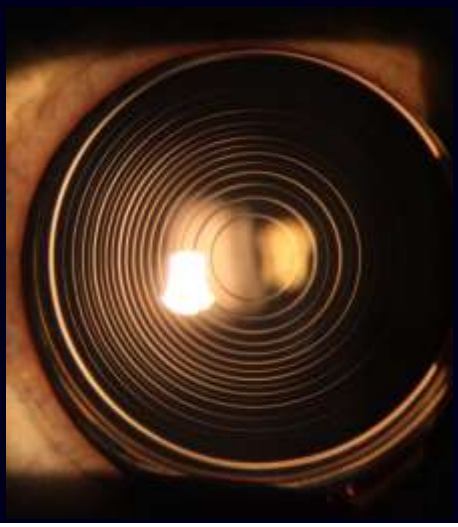
Diffractive Multifocal Lenses after Corneal Laser Vision Correction

SHERAZ DAYA MD FACP FACS FRCOphth FRCS(Ed)
MARCELA ESPINOSA MD
CRISTIA SUNGA BOptom



CENTRE FOR SIGHT

Financial Disclosure

	Company	Code
1.	Abbott Medical Optics Inc.	S
2.	Bausch + Lomb	C,L
3.	Carl Zeiss Meditec	C
4.	Clarvista	C
5.	Ellex	L
6.	Excellens	C, O
7.	LinCor Biosciences	C
8.	Medicem	C
9.	Nidek, Inc.	C,L
10.	Physiol	L
11.	PRN	O
12.	STAAR Surgical	C
13.	Strathspey Crown	C
14.	Scope Pharmaceuticals	C
15.	Rayner	C

C = Consultant / Advisor
E = Employee
L = Lecture Fees
O = Equity Owner
P = Patents / Royalty
S = Grant Support

CENTRE FOR SIGHT

Can Multifocals be used following LVC ?

Considerations following LVC

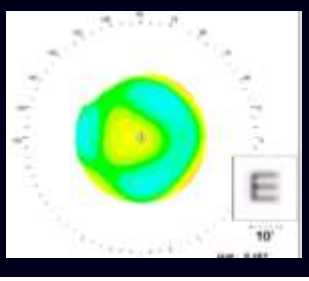
- Demanding patients
- Induced aberrations
- ? Reduced contrast – visual quality
- Dry eye
- Predictabililty - Accurate lens calculations

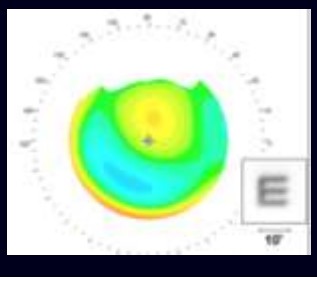
CENTRE FOR SIGHT

Post Laser vision Correction

Induced aberrations

- Spherical aberrations – oblate cornea / small zones
  - Myopia - POSITIVE SA
  - Hyperopia NEGATIVE SA
- Coma – decentered treatments





CENTRE FOR SIGHT

Issues following LVC

- Biometry Error
  - ? Measurement of effective corneal power
  - Refractive surprises
    - Myopic LVC - hyperopic
    - Hyperopic LVC – myopic
  - Why ?
    - Instrument error (not designed for abnormal corneas)
    - ACD error
    - Refractive index change ?
    - Calculation formulas

CENTRE FOR SIGHT

Diffractive Lenses following LVC

- Do Cornea optics combine with diffractive lenses ?
  - Potential for reduced performance – intermediate / near
  - Visual quality issues ?
- Is there a high enhancement rate ?
  - Lens calculation error
- Are NEGATIVE SA lenses harmful post-Hyperopic LVC?
- Is visual quality adversely affected ?

CENTRE FOR SIGHT

Patients & Methods

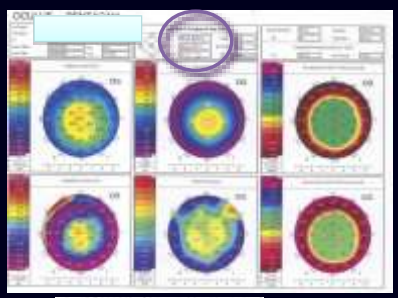
- Retrospective study from Post LVC with Diffractive lenses 2007
- N= 102 eyes 59 patients
- Mean Age: 63 years (range 42 to 79)
- Male: Female 43:61 (eyes)

	EYES	Patient	BILATERAL
Hyperopic LVC:	44	24	20
Myopic LVC:	58	35	23

CENTRE FOR SIGHT

Patients and Methods

- LENS CALCULATION
  - Pentacam Holladay Report K readings
  - Holladay 2 Formula
- SURGERY
  - 1.8mm Microincisional cataract surgery (Stellaris MICS)



	MYOPIA	HYPEROPIA
FINEvision	50	38
FINEvision Toric		2
AT LISA Toric	7	1
AcriLisa bifocal	1	3

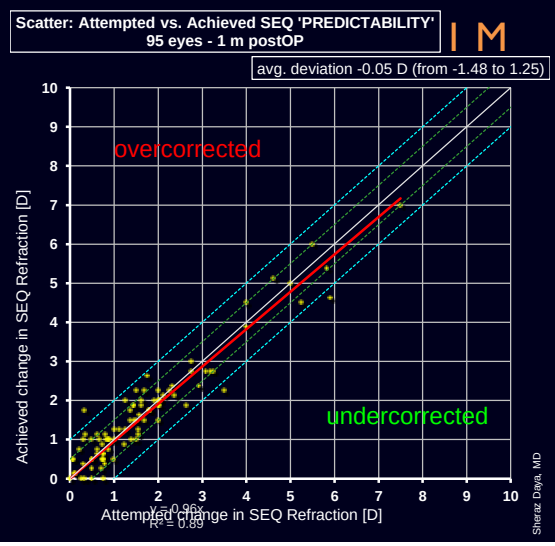
CENTRE FOR SIGHT

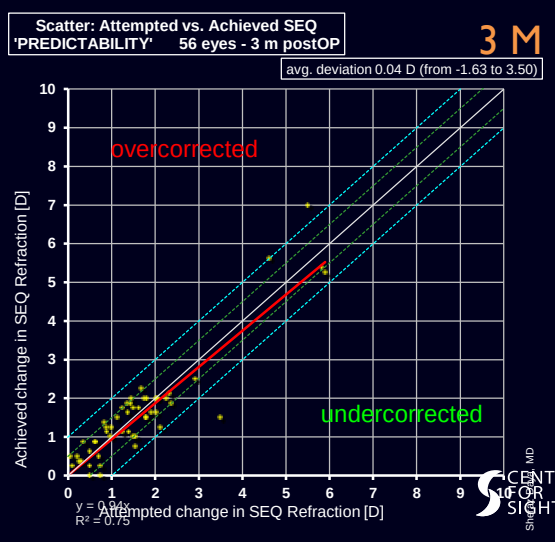
RESULTS – Refractive Outcomes

	PREOP n=104	1M n=95	3M n=56
Sph Equivalent	**-0.10** D ± 2.14 (range -7.50 to +3.50)	**-0.11 D** ± 0.50 (range -1.50 to +1.25)	**0.03 D** ± 0.77 (range -1.63 to 3.50)
Cylinder	**0.56 D** ± 0.48 (range -2.25 to 0.00)	**0.41 D** ± 0.46 (range -2.75 to 0.00)	**0.46 D** ± 0.45 (range -1.50 to 0.00)

CENTRE FOR SIGHT

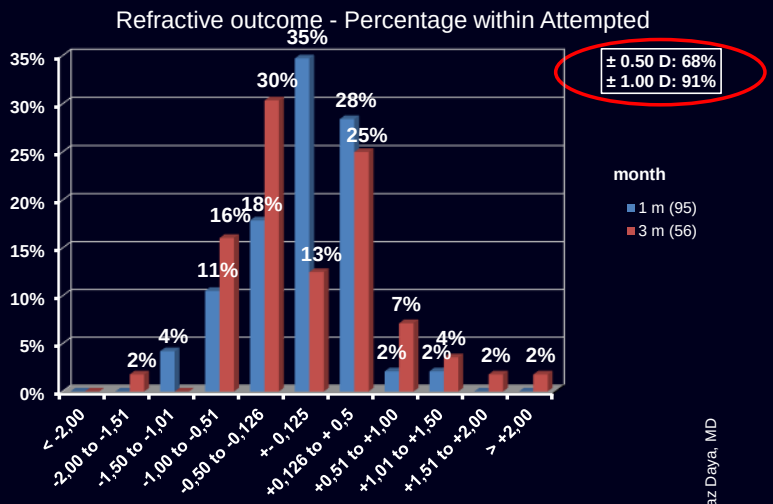
PREDICTABILITY





CENTRE FOR SIGHT

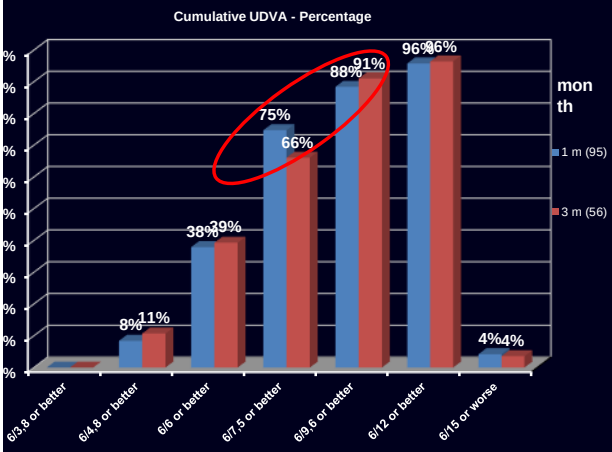
Refractive outcome

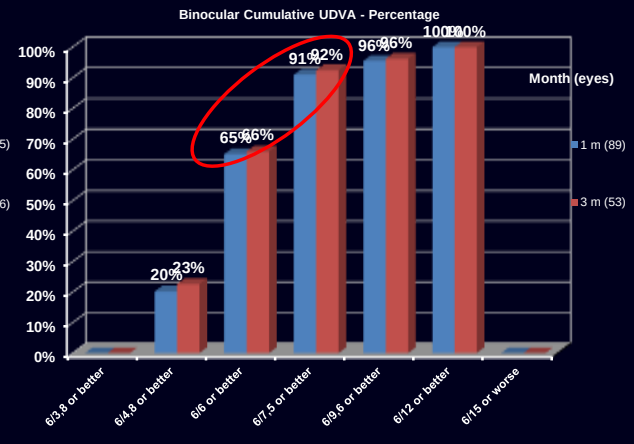


Sheraz Daya, MD

CENTRE FOR SIGHT

UDVA



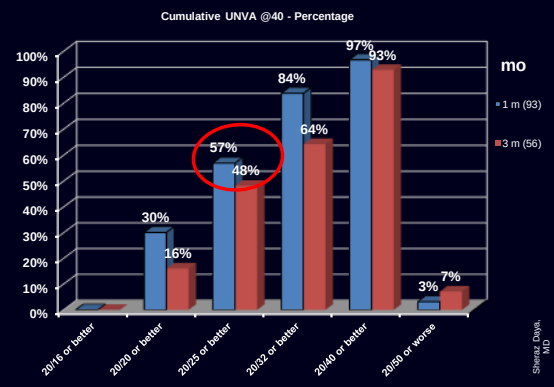


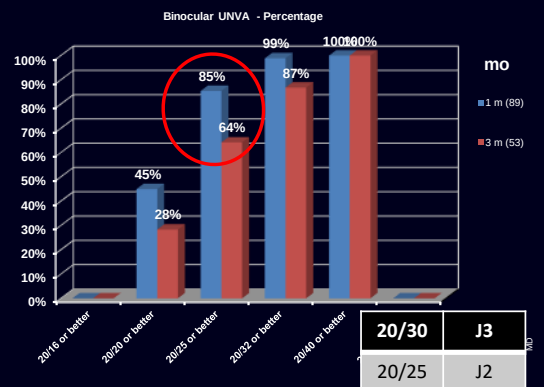
Sheraz Daya, MD

CENTRE FOR SIGHT

Sheraz Daya, MD

UNVA 40cm

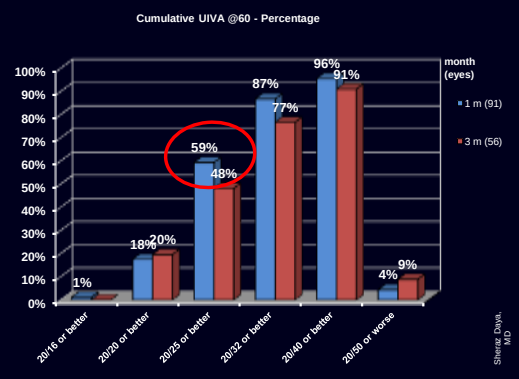


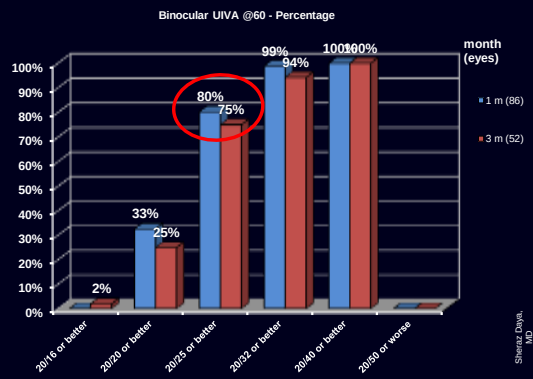


20/30	J3
20/25	J2
20/20	J1

CENTRE FOR SIGHT

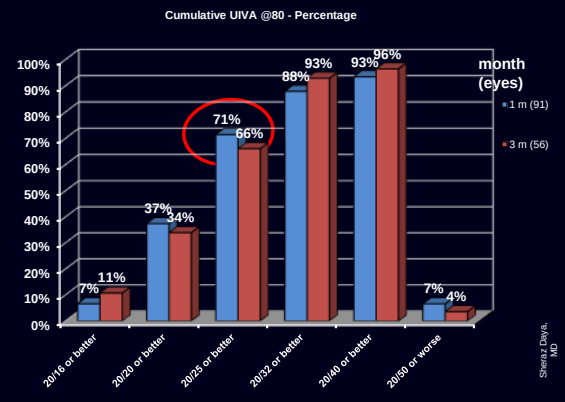
UIVA 60cm

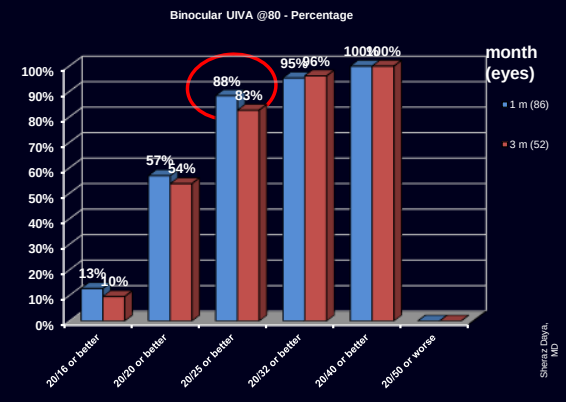




CENTRE FOR SIGHT

UIVA 80cm

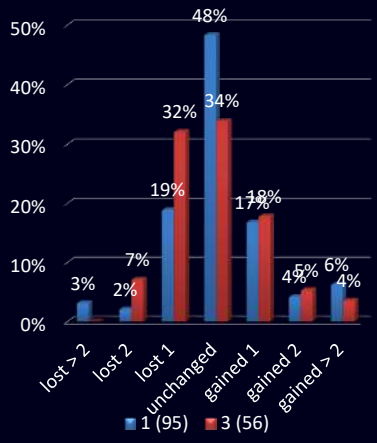




CENTRE FOR SIGHT

SAFETY

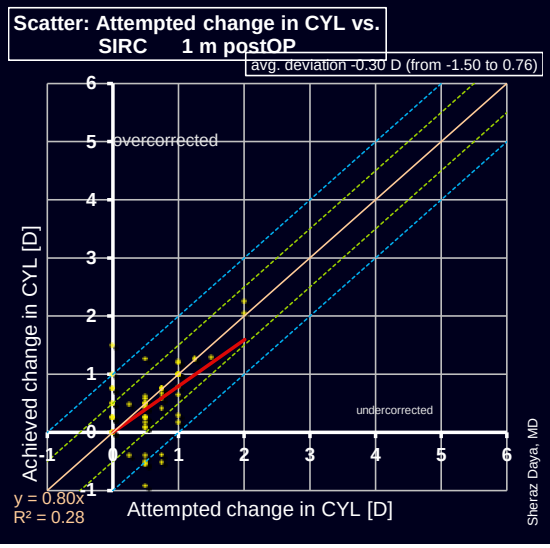
Change in CDVA - Percentage 'SAFETY'

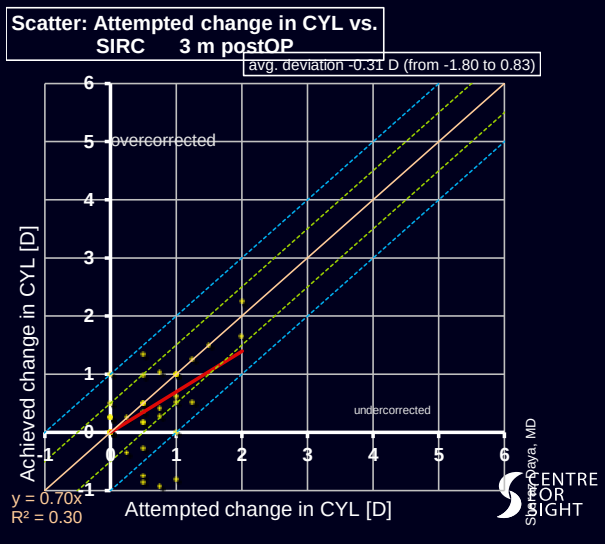


Sheraz Daya, MD

CENTRE FOR SIGHT

ASTIGMATISM





Q values post LVC

- Hyperopic

Q value	Mean	SD	Range
Pentacam (n=29)	**-0.521**	0.303	-0.06—1.50
OPD 3(n=29)	**-0.516**	0.239	-0.17—1.129

Myopic*

Q value	Mean	SD	Range
Pentacam (n= 26)	**+0.271**	0.461	-0.20 to -1.11
OPD 3 (n=25)	**+0.322**	0.547	-.17 to -2.02

* I eye "blended vision"

CENTRE FOR SIGHT

Corneal Aberrations

- Hyperopic

OPD 3 4mm	SA	COMA	TOTAL
Mean	**0.074**	**0.237**	**0.392**
SD	0.0717	0.188	0.284
Range	0.013 – 0.242	0.078 - 0.825	0.087 - 1.296

PENTACAM	SA	HOA
Mean	**0.148**	**0.601**
SD	0.105	0.172
Range	0.066 to 0.312	0.512 - 1.068

Myopic

OPD 3 4mm	SA	COMA	TOTAL
Mean	**0.139**	**0.261**	**0.404**
SD	0.133	0.346	0.456
Range	0.023 -0.513	0.037 - 0.806	0.900 – 1.027

PENTACAM	SA	HOA
Mean	**0.788**	**1.215**
SD	0.252	0.401
Range	0.591 - 1.046	0.891 – 1.821

CENTRE FOR SIGHT

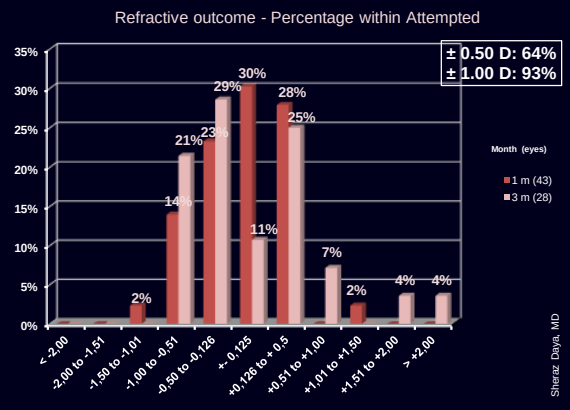
Hyperopia (n=45) vs Myopia (n=59)

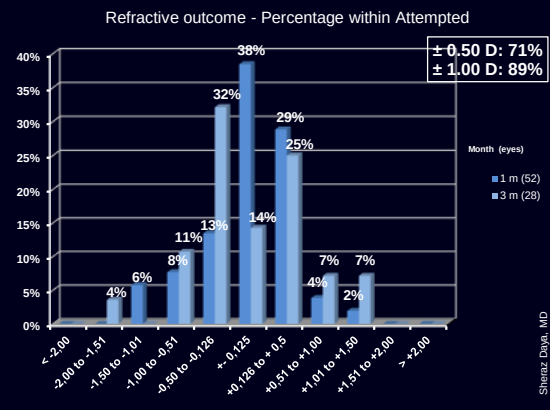
	PREOP (n=45)	1M (n=43)	3M (n=28)
SPH EQUIV	**0.98 D ±** 1.51 (range-5.88 to +3.50)	**-0.15 D** ± 0.46 (range -1.00 to +1.25)	**-0.00 D** ± 0.87 (range -0.75 to +3.50)
CYL	**0.56 D ±** 0.42 (range -2.00 to 0.00)	**-0.54 D** ± 0.51 (range -2.75 to 0.00)	**-0.57 D** ± 0.51 (range -1.50 to 0.00)

	PREOP (n=59)	1M (n=52)	3M (n=28)
SPH EQUIV	**-0.93 D** ± 2.19 (range -7.50 to +2.00)	**-0.08 D** ± 0.53 (range -1.25 to +1.75)	**0.06 D** ± 0.66 (range -1.63 to 1.50)
CYL	**-0.56 D** ± 0.52 (range -2.25 to 0.00)	**-0.29 D** ± 0.38 (range -1.50 to 0.00)	**-0.35 D** ± 0.36 (range -1.00 to 0.00)

CENTRE FOR SIGHT

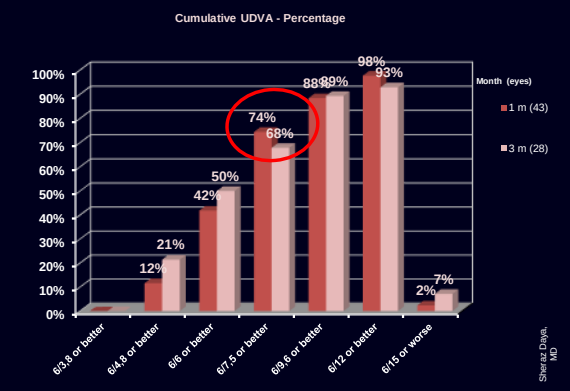
Hyperopic vs Myopic Diffractive post LVC

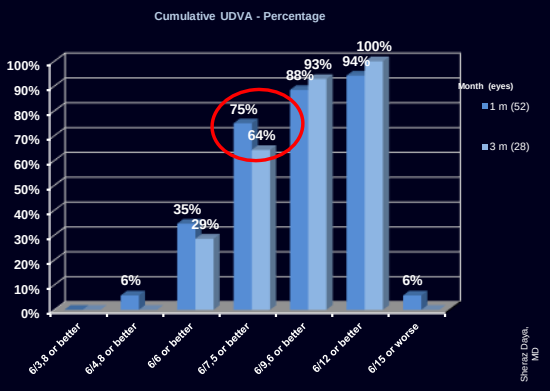




CENTRE FOR SIGHT

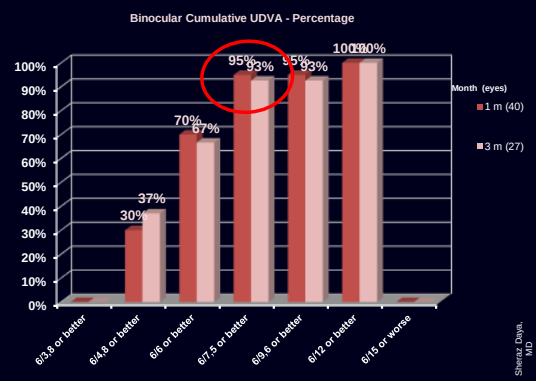
Hyperopic vs Myopic Diffractive post LVC
Monocular UDVA

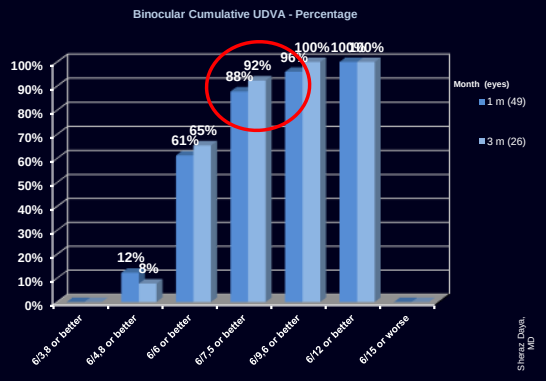




CENTRE FOR SIGHT

Hyperopic vs Myopic LVC –Binocular UDVA

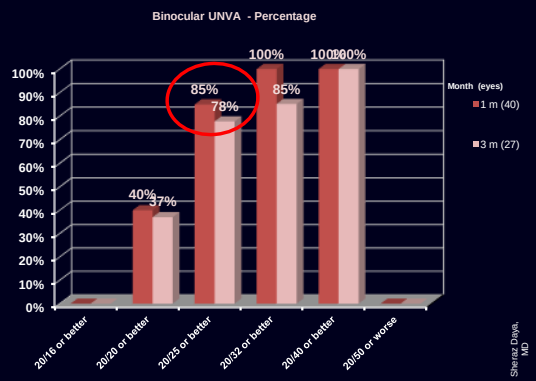


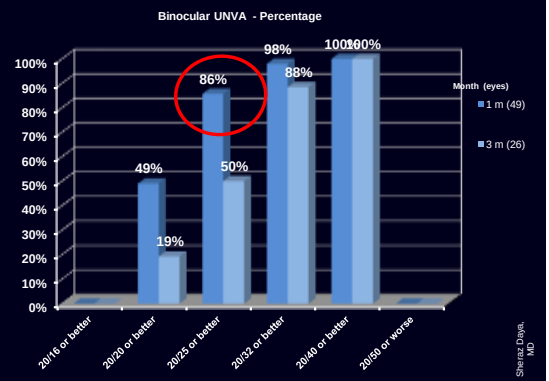


CENTRE FOR SIGHT

Hyperopic vs Myopic LVC

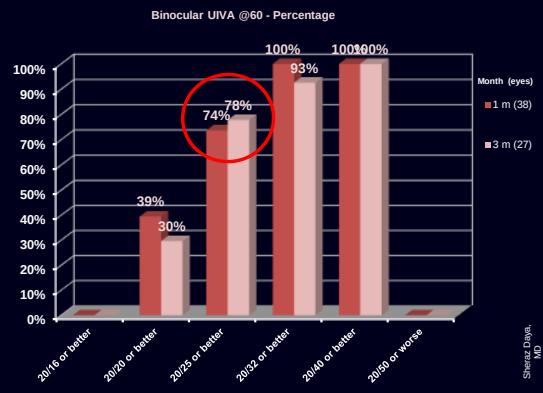
UNVA(40cm) Binocular

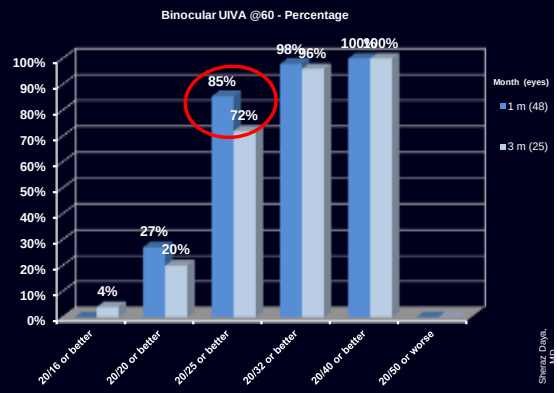




CENTRE FOR SIGHT

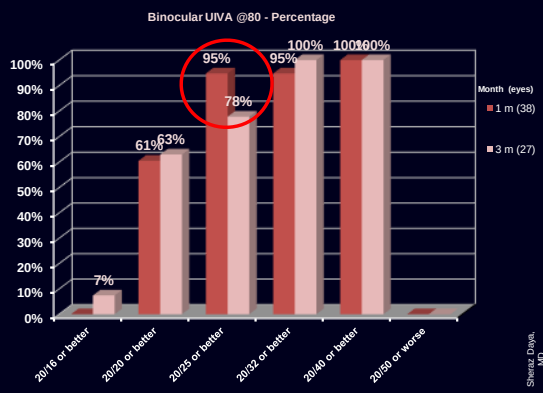
Hyperopic vs Myopic LVC
Binocular 60cm

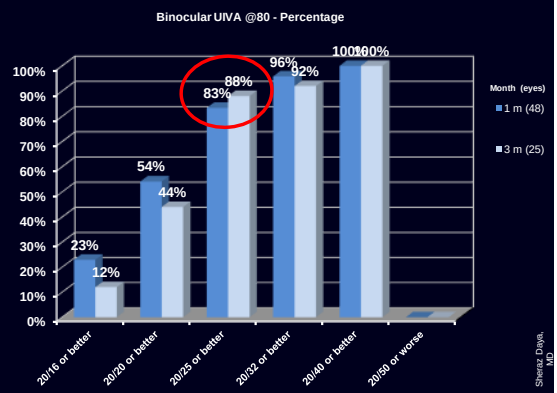




CENTRE FOR SIGHT

Hyperopic vs Myopic LVC
Binocular 60cm

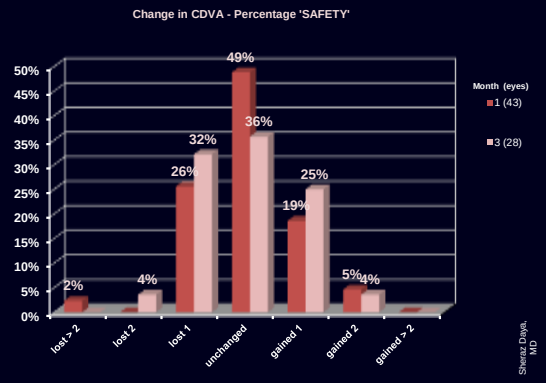


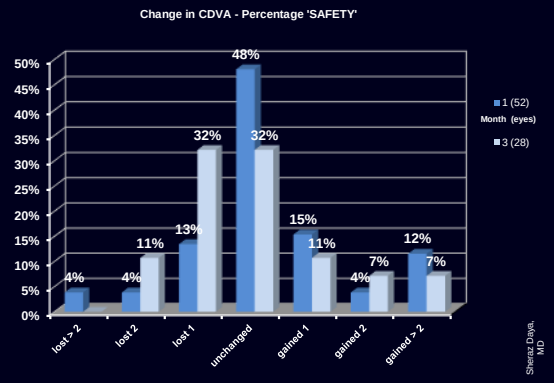


CENTRE FOR SIGHT

Hyperopic vs Myopic LVC

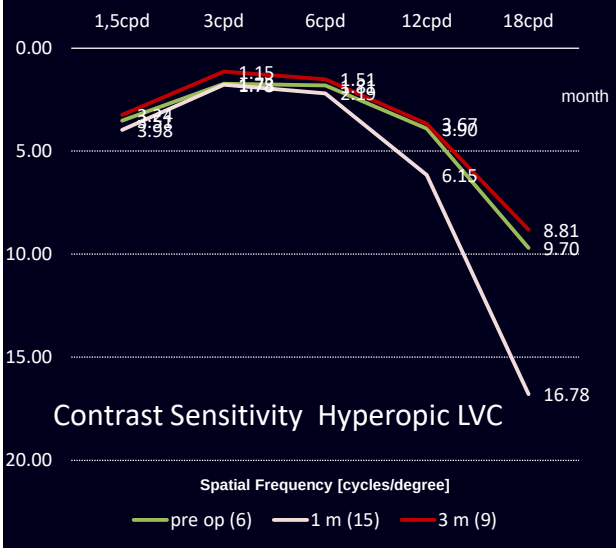
Safety

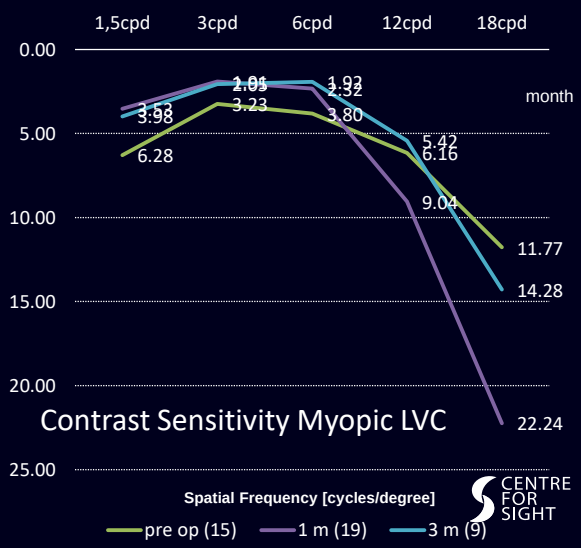




CENTRE FOR SIGHT

Hyperopic vs Myopic LVC - Contrast





CENTRE FOR SIGHT

Interventions

- Enhancements 6 eyes (6%)
  - 3 Lasik (2 prev Hyperopia , 1 myopia)
  - 1 PRK (prev myopia)
  - 2 piggyback lenses (H Lasik)
- Decentered Trifocal 1 eye
  - Required re-centration
- Explantations 0 eyes
- YAG Capsulotomies 6 eyes

CENTRE FOR SIGHT

Diffractive Lenses following LVC

- Did Corneal optics combine with diffractive lenses ?
  - YES – good performance – better in Hyperopic LVC
- Was there a high enhancement rate ?
  - 7% in this study
- Were NEGATIVE SA lenses harmful in post Hyperopic LVC ?
  - no impact – Hyperopic LVC did better than myopes !
- Was visual quality adversely affected ?
  - Contrast sensitivity good at 3 months in both groups- Hyperopic LVC did better
  - No patient complaints – <u>all spectacle free</u>

CENTRE FOR SIGHT

Conclusions

- Diffractive lenses can be used in patients following Corneal Ablative Refractive Surgery
- Consider aberrations at 4.0mm rather than 6.0mm
- Holladay Report / Holladay 2 – accurate IOL calculation
- Careful patient selection and counselling – recommended

CENTRE FOR SIGHT

Thank you …

CENTRE FOR SIGHT