APACRS EyeWorld

Optimizing Patient Outcomes with

Supplement to EyeWorld Asia-Pacific September 2022

Supported by an educational grant from Johnson & Johnson Vision

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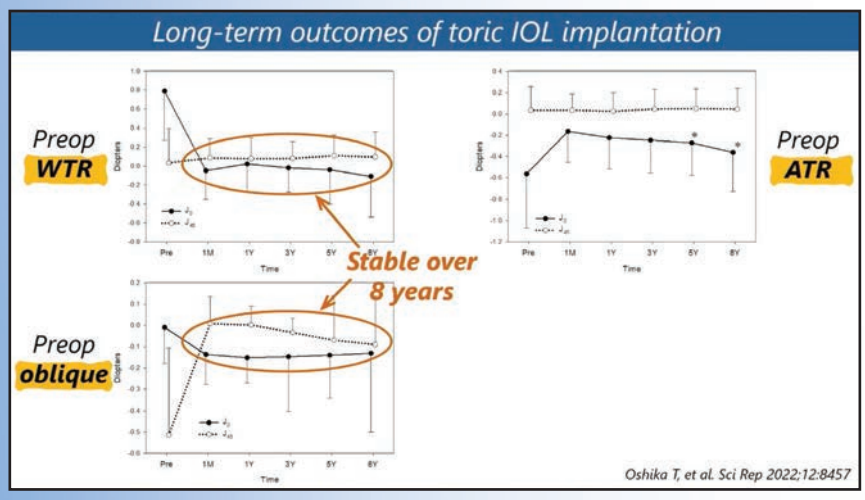
In a lunch symposium hosted on Sunday June 12, 2022, three leaders in cataract surgery presented on new research findings and ways to optimize patient outcomes in the world of IOLs. With Professor Chul Young Choi, South Korea, and Professor Oliver Findl, Austria, as moderators, audience members were first asked to consider their confidence in managing their patients' visual expectations. The survey questions were asked again after the three presentations, and there was a trend in improved confidence in the audience's own abilities to customize treatment for patients and meet their visual expectations in cataract and refractive surgery.

Maximizing Surgical Success with Phaco and Toric IOLs Using Latest Innovations

Professor Tetsuro Oshika, Japan

Astigmatism is an increasingly important consideration in refractive surgery. From an ESCRS 2019 survey, the percentage of cataract procedures that involve a toric intraocular lens (IOL) for patients with clinically significant astigmatism is increasing year by year.



Long-term outcomes of toric IOL implantation shows stable vision for eyes with preoperative WTR and oblique astigmatism, while eyes with preoperative ATR astigmatism showed a reduced astigmatism-correcting effect after 5 years.

To begin his presentation, Prof. Tetsuro Oshika, Japan described the three patterns of astigmatism: with-the-rule (WTR), against-the-rule (ATR), and oblique astigmatism. In WTR astigmatism, the vertical meridian is the steepest and stays close to 90 degrees. In ATR astigmatism, the horizontal meridian stays close to 180 degrees, which is steeper than the vertical meridian. Finally, oblique astigmatism occurs if the principal meridians are neither at 90 degrees nor 180 degrees. The impact of these types of astigmatism on visual function is different as there are age-related changes that come with corneal astigmatism. As patients get older, WTR astigmatism takes over ATR astigmatism in the anterior chamber due to a thicker vertical cornea in older patients.

Prof. Oshika further explained the role of K value in astigmatism. K value actually does not equal total corneal astigmatism. In fact, the K value overestimates WTR astigmatism while the toric IOL overcorrects WTR astigmatism. On the other hand, K values also underestimate ATR astigmatism while the toric IOL undercorrects ATR astigmatism. Furthermore, Prof. Oshika performed an analysis on astigmatism type and uncorrected distance visual acuity (UDVA) and found that age was considered a confounding factor within their analysis.

As for long-term outcomes of toric IOL implantation, Prof. Oshika found in his studies that eyes with preoperative WTR astigmatism and preoperative oblique astigmatism, vision after toric IOL implantation remained stable over 8 years. However, eyes with preoperative ATR astigmatism experienced a reduced astigmatism-correcting effect after 5 years post-toric IOL implantation. "From these findings, we recommend overcorrection for ATR astigmatism," said Prof. Oshika.

Another topic Prof. Oshika discussed was precise axis marking. According to the ESCRS 2019 survey, 41% of ophthalmologists prefer ink marking using an aid instrument and 29% prefer ink marking at slit lamp without an aid instrument. Twenty-two percent (22%) prefer using digital image registration for aligning the toric IOL axis. Prof. Oshika noted that a recent study reported that digital marking is more time

efficient than manual marking, but the improvement in accuracy did not show to be significant: there was no significant difference between manual and digital marking in terms of toric IOL misalignment at 1 week and 1 month after surgery. When using the manual marking method, Prof. Oshika stated that surgeons "need to pay attention. Sometimes the mark may be vertically deviated." Lateral and asymmetrical deviation may also occur.

Another consideration is axis misalignment of toric IOLs. "Sometimes, the lens rotates or deviates significantly, and reposition surgery is required to correct the axis," said Prof. Oshika. In a graph that Prof. Oshika showed, axis rotation occurs mainly in the early postoperative period. The largest rotation occurs at the end of surgery within one hour. Afterward, axis rotation remains stable. Thus, the most critical period of the stability of the toric lens is within 1 hour of surgery. One tip Prof. Oshika provided to reduce misalignment is to wait until the complete unfolding of the lens. "Some lenses are very slow to open," he said. Surgeons should instruct patients to not walk around but to stay at rest for at least 1 hour after surgery. Although there is no data to support this tip, Dr. Oshika believes it may help with stabilizing the toric lens.

One other very important factor that may influence the rotational stability of toric IOLs is the anterior capsule coverage and whether the continuous curvilinear capsulorhexis (CCC) edge completely or partially covers the optic. Prof. Oshika found that at 6 months after surgery, the degree of misalignment significantly differs between eyes with complete coverage compared to eyes with partial coverage of the anterior capsule.

With the latest version of toric IOLs, the TECNIS® Toric II IOL, there is an improved frosted haptic which exerts more friction within the capsule. Prof. Oshika was able to show that the TECNIS® Toric II IOL unfolded much faster than the TECNIS® Toric IOL due to less adhesion of the optic and haptics. With the faster release of the haptic and increased friction, Prof. Oshika found improved rotational stability with the TECNIS® Toric II lens.

Finally, Prof. Oshika investigated the appropriate timing of repositioning surgery and final misalignment of IOLs in a study. He found that, when performed just after primary cataract surgery, some IOLs rotated back to the same position. "It is better to wait one week after cataract surgery before performing repositioning surgery," said Prof. Oshika.

> ***"For a continuous range of vision with better near visual acuity, we need to individualize and optimize using a 'combined' implantation strategy."***
>
> Prof. Chula Young Choi, South Korea

Laboratory & Clinical Evaluation of Multifocal IOLs: Extended Intermediate Functions

Professor Chul Young Choi, South Korea

Recently, Prof. Choi has studied the "physical" and "optical" characteristics of multifocal IOLs. In his presentation, Prof. Choi began with a discussion on surface imaging of different IOL types. In his study, different IOLs may look clear and calm at a low magnification. However, when one views the IOLs at a higher magnification (20,000 times), the IOL appears more wavy and rough except for one IOL: the TECNIS Symfony™ IOL. This specific IOL shows a smoother and more regular pattern. The difference in surface roughness, then, can be attributed to differences in optical scattering on the varied angulated diffractive steps of certain IOLs. To avoid additional surface scattering, surgeons should choose IOLs with a regular straight pattern and with a minimum surface roughness scale.

On the topic of optical bench testing, Prof. Choi compared three different IOLs (TECNIS Synergy™ IOL, ZEISS AT LISA tri, and Alcon PanOptix®) at both 2 mm and 3 mm pupil sizes and at 546 nm wavelength. From this study, the modulation transfer function (MTF) curve of the TECNIS Synergy™ IOL showed a wide reading distance ranging from 33 cm to 27 cm while the other two IOLs showed a narrower reading distance.

When comparing the TECNIS® Monofocal IOL with the TECNIS Eyhance™ IOL, Prof. Choi was able to observe consistent graphs of various pupil sizes. The TECNIS Eyhance™ IOL showed good outcomes with an additional 0.7 diopters of power for smaller pupil sizes. In patients with decentration of up to 0.25 mm, the Eyhance™ IOL showed comparable outcomes to the Monofocal IOL with 91% preservation of the MTF curve. "These are very good outcomes compared to any other trifocal or multifocal IOL," said Prof. Choi.

The last topic Prof. Choi shared with the audience was on spectrophotometer analysis. In one study, Prof. Choi compared the TECNIS Synergy™ IOL, ZEISS AT LISA tri IOL, Alcon IQ PanOptix® IOL, and HOYA Vivinex™ Toric IOL at 20 diopters of base power to determine the light-filtering capabilities of the IOLs. These IOLs were implanted in dry conditions with a transparent base glass, at an aperture size of 1 mm, and at a wavelength range of 350 nm to 800 nm. Prof. Choi studied these IOLs with ultraviolet- and violet-filtering capabilities, which may block high-energy wavelengths. These high-energy wavelengths pose a risk of potential reactive oxygen species (ROS) damage to retinal pigment epithelium (RPE) cells. However, these IOLs allow full transmission of healthy blue light, allowing for advantages in contrast sensitivity, visual performance (especially during night time), circadian rhythm, and sleep quality.

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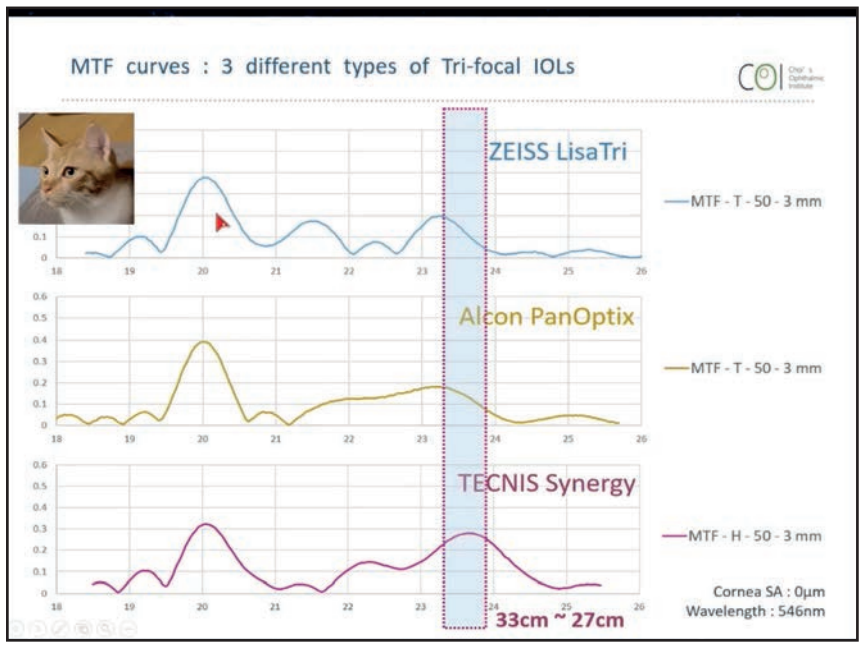
In a variety of studies, Prof. Choi examined outcomes of visual acuity, uncorrected defocus curve, contrast sensitivity, digital reading speed test, questionnaires for subjective satisfaction, photic phenomena, and the visual functioning questionnaire (VFQ-25) for different IOLs including mix & match scenarios. Prof. Choi found positive outcomes in binocular vision for mix & match with TECNIS Symfony™ and +3.25, the PanOptix® IOL, another mix & match (ZEISS AT LARA and AT LISA tri IOLs), and the Synergy™ IOL, though the Synergy™ IOL showed superior outcomes to the other three scenarios. Additionally, the Synergy™ IOL showed higher uncorrected defocus curves and faster reading speeds than the other IOL scenarios. Furthermore, mixing & matching the Synergy™ with Symfony™ or Eyhance™ provided promising uncorrected defocus curves.

In summary, Prof. Choi emphasized the importance of comparing MTF curves of different IOLs (new IOLs may provide wider and higher energies in intermediate and near vision), the significance of surface roughness and optical scattering (regular surface patterns may better reduce surface scattering), and the advantage of full transmission of healthy blue light (provides better contrast especially during night time). Finally, Prof. Choi said, “for a continuous range of vision with better near visual acuity, we need to individualize and optimize using a ‘combined’ implantation strategy.”



MTF curves of three different trifocal IOLs. The TECNIS Synergy™ IOL covers a wide reading distance from 33 cm to 27 cm.

Redefining Near Vision Needs with Presbyopia-Correcting IOL

Han Bor Fam, MBBS, MMed, FAMS, Singapore

For Han Bor Fam, MBBS, MMed, FAMS, viewing distance is a significant factor for patients undergoing IOL implantation. In particular, cell phone viewing distances may range from 32 cm to 40 cm on average for hardcopy text, text messages, and text on the internet for American patients. However, because Chinese characters contain many strokes, viewing distance is estimated to be 33.95 cm. “What we really need [for our Asian patients] is a 33 cm to 36 cm viewing distance,” said Dr. Fam. “So, how do we allow these people to see better with IOLs?”

The answer lies within a new IOL with certain limits. Ideally, this IOL would not have much loss in visual acuity across the defocus range. At minimum, Dr. Fam stated that the range should not be more than 0.2 logMAR between the best distance vision and near vision.

Observing the TECNIS Multifocal® IOL, one can see, with diffractive multifocal technology, that this IOL provides good far and near distance vision but not good intermediate distance vision. With the Symfony™ IOL, an EDOF IOL, there is good far distance vision, but visual acuity tapers off rapidly at 1.5 diopters. With the Synergy™ IOL, though, the combination of diffractive multifocal technology with EDOF technology delivers continuous high-contrast vision across the functional range. The result for patients is peak

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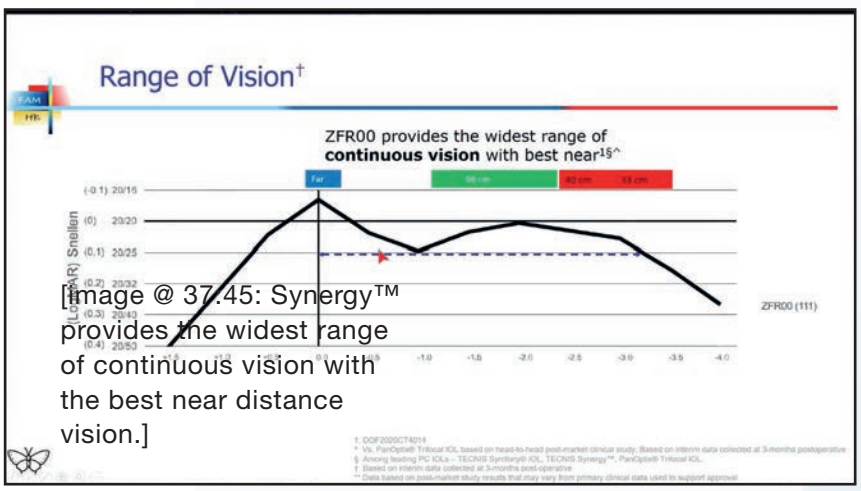
performance at distance vision, indistinct ADD power, and a bridging of the visual gap at < 0.1 logMAR depth (good near vision).

In one of Dr. Fam's recent studies, he examined light intensity ratios and light efficiency of different IOLs and found that EDOF and hybrid presbyopia-correcting lenses provided a higher light efficiency than that of multifocal IOLs. In fact, Synergy™ makes use of 100% of light energy: no energy is wasted compared to monofocal IOLs (81% of light intensity is lost). Thus, the Synergy™ IOL results in significantly better light efficiency than the monofocal IOLs.

In another study, Dr. Fam compared the clinical performance of 116 patients implanted with the Synergy™ IOL to 62 patients implanted with the PanOptix® IOL in a prospective multicenter study. The results of this study showed that Synergy™ provides the widest range of continuous vision with the best near distance vision. Compared to PanOptix®, Synergy™ performs slightly better in far and intermediate distances, but significantly better in near distances. In patient-reported questionnaires, Dr. Fam found that Synergy™ outperforms PanOptix® by almost 10 percentage points in the situation of reading menus in dimly lit restaurants. Additionally, Synergy™ performs better than PanOptix® in the situation of patients noticing steps or curbs at night time. Dr. Fam did note that in terms of quality of vision, from other studies, there was no statistically significant difference among IOL groups in the frequency, severity, and bothersomeness of different disturbing visual symptoms including glare, halos, and starbursts.

When implanting monofocal or multifocal IOLs, Dr. Fam suggests targeting slightly on the plus side of optical power. Specifically for Synergy™, Dr. Fam does not hesitate in targeting as close to + 0.1 D or + 0.15 D as this strategy seems to give less glare and halo compared to targeting myopia.

Concluding his presentation, Dr. Fam stated that, "if you want to see far and near, the Synergy™ IOL is the one you want. It synergistically combines diffractive multifocal technology and EDOF technology to deliver continuous contrasty vision across a wide functional range."



[Image @ 37.45: Synergy™ provides the widest range of continuous vision with the best near distance vision.]

Synergy™ provides the widest range of continuous vision with the best near distance vision.

Optimizing Patient Outcomes with Advanced Surgical Technology

On Sunday June 12, 2022, a video symposium hosted by J&J invited ophthalmologists to discuss their experiences with the CATALYS™ Precision Laser System and the VERITAS™ Vision System. Professor Tae Im Kim, South Korea, began the discussion outlining the advantages of the CATALYS™ laser with implantation using the TECNIS Eyhance™ Toric II IOL. "Among the many fascinating machines [available], I believe the J&J CATALYS™ is undoubtedly the best surgical platform in existence," said Prof. Kim. With less than one second of continuous curvilinear capsulorhexis (CCC) treatment time, a small suction ring size of 19 mm, and a low IOP rise approximately 10 mmHg, Prof. Kim experiences the highest rate of perfect lens fragmentation with CATALYS™. Prof. Kim performs cataract surgeries with the TECNIS Eyhance™ Toric II IOL, which features higher-order aspheric technology, provides improved intermediate vision (compared to aspheric monofocal IOLs), good distance vision, and a similar photic phenomena profile to aspheric monofocal IOLs. Prof. Kim presented patient cases that underwent procedures using the femtosecond laser. In one video presentation, Prof. Kim outlined the procedural steps of implanting the Eyhance™ Toric II lens in a patient with white dense cataracts. The surgery was successful with no complications and improved vision postoperatively. In another successful case of implantation, Prof. Kim was happy to explain that "during the entire surgical procedure, I can clearly see the axis marks and perform IOL alignment according to the marks quite conveniently." Prof. Kim noted that she now prefers to use the CATALYS™ system with Eyhance™ Toric II IOLs in her cataract surgeries for patients with corneal astigmatism.

Mahipal Sachdev, MD, India continued the discussion by presenting new advancements in phacoemulsification with the VERITAS™ Vision System. The VERITAS™ System, Dr. Sachdev explained, is based on three fundamental pillars: improved stability and safety, exceptional phacoefficiency, and a surgeon-centered design. VERITAS™ engages hybrid fluidics with its Advanced Tubing System (ATS) which minimizes post-occlusion surge for unsurpassed chamber stability. Another new design feature with the VERITAS™ System is the ergonomic swivel phaco handpiece which optimizes the surgeon's comfort during surgical procedures to reduce fatigue. There is also an ergonomic foot pedal that also provides more comfort and control. Through one video case presentation, Dr. Sachdev showed his technique with a direct chop, showing how the anterior chamber maintained rock solid stability throughout the procedure. "The VERITAS™ System is a step significantly higher than the present machines," said Dr. Sachdev, because of the advantages of stability, ergonomics, and control.