Presbyopia

Magnifying glasses

How bifocals work

distance vision

near (reading) vision
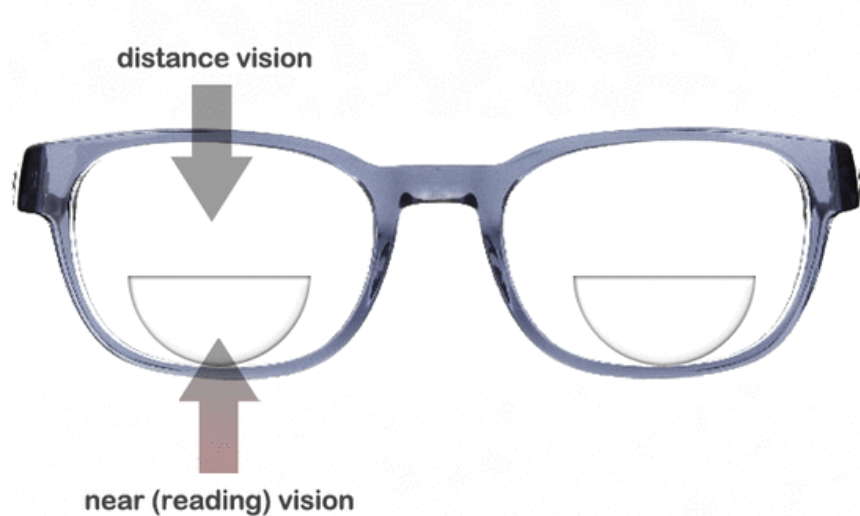
(c) Dr. M.K. Randhawa Optometric Corporation.

Progressive lenses

distance vision

mid-range vision

near (reading) vision
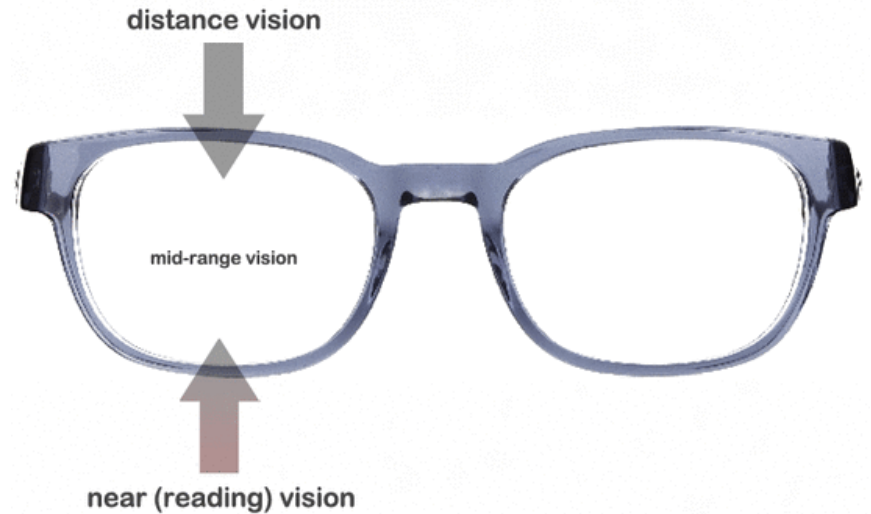
(c) Dr. M.K. Randhawa Optometric Corporation.

Uncomfortable glasses

Multifocal Intraocular Lens

Multifocal IOL

Monofocal IOL

Recent trends of Multifocal IOL

2012년 한국백내장굴절수술학회 및 대한안과학회 회원 설문 조사
– 한국에서의 백내장 수술의 최근 경향 –

Survey by The Korean Society of Cataract and Refractive Surgery and The Korean Ophthalmological Society Members in 2012
-Recent Trends in Cataract Surgery in Korea-

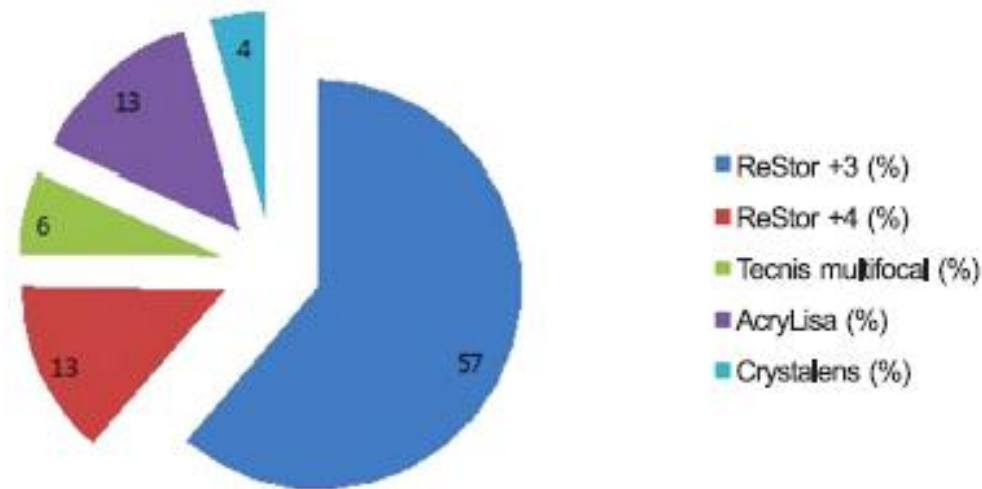**44% of the members performed Multifocal IOL implantation**

Figure 8. Preferred multifocal intraocular lens.

Recent trends of Multifocal IOL
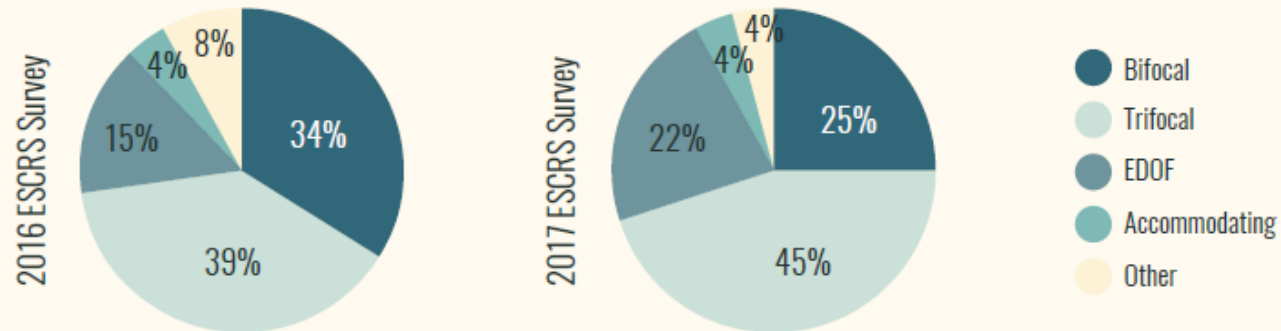
ESCRS

CLINICAL TRENDS SURVEY

2017 Results

Presbyopia Correction

6% of current cataract procedures involve a presbyopia-correcting IOL

43% of current cataract procedures are targeted for monovision or mini-monovision

What type of presbyopia-correcting IOL technology is used in the majority of your presbyopia-correction patients?

2016 ESCRS Survey
- 34%
- 39%
- 15%
- 4%
- 8%

2017 ESCRS Survey
- 25%
- 45%
- 22%
- 4%
- 4%

Legend:
- Bifocal
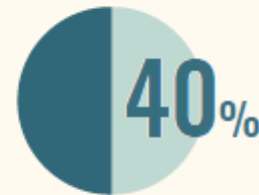- Trifocal
- EDOF
- Accommodating
- Other

Top 3 concerns about performing more presbyopia-correcting IOL procedures

€ **60%**
Cost to patient

48%
Concern over night-time visual quality

40%
Concern over loss of contrast visual acuity

Recent trends of Multifocal IOL

ASCRS Clinical Survey 2013

NT cataract procedures involve

nt cataract procedures

Presbyopia Correcting IOL

Percent of current cataract procedures that involve presbyopia-correcting IOLs

- None
- 1% to 5%
- 5% to 10%
- 11% to 20%
- 21 to 40%

23.4%
32.0%
19.5%
14.5%
10.7%

ths
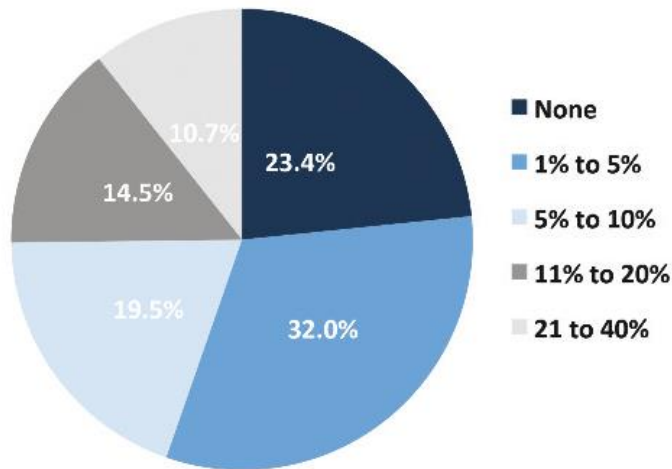
- Average % of cataract procedures is presby-correcting IOLs is 7.9%
- Average % targeted for monovision
  - Overall 18.9%

Over 40%

	Average Pct
All	9%
US	9%
NonUS	11%

2013 ASCRS Annual Clinical Survey
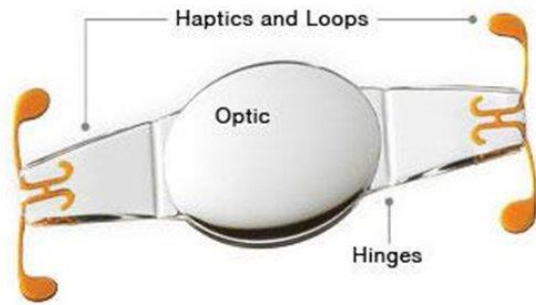
Type of Multifocal IOL

- **Accommodative IOL**

- **Multifocal IOL**
  - **Refractive**
  - **Diffractive**

Type of Multifocal IOL

- ## Accommodative IOL

Crystalens

Tetraflex
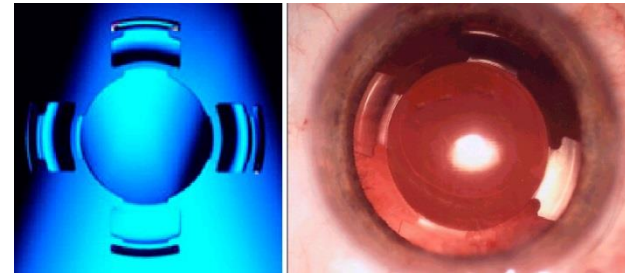
1CU

Synchrony Dual optic IOL

NuLens
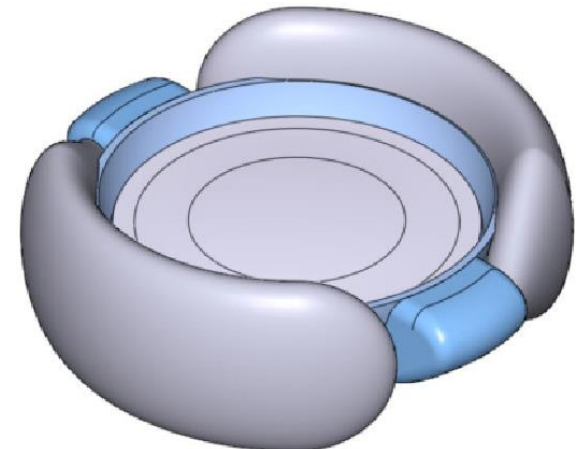
FluidVision

- **Multifocal IOL**
  - **Refractive**
  - **Diffractive**
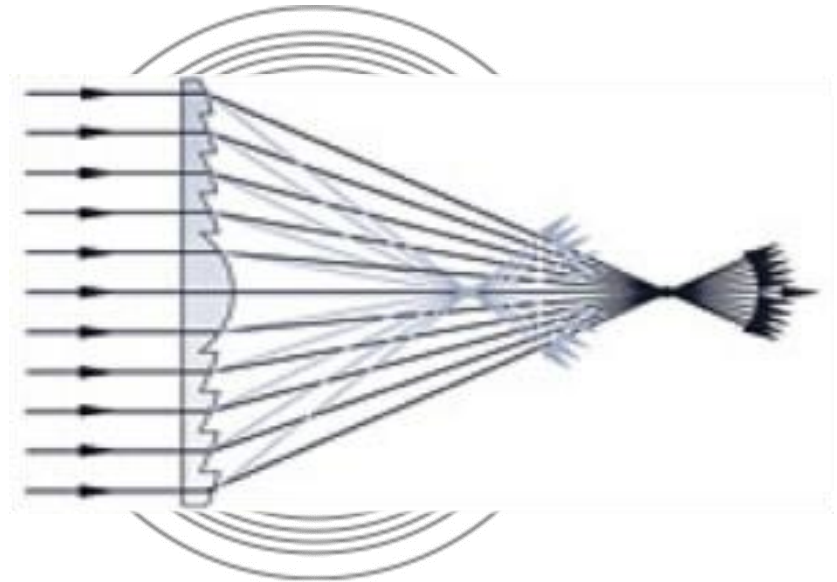
Refractive type   **Diffractive type**

Type of Multifocal IOL

- ## **Light distriubution**

Diffractive type

Refractive type

Near focus

Far focus
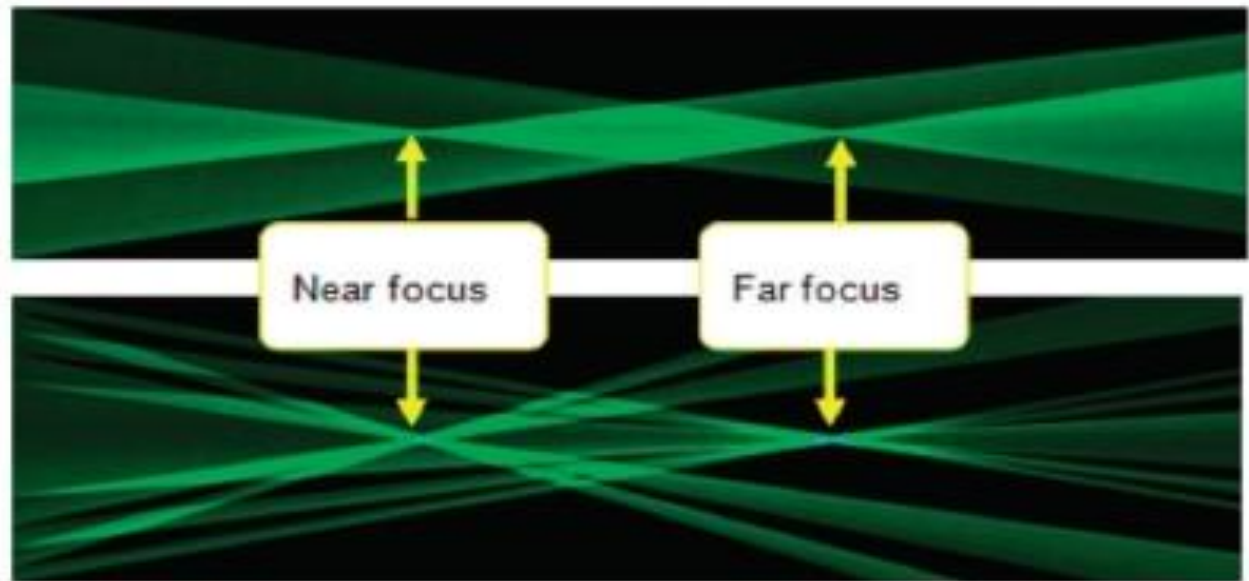
** Simulated images generated using a custom paraxial beam tracing program. Image simulations by Edwin J. Sarver, PhD, Sarver and Associates, Inc., Carbondale, Illinois.

- **Refractive Multifocal IOLs**

ZONE 1:
Distance vision for
bright light conditions.

ZONE 2:
Near vision for bright to
moderate light conditions.

ZONE 3:
Distance vision
for moderate to
low light conditions.

ZONE 4:
Near vision for a full
range of light conditions.

ZONE 5:
Distance vision for
low light conditions.

Zones

Transitions between zones
provide intermediate vision.

ReZoom

Array

Type of Multifocal IOL

Refractive Multifocal IOLs	Diffractive multifocal IOLs
Excellent intermediate and distance vision	Excellent reading vision and very good distance vision
Near vision fair but may not be sufficient to see very small print	The intermediate vision is acceptable but not as good as the far and near vision.
Pupil dependent, variable depending of the design	Less dependent on pupil
High sensitivity for lens centration	More tolerant to the kappa angle and decentration
Potential for halos and glare due to rough areas between the zones	Energy lost caused by light scattering at the diffractive surfaces
Intolerance to kappa angle which varies from patient to patient	High potential of producing halos and glare due to more nontransition areas.

Type of Multifocal IOL

J Cataract Refract Surg 2011; 37:241–250
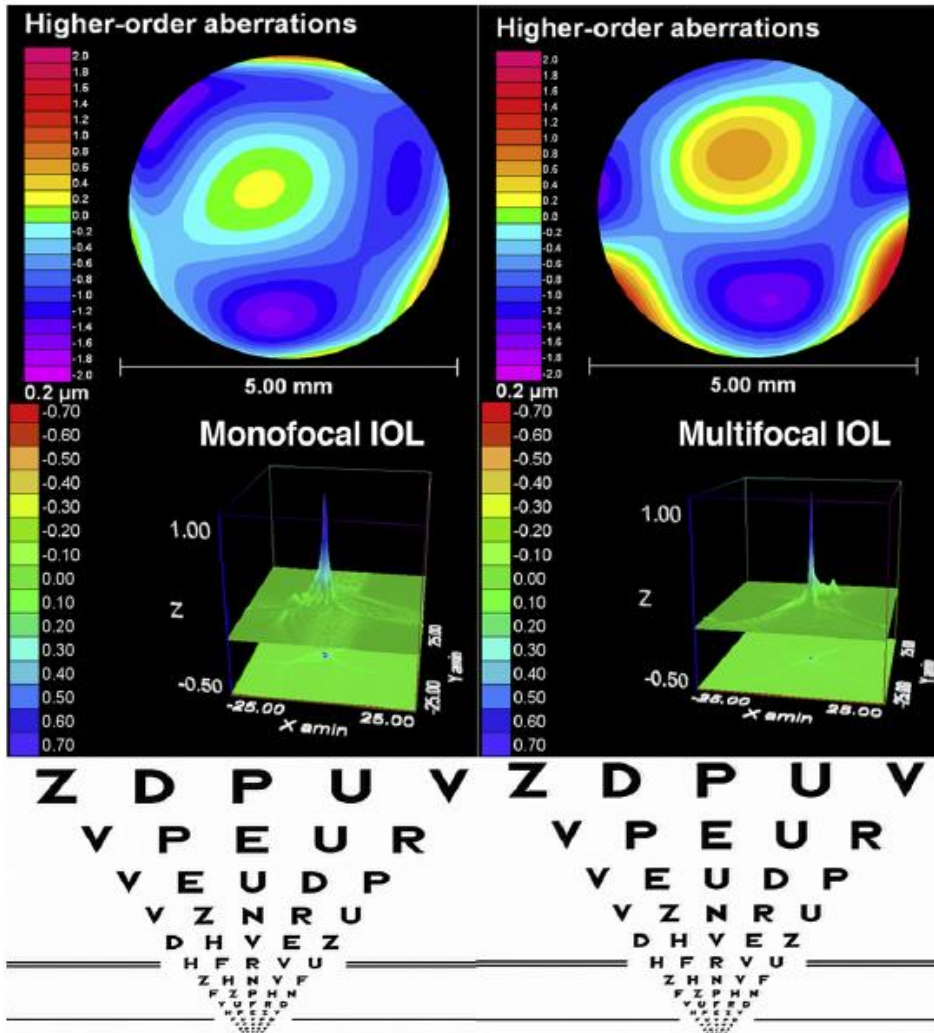
c refractive type

- **No optic ring**
  - **Avoid light scatter**
  - **Less halo and glare**
- **Various Add power (+1.50D, +2.0D, +3.0D)**
- **May provide good near vision.**
- **Increasing energy to the near vision when the pupil enlarged**
- **Increase coma aberration**

PRECIZON PRESBYOPIC

Aspheric Transition zones

C N
C F
C N
F N C
C
F
C
C N
C N F
C C N
F
C
C N
F
C
N
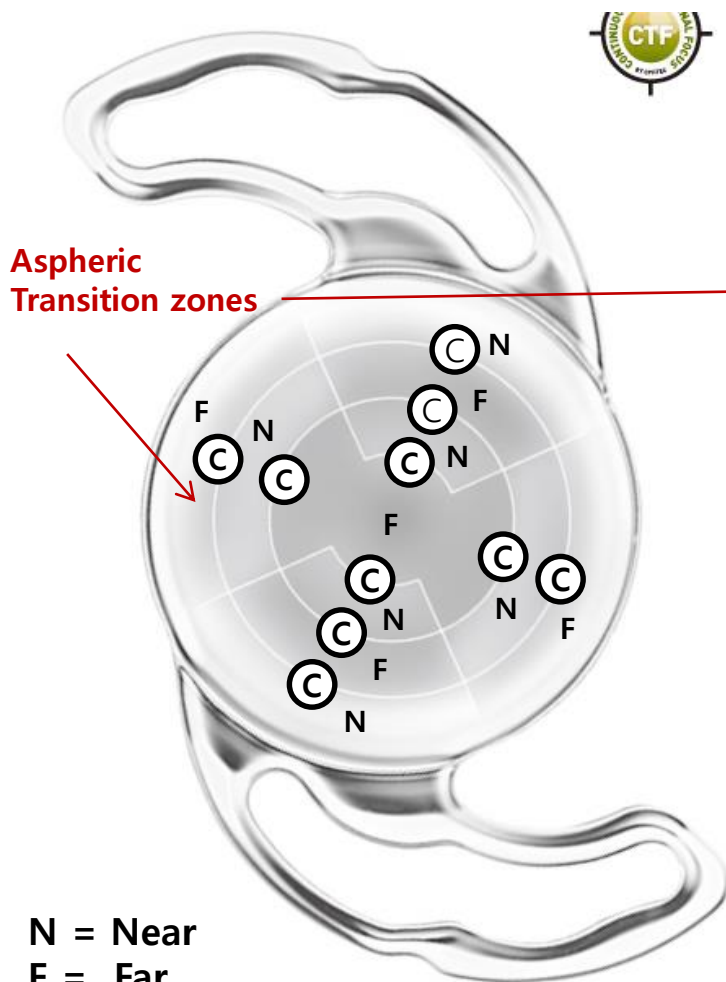
N = Near
F = Far
C = Continuous Transitional Zone
Add power +2.75 D

CTF
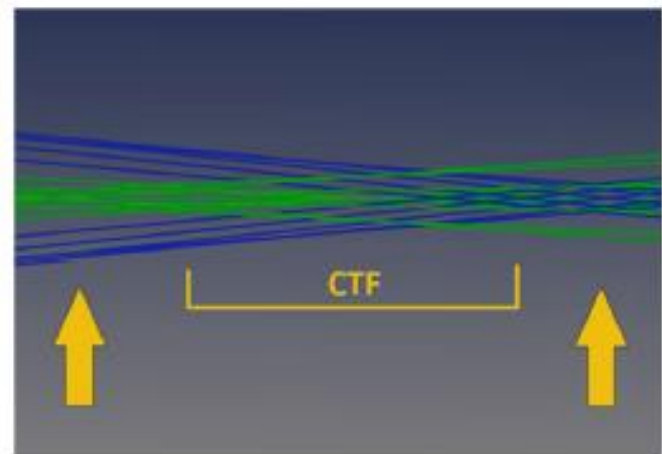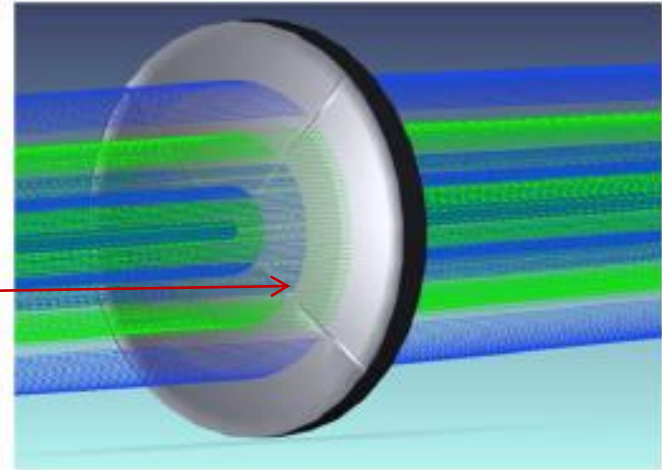
Continuous Transitional Focus (CTF)

Continuous Transitional Focus (CTF)

- A CTF optic is an optic with an **anterior surface with zones at 2,3 and 5 mm ; every zone has multiple segments for far and near.**

- An aspheric **smooth transition zone from far to near** is achieved between the segments with the patented Transitional Conic Technology (TCT).

- Regular Multifocal IOLs will cause positive dysphotopsia, due to light scattering of the concentric rings

- CTF aspheric smooth transition zones minimize transmissions light loss to reduce the problem of halos and glare and more **tolerant to lens decentration**

PRECIZON PRESBYOPIC Benefit

- **Natural vision at all distances**

- **Reducing glare and halos**

- **Pupil independence**

- **Decentration tolerance.**

Centred IOLs Approx. 4 mm pupil size	Decentred IOLs Approx. 4 mm pupil size
MIOL with concentric rings	MIOL with concentric rings
Segmented Bifocal IOL	Segmented Bifocal IOL
Precizon Presbyopic	Precizon Presbyopic

PRECIZON PRESBYOPIC

Far / near surface ratio [%]

Precizon Presbyopic A1 (NVA)
Precizon Presbyopic A0

Far / near (%)

Pupil aperture diameter [mm]
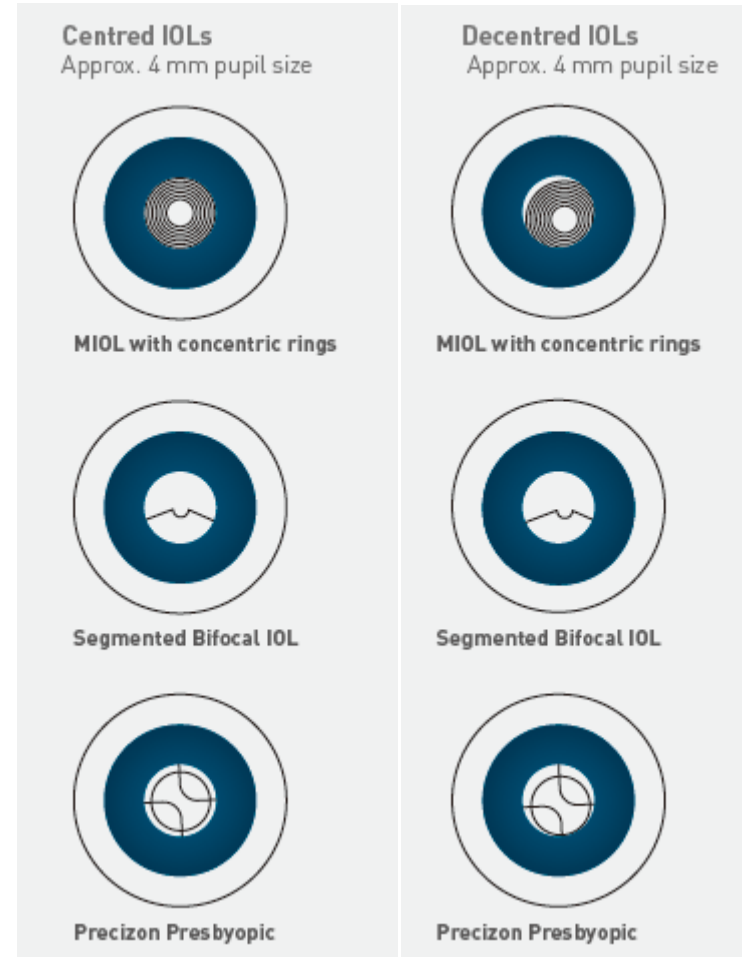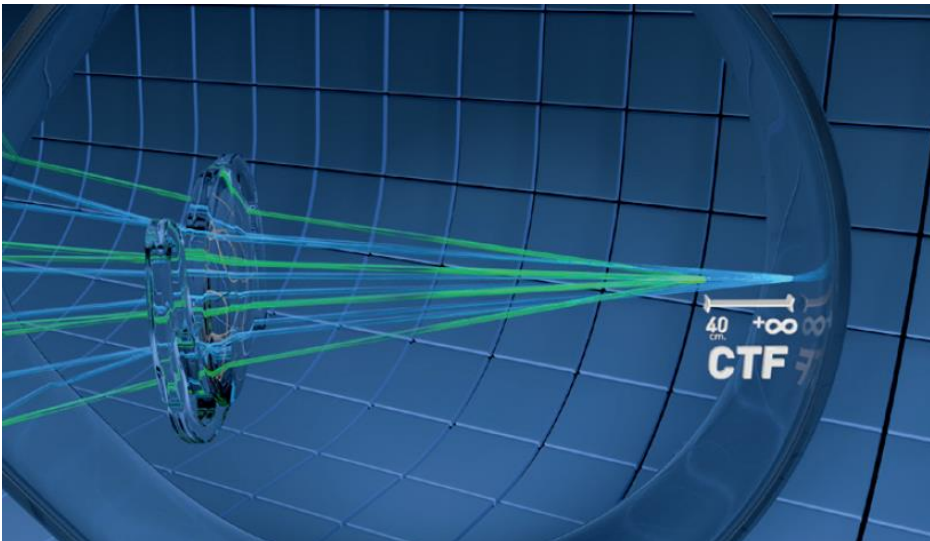
PRECIZON PRESBYOPIC A0
Central far zone size 0.5 / 2.0 mm
Aberration Neutral
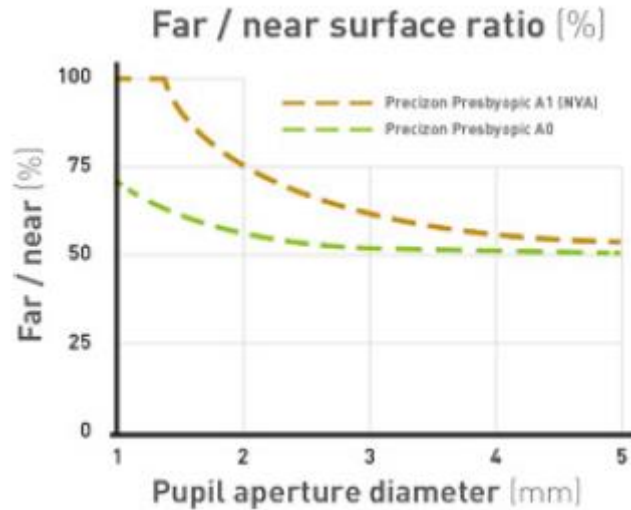
PRECIZON PRESBYOPIC A1 (NVA)
Central far zone size 1.4 / 2.6 mm
Aberration negative (-0.11 μm)

Clinical Outcomes from Company

- **Visual Acuity**

Table 1: Near Visual Acuity at 3 months

Near Visual Acuity	Monocular N=122			Binocular N=61		
	Mean LogMAR	≤0.3 LogMAR	≤0.0 LogMAR	Mean LogMAR	≤0.3 LogMAR	≤0.0 LogMAR
Uncorrected	0.20	83.6%	11.5%	0.14	93.4%	18.0%
Corrected	0.11	95.9%	16.4%	0.06	98.4%	32.8%
Distance Corrected	0.19	87.7%	5.7%	0.14	95.0%	11.7%

Table 2: Distance Visual Acuity at 3 months

Distance Visual Acuity	Monocular N=122			Binocular N=61		
	Mean LogMAR	≤0.3 LogMAR	≤0.0 LogMAR	Mean LogMAR	≤0.3 LogMAR	≤0.0 LogMAR
Uncorrected	0.10	93.4%	23.0%	0.03	98.4%	45.9%
Corrected	0.04	99.2%	41.8%	-0.02	100.0%	60.7%

Table 3: Intermediate Visual Acuity at 3 months

Intermediate Visual Acuity	Monocular N=122			Binocular N=61		
	Mean LogMAR	≤0.3 LogMAR	≤0.0 LogMAR	Mean LogMAR	≤0.3 LogMAR	≤0.0 LogMAR
Uncorrected	0.15	89.3%	12.3%	0.06	96.7%	39.3%
Distance Corrected	0.16	86.1%	15.6%	0.08	93.4%	27.9%

Clinical Outcomes from Company

- **Refraction**

Figure 1: Difference in MRSE between visits
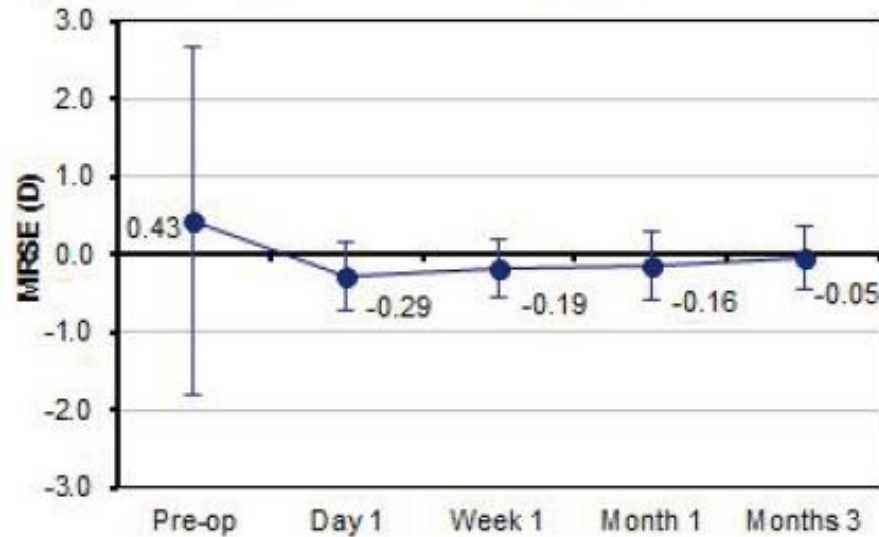
Figure 2: Mean change in MRSE
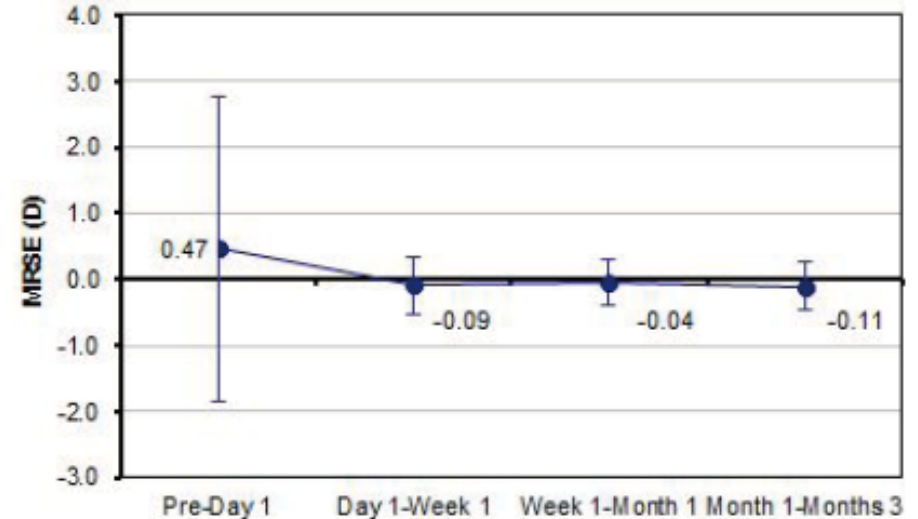
Table 4: Stability of Manifest Refractive Spherical Equivalent

MRSE	N=122
≤1.0 of MRSE between Week 1 and Months 3	96.7%
>1.0 of MRSE between Week 1 and Months 3	3.3%

- **Defocus Curve**

Figure 4: Binocular best corrected defocus curve at 3 months
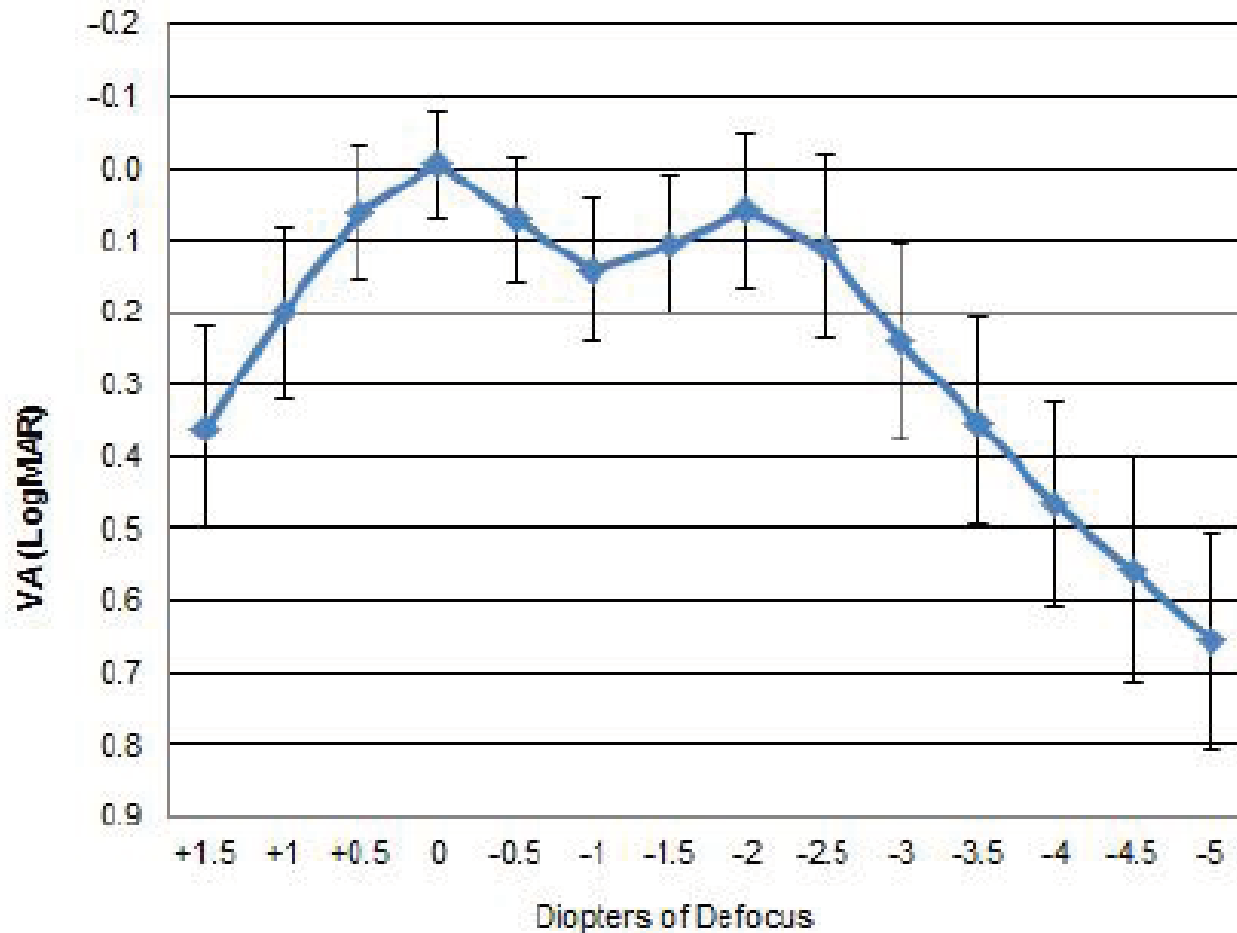
Clinical Outcomes from Company

- **Contrast Sensitivity**

Figure 3: Post-operative contrast sensitivity scores (logMAR)
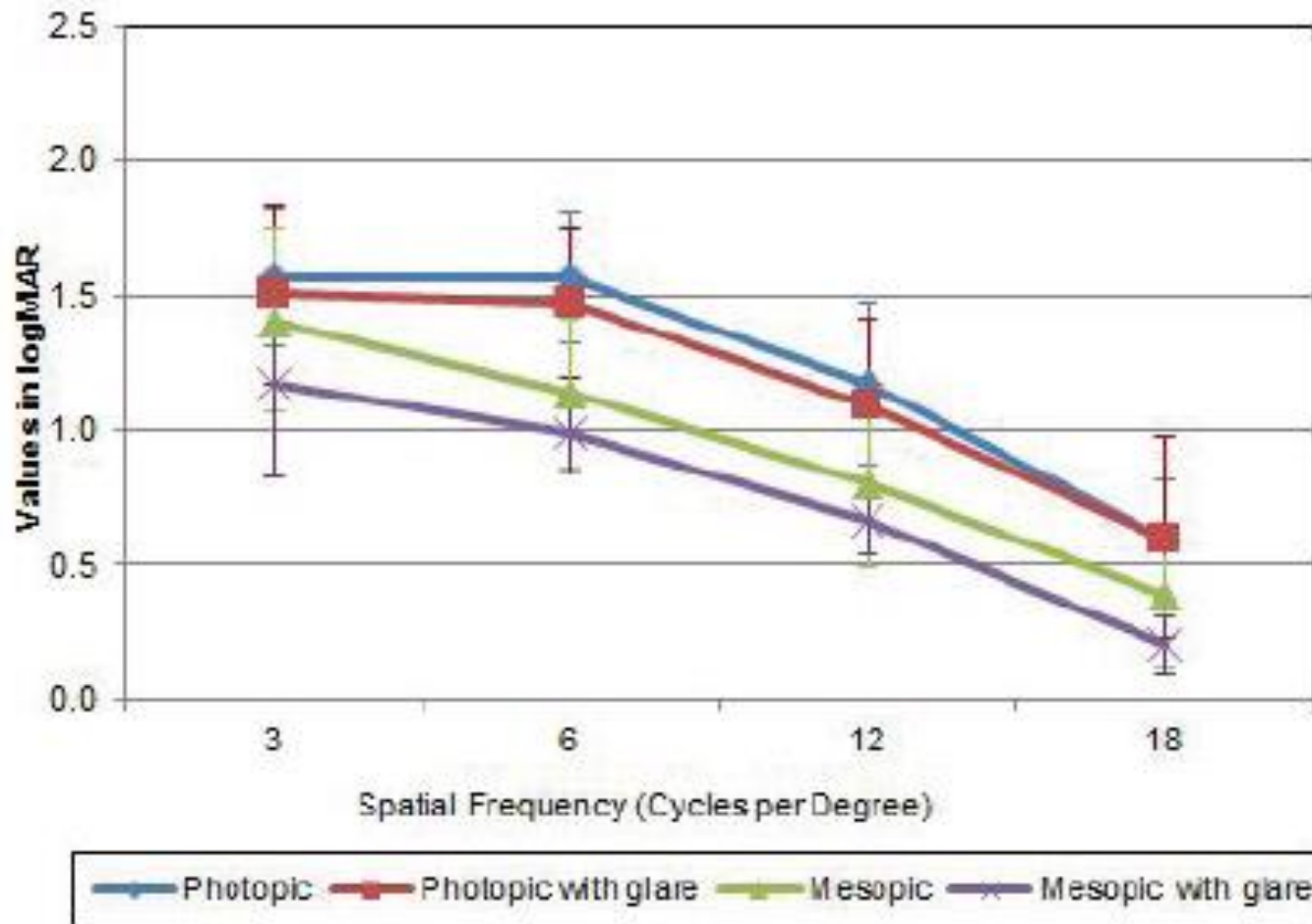
Clinical Outcomes from Company

- **Satisfaction and Quality of Vision**

Figure 5: Spectacle usage at 3 months

80.3% Never
18.0% Occasionally
1.6% Quite often
0.0% Very often

All, n=61

Figure 6: Satisfaction with uncorrected vision at 3 months

45.9% Very
42.6% Quite
11.5% A little
0.0% Not at all

All, n=61
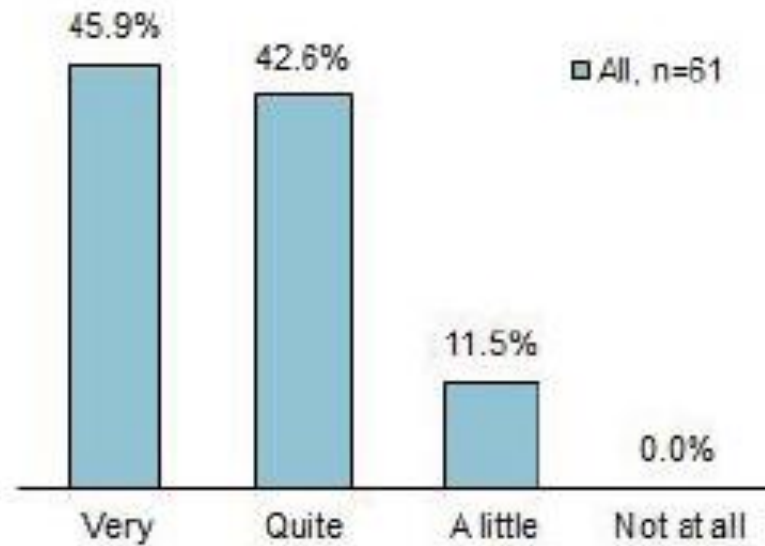
Clinical Outcomes from Company

- ## Satisfaction and Quality of Vision

Table 6: Satisfaction with near, intermediate and far vision at 3 months

Satisfaction with vision at		N=61	
		n	%
Near	Very	33	54.1%
	Quite	23	37.7%
	A little	4	6.6%
	Not at all	1	1.6%
Intermediate	Very	29	47.5%
	Quite	24	39.3%
	A little	7	11.5%
	Not at all	1	1.6%
Far	Very	27	44.3%
	Quite	23	37.7%
	A little	9	14.8%
	Not at all	2	3.3%

Table 7: Overall satisfaction at 3 months

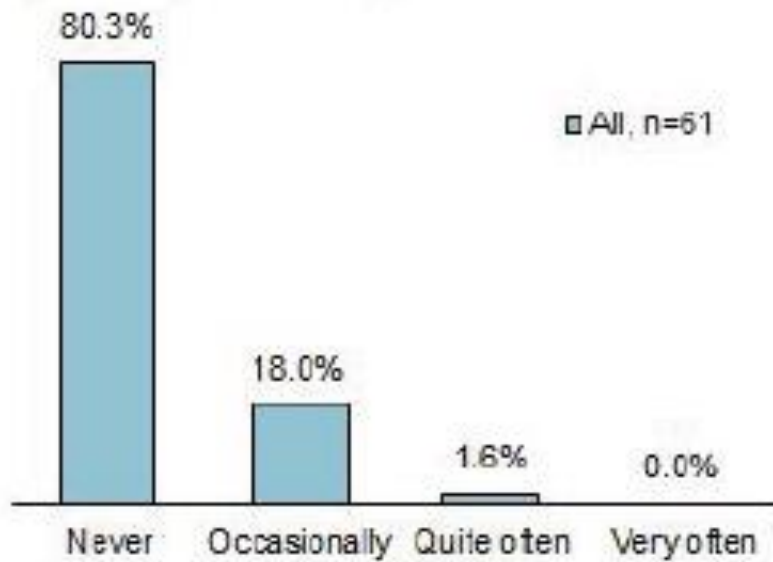| Satisfied with		N=61	
		n	%
Overall outcome	Very	32	52.5%
	Quite	25	41.0%
	A little	4	6.6%
	Not at all	0	0.0%
Achieved quality of vision	Definitely	29	47.5%
	Quite surely	22	36.1%
	Maybe	6	9.8%
	No	4	6.6%
Choice for this lens	Very	33	54.1%
	Quite	21	34.4%
	A little	6	9.8%
	Not at all	1	1.6%
Elect procedure again	Definitely	38	62.3%
	Quite surely	16	26.2%
	Maybe	4	6.6%
	No	3	4.9%
Recommend this lens to others*	Definitely	37	61.7%
	Quite surely	15	25.0%
	Maybe	6	10.0%
	No	2	3.3%

*One subject did not respond to this question (N=60)

Clinical Outcomes from Company

- **Adverse events**

Table 8: Adverse events vs. ISO 19979-7 SPE* rates

Adverse Events		Eyes N=122		ISO SPE* rate %
		n	%	
Cumulative	Cystoid macular edema (CME)	0	0	10
	Hypopyon	0	0	0.2
	Endophthalmitis	0	0	0.2
	Lens dislocation	0	0	1.1
	Pupillary block	0	0	2
	Retinal detachment	0	0	1.2
	Secondary surgical intervention (SSI)	0	0	2.6
Persistent	Corneal stroma edema	0	0	0.5
	Cystoid macular edema	0	0	3.8
	Iritis	0	0	0.9
	Raised IOP requiring treatment	0	0	2.1

* Per ISO 11979-7 (2014) Ophthalmic Implants-Intraocular Lenses (Part 7): The SPE rate is the safety and performance endpoint.

Table 9: complications present at 3 months

Complications	Eyes N=122	
	n	%
PCO	9	7.4
Posterior Capsule Striae	6	4.9

Note: reported with incidence rates of 3% or higher

Clinical Outcomes from Our institution

- **Demographics**

Characteristics	PRECIZON PRESBYOPIC
Number of eyes	14
Sex	M : F = 1 : 6
Age, years old	58.57 ± 7.58 (43 to 69)
Spherical Equivalent (D)	-1.14 ± 2.16 (-5.50 to 1.75)
logMAR CDVA (monocular)	0.13 ± 0.10 (0.00 to 0.30)
logMAR UDVA (monocular)	0.29 ± 0.16 (0.00 to 0.52)
logMAR CDVA (binocular)	0.05 ± 0.05 (0.00 to 0.10)
logMAR UDVA (binocular)	0.15 ± 0.11 (0.00 to 0.44)
Average K (D)	44.78 ± 1.44 (42.83 to 48.13)
Corneal Astigmatism (D)	0.43 ± 0.30 (0.00 to 1.00)
Axial length (mm)	23.74 ± 1.14 (21.21 to 25.21)
Anterior chamber depth (mm)	3.25 ± 0.39 (2.78 to 3.93)
Goal diopter (D)	-0.09 ± 0.13 (-0.36 to 0.14)
Pupil size Photopic (mm)	3.36 ± 1.20 (1.2 to 5.1)
Mesopic (mm)	4.52 ± 0.92 (2.9 to 6.3)

Clinical Outcomes from Our institution

- **Visual Acuity**

Near Visual Acuity	Monocular (N=14)			Binocular (N = 7)		
	Mean LogMAR	≤0.3 LogMAR	≤0.0 LogMAR	Mean LogMAR	≤0.3 LogMAR	≤0.0 LogMAR
Uncorrected	0.15	92.9 %	7.1 %	0.07	100 %	14.3 %
Corrected	0.07	100 %	21.4 %	0.05	100 %	28.6 %
Distance Corrected	0.16	85.7 %	7.1 %	0.12	100 %	14.3 %

Distance Visual Acuity	Monocular (N=14)			Binocular (N = 7)		
	Mean LogMAR	≤0.3 LogMAR	≤0.0 LogMAR	Mean LogMAR	≤0.3 LogMAR	≤0.0 LogMAR
Uncorrected	-0.01	100 %	64.3 %	-0.08	100 %	85.7 %
Corrected	-0.05	100 %	85.7 %	-0.06	100 %	100 %

Intermediate Visual Acuity	Monocular (N=14)			Binocular (N = 7)		
	Mean LogMAR	≤0.3 LogMAR	≤0.0 LogMAR	Mean LogMAR	≤0.3 LogMAR	≤0.0 LogMAR
Uncorrected	0.17	92.9 %	0.0 %	0.08	100 %	14.3 %

Clinical Outcomes from Our institution

- ## Refraction

Difference in MRSE between visits
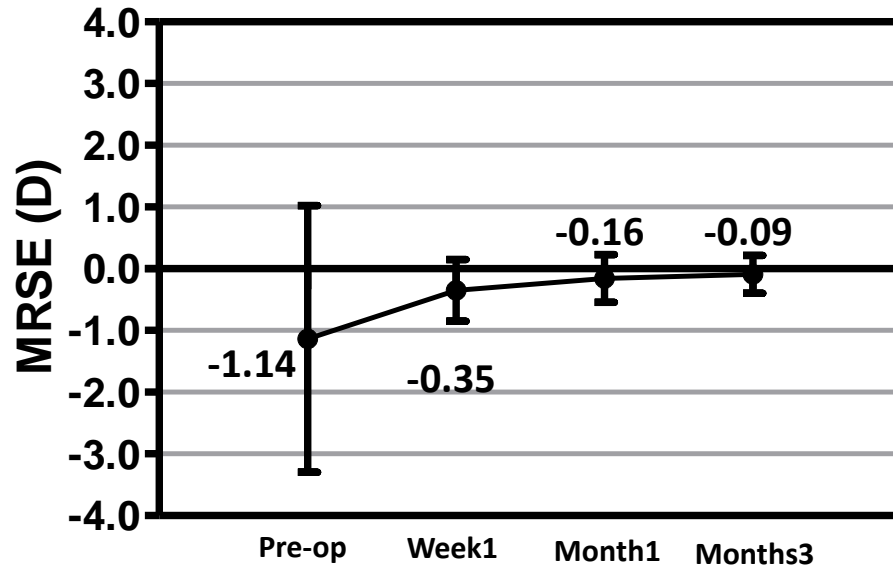
Mean change in MRSE
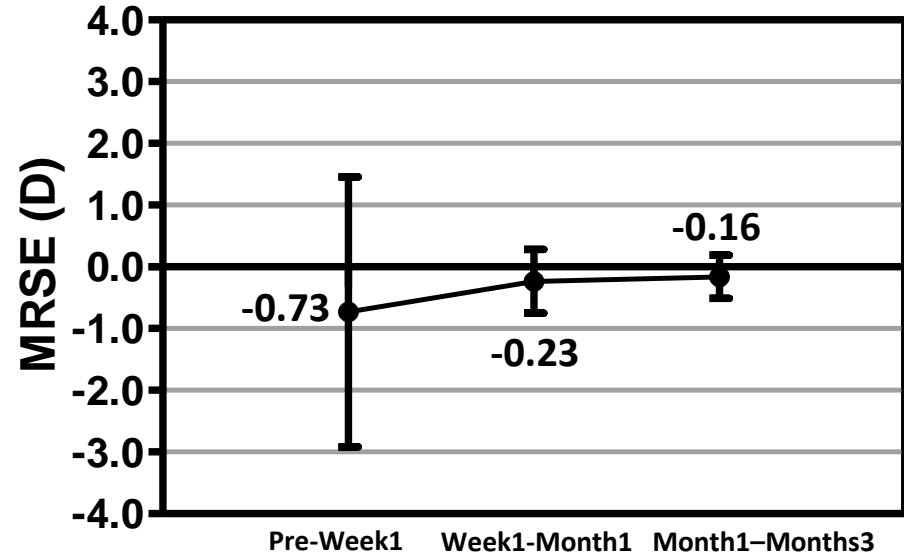
MRSE	N=14
≤ 1.0 of MRSE between Week 1 and Months 3	100 %
> 1.0 of MRSE between Week 1 and Months 3	0 %

- **Defocus Curve**

Binocular best corrected defocus curve at 3 months
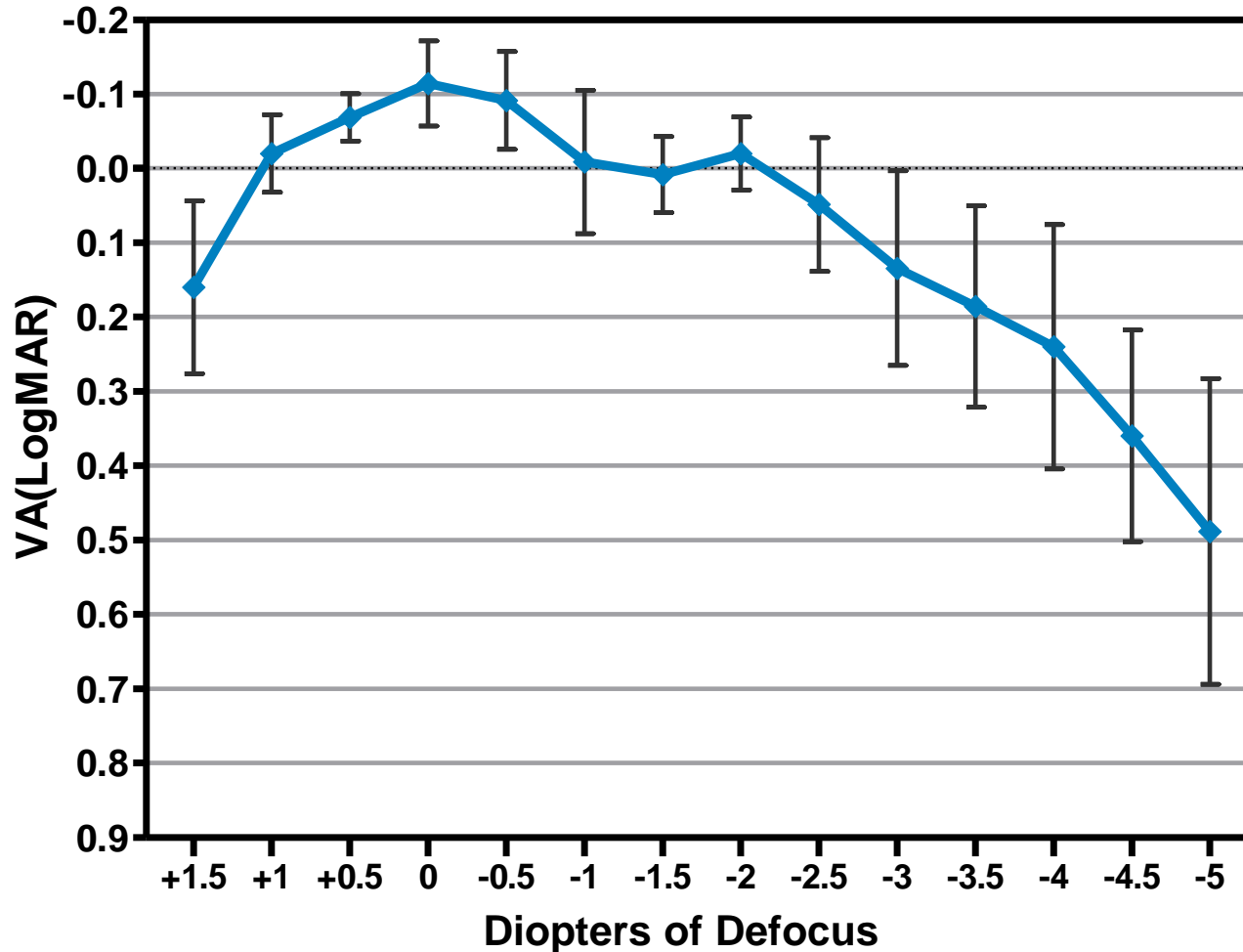
Clinical Outcomes from Our institution

- ## **Contrast Sensitivity**

Post-operative contrast sensitivity scores at 3 months
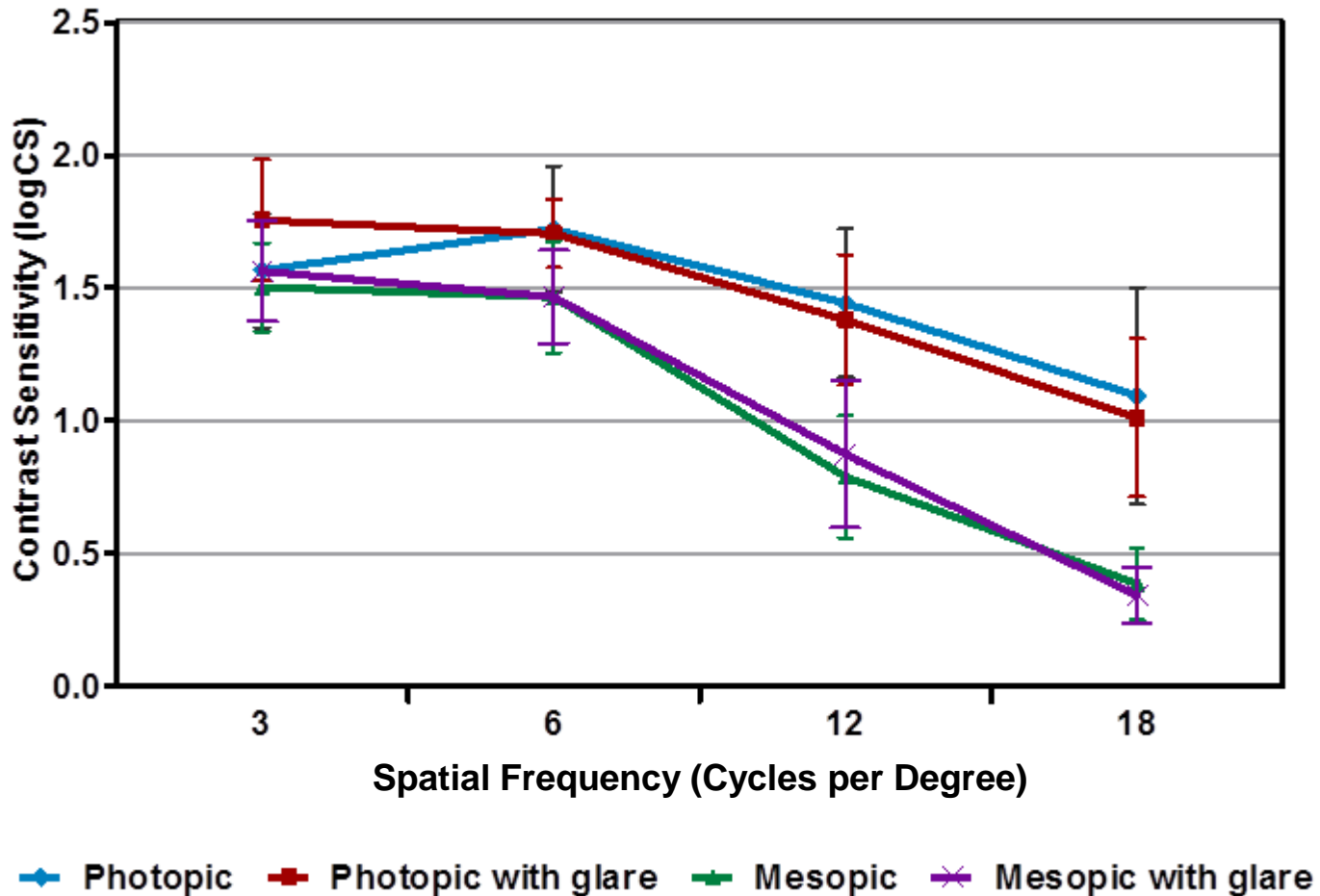
Clinical Outcomes from Our institution

- **Satisfaction and Quality of Vision**

Spectacle Usage at 3 months

85.7% — Never
14.3% — Occasionally
0.0% — Quite often
0.0% — Very Often

Satisfaction with uncorrected vision at 3 months

42.9% — Very
42.9% — Quite
14.3% — A little
0.0% — Not at all
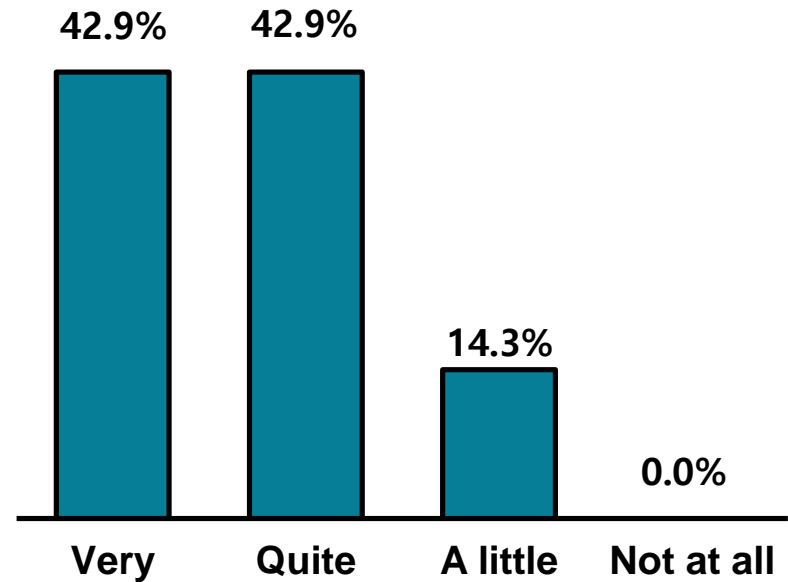
Clinical Outcomes from Our institution

- **Satisfaction and Quality of Vision**

Satisfaction with near, intermediate, far vision at 3 months

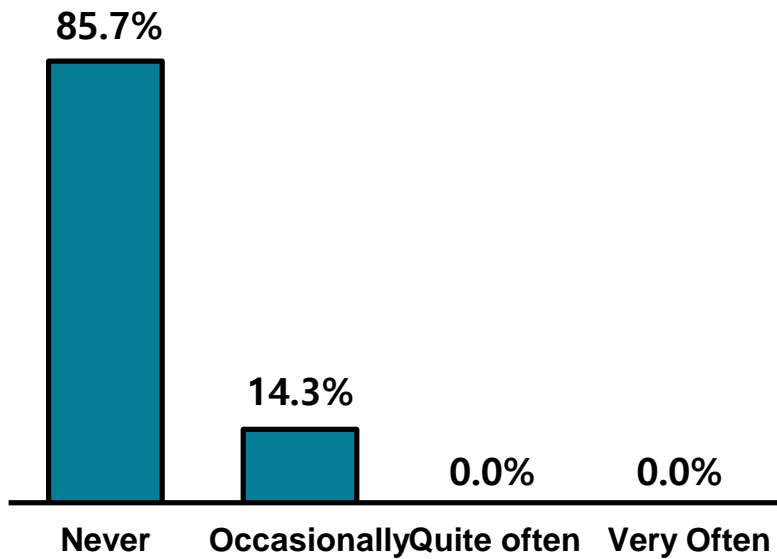| Satisfaction with vision at		N=7	
		n	%
Near	Very	3	42.9%
	Quite	2	28.6%
	A little	2	28.6%
	Not at all	0	0.0%
Intermediate	Very	4	57.1%
	Quite	1	14.3%
	A little	2	28.6%
	Not at all	0	0.0%
Far	Very	4	57.1%
	Quite	2	28.6%
	A little	1	14.3%
	Not at all	0	0.0%
Overall	Very	4	57.1%
	Quite	1	14.3%
	A little	2	28.6%
	Not at all	0	0.0%

- ## Satisfaction and Quality of Vision

Quality of Vision at 3 months

Visual Quality causing discomfort		N=7 n	%
Glare	Never	5	71.4%
	Occasionally	2	28.6%
	Quite often	0	0.0%
	Very often	0	0.0%
Halo	Never	6	85.7%
	Occasionally	1	14.3%
	Quite often	0	0.0%
	Very often	0	0.0%
Starbutst	Never	6	85.7%
	Occasionally	1	14.3%
	Quite often	0	0.0%
	Very often	0	0.0%
Hazy vision	Never	7	100.0%
	Occasionally	0	0.0%
	Quite often	0	0.0%
	Very often	0	0.0%
Blurred vision	Never	7	100.0%
	Occasionally	0	0.0%
	Quite often	0	0.0%
	Very often	0	0.0%

Visual Quality		N=7 n	%
Distortion	Never	6	85.7%
	Occasionally	1	14.3%
	Quite often	0	0.0%
	Very often	0	0.0%
Double Vision	Never	7	100.0%
	Occasionally	0	0.0%
	Quite often	0	0.0%
	Very often	0	0.0%
Fluctuation	Never	5	71.4%
	Occasionally	1	14.3%
	Quite often	0	0.0%
	Very often	1	14.3%
Focusing Difficulties	Never	7	100.0%
	Occasionally	0	0.0%
	Quite often	0	0.0%
	Very often	0	0.0%
Difficulty judging Distance or Depth perception	Never	7	85.7%
	Occasionally	0	14.3%
	Quite often	0	0.0%
	Very often	0	0.0%

Clinical Outcomes from Our institution

- **Adverse events**

Adverse Events		N=14	
		n	%
Cumulative	Cystoid macular edema (CME)	0	0
	Hypopyon	0	0
	Endophthalmitis	0	0
	Lens dislocation	0	0
	Pupillary block	0	0
	Retinal detachment	0	0
	Secondary surgical intervention (SSI)	0	0
Persistent	Corneal stroma edema	0	0
	Cystoid macular edema	0	0
	Iritis	0	0
	Raised IOP requiring treatment	0	0

Complications	N=14	
	n	%
PCO	0	0
Posterior Capsule Striae	0	0

Summary

- **At 3 months of surgery, far, intermediate, and near vision correction were effective.**

- **Overall, the satisfaction of the patient after surgery was fairly satisfied to very satisfied.**

- **Patients with visual discomfort often present, but the results were good in overall.**

- **No adverse events for 3 months after surgery.**

THANK YOU