

INTENSE PULSED LIGHT FOR DRY EYE DISEASE

This procedure improves the health of the meibomian glands.

BY ROLANDO TOYOS, MD



Two decades ago, many doctors considered patients with dry eye disease (DED) a bother and did their best to weed these individuals out of their practices. Few physicians wanted to spend hours dealing with the most common cause of DED, meibomian gland dysfunction (MGD). The advent of LASIK and other refractive cataract procedures led

ophthalmologists to realize that an unhealthy tear film can severely compromise the results of even the best surgeries. When the FDA approved cyclosporine ophthalmic emulsion 0.05% (Restasis; Allergan), the agency suggested to physicians that DED could be treated with more than just artificial tears, warm compresses, and lid scrubs. One such option is intense pulsed light (IPL) therapy.

DISCOVERY

In 2001, I began to incorporate aesthetics into my general ophthalmology practice. I used IPL to coagulate the abnormal telangiectasias of the skin seen in patients with rosacea and to perform facial rejuvenation. Some of my patients with MGD reported that IPL had not only improved their skin but also, surprisingly, their DED symptoms. As I studied their eyelids, meibomian glands, and tear film, I discovered that the IPL had indeed improved the signs and symptoms of DED as well as the health of the ocular surface. My colleagues and I began researching the causes of the improvement and how to optimize the effectiveness of IPL treatment for DED.

IPL uses a xenon flash lamp to produce light in the 500- to 1,000-nm wavelength range that can be pulsed and filtered to allow specific wavelengths of energy to be released. We discovered that specific wavelengths, fluences, and pulses improved meibomian gland function in DED patients. Over time, we became able to treat a wide range of MGD patients successfully by programming specific parameters and instituting a proven protocol with IPL (Figure).

PROTOCOL AND SYSTEMS

In my experience, the best protocol is for patients with MGD to receive IPL treatment from tragus to tragus,

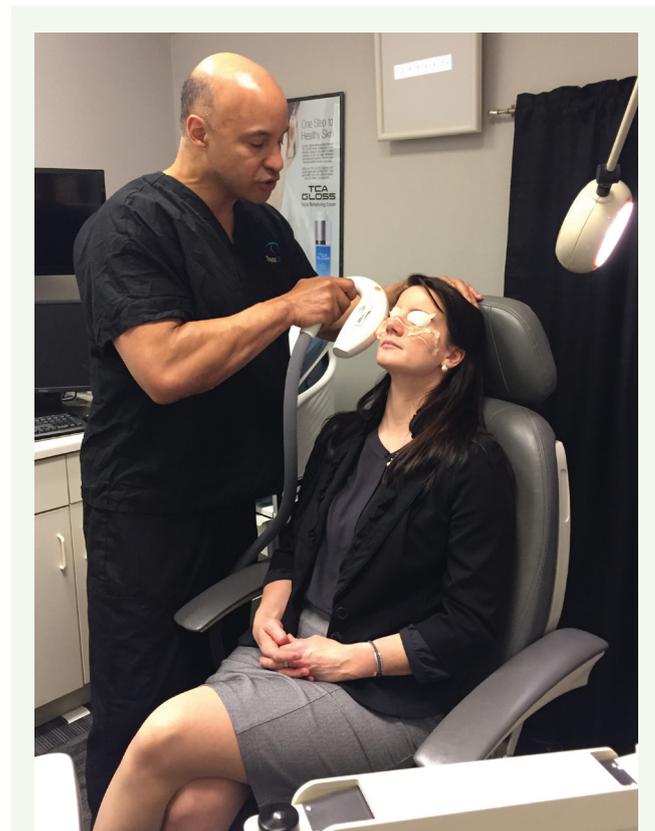


Figure. Dr. Toyos prepares to administer IPL treatment.

including the lids, a few times over the course of 4 months. Not all IPL technologies have the ability to deliver treatment around the lids, because the systems are unable to control the energy and pulses and are not ergonomically designed to maneuver around the lid margins. Also, most IPL technologies lose their ability to consistently provide the specific power programmed. For example, the operator may program an IPL system to deliver 14 J/cm², but after several more uses, the energy level delivered is less than the programmed energy level. In my experience with other IPL systems, I would have to raise the programmed energy levels with increased use to achieve the desired outcome.



AT A GLANCE

- After administering intense pulsed light (IPL) as an aesthetic treatment, Dr. Toyos discovered that the procedure also improved his patients' signs and symptoms of dry eye disease.
- In Dr. Toyos' experience, the best protocol is to apply therapy from tragus to tragus, including the eyelids, but not all IPL systems are capable of this approach.
- IPL's mechanisms of action include killing microorganisms, heating the thick secretions characteristic of meibomian gland dysfunction to facilitate manual expression, and photomodulation.

I use the Lumenis M22 with Optimal Pulse Technology (Lumenis), because I am confident that the energy level programmed will be the energy produced. The consistency of the system has allowed me to program parameters that I have found, with 15 years of experience, to work more than 95% of the time in select patients with DED. Surgeons whom I have trained have found similar success rates with my IPL parameters and protocols.

MECHANISMS OF ACTION

Understanding of the multiple mechanisms through which IPL benefits DED patients has evolved as knowledge of the disease and technology have advanced. One important characteristic of IPL is its ability to kill microorganisms. An IPL robot called the Xenex is now being used to disinfect ORs and hospitals and was a critical part of controlling the Ebola outbreak.^{1,2}

Overgrowth of bacteria and *Demodex* is a hallmark of MGD, and studies show that IPL improves the signs of blepharitis. Also, IPL warms the dermis to temperatures up to 43° C, thus melting the thick secretions produced by patients suffering from MGD and allowing me to manually express the glands easily. I find that heat-assisted gland expression helps to relieve some of the signs and symptoms of DED but does not change the overall function of the glands.

Certain wavelengths of light at specific fluences can stimulate cells and glands to function normally. This process is called *photomodulation*. Importantly, several articles have demonstrated that IPL stimulates fibroblasts in skin to produce more collagen.^{3,4} I believe that the cells of meibomian glands are also stimulated by IPL. Over time, researchers and practitioners will learn more about all



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of the morphological changes that occur to the skin and glands of patients undergoing the procedure.

CONCLUSION

Last year, several published research articles demonstrated that IPL improves the signs and symptoms of DED.^{5,6} As the technology advances, so will the success rate and adoption of the procedure. In his book *Transcend*, futurist Ray Kurzweil, PhD, famously pointed out that it takes 15 years for a medical breakthrough to become the standard of care. I introduced IPL for DED in 2001. Perhaps the procedure is hitting Dr. Kurzweil's tipping point. ■

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