesion counts in treated areas, noted at 6 and 12 weeks after the last treatment. Histologic analysis of the treated areas revealed sebaceous gland necrosis involving both sebocytes and duct epithelium. Larger studies are pending, but if these results are durable and reproducible, a new, highly effective therapeutic approach for acne treatment may be on the horizon.

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