

## Cataract and refractive surgeons offer tips on targeting optimal outcomes



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A panel of well-respected surgeons gave attendees of an *EyeWorld* Corporate Event tips on how to target optimal clinical outcomes in cataract and refractive practice during the 24th annual meeting of the Asia-Pacific Association of Cataract & Refractive Surgeons, held in October 2011.

The symposium, sponsored by Abbott Medical Optics Singapore Pte. Ltd. (AMO, Santa Ana, Calif., USA), was moderated by **Han Bor Fam, MD**, and **Hungwon Tchah, MD**, and included talks from **Gerd U. Auffarth, MD**, and **Perry S. Binder, MD**.

### High-order aberration correction

Dr. Tchah, professor, ophthalmology department, College of Medicine, Ulsan University, Seoul, South Korea, opened the symposium with his talk, "Beyond 20/20," which focused on how cataract and refractive surgeons can use high-order aberration correction to achieve 20/20 best uncorrected vision or better.

Dr. Tchah argued that visual acuity does not equal the same visual quality and said he and others are exploring how to increase visual quality. "Beyond 20/20 is not vision 20/8, but vision with a better quality," Dr. Tchah said. "To achieve this goal, wavefront technology should be applied."

Dr. Tchah showed the results of the

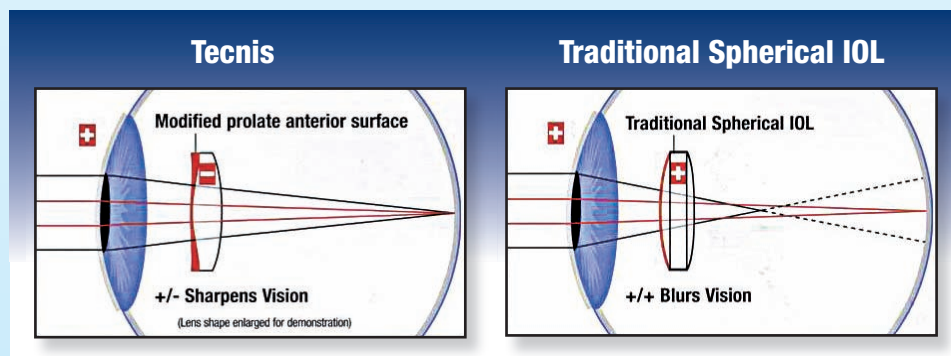
aspheric IOL, Tecnis (AMO), which provided decreased spherical aberration compared with conventional spherical IOLs, and optical bench tests of several multifocal IOLs, "which functioned as they were intended in terms of higher-order aberrations."

Dr. Tchah combines IntraLase technology and the Advanced CustomVue procedure. This blend of technology by AMO is called iLASIK.

"The custom wavefront is working to decrease higher-order aberrations, induced by corneal ablations, resulting in increased visual quality," Dr. Tchah said.

IntraLase technology allows a surgeon to precision-design his or her patient's intracorneal architecture in terms of diameter, depth, edge angle, and morphology—creating the optimal stromal bed for the refractive procedure. Advanced CustomVue then uses WaveScan technology's Fourier algorithms to deliver high resolution, which results in accurate and individualized treatment for a wide range of ophthalmic indications. Advanced CustomVue is the only procedure to offer iris registration, the first fully automated method of aligning and registering wavefront correction, helping to ensure precision and accuracy, according to AMO.

A recent study that was published in the *Saudi Journal of Ophthalmology* titled "Effects of advanced surface ablations and



Previous studies about VISX S4 CustomVue system 2

- Retrospective comparative interventional case(458 patients, 721 eyes)
- LASIK surgery by the same surgeon using 1 of 3 lasers (Visx Star S4, LADARVision 4000, WaveLight Allegretto) with a conventional algorithm or with wavefront-guided software

	VISX convention	VISX-wavefront (CustomVue)	P-value
PostOP HOA RMS (µm)	0.53±0.70	0.28±0.12	0.002
PostOP HOA RMS (% change)	+127±222	+0.2±45	0.000
PostOP SA (µm)	0.26±0.13	0.05±0.12	0.000
PostOP SA change (µm)	+0.19±0.49	+0.03±0.10	

IntraLase femtosecond LASIK on higher order aberrations and visual acuity outcome” also looked at the technology’s effect.

The aim was to “study the changes in wavefront (ocular) and corneal higher-order aberrations (HOAs) and visual acuity (VA) outcomes following wavefront-guided advanced surface ablation (ASA) techniques and IntraLase femtosecond LASIK (iLASIK) in myopia treatment,” according to the abstract. The study was undertaken at the Department of Surgery, Faculty of Medicine and Health Sciences, United Arab Emirates University, Al Ain, as well as the Department of Ophthalmology, University of Ottawa Eye Institute, Ontario, Canada.

Aberrations with BSCVA were analyzed in 240 eyes that underwent the ASA technique, which were equally divided into a flap-on group “where the epithelial flap was preserved and reapplied to the photoablated stromal bed and a flap-off group where the epithelial flap was discarded during the procedure,” and 138 eyes in the iLASIK group.

Corneal topography and ocular aberration were taken before treatment, as well as 3 months post-op.

Results at 3 months showed that “there was a statistically significant ( $P<0.001$ ) surgically induced increase in spherical aberration (SA) in each of the techniques for both ocular and corneal analysis. iLASIK induced significantly less ocular and corneal HOAs ( $P<0.001$ ). The mean manifest refractive spherical equivalent was closer to attempted correction

compared to other groups ( $P<0.001$ ). Eighty-three eyes (70%) of flap-on, 80 (67%) flap-off, and 94 eyes (68%) in the iLASIK group achieved 20/20 uncorrected VA. Fifteen eyes (11%) accomplished 20/12.5 or better in iLASIK compared to 4 (3%) for the flap-on and 7 (6%) for the flap-off ASA group. Only the flap-off treatment showed a consistent correlation between the corrected aberrations and visual performance.”

The study showed that all the patients had comparable 20/20 visual acuity, while 11% of iLASIK patients were able to achieve 20/12.15 or better.

Because of the way higher-order aberrations interact with each other, Dr. Tchah said surgeons may not only have to decrease them but also increase them as part of a customized procedure that aims for better quality of vision.

**iDesign: One instrument, many uses**

Dr. Binder, clinical professor, Gavin Herbert Eye Institute, Department of Ophthalmology, University of California, Irvine; medical monitor for AMO; and medical director for AcuFocus (Irvine, Calif., USA.), touted the benefits of the new iDesign diagnostic system during his talk, “Evaluation of the Performance and Acceptability of an Advanced Wavefront-Guided System.”

Currently, the way we acquire patient exam data is slow and many times has to be repeated because of poor measurements, conflict of data because of off-axis measurements, or incomplete data, Dr. Binder noted.

Besides the traditional paperwork, patients are first refracted with the phoropter after neutralizing their eyeglasses.

“Depending on the practice, whether its cataract or refractive, they are then taken back to a diagnostic room in which they have topography, either placido-based or Scheimpflug-based, or a combination of the two,” Dr. Binder said, adding that patients may also have wavefront aberrometry performed as well as keratometry to assess corneal curvature and measurements of the pupils and IOP. Corneal thickness may or may not be done.

“Surgery days come up and patients may have to repeat many of those processes right before the surgery,” Dr. Binder said. “That’s where we are today. We would like to improve efficiency, as well as decrease the cost for that improved efficiency, while increasing accuracy. That would be a wonderful goal.”

The iDesign Advanced WaveScan Studio, which is now in its fourth generation, takes five sets of ocular measurements within a single capture sequence—auto-refraction, high-resolution Hartmann-Shack wavefront aberrometry, full-gradient topography, and integrated keratometry and pupillometry.

“Within a 3-second single acquisition sequence, the instrument obtains four different measurement frames, which allows for absolute registration, correcting for eye movement and pupil shift,” according to AMO.

“One of the advantages that the iDesign will bring to the table is that the efficiency of the system and accuracy will be increased because there is one sitting, so the patient will not be moved,” Dr. Binder said. “We’re capturing five pieces of information simultaneously. Not only does that save time, but it also allows greater accuracy. We’re now overlaying topography and aberrometry, and that allows us to pinpoint where the source of the aberration is coming from.”

The high-definition sensor, which increases resolution 4 to 5 times over the current WaveScan instrument, allows for maximized capture rates on highly aberrated eyes, which means a surgeon will have the ability to measure complex wavefronts where heretofore wavefronts could not be obtained. “Distortions will have less effect on preventing acquisition of the aberrometry,” Dr. Binder said. “This is going to increase the percentage of eyes that can be captured, and that’s going to



help the number of eyes we can treat with wavefront-guided surgery, improve our diagnostic capabilities, and maybe even help us select patients who have abnormalities that we could not detect, such as early keratoconus patients.”

The full-gradient topography covers more of the corneal surface than ever before—more than 8.3 mm surface area with true central 3-mm data. “The closer we get to the visual axis, the better our predictability of IOL power will be, especially in eyes that have had previous refractive surgery,” Dr. Binder said.

Dr. Binder said capturing data from one instrument is beneficial for both surgeons and patients.

“The situation that we’re in is that we want to get more patients examined per unit time without sacrificing the data collection,” he said. “In terms of cost, instead of having five instruments, you basically only have one. Of course on the day of surgery, that would speed up everything. This integrated instrument provides more information needed for optimal outcomes and improves workflow.”

He added that the registered data sets allow for comparisons between measurements.

“It allows us to analyze highly aberrated eyes, has more enhanced precision, and the autorefraction can do a better job than most manifest refractions,” he concluded.

Dr. Binder said the iDesign is currently being released in Europe as a diagnostic unit.

In the future, he hopes to see software planning between the iDesign and the VISX laser or its successor. “Everything will be transferred electronically, and then we will improve on efficiency even more,” Dr. Binder said. “The data entry is reduced because we’re only doing it once instead of twice (aberrometer and VISX) or three times (add the IntraLase). Cutting down on data entry means cutting down on errors with typing and refractions.”

### The option to choose with the Whitestar

In his talk, “Optimizing Phaco Energy and Efficiency,” Dr. Fam said the Whitestar Signature (AMO), a modular ophthalmic microsurgical system, is unique in that its Fusion Pump allows doctors to switch between peristaltic and venturi pumps while operating.

Dr. Fam is senior consultant and head, Cataract & Implant Service; senior consultant, Refractive Surgery Service and Cornea Service, The Eye Institute at Tan Tock Seng Hospital, National Healthcare Group, Singapore; and clinical lecturer, National University of Singapore.

“Surgeons can switch from the pump they are most familiar or comfortable with,” he said. “The versatility of two pumps increases their chances of being able to match their needs, as opposed to with a single machine. Surgeons can take advantage of the two pumps because each has its own advantages. That way, the risks are lower.”

He said the pump-changing option is especially good for practices with several surgeons. “Surgeons can switch without having to invest in two machines,” he said. “From a department standpoint, where there is more than one surgeon with different techniques, the two pumps should be able to suit most people.”

Dr. Fam said the differences in the pumps are subtle. “The venturi has a very good flow rate, making it highly followable. Unfortunately, if surgeons want a useful vacuum setting for a certain stage of the surgery, they would have too high of a flow rate, which would make surgery dangerous. At that point, they may want to use the peristaltic pump, which is generally slower. It all depends on what they want. Versatility is the main point.”

The Whitestar’s Ellips FX technology assists surgeons with lens extraction by simultaneously blending longitudinal and transversal modalities for smoother cutting. It works with any tip style, straight or curved, and minimizes the risk of thermal damage.

Finally, the Fusion Fluidics technology anticipates occlusions and pre-emptively adjusts the vacuum before occlusions break, providing better chamber stability and improved safety.

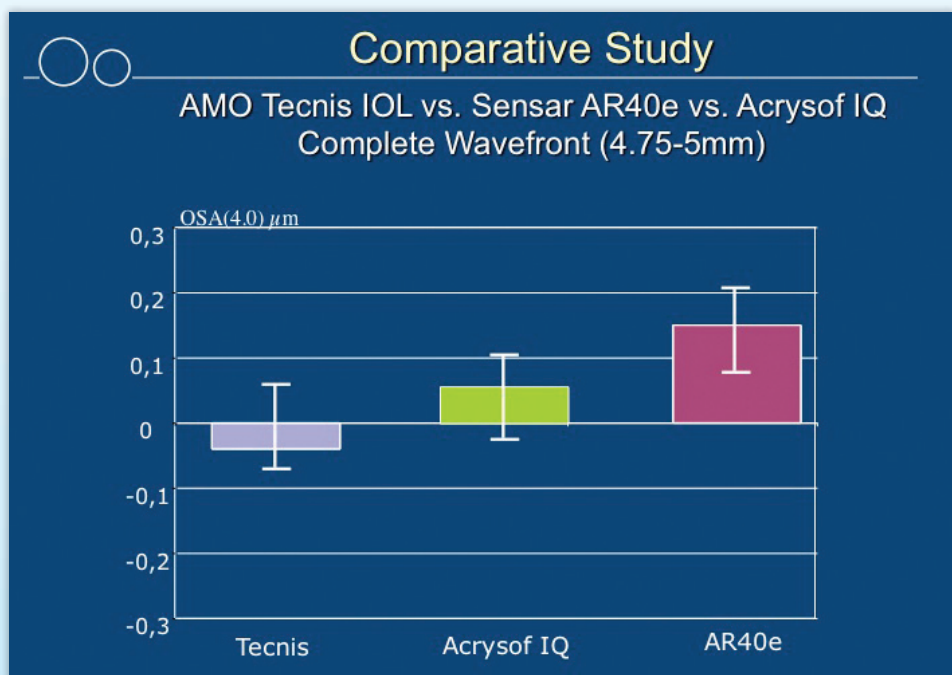
Despite the machine’s impressive technology, surgeons should continue to sharpen their surgical skills, Dr. Fam said.

“Technology is just technology,” he said. “Surgeons need to optimize their technique before surgery. They cannot rely on technology alone. Because of the versatility of the two pumps, the chances of being able to match the technique with a single machine are much higher. Surgeons can take advantage of the two pumps because each pump has its advantages and disadvantages.”

### Talking about IOLs

Finally, Dr. Auffarth, chairman, Department of Ophthalmology, University of Heidelberg, shared his experiences with the Tecnis lenses, both multifocal and toric, in his talk, “Maximizing Patient Outcomes with Multifocal and Toric IOLs.”

“We are now at the point where we are moving from medical cataract surgery

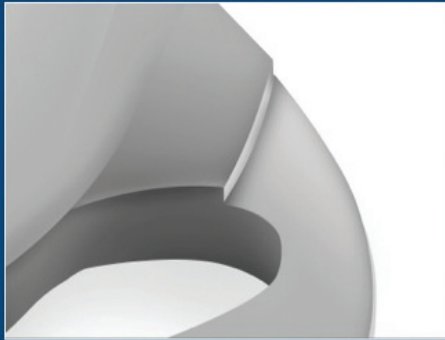




## Tecnis 1-Piece Lens Design

- **PROTEC 360-degree Edge Design**

- The 360-degree square edge has uninterrupted contact with the posterior capsular bag even at the haptic-optic junction
- Designed to prevent cell migration along the haptic
- The frosted edge design minimizes edge glare



to what I would call refractive lens surgery, where we are targeting people who have no cataracts and have a clear lens,” Dr. Auffarth said. “We can remove the lens for refractive purposes because of high ametropia. But we can also do this for patients who have presbyopia. Now the age groups are going down, and it’s not unusual to do this surgery in a 45-year-old using a multifocal lens—that’s something that we didn’t do 15 years ago.”

The Tecnis Multifocal, which has evolved from a rigid PMMA lens to a modern foldable hydrophobic single-piece IOL, provides patients with advanced image quality at all distances and in all lighting conditions and a high level of spectacle independence. This lens and the Tecnis Toric for astigmatism correction are made of a hydrophobic acrylic material with low chromatic aberration.

“The details of the lens give you a couple of advantages,” Dr. Auffarth said.

The Tecnis one-piece has a PROTEC 360-degree edge design, which has uninterrupted contact with the posterior capsular bag even at the haptic-optic junction to minimize PCO by limiting LEC migration.

“It is designed to prevent cell migration along the haptic, and the frosted-edge design minimizes edge glare,” Dr. Auffarth said.

The offset haptic design provides three points of fixation of the lens in the capsule and pushes the optic edge against the posterior capsule helping to minimize PCO.

“It is designed for quick and long-term stabilization of the optic and refraction,” Dr. Auffarth said, adding that the aspheric design of the lens also compensates for average corneal spherical aberrations.

He pointed to a study that compared visual acuity of the Tecnis Multifocal with a monofocal lens. “We get the same quality of vision with the multifocal as the monofocal, which is quite a good sign,” he said.

Dr. Auffarth also noted a study where researchers compared patients who were implanted with the Tecnis IOL to those implanted with the AcrySof IQ (Alcon, Fort Worth, Texas, USA/Hünenberg, Switzerland).

“We have an advantage with this lens. The difference in spherical aberration is quite interesting—around 0.07 microme-

ters,” Dr. Auffarth said.

The difference in residual spherical aberration was 0.078 micrometers with the Tecnis showing  $-0.029$  micrometers of spherical aberration and the IQ showing  $+0.049$  micrometers.

Dr. Auffarth showed a video that demonstrated the new injector for the lens, which goes through a 2.2 or 2.3 mm incision.

“The lens is hydrophobic acrylic, but it’s not as sticky as some of the other lenses on the market. When we insert the lens into the capsular bag, it easily loosens up so we can align it,” Dr. Auffarth said. “It unfolds slowly, which is quite nice.”

Dr. Auffarth said that he started implanting the Tecnis Toric in Heidelberg this year and has found that the lens compensates for pre-existing cylinder and provides excellent functional results.

“Ninety percent of the patients who come into my practice with cylinder can be covered with this lens,” he said.

He added a couple of pearls for the Tecnis lens, especially with using the IOL power calculator provided on the AMO website.

“Do your markings with the patient sitting upward looking straight ahead, otherwise you can alter the position of the lens,” Dr. Auffarth said.

As for the calculator, “always use K values in millimeters, never put it in diopters,” he said. “Depending on the machine you are using and its refractive index, you can have slightly different results.”

### Reference

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