

Presbyopia-Correcting IOLs for Glaucoma Patients

Two clinicians discuss their approach to selecting IOLs for this patient population.

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In May 2005, the Centers for Medicare & Medicaid Services (CMS) issued a ruling that gives patients the option to pay out of pocket for new technology IOLs when undergoing cataract surgery. Among the lenses for which patients may pay a premium are presbyopia-correcting designs, categorized as accommodating and multifocal (or pseudoaccommodating). Although their mechanism of action is not fully understood, accommodating IOLs are designed to move forward (thus changing the effective IOL power) in response to the ciliary muscle's contraction to focus vision at near or intermediate distance. In contrast, multifocal IOLs are designed to deliver a range of vision at various distances through differently powered zones located on the lens' optic.

In clinical trials, the presbyopia-correcting IOLs available in the United States performed well in healthy eyes when the subjects had reasonable expectations. The technologies' role in eyes with retinal, optic nerve, or ocular surface pathology, however, is controversial. This article provides a brief overview of IOLs for presbyopic correction and shares recommendations on their use based on our experience.

ACCOMMODATING IOLs

The Crystalens

The first Crystalens accommodating IOL (Bausch + Lomb, Rochester, NY) was implanted in England in 1991. The FDA approved the AT-45 model in November 2003. Today, the only accommodating lenses available in this country are the Crystalens Five-0, the Crystalens HD, and the Crystalens AO.

These IOLs feature a 5-mm silicone optic with hinges and square edges. Square silicone plate haptics with T-shaped polyamide loops help provide stabilization and centration of the IOL within the capsular bag. For

eyes requiring corrective powers of 17.00 D and higher, the length of the IOL is 11.5 mm. A 12-mm IOL addresses corrections of less than 17.00 D.

The Crystalens Five-0 provides excellent distance and intermediate vision without the reduction of contrast sensitivity that is associated with multifocal IOLs. The blended bispheric optic of the Crystalens HD is supposed to enhance near vision while maintaining excellent contrast sensitivity. Released in January 2010, the Crystalens AO represents the first aberration-free accommodating IOL with aspheric optics.

Potential challenges associated with the Crystalens technology include inaccurate refractive outcomes (due to the varying position and movement of the IOL) and inadequate near vision¹ (Table 1).

On the Horizon

The Synchrony (Abbott Medical Optics Inc., Santa Ana, CA) has a negatively powered posterior optic and a plus-powered anterior optic that are connected by spring haptics. Upon accommodative effort, the distance between the two optics increases.² The Tetraflex accommodating lens (Lenstec, Inc., St. Petersburg, FL) is another monofocal IOL that moves with accommodative effort.³

MULTIFOCAL IOLs

ReZoom

The ReZoom (Abbott Medical Optics Inc.) is a second-generation zonal refractive multifocal IOL that received FDA approval in March 2005. This hydrophobic acrylic lens has five zones; zones 1, 3, and 5 are distance dominant, and zones 2 and 4 are near dominant. Aspheric transitions between the zones are designed to provide improved intermediate vision. This three-piece lens has a 6-mm optic and PMMA haptics.

TABLE 1. DESCRIPTIONS OF PRESBYOPIA-CORRECTING IOLS

	Crystalens HD	ReZoom	Tecnis Multifocal	AcrySof IQ Restor +3.0 D
Type	Accommodating	Multifocal	Multifocal	Multifocal
Composition	Silicone	Acrylic	Acrylic	Acrylic
Optic size (mm)	5.0	6.0	6.0	6.0
IOL design	Plate haptics	Three-piece	Three-piece	Single-piece
UV protection	No	Yes	Yes	Yes
Blue-light protection	No	No	No	Yes
Distance VA	Excellent	Good	Excellent	Excellent
Intermediate VA	Excellent	Good	Excellent	Excellent
Near VA	Good	Fair	Excellent	Excellent
Ocular hypertension/early glaucoma	Yes	No	Yes	Yes
Moderate glaucoma	Yes	No	No	No
Advanced glaucoma	No	No	No	No
Glare/halos ^a	+	+++	++	++

^aComparative symptomatology scale between IOLs: + = minimal, ++ = mild, +++ = moderate.

The ReZoom IOL provides good vision at distance and intermediate distance, but patients often require spectacle correction at near.⁴ Surgeons should warn patients preoperatively about the potential for unwanted visual phenomena such as glare and halos after surgery.⁵ With the recent availability of the Tecnis Multifocal lens (Abbott Medical Optics Inc.), the utilization of the ReZoom lens has decreased significantly.

Tecnis Multifocal

The Tecnis Multifocal is a clear hydrophobic acrylic lens. It offers a pupil-independent, fully diffractive posterior surface designed to optimize vision under all lighting conditions. The IOL's wavefront-designed aspheric anterior surface was engineered essentially to eliminate spherical aberration and thereby enhance the quality of the patient's vision at all distances. The +4.00 D add power attempts to optimize near visual acuity at a preferred reading distance of 33 cm.

US clinical results demonstrate that over 94% of patients are able to function comfortably without glasses at all distances after the bilateral implantation of the Tecnis Multifocal IOL.⁶ This IOL was also designed to reduce chromatic aberration and provide protection from ultraviolet light. The three-piece lens may be placed in the ciliary sulcus. Centration of the IOL is critical to obtaining optimal

visual results. Glare and halos appear to be less problematic with this lens compared with previous multifocal designs.⁶

AcrySof Restor

The FDA initially approved the AcrySof Restor IOL (Alcon Laboratories, Inc., Fort Worth, TX) in March 2005. This single-piece acrylic IOL was the first to offer apodized diffractive technology that allows for both distance and near vision. The term *apodization* refers to the gradual reduction or blending of the heights of the diffractive steps. Apodization, aspheric optics, and the change from a +4.00 to a +3.00 D add power are intended to improve the quality of patients' vision at all distances.

The AcrySof IQ Restor IOL +3.0 D is now the leading presbyopia-correcting IOL in the US marketplace.⁷ This design became available last year and has significantly improved patients' intermediate vision to complement the IOL's already excellent profiles for distance and near vision.^{8,9} The AcrySof Restor lenses feature blue-blocking and ultraviolet light-filtering technology that may prevent the development and/or progression of macular degeneration, but this remains a subject of debate.¹⁰ Patients should be warned of the possibility of postoperative glare and halos, but the incidence of these phenomena is dramatically lower with the most recent iteration of this IOL.^{11,12}

OUR RECOMMENDATIONS

Overview

As with any technology, patient selection is critical. Individuals with glaucoma often may be less-than-ideal candidates for presbyopia-correcting IOLs. These individuals simply may not receive the benefits of accommodating or multifocal IOLs due to limited visual fields and diminished contrast sensitivity. Furthermore, the potentially negative impact of multifocal IOLs on clinicians' ability to follow visual fields is a concern. Currently, we recommend using standard visual field testing techniques and using near vision corrections per one's usual protocols.

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Ocular Hypertension and Early Glaucoma

We would characterize glaucoma as a relative contraindication for the placement of accommodating and multifocal IOLs. This technology may bring tremendous satisfaction to patients who have well-controlled ocular hypertension or early glaucoma without any visual field loss. A thorough, well-documented discussion of the possible risks of decreased visual function with progressive glaucomatous damage is essential, however, with all glaucoma patients undergoing cataract surgery.

Moderate Glaucoma

We tend to avoid multifocal IOLs for patients with moderate, well-controlled glaucoma and mild visual field loss, because their contrast sensitivity may already have diminished, and the risk of a dissatisfied patient is considerable. Because the Crystalens functions much like a monofocal lens, it may be an option in patients who have reasonable expectations for their outcome. Caution, however, is certainly warranted here.

Progressive or Advanced Glaucoma

We do not recommend the use of presbyopia-correcting IOLs in patients with advanced or uncontrolled glaucoma. The benefits of these lenses will be minimal or nonexistent for these individuals. More likely, the IOLs will provide a lesser quality of vision than an aspheric or toric monofocal design. We also favor monofocal IOLs for patients undergo-

ing filtration surgery. After less invasive procedures such as Trabectome surgery (NeoMedix Corporation, Tustin, CA) and canaloplasty (iScience Interventional, Menlo Park, CA), we have had some success with the Crystalens in select patients. Caution is clearly recommended in these cases.

CONCLUSION

Presbyopia-correcting IOLs offer certain glaucoma patients the promise of an increased range of vision and more independence from spectacles. Surgeons must ensure, however, that these individuals have realistic expectations for their outcomes. We prefer monofocal IOLs for most glaucoma patients, but in our experience, select patients benefit from the newer accommodating IOLs. The judicious use of multifocal IOLs in patients with documented well-controlled ocular hypertension or glaucoma with full visual fields may also be reasonable. □

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