

Micropulse Laser in Glaucoma

Alka Pandey

Eye7, Daryaganj, New Delhi, India

Summary

A new type of diode laser- Cyclo G6 or the micropulse laser is helpful in reducing the intraocular pressure in glaucoma. It is a 810 diode laser from Iridex Corporation similar to the trans-scleral cyclophotocoagulation (TSCPC) laser but with a difference. The laser is delivered in a continuous wave fashion in TSCPC whereas in micropulse, it is delivered in short bursts with an "on time" and an "off time". This "off time" helps the target tissue to cool down in between, thereby greatly reducing thermal damage. Thus, this could prove to be an excellent non-surgical option for glaucoma patients.

Delhi J Ophthalmol 2019;29;93-94; Doi <http://dx.doi.org/10.7869/djo.455>

Keywords: Glaucoma , Micropulse laser, MP3 laser, Trans-scleral cyclophotocoagulation

Conventionally, we have been taught from our post graduation days that diode laser is used in end stage disease as it causes tissue destruction, inflammation and resultant vision loss. But micropulse laser offers just the opposite. The traditional diode laser of trans-scleral-cyclophotocoagulation (TSCPC) delivers near- infrared laser in a continuous wave fashion. In contrast, micropulse delivers laser in bursts with an 'on time' and an 'off time' thus greatly reducing focal heating and burning of the tissues. It is like breaking the laser beam into a train of repetitive short pulses (Figure 1), allowing the tissue to cool between pulses, thereby alleviating cumulative or continuous thermal damage. Due to the intermittent off period, there is minimal or no tissue destruction, minimal inflammation and therefore no additional vision loss. This procedure can thus be done in seeing eyes also. That is a huge advantage.

Cyclodestructive procedures have been associated with various complications like vision loss, corneal edema, pupillary distortion, cystoid macular edema and hypotony (most dreaded complication) and hence were reserved for end stage refractory glaucomas.¹ But the micropulse laser has been safely and effectively used in all forms of glaucomas including refractory glaucomas minus these dreaded complications. Several clinicians like Radcliffe et al, Aquino et al, Tan et al and Toyos et al have used micropulse laser in their patients with about 70-80% success rates.^{2,3,4,5}

The micropulse laser has been used for retinal diseases for many years. It is shown to be effective in diseases like central serous retinopathy (CSR), diabetic macular edema (DME), proliferative diabetic retinopathy (PDR) and macular edema secondary to retinal vein occlusion (RVO).^{6,7} However it is only recently being used for glaucoma management. It is postulated that this laser treatment lowers intraocular pressure by increasing the existing uveoscleral outflow without actually photocoagulating the target tissue.⁴ Further, MP3 laser shortens the ciliary longitudinal muscles thereby opening up the Schlemm's canal and trabecular meshwork spaces and increasing aqueous outflow by the conventional pathway. Indications of use can be both open and narrow angle glaucomas (after the conventional management of iridotomy etc.) as well as refractory glaucomas.

Micropulse laser treatment is performed with the Iridex Cyclo G6™ 810 laser system or MP3 (Iridex Corporation) (Figure 2). It is a 810 diode laser, the same as that used in trans-scleral cyclophotocoagulation (TSCPC) but with a difference. The fibre - optic tip of the micropulse P3 probe is 600 µm in diameter and protrudes 0.4 mm from the hand piece.⁸ This allows accurate positioning of the probe tip at 3 mm posterior to the limbus. The procedure is done under peribulbar anaesthesia. The laser contact probe is placed over the conjunctiva with its notch at the limbus and the flat surface facing the eyelid. Laser power is set at 2000 MW. The duty cycle of MP3 is 31.3%, i.e. it delivers laser for 0.5 ms of "on time" where the ciliary body is targeted and then the laser is off for 1.1 ms i.e the laser is off for the remaining 68.7% of the time. This allows the tissue to cool down between the laser shots, thus greatly reducing thermal damage. The laser is applied in a sweeping motion in the superior and inferior quadrants for a total duration of 160 seconds (80 sec each in superior and inferior quadrants). This allows for a uniform, slow and steady application of laser energy.⁶ Avoid the 3 and 9 o' clock positions as well any bleb area. The potential side effects of this procedure are post-operative pain, inflammation and infection. Post operative management includes topical steroids tapered over 3-4 weeks depending upon the inflammatory response of the individual eye. All anti glaucoma drugs should be continued for at least a month after MP3 treatment and then slowly withdrawn one by one, again depending upon the intraocular pressure response. The micropulse treatment can be repeated without any harmful effects but one should wait for at least 2-3 months before retreatment.

Now here is something in glaucoma treatment which is non-invasive, non-destructive, sight-preserving, a LASER procedure, repeatable, with minimal follow up care and still advocates good IOP control. The micropulse laser procedure offers to bridge the gap between long term medicines (with their associated side effects) and the more riskier incisional glaucoma surgeries.

As Dr. Robert J. Noecker says - "The MP3 device revolutionizes the current thinking of cyclophotocoagulation."

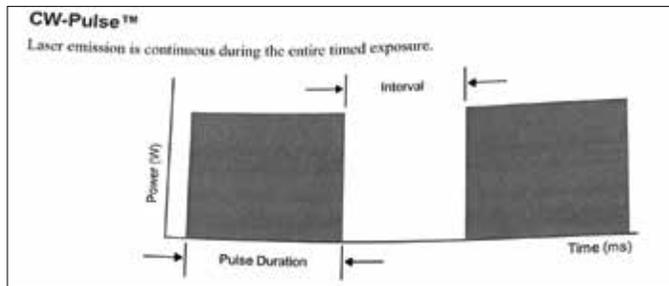


Figure 1(a): Continuous wave pulse
(Source: IRIDEX Cyclo G6™ Laser System Operator Manual)

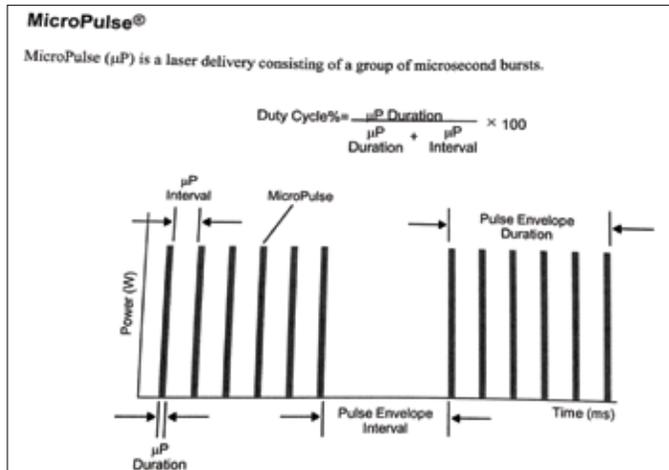


Figure 1(b): Micropulse
(Source: IRIDEX Cyclo G6™ Laser System Operator Manual)



Figure 2: MP3 Machine



Figure 3: PROBE Positioning

References

1. Dastiridou AI, Katsanos A, Denis P, Francis BA, Mikropoulos DG, Teus MA, et al. Cyclodestructive Procedures in Glaucoma: A Review of Current and Emerging Options. *Adv Ther* 2018; 35:2103–2127.
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 Exp Ophthalmol* 2010; 38:266–272.
3. Radcliffe N, Vold S, Kammer JA, Ahmed IK, Parekh PD, Noecker RJ, Khatana A. Micropulse transscleral cyclophotocoagulation (mTSCPC) for the treatment of glaucoma using the micropulse P3 device. American Glaucoma Society 2015. Poster Presentation.
4. Aquino MC, Lim D, Chew PTK. Micropulse P3™(MP3) Laser for Glaucoma: An Innovative Therapy. *J Curr Glaucoma Pract* 2018; 12:51-52.
5. Toyos M and Toyos R. Clinical Outcomes of Micropulsed Transcleral Cyclophotocoagulation in Moderate to Severe Glaucoma. *J Clin Exp Ophthalmol* 2016, 7:6.
6. Scholz P, Altay L, Sascha Fauser S. A review of Subthreshold Micropulse laser for Treatment of Macular Disorders. *Adv Ther* 2017; 34:1528–1555.
7. Kiire C, Sivaprasad S, Chong V. Therapy for retinal disorders. *Retina Today* 2011; 67-70.
8. Iridex Cyclo G6™ Laser System Operator manual.

Cite This Article as: Pandey A. <i>Micropulse Laser in Glaucoma.</i>
Acknowledgments: Nil
Conflict of interest: None declared
Source of Funding: None
Date of Submission: 22 January 2019 Date of Acceptance: 04 March 2019

Address for correspondence

Alka Pandey MS
Eye7, 4802-Bharat Ram Road,
24- Daryaganj, New Delhi-110002,
India
Email id: alkaspgi2002@gmail.com



Quick Response Code