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Excellent Safety Profile of MicroPulse Laser Trabeculoplasty (MLT) for Glaucoma

In ongoing multi-center trials, MLT continues to show promise for applications in glaucoma.

BY IQBAL "IKE" AHMED, MD

The viability of MicroPulse Laser Trabeculoplasty (MLT, IRIDEX Corporation) as a treatment option for glaucoma continues to gain traction based on growing clinical experience. One-year data from an MLT multi-center trial further demonstrated its safety and clinical effectiveness.[1]

The concept behind pulsed laser delivery is to minimize thermal energy and therefore its resultant physiological damage to ocular tissue. Similar technology has been adapted to other subspecialties of ocular care, including retinal disease[2-4] and phacoemulsification for cataract surgery. Studies also have shown little to no collateral tissue damage with MLT compared to conventional continuous-wave (CW) laser therapy.[5]

BENEFITS OF MICROPULSE TECHNOLOGY

MicroPulse technology finely controls thermal elevation by "chopping" a CW beam into a train of repetitive microsecond pulses separated by brief rest periods which prevent the buildup of thermal energy (Figure 1). Studies show it is as clinically effective as conventional CW laser for the treatment of diabetic macular edema without any visible laser-induced damage during and at any time after treatment.[2-4]

The use of MicroPulse for the treatment of glaucoma has been compared to selective laser trabeculoplasty (SLT). I have a lot of success with SLT, and I continue to use this technology today. Recently, I have been interested in using MLT for trabeculoplasty. Both are easy to learn, may reduce patients' dependence on topical medications, can be used earlier in glaucoma management, and are repeatable. However, they do differ in their theoretical mechanisms of actions. SLT targets intracellular melanin and activates macrophages,[6] and selectively damages pigmented cells in the trabecular meshwork, which may induce postoperative inflammation and IOP spikes. MLT thermally affects trabecular cells without destroying them by allowing a cooling period between pulses, thereby preventing tissue destruction. The goal of MLT is to stimulate a biological response with the trabecular meshwork while reducing tissue damage.[5,7,8]

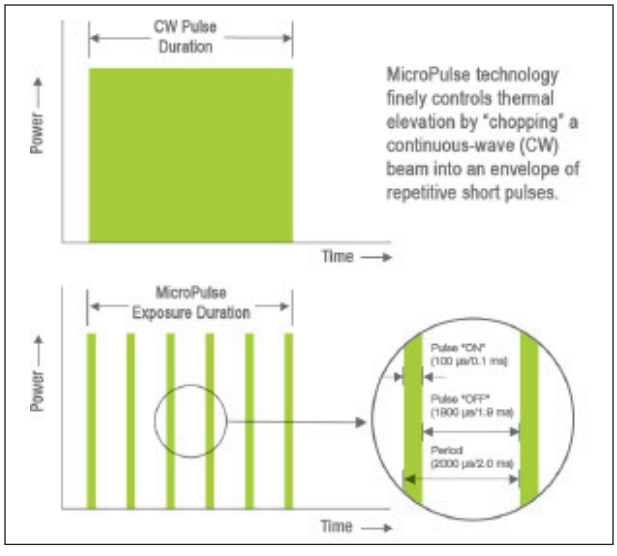

Figure 1. The mechanism of action of MicroPulse technology.

Other differences include spot size and laser system functions. MLT uses a 300-µm spot size, provides an adjustable speed of the MicroPulse repetition rate and the on/off times, and the laser system is multifunctional for treating other glaucoma and retinal disorders using CW and MicroPulse applications. SLT, by comparison, employs a 400-µm spot, only the pulse energy's delivery can be controlled, and the SLT laser is a dedicated system for this single procedure (Table 1).

MULTI-CENTER MLT STUDY DETAILS

A study to assess the clinical effects of MLT is being conducted at three sites within the United States and one in Canada. All study sites are using the IQ 532 laser system (IRIDEX) with the same treatment parameters: 532-nm (green) wavelength, 300-µm spot size, 300-ms envelope duration using 1,000 mW of power at a 15% duty cycle, and delivering confluent applications 360°. A previous study conducted by David Gossage, DO, indicated that MLT performed with the IQ 532 laser has the greatest dose response

TABLE 1. MLT & SLT SIMILARITIES AND DIFFERENCES

MLT	SLT
532-nm and 577-nm wavelengths	532-nm wavelength
Thermally affects (not destroys) pigmented trabecular meshwork cells without thermal or collateral damage.	Selective destruction of pigmented trabecular meshwork cells without thermal or collateral damage.
Appears repeatable	Appears repeatable
No visible signs of treatment intra- or postoperatively	Visible signs of treatment intra- and sometimes postoperatively
Rare postoperative inflammation	Mild postoperative inflammation
300-µm spot size (smaller spot size to access narrow angles)	400-µm spot size
Minimal to no complications	Minimal complications; rare IOP spikes are possible
Multifunctional: CW and MicroPulse applications for glaucoma and retinal disorders	Single application: SLT

at 1,000 mW as opposed to 300 mW and 700 mW.[1]

For the 50 patients in this study, the data demonstrated a reduction in IOP over 6 months, minimal-to-no IOP spikes, and extremely low postoperative inflammation. Most eyes had no cells in the anterior chamber in the first hour after the treatment; the remaining few had 1 to 2 cells per high-power field. I am most impressed by this lack of cells in the anterior chamber, because other laser trabeculoplasty procedures usually generate some cellular reaction. I think it is a very strong sign of this technology's clinical safety.

The encouraging responses we are seeing with these early experience studies are enabling us to initiate more formal studies that will evaluate the medium- and long-term effectiveness of MLT using various parameters. Currently, recruitment is underway for a head-to-head comparison study of MLT versus SLT for treating open-angle glaucoma.

MLT IN CLINICAL PRACTICE

Depending on the patient's comfort level with laser versus topical drops, I may use MLT as a primary option for IOP control in my practice. Certainly, I and other clinicians have successfully used MLT to reduce the number of medications for some patients,[9] thereby reducing topical side effects while saving them time and money. I do prefer MLT for patients for whom compliance with eye drops is problematic. With either modality, it is important that glaucoma patients understand the need for continual monitoring and follow-up. Like most laser trabeculoplasties, MLT appears to show some attrition over time.

MLT continues to grow in popularity thanks to its multipurpose nature, ease of use, and reduced costs for practitioners and patients. I think MLT offers glaucoma specialists a promising option for IOP control that is noninvasive and appears to minimize tissue damage and IOP spikes. I look forward to continued research into the applications of MLT. ■

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MicroPulse Videos

Use this QR code to view the webcast "MicroPulse for Glaucoma and Retina: What's the Hype?"

- MicroPulse Laser Trabeculoplasty as a Safe Alternative, by Iqbal "Ike" Ahmed, MD
- Why and How I've Incorporated MicroPulse Into My Comprehensive Practice, by David Gossage, DO
- DME: Role of Laser and MicroPulse Strategies in the Anti-VEGF Era, by Elias Reichel, MD

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