

NEW LASER THERAPIES FOR GLAUCOMA



A valuable nonincisional strategy.

BY NISHA CHADHA, MD



Laser treatments for glaucoma provide non-incisional options for reducing IOP. These procedures target either aqueous outflow via treatment of the trabecular meshwork or aqueous inflow via treatment of the ciliary processes. Laser trabeculoplasty (LTP), involving the application of laser energy to the trabecular meshwork, provides an

alternative to medication for treating open-angle glaucoma. In contrast, transscleral cyclophotocoagulation (TSCPC), involving ablation of the ciliary processes, has traditionally been reserved for eyes with advanced glaucoma or refractory cases typically having failed medical and surgical management.

Recently, a new laser modality became available that offers unique versions of both LTP and cyclophotocoagulation. MicroPulse technology (Iridex) delivers pulsed energy over a designated duty cycle, allowing both “on” time for treatment as well as “off” time for tissue cooling. Because the laser is not designed to ablate or cause any thermal change to tissue, treatment is considered to be gentler



Figure 1. The 532-nm micropulse laser console.

than traditional laser therapies. Micropulse cyclophotocoagulation (MP-CPC) and micropulse laser trabeculoplasty (MLT) have still been shown to be effective in achieving IOP reduction, with less inflammation and a superior safety profile compared to its traditional counterparts.¹⁻⁴

SELECTIVE LASER TRABECULOPLASTY

Latina and colleagues first described Q-switched 532-nm Nd:YAG LTP or selective laser trabeculoplasty (SLT) in 1998.⁵ Using a gonioscope, the surgeon visualizes the pigmented trabecular meshwork and applies laser energy to this tissue. SLT is thought to lower IOP by increasing outflow through the trabecular meshwork.⁶ Up to 360° of trabecular meshwork can be treated with the following settings: 0.6- to 1-mJ power, 400-µm spot size, and 3-nanosecond duration. Power is titrated until bubble formation is observed.

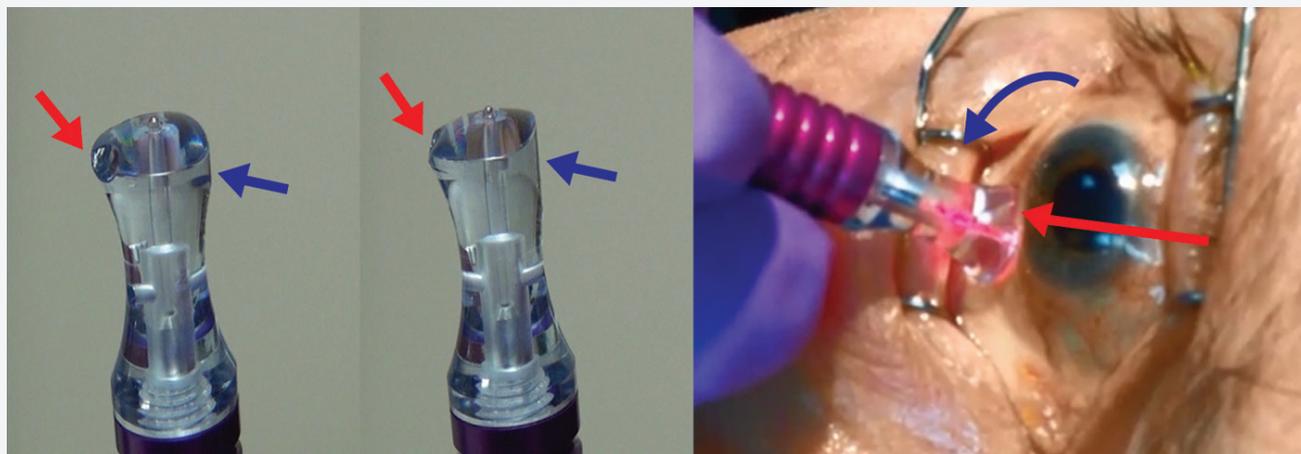
SLT has been shown to be as effective as one IOP-lowering medication, and it can be used as an initial treatment for open-angle glaucoma or ocular hypertension.⁷ The procedure's success when repeated has also been demonstrated.⁸⁻¹⁰ Complications include infrequent IOP elevation and iritis and, rarely, corneal edema.

MICROPULSE LASER TRABECULOPLASTY

MLT targets the trabecular meshwork in a fashion similar to SLT. Laser energy is delivered in a pulsed fashion,

AT A GLANCE

- Laser treatments for glaucoma provide nonincisional options for reducing IOP.
- These procedures target either aqueous outflow via treatment of the trabecular meshwork or aqueous inflow via treatment of the ciliary processes.
- Recently, a new laser modality became available that offers unique versions of both laser trabeculoplasty and cyclophotocoagulation. Because of the pulsed laser delivery, treatment is considered to be less inflammatory than traditional continuous-wave laser therapy and to have a more favorable safety profile.



(Courtesy of Iridex)

Figure 2. The MicroPulse P3 Glaucoma Device on the Cyclo G6 Glaucoma Laser System. Arrows indicate proper positioning: flat side toward the eyelid and notched side toward limbus.

however, and is therefore not considered to cause any tissue damage. Treatment is applied confluent across 360° of trabecular meshwork for a target of 120 spots with the following laser parameters: 1,000-mW power, 300-µm spot size, 300-nanosecond duration, and a 15% duty cycle.¹ Because of the micropulse modality, no tissue reaction is seen during treatment, which can make the confirmation of proper treatment challenging initially. Like SLT, MLT is also repeatable. The procedure has been performed with 532- and 577-nm laser wavelengths.

In one study using the 577-nm laser, 360° MLT achieved an average IOP reduction of 19.5% in over 70% of cases, with a safety profile comparable to that of SLT.¹ Another prospective study comparing MLT to SLT found an equivalent IOP reduction between groups, with greater comfort reported for patients in the MLT group.²

TRANSCLERAL CYCLOPHOTOCOAGULATION

TSCPC involves the indirect application of an 810-nm diode laser to the ciliary processes via a probe placed on the sclera. The procedure often causes a robust inflammatory response, which can lead to cystoid macular edema, vision loss, hypotony, and—rarely—phthisis and sympathetic ophthalmia. For this reason, physicians traditionally reserve TSCPC for patients with refractory glaucoma or poor surgical candidates.

The Cyclo G6 Glaucoma Laser System (Iridex) is designed to deliver micropulse treatment to the ciliary processes. With a traditional transscleral laser, the surgeon performs discrete applications of laser energy via the G6 probe. MP-CPC, in contrast, is applied via slow sweeps along the limbus with the MicroPulse P3 Glaucoma Device (Iridex). The standard parameters are sweeps over each hemisphere

Micropulse technology offers a novel means of laser delivery that has been shown to be safe and effective.

for a range of 100 to 240 seconds at a power of 2,000 mW with 31.3% duty cycle.

The mechanism of IOP reduction via the Cyclo G6 is not clearly understood, because micropulse delivery avoids ciliary body ablation, but MP-CPC is thought to stimulate aqueous outflow.¹¹ Because of the micropulse laser format, treatment is less inflammatory than traditional TSCPC and is considered to have a more favorable safety profile. MP-CPC is therefore considered to be an option for IOP reduction in surgically naïve eyes.

Kuchar and colleagues found MP-CPC to lower IOP by 20% to 30% in more than 70% of treated eyes, and they reported a better safety profile compared to traditional TSCPC.³ In a randomized study comparing MP-CPC and TSCPC, Aquino et al found the procedures to be equally effective at lowering IOP, but they reported a higher success rate and lower incidence of complications with MP-CPC.⁴ A histologic analysis of cadaveric eyes treated with TSCPC and MP-CPC revealed less ciliary body tissue disruption with the latter procedure.¹²

Selective Laser Trabeculoplasty

- SLT treats up to 360° of the trabecular meshwork.
- It can be as effective as one IOP-lowering medication.
- SLT may be an initial treatment for open-angle glaucoma or ocular hypertension.
- The procedure is repeatable.

Micropulse Laser Trabeculoplasty

- MLT applies treatment confluent across 360° of the trabecular meshwork.
- The pulsed delivery of laser energy is thought to avoid tissue damage.
- The safety profile of MLT is similar to that of SLT.
- A lack of observable tissue reaction makes the confirmation of proper treatment challenging initially.
- The procedure is repeatable.

Four Modern Laser Treatment Options for Glaucoma

Transscleral Cyclophotocoagulation

- TSCPC treats the ciliary processes via a probe placed on the sclera.
- The procedure causes a robust inflammatory response, which can lead to cystoid macular edema, vision loss, hypotony, phthisis, and sympathetic ophthalmia.
- TSCPC is traditionally reserved for patients with refractory glaucoma or poor surgical candidates.

Micropulse Cyclophotocoagulation

- MP-CPC avoids ciliary body ablation. Its mechanism of IOP reduction is not clearly understood.
- The procedure is less inflammatory and is considered safer than TSCPC.
- MP-CPC is an option in surgically naïve eyes.

CONCLUSION

Laser treatments are valuable nonincisional options for glaucoma management. Micropulse technology offers a novel means of laser delivery that has been shown to be safe and effective. ■

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- financial interest: none acknowledged