Clinical Evaluation of Iris and Femtosecond Guided Toric IOL Alignment for the Treatment of Low Refractive Astigmatism

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Surgical Goals: Toric IOLs

Consistently:

- Excellent UCVA
- High Patient Satisfaction
- Reduction or elimination of astigmatic error

Residual error impacts all of these, severely

Important to be on target with both sphere and cylinder

Goal: 0.5D or less of astigmatism

Presbyopic Toric & Monofocal Toric IOLs

Bifocal, Trifocal & EDOF Toric IOLs

Lowest power torics:
Correct 1D of astigmatism at Corneal Plane

Monofocal Torics

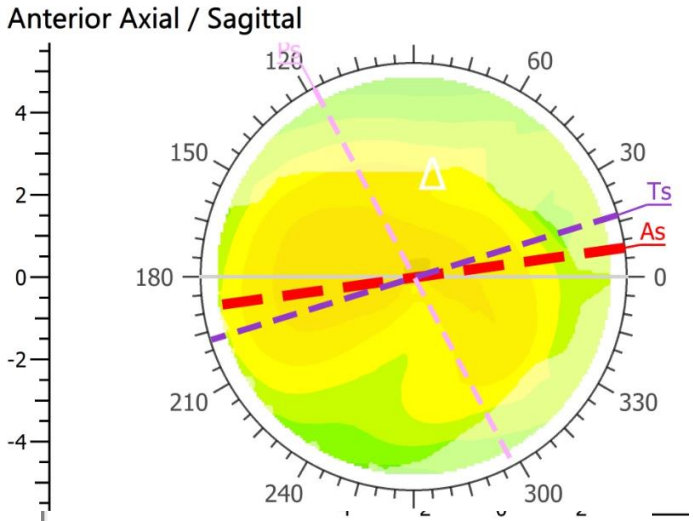
Alcon & JNJ: Correct 1D of astig at Corneal Plane
B&L: Corrects 0.85D of astig at Corneal Plane

Light adjustable lens

Corrects low levels of astigmatism - but is not part of this talk

Preop planning

Corneal topography performed: Photos of iris taken at the same time



K-READINGS

Keratometric SimK	(n=1.3375)
Average K	44.80 D (7.53 mm)
Steep K	45.05 D (7.49 mm) @ 8°
Flat K	44.54 D (7.58 mm) @ 98°
Astigmatism	0.51 D

Would you consider a toric IOL in a patient who has just 0.51D of astigmatism?

Based on work by Doug Koch, MD, Liz Yeu, MD and Mitch Weikert, MD at Baylor

The posterior cornea adds 0.4D to 0.6D of horizontal astigmatism

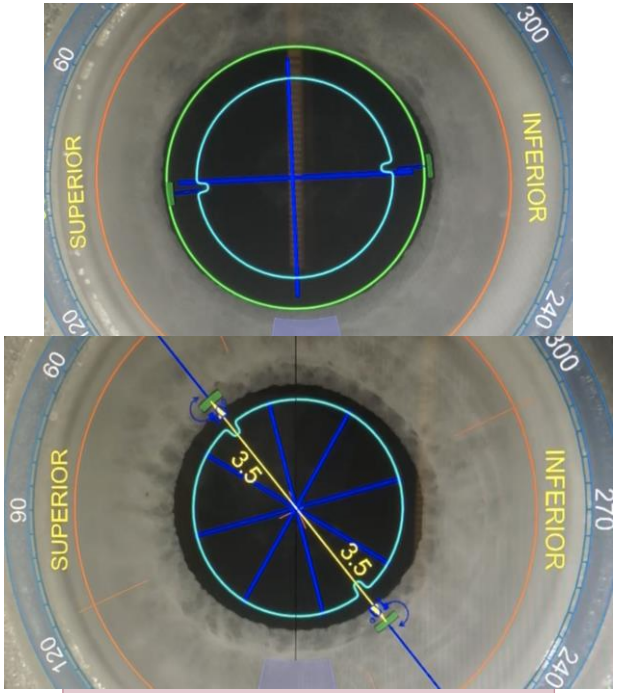
Total Cornea	
Astigmatism	0.97 D @ 17° (Steep

Measured Total Corneal Astigmatism

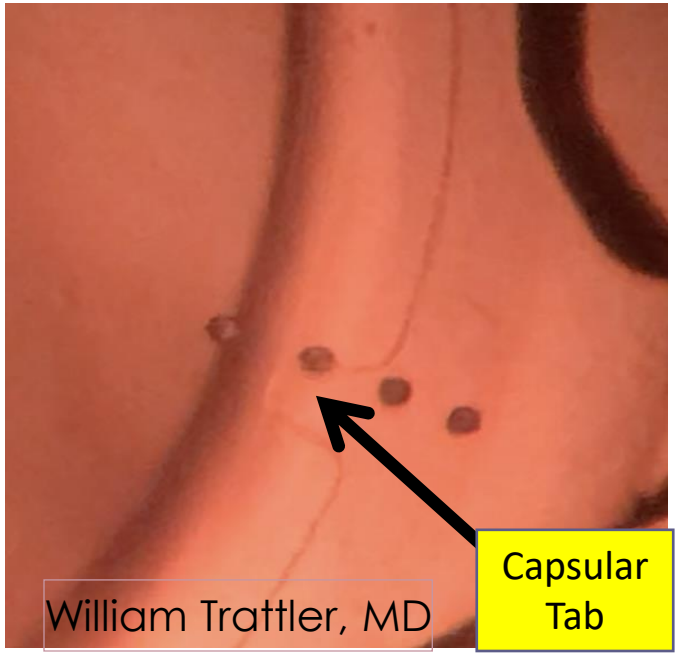
Capsular Tabs and corneal marks Placed

Iris Registration: comparing preop topography to intraop images

-Ensures proper alignment of guidance marks via Lensar laser



Intraop marking during femto
With iris registration (Lensar)

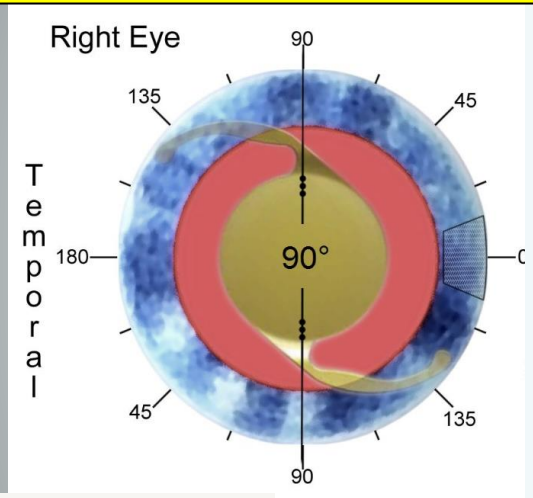


Capsular tab and Toric Marks

Impact of Axis on IOL Calculation – using low power toric (1.50D)

Flat K: 42@ 180 Steep K: 43.25@ 90

Vertical Astigmatism of 1.25D
Subtract 0.55D of astigmatism

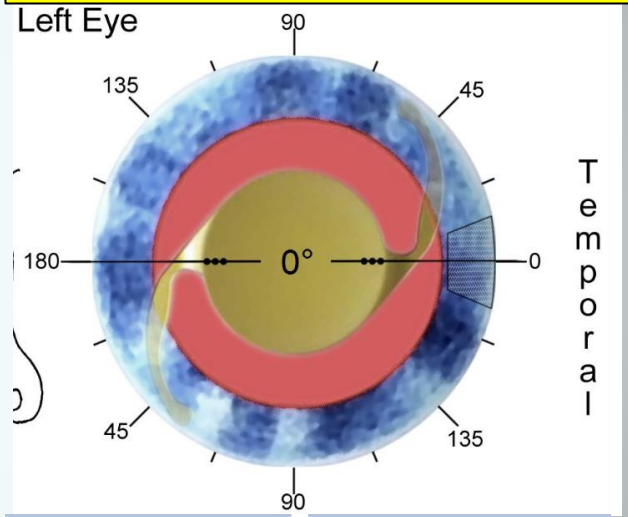


Non Toric	0.66 Cyl Axis 90
1.5	0.36 Cyl Axis 180

Axis flipped by .36D

Flat K: 42@ 90 Steep K: 42.5@ 180

Horizontal Astigmatism of 0.5D
Add 0.4D of astigmatism



1.5	0.10 Cyl Axis 90

Axis flipped by 0.1D

Barrett TORIC IOL Formula

A Constant/LF: 119.3 / 2.04 AL: 24 ACD: 3.5

Clinical Evaluation of Iris Registration and Femtosecond Guided Toric IOL Alignment for the Treatment of Low Refractive Astigmatism

Purpose:

To evaluate the accuracy of toric IOLs aligned with iris-registered, laser assisted refractive capsulotomy during routine cataract surgery in patients with lower powers of astigmatism less than or equal to 1.25D of total corneal astigmatism.

Methods:

44 subjects received monofocal toric IOLs

Preop total corneal astigmatism of less than or equal to 1.25D

Two IOL types included:

MX60ET125 (B&L): reduces astigmatism by 0.83D at the cornea plane

ZCU150 (JNJ): reduce astigmatism by 1.0D at the cornea plane

All patients underwent iris registration & femtosecond guided refractive capsulotomies (LENSAR, Orlando, FL).

Astigmatism power calculations were determined using total/anterior corneal power with the Cassini Ambient, IOLMaster 700, and Pentacam

Clinical Evaluation of Iris Registration and Femtosecond Guided Toric IOL Alignment for the Treatment of Low Refractive Astigmatism

Results:

32 female & 12 male eyes were part of the registry

Average age of 77 (Range 58 to 87)

34 of 39 (87.2%) eyes targeted for distance achieved 20/25 or better UCVA.

37 of 41 (90.2%) eyes were within 0.5D of SE using the Barrett formula

Note – 1 eye was 20/25 UCVA but not refracted

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Astigmatism results

Preop: Avg measured total corneal astigmatism on IOL master 700: 1.02D

Postop: Avg refractive astigmatism was 0.32D.

Reduction of astigmatism with low power toric IOLs was 0.70D

1.02D - 0.70D = 0.32D

33 of 41 (80.5%) eyes had refractive cylinder of 0.5D or less postop.

39 of 41 (95.1%) eyes had a refractive cylinder of 0.75D or less postop.

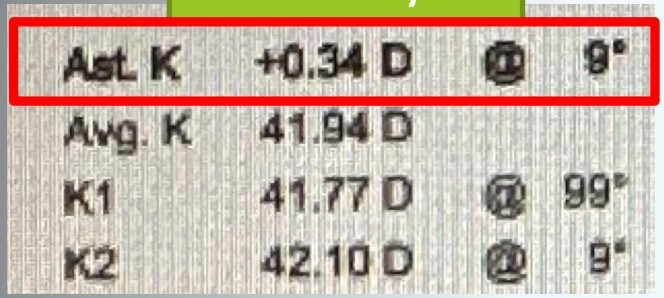
3 Devices to measure Corneal power

Case Example:

67 year old female with 2+NS & low astigmatism

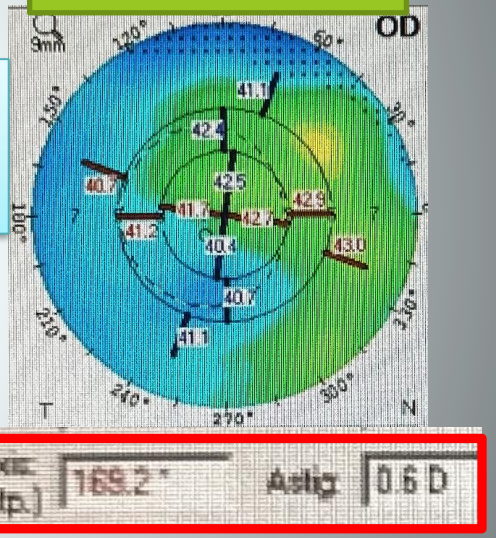
Should we consider a toric IOL here?

Biometry Ks

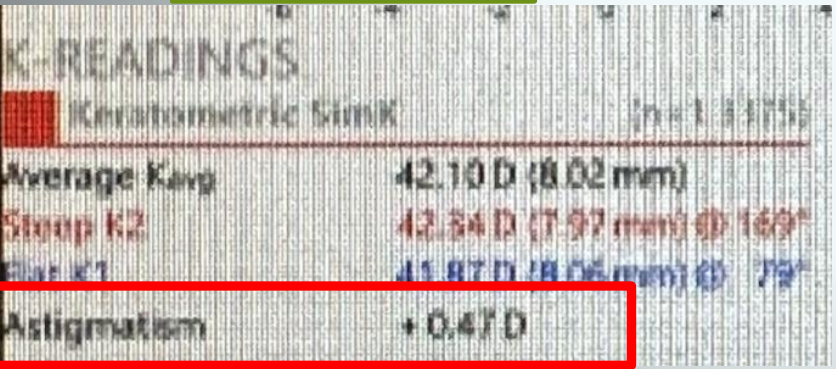


Some devices also measure TOTAL Cornea Power

Tomography Ks



Topography Ks



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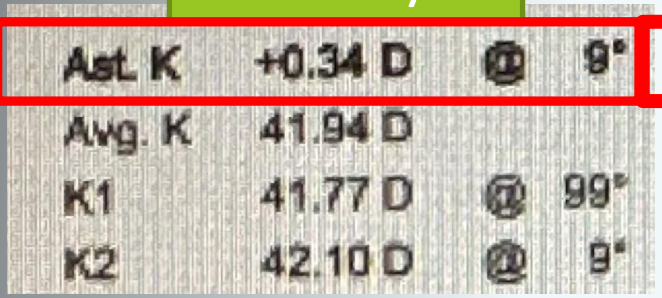
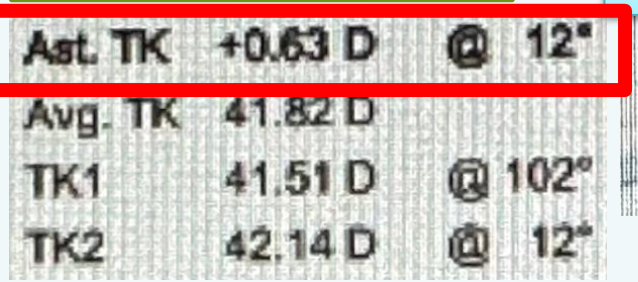
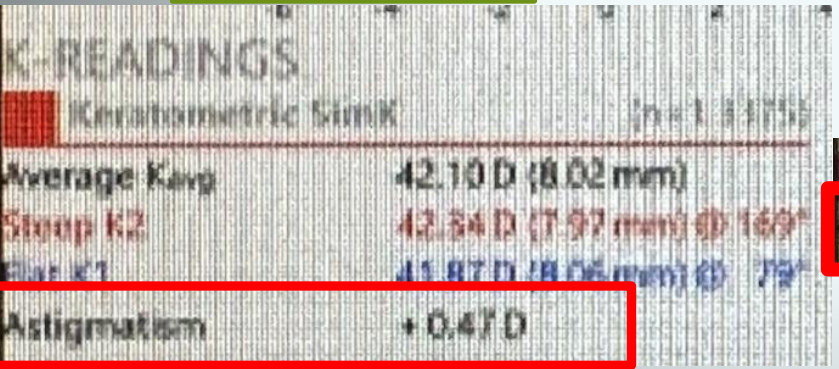


Biometry Total Ks

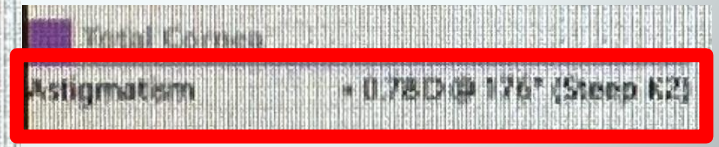


Barrett Calculator (Biometry)
Toric IOL: Residual astigmatism is 0.25D

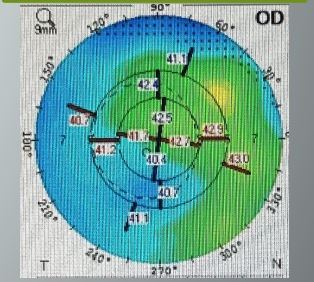
Topography Ks



Topography Total Cornea Ks



Tomography Ks



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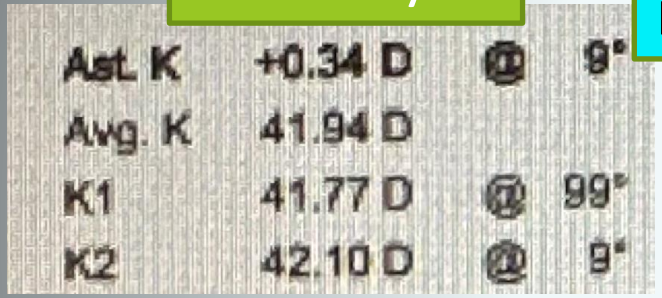
Final Result

Biometry Ks



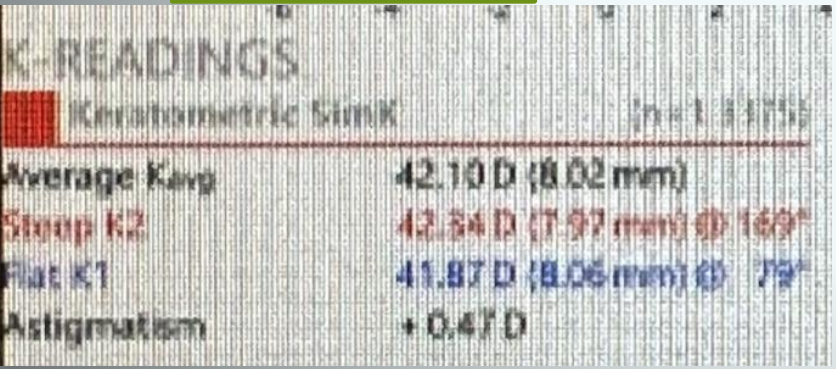
Final Result with TORIC IOL

ZCU150	(+)22.5

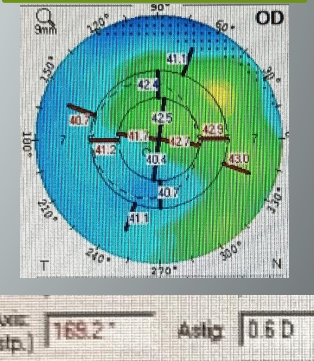
43 Days Postop
UCVA = 20/20
-0.25 sphere = 20/20

Biometry Toric Planner

Topography Ks



Tomography Ks

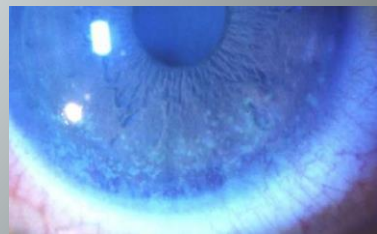


Potential Causes of Residual Astigmatism

1. *Axis off-target*
   - Preop measurements inaccurate
   - Errors with identifying proper axis during surgery
   - Rotation of IOL postoperative

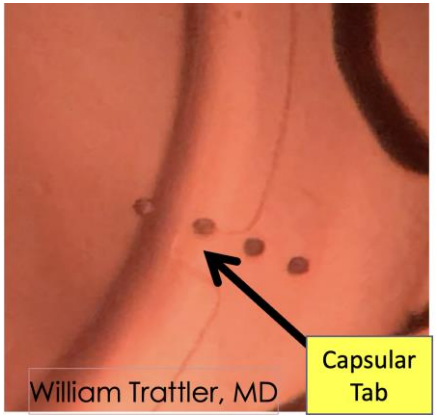
2. *Wrong astigmatism power*
   - Preop measurements/calculations errors
     - Topo Ks, IOL Ks not in agreement
   - Surprising Surgically Induced Astigmatism (SIA)
   - Surprising Posterior Cylinder
     - Too high or lower than expected

Note: Ocular surface disease can impact the preop measurements



Summary: Iris Registration and Femtosecond Guided Toric IOL Alignment for the Treatment of Low Refractive Astigmatism

- 87.2% of eyes achieved 20/25 or better UCVA
- 80.5% of eyes achieved a refractive cylinder of 0.5D or less postop



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