The New Age of Prebyopia Correcting IOLs

In an APACRS webinar hosted on November 18, 2021, five leaders in refractive cataract surgery came together for a discussion on the rapid development of new intraocular lens (IOL) designs that provide partial or full presbyopia correction. Refractive and cataract surgery has transformed greatly, and this lively interactive session reviewed some of the latest options in presbyopia correction and optimizing results for our cataract patients.

Redefining Spectacle Freedom with Presbyopia-Correcting IOL Technologies

Han Bor Fam, MD, Singapore

Visual needs for cataract surgery patients are wide and extensive and evolving to require more reading needs and closer reading distances.

Ideally, an IOL should allow patients to see distance well with continually good vision up to 33cm of near vision. With diffractive bifocal technology, patients have very good distance vision and very good near vision, but there is a big gap in between, and "this is not very useful for the patient," says Han Bor Fam, MD. In a comparison among different IOLs, Dr. Fam showed that the TECNIS Symfony® extended depth of focus (EDOF) IOL provides high contrast, excellent distance vision and functional near vision. The TECNIS Synergy™ IOL, on the other hand, combines diffractive multifocal technology with TECNIS Symfony® to deliver continuous high-contrast vision across the functional range. The TECNIS Synergy™ IOL performs extremely well at distance vision, has indistinct ADD power, and bridges the visual gap of less than 0.1 logMAR, allowing patients with different requirements the freedom to see and work at their preferred personal distances.

"TECNIS Synergy™ is a smart choice for cataract patients requiring good visual acuity across a wide range of distance."

Dr. Han Bor Fam

Dr. Fam discussed a few studies to show the effectiveness of TECNIS Synergy™. In one study, "Light Efficiency Distribution of Presbyopia-Correcting IOL," Dr. Fam found that it is possible to determine usable light energy at distinct foci by observing the ratio of total light efficiency over the clinically relevant defocus range. EDOF IOLs and hybrid presbyopia-correcting lenses were found to have higher light efficiency than multifocal IOLs. Specifically, TECNIS Synergy™ loses 0% of light compared to a monofocal lens, TECNIS Symfony® loses 4%, and bifocals lose almost 20%.

In a different prospective multicenter study, Dr. Fam compared the TECNIS Synergy™ IOL to the PanOptix® Trifocal IOL and found that TECNIS Synergy™ had higher visual acuities at every distance tested (far, intermediate, near [40 cm], and near [33 cm]) compared to the PanOptix® IOL. In terms of illumination and contrast, both TECNIS Synergy™ and PanOptix® had similar mesopic best corrected distance visual acuity (BCDVA), though TECNIS Synergy™ was superior in terms of distance visual acuity and photopic low-contrast BCDVA. Patients also reported seeing objects and reading street signs in the evening better with the Synergy™ IOL.

In a published paper by Gabric et al (J Refract Surg 2021), Dr. Fam explained an impressive finding: this prospective case series showed that 100% of patients achieved uncorrected near visual acuity (40 cm) at 0.10 logMAR or better and 99% of patients achieving uncorrected distance visual acuity at 0.10 logMAR or better with the TECNIS Synergy™ IOL. Additionally, patients reported high satisfaction with the TECNIS Synergy™ IOL.

The TECNIS Synergy™ IOL, Dr. Fam concluded, is a smart choice for cataract patients requiring good visual acuity across a wide range of distances. This IOL combines diffractive multifocal technology with EDOF, delivers continuous high-contrast vision, and affords high levels of binocular visual acuity from far to near.


Graham BARRETT
Australia


Han Bor FAM
Singapore


Ike AHMED
Canada


Hiroko BISSEN-MIYAJIMA
Japan


Ronald YEOH
Singapore

Case discussions: Achieving Spectacle Independence Success with Presbyopia-Correcting IOLs

Ike Ahmed, MD, Canada

"We have seen a variety of technologies that have emerged in the market in the last couple of years," says Ike Ahmed, MD, the cases he presented during the webinar highlighted these technological advances" With the evolving visual needs of patients and the shift towards digital platforms amongst all age groups, it is important to consider a variety of lens options to enhance spectacle freedom.

When considering near vision, clinicians must think further than just discussing outcomes in terms of reading vision. Near vision can consist of a variety of tasks outside of reading, and includes personal working distance which can vary from patient to patient.

It is also helpful to correlate defocus curves to function: the more the lens is able to maintain excellent vision, there is an increase in range of vision. For near vision tasks such as reading books and newspapers or using mobile devices, patients may require a lens that provides more than 2.5 diopters of defocus. Dr. Ahmed explained that there are many ways to address the interest in different ranges of visions and includes using multifocal IOLs, EDOF IOLs, and monofocal IOLs. For example, monovision can be classified in many ways and to many degrees. Micro-monovision may be helpful for some EDOF IOL designs while monofocal lenses may be appropriate to set at -1 D and -1.5 D, depending on the patient's interest.

In picking the right presbyopia-correcting (PC) IOL, surgeons should aim to match their patients' expectations while understanding that there is always some tradeoff when manipulating light. The factors we have when it comes to choosing the right IOL include maintaining visual quality and contrast, enhancing range of vision and depth of field, and minimizing dysphotopsia. While high visual quality can be prioritized, there may be a tradeoff of dysphotopsia, and Dr. Ahmed says that he does not shy away from that point when discussing outcomes with patients, stating that the conversation is very important prior to implantation. "Halos and glares are tolerable for the vast majority of patients as we've seen from clinical studies."

"Contrast sensitivity and low-light contrast is enhanced in TECNIS Synergy™ particularly for eyes with larger pupils which is quite unique."

Dr. Ike Ahmed

The TECNIS Synergy™ IOL is one of the more novel IOLs with a hybrid design of the lens, rather than having a trifocal design. TECNIS Synergy™ provides a good continuous range of vision as well as having the best low-light performance compared to other trifocal IOLs. "Contrast sensitivity and low-light contrast is enhanced in TECNIS Synergy™ particularly for eyes with larger pupils which is quite unique," says Dr. Ahmed. This is primarily due to the active chromatic aberration design of this lens as well as the optical material. The aspheric design of the lens and violet light filtering also enhance contrast for this lens.

In one case presentation, a 58-year-old female nurse reported reduction of vision in both eyes having used monovision contact lens. She was keen on spectacle independence and her lifestyle is quite active with hiking, mountain climbing, and partaking in hobbies where lower contrast vision is important. She also performs a lot of near to intermediate work as a nurse, going back and forth between computer work and near work such as placing IVs and drawing blood. Upon preoperative assessment, visual acuity was 20/30 OD and 20/40 OS, and the patient had 2+ NS OU, mild dry eye disease, 1+ PEE, and uses artificial tears 2 to 3 times a day. With the implanted TECNIS Synergy™ IOL in both eyes, the patient's issues were addressed. The patient reported a full range of vision and the ability to do all tasks at work while being able to hike during dusk with no issues. Dr. Ahmed stated that Synergy™ is a great choice for providing patients with great near vision and low contrast vision. With the good clinical outcomes of Synergy™, "this is how technology is moving forward."

Supported by

Johnson & Johnson VISION

The New Age of Prebyopia Correcting IOLs

Complementing My Practice PCIOL Portfolio

Hiroko Bissen-Miyajima, MD, Japan

Presbyopia-correcting (PC) IOL usage in cataract surgery in Japan remains quite low at 5%, though Hiroko Bissen-Miyajima, MD reports a usage rate of 85% in her own practice. Dr. Bissen-Miyajima began using PC IOLs in the 1990s and has had experience with both refractive and diffractive IOLs. Currently, the most commonly used PC IOLs are EDOF IOLs and continuous range of vision (CRV) IOLs.

For successful implantation of PC IOLs, Dr. Bissen-Miyajima states that it is important to "understand the patient's expectation for vision" so as to avoid unhappy patients following implantation. In trying to understand patient expectations, Dr. Bissen-Miyajima conducted patient surveys through a national cohort study as well as in her own practice. The national cohort study observed patient expectations at 65 institutions across Japan, analyzing 1,384 eyes of 871 patients. Although this data is not specific to the TECNIS Synergy™ IOL, a variety of PC IOLs were used in Dr. Bissen-Miyajima's study, and eyes were analyzed at varying distances. Fifty-nine percent (59%) of patients were satisfied or very satisfied with their near vision, while 88% and 75% of patients were satisfied or very satisfied with their distance and intermediate vision, respectively. "There is still room to improve with near vision," says Dr. Bissen-Miyajima. This concern is important because in the Asian population, Chinese characters need to be 1.54 times larger than the English alphabet to provide the same visual acuity, thus the need for better near vision.

"Our biggest concern for selecting the correct PC IOL is with unhappy patients whose complaints are severe and who require long-time consultation," says Dr. Bissen-Miyajima. To understand patients' postoperative satisfaction, Dr. Bissen-Miyajima conducted an evaluation of unsatisfied patients at her hospital. She was able to analyze surveys from 464 patients. From the 6.8% of patients who reported they were dissatisfied or extremely dissatisfied. Dr. Bissen-Miyajima was able to determine that the keys to successful PC IOL implantation are to provide sufficient near vision and minimize the loss of contrast sensitivity.

Dr. Bissen-Miyajima pointed out that although the TECNIS Symfony® IOL does provide better contrast sensitivity than other bifocal IOLs, but up-close near vision still lags behind trifocal IOLs. Combining the TECNIS Symfony® IOL with the technologies of the TECNIS® Multifocal IOL, which gives good distance and near vision but lacks in contrast sensitivity, results in the TECNIS Synergy™ IOL which has the optical benefit of both. In a retrospective study analyzing 33 eyes, the TECNIS Synergy™ IOL showed comparable UCVA to the combined distance acuities of TECNIS Symfony® and TECNIS® Multifocal IOLs. Additionally, contrast sensitivity was within normal range.

In one case report, Dr. Bissen-Miyajima described a 69-year-old male pilot who strongly wished for spectacle independence with a high concern for glares and halos. After being told the advantages and disadvantages for different PC IOLs, the patient selected implantation with TECNIS Synergy™, and his surgical outcomes were excellent. "The patient told me that this was the best decision of his life," said Dr. Bissen-Miyajima.

In her practice, Dr. Bissen-Miyajima says CRV IOLs such as TECNIS Synergy™ and EDOFs like the TECNIS Symfony® IOL both have a place in practice. For patients who wish for good continuous vision from distance to near, TECNIS Synergy™ is a good choice.

For patients who want very good contrast sensitivity and high-quality vision, yet do not mind using reading glasses for small print, TECNIS Symfony® is an option.

"In the Asian population, Chinese characters need to be 1.54 times larger than the English alphabet to provide the same visual acuity, thus the need for better near vision."

Dr. Hiroko Bissen-Miyajima

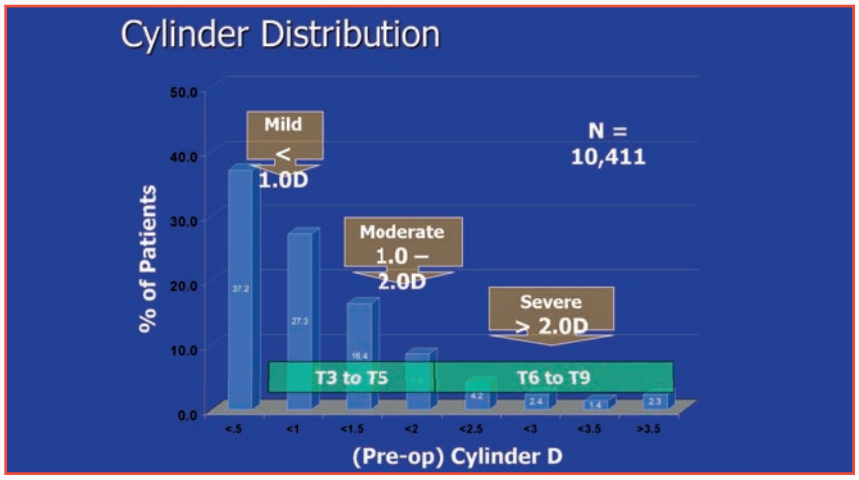
> **“In picking the right presbyopia-correcting (PC) IOL, surgeons should aim to match their patients’ expectations while understanding that there is always some tradeoff when manipulating light.”**
>
> Dr. Ike Ahmed

The Importance of Precise Toric Correction for PC IOLs

Ronald Yeoh, MD, Singapore

Looking at global data from 2016, less than 10% of IOL implantations utilize toric IOLs. However, Dr. Yeoh stated that his personal usage of toric IOLs has been around 40% since 2015. “With the increased efficacy and recognition of the precision of the Barrett toric calculator, this went up to 75% in 2017,” says Dr. Yeoh. Last year, Dr. Yeoh was implanting 80% toric IOLs in his patients.

It is important, though, when implanting toric IOLs to observe the incidence of astigmatism in cataract patients. “When we are doing presbyopia-correcting IOLs, we are aiming for spectacle freedom, and hence image-degrading astigmatism really has to be eradicated,” says Ronald Yeoh, MD. In fact, in PC IOLs, astigmatism degrades image quality much more so than in monofocal IOLs. Recent data has shown that 65% of patients achieve 1 diopter or less of corneal cylinder, implying that only 35% of cataract patients require a toric IOL.



Less than 65% of patients have 1 diopter or less of corneal cylinder.

This statistic conflicts with Dr. Yeoh’s use of toric IOLs in up to 80% of his patients.

Dr. Yeoh explains that traditional thinking implies that toric calculations are done only for patients with more than 1 diopter of astigmatism, and thus toric IOLs are only used for these patients. “This is flawed thinking,” says Dr. Yeoh, “because it disregards posterior corneal astigmatism (PCA).” K values do not equal total corneal astigmatism, and against-the-rule (ATR) astigmatism is hidden in the posterior cornea which is not actually measured by anterior keratometry. To apply this theory in practice, posterior corneal astigmatism is built into the Barrett Toric Calculator, and the Integrated K calculator optimizes three sets of K data. The values that result from the calculator allow for improved residual astigmatism outcomes.

While Dr. Graham Barrett is particular about correcting astigmatism at the time of cataract surgery for monofocal IOLs and monovision, Dr. Yeoh believes that we should be even more particular about correcting astigmatism when using PC IOLs. Doing toric calculations in all patients using the Barrett Toric Calculator is key when aiming for zero astigmatism in cataract patients. Interestingly, Dr. Yeoh presented data showing that, out of more than 4 million total clicks to all Barrett IOL Calculators, only about 28% of those clicks were directed to the Barrett Toric Calculator. The majority of clicks (66%) went to the Barrett Universal II Formula, which is used only for the spherical component. “We still have a ways to go to convince people that they should really be doing toric calculators as their first line rather than the spherical calculation,” says Dr. Yeoh.

While there are an abundance of IOL options for clinicians to choose from, the most important factors to consider are the patients’ desired outcomes and tailoring IOL implantation to their lifestyle. The interactive panel discussion from this webinar provided an opportunity for key clinicians in the cataract and refractive arena to share their ideas on which IOLs provide benefit to which types of patients. “We’re all looking for better ways to funnel patients the right way,” says Dr. Ahmed.

> **“Doing toric calculations in all patients using the Barrett Toric Calculator is key when aiming for zero astigmatism in cataract patients.”**
>
> Dr. Ronald Yeoh