

# REFRACTIVE OUTCOMES IN PATIENTS WITH PRIMARY ANGLE-CLOSURE GLAUCOMA



The potential role of peripheral anterior synechiae.

BY CHUNGKWON YOO, MD, PHD, AND TAE-EUN LEE, MD, PHD

Individuals with cataracts also often have glaucoma because increasing age is a risk factor for the development of both.<sup>1</sup> There is growing evidence that cataract surgery can lower IOP in eyes with glaucoma.<sup>2</sup> The role of cataract surgery as an option to control IOP remains controversial in eyes with open-angle glaucoma (OAG). The procedure's efficacy, however, is well established for eyes with angle-closure glaucoma (ACG),<sup>2</sup> largely owing to greater changes in the anterior segment configuration of eyes with a closed versus an open anterior chamber angle. Evidence from the randomized controlled Effectiveness of Early Lens Extraction for the Treatment of Primary Angle-Closure Glaucoma (EAGLE) trial supports the IOP-lowering efficacy of clear lens extraction in eyes with primary ACG (PACG).<sup>3</sup>

Another consideration with cataract surgery on eyes with

glaucoma is that refractive outcomes can be less accurate than in eyes without the disease,<sup>4,5</sup> and the difference seems to be more pronounced in eyes with ACG.<sup>5,6</sup> We recently studied the influence of peripheral anterior synechiae (PAS) on the refractive outcome of cataract surgery in eyes with PACG. This article summarizes our results.<sup>7</sup>

## REFRACTIVE PREDICTABILITY

Manoharan and colleagues found that the incidence of a refractive surprise after cataract surgery was higher in eyes with glaucoma than in control eyes (40.3% vs 29.9%).<sup>6</sup> The odds ratios of a refractive surprise in eyes with OAG, ACG, and pseudoexfoliation glaucoma were 1.90, 14.54, and 7.27 (all  $P < .05$ ), respectively.<sup>5</sup> Refractive outcomes after clear lens extraction in eyes with PAC and an IOP greater than 30 mm Hg and in

eyes with PACG were also suboptimal in the EAGLE trial.

Kang et al retrospectively compared the refractive predictability of phaco cataract surgery in PACG and normal eyes.<sup>8</sup> IOL power calculations were inaccurate in 50% of the PACG group compared to 27% of the control group. Among PACG eyes, 21% experienced a hyperopic shift, and 29% experienced a myopic shift.

A retrospective Korean study found no significant difference in the refractive predictability of cataract surgery in eyes with OAG and ACG.<sup>9</sup> A large lens vault, however, was shown to be predictive of an unsatisfactory postoperative refractive outcome. In contrast, Kim et al found that the postoperative change in refractive error was greater in ACG eyes compared to eyes without glaucoma or OAG, and the direction of the refractive shift varied.<sup>10</sup> Preoperative lens thickness also correlated with greater postoperative absolute changes in refractive error. Additionally, Seo et al found that IOL power calculations for PAC and PACG eyes could be inaccurate; the investigators reported a tendency toward hyperopia and found that the preoperative relative lens vault predicted the postoperative refractive outcome.<sup>11</sup>

Refractive outcomes in eyes with ACG tend to be less predictable

## AT A GLANCE

- ▶ The refractive outcome of cataract surgery tends to be less predictable in eyes with angle-closure glaucoma than in eyes without glaucoma and eyes with other forms of the disease.
- ▶ A recent study suggests that the presence or absence of peripheral anterior synechiae may influence postoperative refractive outcomes in patients with primary angle-closure glaucoma.

because of their anatomical features, including a shallow anterior chamber, a thickened and anteriorly positioned lens, weak zonules, and a short axial length. The direction of the refractive shift (hyperopic or myopic) after phacoemulsification appears to vary and to depend on the magnitude of the influencing factors.

### PERIPHERAL ANTERIOR SYNECHIAE

PAS are permanent adhesions between the iris and the corneoscleral region. They are an important risk factor for IOP elevation in PACG and one of the pathognomonic signs used to differentiate PAC/PACG from suspected PAC.<sup>12</sup> PAS are also associated with anterior placement of the ciliary processes.<sup>13</sup> In this regard, one may expect an IOL to be more anteriorly located in eyes with PAS.

To evaluate the effects of PAS on refractive outcomes, we recently conducted a retrospective, cross-sectional study of 70 patients with PACG who underwent cataract surgery.<sup>7</sup>

#### Effect of PAS on refractive outcomes.

Patients were divided into two groups based on the presence or absence on preoperative gonioscopy of PAS—the PAS (+) and PAS (-) groups, respectively. The IOL power was calculated using the SRK/T, Hoffer Q, Haigis, and Holladay formulas. The mean absolute error (MAE) and predicted refractive errors were compared between PAS (+) and PAS (-) groups. In a subanalysis, we evaluated refractive error with regard to the extent of PAS.

The MAE was greater in the PAS (+) group (0.61–0.70 vs 0.33–0.45 D, all  $P < .05$ ) with all four formulas. Refractive outcomes tended toward myopia in the eyes with PAS (-0.30 to -0.51 vs -0.05 to +0.24 D, all  $P < .05$ ). The MAEs or predicted refractive errors, however, were not different irrespective of the extent of PAS (all  $P > .05$ ).

There are several possible explanations for a less predictable refractive outcome and greater myopic shift in eyes with PAS. First, the PAS

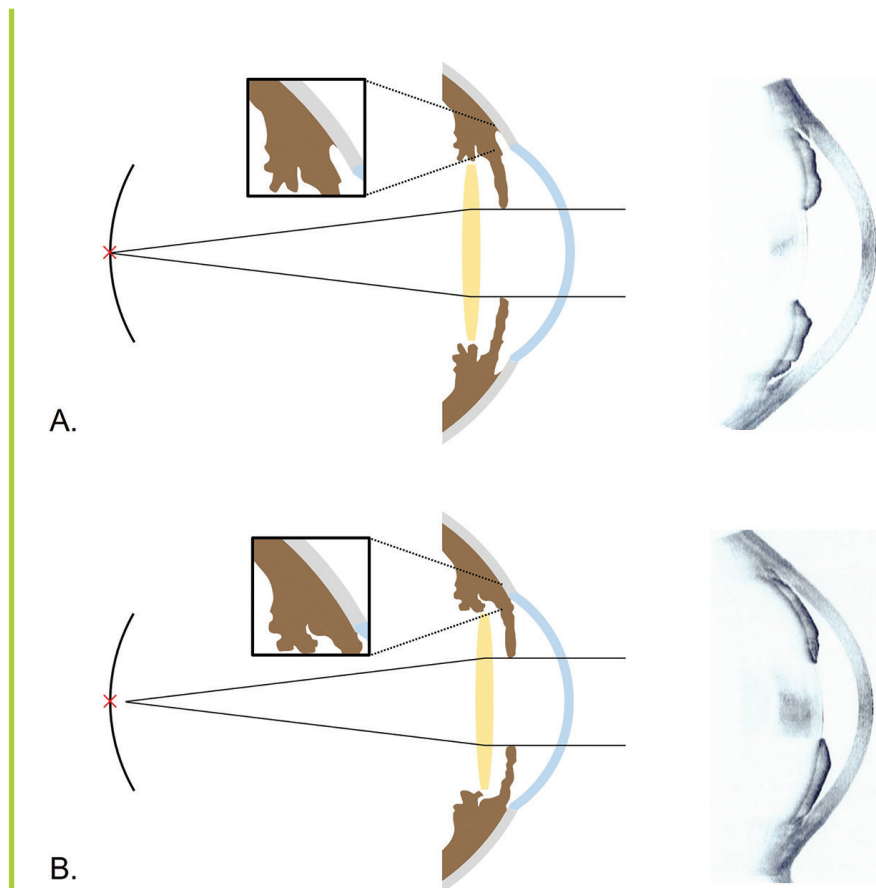


Figure. Possible mechanisms of refractive error after cataract surgery in PAC eyes without (A) and with (B) PAS and representative images of anterior segment OCT. Because anterior chamber deepening was limited by PAS, a myopic shift could occur. Reprinted from Lee TE et al.<sup>13</sup>

may be evidence of the structural difference between the two groups. Assuming no significant intergroup difference in other biometric variables, eyes with PAS may have abnormalities such as weak zonules or a large capsular bag. IOL instability due to these abnormalities could have induced a greater degree of refractive error in eyes with PAS. Increased choroidal thickness has also been reported to be associated with a myopic shift after cataract surgery in eyes with PACG.<sup>14</sup> These various anatomic risk factors might have resulted in the PAS formation.

Second, deepening of the anterior chamber after surgery might have differed between the two groups. The presence of PAS might have

limited posterior shifting of the IOL plane, which could explain the greater myopic shift experienced by eyes with PAS compared to eyes without PAS (Figure). Supporting this hypothesis is a report by Yoo et al that the trabecular–ciliary processes distance was shorter in PACG eyes with PAS than in PACG eyes without PAS. This suggests that anteriorly located ciliary processes might have influenced the development of PAS.<sup>13</sup>

**Limitations and implications.** Our study is limited by its retrospective design and lack of postoperative PAS assessment. Additional studies on the extent of postoperative PAS and their effects on refractive outcomes are warranted to validate our findings.

**CONCLUSION**

Our study indicates that IOL power calculations can be less accurate in ACG eyes with PAS compared to ACG eyes without PAS. The presence or absence of PAS may influence postoperative refractive outcomes in patients with PACG. ■

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**TAE-EUN LEE, MD, PHD**

- Professor, Department of Ophthalmology, Jeonbuk National University Medical School and Hospital, Jeonju, South Korea
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**CHUNGKwon YOO, MD, PHD**

- Chief, Department of Ophthalmology, Korea University Anam Hospital, Korea University Medical Center, Seoul, South Korea
- Professor, Department of Ophthalmology, Korea University College of Medicine, Seoul, South Korea
- ckyoemd@korea.ac.kr
- Financial disclosure: None