

Redefining cyclophotocoagulation with modified laser delivery

While traditional transscleral cyclophotocoagulation is effective at lowering IOP in patients with glaucoma, it has a high rate of side effects. The new MicroPulse system is effective and affordable with an excellent safety profile.

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Like most hypotensive medications that patients are commonly prescribed, cycloablation was first introduced to reduce IOP by decreasing the production of aqueous humour via the destruction of the ciliary epithelium.

Over time, this treatment has evolved to transscleral cyclophotocoagulation (TSCPC) using a diode laser, which was found to produce the most targeted destruction in the ciliary epithelium.¹

While traditional TSCPC is effective at lowering IOP, it has also caused occasional cases of hypotony, phthisis and macular oedema. In a recent literature review, the incidence of hypotony (including phthisis) was found to be as high as 10%.²

While initially applied primarily to patients with recalcitrant glaucoma and few treatment options, TSCPC has gained in popularity in recent years. Studies show that TSCPC patients had final IOP results on par with tube and trabeculectomy patients, with fewer patients losing two or more lines of vision.^{3,4}

TSCPC was found to be more effective than medical therapy at lowering IOP.⁵

MicroPulse laser therapy

The development and recent FDA clearance of the new MicroPulse P3 glaucoma device (MP3; IRIDEX Corp.), powered by the new Cyclo G6 Glaucoma Laser System, has revolutionised cyclophotocoagulation using Iridex's proprietary MicroPulse technology. First tested with retinal applications, multiple studies have shown MicroPulse TSCPC to be at least as effective as continuous-wave TSCPC, with fewer complications.⁶⁻⁸ MicroPulse programming takes a continuous wave of laser and breaks it into a series of repetitive pulses separated by pauses

that allow the tissue to cool, thus refraining from completely killing cells or causing damaging thermal build-up.^{9,10}

I liken the technique to anti-lock brakes on a car. If you slam the brakes on, too much braking power can cause the wheel to freeze and the tyres to skid. Anti-lock brakes disseminate the braking power to prevent locking or skidding and ultimately stop the car safely, in a shorter distance. MicroPulse technology separates the laser delivery into a series of short pulses, controlling heat build-up and preventing thermal spread.

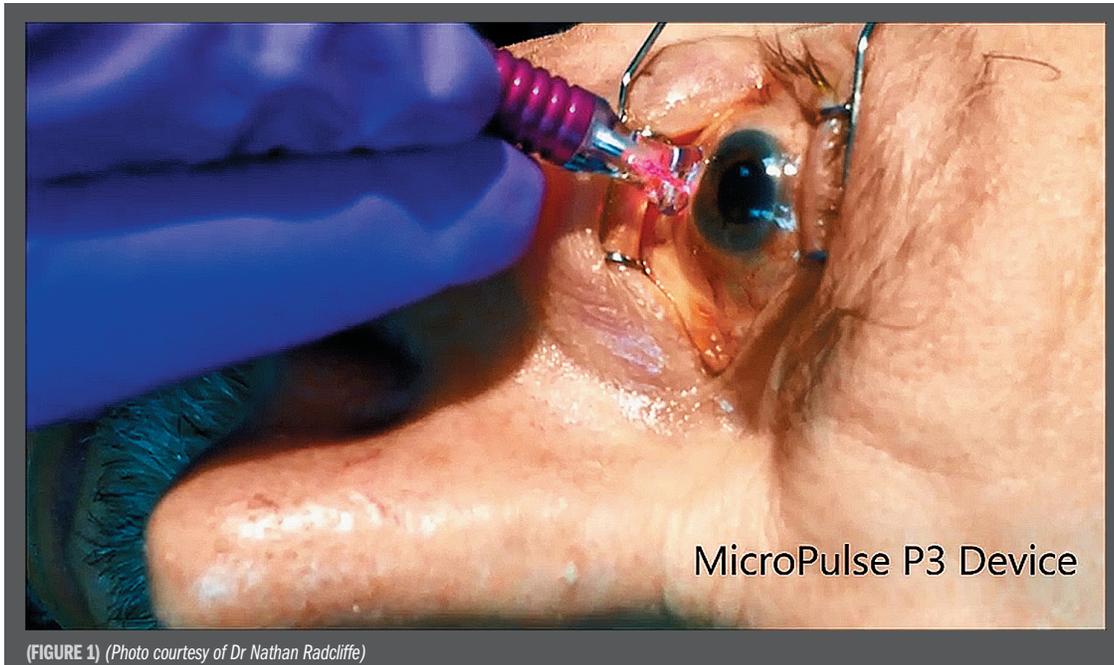
As with continuous-wave TSCPC, the application of MicroPulse laser energy is guided by the probe. There may be some variability from one person to the next in terms of location of the pars plana and ciliary body; likewise, there is some variability of efficacy with both procedures. However, the application of MicroPulse to this traditional glaucoma laser therapy is showing very positive outcomes.

Cyclophotocoagulation revolutionised – early clinical results

Data were recently pooled from several institutions, including mine, to review 48 eyes from 45 patients.⁸ Following retrobulbar anaesthesia, each eye received two treatments of 50–90 s using the MP3 device with an 810 nm laser (Iridex). MicroPulse was set to a 31.3% duty cycle (0.5 ms treatment pulse followed by

IN SHORT

► **MicroPulse transscleral cyclophotocoagulation is an effective, affordable and safe technique to lower IOP in patients with glaucoma.**



(FIGURE 1) (Photo courtesy of Dr Nathan Radcliffe)

1.1 ms of rest) and the eye was treated over the superior and inferior hemispheres, avoiding the temporal-most clock hour. Postoperative topical steroids were prescribed.

At three months, we saw a mean reduction in IOP of 29.8% from baseline, which equals an average drop of 8.5 mmHg ($P = 0.027$). The decrease in IOP was accompanied by a significant reduction in the number of ocular hypotensive medications the patients required, from a mean (standard deviation) of 3.3 (0.3) at baseline to 2.4 (0.3) at month three. There were no cases of visually significant hypotony, macular oedema or phthisis bulbi.

Our results reinforced the findings of the previous prospective clinical study by Professor Paul Chew, MBBS, MMed(Ophth), FRCS(Ed), FRCOphth, FAMS, of the National University of Singapore. Professor Chew's study demonstrated a reduction in IOP of more than

30% at 18 months, and the mean number of medications reduced from 2.1 to 1.3.¹¹

The versatility of the MicroPulse P3 device

One of the great benefits of the MP3 device is that it is incredibly versatile. The lower rate of complications demonstrated by Chew and others has led some of my colleagues and me to use this therapy earlier in the course of the disease than we would use continuous-wave TSCPC. It can be performed on an eye at any stage of glaucoma, regardless of whether the patient has never had ocular surgery or has undergone ten previous procedures.

It can also be repeated as often as needed, making it easily titratable. A great candidate for MP3 treatment would be an older person who lives alone and has difficulty finding caregivers.

This person would be greatly inconvenienced by the temporary vision loss following

a trabeculectomy or tube shunt, whereas they can go home following MP3 treatment and not worry about falling, risk of bleeding or infection.

The procedure can be performed in the operating room or the office, and takes about as long as uncomplicated cataract surgery. Following MP3 treatment, patients are given topical steroids but there are no restrictions on the eye.

As there is no incision, there is no risk of infection. In addition, it is very cost-effective compared with both medication and more invasive surgeries. With its excellent safety profile, it is possible that the MP3 device will have a prominent place in our arsenal against glaucoma.

I await additional results on long-term trials examining the safety and efficacy of MicroPulse TSCPC.

Case study

A recent case demonstrated the value that non-incisional, non-



(FIGURE 2) (Photo courtesy of IRIDEX)

pharmacologic therapies can have in improving the quality of life for glaucoma patients.

A 91-year-old man presented on three different IOP-lowering medications. While otherwise doing well, he was struggling to care for himself, and his family and home health aides were having difficulties administering all of the drops every day. His visual acuity was 20/30 with a pressure of 21 mmHg in the right eye and 20/400 with a pressure of 40 mmHg in the left eye. On examination, he was found to have severe blepharitis, and his optic nerves demonstrated moderate damage in the right eye and advanced field loss in the left.

When considering his treatment options, it was immediately obvious that he needed lower pressure in both eyes. An additional eyedrop would be optimal, but was not viable in his case. Additionally, given his already documented issues with drops, the severe

blepharitis and his age, incisional glaucoma surgery was deemed to be high risk with the prospect of little reward.

Consequently, the patient was scheduled for MicroPulse laser trabeculoplasty with the 532 nm laser in the right eye, and MicroPulse cyclophotocoagulation with the 810 nm laser in the left eye. At one month post-procedure, his IOP was dramatically reduced, to 14 mmHg OD and 12 mmHg OS. The eye examination was otherwise unchanged. However, as his pressure was not at or below his target, in addition to the ongoing issues with eyedrop administration, medication was halted and he will be re-evaluated in one month's time.

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