

# Revealed astigmatism versus residual astigmatism after multifocal toric IOL implant

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## Background & Objectives

Patient with mild corneal scarring and multifocal toric IOL (TIOL) was unhappy with vision after cataract surgery. To investigate possible causes and find proper solutions, a rigid gas permeable (RGP) and soft toric contact lens (CL) were both trialed. This case demonstrates the difference between "residual astigmatism" and the "revealed astigmatism" of a TIOL + RGP.

- Residual astigmatism = astigmatic refractive error after IOL implant
- Revealed astigmatism = astigmatic refractive error equal to the cylindrical power of an IOL implant, induced by neutralizing corneal astigmatism
- Front surface toric RGP = spherical back surface RGP with cylindrical power on the front surface of the lens
- Importance of expectations and lifestyle considerations for surgical planning

### Pre-operative evaluation

- 65 YOF presents for cataract eval
- POHx:
- nuclear sclerosis OU
- soft multifocal CL wear OS only (dominant eye OS), failed monovision CL

	OD	OS
Visual Acuity	(sc) 20/70 and J3	cc 20/50 and J2
Manifest Refraction	+0.50-2.25x105	+1.25-1.25x085

#### Slit Lamp and Fundus Exam External Exam Normal Normal External Slit Lamp Exam Lids/Lashes s/p blepharoplasty UL s/p blepharoplasty UL Conjunctiva/Sclera faint round ant stromal scar 10:00, faint round ant stromal scar 10:00, Cornea shagreen , +FR, no staining, no guttae, no | shagreen , no staining, tr guttae central, no **Anterior Chamber** Normal Normal Normal, dilates >7mm Normal, dilates >7mm 2+ NS, 1+ CS 2+ NS Lens Vitreous Posterior vitreous detachment Posterior vitreous detachment **Fundus Exam** Left Normal Normal Disc C/D Ratio 0.4 RPE mottling temporal to fovea Macula Normal Vessels Normal Normal Periphery Normal Normal

• Patient sent to retina specialist for eval prior to cataract surgery and was cleared for multifocal toric IOL

# Cataract surgery

- Pt underwent cataract extraction with MFTIOL OD, then OS
- MFTIOL OS: DFT415 (=1.55 DC), +23.00D, 24 degree meridian, aim +0.45D
- Pt reported good uncorrected vision at POD1 and POW1 OS
- POD1: UCVA 20/50-2
- o POW1: 20/150, BCVA 20/50
- POM1: BCVA 20/50; pt reports worse and fluctuating vision OS. MRx: -0.75 1.50 x 045

## Post-operative care and CL fitting

• Due to anterior stromal scars, RGP over-refraction was performed. BCVA was 20/25-3 with ORx of:

Can you guess the RGP ORx?

(pl-1.50x025)

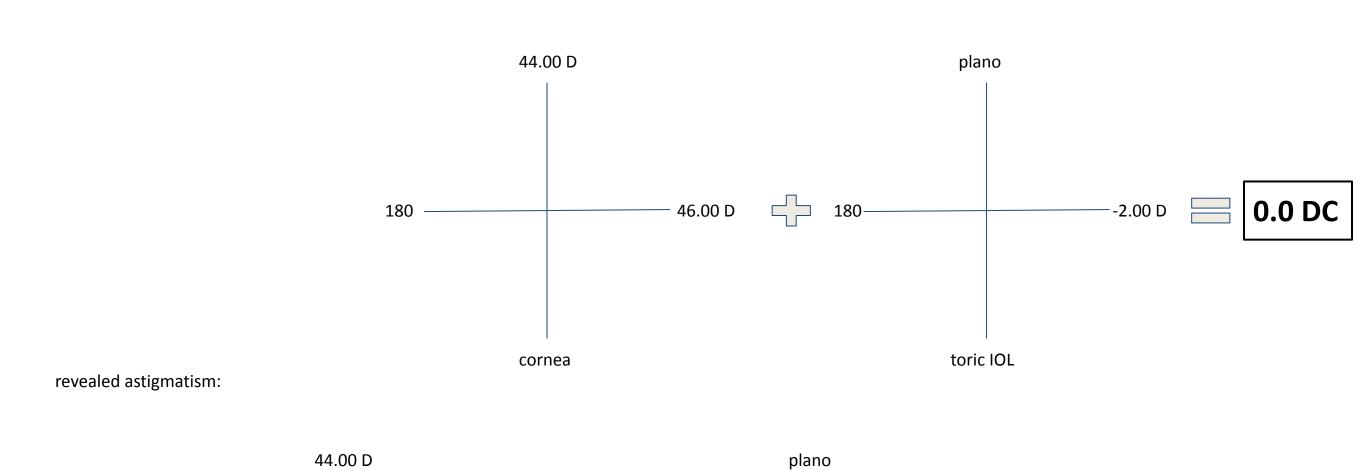
- Pt elected to proceed with RGP fit.
- Ordered CL: Boston ES / 7.9 bc / 9.1 dia / pl -1.50 x025
- 20/25-2, adequate fit, lens dispensed
- Next f/u: pt reported fluctuating vision
  - O VA 20/50+1
  - CL fit: inferiorly decentered
  - ORx +0.75-1.25x045, VA 20/25+1
- A soft toric CL was instead trialed: Biofinity Toric 8.7 bc / 14.5 dia / -0.50 -1.25 x030:
  - o good fit, no rotation, 20/25+1 and J7, no ORx
  - The patient wanted to try multifocal CL in order to enhance her near vision. A soft toric multifocal, comfilcon A / 8.7 bc / 14.5 dia / -0.50-1.25x030 ADD+2.00D was ordered
- Next f/u: pt reported improved comfort, but wanted more intermediate vision,
  - VAcc 20/30-2 and J2.
  - CL well centered, adequate movement, and no rotation.
  - $\circ$  ORx = +0.75, VA 20/20-2 and J2 with subjective improvement in computer vision
- Finalized CL OS: comfilcon A / 8.7 BC / 14.5 DIA / +0.75 -1.25 x030 ADD +2.00D

# Conclusion

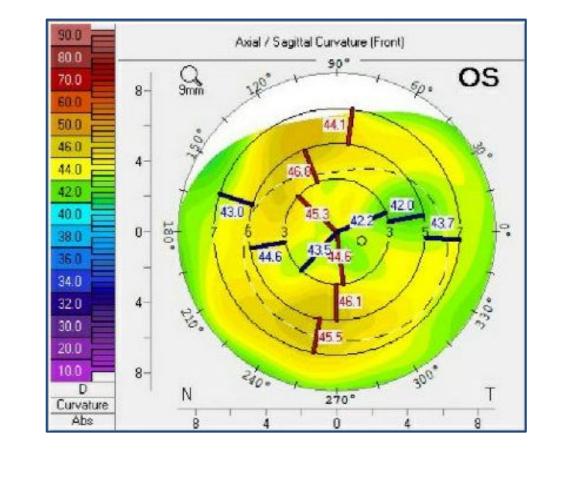
When visual outcome after cataract surgery is poor, underlying pathology must be considered before further correction is pursued. Due to patient's corneal scarring, an RGP was trialed in the event that there was sub-clinical irregular astigmatism. However, once an RGP is placed on the cornea, all corneal astigmatism is eliminated, thus revealing all of the cylindrical power from a toric IOL. The required RGP becomes toric, which can involve lens awareness and fluctuation in vision if prism-ballasted front surface toric needs to be made. In contrast, residual refractive error occurs after most cataract surgery to varying degrees of severity. Similar to phakic eyes, against-the-rule and oblique astigmatism have a greater impact on uncorrected visual acuity, as displayed in this case (1). Trialing a CL can help the patient and surgeon decide on next steps for correction of residual refractive error.

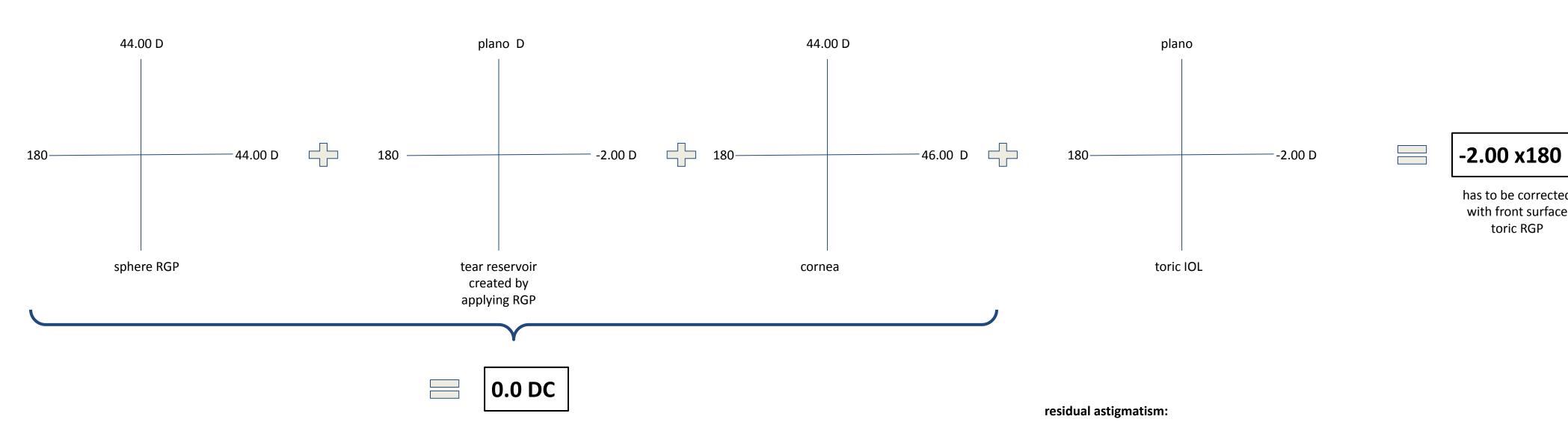
#### Causes of residual refractive error (2)

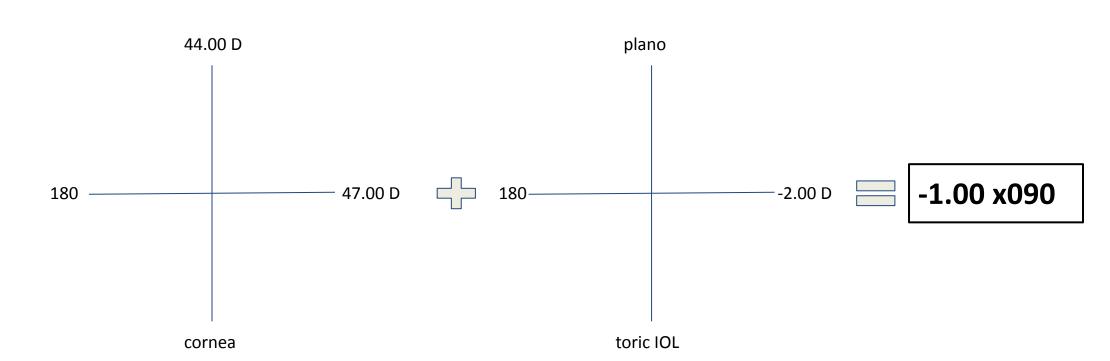
- ocular surface disease
- anterior basement membrane dystrophy
- other irregular astigmatism
- surgically induced astigmatism
- posterior astigmatism
- extremes of axial length/IOL prediction errors
- IOL tilt



ideal toric IOL outcome:







# References

- 1. Hasegawa, Yumi, et al. "Type of Residual Astigmatism and Uncorrected Visual Acuity in Pseudophakic Eyes." *Nature News*, Nature Publishing Group, 24 Jan. 2022, https://www.nature.com/articles/s41598-022-05311-x.
- 2. Jeremy Z. Kieval, MD. "Residual Astigmatism after Iol Implantation." *Review of Ophthalmology*, 6 July 2015, https://www.reviewofophthalmology.com/article/residual-astigmatism--after-iol-implantation.

