



NewVision Clinics

Understanding and Correcting for Toric IOL Refractive Surprises

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Dr Alpins and Mr Stamatelatos
have a financial interest in the
ASSORT® Surgical Management Systems

Why the surprise?*

- **SIA** (phaco incision) and preop measurement variation
- **Magnitude** of toric IOL (non-optimized lens constant)
- **Misalignment** of IOL
- **Ocular residual astigmatism (ORA)**
Pre-existing idiosyncrasies

* [Alpins N, Ong JKY, Stamatelatos G. Refractive surprise after toric intraocular lens implantation: Graph analysis. J Cataract Refract Surg 2014; 40: p. 283-294.](#)

Case Study

- LP 45 y.o
- OD
- Cataract Sx
- Unaided VA < 20/200
- Manifest refraction -9.25 / -5.75 x 178 (20/30)
- K readings 41.87 / 46.00 @ 94

Preop IOL selection (www.assort.com)

Identification

Surgeon

Patient



Pre-op Parameters

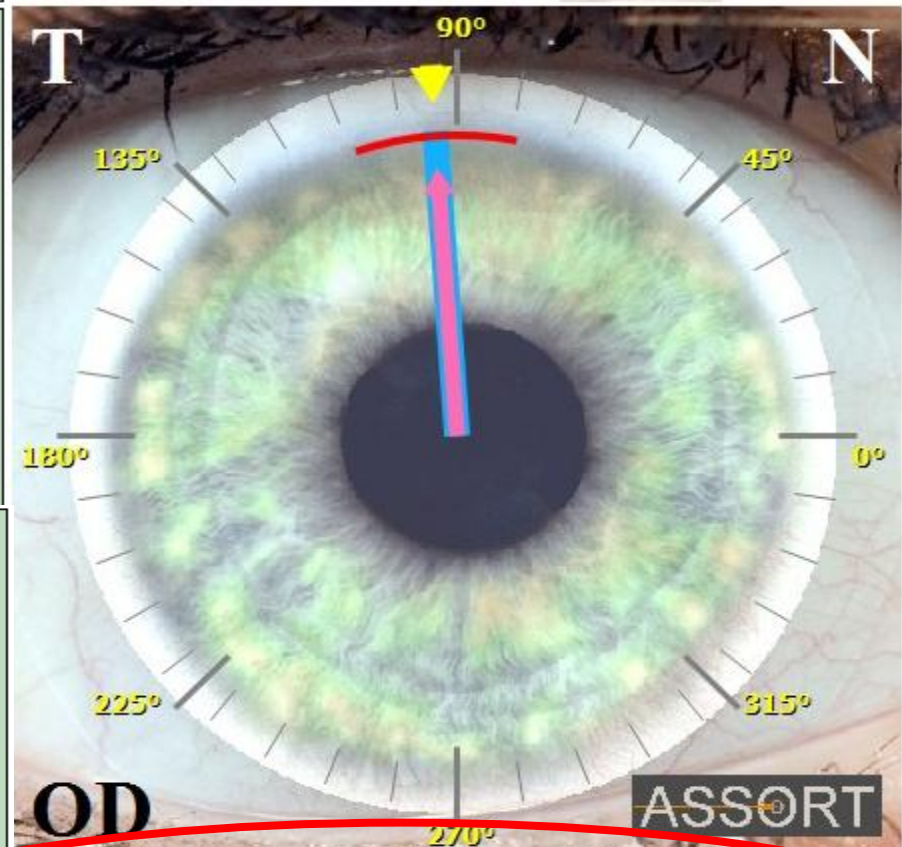
	Flat	Steep	Steep Meridian	
Keratometry	41.87	46.00	@ 94	☒ D ☐ mm
Corneal Refractive Index	1.3375 ▼			
Phaco Incision Flattening	0.50 D			
Phaco Incision Meridian	94 °			
Phaco Target	3.63	@	94	
Axial Length	26.70 mm			

Implant Parameters (IOL plane)

IOL Type ▼

	Sph Equiv	Cylinder	Planned +ve Axis
IOL Power	10.50	5.25	94
	Sphere 7.88		

SRK/T A Constant
Effective lens position (mm)



IOL Power

3.42 Ax 94 (corneal plane)

Expected Refraction

-0.12 / 0.22 Ax 94 (corneal plane)

Postop refractive surprise! (www.assort.com)

Implant Parameters (IOL plane)

IOL Type

Details ...

Sph Equiv Cylinder Planned +ve Axis

IOL Power

Sphere

SRK/T A Constant: 118.40
Effective lens position (mm): 6.16

Set lens constant

Post-op Analysis

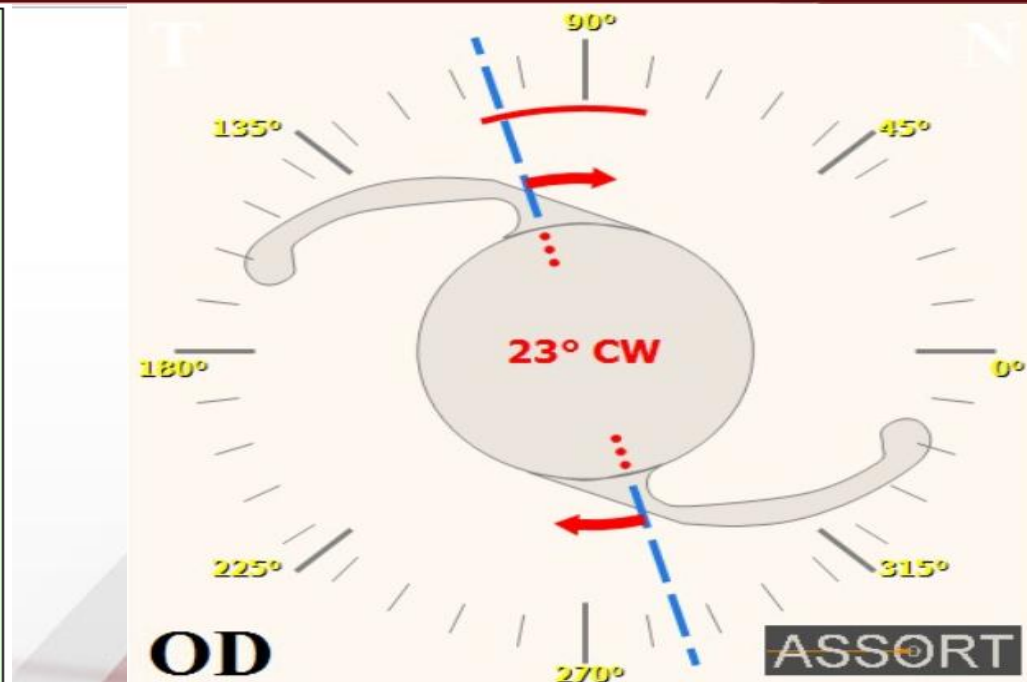
Actual IOL axis

Manifest Refraction Sphere / Cylinder X Axis

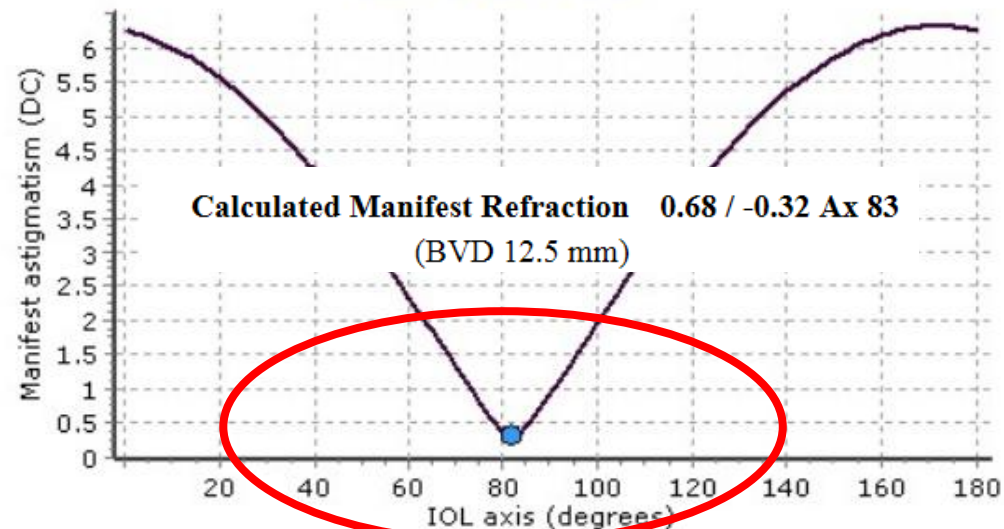
Back Vertex Distance mm

Minimum refractive cylinder should occur when the IOL axis is at 82°

Rotate



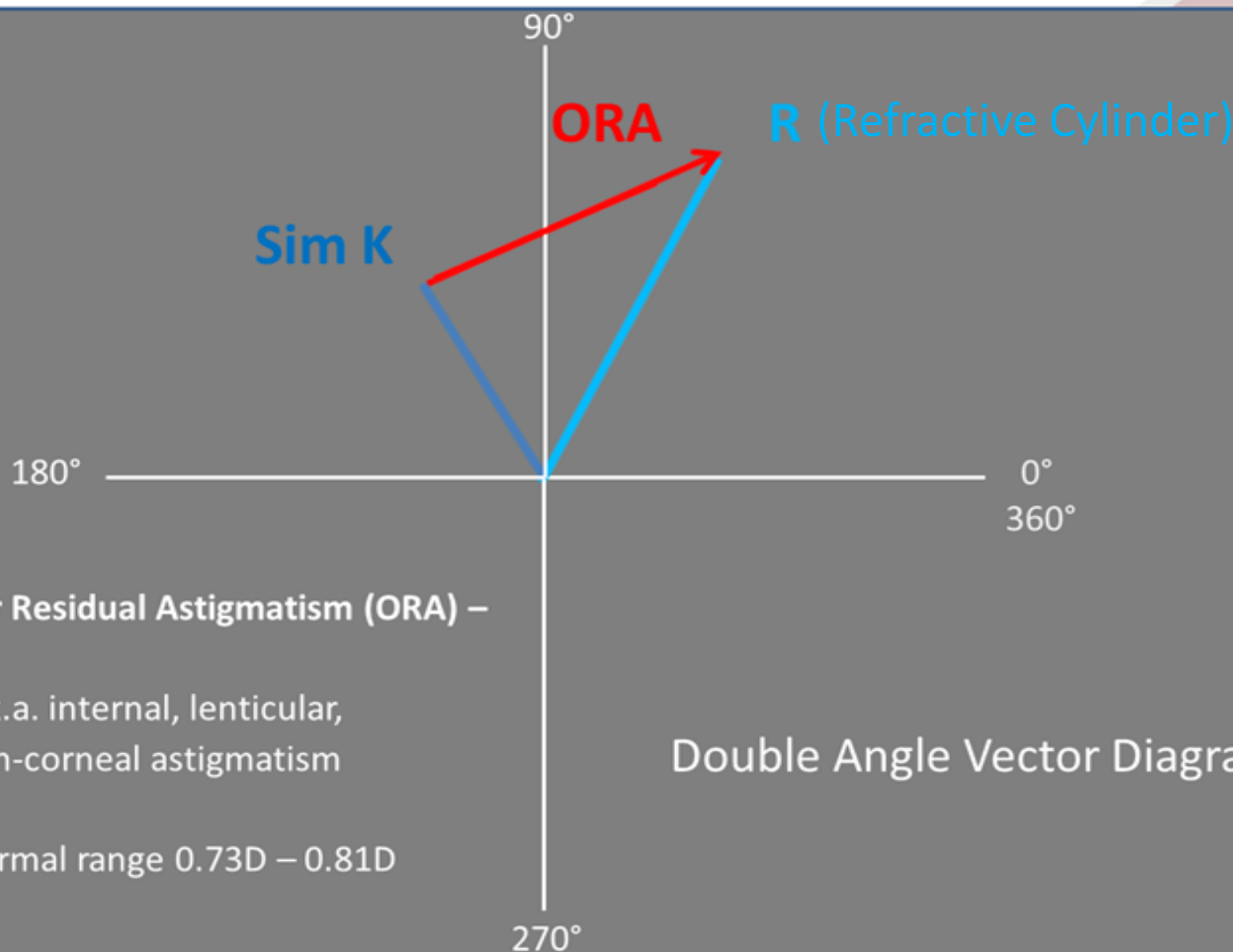
Effect of lens rotation



Unavoidable sources of error

- **ELP** - Lens position different to that expected
- **Rotation** of IOL post surgery
- **ORA** - pre-cataract ORA / lenticular astigmatism

Corneo-Refractive vectorial difference (ORA)



Ocular Residual Astigmatism (ORA) –

- a.k.a. internal, lenticular, non-corneal astigmatism
- normal range 0.73D – 0.81D

Double Angle Vector Diagram

Case Study 2

- PR 48 y.o
- OD
- RLE Sx
- Unaided VA 20/60
- Manifest refraction +6.50 / -5.75 x 95 (20/20)
- K readings 37.87 / 41.75 @13

Preop IOL selection (www.assort.com)

Identification
Surgeon
Patient

Pre-op Parameters

Flat	Steep	Steep Meridian	
Keratometry 37.87	41.75	@ 13	☒ D ☐ mm
Corneal Refractive Index 1.3375			
Phaco Incision Flattening 0.50			D
Phaco Incision Meridian 193			°
Phaco Target 3.38			@ 13
Axial Length 23.78			mm

Implant Parameters (IOL plane)
IOL Type

Sph Equiv

IOL Power
Sphere

Cylinder

☒ SRK/T A constant
☐ Holladay 1 Surgeon Factor
☐ Hoffer Q pACD

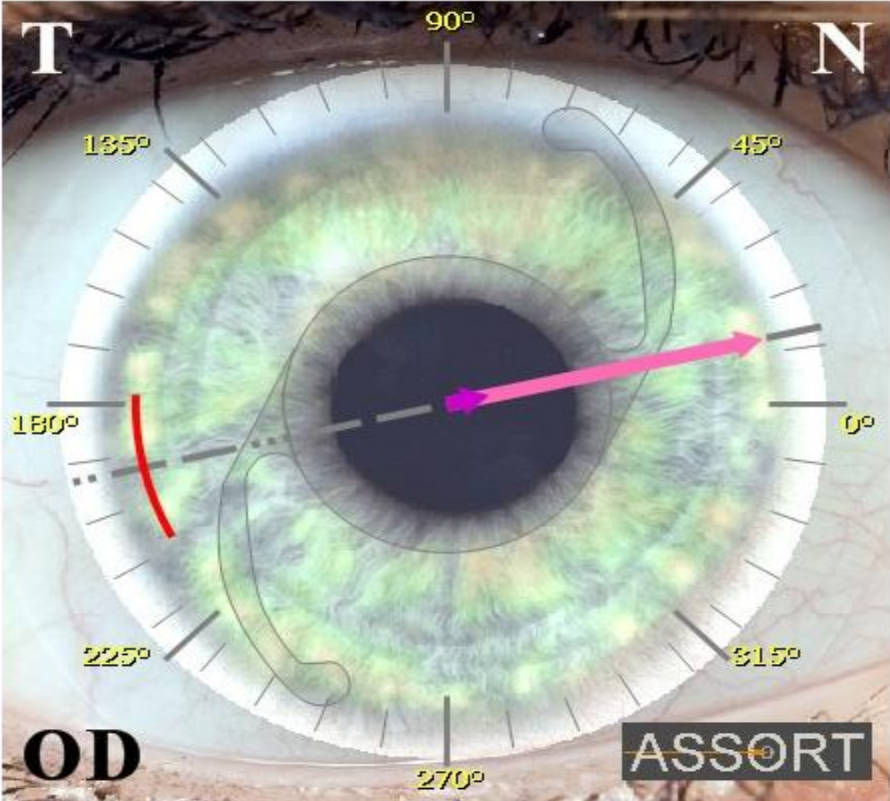
+ve Axis

Value

Effective lens position: 5.06 mm



☒ OD
☐ OS



Phaco Incision	
Phaco Flattening	0.50 @ 13
Phaco Target	3.38 @ 13
IOL Power	3.00 Ax 13 (corneal plane)
Expected Refraction	0.18 / 0.45 Ax 13 (corneal plane) -cyl

Dr Noel Alpines

Preop IOL selection (www.assort.com)

Pre-op Parameters

Flat Steep Steep Meridian
Keratometry @ ☒ D ☐ mm
Corneal Refractive Index
Phaco Incision Flattening D
Phaco Incision Meridian °
Phaco Target @
Axial Length mm

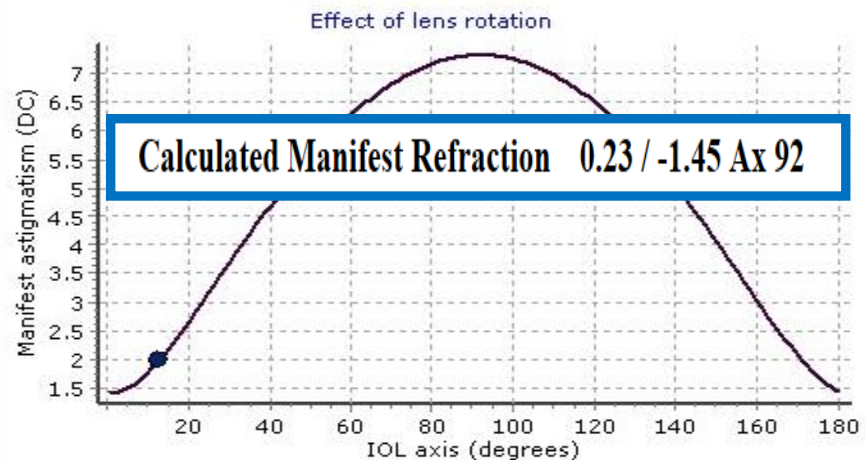
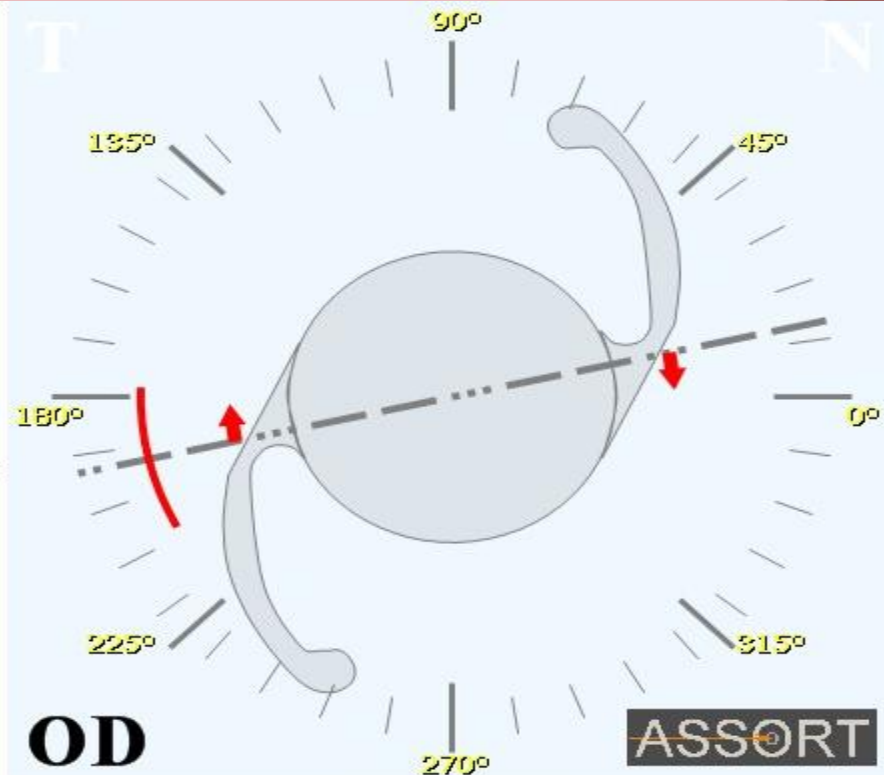
Implant Parameters (IOL plane)

IOL Type
Sph Equiv
IOL Power Sphere
Cylinder
+ve Axis
☒ SRK/T A-constant Value
☐ Holladay 1 Surgeon Factor
☐ Hoffer Q pACD
Effective lens position: 5.06 mm

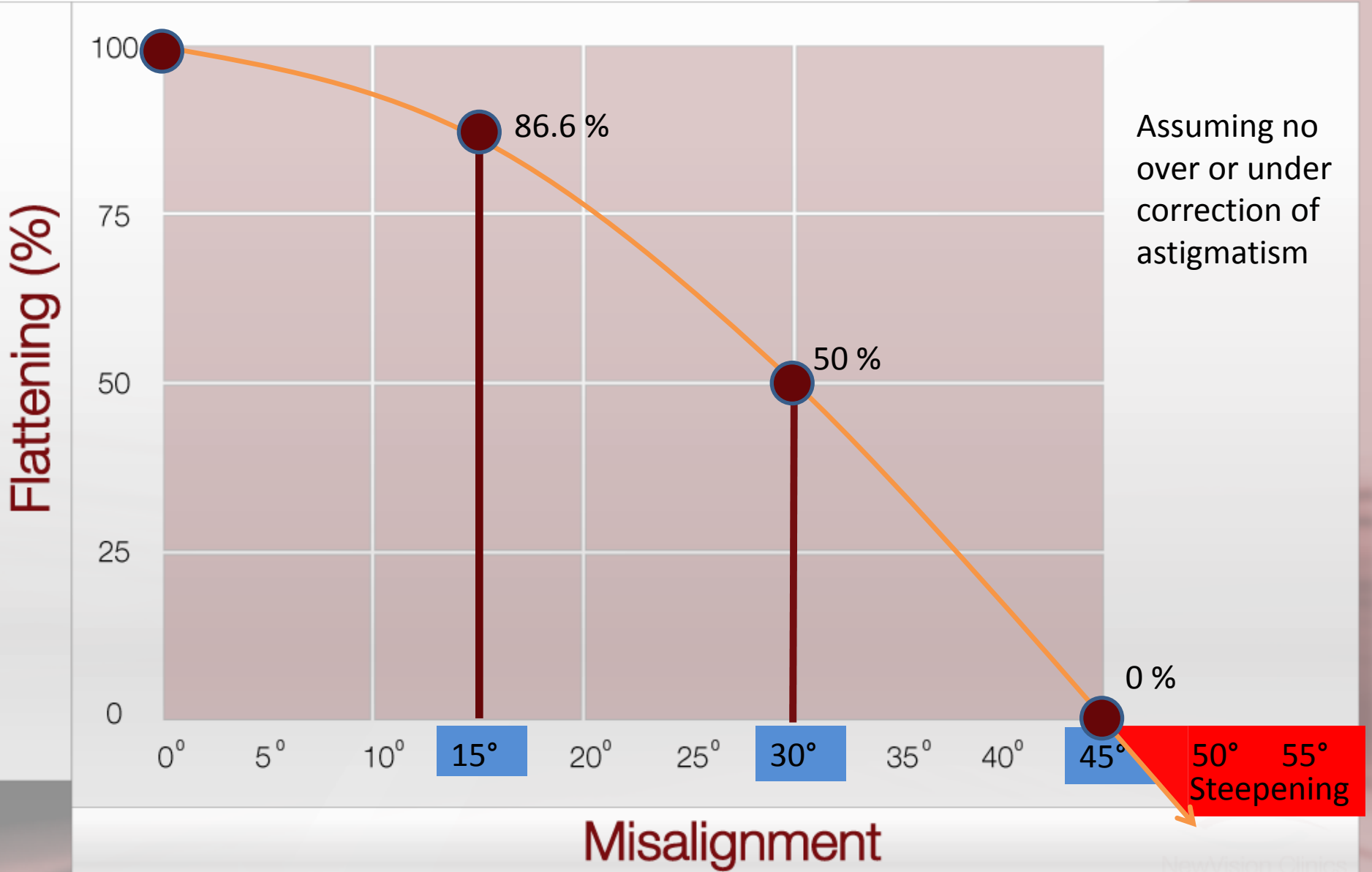
Post-op Parameters

Manifest Sphere Cylinder Axis
Refraction
Back Vertex Distance mm

Minimum refractive cylinder has been calculated to occur at an IOL axis of 2 degrees



Effect of toric IOL misalignment



Summary – IOL refractive surprise

Treatment modes for toric IOL refractive surprises:

- **Rotation of IOL**– where good reduction of refractive cylinder is achievable
- **Exchange of IOL** – magnitude error only
- **LASIK** – to correct both magnitude and axis problems