

Advanced Cataract Surgery With Multifocal IOL Implantation: Seven years follow up



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Financial Disclosure

Dr Piovella has the following financial interests or relationships to disclose.

As consultant:

Abbott Medical Optics
Aaren Scientific
Carl Zeiss Meditec

As lectures fees:

BVI Beaver Visitec International
Ocular Therapeutix
TearScience

Dr Kusa has no financial interests or relationships to disclose

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Quality of Vision

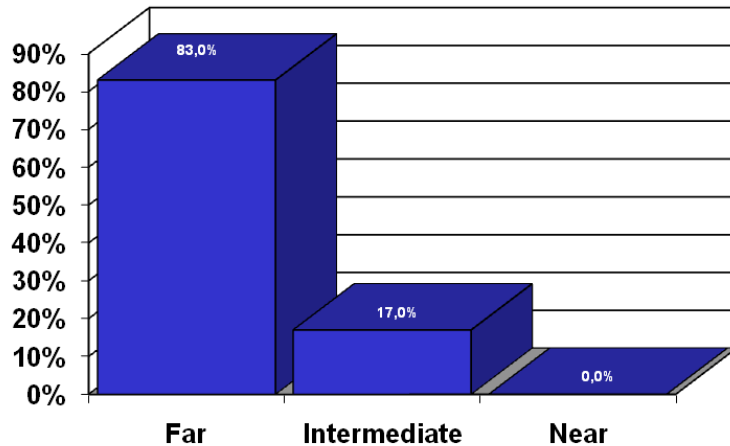
Effect of Contrast Reduction



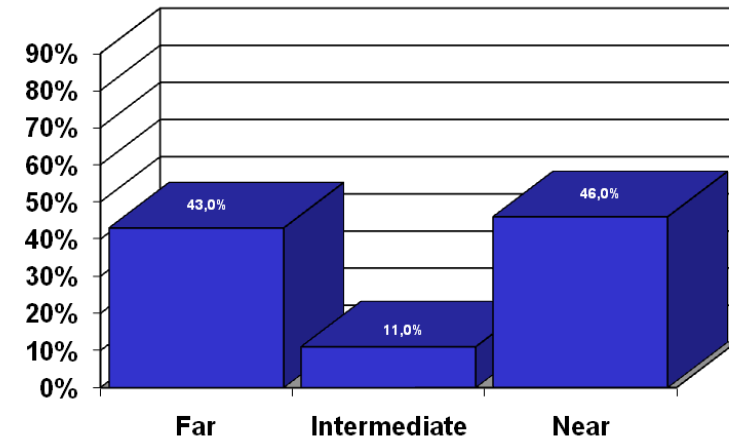
Pupil Size and % Light Distribution Refractive MIOL Technology



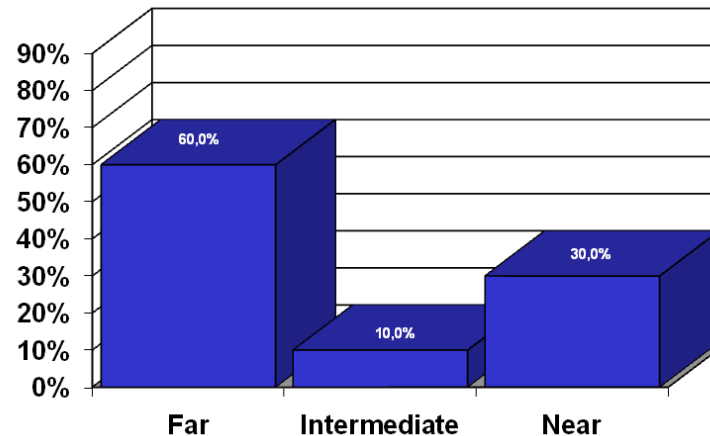
All multifocal IOLs provide adequate performance for Far and Near distances at nominal 3 mm pupil and **differences** can be shown towards the limits of the pupil range: 2 mm and 5 mm



**Refractive IOLs and % Light Distribution
Pupil Size 2 mm**



**Refractive IOLs and % Light Distribution
Pupil Size 3 mm**



**Light Refractive IOLs
and % Light
Distribution
Pupil Size 5 mm**

Sources: IOL data are from the FDA submission for the optic profile.

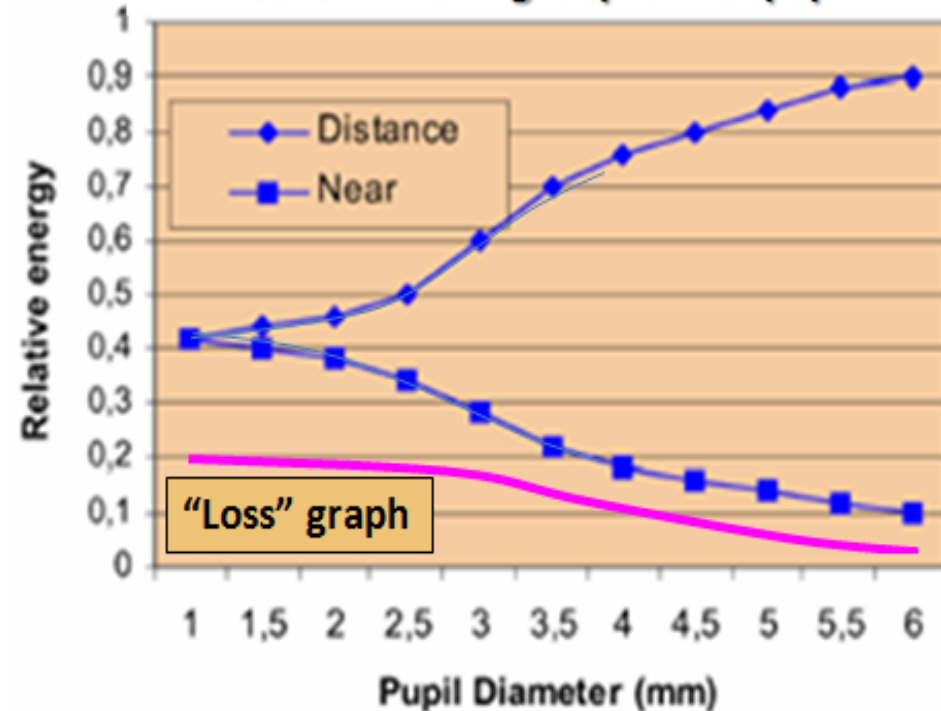
Diffraction MIOL : ReSTOR® (Alcon)

Diffraction Efficiency : % Light Distribution and Light Loss

Light Loss" graph is absolute light energy; Far and Near graphs are relative values.



ReSTOR MIOL Light Split with pupil



Advantages

➤ Distance Dominant

➤ Diffractive Optics allow for Far and Near vision

➤ Apodized diffractive design to reduce halos

Disadvantages

➤ May not have sufficient

➤ Near at large pupils

➤ No provision for intermediate focus

➤ Substantial percent of light is outside range of vision for small to medium pupils

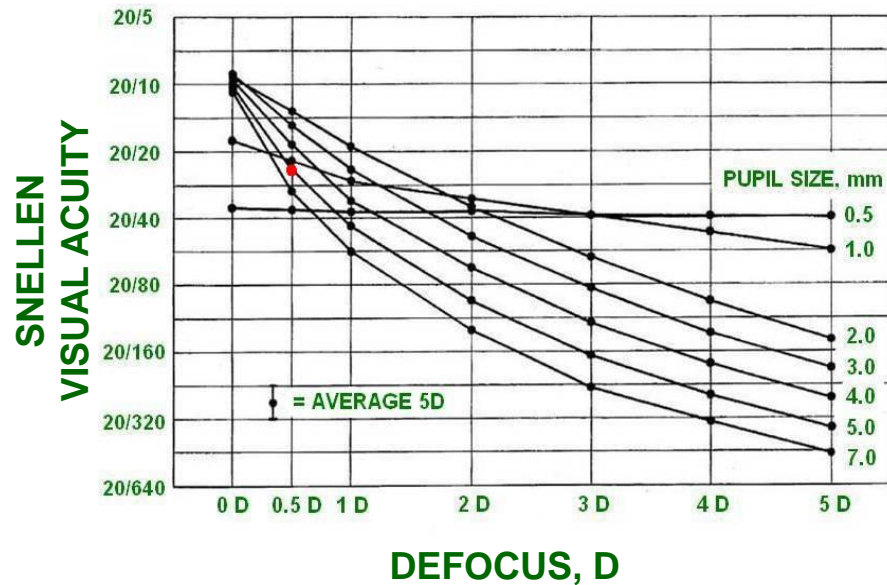
% LIGHT DISTRIBUTION				LIGHT "LOSS"
	Near	Intermediate	Far	Outside Range of Vision
2 mm pupil	40%	0%	40%	20%
5 mm pupil	10%	0%	84%	6%

Residual Refractive Error as Function of Pupil Size and Defocus



Monofocal Technology Visual Acuity Sensitivity to Residual Refractive Error as Function of Pupil Size (Patent of Jack Holladay)

Visual Acuity (20/24) with 0.50 D Defocus and 5mm Pupil Size



Monofocal Technology Snellen Visual Acuity as Function of Pupil Size and Defocus (Patent of Jack Holladay)

Pupil size

D
i
o
p
t
e
r
s

	<u>2.0</u>	<u>3.0</u>	<u>4.0</u>	<u>5.0</u>	<u>6.0</u>	<u>7.0</u>
<u>TDL</u>	20/09	20/06	20/04	20/04	20/03	20/03
<u>0.0</u>	20/10	20/09	20/10	20/10	20/11	20/11
<u>0.50</u>	20/12	20/15	20/19	20/24	20/28	20/30
<u>1.00</u>	20/19	20/24	20/33	20/44	20/52	20/56
<u>2.00</u>	20/36	20/49	20/68	20/95	20/121	20/130

TDL indicates Theoretical Diffraction Limits

Diffraction Technology

Snellen Visual Acuity as Function of Pupil Size and Defocus



- In Multifocal lenses, VA sensitivity to refractive error depends on a multifocal design.
- In a diffractive MIOL the effect of refractive error was about twice more sensitive to than in case of a monofocal IOL : postoperative refractive result of -0,50 sf is equivalent to the total aberrations amount of -1 sf with MIOL.
- Toric vs. spherical it is two times difference: the effect of 1 D cylinder error on VA is about 0.5 D spherical refractive error

Weak Points of Diffractive Multifocal IOLs

- Reduction of Contrast Sensitivity (up to 30%)
- Diffraction Grooves(Blaze hight) Creates Different Diffraction Efficiency and Light Loss
- Toric Multifocal when 0,75 D of Corneal Astigmatism
- Healos, Glare and Ghost Images are Difficult to Manage in Suspicious Patients
- Poor Intermediate Distance Vision
- 0.50 Diopter SE generates loss of more than one line of Visual Acuity
- Perfect Target: Plano Postop Refractive Results

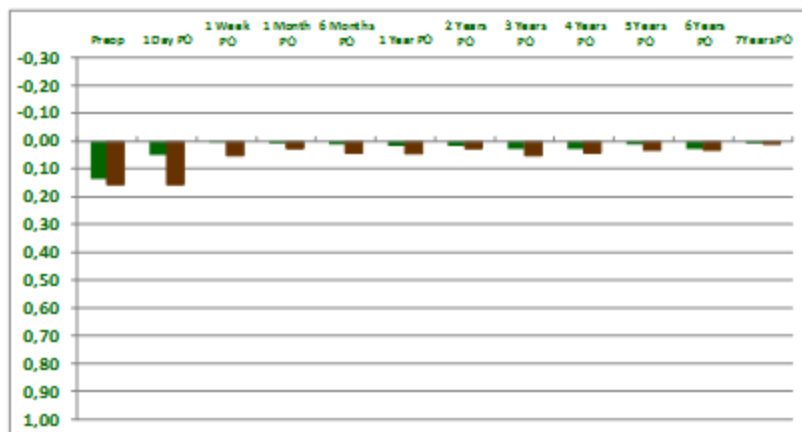
Mix and Match Best Corrected Visual Acuity 7 Years PO. Results



52 Eyes of 52 patients (32 female, 20 male)
Mean age 69.33 ± 11.35 years

Tecnis®
ReZoom®

LOGMAR



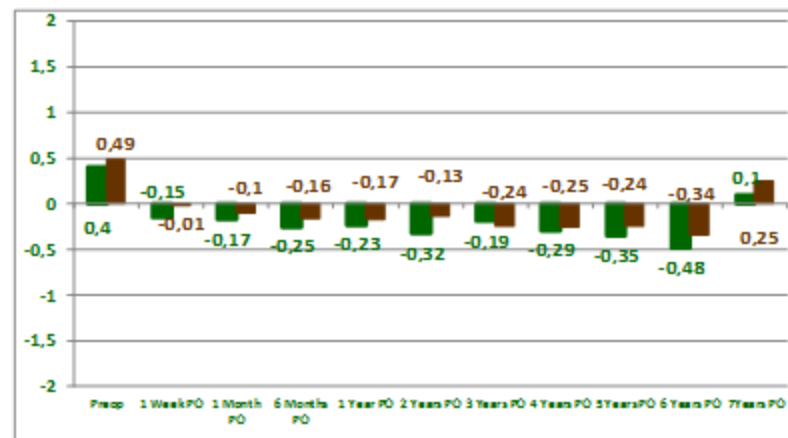
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Mix and Match Sphere Equivalent 7 Years PO. Results



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DIOPTERS



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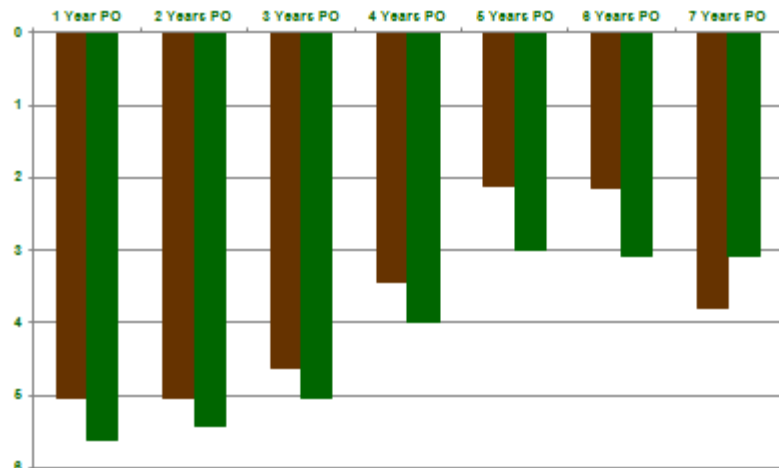
EYEVISPOD - 7 Years PO. Results Mix and Match Uncorrected Near Vision Visual Acuity



EYEVISPOD - 7 Years P.O. Results Mix and Match Uncorrected Intermediate Vision Visual Acuity



Monocular VA Jaeger



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	1 year p.o.	2 years p.o.	3 years p.o.	4 years p.o.	5 years p.o.	6 years p.o.	7 years p.o.
Intermediate (70 cm) Binocular Visual Acuity	Intermediate vision is efficient in 53% of the cases	Intermediate vision is efficient in 54% of the cases	Intermediate vision is efficient in 54% of the cases	Intermediate vision is efficient in 54% of the cases	Intermediate vision is efficient in 53% of the cases	Intermediate vision is efficient in 54% of the cases	Intermediate vision is efficient in 55% of the cases

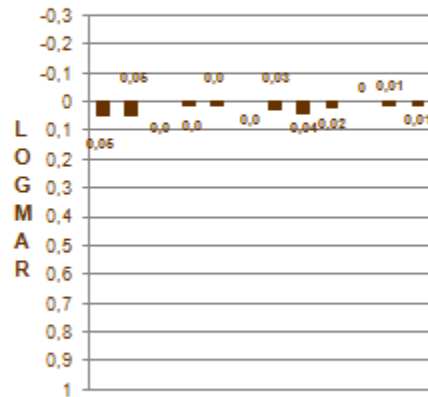
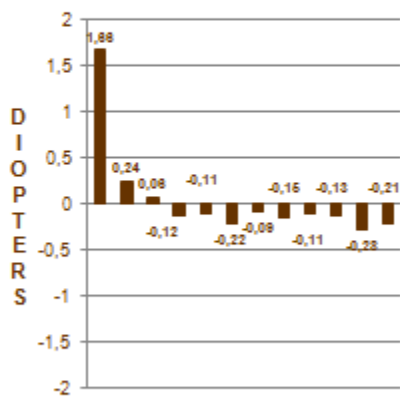
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Tecnis MIOL bilateral Implantation

32 Eyes of 16 patients

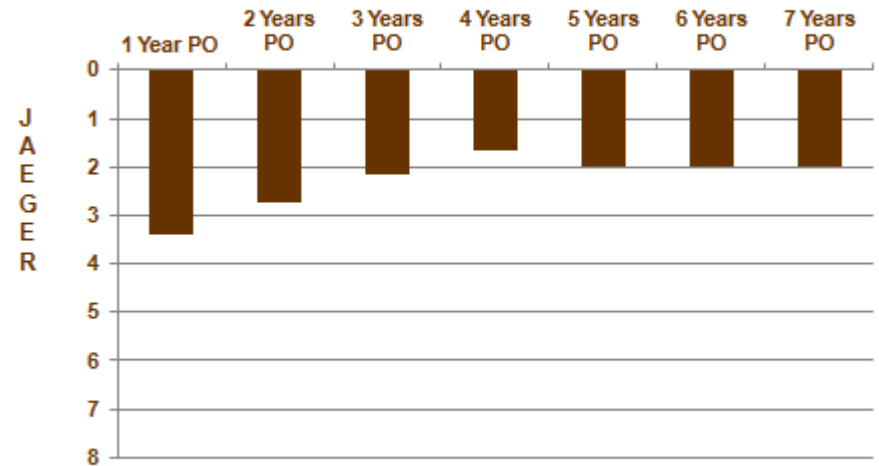


Tecnis® MIOL
Sphere Equivalent and BCVA Visual Acuity



plovella@plovella.com

Tecnis® MIOL
Monocular Uncorrected Near Vision Visual Acuity



Binocular V A Jaeger 7 years po 2.00 ± 0.00

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YAG LASER TREATMENTS



104 implants (52 ReZoom – 52 Tecnis) Mix and Match:

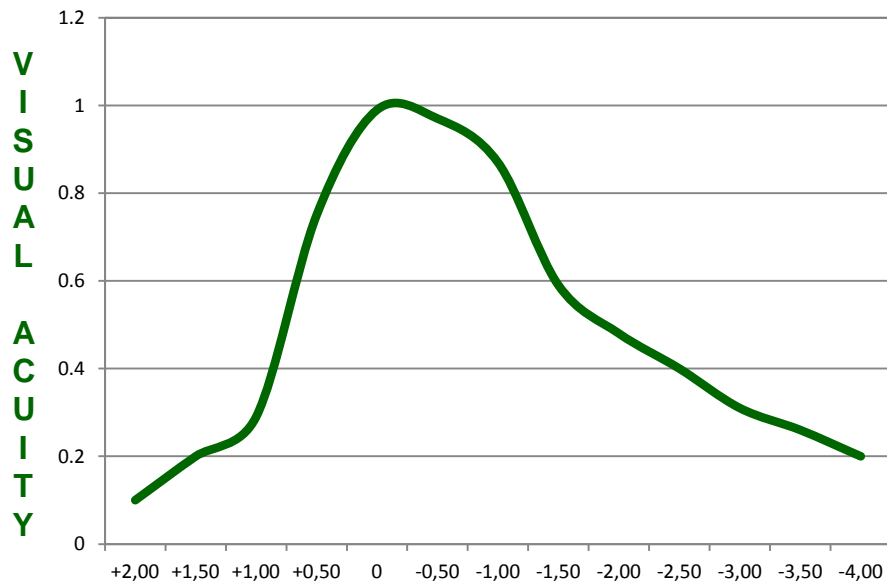
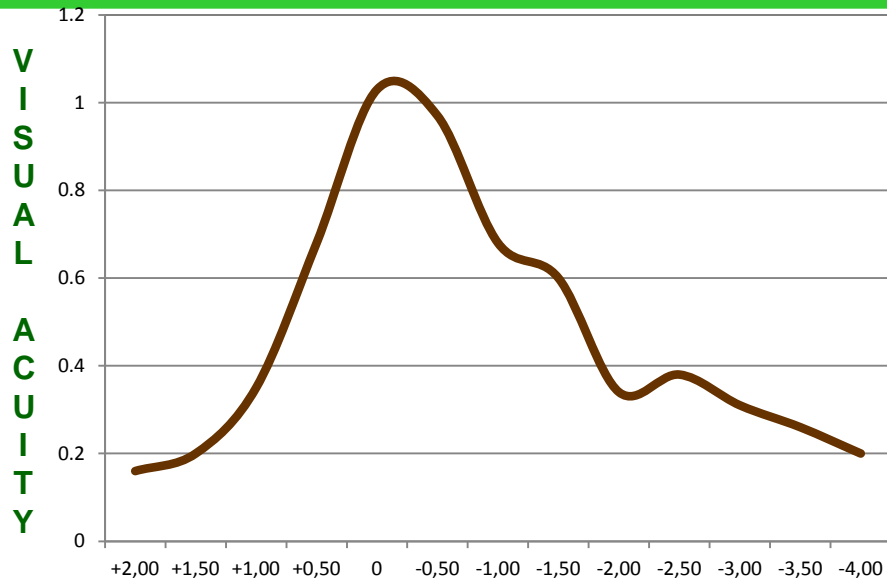
22 ReZoom Eyes : yag laser treatments (42.3%)

20 Tecnis Eyes : yag laser treatments (38.5%)

32 implants Bilateral Tecnis:

22 Tecnis Eyes yag laser treatments (68.7 %)

Monocular defocus curve Multifocal IOL Tecnis® AMO ABBOTT

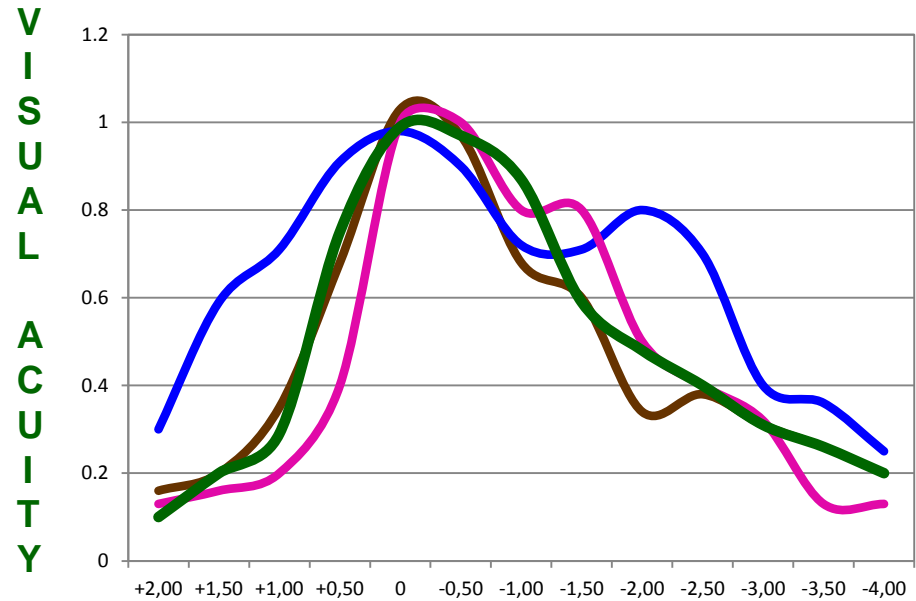


TECNIS® MIOLs

AT LISA® tri MIOLs

Synchrony Dual Optics AIOL

ReZoom® MIOLs



Quality of Vision

Contrast Sensitivity and Control Values



Control values for CS are derived from Hohberger paper

B. Hohberger et al. "Measuring contrast sensitivity in normal subjects with OPTEC® 6500: influence of age and glare" Graefes Arch Clin Exp Ophthalmol, 2007; 245:1805-1814

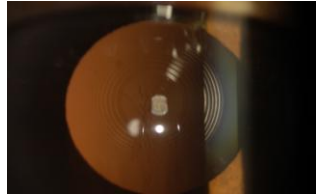
- 10-14 healthy phakic subjects for the following age groups
<30; 30-39;40-49;50-59;≥60
- Functional Image Analyzer OPTEC 6500P
- Daytime (85 cd/m²), Nighttime (3 cd/m²) and
Nighttime with Glare(3 cd/m²)
- Monocular testing
- Paper demonstrated strong age dependence of C S with age



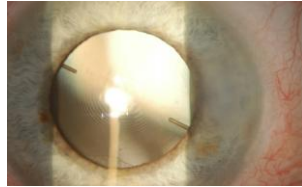
Multifocal IOLs Contrast Sensitivity



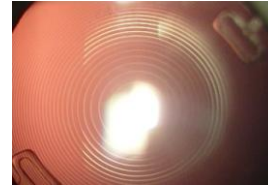
Acri.LISA®



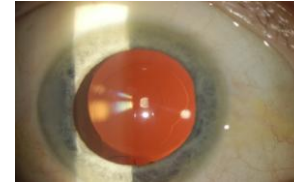
Acri.LISA® Toric



Tecnis®



Optivis®



ReZoom®

