

## If laser iridotomy did not significantly open the angle, do I always resort to a laser iridoplasty?

Ma. Catherina Coronel-Nasol, MD<sup>1,2</sup>, Aldo Mar B. Cariaga, MD<sup>1,3,4</sup>,  
Benjamin M. Abela, Jr., MD<sup>1,5</sup>

<sup>1</sup>Philippine Glaucoma Society

<sup>2</sup>University of Santo Tomas Hospital, Manila

<sup>3</sup>University of the Philippines Manila, Manila

<sup>4</sup>Baguio General Hospital Medical Center, Baguio, Benguet

<sup>5</sup>Makati Medical Center, Makati City

Disclaimer: The topic was presented during the Philippine Academy of Ophthalmology (PAO) – sponsored Lifelong Educational Access Program (LEAP) last August 4, 2018. The speaker's stance on the controversial issue was randomly assigned and may not necessarily reflect his/her own views and actual practice. The authors report no conflict of interest.

### **Do I do laser iridoplasty if laser iridotomy fails? Yes, I Do.**

**Ma. Catherina Coronel-Nasol, MD, DPBO**

Laser iridotomy and iridoplasty are two laser procedures that both address angle closure but in different ways. In laser iridotomy, a hole is created in the iris to equalize the pressures in the anterior and posterior chambers thereby relieving relative or absolute pupil block. On the other hand, laser iridoplasty creates contraction burns to the peripheral iris to pull the iris stroma away from the angle structures therefore deepening the angle recess.

The indications for these two procedures differ as well. Usually, laser iridotomy is the first procedure done to address angle closure glaucoma. It is also used to address acute attacks and fellow eyes of acute attacks. Laser iridotomy can also be done in primary angle closure suspects in cases where repeated pupillary dilatation is required, when there is difficulty in accessing immediate ophthalmic care, or when there are symptoms suggesting of intermittent angle closure.<sup>1</sup> Laser iridotomy is also an initial therapy for suspected plateau iris and malignant glaucoma. It can also be used as a temporizing measure for phacomorphic glaucoma.<sup>2</sup>

On the other hand, laser iridoplasty is used mainly

to treat plateau iris. But it can also be done in cases where there is residual appositional angle closure, in acute attacks where laser iridotomy is not possible due to hazy media, in acute attacks in a patent iridotomy, and prior to laser trabeculoplasty when angle remains anatomically narrow after a laser iridotomy.<sup>1,3</sup>

Although laser iridotomy can prevent progression of angle closure, it can only address the element of pupillary block. However, there are different mechanisms of angle closure that can occur simultaneously or sequentially in a patient. Different levels of blockade are as follows: site 1 – pupil block which gives an iris bombe appearance; site 2 – anteriorly rotated ciliary processes that push iris forward and/or a thick peripheral iris which is present in plateau iris; site 3 – lens induced forward displacement of the iris; and site 4 – ciliary block and other posterior mechanisms.<sup>1</sup>

Laser iridotomy opens the drainage angle in a majority of primary angle closure suspects. However, angles in a significant minority of eyes remained closed after iridotomy. According to the ultrasound biomicroscopy study of Kumar *et al.*, plateau iris is seen in 1/3 of primary angle closure suspects after laser iridotomy. And of the 30% primary angle closure suspect patients with plateau iris configuration prior to laser iridotomy, 75% had persistent condition after laser iridotomy.<sup>4</sup> This is one of the reasons why it is

logical to perform laser iridoplasty if the angles have not opened significantly after iridotomy.

Ramakrishnan *et al.* investigated the efficacy of iridoplasty in the treatment of eyes with primary angle closure (PAC) and plateau iris syndrome (PIS) unresponsive to iridotomy using anterior segment optical coherence tomography (OCT). They found out that after iridoplasty, there was a significant decrease in intraocular pressure from  $24.4 \pm 5.6$  to  $16.5 \pm 5.4$  mmHg, a decrease in number of medications from  $1.6 \pm 0.9$  to  $0.7 \pm 1.1$ , and a reduction in peripheral anterior synechiae from 3.5 to 2 clock hours in PAC group and 3.8 to 2.5 clock hours in PIS group. In addition, increases were noted in the angle opening distance at 500  $\mu\text{m}$ , trabecular-iris space at 500  $\mu\text{m}$ , and scleral spur angle as measured by the anterior segment OCT. Aside from that, there were no significant complications after iridoplasty making it a safe and effective procedure.<sup>5</sup>

Doing these two procedures simultaneously in primary angle closure suspects and primary angle closure glaucoma patients resulted to positive effects on the configuration of anterior chamber. Although doing the two procedures simultaneously did not significantly offer an additional decrease in intraocular pressure nor a decrease in the number of medications compared to just doing laser iridotomy alone, both significantly increased the mean anterior chamber depth and anterior chamber volume.<sup>6</sup> Together, they also decreased the amount of peripheral anterior synechiae by 1 clock hour.<sup>7</sup>

In conclusion, laser iridotomy is an acceptable procedure addressing angle closure by relieving relative or absolute pupil block. However, there are other mechanisms of angle closure that can occur simultaneously or sequentially. One of the most common mechanisms of angle closure aside from pupil block is plateau iris or thick peripheral iris. This condition can be addressed by laser iridoplasty. It has been shown in the studies mentioned that laser iridoplasty is a safe and effective procedure addressing residual angle closure after a patent laser iridotomy.

#### REFERENCES:

1. South East Asia Glaucoma Interest Group. Asia Pacific Glaucoma Guidelines. 2<sup>nd</sup> ed. Sydney: The Group; 2008.
2. American Academy of Ophthalmology. Primary Angle Closure Preferred Practice Patterns. San Francisco: American Academy of Ophthalmology; 2013.
3. European Glaucoma Society. Terminology and Guidelines for Glaucoma, 4<sup>th</sup> ed. Italy: PubliComm; 2014.

4. Kumar RS, Baskaran M, Chew PT, *et al.* Prevalence of plateau iris in primary angle closure suspects: an ultrasound biomicroscopy study. *Ophthalmology*. 2008;115:430-434.
5. Ramakrishnan R, Mitra A, Abdul Kader M, Das S. To Study the Efficacy of Laser Peripheral Iridoplasty in the Treatment of Eyes with Primary Angle Closure and Plateau Iris Syndrome Unresponsive to Laser Peripheral Iridotomy, Using Anterior Segment OCT as a Tool. *J Glaucoma*. 2016;25(5):440-446.
6. Lee JR, Choi JY, Kim YD, Choi J. Laser Peripheral Iridotomy with Iridoplasty in Primary Angle Closure Suspect: Anterior Chamber Analysis by Pentacam. *Korean J Ophthalmol*. 2011;25(4):252-256.
7. Sun X, Liang YB, Wang NL, *et al.* Laser Peripheral Iridotomy with and without Iridoplasty for Primary Angle Closure Glaucoma: 1 year Results of a Randomized Pilot Study. *Am J Ophthalmol*. 2010;150(1):68-73.

### **Do I do laser iridoplasty if laser iridotomy fails? No, I Don't.**

**Aldo Mar B. Cariaga, MD**

Managing a failed laser iridotomy (LI) starts by understanding how these two lasers address angle closure. LI is specifically used for pupillary block, the most common cause of angle closure glaucoma. Numerous studies have proven that LI is very effective in preventing the development of pupillary block in narrow angles.<sup>1-6</sup> On the other hand, the main indication for laser iridoplasty is angle closure caused by mechanisms other than pupillary block.<sup>7</sup> This procedure is mainly for plateau iris but it is also used to break peripheral anterior synechia and to widen the angles in the presence of iris cysts.

While many studies have proven that argon laser peripheral iridoplasty (ALPI) when done in conjunction with LI significantly increases angle width better than LI alone, not all failed LIs are to be addressed with an ALPI.<sup>8-10</sup>

A failed iridotomy may be defined as an intraocular pressure (IOP) that remains high or an angle that remains narrow or occludable after an iridotomy. When confronted with one of these scenarios, it is more reasonable to determine the cause of the failure and address this accordingly, than to simply perform an ALPI and see if it works.

There are several possible causes of persistently high IOP after LI. These include residual peripheral anterior synechiae, concomitant primary open angle glaucoma (POAG), steroid-induced IOP increase, inflammation, and trabecular meshwork damage from repeated iridocorneal touch. Among these possible

causes, ALPI has only been shown to work in eyes with residual peripheral anterior synechia. ALPI has no effect on eyes with concomitant POAG and IOP elevation from steroid use. ALPI may worsen those with severe anterior chamber inflammation or trabecular meshwork damage.

On the other hand, possible causes of persistently narrow angles post-LI include plateau iris, ciliary body cysts, thick lens, non-patent iridotomy, choroidal effusion, and malignant glaucoma. Among these causes, only eyes with plateau iris, thick lens, or ciliary body cysts are amenable to ALPI.<sup>11-13</sup> Without correctly addressing the underlying disease process, performing an ALPI on eyes with a non-patent iridotomy, choroidal effusion, and malignant glaucoma will only cause corneal endothelial damage, delay in the proper management, and possibly permanent synechial closure of the angles.

In conclusion, when we are faced with a case of failed LI, our treatment should be directed towards the pathology of the cause of failure. Many times, this will relieve the angle closure and prevent unnecessary ocular damage or delay in the appropriate management.

#### REFERENCES:

1. Anwar F, Turalba A. An Overview of the Treatment Methods for Primary Angle Closure. *Semin Ophthalmol.* 2017;32(1):82-85.
2. Moghimi S, Bijani F, Chen R, et al. Anterior Segment Dimensions Following Laser Iridotomy in Acute Primary Angle Closure and Fellow Eyes. *Am J Ophthalmol.* 2018;186:59-68.
3. Mansoori T, Balakrishna N. Anterior Segment Morphology After Laser Iridotomy in Primary Angle Closure Suspects. *Clin Exp Optom.* 2018;101(3):333-338.
4. Radhakrishnan S, Chen P, Junk A, et al. Laser Peripheral Iridotomy in Primary Angle Closure: A Report by the American Academy of Ophthalmology. *Ophthalmology.* 2018;125(7):1110-1120.
5. Lei K, Wang N, Wang L, Wang B. Morphological Changes of the Anterior Segment After Laser Peripheral Iridotomy in Primary Angle Closure. *Eye.* 2009;23:345-350.
6. Kashiwagi K, Abe K, Tsukahara S. Quantitative Evaluation of Changes in Anterior Segment Biometry by Peripheral Laser Iridotomy Using Newly Developed Scanning Peripheral Anterior Chamber Analyser. *Br J Ophthalmol.* 2004;88:1036-1041.
7. Gomeas Prado V, Dorairaj S, Biteli LG, et al. Role of Laser Iridoplasty in the Management of Angle Closure Mechanisms Other Than Pupillary Block. *J Curr Glaucoma Pract.* 2014;8(2):82-4.
8. Cho HK, Kee C, Yang H, et al. Comparison of Circumferential Peripheral Angle Closure using Iridotrabeular Contact Index After Laser Iridotomy Versus Combined Laser Iridotomy and Iridoplasty. *Acta Ophthalmol.* 2017;95(7):e539-e547.
9. Smythe B, Ngo Y. An Overview of Laser Iridoplasty.

Glaucoma Today. March/April 2012. <http://glaucomatoday.com/2012/04/an-overview-of-laser-iridoplasty/> Accessed July 10, 2019.

10. Prado VG, Dorairaj S, Gustavo Biteli L, et al. Role of Laser Iridoplasty in the Management of Angle Closure Mechanisms other than Pupillary Block. *J Curr Glaucoma Pract.* 2014;8(2):82-84.
11. Tomey K, Al-Rajhi A. Neodymium:YAG Laser Iridotomy An Initial Management of Phacomorphic Glaucoma. *Am J Ophthalmol.* 1992;99(5):660-665.
12. Sowka J. Phacomorphic Glaucoma: Case and Review. *Optometry.* 2006;77:586-589.
13. Papaconstantinou D, Georgalas I, Kourtis N, et al. Lens-Induced Glaucoma in the Elderly. *Clin Interv Aging.* 2009;4:331-336.

### ***Consolidating the Evidence***

**Benjamin M. Abela, Jr., MD**

It is important to address the cause of the persistently high intraocular pressure (IOP) despite the presence of a patent iridotomy. Cases of post-iridotomy with persistently high IOPs that cannot be treated by a sequential iridoplasty include mixed glaucoma, scarred trabecular meshwork, and malignant glaucoma.<sup>1</sup>

On the other hand, there are benefits of doing a laser trabeculoplasty after laser iridotomy.<sup>2</sup> A study revealed that as many as 33% of eyes with primary angle closure that underwent laser iridotomy had plateau iris configuration on ultrasound biomicroscopy.<sup>3</sup> Several studies also support a sequential iridoplasty after iridotomy. Findings include significant drop in the baseline IOP, significant reduction in the number of medications needed to attain target IOPs, significant decrease in the peripheral anterior synechia, and significant improvement in the angle parameters as measured by the anterior segment optical coherence tomography. In addition, there was a significant drop in the percentage of patients who needed additional surgical intervention.<sup>4</sup>

The evaluating clinician should always remember to do a very good gonioscopy in order to determine whether the cause of the angle closure is appositional or synechial. Then he/she should determine which of the 4 mechanisms is present: is it pupillary block (50%), a plateau iris (20%), phacomorphic mechanism (>20%), or malignant glaucoma (<10%)?<sup>5</sup> It is important to monitor these patients closely. Studies have shown that about 60% of patients with synechial closure, no matter how small the number of clock-hour closure, will progress to further closure and more than 30% will need surgical intervention.<sup>6</sup>

## REFERENCES:

1. Sun X, Liang YB, Wang NL, *et al.* Laser Peripheral Iridotomy with and without Primary Angle Closure Glaucoma: 1 year results of a randomized pilot study. *Am J Ophthalmol.* 2010;150(1):68-73.
2. Ang GS, AP Wells. Factors influencing laser peripheral iridotomy outcomes in white eyes: an anterior segment optical coherence study. *J Glaucoma.* 2011;20(9):577-583.
3. Radhakrishnan S, Chen P, Junk A, *et al.* Laser Peripheral Iridotomy in Primary Angle Closure: A Report by the American Academy of Ophthalmology. *Ophthalmology.* 2018;125(7):1110-1120.
4. Bansal S, Balakrishnan SA, Blachley T, *et al.* Subsequent receipt of interventions for glaucoma among a nationwide sample of patients who underwent laser peripheral iridotomy. *Am J Ophthalmol.* 2015;160(2):275-282.
5. Asia Pacific Glaucoma Society. Asia Pacific Glaucoma Guidelines. Kugler Publications, 2016.
6. Rao A, Rao HL, Kumar AU, *et al.* Outcomes of laser peripheral iridotomy in angle closure disease. *Semin Ophthalmol.* 2013;28(1):4-8.