

# ArtIOLs<sup>®</sup>

Intraocular Lenses



**VOPTICA**  
SMART VISUAL OPTICS

The image features a grayscale diagram of a human eye in cross-section. A large, semi-circular arc is drawn over the eye, representing the lens. The lens is divided into two main sections by a thin horizontal line. The upper section is a thick, curved lens, and the lower section is a thinner, flatter lens. The text "ArtIOLs" is centered within the upper section of the lens. The "O" in "ArtIOLs" is stylized with a circular graphic element inside it. The background is black, and the eye diagram is rendered in shades of gray.

ArtIOLs<sup>®</sup>

***“The first **inverted meniscus EDOF IOL**”***

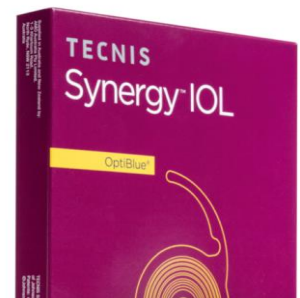
## Prof. Pablo Artal

Has long history  
contributing to develop  
the most innovative  
IOLs in the world



## Track Record

- First aspheric IOL
- First diffractive aspheric IOL
- First diffractive EDOF
- First adjustable IOL



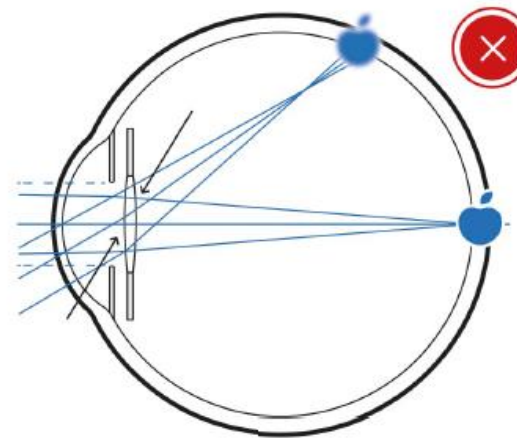


# ArtIOLs<sup>®</sup>

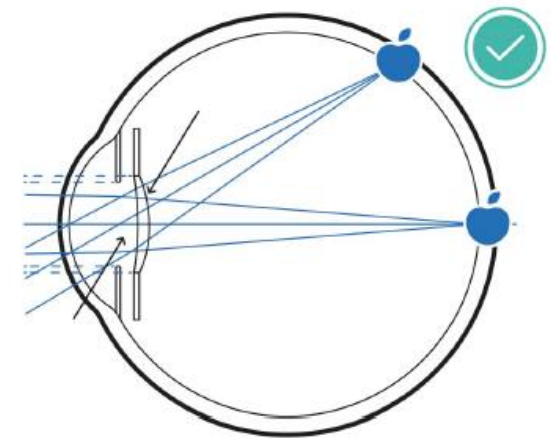
# A NEW CONCEPT

**Extraordinary optical design**

Meniscus shape conceived to mimic the natural crystalline lens that **provides optimized field curvature and improved peripheral vision for your patients.**



Standard IOL



ArtIOLs<sup>®</sup>

**\* Patented technology**



US 20200383775A1

(19) United States  
 (12) Patent Application Publication (10) Pub. No.: US 2020/0383775 A1  
 ARTAL SORIANO et al. (43) Pub. Date: Dec. 10, 2020

(54) INTRAOCULAR LENS AND METHODS FOR OPTIMIZATION OF DEPTH OF FOCUS AND THE IMAGE QUALITY IN THE PERIPHERY OF THE VISUAL FIELD (52) U.S. CL. CPC: A61F 2/164 (2015.04); A61F 2/021681 (2013.01); A61F 22/30908 (2013.01); A61F 22/30906 (2013.01); A61F 22/30901 (2013.01)

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 (73) Assignee: VOPTICA, S.L., Murcia (ES)  
 (21) Appl. No.: 16/086,897  
 (22) Filed: Jul. 11, 2019  
 (30) Foreign Application Priority Data

(57) **ABSTRACT**  
 Intraocular lens and methods for optimization of depth of focus and the image quality in the periphery of the visual field. The intraocular lens (100) comprises a central part and a peripheral part, the central part being the optical part (600) and the peripheral part comprising mechanical fasteners (601) and the central part comprising an aspherical concave anterior surface (602), which is the surface closest to the iris of the eye once the lens (100) has been implanted in the eye, and an aspherical convex posterior surface (602), which is the surface closest to the retina of the eye once the lens (100) has been implanted in the eye, such that the radius of curvature of the posterior surface (602) of the central part is smaller than the radius of curvature of the anterior surface (601) of the central part, with a ratio between radii of

# Non-diffractive EDOF IOL



## TECHNICAL SPECIFICATIONS

### Optics

Lens type	Single piece foldable lens
Optical design	Aspheric optics with extended depth of focus
Shape	Inverted meniscus
Material	Hydrophobic Acrylic UV absorbing and blue light filter
Power range	+10.00 to + 30.00 Diopters
Optical diameter	6.0 mm
Total diameter	13.0 mm
Refractive index	1.54 (glistening free)
Edge design	Square

### Optical Biometry

Suggested A-Constant*	Art25 / Art40 / Art70
SRK/T	120.0

### Haptics

Haptic design	C-L haptic
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### Delivery System

Injector-Cartridge set	Single use
Recommended incision size	≥ 2.2mm
Lens delivery	Single handed plunger

\*It is recommended that surgeons personalize the constants they use.

# ArtIOLs<sup>®</sup> models



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**Enhanced  
Monofocal**



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**EDOF**

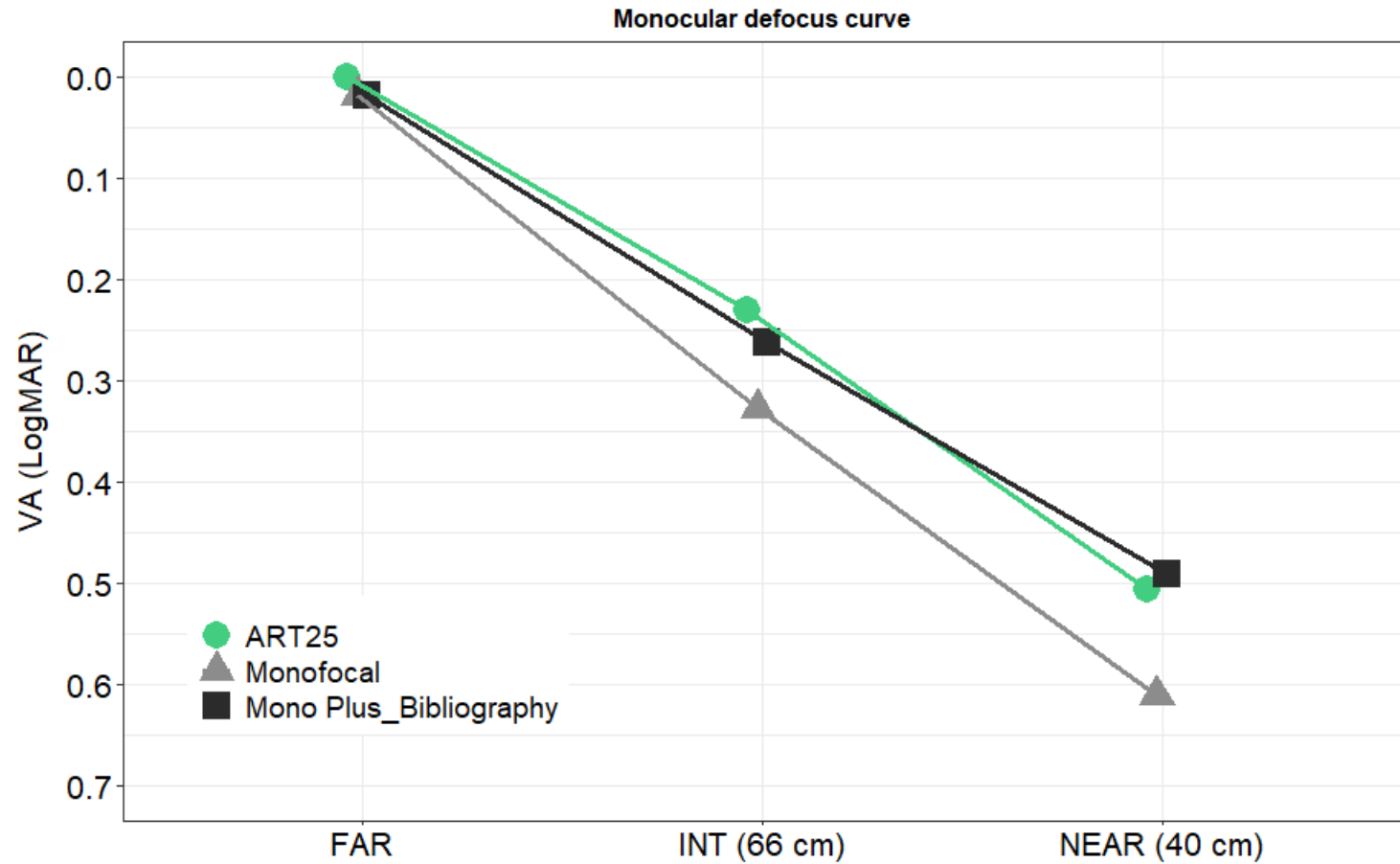


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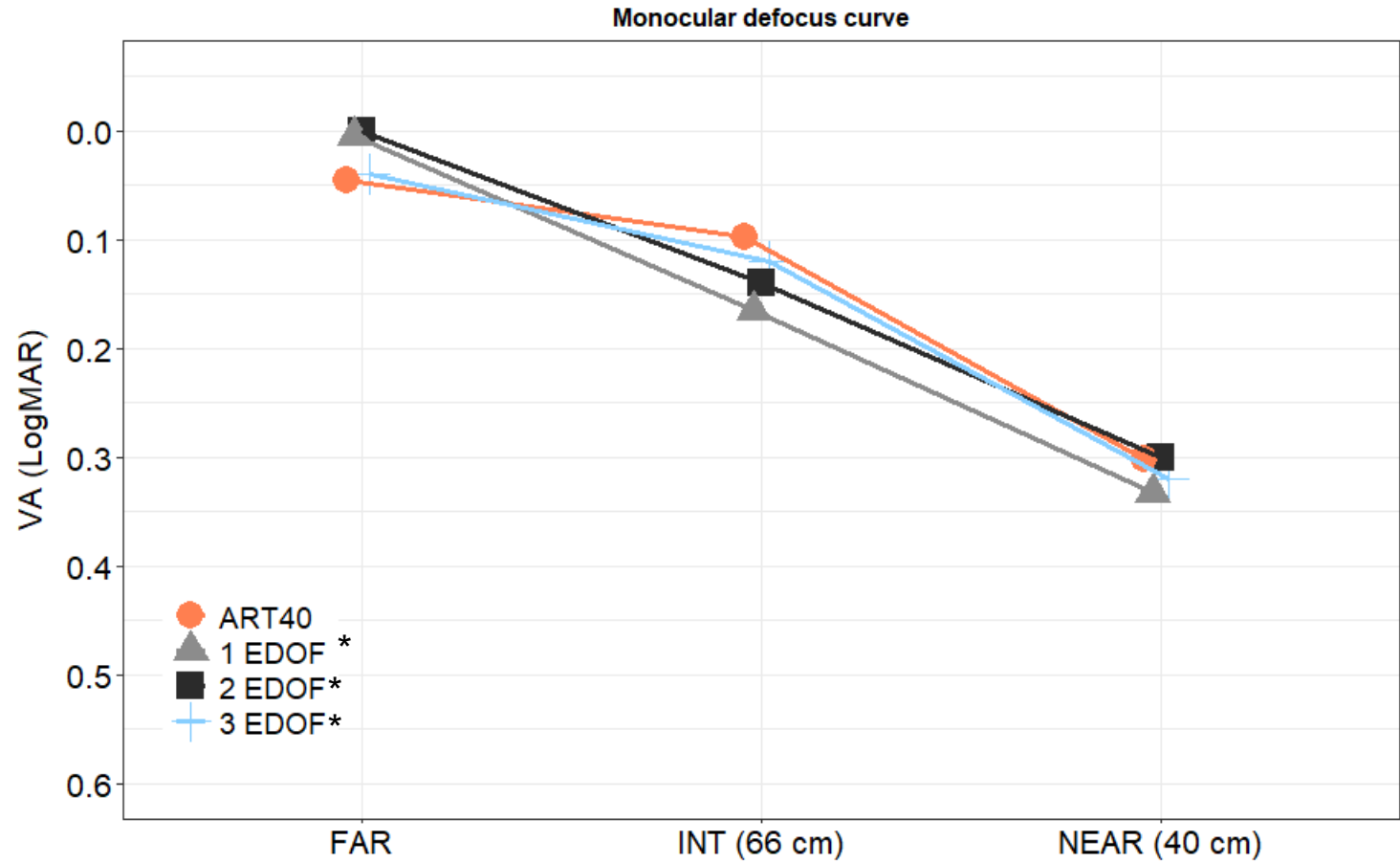
**Full Range of  
Focus**



# ART25 compared to Enhanced Monofocal



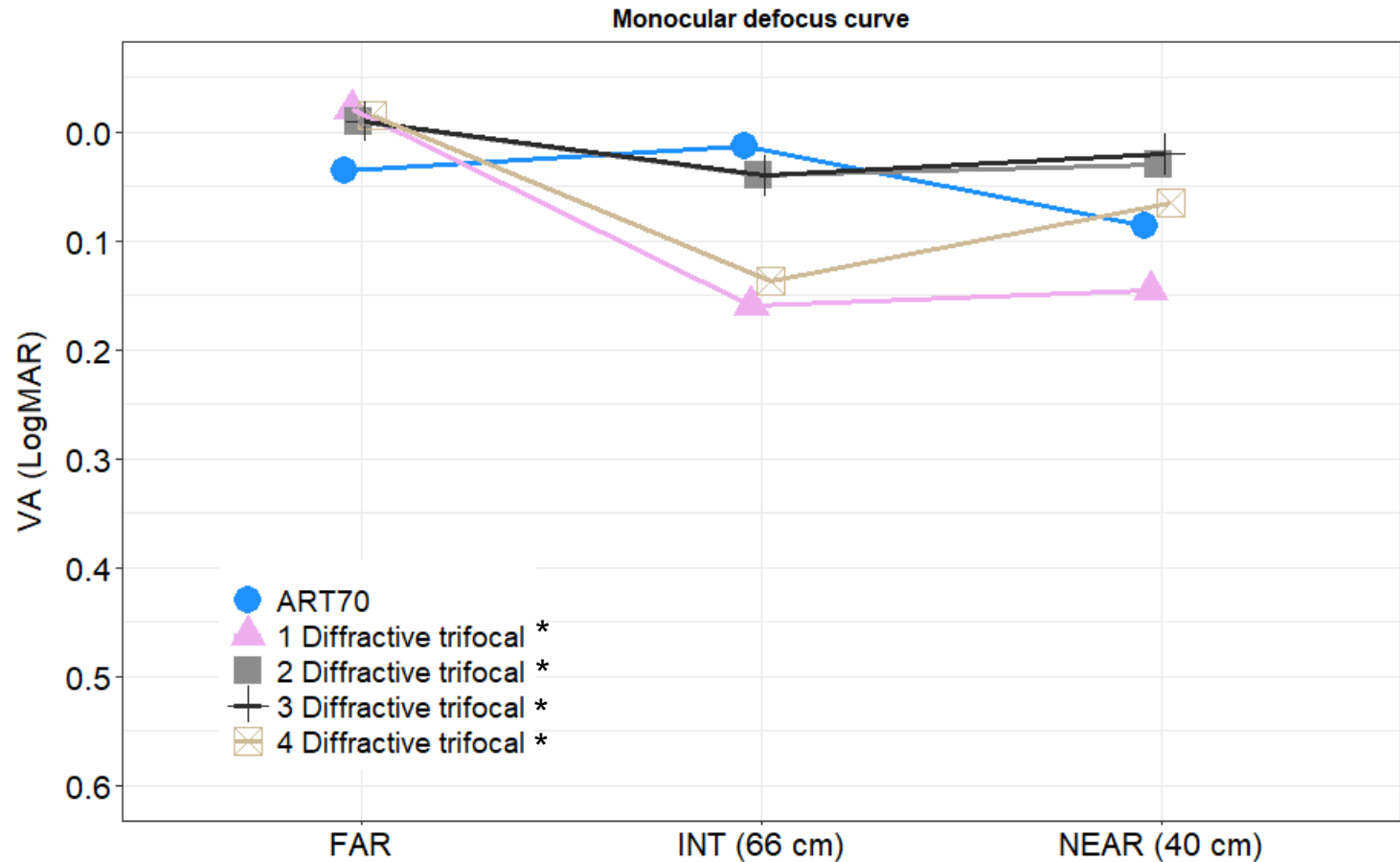
# ArtIOL® 40 compared to EDOF



\* DATA TAKEN FROM BIBLIOGRAPHY



# ArtIOL<sup>®</sup> 70 compared to Trifocal



\* DATA TAKEN FROM BIBLIOGRAPHY

# FIRST CLINICAL RESULTS!



Combination



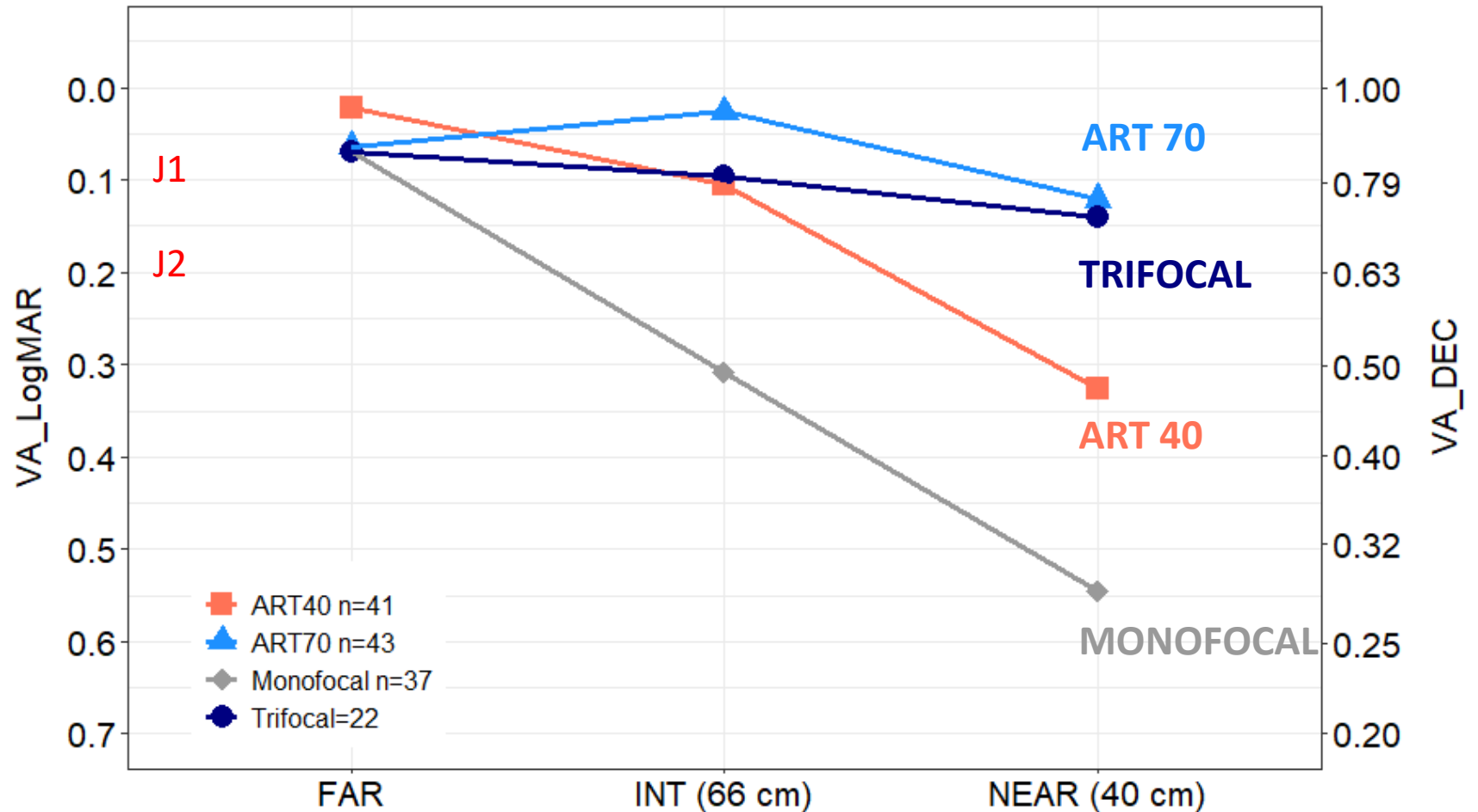
Jose Maria Marín, MD, PhD



# MONOCULAR DEFOCUS CURVE (UCVA)



Monocular defocus curve (Uncorrected)

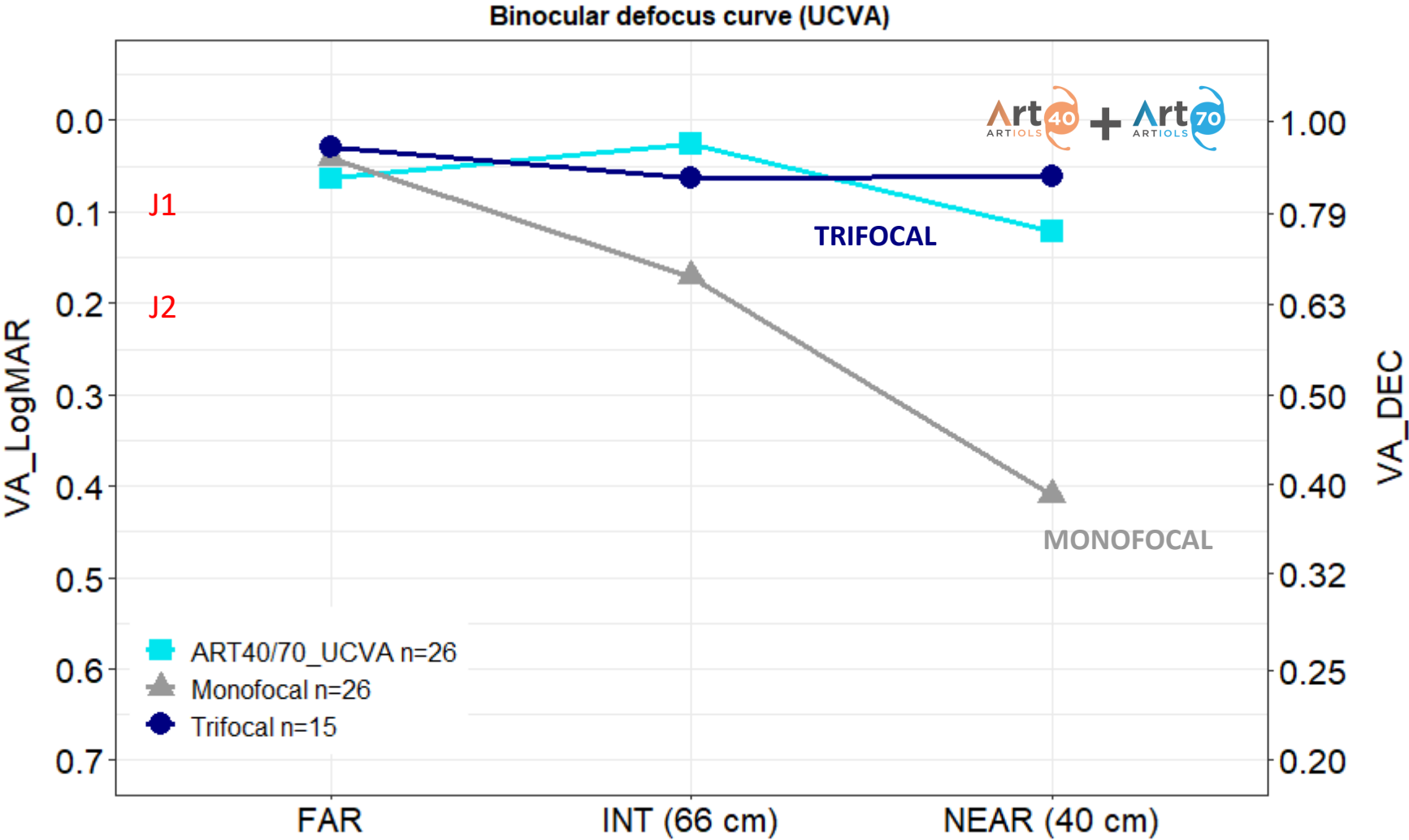


## Spherical equivalent Post-op

	Media (D)	DS
<b>Art40*</b>	-0.27	±0.29
<b>Art70*</b>	-0.66	±0.38
<b>Monofocal</b>	-0.26	±0.31
<b>Trifocal</b>	-0.01	±0.40

\*Good tolerance to refractive errors

# BINOCULAR DEFOCUS CURVE (UCVA)

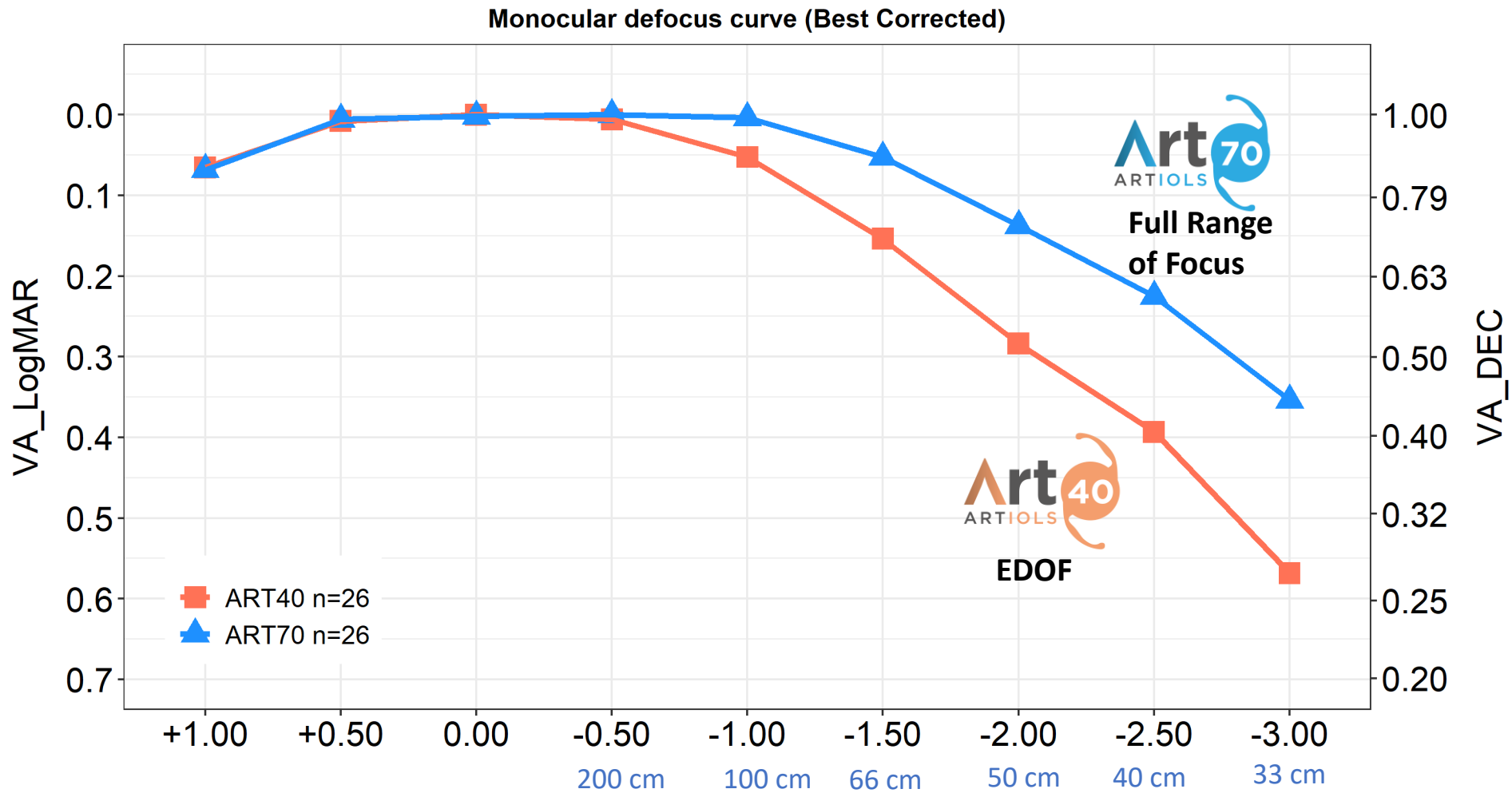


TRIFOCAL

MONOFOCAL

- ART40/70\_UCVA n=26
- Monofocal n=26
- Trifocal n=15

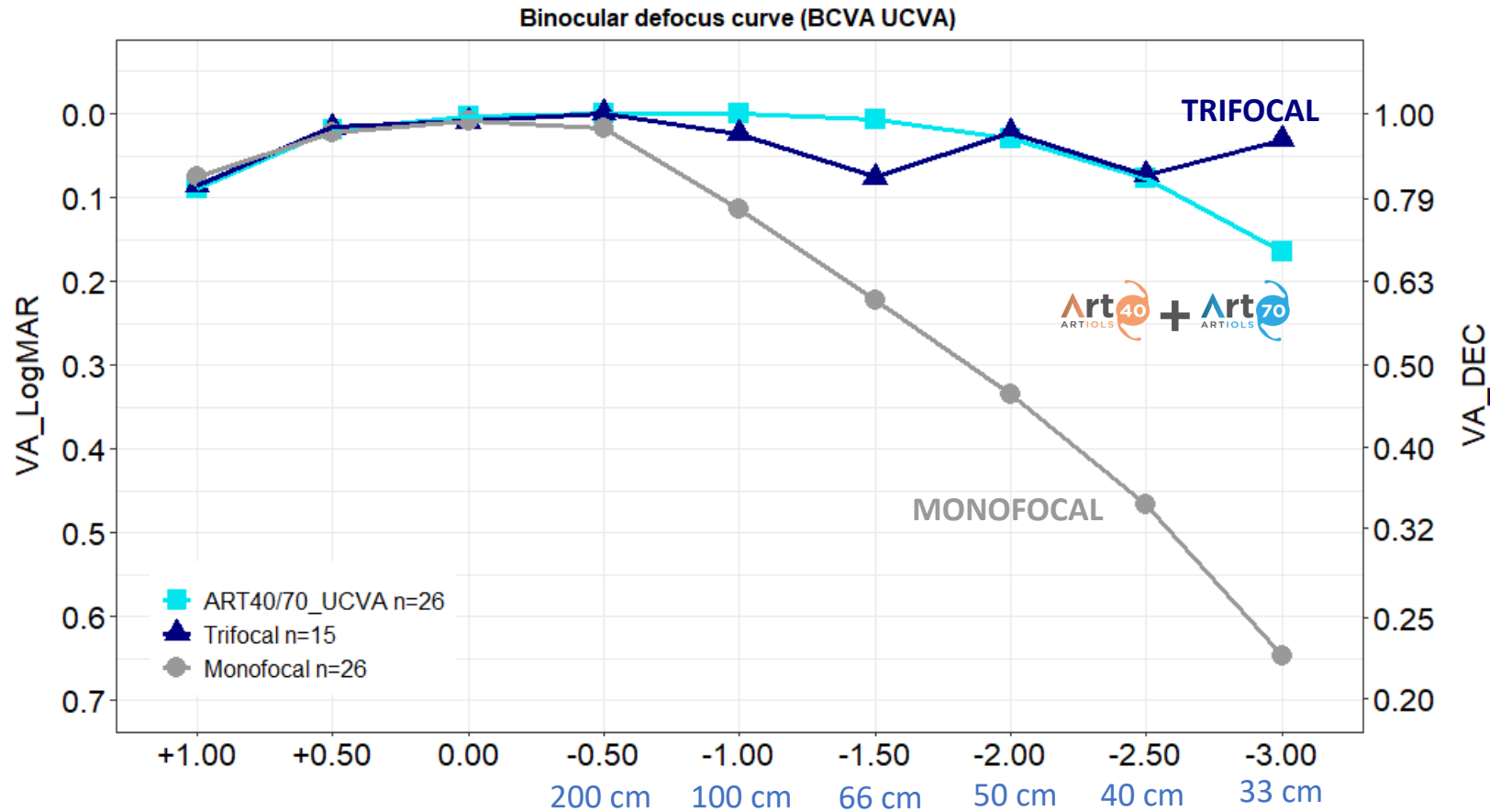
# MONOCULAR DEFOCUS CURVE (BCVA)





# BINOCULAR DEFOCUS CURVE

(UCVA ArtIOLS 40/70 and BCVA trifocal)



**ART40 + ART70 provide comparable VA results at all distances than trifocal diffractive IOLs without dysphotopsias**

# Quality of Vision questionnaire (QoV)



Percentage of patients that reported never experiencing

Frequency	Disturbance	Never
	Glare	100%
	Halos	96.4%
	Starbursts	92.9%
	Hazy Vision	96.4%
	Blurred Vision	96.4%
	Distortion	100%
	Double Vision	100%



# Patient-Reported Spectacle Independence Questionnaire (PRSIQ)



<b>Glasses</b>		<b>% NO</b>
	<b>FAR</b>	<b>85.7%</b>
	<b>INTERMEDIATE</b>	<b>85.7%</b>
	<b>NEAR</b>	<b>71.4%</b>

<b>Frequency</b>		<b>% None or a little of the time</b>
	<b>FAR</b>	<b>100.0%</b>
	<b>INTERMEDIATE</b>	<b>96.4%</b>
	<b>NEAR</b>	<b>78.6%</b>

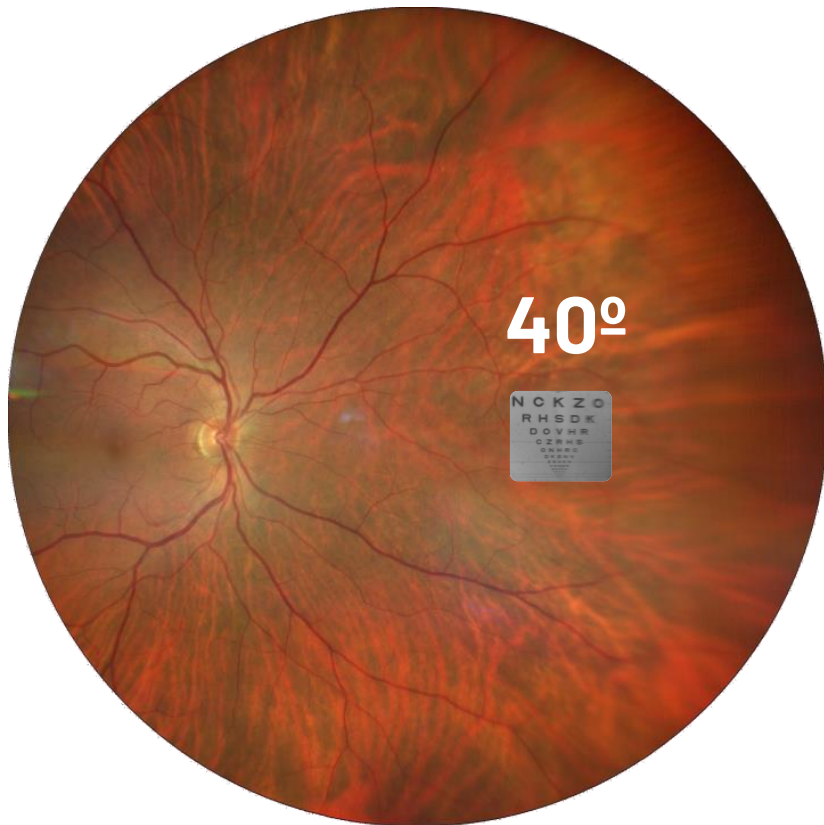
<b>Comfort</b>		<b>% All and most of the time</b>
	<b>FAR</b>	<b>100.0%</b>
	<b>INTERMEDIATE</b>	<b>96.4%</b>
	<b>NEAR</b>	<b>92.9%</b>



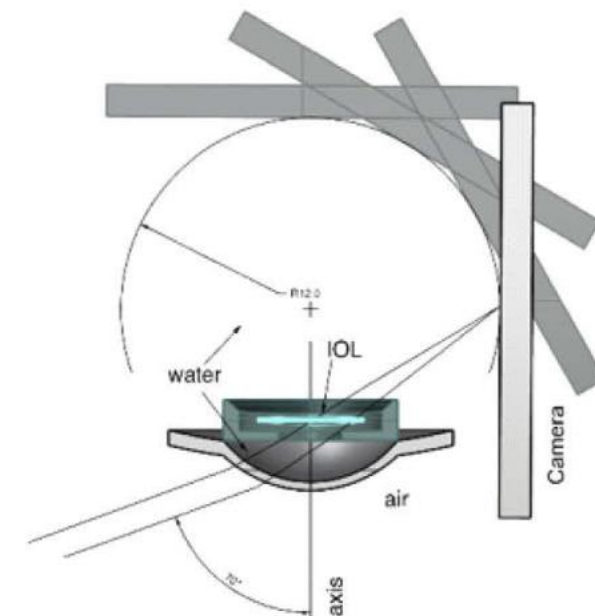
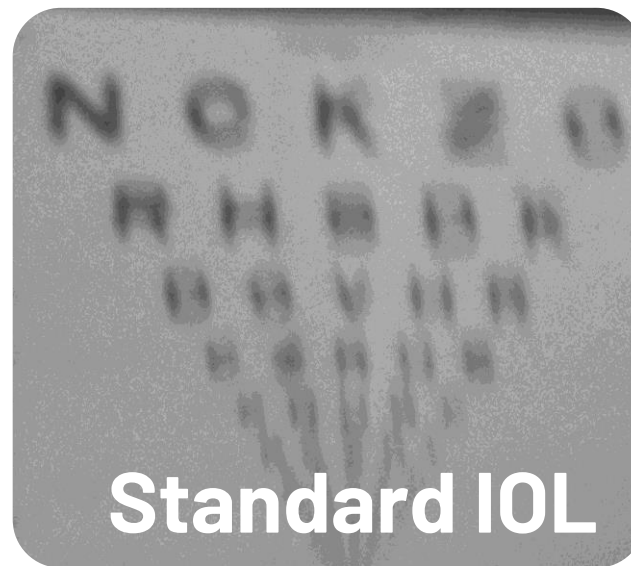
# Clinical Summary... ArtIOLs®

- **ART70 : provides good vision at all distances**
- **ART40: provides good vision at far and intermediate**
- **ART25: provide better visual performance than standard monofocal.**
- **Possibility of optimization to corneal aberration**
- **No halos or dysphotopsias**
- **The combination of ART40 and ART70 give comparable visual acuity results than trifocal diffractive IOLs without dysphotopsias**

# Images recorded in the retina of a model EYE with REAL IOLs

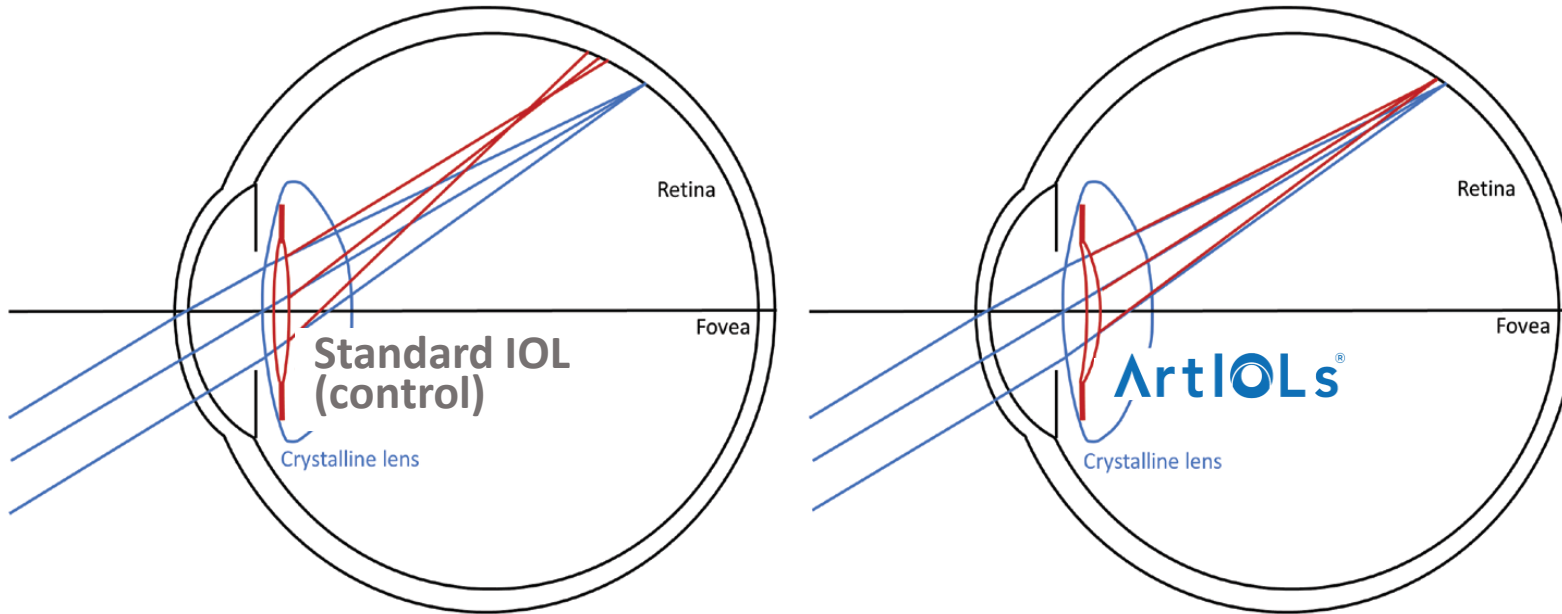


Peripheral image quality in pseudophakic eyes.  
**Biomed. Opt. Express 2020**



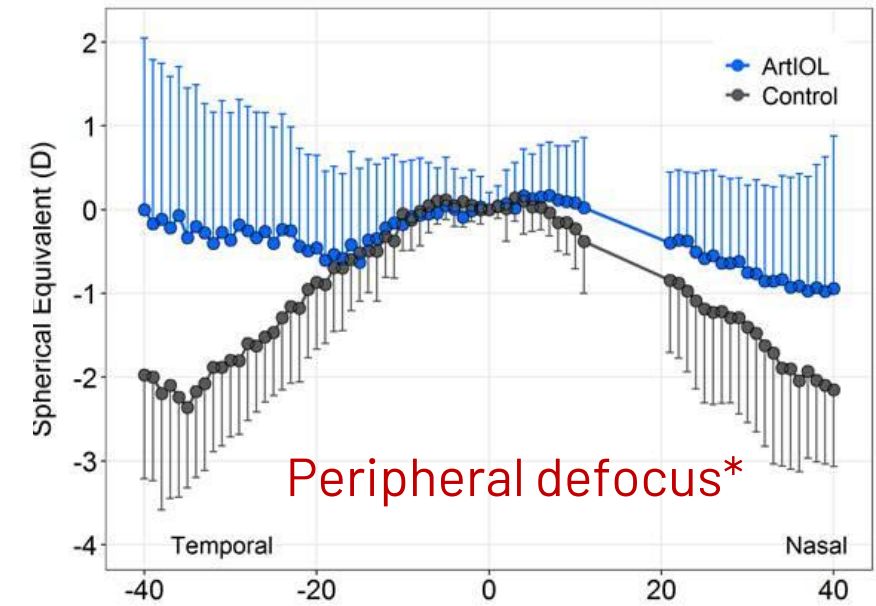


# Peripheral improvement

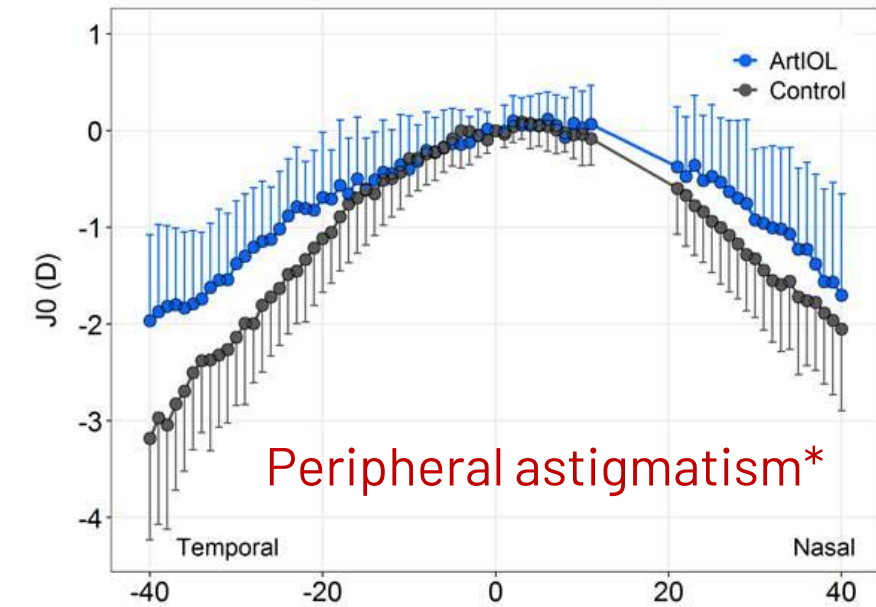


**ArtIOLs reduce** peripherally compared to standard IOL:  
**2 D defocus**  
**1 D astigmatism**

*\*Peripheral Refraction and Contrast Detection Sensitivity in Pseudophakic Patients Implanted With a New Meniscus Intraocular Lens. J Refract Surg. Vol 28. 2022*



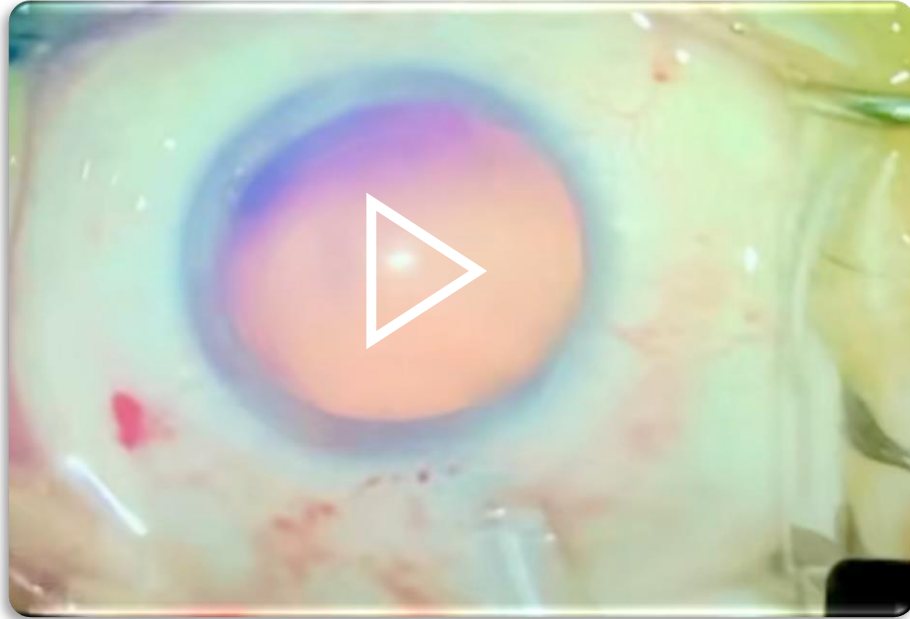
Peripheral defocus\*



Peripheral astigmatism\*

**Standard surgeries with good refractive accuracy!**

# More than 1310 ArtIOLs<sup>®</sup> implanted!

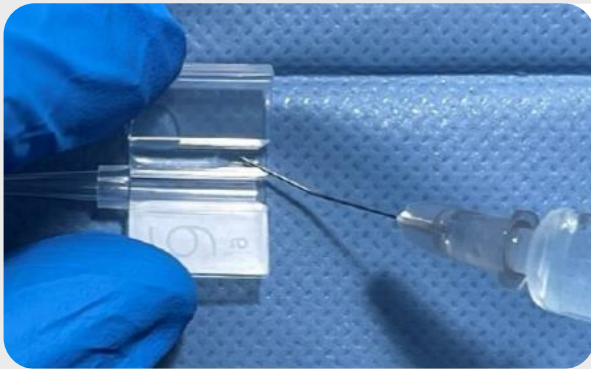


- Standard surgery
- Incision size  $\geq 2.2$  mm
- IOL in capsular bag
- Clockwise rotation

# Loading guide

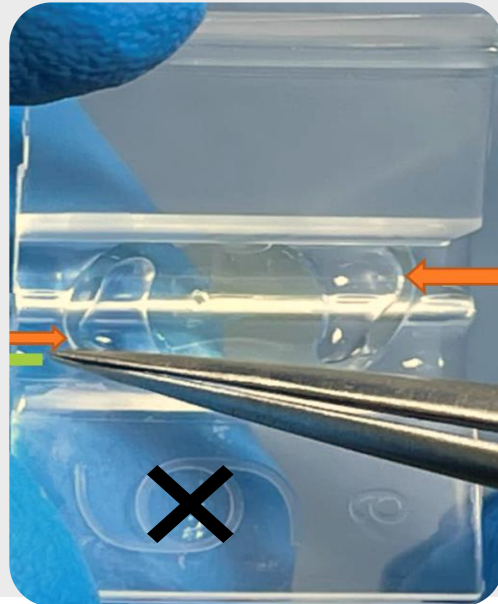
1

Apply **ONLY BSS** in the cartridge



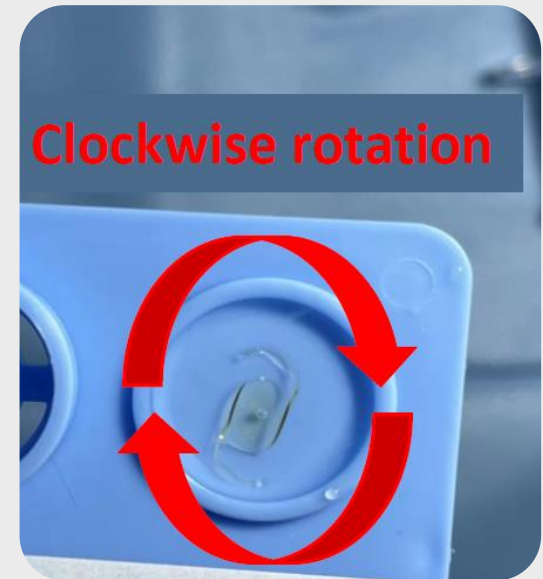
2

Do **NOT** place the haptics over the optics



3

Make sure it rotates **CLOCKWISE**



# Loading Video





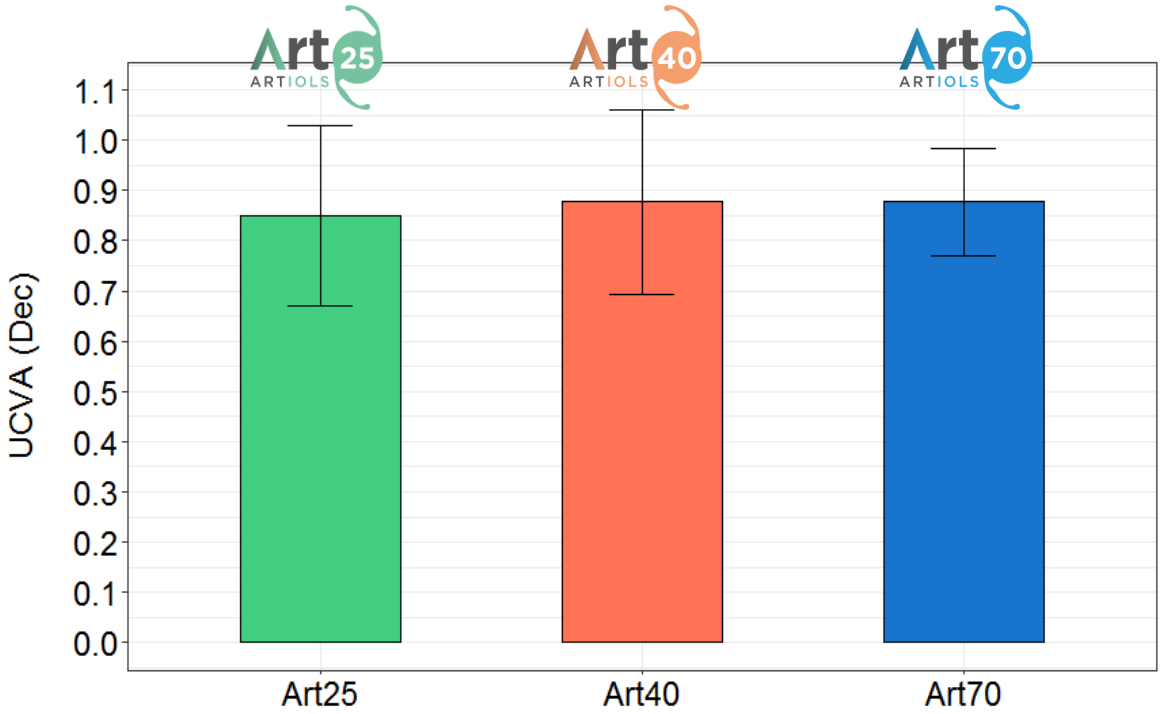
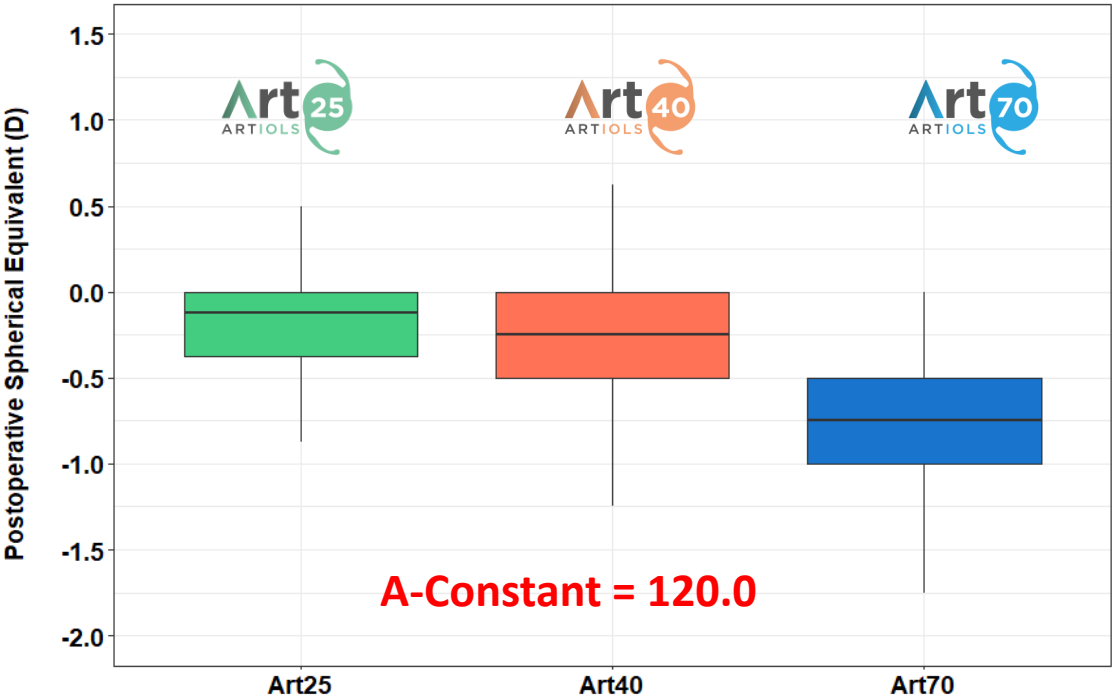
# A-Constant and refractive target

- **A-Constant = 120.0** for the **SRK-T** formula
- Refractive target **EMMETROPIA** (0 D)
- Post-surgery spherical equivalent:
  - -0.25 D for ART40\*
  - -0.75 D for ART70\*



\*Patients are left slightly myopes to increase the depth of focus, however, post-surgery refraction provides **good FAR UCVA** even with the residual myopia

# Post-op spherical equivalent & UCVA post-op

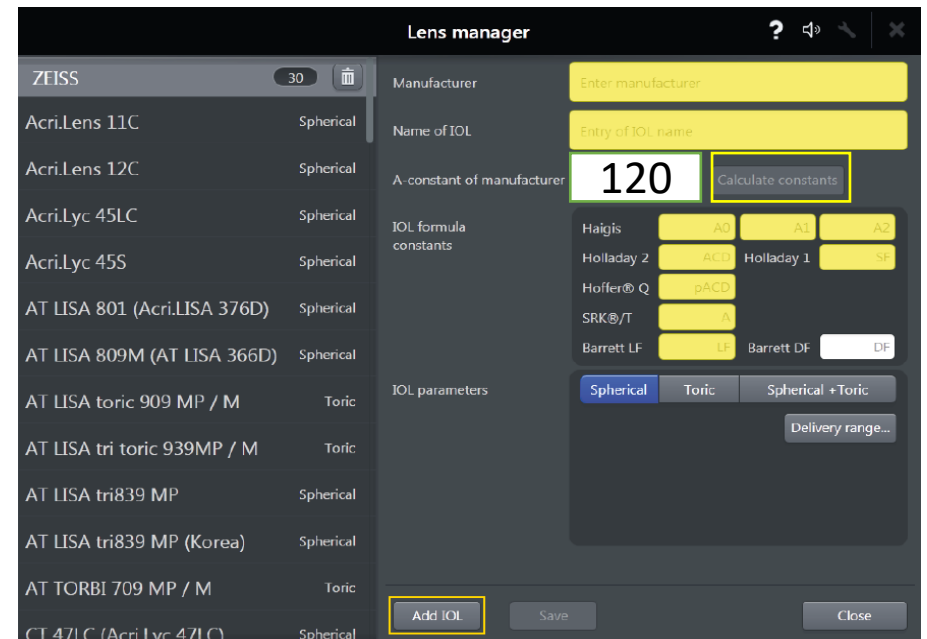
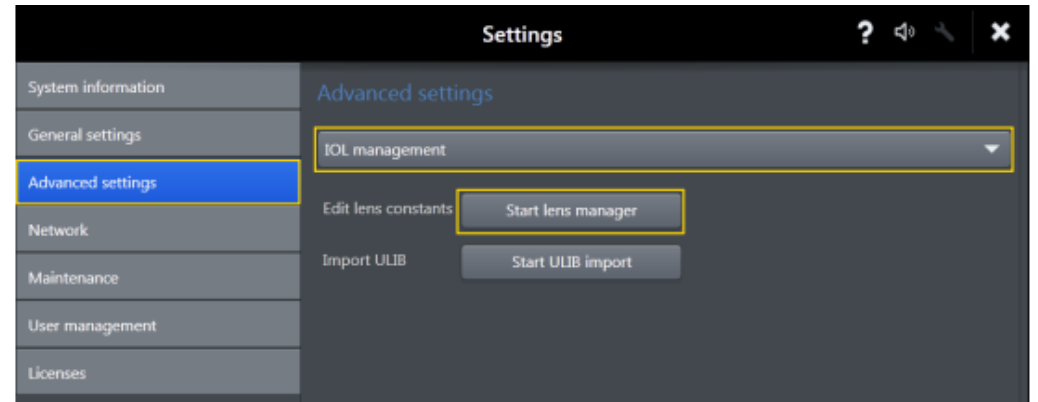


Postoperative spherical equivalent (D)	Mean	SD
<b>Art25 (n=474)</b>	-0.16	±0.37
<b>Art40 (n=264)</b>	-0.33	±0.47
<b>Art70 (n=53)</b>	-0.75	±0.48

# Biometer: IOL Master 700

## Instructions to add a new IOL :

1. Log in with the respective surgeon's account in order to have Access to the Lens Manager settings
2. Go to Settings>Advanced Settings>IOL Management>Click on "Start lens manager"
6. Click on "Add IOL"
7. Enter the IOL information (i.e. Manufacturer =ARTIOLs, Name of IOL=ART25, ART40 or ART70)
8. Enter A constant of manufacturer (120.0 for each ArtIOL models)
9. Click on Calculate Constants. The constants for other formulas will be calculated automatically
10. Save the IOL created



# CLINICAL PROTOCOL ARTIOL STUDY



**Purpose:** To assess the visual performance of the combination of two new EDOF and enhanced EDOF IOL (Art40 and Art70).

**Art40: Dominant eye**

**Art70: Non-dominant eye**

## VISIT 1

### Pre-surgery measurements (monocular):

- Uncorrected distance visual acuity
- Objective refraction
- Subjective refraction
- Best corrected distance visual acuity
- PIO
- **Biometry and keratometry.** The power of the IOL must be calculated with SRK-T formula and an A constant of 120.0. The refractive target must be 0 and the selected power the nearest power to emmetropia.

## VISIT 2

### Post-surgery measurements (monocular and binocular) -- 30-90 days post -operatively:

- Objective refraction
- Subjective refraction
- **Right eye, left eye and binocular:**
- Uncorrected defocus curve from +1.00 D to -3.00 D
- Uncorrected near visual acuity with a reading test

# CLINICAL PROTOCOL ARTIOL STUDY



DATE OF VISIT: m  d  y  VISIT 1  
 PATIENT ID:  ArtIOLs®



DATE OF VISIT: m  d  y  VISIT 2  
 PATIENT ID:  ArtIOLs®

ALL ITEMS MUST BE COMPLETED. MISSING OR INCORRECTLY COMPLETED ITEMS WILL REQUIRE ADDITIONAL FOLLOW-UP

## PRE-OP (ArtIOL study)

RIGHT EYE     LEFT EYE

### MONOCULAR MEASUREMENTS

OBJECTIVE REFRACTION:              
 SPH                                  CYL                                  AXIS

SUBJECTIVE REFRACTION:                BCDVA:   
 SPH                                  CYL                                  AXIS

UCDVA:

PIO:

BIOMETRY (or please attach a copy of biometry):

K1:     AXIS:     K2:     AXIS:

TK1:     AXIS:     TK2:     AXIS:

AXIAL LENGTH:

MODEL IOL SELECTED:     ART40\*     ART70\*

\*A-constant (SRK/T) 120. Rx target: EMMETROPIA

POWER IOL SELECTED: \_\_\_\_\_ RESIDUAL RX: \_\_\_\_\_

ALL ITEMS MUST BE COMPLETED. MISSING OR INCORRECTLY COMPLETED ITEMS WILL REQUIRE ADDITIONAL FOLLOW-UP

## POST-OP (ArtIOL study)

PUPIL SIZE (mm):

RE: \_\_\_\_\_

IOL

LE: \_\_\_\_\_

OBJECTIVE REFRACTION:

RE    SPH    CYL    AXIS  
          
 SPH    CYL    AXIS

LE              
 SPH    CYL    AXIS

SUBJECTIVE REFRACTION:

RE    SPH    CYL    AXIS    BCVA  
              
 SPH    CYL    AXIS    BCVA

LE                  
 SPH    CYL    AXIS    BCVA

NEAR TEST: RE:   
 (Uncorrected) LE:

BINO

UNCORRECTED DEFOCUS CURVE:

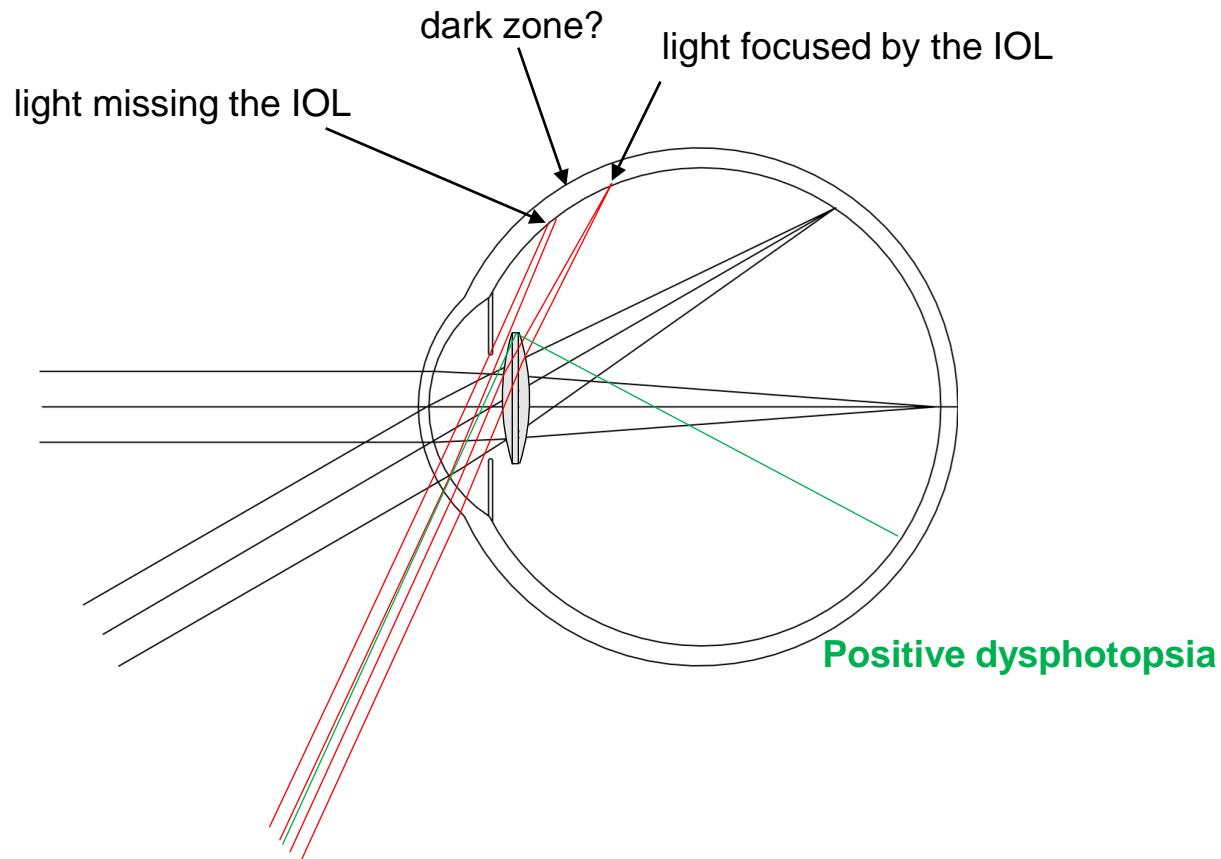
DISTANCE (D)	UNCORRECTED VA		
	RE	LE	BINO
+1.00			
+0.50			
0.00			
-0.50			
-1.00			
-1.50			
-2.00			
-2.50			
-3.00			

\*PHOTOPIC CONDITIONS

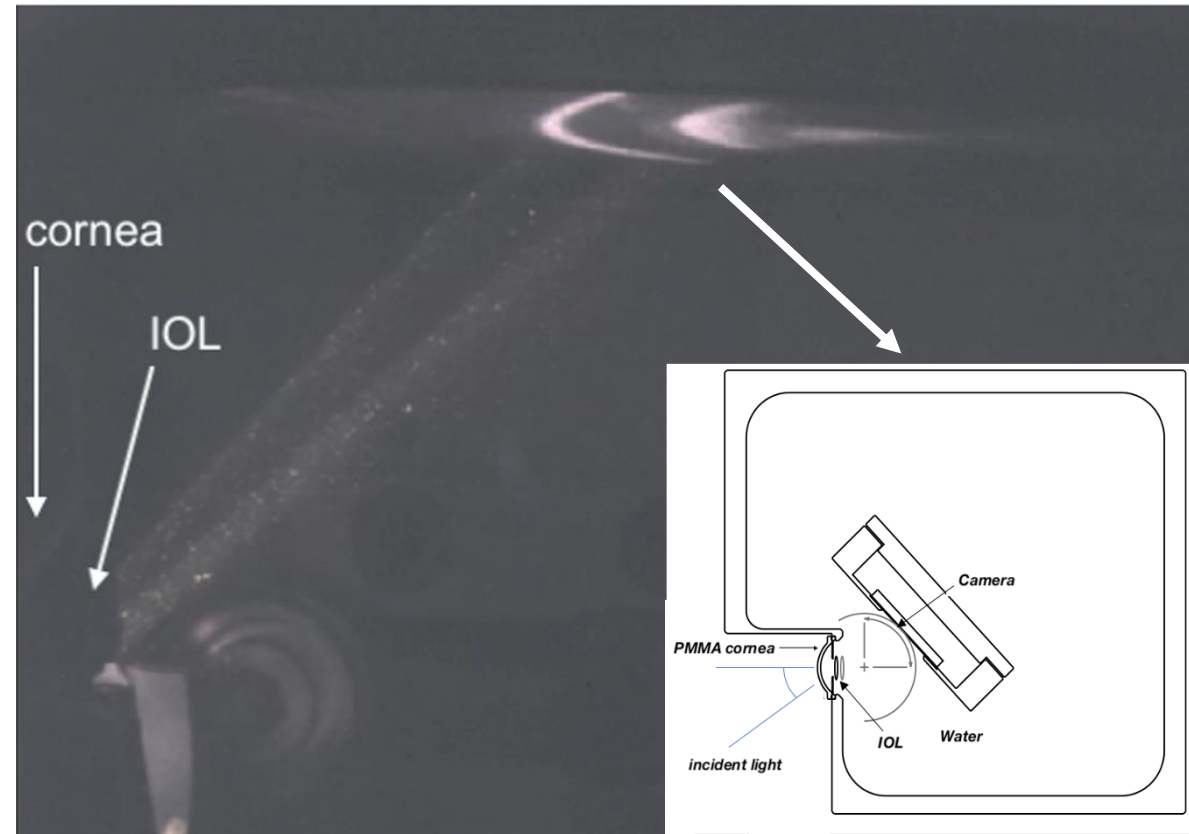


# Physical model of the pseudophakic eye to record negative dysphotopsia

## Negative dysphotopsia



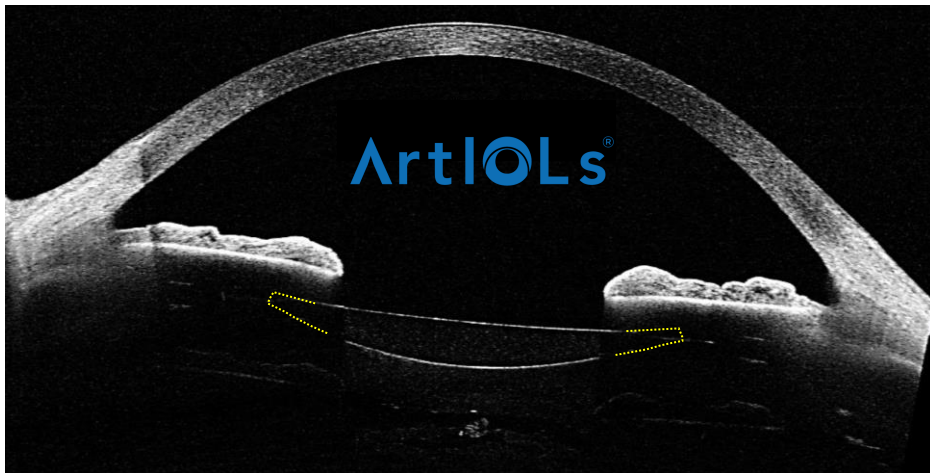
Photograph of a bright beam of light in the artificial eye for demonstration purposes (no camera present, light projected on the housing's wall.)





# The ARTIOL's unique **Inverted Meniscus** optical design, **MINIMIZES** negative dysphotopsias

To eliminate this dark band, it is essential to **reduce (or block) the peripheral crescent** and **increase the light transmitted through the IOL** at wide angles.



**The inverted meniscus** reduces the peripheral gap between the iris and the IOL, capturing more light through the IOL and reducing the intensity of the crescent.





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