# MicroPulse Trans-scleral Cyclophotocoagulation (mTSCPC) for the Treatment of Glaucoma Using the MicroPulse P3 Device

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CYCLO G6™ Glaucoma Laser System

## Introduction

Standard trans-scleral cyclophotocoagulation, performed with an 810nm diode laser, is an effective nonincisional treatment for refractory glaucoma. Concerns, however, about adverse events including macular edema, hypotony, and phthisis bulbi have limited widespread adoption of this treatment modality.

Alternatively, micropulse laser energy delivered transcerally offers the potential for improved safety and visual outcomes. To this end, the MicroPulse P3 (MP3, Iridex Corporation, Mountain View, CA) has been developed. In MicroPulse laser mode, brief (e.g., 0.5 ms) laser bursts are followed by slightly longer (e.g., 1ms) rest periods repeatedly delivered over a longer envelope of time (e.g., 50 sec). This laser application mode may inhibit thermal spread and collateral thermal damage and may lead to enhanced uveoscleral outflow. Moreover, this application would likely be safer and more efficacious than continuous wave trans-scleral cyclophotocoagulation.[1]

## Purpose

The purpose of this study was to evaluate the outcomes of patients who underwent micropulse trans-scleral cyclophotocoagulation (mTSCPC) with an 810 nm laser (Iridex) and MicroPulse P3 device (MP3).

## Methods

- Forty-eight eyes of 45 patients received retrobulbar anesthesia followed by two 50-90 second mTSCPC treatments over the superior and inferior hemispheres, sparing the temporal most clock hour
- The laser (Figure 1) was set on MicroPulse mode with a duty cycle of 31.3% (0.5ms laser bursts followed by 1.1ms rests, repeated throughout the 50-90 second laser application per hemisphere), Table 1.
- Topical steroids were prescribed postoperatively and intraocular pressure (IOP) was monitored

**Table 1. Treatment Parameters**

| MicroPulse Duty Cycle | Time/Hemisphere (secs) | Power (mW) |
|---|---|---|
| 31.30% | 50-90 | 2000-2250 |

**Figure 1. Cyclo G6 laser**


**Figure 2. MicroPulse P3 device (MP3)**


## Results

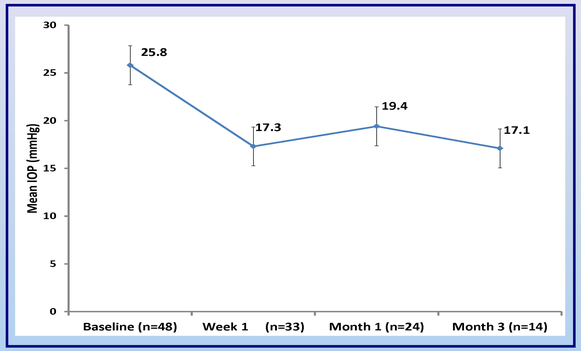


**Figure 3. Mean IOP at Baseline and Each Follow-up Visit**

- Mean IOP was significantly reduced from 25.8 ± (SEM)1.3 mm Hg at baseline to a mean of 17.1 ± 2.1 mm Hg at month 3
  - The mean % change in IOP was:
    - 21.6% at Week 1 (P<.001)
    - 30.0% at Month 1 (P=.002)
    - 29.8% at Month 3 (P=.027)

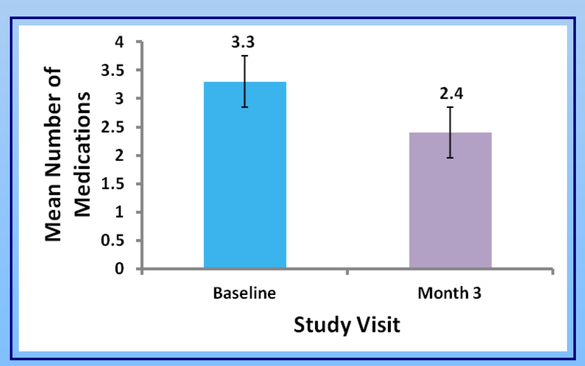


**Figure 4 . Mean Number of Ocular Hypotensive Medication Use at Baseline and Month 3**

- The mean number of ocular hypotensive medications required to control IOP was significantly reduced throughout the study
  - Mean of 3.3 ± (SEM) 0.3 medications at baseline to a mean of 2.4 ± 0.3 medications at month 3
    - Mean reduction of 0.91 ± 0.3 ocular hypotensive medications (P=0.018)

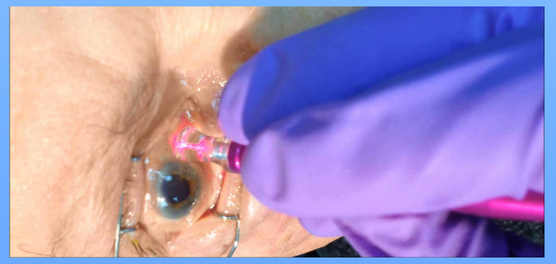

**Figure 5. Screen shot from surgical video**

- MicroPulse P3 device

Safety

- No cases of visually significant hypotony, macular edema or phthisis bulbi were observed.
- One patient experienced a > 2 line reduction in visual acuity from worsening of a pre-existing cataract.

## Discussion

In this retrospective series of patients with refractory glaucoma, mTSCPC had an excellent safety profile. No cases of visually significant hypotony, macular edema or phthisis bulbi were observed. These are likely better outcomes than with standard TSCPC, however a head-to-head trial would be required to demonstrate this. One recent literature review reported a 10% incidence of hypotony (including phthisis) with the standard procedure[2].

In the present study, mTSCPC produced a low rate of post-operative inflammation. There was a mean IOP reduction of 29.8% after 3 months. This reduction is consistent with the pressure reduction achieved from standard TSCPC. mTSCPC also allowed for a significant reduction in the number of ocular hypotensive medications to control IOP, from a mean of 3.3 medications at baseline to a mean of 2.5 medications at Month 3. As a comparison, early work from Professor Paul Chew of the National University Hospital, Singapore, demonstrated a 33% reduction in IOP at 18 months as well as a reduction in medications from a mean of 2.1 to 1.3[3]. It is possible that the MicroPulse P3 device, which uses a laser application mode that may inhibit thermal spread and collateral thermal damage, works through a different mechanism by increasing uveoscleral outflow[3].

Although traditional CPC has an adequate safety profile, the micropulse cyclophotocoagulation technique could have a larger place in glaucoma management. Because the surgery is non-penetrating and does not induce conjunctival scarring, infection is unlikely, and the need for intense early follow up is significantly reduced. Additionally, bleeding risk related to the procedure itself is low compared to other incisional glaucoma surgeries, though local anesthesia techniques associated with any procedure can rarely result in bleeding.

## Conclusions

The mTSCPC procedure is a promising new treatment for glaucoma that offers a safe and effective alternative to established, more destructive treatment modalities. This laser application mode may inhibit thermal spread and collateral thermal damage and may lead to enhanced uveoscleral outflow[3]. Further study is warranted.

## References

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