IOL SELECTION FOR GLAUCOMA PATIENTS

A review of the pros and cons of premium IOLs in glaucomatous eyes.

BY SUSAN LIANG, MD

Many advances in cataract surgery and IOL technology have been made in recent decades. Compared with traditional spherical and monofocal lenses, premium IOLs offer more options to meet patient expectations for distance, intermediate, and near vision without dependence on spectacles. To date, there is limited literature on the use of these lenses in patients with concurrent ocular diseases, including glaucoma. Therefore, careful patient selection and close attention to disease stage are crucial when we implant premium IOLs in glaucomatous eyes. In this article, Susan Liang, MD, discusses currently available premium IOLs and their potential applications and limitations in patients with glaucoma.

Innovations in premium IOL design and functionality have given providers and patients more choices than ever to achieve desired visual outcomes and improve spectacle independence after cataract surgery. Selecting the right lens to match the individual visual needs of each patient is one of the most important decisions in cataract surgery. For patients with both cataract and glaucoma, this decision can be even more complicated.

In order to select the best IOL for each eye, one must first understand the pros and cons of the different lens types as they relate to the structural and functional changes associated with glaucoma. This article reviews the pros and cons of premium IOLs for cataract surgery in glaucomatous eyes, based on their presbyopia-correcting, toric, or aspheric lens designs.

PRESBYOPIA-CORRECTING IOLs

There are three types of presbyopia-correcting IOLs available in the United States: multifocal, extended depth of focus (EDOF), and accommodating IOLs.

Multifocal IOLs. Multifocal IOLs can have diffractive, refractive, or hybrid design optics, and they can have bifocal or trifocal designs. Studies have shown that multifocal IOLs, in comparison with monofocal IOLs, are effective at improving near visual acuity without an effect on distance vision.1 As a tradeoff, however, multifocal IOLs have been associated with higher incidences of decreased contrast sensitivity and subjective photic phenomena such as halos and glare.2 Further studies are needed to elucidate whether there is a significant difference in contrast sensitivity between the bifocal and trifocal IOL designs.

Most studies evaluating multifocal IOLs have used stringent patient selection criteria, specifically including patients with only cataracts and no concurrent eye diseases. Few studies in the literature have evaluated the impact of multifocal IOLs in glaucomatous eyes. Those that have been published have small sample sizes, and their results suggest that glaucoma patients could benefit from multifocal IOLs.1,3

It has been shown, however, that glaucoma preferentially affects contrast sensitivity more than visual acuity, and the decrease in contrast sensitivity correlates with...
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visual field loss. Contrast sensitivity is the visual function that allows one to differentiate the luminance between an object and its background, and it is important for day-to-day activities. Decreased contrast sensitivity in glaucoma can cause visual symptoms and complaints of poor vision despite normal visual acuity. Because both glaucoma and multifocal IOLs produce a decrease in contrast sensitivity that adversely affects visual function, it stands to reason that multifocal IOLs must be selected with significant caution in patients with glaucoma, especially in the absence of evidence from large randomized trials. Currently, concurrent eye diseases such as glaucoma are a relative contraindication for multifocal IOLs.

EDOF IOLs. The one EDOF IOL approved in the United States (Tecnis Symfony, Johnson & Johnson Vision) uses a diffractive echelette technology and achromatic optics to increase the eye’s range of focus. The literature shows conflicting results comparing contrast sensitivity between EDOF IOLs and other IOL designs. For example, a 2019 systematic review and meta-analysis reported that EDOF IOLs were associated with reduced contrast sensitivity but higher spectacle independence compared with monofocal IOLs. Additionally, EDOF IOLs performed better than trifocal IOLs for contrast sensitivity, with no difference in halos and spectacle independence.

Another 2017 comparative analysis of four IOL models by Pedrotti et al showed no significant difference in photopic contrast sensitivity between monofocal IOLs and EDOF IOLs. In comparison with two apodized diffractive-refractive multifocal IOLs, however, the monofocal IOLs and EDOF IOLs demonstrated significantly better contrast sensitivity. With respect to the issue of decreased contrast sensitivity in glaucoma patients, EDOF IOLs that provide better contrast sensitivity than multifocal IOLs may offer an advantage over the latter lens style. However, further investigation with large randomized trials is necessary to better delineate IOL selection for glaucoma patients.

Accommodating IOLs. Accommodating IOLs use the action of the ciliary muscles to focus vision. Studies have shown that these lenses are effective in improving distance and intermediate vision without decreasing contrast sensitivity. They do not depend on pupil size and cause less photic disturbances than multifocal IOLs. Their disadvantage in glaucoma patients relates to the associated higher risk for capsular contraction, which is more common in patients with pseudoexfoliation. Patients with pseudoexfoliation also have weaker zonules, which may affect the functionality of the IOLs’ accommodative system.

Toric IOLs

Toric IOLs can reliably reduce astigmatism and improve uncorrected vision in eyes with cataract and glaucoma. In glaucoma patients, toric IOLs have been particularly useful for correcting astigmatism in eyes with astigmatism induced by previous trabeculectomy. In glaucoma patients with pseudoexfoliation, in whom small pupils and zonulopathy are common surgical risks, careful consideration must be made for possible IOL decentration, axis misalignment, or dislocation.

As trabeculectomy has been shown to cause refractive changes due to decreased axial length and surgically induced astigmatism, toric IOLs should be used with caution in combined phacotrabeculectomy cases. In this setting, the postoperative astigmatic and refractive targets may be too difficult to predict. In general, however, there is consensus that toric IOLs can be good options for patients with glaucoma and in combination with refraction-neutral MIGS procedures.

Aspheric IOLs

The optics of aspheric IOLs have been designed to offset the positive spherical aberration of the aging eye, which can cause decreased contrast sensitivity. Studies have shown that the reduction of spherical aberration with aspheric IOLs decreases glare and halos and improves contrast sensitivity. In glaucomatous eyes with decreased contrast sensitivity, aspheric IOLs that increase contrast sensitivity should be beneficial. One caveat against aspheric IOLs relates to glaucoma patients with weak zonules, in whom decentration of aspheric IOLs can cause more visual distortions when compared with decentration of spherical IOLs.

Further Considerations

In choosing an IOL for a patient with glaucoma, it is important to consider the impact of the IOL on glaucoma monitoring methods, such as visual field assessment and optic nerve imaging. A 2013 study by Aychoua et al showed that patients...
with diffractive multifocal IOLs had a clinically relevant reduction in visual sensitivity (mean deviation) as assessed with standard automated perimetry size III and size V. The investigators concluded that the reduction seemed to be related to the multifocal lens design as opposed to the patients’ pseudophakic status. Further, a 2009 study by Inoue et al11 reported wavy horizontal artifacts on OCT in patients with diffractive multifocal IOLs. Additionally, with premium IOLs, cost must be considered, as these lenses are expensive and are not typically covered by insurance.

CONCLUSION
In general, there is consensus among ophthalmic thought leaders that certain glaucoma patients can benefit from all available IOL options. These include glaucoma suspects, patients with ocular hypertension, and patients with early glaucoma that is well controlled and shows no signs of progression. For these patients, IOL selection should be based on their desired refractive outcomes. For patients with moderate or severe glaucoma, in whom premium IOLs are relatively contraindicated, the choice of IOL should be made on an individual basis and should focus on the patient’s motivation, visual expectations, rate of glaucomatous progression, surgical risks (eg, zonular stability), pupil size, and ocular surface disease.


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