GLAUCOMA EXPERTS

GLAUCOMA LASER THERAPY: LESS IS MORE

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As mentioned previously in Glaucoma Experts, when it comes to glaucoma therapy, less is more. In truth, the best of any therapy often comes down to selecting the simplest option. In laser therapy, the same is likely true.

Recently, Iridex brought a new mode of laser delivery to two familiar glaucoma therapies: laser trabeculoplasty and transscleral cyclophotocoagulation (CPC). This laser mode is known as *micropulse*. Whereas a number of variables exist with a standard laser application—including the laser spot size, power, duration, and wavelength—micropulse technology modulates the laser duration by breaking it up into a cycle of short laser pulses followed by a brief rest period. This cycle of laser application followed by rest is then repeated throughout the laser treatment.

For example, the surgeon might choose to apply the laser for 0.5 ms followed by 1.1 ms of rest and repeat this throughout a 300-ms treatment. This would create a duty cycle—or the percentage of time that the laser is actually delivering energy—of 31.3%.

DURATION: the total length of time that laser energy is delivered, including the rest periods

DUTY CYCLE: the percentage of time that the laser is delivering energy versus resting

The potential advantage of micropulse is that the surgeon can still deliver the same amount of laser energy to the target tissue, without causing collateral thermal spread and damaging or coagulating adjacent tissues that he or she does not wish to treat. With a continuous-mode laser, as time goes on, thermal energy must spread to adjacent tissues; however, in micropulse mode, the rest period allows for tissue cooling, which inhibits thermal spread.

Micropulse laser trabeculoplasty (MLT) allows therapy to be delivered to the trabecular meshwork to initiate a biologic response, rather than a mechanical stretching of the trabecular meshwork. On visualizing the MLT laser beam (spot size of 50 µm) as the treatment is delivered, there is no visual tissue contraction and there are no bubbles released. Because MLT leaves no trabecular meshwork scarring, it may be similar to selective laser trabeculoplasty (SLT).

A biologic response is thought to be part of the reason that SLT works, and evidence in support of this comes from the fact that SLT seems to lower IOP in the contralateral eye, indicating that a possible bilateral immune response could be part of the mechanism. One unique aspect of MLT is that it does not seem to create intraocular inflammation or IOP elevations immediately after the procedure, and it does not require any postoperative anti-inflammatory treatment.

Steven Vold, MD; Ike Ahmed, MD; Rob Noecker, MD, MBA; and I pooled our cases of MLT using the Iridex IQ 532 micropulse laser and found IOP reductions between 20% and 25%, with a reduction in eye drop usage as well.

One thing that makes MLT unique is that it seems not to create intraocular inflammation or IOP elevations immediately after the procedure, and it does not require any postoperative anti-inflammatory treatment. Shortly after having a positive experience with MLT, my colleagues and I began performing micropulse transscleral CPC. All of the same principles apply, but now we are delivering therapy to the ciliary body to reduce aqueous production or possibly to enhance uveoscleral outflow.

Now, it should be said that standard CPC has an excellent efficacy profile, reducing IOP by 40% to 50% in a number of studies.[1-4] However, the safety profile was suboptimal. Some eyes have developed significant inflammation, macular edema, hypotony, or (rarely) phthisis bulbi. Because of these adverse events, the efficacious traditional CPC therapy was not being used with significant frequency.

Micropulse CPC can be performed in a manner similar to traditional CPC. Instead of delivering 15 or so 2-second pulses to the sclera at a power of 2,000 mW, we use the micropulse setting (31.3% duty cycle) and continuously "paint" the sclera in a circular manner for about 100 seconds, sparing the temporal region. I use between 2,000 to 2,500 mW for 100 to 150 seconds, depending on the patient's baseline vision, IOP, and medication use.

This year, I presented a new case series of micropulse CPC at the American Glaucoma Society (AGS) meeting.[5] We saw about a 30% pressure reduction with no significant complications. Postoperatively, the eyes were much quieter than after traditional CPC. This therapy can be performed in early or late glaucoma and before or after any other procedure, and it can be used in urgent situations, including in the office setting after the application of a retrobulbar block.

For me, an ideal candidate for micropulse CPC would be an older patient, perhaps someone who lives alone and has serious glaucoma but might be at high risk for the OR (eg, myopia). This patient could have the laser in the office and follow-up several weeks later, most likely with excellent pressure reduction and without having to worry about any significant limitations during the early recovery period. But the patient pool is expanding, and I have performed the procedure as a primary intervention on patients wishing to avoid surgery with great success.

CONCLUSION

New laser parameters have reformed the glaucoma laser landscape. Micropulse therapy has arrived for laser trabeculoplasty and for CPC. We should continue to explore new laser settings to maximize the efficient delivery of safe and efficacious therapies for our patients with glaucoma. ■