



مركز تداعي الجراحي  
Tadawi Surgical Center



# Laser Blended Vision for presbyopia: (5 years FU)

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Tadawi Surgical Center

# Presbyopia: The Challenge for Perfection

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- Clear vision at **distance**
- Clear vision at **intermediate**
- Clear vision at **near**
- Maintaining **optical quality**
  - Safety of CDVA
  - Contrast sensitivity
  - Night vision preservation
- Maintaining **binocularity**
- High patient **tolerance**
- Short **adaptation** time
- Simultaneous correction of **refractive error**
- **Reversibility** / repairability



*Always a  
compromise  
on something*

# Presbyopia: Ideal Solution

Far Distance



Distance



Intermediate

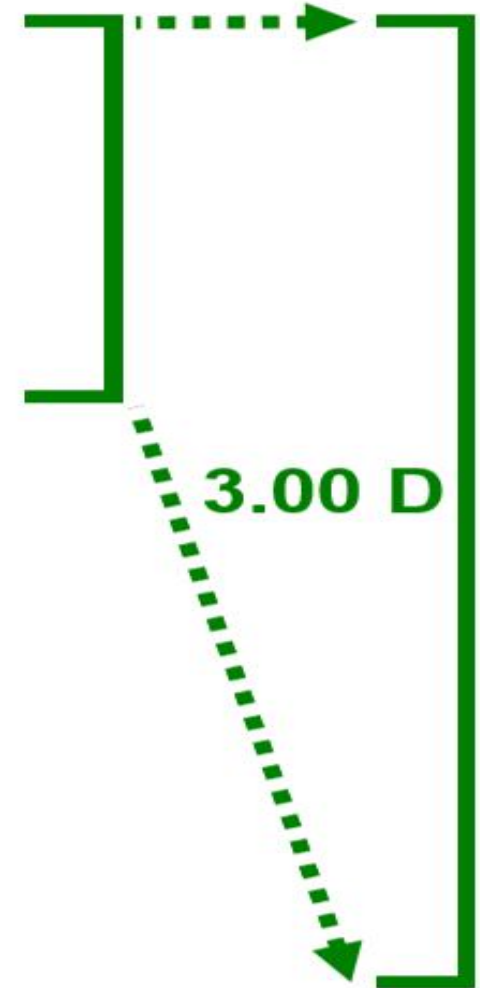
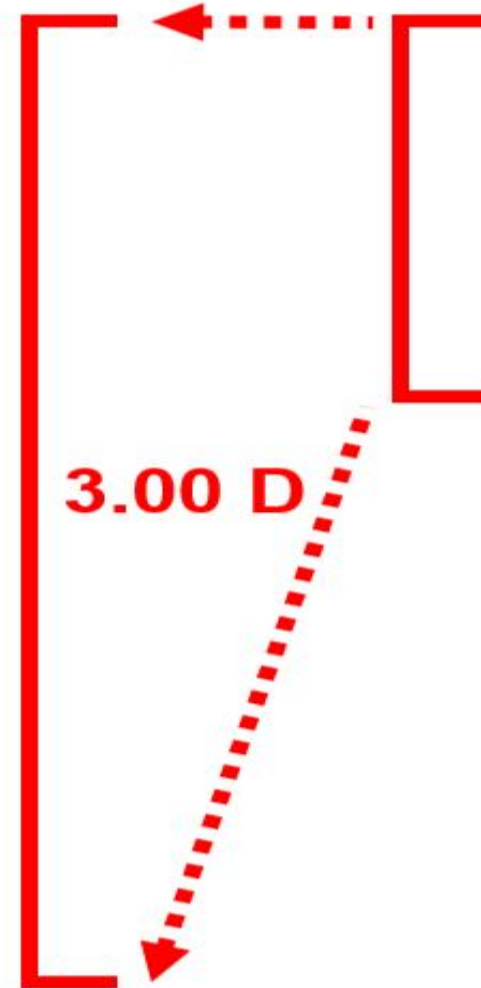


Near



Right Eye

Left Eye



LONDON  
VISION  
CLINIC



COLUMBIA UNIVERSITY  
MEDICAL CENTER



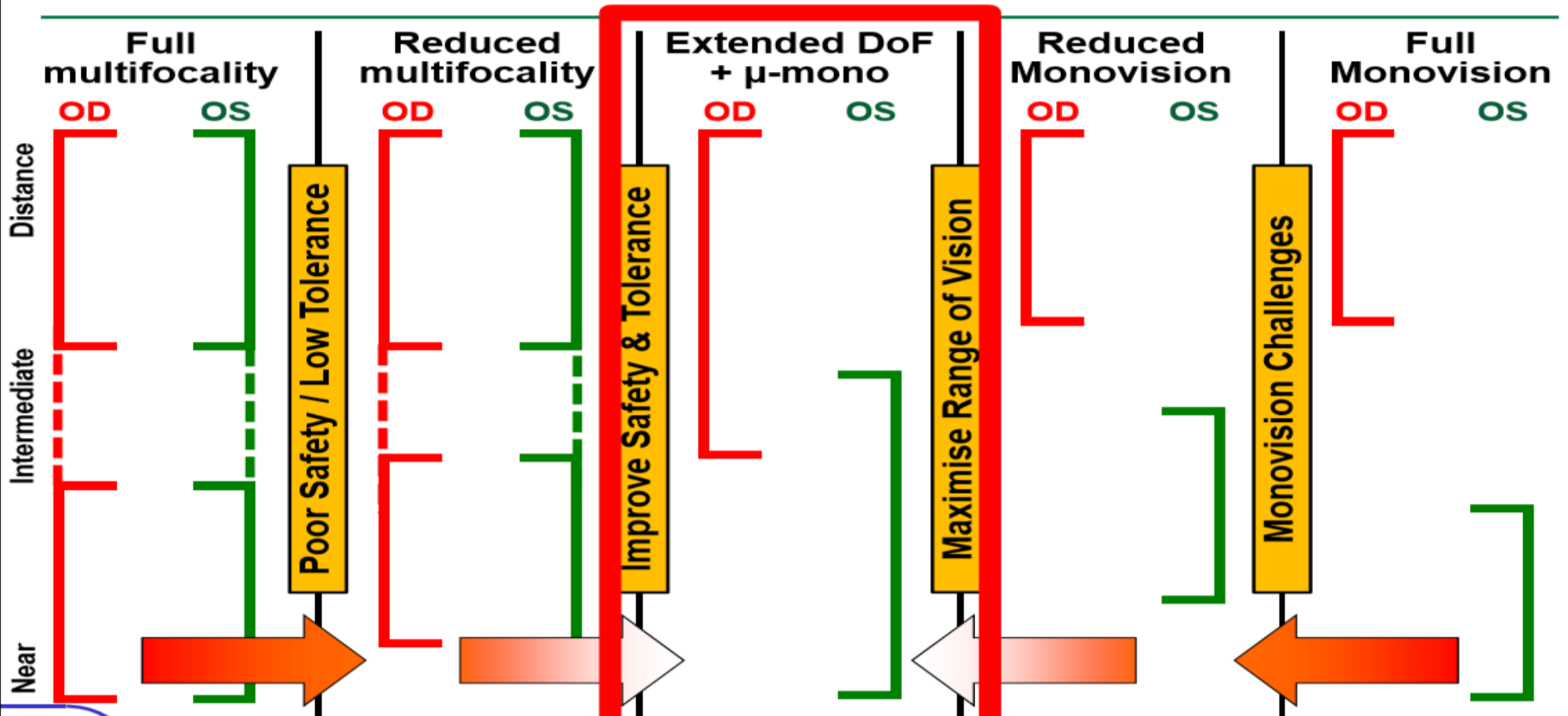
QUINZE-VINGTS



Ulster  
University

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# Trends in presbyopic correction

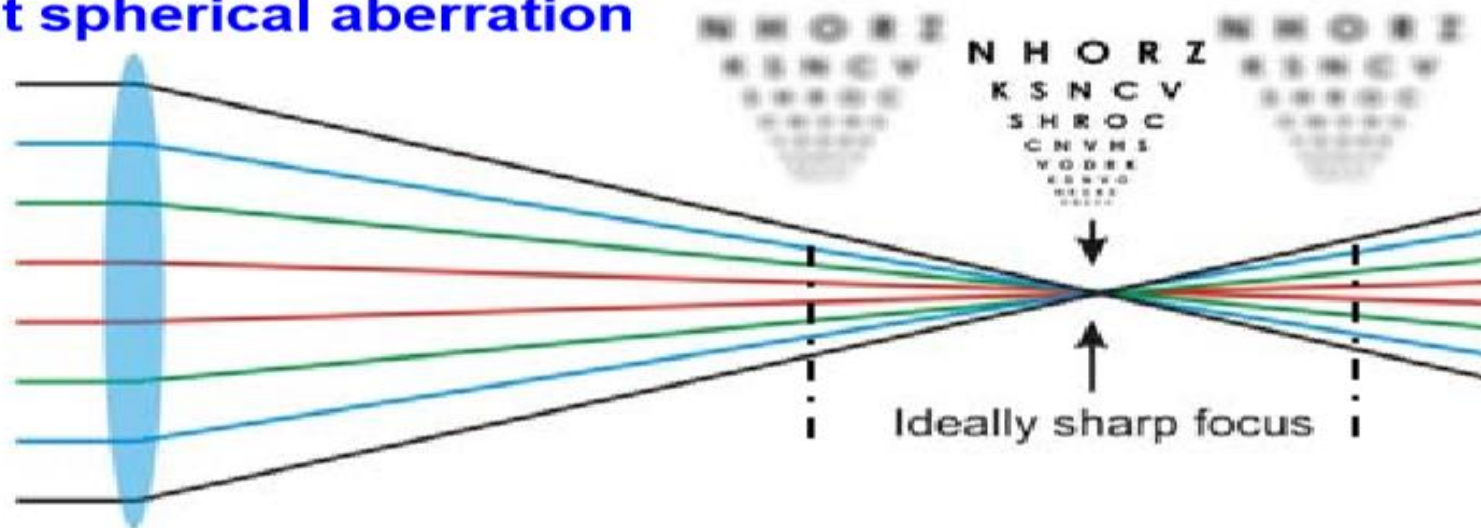


# Increase depth of field with spherical aberration

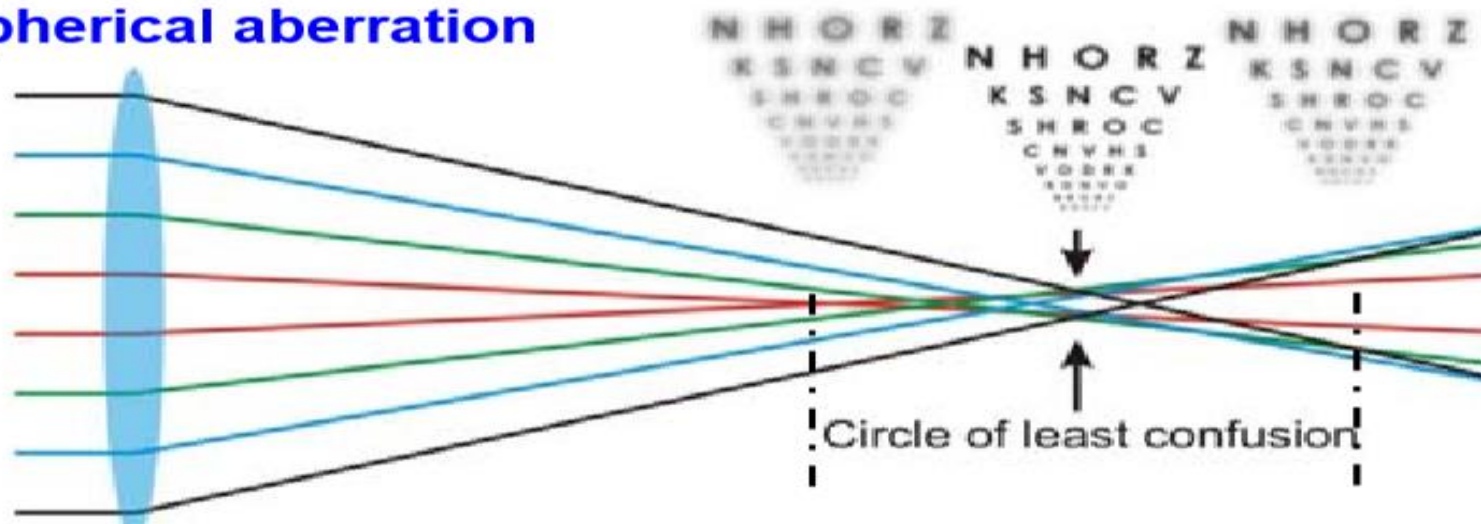
- ▶ None of them reported a nonspecific lack of adaptation.
- ▶ Naturally occurring aberration.
- ▶ Increases with age.
- ▶ Increases during accommodation.

# Influence of Spherical Aberration on Depth of Field

without spherical aberration



with spherical aberration

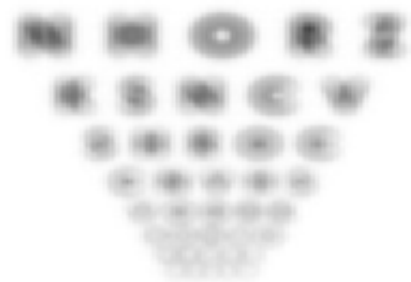


# Influence of Spherical Aberration on Depth of Field

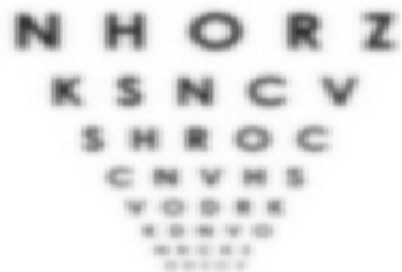
	0.00 D	-0.50 D	-1.00 D	-1.50 D	-2.00 D
<i>without</i> spherical aberration @ 7 mm					
<i>with</i> spherical aberration @ 7 mm					

# Simulation for -1.50 D defocus

-1.50 D @ 7 mm



Reduce pupil size to 4 mm



Add spherical aberration



With spherical aberration and @ 4 mm



Central neural processing





# **PRESBYOND Laser Blended Vision for Myopia, Hyperopia, and Emmetropia**

**(Non-linear Aspheric Presbyopic Micro-monovision LASIK)**

## **LASIK for Myopic Astigmatism and Presbyopia Using Non-linear Aspheric Micro-monovision With the Carl Zeiss Meditec MEL 80 Platform**

Dan Z. Reinstein, MD, MA(Cantab), FRCSC, FRCOphth;  
Timothy J. Archer, MA(Oxon), DipCompSci(Cantab); Marine Gobbe, PhD, MSTOptom

*Journal of Refractive Surgery* • Vol. 27, No. 1, 2011

*Posted online: March 1, 2010*

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*Journal of Refractive Surgery* • Vol. 28, No. 8, 2012

# Laser Blended Vision – Micro-Monovision

Far Distance



Distance



Intermediate



Near



Dominant Eye

Non-Dominant Eye

DOF: 1.50 D

Nominal Rx: plano

-0.75 D

“Blend Zone”

Nominal Rx: -1.50 D

DOF: 1.50 D

-2.25 D

## Blended Vision: Enhancement Rate

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	<b>Myopia -8.50</b>	<b>Hyperopia +5.75</b>	<b>Emmetropia</b>
<b>All</b>	19%	22%	12%
<b>Distance eyes (20/25 or worse)</b>	9%	9%	6%
<b>Near eyes (J3 or worse)</b>	8%	9%	7%

# Laser Blended Vision: Results

## LASIK for Myopic Astigmatism and Presbyopia Using Non-linear Aspheric Micro-movision With the Carl Zeiss Meditec MEL 80 Platform

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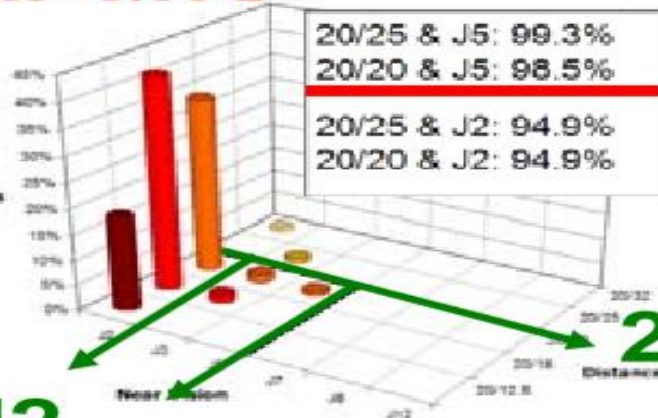
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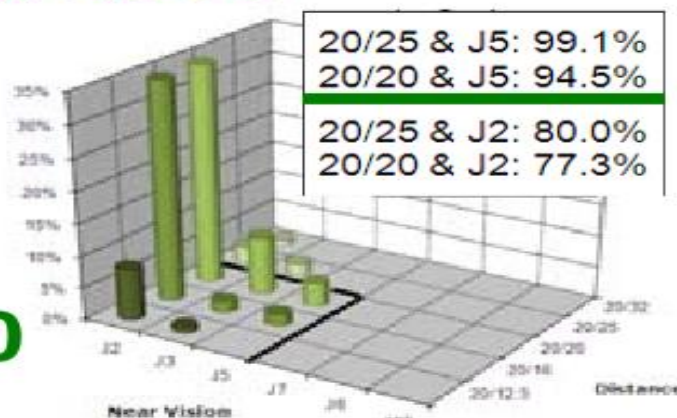
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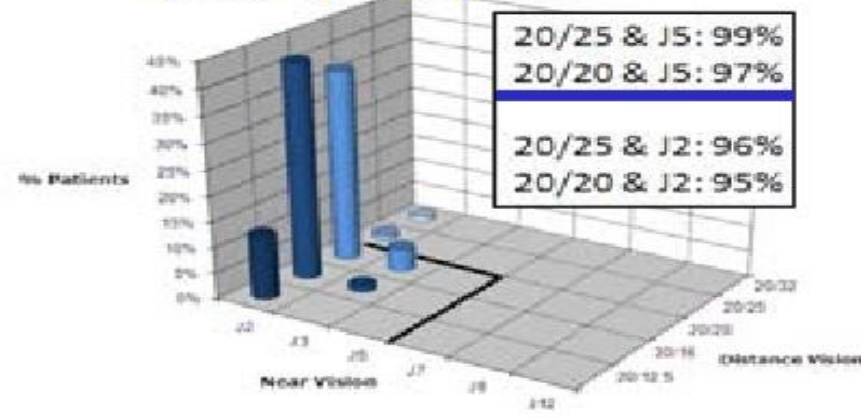
upto -8.50 D



upto +5.75 D



-0.88 to +0.88 D



J2  
J5

Myopia to -8.50D

20/20 & J2

95%

Hyperopia to +5.75 D

20/20 & J2

77%

Emmetropia

20/20 & J2

95%

# Reversibility: Simple Retreatment

Far Distance



Distance



Intermediate



Near



Dominant Eye

Non-Dominant Eye

DOF: 1.50 D

DOF: 1.50 D

-0.75 D



# Expectations: Three Stages of Recovery

## 1. Immediate & day one (swelling, healing response)



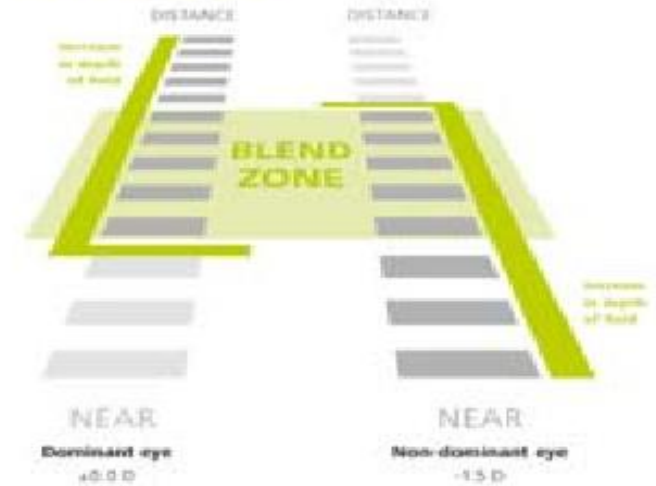
- Slight discomfort
- Dry eye sensation
- Night vision halos
- Slight blurring
- Visual fluctuations

## 2. First few weeks (swelling, healing, adaptation)



- Visual fluctuations
  - Morning to evening
  - Day to day
- NV good/DV bad
- DV good/NV bad

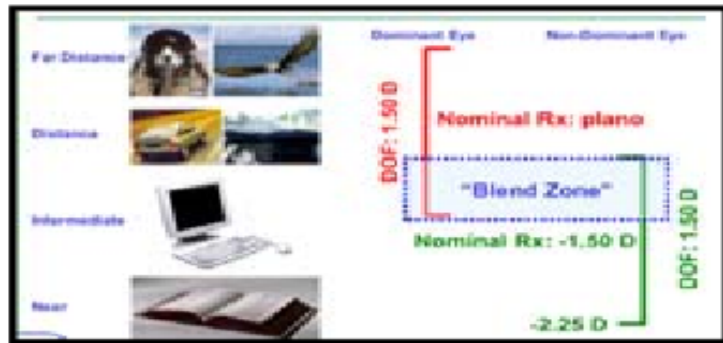
## 3. Three/four months (adaptation)



- Always use both eyes
- Don't 'test' each eye
- Prescribe temporary glasses if necessary
- Remain aware of adaptation process
- Often happens 'overnight'
- Retreatment if required

# Adaptation Time: Cross-Blur

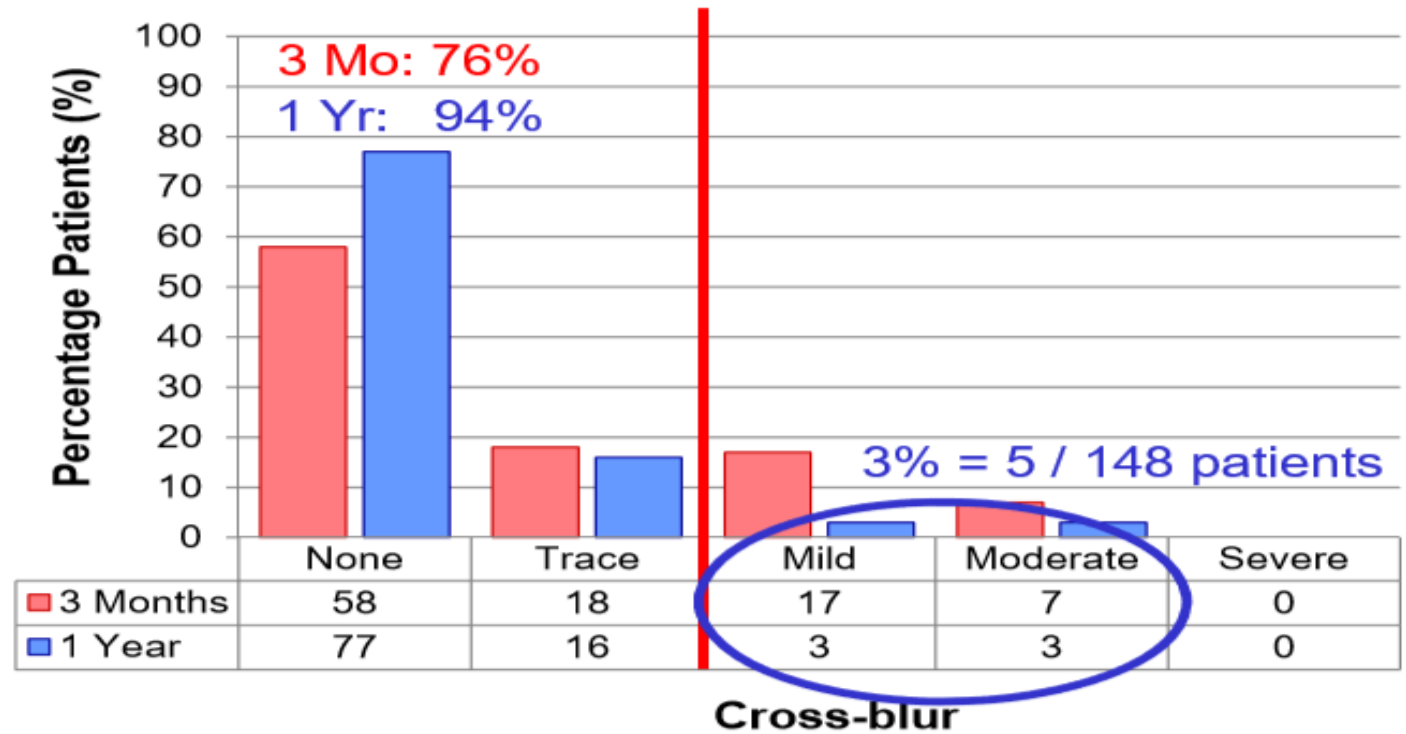
- Adaptation time required to adjust to anisometropia
  - Patient notices the difference between the eyes
  - May require glasses for driving
  - Feels “uncomfortable” / distance “fogging” binocularly



**LASIK for Presbyopia Correction in Emmetropic Patients Using Aspheric Ablation Profiles and a Micro-monovision Protocol With the Carl Zeiss Meditec MEL 80 and VisuMax**

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# Just Prescribe Temporary Spectacles

Far Distance



Distance



Intermediate



Near



Dominant Eye

Non-Dominant Eye

DOF: 1.50 D

Nominal Rx: plano

-0.75 D

Nominal Rx: -1.50 D

DOF: 1.50 D

plano

-1.50 D

2.25 D





# Fine Tune with Retreatment if not Adapting

Far Distance



Dominant Eye

Non-Dominant Eye

DOF: 1.50 D

DOF: 1.50 D

Need to document stability: no change  $>0.25$  D in sphere or cylinder over two month period

Intermediate



-0.75 D

Near



# Expected Visual Course

	<b>Myopia</b>	<b>Hyperopia / Emmetropia</b>
<b>Distance vision</b>	Expected to be good and remain good	May be slightly blurry due to initial overcorrection, but expected to improve over time
<b>Near vision</b>	May be slightly blurry due to initial overcorrection, but expected to improve over time	Expected to be excellent initially, but may reduce over time

# Our presbyopia laser correction



# PURPOSE

- ▶ We **Prospectively** studied the first consecutive **100 patients** with presbyopia who underwent femtoLASIK with the wave front-guided Laser Blended Vision(®) Program by Zeiss(®) in our Excimer Laser Zeiss Mel-90 by Carl Zeiss Meditec(®) (Jena, Germany) over the last **60 months**, for the correction of presbyopia with **myopia**, **astigmatism**, **hyperopia** or **emmetropia**.

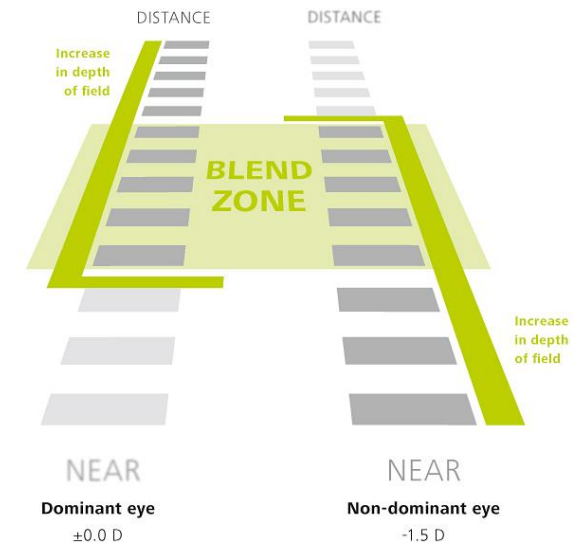


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# METHODS

- ▶ The program has a non-linear aspheric ablation profile that increases the **spherical aberration** in both eyes.
- ▶ A slight myopia of **-1.5 diopters** (D) in the **non-dominant** eye is also programmed.
- ▶ We analyzed the results patient satisfaction, efficacy, safety and predictability of the procedure.
- ▶ Follow-up was from **24 to 60 months**.



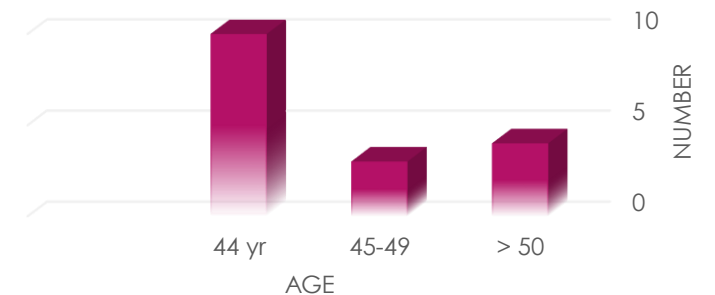
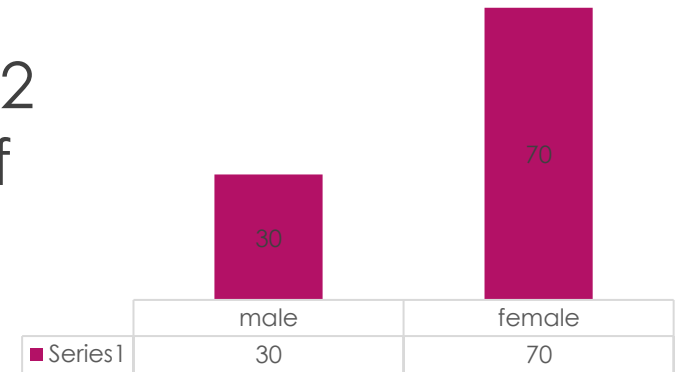




We are **highly selective** for our ►  
patients

# RESULTS

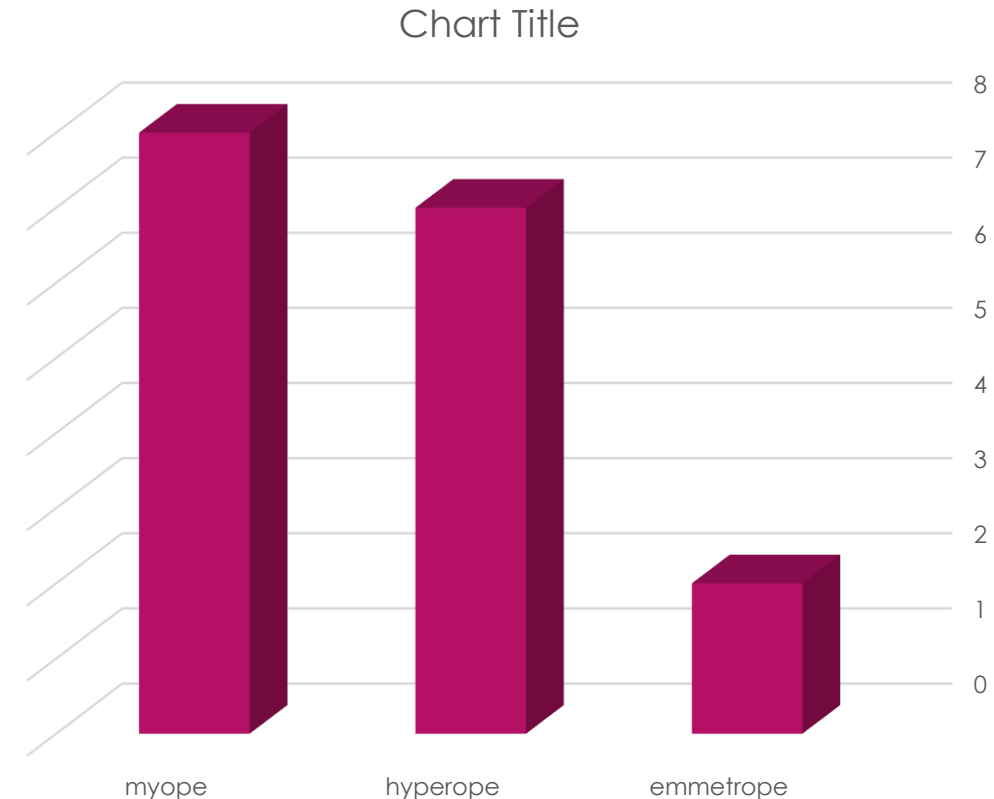
- ▶ **SEX:**
- ▶ 30 male and 70 female patients between 42 and 57 years old were studied, for a total of 200 eyes.
- ▶ **AGE :**
- ▶ 44 patients (44%) were between 40 and 44;
- ▶ 33 patients (33%) were between 45 and 49;
- ▶ 23 patients (23%) were 50 years or more.



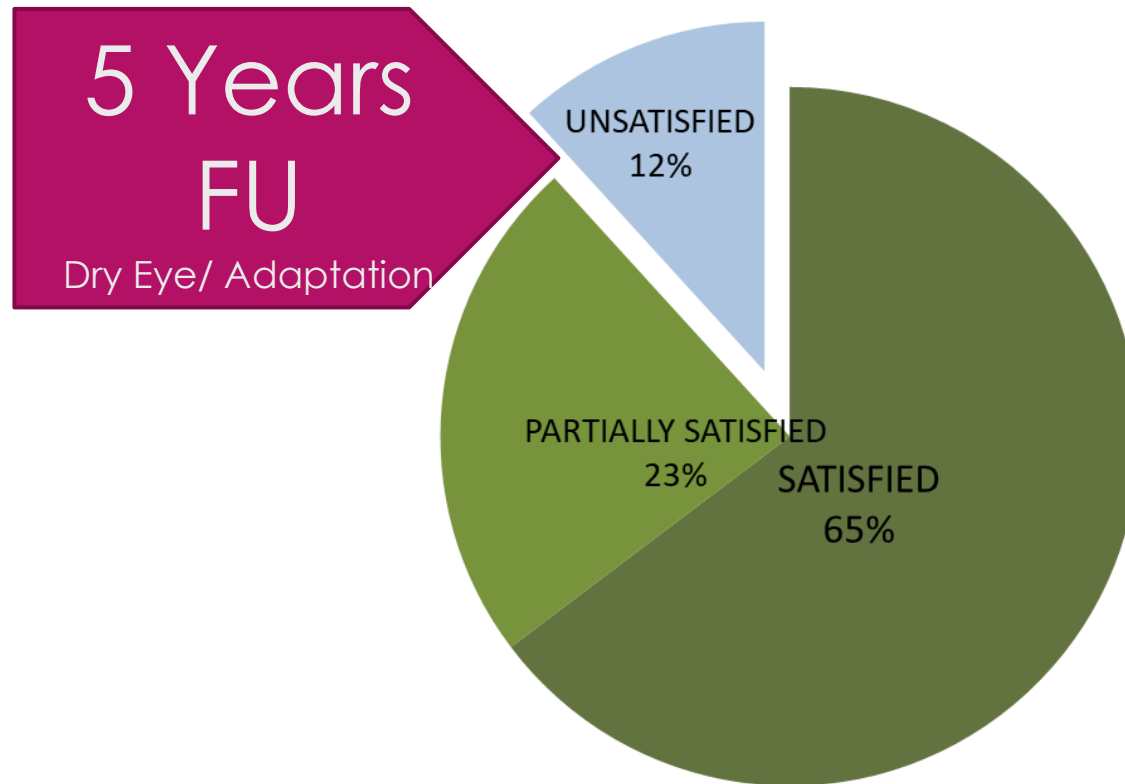


# Refractive error type:

- ▶ 11 patients (11%) were **emmetropic** (0.5 or less spherical equivalent).
- ▶ 48 patients (48%) were **myopic** or myopic astigmatic,
- ▶ 41 patients (41%) were **hyperopic** or hyperopic astigmatic.



# Satisfaction 60 months



# Unsatisfied patients

DEMOGRAPHIC DATA					PRE OP DATA								POST OP							
NAME	SEX	AGE	EYE	SX DATE	PRE OP NV	SE	SP	CYL	AX	VA	K READINGS KF KS	X BLUR	BV DV	VA DV	VA NV	SP	CYL	AX	CVA	REFRACTION TOLERATION/ SATISFACTION
SULTAN MOHD AL SOFIANI	M	43	OD	JUL 25 2019	N4	-1.25	-1.25	0	0	20/25	42.6 X 31 43.0 X 121	0	20/30	20/30	N8	0	0	0	20/30	TOLERATED BUT NOT SATISFIED
SULTAN MOHD AL SOFIANI	M	43	OS	JUL 25 2019	N4	-1.25	-1.25	0	0	20/25	42.7 X 142 43.2 X 52	-1.5	20/30	20/60	N6	-1.25	0	0	20/25	TOLERATED BUT NOT SATISFIED
MESOOON MOHD AL SWAT	F	55	OD	JUL 02 2019	N19	2.25	2.25	0	0	20/30	43.9 X 169 44.4 X 79	0	20/30	20/40	N24	0	0.75	110	20/30	TOLERATED BUT NOT SATISFIED
MESOOON MOHD AL SWAT	F	55	OS	JUL 02 2019	N19	2.25	2.25	0.25	155	20/30	43.9 X 164 44.6 X 74	-1.5	20/30	20/60	N10	-1.5	-1	10	20/40	TOLERATED BUT NOT SATISFIED

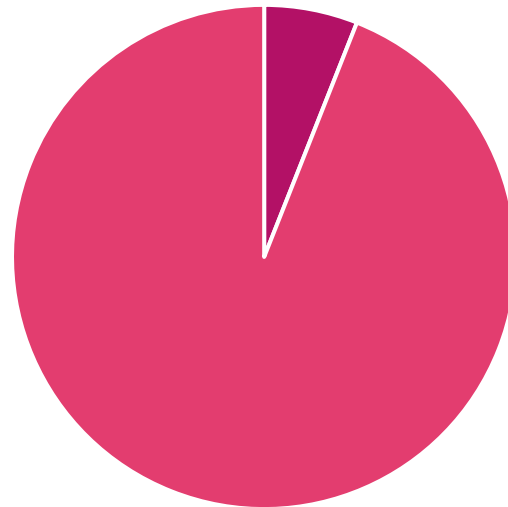
Very poor NV

Improved NV

Dry eye

# Enhancement rate

Reoperation 6%



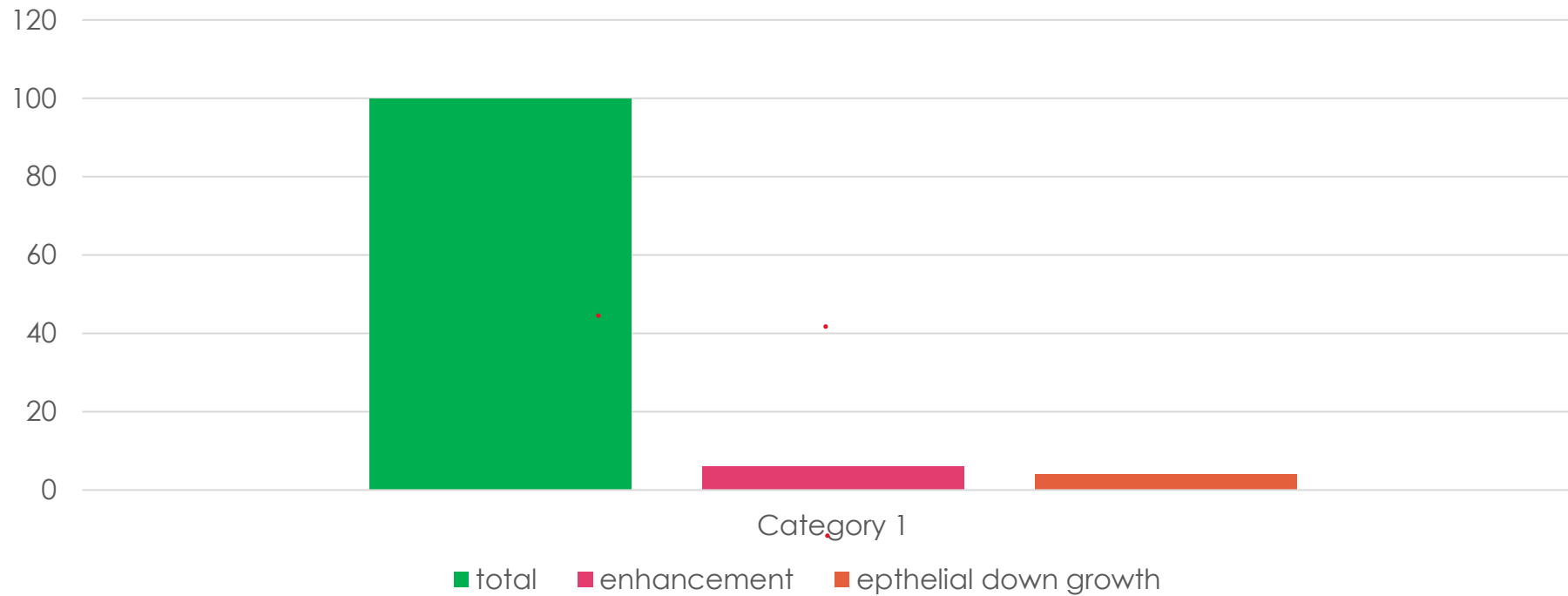
■ reoperation ■ 2nd Qtr ■ ■

Enhancement rate 6%

Highly selective

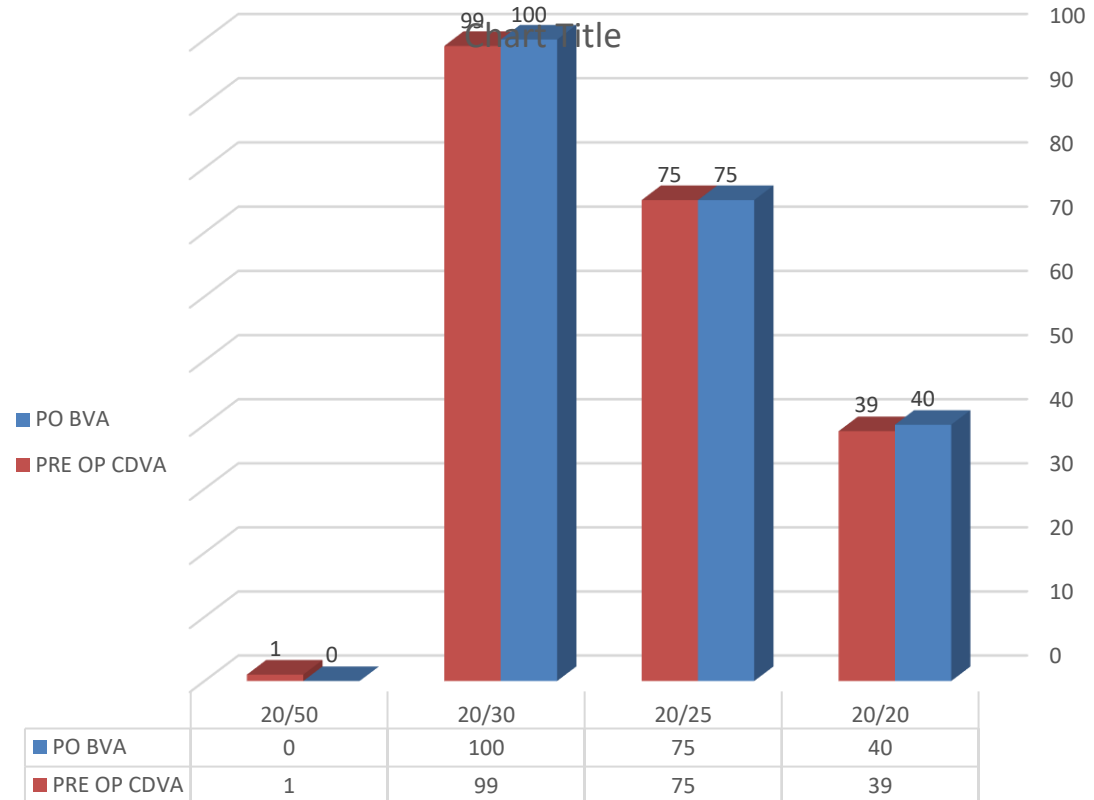
Myopia	Hyperopia	Emmetrope
%1	%3	%2

# Epithelial down growth 66% in reoperated cases

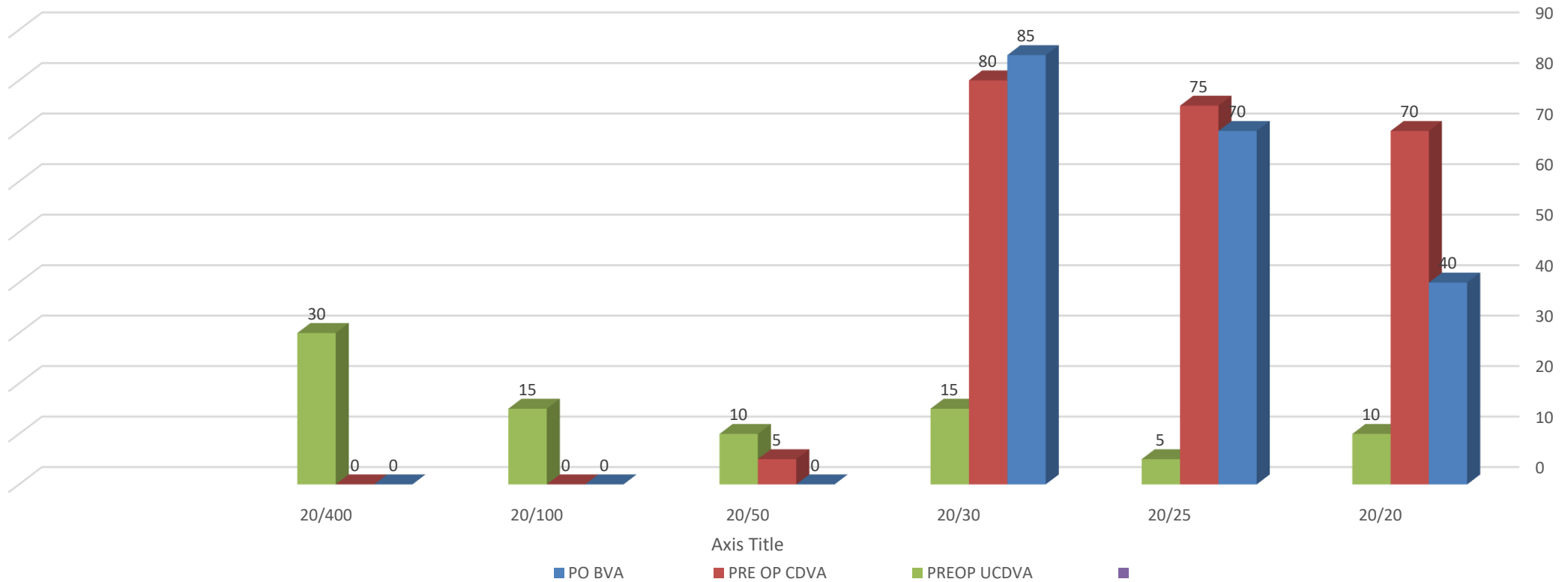


# Distance vision

- ▶ Post-operative visual acuity without correction for distance was 20/20 in 47 patients (47%) .
- ▶ **20/25** or better in 83 patients (**83%**) (Binocular).

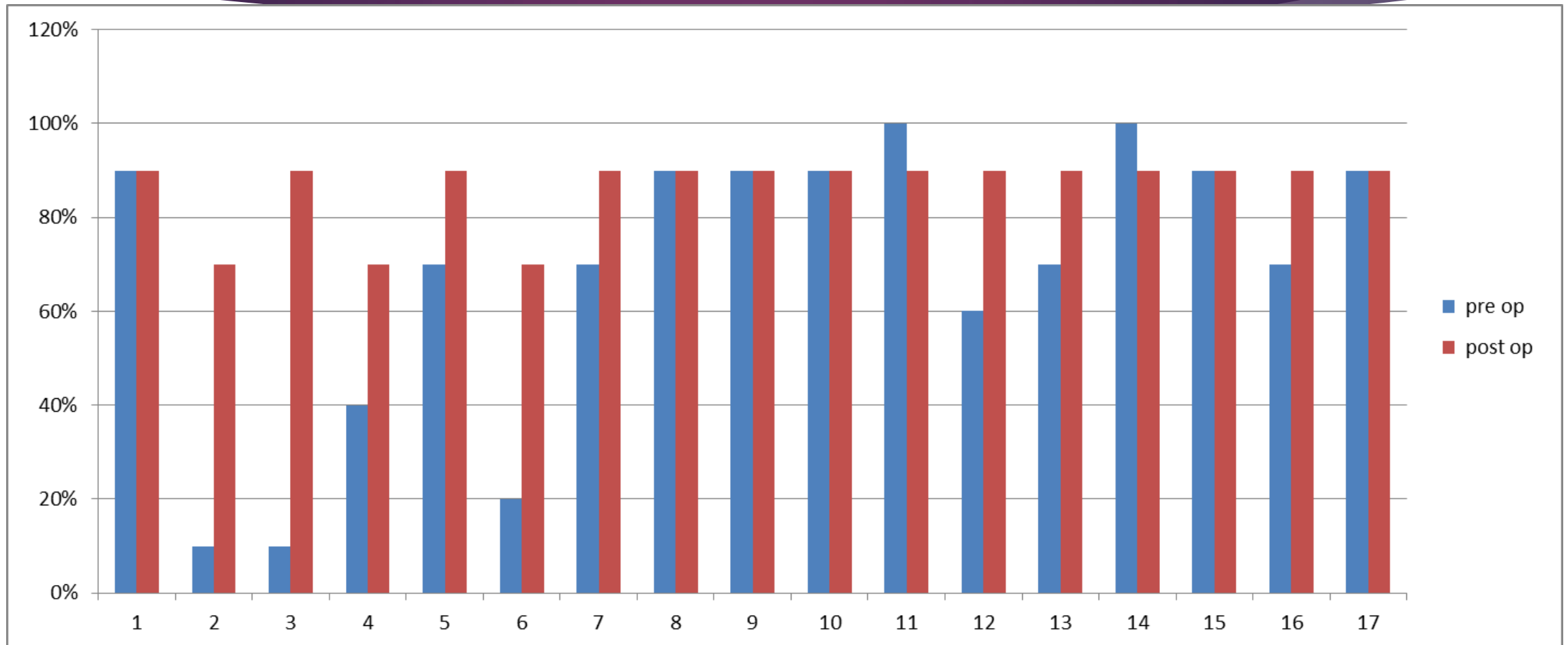


# DISTANCE VISION





# Near vision PRE & P.O



# Near vision

## ▶ PREOP

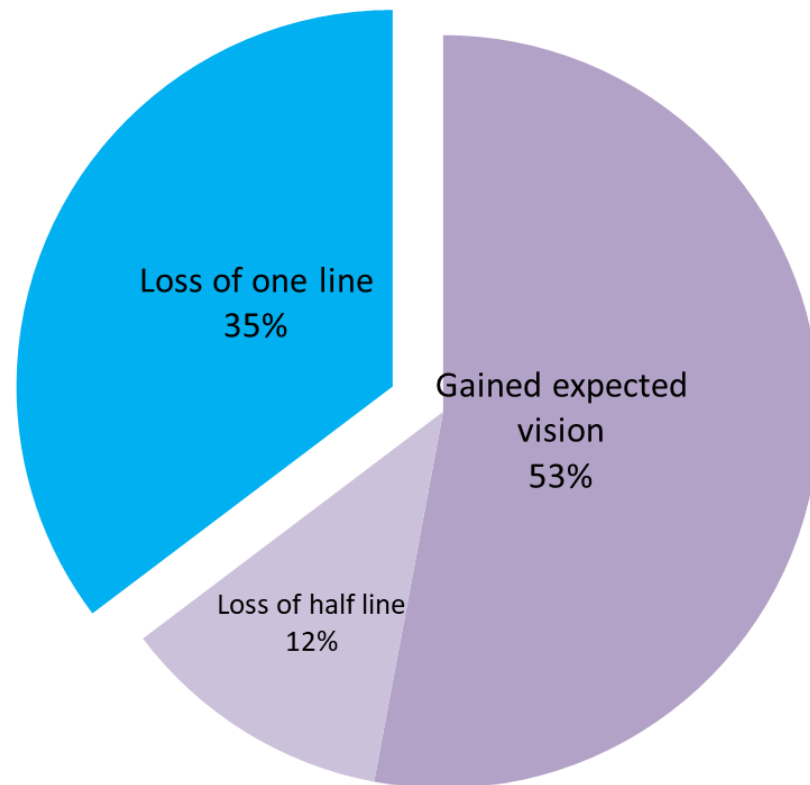
- ▶ 53 patients (53%) had pre-op near vision between N9 - N24.
- ▶ **47 MYOPIC patients** (47%) had pre-op near vision between N4 – N6.

## ▶ PO

- ▶ 77 (77%) has PO near vision N4 or better (efficacy).
- ▶ 23 patients (23%) has post-operative near vision between N9 and N10. (Hypreope With Poor Pre-Op NV)

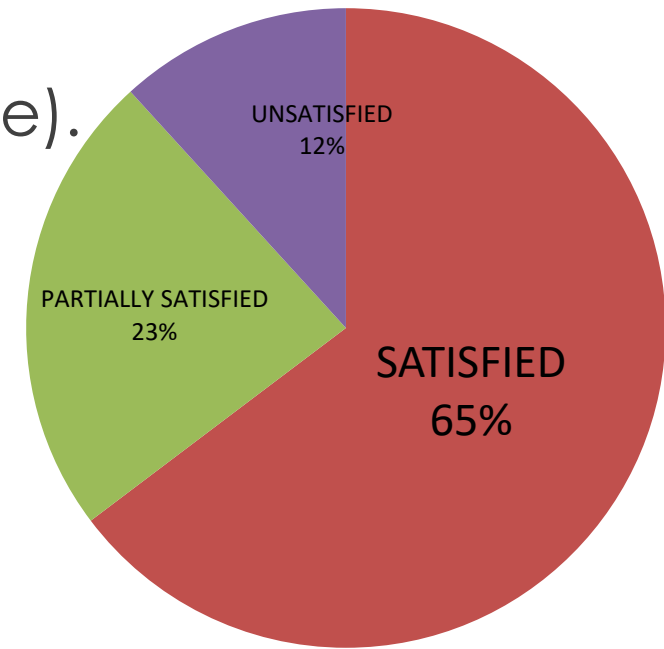
# Predictability

## EXPECTED DISTANCE VA



# Safety & expectation

- ▶ The predictability within 0.5 D was 83%. (**Safety 99.7%**).
- ▶ A total of **88%** were **satisfied** (complete & partial satisfaction )with the procedure and the toleration was 100%.
- ▶ 12% did not achieve their expectations (severe dry eye).
- ▶ 90% reported dry eye.



# Safety & expectation

- ▶ No patient reported lack of adaptation.
- ▶ No complications except epithelial down growth in 4 cases
- ▶ No permanent eye-glasses required.
- ▶ enhancement needed for 6 patients (6%), all within 1<sup>st</sup> year.
- ▶ 2 patients ask for extra glass either for reading or driving .

# CONCLUSIONS

- ▶ Laser Blended Vision(®) is an excellent option, well tolerated, stable and effective for patients with presbyopia, myopia, astigmatism, hyperopia or emmetropia.
- ▶ Excellent alternative for intraocular procedure.
- ▶ Satisfaction may need more than 6 mo.
- ▶ Patient selection & counseling are important .
- ▶ May start with minimal micromonovision (0.75-1.0) then increase to 1.5-2.0 latter if needed.

# CONCLUSIONS

***Be highly selective*** ▶

**Thank you very much**

