

Micropulse Laser Trabeculoplasty

A new treatment modality offers efficacy, comfort, and selectivity on a practical, multiuse platform.

BY ANDREW G. IWACH, MD

The clinical management of glaucoma is evolving, thanks to changes in population demographics, a growing understanding of the disease, and, most importantly, advances in both pharmaceutical and laser technology. Medicare claims data show that the number of trabeculectomies performed has decreased by 44% in the decade since latanoprost was introduced. Better medical therapy has meant fewer filtering surgeries, despite an aging population. Since 2001, the year that selective laser trabeculoplasty (SLT) was approved, physicians' use of the laser trabeculoplasty code has more than doubled.¹

A new option in glaucoma treatment is micropulse laser trabeculoplasty (MLT). The procedure is performed with the Iridex IQ810 810-nm laser (Iridex Corporation, Mountain View, CA), a multifunctional laser system. The platform has many other applications for ophthalmology, including transscleral cyclophotocoagulation (see *The G-Probe: Cyclophotocoagulation Performed in the Clinic*), pan-retinal photocoagulation, iridotomy, and laser suture lysis. Some surgeons have expressed concern that the 810-nm laser cannot cut certain sutures, because the laser energy is not absorbed well by deep red suture material. In my experience, however, this laser works as well as an argon laser for suture lysis.

THE BENEFITS OF LASER THERAPY

Continued improvements in laser therapy for glaucoma can only benefit patients. This form of treatment continues to be an attractive alternative or adjunct to medical therapy for a number of reasons.

Even today's first-line medications—the prostaglandin analogs—have some side effects. Hyperemia and lash growth are generally considered to be minor, cosmetic problems. Red eyes, however, can be a liability for young patients who are still working. Moreover, although most people enjoy having long, thick eyelashes, the number of

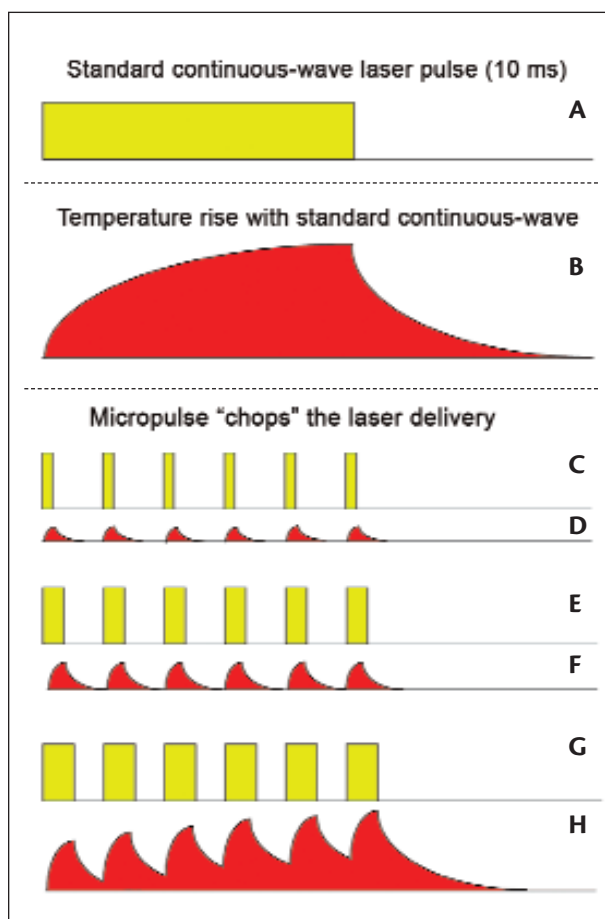


Figure 1. With a standard continuous-wave laser pulse (A), the temperature rises considerably throughout the pulse (B). Micropulsing chops the pulse's delivery into short bursts (C, E, G), and the thermal increase is controlled by the "on" and "off" times within each micropulse (D, F, H), thus resulting in cellular thermal injury rather than cellular death. Micropulse settings are approximately 0.3 milliseconds on and 1.7 milliseconds off.

THE G-PROBE: CYCLOPHOTOCOAGULATION PERFORMED IN THE CLINIC

By Richard A. Lewis, MD

Although not discussed or studied as often as trabeculectomy and not as exciting as the new canal-based procedures, cyclophotocoagulation remains an important therapeutic option in the management of glaucoma. This technique lowers IOP by disrupting aqueous production in the ciliary body by means of the application of laser energy either through the sclera (the transscleral approach) or directly to the ciliary processes (with an endoscope). I find cyclophotocoagulation useful in a variety of clinical settings, including blind, painful eyes and aphakic eyes. The procedure is also appropriate for certain high-risk surgical patients and those who cannot medically tolerate incisional glaucoma surgery.

THE G-PROBE

Currently, the least expensive and most practical approach to cyclophotocoagulation uses the G-Probe with the Iridex IQ810 laser (Iridex Corporation, Mountain View, CA) attached to a slit lamp (Figure 1). This diode laser's portability permits its use in a clinic's treatment room or the operating suite. With proper care of its cable and tip, the G-Probe can be used repeatedly. Furthermore, the Iridex IQ810 laser has multiple applications in glaucoma, including micropulse laser trabeculoplasty and laser suture lysis.

I have found the G-Probe to be a wonderful aid during transscleral cyclophotocoagulation. It provides a limbal guide to the placement of the laser treatment over the ciliary processes. An instructional video produced by Douglas Gaasterland, MD, on the procedure is a wonderful step-by-step reference (available from Iridex Corporation with the purchase of the Iridex IQ810 laser).

MY TECHNIQUE

I perform cyclophotocoagulation in the office at the slit lamp. After obtaining informed consent, I place a lid speculum and administer a retrobulbar injection of 3 to 5 mL of lidocaine. Next, I apply laser energy with the G-Probe over 180° in the inferior limbus. Although the spot size is fixed with the G-Probe, the energy can be adjusted starting at 1,500 mW with a duration of 2,000 milliseconds. When applying the laser energy, I listen for a "pop" and will increase the energy until I hear it.

After eight applications, I perform a subconjunctival injection of Decadron (Merck & Co, Inc., Whitehouse Station, NJ), place an eye patch, and send patients home with instructions to use prednisolone acetate q.i.d. for 2 weeks. Their discomfort is minimal, and the procedure is

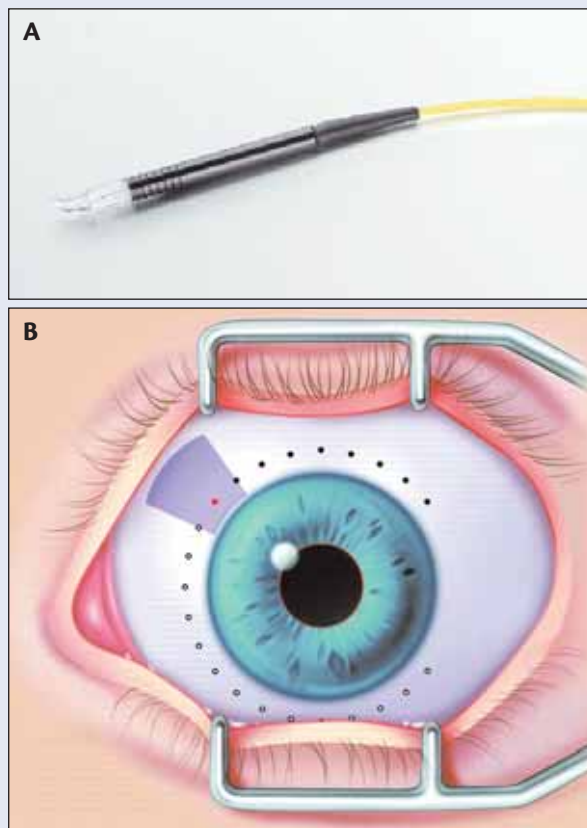


Figure 1. Using the G-Probe (A), the surgeon applies laser energy over 180° using six to eight spots (B).

well tolerated. If their IOP does not drop sufficiently, I will repeat cyclophotocoagulation at 2 months by placing an additional eight spots for 180° along the temporal limbus (leaving 90° untouched).

CONCLUSION

Cyclophotocoagulation is a valuable option for managing my patients' glaucoma. The Iridex IQ810 laser—with its multiple uses (trabeculoplasty, suture lysis, iridoplasty, and cyclophotocoagulation)—is a very practical laser for the glaucoma specialist.

Richard A. Lewis, MD, is in private practice in Sacramento, California. He acknowledged no financial interest in the product or company mentioned herein. Dr. Lewis may be reached at (916) 649-1515; rlewiseyemd@yahoo.com.



TABLE 1. DR. IWACH'S PRELIMINARY RESULTS WITH MLT

Patient	Age, y	Eye	Diagnosis	Prior Laser	Preoperative Medications	Preoperative IOP	Last Follow-Up, wk	IOP at Last Follow-Up
1	71	OD	OAG/PDS	None	3	14 mm Hg	4	11 mm Hg
1	71	OS	OAG/PDS	ALT	3	13.5 mm Hg	2	11 mm Hg
2	74	OD	OAG	SLT 360 X2	3	15 mm Hg	2	12 mm Hg
3	68	OD	OAG	None	3	17 mm Hg	2	9 mm Hg
4	64	OD	OAG	None	3	22 mm Hg	3	16 mm Hg

Note: OAG = open-angle glaucoma, PDS = pigmentary dispersion syndrome.

cases of trichiasis in my practice has increased markedly, because extra lashes sometimes grow inward.

With pharmaceuticals, patients have the hassle and cost of instilling a medication every day for the rest of their lives, and their risk of glaucomatous progression increases if they fail to adhere to their prescribed regimen—a common problem. The data on the refill rates of glaucoma medications are abysmal. Six months after being filled initially, about half of glaucoma prescriptions are not refilled. The rate is similar for statin therapy, which also treats an asymptomatic disease.²

With any therapy—laser, medical, or surgical—physicians must perform a risk/benefit analysis. The Ocular Hypertension Treatment Study clearly demonstrated that reducing IOP decreased the risk of glaucomatous changes in the optic nerve and visual field. Approximately 90% of the untreated group in this study, however, did not progress.³

In reality, glaucomatous progression is typically slow. Many patients with risk factors such as elevated IOP or a family history of the disease never develop significant visual field loss. Of course, continued monitoring of these individuals is still critical.

Clinicians should minimize patients' risk of losing vision during their lifetime while also affecting their current quality of life as little as possible. MLT offers physicians the potential to do just that by lowering IOP with few side effects.

HOW MLT WORKS

MLT is similar to SLT in that both procedures aim to stimulate the trabecular meshwork while minimizing collateral damage to the surrounding structures. MLT is performed with a slit-lamp adaptor for the Iridex IQ810 laser.

The spot size in MLT is 300 μ m versus 400 μ m in SLT and 50 μ m in argon laser trabeculoplasty (ALT). The larger-spot procedures are easier and faster to perform than ALT.

The energy wavelength and pulse profile of MLT is quite different from anything else I have seen. ALT relies on continuous-wave energy that causes a significant thermal rise and permanently denatures the trabecular meshwork tissue. SLT avoids this problem by means of a very short pulse length. MLT uses a much longer pulse length than SLT, but the temperature rises slowly, because laser energy is deliv-

ered in short microbursts over an extended period of time (milliseconds versus nanoseconds for SLT).

Each time the surgeon depresses the foot pedal to deliver an individual pulse, what is actually delivered is a 300-millisecond envelope of 150 2-millisecond micropulses (Figure 1). Each micropulse consists of 0.3 milliseconds of laser on time (pulse width) and 1.7 milliseconds of laser off time (pulse interval). The micropulse width allows less time for the laser-induced heat to spread to adjacent tissues, thereby confining the thermal rise to the absorbing targeted trabecular meshwork tissue. I perform between 50 and 70 pulses over the entire height of the trabecular meshwork for each 180° with a power setting of 2,000 mW.

MLT has lowered IOP in the small cohort of patients I have treated thus far (Table 1). Although my data are very preliminary and follow-up is limited, I am now in the early stages of a planned larger study. As with any form of laser therapy, some complications are possible, but they are usually self-limited. I have observed no complications with MLT thus far in my practice.

CONCLUSION

MLT has the potential to save patients money, reduce my concern over their level of compliance with a prescribed drug regimen, and improve their quality of life compared with medical therapy. A definite benefit to glaucoma specialists and comprehensive ophthalmologists is that the Iridex IQ810 laser has multiple applications. I am hopeful that further study of MLT will demonstrate its efficacy. □

Andrew G. Iwach, MD, is Executive Director of the Glaucoma Center of San Francisco and Associate Clinical Professor of Ophthalmology at the University of California, San Francisco. He is on the speakers' bureau for Lumenis Inc. Dr. Iwach may be reached at (415) 981-2020; lowiop@earthlink.net.



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