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Letter to the Editor: One-Year Outcomes of Micropulse Cyclophototherapy for Primary Open-angle Glaucoma

We read with interest the original study "One-year outcomes of micropulse cyclophototherapy for primary open-angle glaucoma."[1] We would like to congratulate the authors for their work which highlights some important concepts about MicroPulse transscleral cyclophototherapy (MPTCP). Reviewing these concepts will help to put into context the results of Tong et al[1] and optimize and standardize MPTCP treatment parameters moving forward.

In Tong et al's[1] study, the authors concluded that the intraocular pressure (IOP)-lowering effect of MPTCP treatment in primary open-angle glaucoma patients was modest and transient. They did not see a significant reduction in medication use and found that additional glaucoma surgery was needed in a number of patients. The authors suggested that while the IOP-lowering effect of MPTCP appears to be transient, it might have a role as a temporizing measure before other glaucoma surgery.

We believe that the authors' conclusion that the effect of MPTCP in primary open-angle glaucoma patients is modest and transient, is based on the use of subtherapeutic treatment parameters. The laser settings used in this study were 2 W applied over 100 seconds of total treatment time at a set duty cycle of 31.3%. At these settings, the maximum total energy (TE) of 62.6 J (TE is calculated by multiplying power×total treatment duration×the duty cycle) used in this study is at the lowest end of the range reported in the literature.[2] In addition, Tong et al[1] state that in some instances, up to 50% of the limbal circumference of the eye was left untreated when areas of previous surgery were avoided. The authors also state that the power and duration of the treatments were sometimes decreased as well. Thus, in many patients, the energy delivered was effectively <62.6 J.

The low TE used by Tong et al[1] has already been shown in the prior literature to result in a suboptimal nonsustainable IOP-lowering effect.[3] Tong et al[1] do state that maximal IOP decrease was greater when higher energy was used, and this is supported by the literature, which shows a dose-response relationship for MPTCP.[4,5] For example, Marchand et al[5] performed a prospective 18-month study using TE between 150.2 and 200.4 J. At 18 months, mean IOP was reduced by 40.1% in the group that received 200.4 J of treatment compared with 30.8% in the group that received 150.2 J of treatment. Treatment absolute success, as defined as IOP between 6 and 21 with a reduction in IOP of 25% with equal or less number of medications, was overall 61.5% at 12 months and 59.6% at 18 months.

When rates of retreatment are examined in the literature, it is clear that lower energy administered during MPTCP is also associated with higher rates of retreatment. Aquino et al[6] and Tan et al[7] used the exact same amount of energy as Tong et al[1] (62.6 J) and had retreatment rates of 48% (Aquino et al[6]) and 35% (Tan et al[7]). In contrast, the rates of retreatment were significantly lower in Al Habash and AlAhmadi[8] (5.6%) and Yelenskiy et al[9] 8.6%. Al Habash et al[8] used TE of 165.2 J and Yelenskiy et al[9] 111.6–148.8 J, almost 2–3 times more than Tong et al.[1]

The final important variable of MPTCP treatment is sweep velocity.[2] Tong et al[1] mention that the treatment probe was moved in a continuous sliding motion; however, sweep velocity was not described. To illustrate the importance, slowing sweep velocity from 2.8 mm/s (10 passes of 8 s sweeps over 80 s of total treatment time) to 1.4 mm/s (5 passes of 16 s sweeps over 80 s of total treatment time) doubles the treatment fluence.[2] Fluence, which is significantly impacted by sweep velocity, is the energy delivered per unit area (Fluence = Energy used × duty cycle × dwell time/area).[2]

We believe the current best practices discussed here put into perspective the work by Tong et al.[1] We also recommend that every new publication have a standardized and clear description of all the MPTCP parameters (power, duty cycle, sweep velocity, and number of sweeps) used to better assess the amount of energy delivered to the eye. In addition, we recommend consideration of the World Glaucoma Association (WGA) guidelines as a systematic approach when evaluating for side effects or potential complications.

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Response to Letter to the Editor: One-Year Outcomes of Micropulse Cyclophototherapy for Primary Open-angle Glaucoma

We thank Grippo and colleagues for their interest and comments regarding our study.

Our study found that micropulse transscleral cyclophototherapy (MPTCP) had a transient and modest effect in eyes with primary open-angle glaucoma, with a similar medication burden.[1] We believe MPTCP remains to be a very useful treatment modality, especially for patients with concurrent medical comorbidities requiring optimization before definitive glaucoma surgery.[1]

First, Grippo and colleagues believed that our study's treatment parameters were subtherapeutic, leading to a suboptimal effect of MPTCP. Many studies on MPTCP were conducted in different geographical areas and included patients with different ethnicities as well as different glaucoma subtypes.[2,3] With these differences, direct comparison of outcomes between different studies, such as retreatment rates, should be avoided.

MPTCP utilizes diode laser energy which is absorbed by pigmented intraocular tissues, including that of the ciliary body epithelium.[4] In our study, our patients are of ethnic races with more tissue pigmentation. Taking the above into account, our parameters seek to avoid excessive energy delivery to our patients' eyes, in which the intraocular tissues are more likely to absorb more energy compared with patients of less pigmented races. Higher energy delivered may potentially play a contributory role to complications seen, such as inflammation, tonic pupil and cystoid macular edema.[2,3]

There is currently no consensus on a standardized protocol for MPTCP treatment parameters. Variations in the laser parameters used in the real world setting often depend on surgeon preferences and are adapted to the patients' clinical characteristics for patient safety, which is paramount. As mentioned, MPTCP can always be safely repeated when required and its relative safety has been described in previous studies.[1,4,5]

Second, we had acknowledged that the retrospective nature of the study carry its inherent limitations.[1] Treatment parameters varied between patients who were managed by different surgeons. Hence, specific information such as sweep velocity was not available. As mentioned in our article, we suggest for more prospective studies to examine the effects of various treatment parameters and their influence on the outcomes of intraocular pressure lowering in different glaucoma subtypes.[1]

We believe the above discussion addresses the points raised by Grippo and colleagues. In future, when more information is gathered from larger prospective studies, recommendations on MPTCP settings can be made for optimal patient care, taking into account specific patient demographics and glaucoma subtypes.

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