

MANAGEMENT OF ANGLE-CLOSURE GLAUCOMA



Appropriate and timely intervention is crucial.

BY CHANDRASEKHARAN KRISHNAN, MD

Primary angle-closure glaucoma is the most common form of glaucoma worldwide and the leading cause of irreversible bilateral blindness. Management of angle-closure glaucoma presents diagnostic and therapeutic challenges to clinicians. It is important to understand the full spectrum of the disease with the underlying anatomic changes and pathophysiology and to discern the role of various interventions at different stages of the disease to optimize outcomes and minimize complications. In this article, Dr. Krishnan reviews the current terminology across this complex disease entity and discusses the role of laser iridotomy, trabeculectomy, goniosynechialysis, and cataract extraction.

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Angle-closure glaucoma can be a devastating disease. In the acute form, permanent vision loss can occur within a matter of hours. In the chronic form, a slow, inexorable rise in IOP leads to compromise of trabecular meshwork function with synechial closure of the drainage angle. As such, appropriate and timely management is crucial.

Before exploring the management of angle-closure glaucoma, it is important to understand the terms used

in association with this disease, as the descriptions have changed over the years. This article uses terminology established by the AAO Preferred Practice Pattern guidelines for angle-closure glaucoma.¹

In primary angle-closure suspect (PACS), primary angle closure (PAC), and primary angle-closure glaucoma (PACG), several risk factors have been well established, including Asian or Inuit descent, female gender, hyperopia, advancing age, and family history in a

first-degree relative. In addition, several ocular biometric factors, including a shallow anterior chamber, short axial length, and the thickness and increased anterior curvature of the crystalline lens, have been shown to play a significant role in pathogenesis of the disease.²

As the eye ages, iridolenticular contact increases, largely due to an increase in the anteroposterior diameter of the lens. This results in relative pupillary block, causing a forward bowing of the iris and increased iridotrabecular contact, which, over time, leads to trabecular dysfunction and/or iridotrabecular synechiae. The extent of iridotrabecular contact, IOP level, and the status of the optic nerve help differentiate and define the various terms (Table).

MANAGEMENT APPROACHES

Management of PAC and PACG has traditionally involved a combination of laser peripheral iridotomy (LPI), pressure-lowering medications, and glaucoma filtration surgery. For PACS in particular, LPI is considered the standard of care. However, lens removal is becoming an increasingly popular option for the management of these conditions.

AT A GLANCE

- ▶ Although laser peripheral iridotomy reduces the risk of conversion from primary angle closure (PAC) to primary angle-closure glaucoma (PACG), a significant percentage of patients treated with iridotomy alone progress.
- ▶ In patients with PAC or PACG and visually significant cataract, cataract removal can improve visual acuity and angle anatomy.
- ▶ Primary angle closure suspects have a low rate of conversion to PAC or PACG, whether these patients undergo an iridotomy or are observed.

TABLE. COMPARISON OF PACS, PAC, AND PACG				
	Iridotrabecular Contact	Elevated IOP?	Peripheral Anterior Synechiae?	Optic Nerve Damage?
Primary Angle-Closure Suspect	> 180°	No	No	No
Primary Angle Closure	> 180°	Yes	Yes	No
Primary Angle-Closure Glaucoma	> 180°	Yes	Yes	Yes

Laser peripheral iridotomy. LPI and medications are often used to acutely manage elevated IOP. Although LPI is quite effective in treating acute angle closure and reduces the risk of conversion from PAC to PACG, a significant number of patients treated with LPI alone progress from PAC to PACG, requiring additional intervention.³ In one study of 37 patients presenting with acute PAC, 18 patients were randomly assigned to LPI and 17 to phacoemulsification with lens placement. Failure of postoperative IOP control, defined as either having an IOP of between 22 to 24 mm Hg on two occasions or an IOP of greater than 25 mm Hg on one occasion, was then measured. The 2-year failure rate was 39% in the LPI group and 11% in the phaco/IOL group.⁴

Observational studies and anterior segment OCT studies have shown that peripheral iridotomy in eyes with PACS slows the rate of angle narrowing over time compared with no iridotomy.⁵ However, the angles of eyes that have undergone prior LPI do continue to narrow. Additionally, although iridotomy is reasonably safe, a small but significant number of patients develop visual disturbances of glare, halos, or ghost images caused by the procedure, regardless of location.⁶

In the recently published Zhongshan angle-closure prevention study, 889 PACS patients were randomly assigned to undergo iridotomy in one eye and observation in the other eye. After randomization, patients were monitored over a 6-year period. Primary endpoints were IOP greater than 24 mm Hg on two separate occasions, peripheral anterior synechiae greater than 1 clock hour, or an acute angle-closure attack. Over this time, patients in the observa-

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tion group were more likely to develop peripheral anterior synechiae, although the rates were low (15 in the laser group and 30 in the control group). Acute angle-closure attacks were rare in both groups (one in the LPI group and five in the control group), as was elevation of IOP over 24 mm Hg (three in the LPI group and five in the control group).⁷

Glaucoma filtration surgery. Trabeculectomy has traditionally been the surgery of choice for PACG after medical treatment and laser treatment have failed. Trabeculectomy is an effective procedure for lowering IOP; however, it comes with both short-term and long-term risks that can impair vision permanently. In one study of 51 medically uncontrolled PACG eyes with coexisting cataracts, combined phacoemulsification and trabeculectomy was more effective than phacoemulsification alone in controlling IOP. The combined approach, however, was associated with more postoperative complications and more progression of optic neuropathy compared with phacoemulsification alone.⁸

Lens extraction. As previously stated, the crystalline lens plays a sig-

nificant role in the development of PAC and PACG. Lens removal serves two purposes. First, it eliminates iridolenticular contact, alleviating relative pupillary block. Second, it prevents gradual angle narrowing, as the pseudophakic IOL is of uniform size. In a patient with PAC or PACG and visually significant cataract, cataract removal can improve visual acuity and angle anatomy and lower IOP.⁹

Decision-making becomes more complicated in eyes without visually significant cataracts. A 2013 study by Tham and colleagues¹⁰ found that IOP control was similar in PACG patients undergoing clear lens extraction versus trabeculectomy. The trabeculectomy group required fewer medications, but there were also more complications associated with trabeculectomy.

The 2016 EAGLE study¹¹ compared clear lens extraction to LPI in patients with PAC and PACG. The investigators found that patients who underwent clear lens extraction required fewer medications, had lower IOP, and needed fewer subsequent interventions. These patients also noted an

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improvement in their quality of life after cataract extraction, likely related to improvement of their vision. Risks were fairly similar overall.

Goniosynechialysis. In patients with significant peripheral anterior synechiae, goniosynechialysis is an effective tool when paired with cataract surgery.¹² However, results are better when this procedure is performed within an appropriate time frame of peripheral anterior synechiae formation. Goniosynechialysis can be performed via direct or indirect visualization and is reported to be much less effective as a standalone procedure. In a 2016 study, 145 eyes of 133 consecutive patients with PACG and greater than 180° of angle closure and cataract were randomly assigned to either trabeculectomy or phacoemulsification with IOL implantation and goniosynechialysis. At 12 months, IOP was similar between the two groups.¹³

CONCLUSION

Traditional surgical treatment of PACS, PAC, and PACC includes iridotomy and trabeculectomy. Although useful, these procedures can have serious complications. As such, it is worth considering the role of lens removal in these patients, as this intervention alone can be effective in the management of these conditions. ■

1. Primary angle closure PPP – 2015. American Academy of Ophthalmology. November 2015. www.aao.org/preferred-practice-pattern/primary-angle-closure-ppp-2015. Accessed January 1, 2018.
2. Moghimi S, Vahedian Z, Fakhraie G, et al. Ocular biometry in the subtypes of angle closure: an anterior segment optical coherence tomography study. *Am J Ophthalmol*. 2013;155(4):664-673.
3. Aung T, Ang LP, Chan SP, Chew PT. Acute primary angle-closure: long-term intraocular pressure outcome in Asian eyes. *Am J Ophthalmol*. 2001;131(1):7-12.
4. Husain R, Gazzard G, et al. Initial management of acute primary angle closure: a randomized trial comparing phacoemulsification with laser peripheral iridotomy. *Ophthalmology*. 2012;119(11):2274-2281.
5. Jiang Y, Chang DS, Zhu H, et al. Longitudinal changes of angle configuration in primary angle-closure suspects: the Zhongshan Angle-Closure Prevention Trial. *Ophthalmology*. 2014;121:1699-1705.
6. Srinivasan K, Zebardast N, Krishnamurthy P, et al. Comparison of new visual disturbances after superior versus nasal/temporal laser peripheral iridotomy: a prospective randomized clinical trial. *Ophthalmology*. 2018;125(3):345-351.
7. He M, Jiang Y, Huang S, et al. Laser peripheral iridotomy for the prevention of angle closure: a single-centre, randomised controlled trial [published online March 13, 2019]. *Lancet*. doi:10.1016/S0140-6736(18)32607-2.
8. Tham CC, Kwon YY, Leung DY, et al. Phacoemulsification versus combined phacotrabeculectomy in medically uncontrolled chronic angle closure glaucoma with cataracts. *Ophthalmology*. 2009;116(4):725-731.
9. Lai J, Tham C, Chan JC. The clinical outcomes of cataract extraction by phacoemulsification in eyes with primary angle-closure glaucoma (PACG) and co-existing cataract: a prospective case series. *J Glaucoma*. 2006;15(1):47-52.
10. Tham CC, Kwong YY, Baig N, et al. Phacoemulsification versus trabeculectomy in medically uncontrolled chronic angle-closure glaucoma without cataract. *Ophthalmology*. 2013;120(1):62-67.
11. Azuara-Blanco A, Burr J, Ramsay C, et al. Effectiveness of early lens extraction for the treatment of angle-closure glaucoma (EAGLE): a randomised controlled trial. *Lancet*. 2016;388(10052):1389-1397.
12. Rodrigues IA, Alagband P, Beltran Agullo L, et al. Aqueous outflow facility after phacoemulsification with or without goniosynechialysis in primary angle closure: a randomised controlled study. *Br J Ophthalmol*. 2017;101(7):879-885.
13. Zhang H, Tang G, Liu J. Effects of phacoemulsification combined with goniosynechialysis on primary angle-closure glaucoma. *J Glaucoma*. 2016;25:e499-e503.

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