

Dual Optics Accomodative IOL: Results after 15 years

G. U. Auffarth

International Vision Correction Research Centre (IVCRC)
The David J. Apple International Laboratory for Ocular Pathology
Department of Ophthalmology
Ruprecht-Karls-University of Heidelberg
Chairman: G. U. Auffarth, MD, PhD, FEBO, FWCRS



IVCRC / DJ Apple Laboratory: Financial Disclosure 2025/2026

Afidera³
Alcon^{1,2,3,4}
AMO/Johnson&Johnson^{1,2,3,4}
Carl Zeiss Meditec^{1,2,3,4}
Contamac¹
Cristalens^{1,2,3,4}
Elios^{1,3,4}
Eyebright³
EyeD¹
Eyedeal¹
EyeYon^{1,2,4}
Fluoron¹
Hanita^{1,2,3,4}
Hoya^{1,2,3}
Kowa^{1,2,3}
Oculus^{1,3}
Presbia¹
Rayner^{1,2,3,4}
Teleon^{1,2,3}
1stQ¹



Klaus Tschira Stiftung
Gemeinnützige GmbH



1 = Research Grants; 2 = Travel Expenses; 3 = Lecture Fees; 4 = Consulting

Accommodative IOLs (A-IOLs)

1. Position changing designs
 - Single Optic A-IOLs
 - Dual Optic A-IOLs
2. Shape-changing designs
3. Lens-filling techniques



Abb. 1: a) Crystalens, b) 1 CU, c) Synchrony, d) NuLens (Prototyp), e) FluidVision

Data on file:

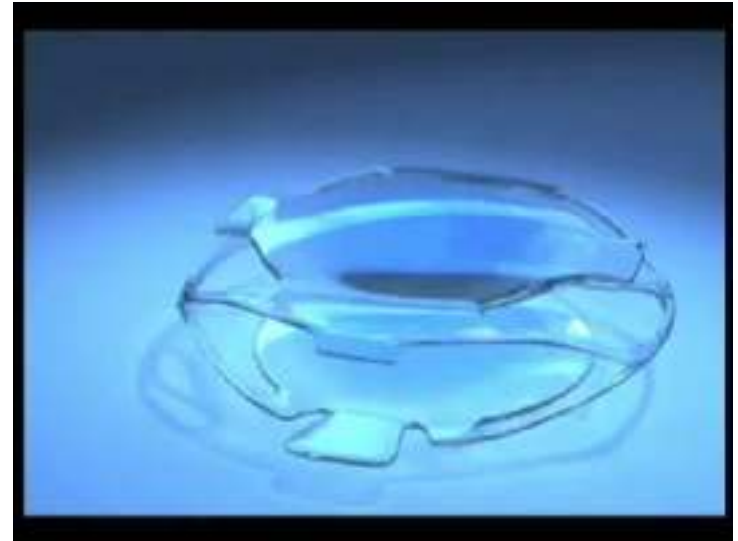
Auffarth GU, Thomas BC. Akkomodative IOLs: Was gibt es Neues? [Accommodating IOLs: What is new?]. *DGII Band*. 2011

Pepose JS, Burke J, Qazi M. Accommodating Intraocular Lenses. *Asia Pac J Ophthalmol (Phila)*. 2017;6(4):350–357. doi:10.22608/APO.2017198



Synchrony A-IOL

- One-piece dual-optic A-IOL
- Optic shift principle, triggered by ciliary muscle contraction
- 4 spring-like haptics connect:
 - Anterior plus lens (biconvex, 5.5 mm, approx. +32 D)
 - Posterior minus lens (biconcave, 6 mm, adjustable negative power)

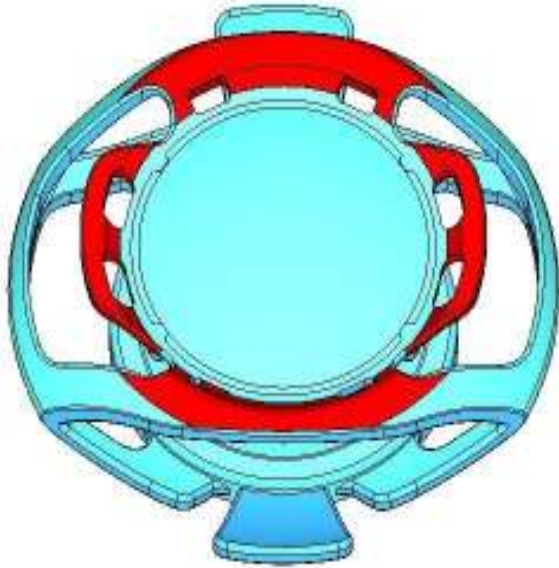


Data on file:

Auffarth GU, Thomas BC. Akkomodative IOLs: Was gibt es Neues? [Accommodating IOLs: What is new?]. *DGII Band*. 2011

McLeod SD, Vargas LG, Portney V, Ting A. Synchrony dual-optic accommodating intraocular lens. Part 1: optical and biomechanical principles and design considerations. *J Cataract Refract Surg*. 2007;33(1):37–46. doi:10.1016/j.jcrs.2006.09.020

Dual-Optic AIOL Key Features

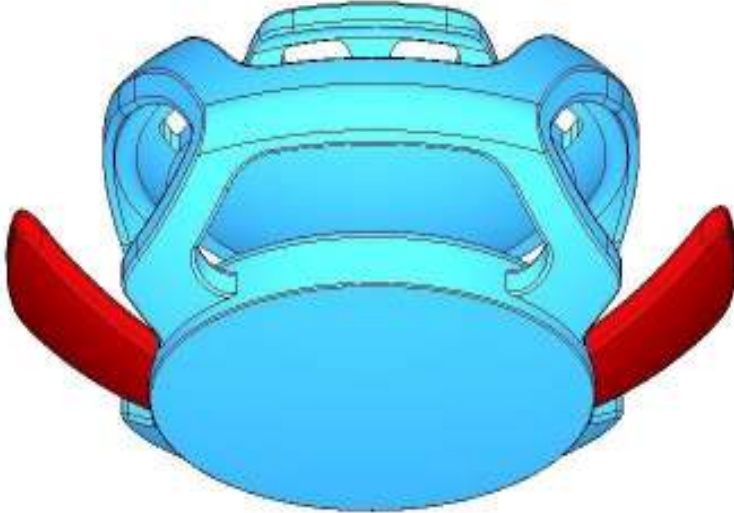


Aqueous Channels

- Support the anterior bag while providing fluid channels
- Facilitate fluid exchange
- Tent anterior capsule preventing capsule – IOL sealing and rubbing



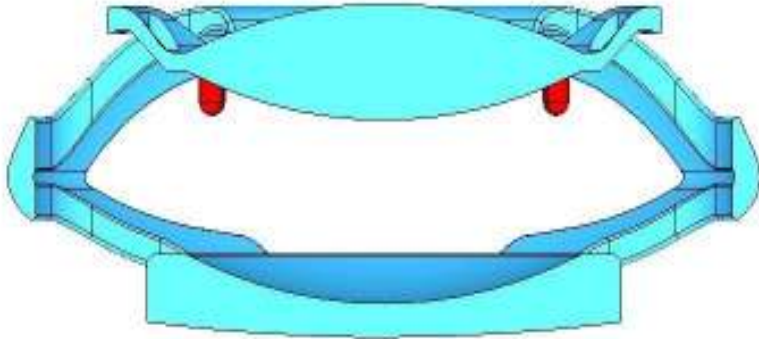
Dual-Optic AIOL Key Features



Posterior Wings

- Insure proper posterior position
- Compensate for capsular bag size variations
- Prevent decentration

Dual-Optic AIOL Key Features

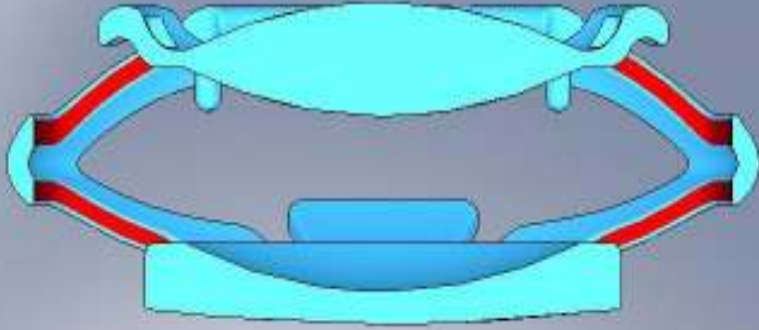


Spacers

- Provide consistent separation distance at emmetropia
- Prevent lens adhesion



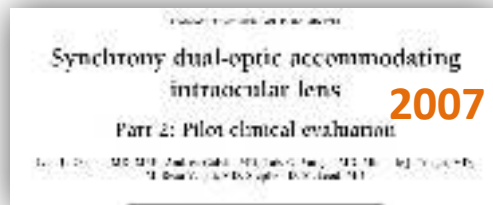
Dual-Optic AIOL Key Features



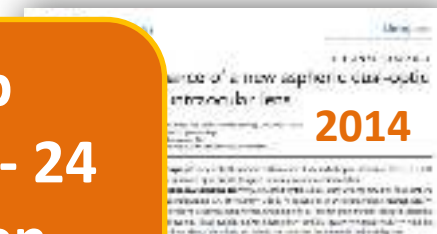
Spring Haptics

- Bias the system open
- Provide consistent separation force
- Optimized movement

Previous publications on Synchrony



To date, only I follow up performance data up to 6 - 24 months postop have been published





Retrospective analysis Heidelberg Eye Clinic

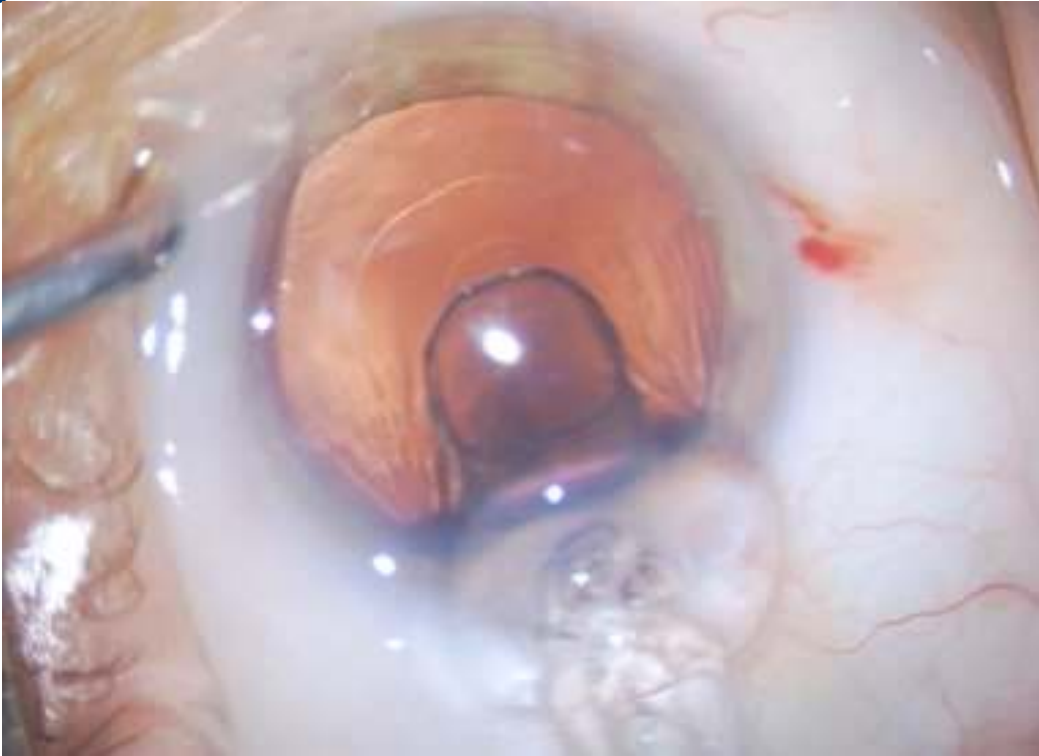
- Synchrony implanted in 32 eyes of 20 patients between 2009 – 2011
- Patients with presbyopia, age-related or traumatic cataract
- 11 patients (18 eyes) available for 15-year follow-up (age between 34 - 81 years)
 - 7 patients with bilateral implantation
 - 4 patients with monolateral implantation:
 - Partner eye:
 - ❖ 2 phakic
 - ❖ 1 with monofocal IOL (external implantation)
 - ❖ 1 with trifocal IOL (Teleon Lentis MPlus LS-313 MF30, external implantation)



International Vision Correction Research Centre (IVCRC), University Eye Clinic Heidelberg, Germany; Data on file



Implantation of Dual Optic Accommodative IOL (Synchrony)

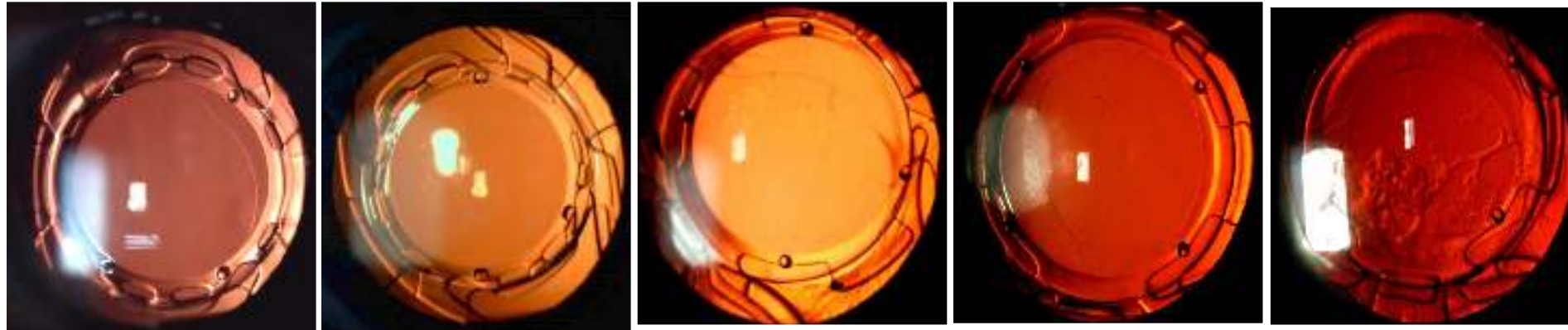


Preloaded Injector System:
Incision size 3.8-4.0mm



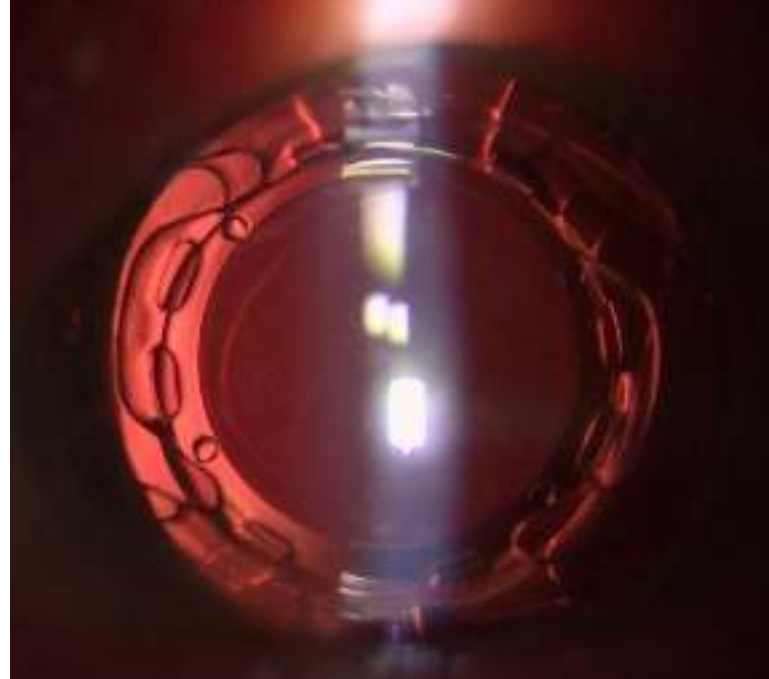
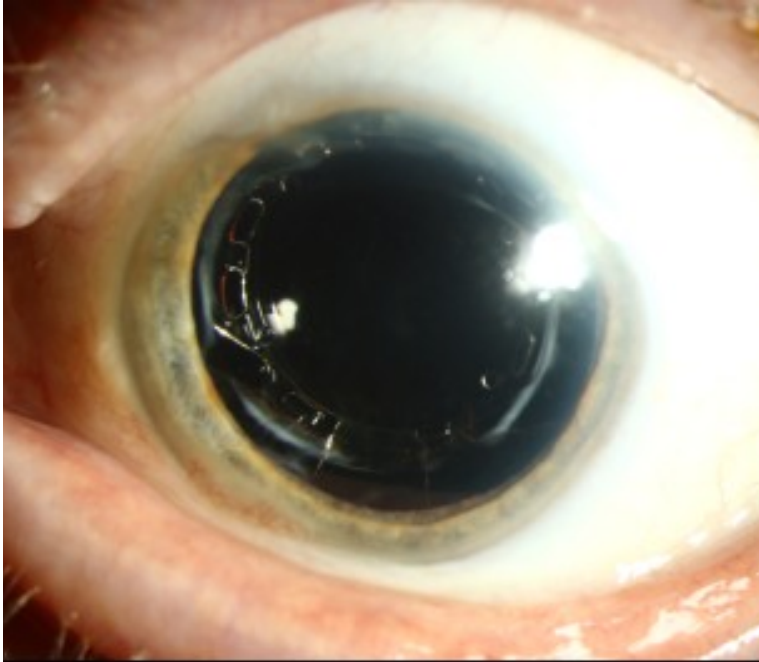
International Vision Correction Research Centre (IVCRC), University Eye Clinic Heidelberg, Germany; Data on file

○ ○ Slit lamp photography 6-12 Months Post-OP



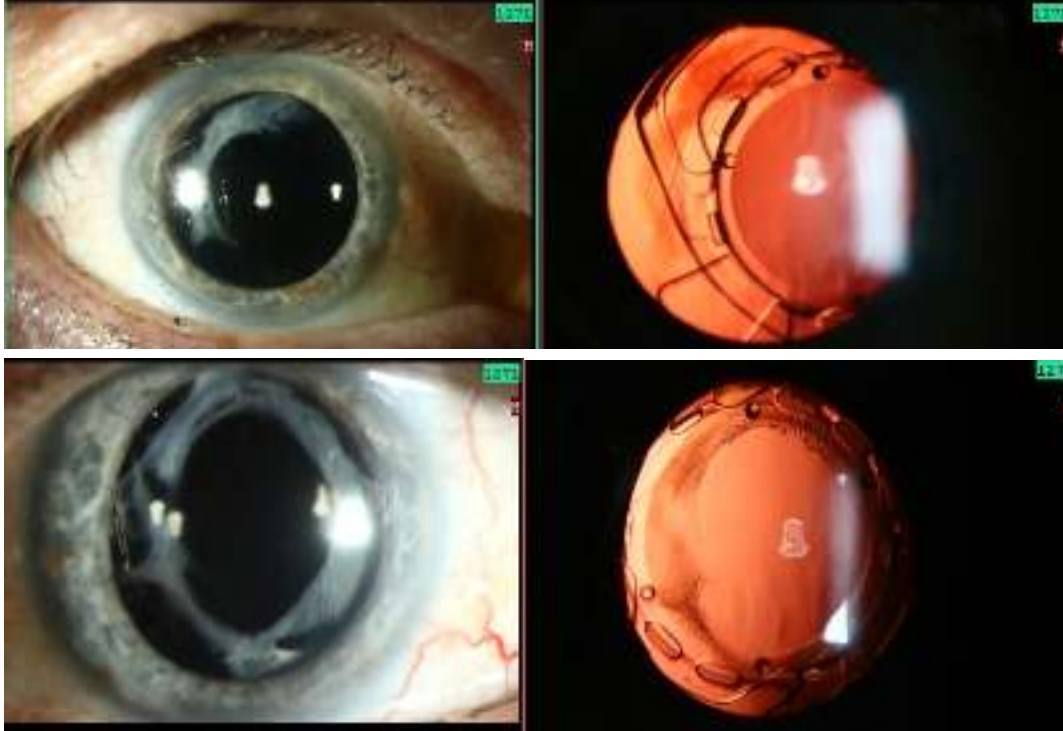
International Vision Correction Research Centre (IVCRC), University Eye Clinic Heidelberg, Germany; Data on file

○ ○ Slit lamp photography > 10-15 years Post-OP



International Vision Correction Research Centre (IVCRC), University Eye Clinic Heidelberg, Germany; Data on file

○ ○ Slit lamp photography > 10-15 years Post-OP



**Pat 3 OD
1.84 mm
decentered**

**Pat 3 OS
0.07 mm
decentered**



International Vision Correction Research Centre (IVCRC), University Eye Clinic Heidelberg, Germany; Data on file

○ ○ Slit lamp photography > 10-15 years Post-OP



Pat 1 OD

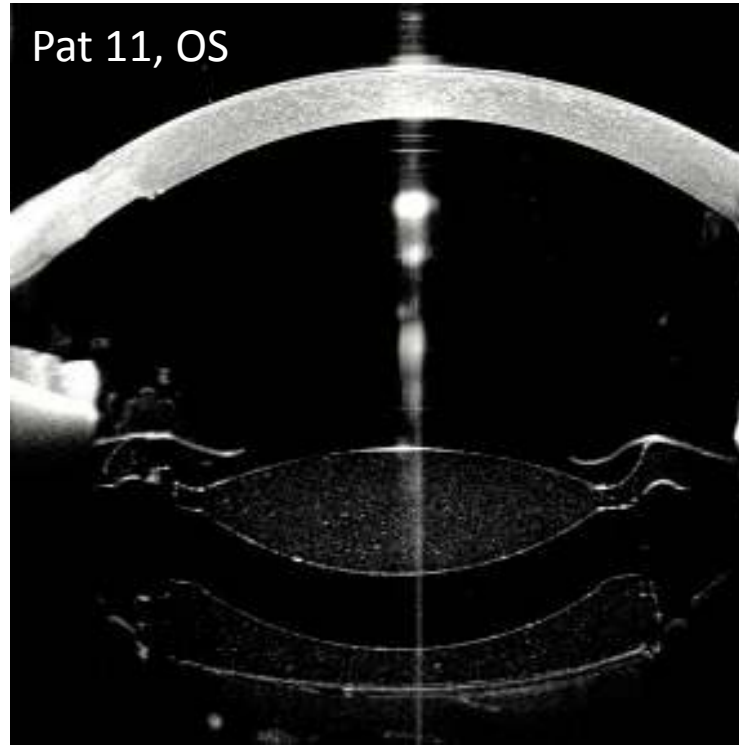


**Pat 1 OS:
+ Add-on IOL**



International Vision Correction Research Centre (IVCRC), University Eye Clinic Heidelberg, Germany; Data on file

○ ○ Slit lamp photography > 10-15 years Post-OP

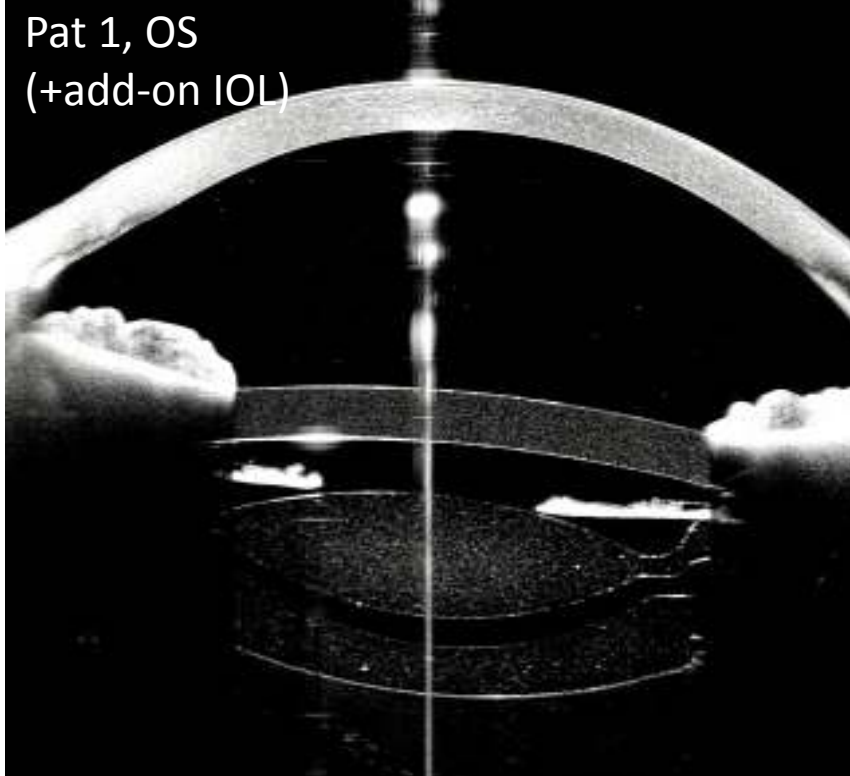


International Vision Correction Research Centre (IVCRC), University Eye Clinic Heidelberg, Germany; Data on file



Slit lamp photography > 10-15 years Post-OP

Pat 1, OS
(+add-on IOL)



International Vision Correction Research Centre (IVCRC), University Eye Clinic Heidelberg, Germany; Data on file



Manifest refraction & Visual acuity (VA)

> 10-15 years Post-OP

Manifest refraction	Sph. equivalent (SE)	Residual asti
	-0.47 ± 0.80	-0.89 ± 0.54
ΔK absolute (IOL Master)	1.22 ± 1.0	
Asti (Pentacam)	1.21 ± 0.85	

VA	mon	bin
UDVA (4 m)	0.21 ± 0.18	0.08 ± 0.16
CDVA (4 m)	-0.02 ± 0.11	-0.08 ± 0.10
UIVA (80 cm)	0.10 ± 0.20	-0.04 ± 0.12
DCIVA (80 cm)	0.06 ± 0.16	-0.02 ± 0.16
UIVA (66 cm)	0.08 ± 0.17	-0.03 ± 0.13
DCIVA (66 cm)	0.10 ± 0.17	0.01 ± 0.16
UNVA (40 cm)	0.12 ± 0.21	0.02 ± 0.18
DCNVA (40 cm)	0.23 ± 0.21	0.09 ± 0.14
BCNVA (40 cm)	-0.03 ± 0.11	-0.10 ± 0.11
Addition (40 cm)	1.85 ± 0.40	



International Vision Correction Research Centre (IVCRC), University Eye Clinic Heidelberg, Germany: Data on file

Subgroup analysis: performers vs. non-performers

Non-performers:

best corrected VA worse than 0.20
logMAR in all tested distances

Manifest refraction	SE	Residual astl
	-0.06 ± 0.73	-0.86 ± 0.46
ΔK absolut (IOL Master)	1.64 ± 1.33	
Asti (Pentacam)	1.60 ± 1.10	
VA	mon	bin
UDVA (4m)	0.31 ± 0.14	0.12 ± 0.0
CDVA (4 m)	0.09 ± 0.06	0.07 ± 0.05
UIVA (80 cm)	0.20 ± 0.10	0.08 ± 0.02
DCIVA (80 cm)	0.23 ± 0.09	0.18 ± 0.16
UIVA (66 cm)	0.25 ± 0.10	0.13 ± 0.07
DCIVA (66 cm)	0.28 ± 0.10	0.24 ± 0.10
UNVA (40 cm)	0.31 ± 0.18	0.25 ± 0.15
DCNVA (40 cm)	0.42 ± 0.19	0.26 ± 0.14
BCNVA (40 cm)	0.08 ± 0.05	0.06 ± 0.04
Addition (40 cm)	1.89 ± 0.46	

Performers:

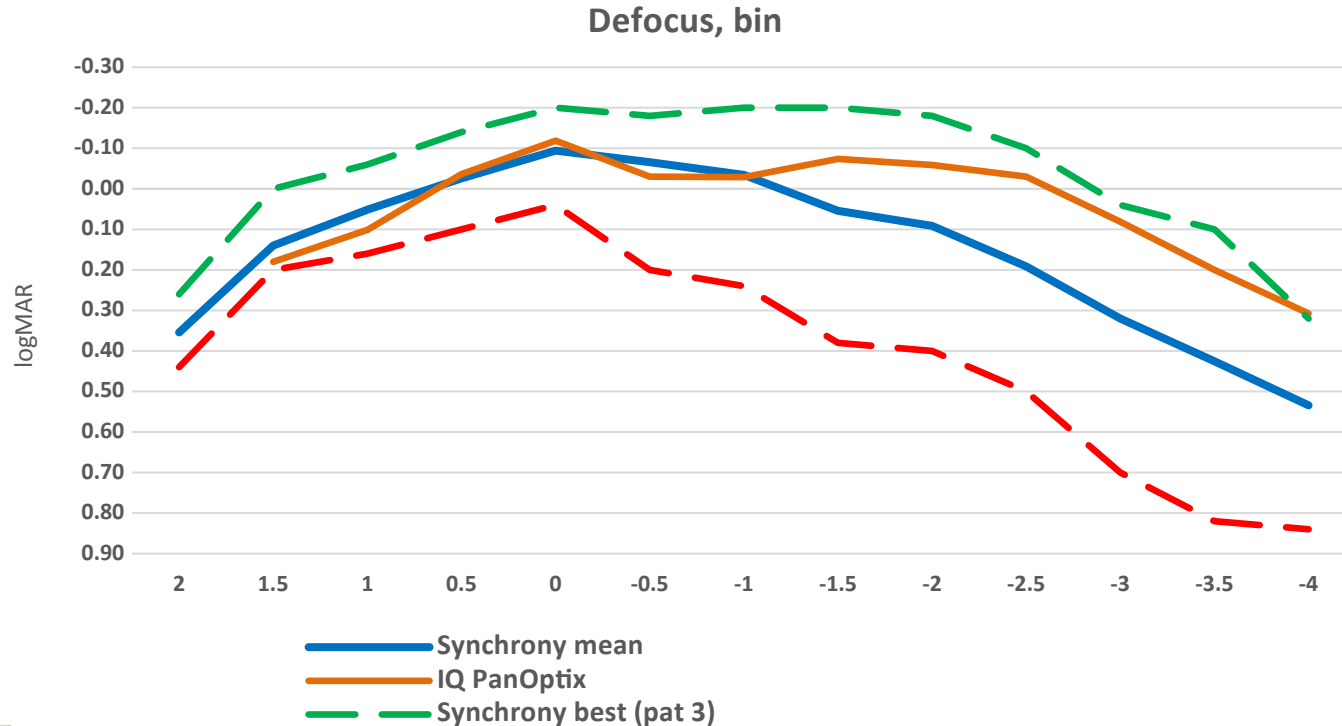
best corrected VA of 0.20 logMAR or
better in all tested distances

Manifest refraction	SE	Residual astl
	-0.91 ± 0.59	-0.32 ± 0.82
ΔK absolut (IOL Master)	0.90 ± 0.42	
Asti (Pentacam)	0.93 ± 0.41	
VA	mon	bin
UDVA (4m)	0.14 ± 0.18	0.07 ± 0.19
CDVA (4 m)	-0.09 ± 0.07	-0.14 ± 0.05
UIVA (80 cm)	0.03 ± 0.21	-0.09 ± 0.11
DCIVA (80 cm)	-0.04 ± 0.09	-0.10 ± 0.06
UIVA (66 cm)	-0.03 ± 0.09	-0.09 ± 0.08
DCIVA (66 cm)	-0.01 ± 0.07	-0.08 ± 0.06
UNVA (40 cm)	0.0 ± 0.12	-0.08 ± 0.07
DCNVA (40 cm)	0.11 ± 0.11	0.03 ± 0.07
BCNVA (40 cm)	-0.11 ± 0.08	-0.16 ± 0.05
Addition (40 cm)	1.82 ± 0.36	



International Vision Correction Research Centre (IVCRC), University Eye Clinic Heidelberg, Germany: Data on file

Defocus curves > 10-15 years Post-OP

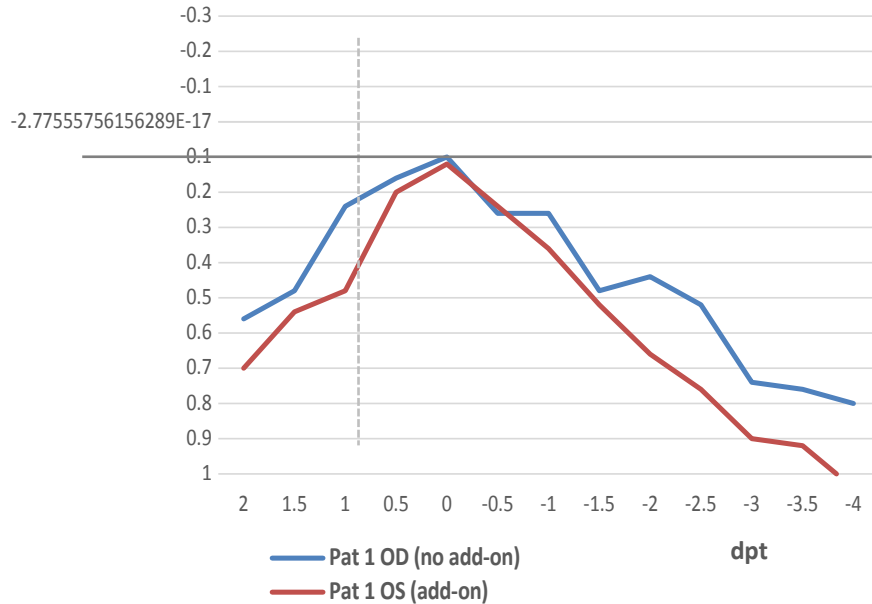


International Vision Correction Research Centre (IVCRC), University Eye Clinic Heidelberg, Germany; Data on file

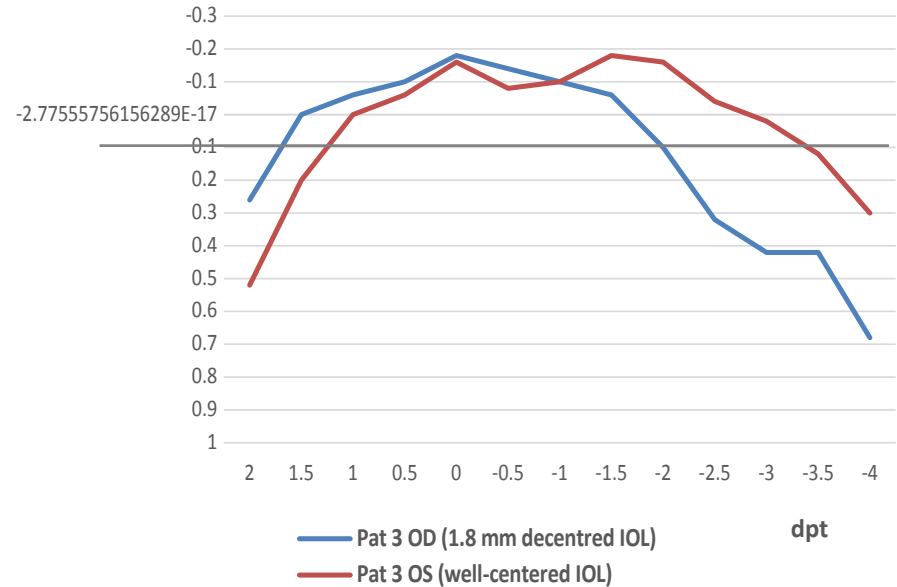
Defocus curves > 10-15 years Post-OP

Defocus curves: worst vs best

Defocus mono, pat 1



Defocus mono, pat 3



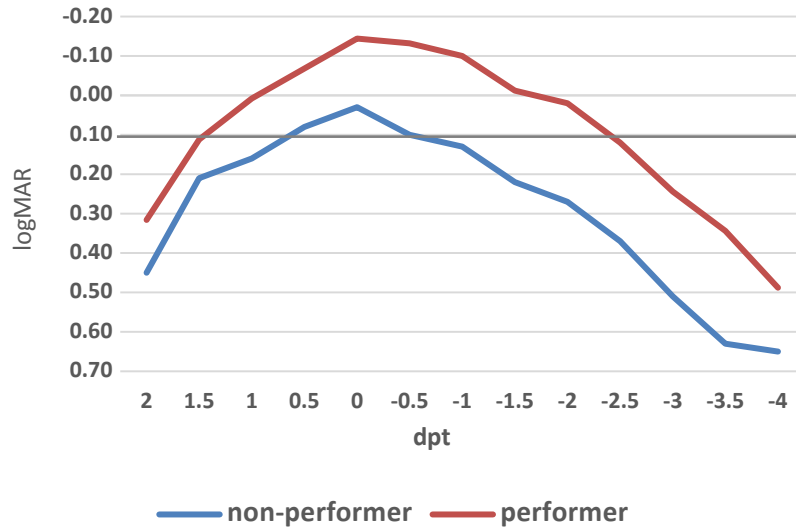
International Vision Correction Research Centre (IVCRC), University Eye Clinic Heidelberg, Germany: Data on file



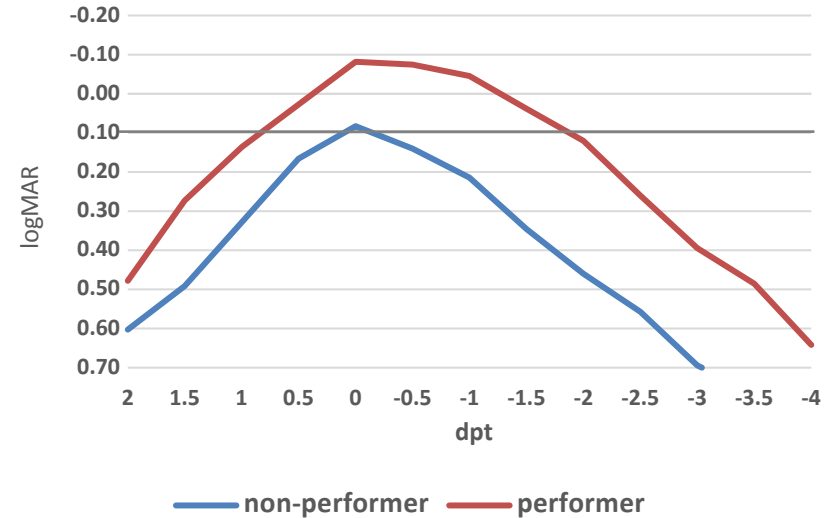
Defocus curves > 10-15 years Post-OP

Defocus curve: performers vs non-performers

bino, performers vs non-performers



mono, performers vs non-performers



International Vision Correction Research Centre (IVCRC), University Eye Clinic Heidelberg, Germany; Data on file

Halo & Glare > 10-15 years Post-OP



Synchrony
36% no halos
73% no glare



International Vision Correction Research Centre (IVCRC), University Eye Clinic Heidelberg, Germany; Data on file

○ ○ Conclusions: Dual Optic AIOL 10-15yrs. Post-OP

- Astigmatism induction due to large(r) incision (4.5mm)
- Performance decrease due to capsular fibrosis / decentration
- Visual acuity, range of vision and halo/glare perception varied considerably among patients;
- Patients often required a few seconds of accommodation to reach their best visual acuity at the tested distances;
- 57% of binocularly implanted patients required reading glasses;
- The majority of patients were satisfied with the result; dissatisfaction was seen in monocularly-implanted patients.
- Evaluation of objective Accommodation (I-Trace, DSA is ongoing)



International Vision Correction Research Centre (IVCRC), University Eye Clinic Heidelberg, Germany; Data on file



**Steinbeis-Forschungszentrum
The David J Apple Center
for Vision Research**



IVCRC.net
International Vision Correction
Research Center Network