

Incorporating Presbyopia - Correcting IOLs Into Your Practice

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Why use a presbyopia-correcting intraocular lens?

Because this is for the patient's benefit. Patients coming for cataract surgery have the opportunity to have their refractive error corrected and lessen their need for eyeglasses. Whether this decreased need for glasses is only for distance vision or will encompass near vision as well is a question that we should ask each patient. Each patient's lifestyle and needs are different. Plus there are sacrifices in terms of quality of vision and cost implications to consider. For us surgeons, offering presbyopia-correcting lenses expands our practice and helps us keep up with current trends.

What are the different types of presbyopia correcting IOLs?

I categorize presbyopia-correcting IOLs into 3 categories: multifocal, accommodating, and extended depth of focus IOLs.

Multifocal IOLs split light into different focal points to allow vision at different distances. The most common multifocals are diffractive in design using the Fresnel principle wherein a plane wave of light is transformed into an infinity of secondary spherical waves after diffraction. The harmonics of propagation result in orders of diffraction. Bifocal multifocals such as the Restor (Alcon, USA), Tecnis (AMO, USA), AcriLisa (Carl Zeiss, Germany) have

2 diffraction orders for far and near. Trifocal multifocals such as the Finevision (Physiol, Belgium) and Lisa Tri (Carl Zeiss, Germany) have 3 diffraction orders for far, intermediate, and near. In the newer trifocal designs, more light is concentrated for distance vision as the pupil dilates whereas more light is concentrated for near vision as the pupil constricts. I prefer to use trifocal IOLs in my practice because in my opinion, they provide a good range of vision and I have found no disadvantage of the trifocal versus the bifocal multifocal IOLs.

Accommodating IOLs involve either forward-backward axial movement, change in lens thickness or optic arching. The net effect is a change in focal point from distance to near vision. The Crystalens (Bausch and Lomb, USA) is currently still the only USFDA-approved accommodating IOL which gives an accommodative amplitude of 1.0-1.5D. It provides excellent distance and intermediate vision. However, near vision is not as strong as multifocal IOLs; therefore, a refractive target to -0.50D or a minimonovision strategy is employed to improve near vision and decrease spectacle independence.

Extended depth of focus (EDOF) IOLs are a new concept in presbyopia correction. Rather than creating two or three foci seen in multifocal IOLs or a single focal point that shifts as seen in an accommodating IOL, an EDOF IOL smooths out the dips in the defocus curve to create one elongated focal point.

The WIOL (Medicem, Czech Republic) is a 7.5mm round disc with no haptics that expands to 9.0 to 9.5mm diameter to occupy the entire capsular bag 36 hours after implantation. It has a flat anterior and curved posterior surface and is made

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of hydrogel. Polyfocal hyperbolic optics and aberration change allow the lens to expand the range of vision to approximately 2.0D for better near vision. The IC-8 small aperture IOL (Acufocus, USA) is a single piece monofocal hydrophobic acrylic lens containing a round mask with a central aperture of 1.36mm. The mechanism of small aperture (pinhole) optics for presbyopia was developed using experience from the Acufocus corneal inlay. The principle of pinhole optics for presbyopia has been expanded from cornea to intraocular lens. The Tecnis Symfony (AMO, USA) is a hydrophobic acrylic IOL which employs an echelette design and achromatic technology to expand the depth of focus and decrease chromatic aberration resulting in enhanced contrast sensitivity.

EDOF IOLs expand the range of vision with minimal induction of glare or haloes. Near vision, however, is not as clear as multifocal IOLs. A myopic refractive target of -0.50D or a mini-monovision strategy is preferred to decrease spectacle dependence.

How to use presbyopia-correcting IOLs?

Definitely, additional effort from the surgeon is needed when using a presbyopia-correcting lens over a monofocal lens.

It all starts with learning both current and up-and-coming technologies. Attending conferences and listening to experts is needed to keep up with all the developments in the IOL world and sort out which lens one intends to use. When a patient comes for consultation, more chair time is needed to explain the options and manage expectations. A thorough discussion of quantity versus quality of vision is crucial so the patient may be guided as to which type of presbyopia-correction they would like for their eyes. Multifocal IOLs provide good near vision but at the cost of lowering contrast and inducing glare and haloes; whereas accommodating and EDOF lenses provide good distance and intermediate vision, give only fair near vision but have good image quality. Selection can be difficult because all patients want the best vision in all distances without any compromise. We should avoid the temptation of downplaying the drawbacks of each technology because as the medical practitioner, it is our duty to disclose all the facts to avoid misleading patients into making a decision they may later regret and complain about.

Preoperative planning needs careful attention, specifically IOL power selection. It is important to understand that an IOL will work at its best if you achieve the correct refractive outcome. I strongly suggest using an optical biometer or immersion A-scan to compute the lens power. For the multifocal IOLs, it is preferable to achieve a refractive outcome of plano or slight hyperopia (+0.25D); whereas for the EDOF and accommodating lenses, I suggest achieving a refractive outcome of slight myopia (-0.50D) or a mini-monovision outcome wherein the dominant eye is -0.25D and the non-dominant eye is -0.75D.

Intraoperatively, a capsulotomy size of 5.5mm is suggested for the Crystalens accommodating IOL, 5.7mm for the WIOL EDOF lens, and 5.0mm for all the other lenses. A femtosecond laser to create an accurate capsulotomy diameter with perfect circularity and centration would be very helpful in achieving a consistent effective lens position. Other intraoperative pointers are complete removal of viscoelastic under the IOLs, cleaning the underside of the anterior capsule and ensuring that the anterior chamber is deep and the eyeball firm with no leaks. An interval of at least one week between surgeries of both eyes is suggested to have a refraction reading of the first eye. This will guide in selection of IOL power for the second eye with more efficient targeting of the refractive outcome.

I suggest discussing the presbyopia-correcting IOL options to everyone who desires cataract surgery. Do not feel it is a waste of your time or the patient's. It is but fair that you present all the technologies available. It is also important to manage expectations by presenting both the advantages and drawbacks of the technologies. However, when the patient finally makes the choice, we have to be prepared to exert all efforts to ensure a good outcome. The most important factor is achieving the correct refractive result. We should not expect the lens to work nor blame the lens technology if we did not achieve the desired refraction postoperatively. Just like cataract surgery techniques, the more experience you gain, the more efficient and successful you will become at IOL power targeting. Good luck to everyone who desires to begin the journey into presbyopia correction during cataract surgery.