

ESCRS
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**NEW
INTRA
OCULAR
ENSES**



NEW INTRAOCCULAR LENSES

There is a huge range of IOLs available to the surgeon of today.

Soosan Jacobs MD reports

In today's increasingly demanding world, the perfect cataract surgery needs to be complemented by a suitable IOL. Surgeons can choose from an ever-increasing array of monofocal, multifocal and accommodative IOL options to meet their patients' needs.

Multifocal IOLs have two distinct foci with blurry vision in between. Focusing on one, may cause glare and haloes from the other. The Mplus, Mplus X (Oculentis) and SBL-3 (Lenstec) are rotationally asymmetric segmented bifocal IOLs with sector-shaped near vision segment giving two focus zones for better depth of focus.

AT Lisa (Zeiss), FineVision (PhysIOL), PanOptix (Alcon), Alsafit (Alsanza) and Acriva Reviol (VSY Biotech) are available trifocals and most have toric versions. Trifocals provide better intermediate vision with fewer side-effects by using second-order light diffraction and asymmetric light distribution. These are popular in Europe.

"I prefer the AT Lisa Trifocal and the PanOptix IOL for correcting presbyopia. Both of these gave us good visual acuity for all distances and high patient satisfaction," notes Tomas Kohnen MD, Professor and Chair, Department of Ophthalmology, Goethe University Frankfurt, Germany.

Extended depth of focus (EDOF) IOLs

are the latest variation in multifocal lens solutions. An elongated area of focus extends depth. Peak resolution is only minimally affected, thereby giving reasonably clear vision at all distances with lesser glare and haloes or loss of contrast as compared to multifocals. They are preferable over conventional multifocal IOLs in eyes with maculopathy, irregular corneas or glaucoma.

An AAO Task Force consensus statement requires EDOF IOLs to be within one line of BCVA of monofocal IOLs; to have 0.5D more of defocus than a monofocal at 20/30 level (therefore, approximately 1.25D defocus), and 50% patients to be better than 20/30.

In my experience, EDOF IOLs have generally given good uncorrected distance and intermediate vision; however, near vision from standard multifocals may be better. Therefore, it may be implanted in the dominant eye first followed by a micromonovision strategy with EDOF IOL or a multifocal in the non-dominant eye.

EDOFs like the Tecnis Symphony IOL (AMO) use a biconvex design, anterior aspheric surface, posterior achromatic diffractive surface with an echelette design to give better intermediate vision with less haloes and light scatter.

The AT LARA 829MP (Zeiss) is the latest EDOF lens to appear. It has a diffractive aspheric design, chromatic correction and smoother phase zones that optimise contrast sensitivity and minimise light scattering and visual side-effects. In pre-clinical studies, it has shown higher visual acuity over wider range of focus than the Symphony.

"Concerning monofocal IOLs, I see many IOLs at a very high standard. I still prefer open-loop IOLs and hydrophobic acrylic that are fully transparent (not blue blocking) and that do not have any reports of significant glistenings. In the arena of presbyopic correcting IOLs, I prefer trifocal IOLs for patients that are hoping for spectacle independence. For myopes and



I still prefer open-loop IOLs and hydrophobic acrylic that are fully transparent (not blue blocking)...

Oliver Findl MD

less risk-taking patients I prefer classical mini-monovision of 1.25D or EDOF IOLs with micro-monovision of 0.5D," said Oliver Findl MD, of the Vienna Institute for Research in Ocular Surgery.

Small-aperture IOLs also extend depth of focus. These are especially effective in post LASIK, post RK eyes and in irregular corneal astigmatism.

The IC-8 IOL (AcuFocus) is a single-piece hydrophobic monofocal IOL that works similar to Kamra corneal inlay and uses the pinhole principle to increase depth of focus to about 3D. It has a non-diffractive 3.23mm diameter opaque PVDF mask with 1.36mm central aperture. Results show good distance, intermediate and near vision (especially when targeting -0.75 D myopia) and improvement of up to -1.5D of astigmatism. It is also more forgiving of missing the target refraction.

The XtraFocus Pinhole implant (Morcher) designed by Trindade et al. is another small-aperture sulcus IOL made of black acrylic with a central pinhole. Fundus imaging is possible and vitreoretinal surgery can be performed when required through both these IOLs.

ACCOMMODATIVE IOLS

Partially accommodating IOLs rely on changes in axial position of the IOL. Single-optic IOLs such as Crystalens (B&L), 1CU IOL (HumanOptics), Tetraflex (Lenstec) as well as dual-optic IOLs such as Synchrony (AMO) give antero-posterior movement said to give some degree of both near and distant vision. Synchrony Vu has a central blended aspheric zone to extend depth of focus.

Accommodative IOLs remain the holy grail of ophthalmic surgery. Several options now available are getting closer to the goal of restoring accommodative vision. Some of these act by various mechanisms, including changing optic shape, curvature or thickness to change focus.

In-the-bag accommodative IOLs are an interesting innovation. The FluidVision (PowerVision) changes accommodative power by increasing and decreasing the quantity of fluid within the optic.

The Sapphire IOL (Elenza) is electronically controlled, remotely programmable, customisable and utilises nanotechnology, artificial intelligence and advanced electronics to auto-adjust focus in response to pupillary changes. Speed and amplitude of pupillary responses are used to differentiate between light and accommodation. The

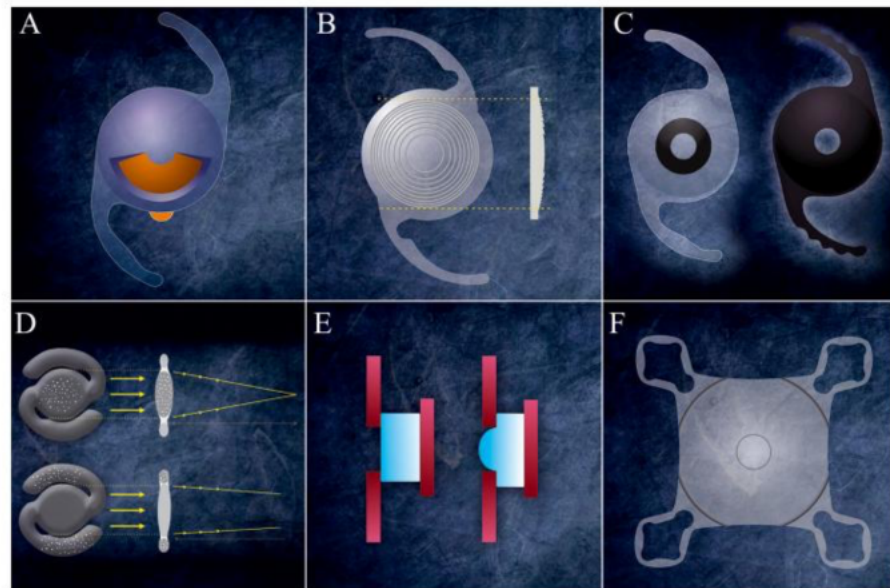


Fig: A: Segmented bifocal; B: EDOF IOL; C: Small aperture IOLs; D: FluidVision in-the-bag accommodative IOL; E: Dynacurve sulcus implanted accommodative IOL; F: Scharioth macula lens

power-cell requires recharging every three-to-four days, has hibernation mode and a fail-safe mechanism that converts it to monofocal status till recharged.

Juvene (LensGen) is a two-lens modular IOL made of a monofocal base lens into which a fluid-optic accommodating component that changes curvature is placed. The WIOL-CF (Medicem) accommodative polyfocal IOL has a 9mm optic made of proprietary hydrogel (WIGEL). The hyperbolic posterior optic gives polyfocality, and ciliary body contraction causes lens deformation, pseudoaccommodation and accommodation. Capsular fibrosis and IOL tilt can lead to loss of effect of in-the-bag accommodative IOLs.

Sulcus-implanted accommodative IOLs are also making an appearance. These are not affected by capsular bag fibrosis. The Dynacurve IOL (NuLens) changes curvature in response to accommodation by using the collapsed bag-zonular complex as a mobile diaphragm, which activates a piston that modifies a flexible membrane to provide spherical or aspherical dynamic surface, thus giving accommodation. The Lumina lens (Akkolens/Oculentis) has two optical elements shifting in a plane perpendicular to the optical axis producing accommodation.

SPECIAL FUNCTION IOLS

Tecnis toric, Symphony toric, Trulign, Lentis toric, enVista, Acrysof IQ and Acrysof IQ ReSTOR multifocal toric are some of the choices available for astigmatism correction.

Adjustable IOLs allow postoperative adjustments. Light Adjustable Lens (LAL - Calhoun Vision) is a silicone IOL containing light-sensitive macromers that are modified post-operatively using a digital light delivery device to attain desired refraction. UV-protective glasses are worn till changes

are finally locked in by re-irradiation.

Refractive indexing utilises the femtosecond laser to create patterns in the IOL, thereby correcting myopia, hyperopia, astigmatism and higher-order aberrations. It also gives the ability to create specific focal patterns in the IOL.

Multi-component IOLs allow adjustability by changing the optic component alone while the base component remains fixed, e.g. Perquisite (IVO) and Harmoni (ClarVista Medical).

Piggyback IOLs are available for primary or secondary implantation. Piggyback aspheric, multifocals, torics, negative dysphotopsia (ND) and Age related Macular Degeneration (AMD) IOLs are available. Some examples are Clariflex (AMO), Sulcoflex (Rayner) and AQ5010 (Staar).

The Scharioth macula lens for AMD has central 1.5mm diameter with +10D add giving magnification of about 2X. The EyeMax mono, also for AMD, extends usable macula by 10 degrees in all directions. However, progression of AMD can negate the effect. The Masket ND 90S IOL (Morcher) for negative dysphotopsia has a peri-optic groove to capture the rhexis.

All of the preceding options notwithstanding, monofocal IOLs remain the most commonly implanted IOLs. The field of monofocal intraocular lenses also continues to evolve. For example, Alcon recently released the Clareon IOL with higher water content, glistening free material and modified anti-glare edge. It comes with an automated lever-based disposable pre-loaded injector (AutonoMe).

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JCRS SYMPOSIUM

Controversies in Anterior Segment Surgery

Monday
April 16, 2018
1:00–2:30 PM



Moderators:

Nick Mamalis, MD
Sathish Srinivasan, MD

- ▶ Presbyopia-Correcting IOLs
- ▶ Surgical Correction of Aphakia in a 60-Year-Old
- ▶ Treating Inflammation After Intraocular Surgery

During the ASCRS Annual Meeting
Washington, DC, USA

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JCRS HIGHLIGHTS

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CXL INNOVATION

Contact lens-assisted corneal crosslinking (CXL), which uses a riboflavin-soaked UV barrier-free contact lens placed on a de-epithelised cornea before UVA exposure, is a relatively new technique. The objective is to artificially increase the functional thickness or to artificially decrease the effective UVA irradiation of the corneal stroma during the crosslinking procedure. The demarcation line is used as a surrogate measure of the depth and effectiveness of crosslinking. Researchers conducted a small clinical study looking at the demarcation line depth after contact lens-assisted CXL for progressive keratoconus comparing dextran-based and hydroxypropyl methylcellulose (HPMC)-based riboflavin solutions. CXL performed using riboflavin 0.1% combined with HPMC as the carrier agent resulted in a significantly deeper demarcation line than when the procedure was performed with dextran 20.0%-based riboflavin. *C Malhotra et al., JCRS, "Demarcation line depth after contact lens-assisted corneal crosslinking for progressive keratoconus: Comparison of dextran-based and hydroxypropyl methylcellulose-based riboflavin solutions", Volume 43, Issue 10, 1263–1270.*

PINHOLE IMPLANT FOR ASTIGMATISM

Irregular corneal astigmatism from causes including keratoconus, post-radial keratotomy, post-penetrating keratoplasty and traumatic corneal laceration impairs visual function. Brazilian researchers report a case series of 21 patients treated with a novel pinhole implant. The device is a black opaque diaphragm with a 1.3mm central opening and no refractive power. It is designed to be implanted in the ciliary sulcus of pseudophakic eyes in a piggyback configuration. Patients receiving the implant had statistically significant improvement in uncorrected and corrected distance visual acuities. No major complications occurred. *CC Trindade et al., JCRS, "New pinhole sulcus implant for the correction of irregular corneal astigmatism", Volume 43, Issue 10, p1297–1306.*

POST-OP FALLS AFTER CATARACT SURGERY

While cataract surgery has been shown to reduce the incidence of falls in elderly patients, post-op falls still do occur. A prospective cohort study conducted at eight public hospital eye clinics in Australia looked at 196 patients that completed first-eye surgery. First-eye cataract surgery reduced incident falls by 33%. Poorer dominant-eye visual acuity was associated with falls during the study timeline. Patients with larger than a spherical equivalent of ± 0.75 dioptre change in the spectacle lens (operated eye) had a twofold greater incidence of falls in the period after first-eye cataract surgery than those with less or no change in lens power. The increased risk linked to major changes in the dioptric power of spectacle correction of the operated eye after surgery suggests that cautious postoperative refractive management is important. *A Palagyi et al. JCRS, "Visual and refractive associations with falls after first-eye cataract surgery", Volume 43, Issue 10, p1313–1321.*



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