Modality approaches bilateral glaucoma in single treatment

Laser therapy gives patients access to strategy that reduces IOP, lowers reliance on drugs

By Ahad Mahootchi, MD, Special to *Ophthalmology Times*

Though medical therapy is the typical first line-treatment strategy in glaucoma, there is much interest in developing therapy approaches that effectively lower IOP while reducing the need for drop therapy.

Incisional surgical options typically remain a consideration for end-stage disease, while the largest need in glaucoma management is an approach for the majority of patients with mild-to-moderate glaucoma.

In particular, laser therapy offers a viable strategy for these patients, although not all platforms for delivery are equal.

The MicroPulse P3 (MP3) probe powered by the Cyclo G6 laser (Iridex) is a powerful-yet-gentle treatment for a range of patients, equally applicable to wide assortment of glaucoma types. This modality represents a new way to treat glaucoma that results in pressure reductions while lessening patients' reliance on medical therapy.

A NOVEL TREATMENT

The probe powered by the laser may look similar to traditional transcleral cyclophotocoagulation (TSCPC).

However, there is nothing similar in regard to patient selection or postop experience to the patient or physician. It may look like the laser cyclodestructive procedures of yester-year when performing this 3-minute procedure. That is where the similarity ends.

Patients recover vision in minutes and are free of pain and inflammation. The ciliary body laser treatment does not ablate the ciliary body. The mechanism is believed to enhance uveoscleral outflow in addition to affecting outflow.[1]

Although seemingly counter-intuitive, MicroPulse is not simply a reduction in laser power or a way to adjust the interval; rather, MicroPulse is a different way of applying laser—both more specific to the target tissue, as well as less destructive to target and adjacent tissue. MP allows for a treatment effect without the inflammation and destructive effect associated with continuous wave laser.

I prefer to perform MicroPulse TSCPC for about 3 minutes total, or about 90 seconds in each hemisphere, in patients with darker colored irises. The treatment duration might increase to 100 to 110 seconds per hemisphere in a blue eye.

Because the MicroPulse TSCPC has a favorable safety profile it is widely applicable. I have used it for a wide range of cases, ranging from mild to end-stage, and have yet to find a patient type in which it is not a viable option. Even in uveitis-prone patients I have not stirred up iritis.

Evidence that MicroPulse TSCPC is effective even in the most difficult cases is demonstrated in a recent prospective interventional case series by Tan et al.[2]

In a series of 40 eyes of 38 consecutive patients with refractory glaucoma, mean IOP was reduced from 39.3 ± 12.6 mm Hg at baseline to 31.1 ± 13.4 mm Hg at 1 day, 28.0 ± 12.0 mm Hg at 1 week, 27.4 ± 12.7 mm Hg at 1 month, 27.1 ± 13.6 mm Hg at 3 months, 25.8 ± 14.5 mm Hg at 6 months, 26.6 ± 14.7 mm Hg at 12 months, and 26.2 ± 14.3 mm Hg at 18 months ($p < 0.001$ at all time points (Figure 1).

Before investing in a P3 probe for my clinic, I contacted these researchers to see what they thought the durability of MicroPulse TSCPC may be. Dr. Tan and colleagues reported to me that many of the patients they followed in the study were still doing well 5 and even 6 years after a single treatment (personal communication).

I have performed MicroPulse TSCPC now in 75 cases with a full range of glaucoma, from mild to severe, using varying treatment endpoints. In some cases, the goal was to achieve lower pressure, while in others, patients expressed a desire to reduce their reliance on costly glaucoma drops. Regardless, the predefined treatment endpoint has been achieved in 73 of these cases.

Ultimately, MicroPulse TSCPC may supplant many current intermediary approaches to glaucoma. It is easier to perform than a valve procedure or a trabeculectomy, and has a much more favorable safety profile.

It can easily be a first-line therapy for people who cannot afford or do not want to use

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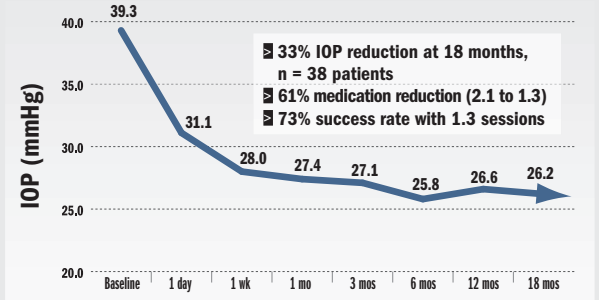
TAKE-HOME

- ***Laser therapy that approaches bilateral glaucoma in a single treatment provides greater efficacy for the practice and more convenience for patients.***



(FIGURE 1) Evidence that the laser therapy is effective even in the most difficult cases is demonstrated in a recent prospective interventional case series by Tan et al. *(Figure courtesy of Ahad Mahootchi, MD)*

CAPSULOTOMY

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To make the capsulotomy, very low energy electrical impulses are delivered to the cutting ring. This causes a rapid and momentary increase of temperature, leading to vaporization of water molecules that are trapped between the cutting ring and the capsule. The result is instantaneous mechanical cleavage of the capsule membrane around the entire circumference of the ring in about 4 ms.

"There is no heating of the tissue with this technique, and it is not cautery, which would create a capsulotomy with a weaker edge," he said.

Once the capsulotomy is made, the suction is released, and the device is withdrawn from the eye along with the excised capsule disc.

PPC performance has been evaluated in several studies. Results from a series of investigations conducted by Dr. Chang with Nick Mamalis, MD, and Liliana Werner, MD, PhD, in human cadaver eyes and in vivo in rabbit eyes highlighted the safety and efficacy of the novel tool for creating round, complete capsulotomies [*Ophthalmology.* 2016;123:255-264].

Serial slit lamp examination in the animal eyes showed no differences comparing eyes that underwent PPC and fellow eyes in which capsulotomy was done using manual continuous curvilinear capsulorhexis (CCC) with respect to corneal edema, anterior chamber inflammation, capsular fibrosis, or capsule opacification.

The technology consists of a control console and a disposable handpiece containing the capsulotomy tip. The tip is comprised of a 6-mm silicone suction cup and the cutting element—a 5-mm nitinol capsulotomy ring. *(Image courtesy of Mynosy)*

"We also used a thermocouple to measure temperature change at the iris and corneal endothelium during the PPC and found negligible increases in both duration and magnitude," Dr. Chang said.

The capsulotomies created with the nanopulse technology were found to be perfectly circular and free of tags. Intraoperative Miyake-Apple videos obtained during a study using paired human cadaver eyes showed minimal zonular movement during the procedure that was no different than that occurring during manual CCC. Imaging of human cadaver capsulotomies with scanning electron microscopy showed the capsule edges had the same smooth appearance of those created by manual CCC.

In collaboration with Vance M. Thompson, MD, John P. Berdahl, MD, and Joel M. Solano, MD, a comparative study in paired human cadaver eyes evaluated rim strength of capsulotomies created using the PPC technology, a femtosecond laser, or manual CCC [*Ophthalmology.* 2016;123:265-274]. The PPC capsulotomies were consistently the most resistant to tearing when capsulotomy edge retractors attached to force transducers were used to stretch the edge.

"The finding that the PPC capsulotomy edge was significantly stronger was intriguing," Dr. Chang said. ■

DAVID F. CHANG, MD

E: *dceye@earthlink.net*

This article was adapted from Dr. Chang's presentation at the 2015 meeting of the European Society of Cataract and Refractive Surgeons. Dr. Chang is a consultant for Mynosys.

SINGLE TREATMENT

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drops, yet it is also a successful adjunctive option when drop therapy does not achieve the target pressure. It is more widely applicable than laser trabeculoplasty; it can also be used at the time of cataract surgery, although unlike some of the MIGS category, it can be reimbursed as a stand-alone procedure.

The availability of MicroPulse TSCPC has allowed us to design a treatment algorithm for bilateral treatment of glaucoma, which would not be possible with other treatments, because of visual morbidity.

When I have a patient with bilateral glaucoma, I will bring him or her to the operating room and use a very low dose combination of Fentanyl, Versed, and Propofol to induce a mild anesthetic state without ophthalmic blocking for the 6 minutes it takes to apply the treatment. We have found that we can avoid using a block at all. As a result, patients are able to leave the recovery area in 15 minutes or less. They return to normal activities immediately after that. The postoperative recovery area is never congested when using the low-dose anesthesia.

CONCLUSION

About one-half of patients who respond to treatment do so within 2 weeks. After the first couple of cases, I realized that inflammation was significantly reduced compared with other procedures and laser treatments, and so it was unnecessary to see patients back on the first post-treatment day.

As a result, the need for follow-up examinations is based on how badly the visual field is at baseline. If the field is not terrible, (as most mild-to-moderate cases are) there is a bit more latitude in bringing the patient back for follow-up.

This treatment modality has proven to be an effective addition to practice. Addressing bilateral glaucoma in a single treatment—one that does not depend on patients' compliance—is more efficient for practice and more convenient for patients. This is not just a new way to perform the same treatments that are performed with standard continuous wave laser, it gives patients access to a safe and effective treatment strategy that reduces IOP and lessens dependence on medical therapy. ■

References

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2. Tan AM, Chockalingam M, Aquino MC, Lim ZI, See JL, Chew PT. Micropulse transscleral diode laser cyclophotocoagulation in the treatment of refractory glaucoma. *Clin Experiment Ophthalmol.* 2010;38:266-272.

AHAD MAHOOTCHI, MD

P: *813/779-3338* E: *am@seebetterflorida.com*

Ahad Mahootchi, MD, is medical director of The Eye Clinic of Florida, Zephyrhills, FL. He is a consultant and speaker for Iridex.