GP Toric Lenses
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End of Lecture, You Will Be Able To...
- Know candidates for front surface, back surface, and bitoric lenses and how to empirically fit them
- Write prescription for GP toric lenses

Astigmatism Prevalence
- ≥1.00 DC in 20-60 year old US
  - 25%
- ≥1.50 DC in 5-6 year old US
  - 12%

Why GP Toric Lenses
- Corneal toricity
- Poor vision with soft toric
- Poor fit with spherical GP
  - 3.9 staining
  - Excessive bearing
- Spectacle blur
- Reduce flexure

Fitting Philosophies – All Back Torics
- Full alignment (saddle fit)
  - Typically 2.00 to 2.50 D K toricity
  - On K for each meridian
  - Tighter fit, more centered
    - Smaller diameter, interpalpebral fit

Fitting Philosophies – All Back Torics
- Low toric simulation
  - Typically when K toricity >2.50 D
  - Base curve undercorrects corneal toricity
    - BC aligns (± 0.25 D) with flat meridian and undercorrects steep meridian
  - Typically 75% of corneal toricity
    - <0.75 D flatter than steep K
  - Small amount of “rock” over flat meridian
  - Diameters can be bigger

All Back Surface Torics - Base Curve
- Ks: 42.50 / 45.50 @ 090
- Saddle fit
  - BCflat: 42.50
  - BCsteep: 44.50
- Low toric simulation
  - BCflat: 42.50
  - BCsteep: 44.75

GP Toric Options
- Back surface toric (spherical front surface)
- Bitoric
- Front surface toric (spherical back surface)
  - Consider spectacle cylinder, corneal cylinder, residual astigmatism

Bitoric
- Probably 95% of toric GP lenses
- Two curvatures on back surface and two curvatures on front surface
Bitoric
- Specify BC/Power for each meridian
  - It is as though you are fitting a spherical lens on each meridian independently
  - Use optical cross
  - Power for toric CL not written in spherocylindrical notation

Calculating Bitoric Lenses
- Empirical
  - Optical crosses
  - Mandell-Moore Bitoric Worksheet
    - http://www.gpli.info/mandell-moore/
  - Diagnostic
    - Spherical trial lens
    - SPE trial lens

Empirically Order Bitoric
- Manifest Rx: -1.00 -3.00 X 180
  - Ks: 43.00 / 46.00 @ 090

Empirically Order Bitoric
- Example: Saddle
  - Secondary Curve
    - BC + 1.0 mm; 0.4 mm wide
  - Peripheral Curve
    - BC + 3.0 mm; 0.2 mm wide
  - OZD
    - OAD = (2 * SCW) + (2 * PCW) + OZD
  - CT
    - Use power that yields greatest CT (most +)
      - CT_{-max} = 0.18 + 0.01 (power)
      - CT_{+max} = 0.18 + 0.02 (power)

Empirically Order Bitoric
- Example: Low Toric

Order a GP Lens
- Secondary Curve
  - BC + 1.0 mm; 0.4 mm wide
- Peripheral Curve
  - BC + 3.0 mm; 0.2 mm wide
- OZD
  - OAD = (2 * SCW) + (2 * PCW) + OZD
- CT
  - Use power that yields greatest CT (most +)
    - CT_{-max} = 0.18 + 0.01 (power)
    - CT_{+max} = 0.18 + 0.02 (power)

Empirically Order Bitoric
- Example: Low Toric

Empirically Order Bitoric
- Low toric simulation

Mandell-Moore Bitoric Guide
- Manifest Rx: -1.00 -3.00 X 180
  - Ks: 43.00 / 46.00 @ 090
Mandell-Moore Bitoric Guide

Bitoric

• Toric front surface to correct induced cyl (SPE) and residual astigmatism (CPE)

Spherical Power Effect (SPE)

• Rotation doesn’t affect vision
• \( \Delta \text{BC} = \Delta \text{CL Power} \)
• \( \text{BC: 42.50 / 44.75} = \Delta \text{CL Power} \)
• \( \text{Power: } -1.25 / -3.50 = \Delta \text{CL Power} \)
• Alter Power to make \( \Delta \text{Power} \) same as \( \Delta \text{BC} \)
• Amount change power = residual astigmatism

Cylindrical Power Effect (CPE)

• \( \Delta \text{BC} \neq \Delta \text{Power} \)
• \( \text{BC: 42.50 / 44.75} \)
• \( \text{Power: } -1.25 / -4.50 = \Delta \text{CL Power} \)

CPE Bitoric

• \( \text{Ks: 41.00 / 45.00 @ 090} \)
• \( \text{MR: } -2.00 -4.00 \times 180 \)

CPE Bitoric-Residual Astigmatism

• Correct appropriately if no rotation

CPE Bitoric-Rotated

• \( \text{Ks: 41.00 / 45.00 @ 090} \)
• \( \text{MR: } -2.00 -4.00 \times 180 \)
CPE Bitoric Rotated-Residual Astigmatism

• Refractive error not corrected if rotate lens

SPE Bitoric

• Ks: 41.00 / 45.00 @ 090
  • ΔPower = ΔBC
• MR: -2.00 - 4.00 X 180

Order SPE Bitoric Low Toric Simulation Fit

• Manifest: +1.00 - 2.50 X 180
• Ks: 43.00 / 46.00 @ 090

SPE Bitoric-Residual Astigmatism

• -0.38 X 180 residual

Order SPE Bitoric Low Toric Simulation Fit

• Induced -0.50 X 180 astigmatism
**SPE Bitoric Rotated**

-4.00 -3.00 -2.00 +1.00
+1.00 +3.00 +0.25 -0.25

**SPE Bitoric Rotated-Residual Astigmatism**

-1.50 +1.00 -2.00 +1.00
BC Correction Residual

• Induced -0.50 x 180 astigmatism

**Order SPE Bitoric Low Toric Simulation Fit**

**Back Surface Toric**

- When refractive astig = 1.5 * corneal toricity
- You could design a "bitoric" lens and never know the difference
- If you know, you could save $10 when you order

**Back Surface Toric Summary**

• Example
  - Manifest Rx: +1.00 -3.00 X 180
  - Ks: 42.00 / 44.00 @ 090

**Order a Back Surface Toric**

- Manifest Rx: +1.00 -3.00 X 180
- Ks: 44.00 / 46.00 @ 090

**Front Surface Toric**

- ≥ 1.0 D residual astigmatism
- ≤ 2.00 corneal toricity
- Typically soft toric, but patient may not like vision

**Front Surface Toric Example**

- Ks: 41.00 / 41.50 @ 090
- MR: -1.00 -2.00 X 180
- CL: BC = 40.75; Power = -3.00

**Front Surface Toric Example**

| Toric Rx | Initial BC | Ks 41.00/41.50 | Power | MR 1.00 -2.00 X 180 | CL BC = 40.75 | Power =-3.00 |
Assessing GP Torics

- SOR
  - ScOR if not 20/20ish
- Contact lens fit
  - Movement
  - Centration
  - Rotation (maybe)
  - Fluorescein