

UNLOCKING PRIMARY ANGLE-CLOSURE DISEASE



Researchers investigated risk factors associated with primary angle-closure disease and the long-term outcomes of early phacoemulsification compared to laser peripheral iridotomy.

BY RITHAMBARA RAMACHANDRAN, MD, AND LAMA A. AL-ASWAD, MD, MPH

EVALUATION OF REFRACTIVE STATUS AND OCULAR BIOMETRIC PARAMETERS IN PRIMARY ANGLE CLOSURE DISEASE

Loh CC, Kamaruddin H, Bastion MLC, Husain R, Isa HM, Din NM¹

Industry support: None

ABSTRACT SUMMARY

This cross-sectional study evaluated the refractive status and various ocular biometric parameters of individuals with a past episode of angle closure who presented to a single hospital clinic in Malaysia. The investigators identified 171 patients (268 eyes) with primary angle closure (PAC) and recorded their visual acuity, refraction, and ocular biometry measurements, including central anterior chamber depth (ACD), axial length (AL), lens thickness (LT), vitreous cavity length, and relative lens position (RLP).

Of the total 268 eyes, 92 had suspected PAC, 30 had PAC, and 146 had primary angle-closure glaucoma. A majority of the patients were of Chinese ethnicity (73.5%), and a majority were female (64.9%). Approximately half (51%) of the eyes were hyperopic, and the primary angle-closure glaucoma group had the highest percentage of hyperopia (50.4%). Myopia (low and moderate) and emmetropia were present in 17.9% and 31% of the eyes, respectively.

STUDY IN BRIEF

- A cross-sectional study found that a decrease in relative lens position is a predictor of angle-closure disease in myopic eyes, whereas an increase in lens thickness can predict angle-closure disease in hyperopic eyes.

WHY IT MATTERS

Ocular biometry in patients with primary angle closure has been studied extensively, but specific data on the relationship between myopia and angle closure are lacking. The Global Prevalence of Myopia and High Myopia study predicted that, by the year 2050, 49.8% of the world's population will be myopic.² Loh and colleagues evaluated whether different biometric parameters can predict angle-closure disease in myopic individuals versus hyperopic individuals to help predict angle-closure events.

The AL and vitreous cavity length were significantly greater in myopic eyes ($P < .001$), whereas the ACD did not differ statistically between the three refractive groups. Importantly, the RLP was reduced in myopic eyes (significant pairwise comparison: $P = .006$ for hyperopia vs myopia), but the LT was greater in hyperopic eyes (significant pairwise comparison: $P = .006$ for hyperopia vs myopia).

These results suggest that RLP may be an important predictor of angle-closure disease in myopic eyes, whereas LT may be an important predictor in hyperopic eyes.

DISCUSSION

What exactly is RLP, and how can it be used to predict angle-closure disease in people with axial myopia?

RLP—calculated as $(ACD + \frac{1}{2} LT) / AL$ —is a way of understanding how anterior displacement of the lens relative to other structures in the anterior chamber can affect the angle. An advantage of RLP is that its components can be measured using in-office optical biometry systems and subsequently calculated. As shown in this study and others, the final RLP appears to be a key predictor of angle-closure disease in myopic

patients. In particular, studies that have used ultrasound biomicroscopy and anterior segment OCT have found that RLP decreases significantly with appositional closure.^{3,4} The reason behind this observation is currently unknown but may be due to inherent zonular laxity in eyes with myopia, thinner lenses, less anterior rotation of the ciliary body, or a disproportionate elongation of the anterior segment.

How do the results of this study compare to those of similar studies?

Specific correlations between biometric features and refractive

status have been inconsistent. A 2019 systemic review by Gaurisankar et al found a strongly negative correlation between AL and refractive status ($r = -0.67$; 95% CI: -0.76, -0.56), with a reduction in myopic power of 2.30 D on average for each 1 mm of axial elongation.⁵ Gaurisankar and colleagues also found the mean weighted corrected correlation between AL and ACD to be only moderate ($r = 0.49$; 95% CI: -0.04, 0.58), meaning that eyes with longer ALs had longer ACDs. In contrast, Mohamed-Noor and Abd-Salam found that the ACD was shallower among individuals with myopia

compared to those with hyperopia or emmetropia but that the AL did not differ significantly between the groups.⁶ Yong et al found no difference in either ACD or RLP among groups of patients with angle-closure glaucoma who had different refractive statuses, but these investigators did find that myopic patients with angle closure had longer ALs and vitreous cavity lengths.⁷ Importantly, many of these studies did not exclude lenticular myopia, thus likely conflating the effects of refractive status and biometric parameters in patients with PAC.

TEN-YEAR CLINICAL OUTCOMES OF ACUTE PRIMARY ANGLE CLOSURE RANDOMIZED TO RECEIVE EARLY PHACOEMULSIFICATION VERSUS LASER PERIPHERAL IRIDOTOMY

Chan C, Tang FY, Leung DY, Lam TC, Baig N, Tham CC⁸

Industry support: None

ABSTRACT SUMMARY

This study presents the 10-year clinical outcomes data of a previously published randomized controlled trial⁹ in which eyes with acute primary angle closure (APAC) received either early phacoemulsification or laser peripheral iridotomy (LPI). Forty of the original 62 eyes (19 from the phaco group and 21 from the LPI group) were examined. The mean follow-up duration was 10.7 ± 0.7 years. None of the patients underwent additional glaucoma procedures in that time, but 15 (71.4%) patients in the LPI group underwent lens extraction during that interval.

The phaco group used less medication, had less extensive anterior synechiae, and had more open angles as graded using Shaffer gonioscopy. In the LPI group, five eyes had a persistent IOP elevation at two consecutive visits, and four eyes were blind (BCVA worse than 6/60 and/or central visual field $< 20^\circ$); no eye in the phaco group

experienced a persistent IOP elevation or became blind. There was no difference in mean IOP, BCVA, or number of eyes with visual field progression between the two groups.

DISCUSSION

How did the results of the 10-year study compare to those of the 18-month follow-up study?

The initial study by Lam et al⁹ looked at the prevalence of elevated IOP (defined as an increase to greater than 21 mm Hg after glaucoma

medications were stopped) at day 1; week 1; and months 1, 3, 6, 12, and 18. The prevalence of IOP elevation at 18 months was 3.3% (1 of 30 eyes) and 46.7% (14 of 30 eyes) in the phaco and LPI groups, respectively ($P < .0001$). In comparison, in the study of 10-year outcomes,⁸ there remained IOP elevation in five of 21 eyes (23.8%) initially treated with LPI but none of the eyes initially treated with phacoemulsification.

There was also a significant difference in the mean number of

STUDY IN BRIEF

- ▶ This study found that early phacoemulsification was more effective than laser peripheral iridotomy (LPI) at preventing IOP elevation and blindness and at reducing the amount of IOP-lowering medication required after medically aborted acute primary angle closure (APAC).

WHY IT MATTERS

The authors of this study suggest that phacoemulsification should be performed early to open the angle in APAC eyes originally managed medically, to prevent further irreversible damage to the trabecular meshwork, to lower the risk of IOP elevation and blindness, to reduce the amount of IOP-lowering medication required, and to improve visual acuity. In a subgroup analysis, eyes that underwent LPI first and subsequently received phacoemulsification more than 18 months after the initial APAC attack required more medication than eyes that initially underwent phacoemulsification instead of LPI, suggesting that earlier phacoemulsification yields higher benefits.

glaucoma medications required to maintain an IOP below 21 mm Hg. At 18 months, the phaco group required 0.03 ± 0.18 bottles per eye, and the LPI group required 0.90 ± 1.14 bottles per eye ($P < .0001$). At 10 years, these differences persisted (0.16 ± 0.37 bottles per eye in the phaco group vs 0.76 ± 1.09 bottles per eye in the LPI group, $P = .028$). The use of fewer bottles reduces both the financial burden and the associated side effects of topical medical therapy. No statistically significant difference in logMAR acuity or visual field parameters was noted between the two groups at either time point.

The current study⁸ was limited by the fact that 71% of the eyes assigned to early LPI underwent phacoemulsification during the 10-year period.

How practical is early phacoemulsification for APAC eyes?

All patients received either phacoemulsification or LPI within days of the abortion of the APAC attack, as soon as the IOP decreased to below 21 mm Hg and the inflammation settled sufficiently to permit safe intervention. The success rate of medical management alone, however, is not 100%. In a study by Ramli et al, medical therapy resolved APAC within 12 hours in only 76.2% of the patients, with lower success rates at earlier time points.¹⁰

Given this slow rate of resolution, it has been argued that other techniques such as the controversial

anterior chamber paracentesis may cause less damage to the optic nerve and anterior segment structures because of a more rapid onset of action. The Effectiveness in Angle-Closure Glaucoma of Lens Extraction (EAGLE) study found that initial treatment with clear lens extraction in PAC patients was associated with a better quality of life, a lower IOP, and less need for glaucoma surgery at 36 months compared to the standard of care—LPI.¹¹ Nevertheless, phacoemulsification is not widely accepted as an initial treatment for APAC because of the surgical challenges of operating on an eye during or soon after an acute attack. The surgery can be technically challenging because of a shallow anterior chamber, poor mydriasis, posterior synechiae adherent to the lens, possible zonular weakness, and residual corneal edema. In contrast, LPI is technically easier, quicker, cheaper, and safer to perform. From a practical standpoint, therefore, early LPI followed by phacoemulsification soon after the resolution of ocular inflammation may be optimal. The exact time course remains controversial. ■

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JAMES C. TSAI, MD, MBA | SECTION EDITOR

- President, New York Eye and Ear Infirmary of Mount Sinai, and System Chair of Ophthalmology, Mount Sinai Health System, New York
- Member, GT Editorial Advisory Board
- jtsai@nyee.edu
- Financial disclosure: Consultant (Eyenovia, ReNetX Bio)

LAMA A. AL-ASWAD, MD, MPH

- Professor of Ophthalmology, Professor of Population Health, and Vice Chair for Innovation, NYU Langone Health, New York
- lama.al-aswad@nyulangone.org
- Financial disclosure: Advisor (AI Optics, Carl Zeiss Meditec); Consultant (Aerie Pharmaceuticals, Topcon Medical Systems, Verily); Equity owner (GlobeChek); Grant support (Save Vision Foundation); Research support (Topcon Medical Systems)

RITHAMBARA RAMACHANDRAN, MD

- Ophthalmology resident, NYU Langone Health, NYU Grossman School of Medicine, New York
- Financial disclosure: None