Astigmatism Management in Cataract Surgery

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March 15, 2016

Cataracts in the U.S.

- Estimates around 22 million adults >40
- 3,000,000 cataract surgeries per year
- Increasing with aging population
- The last of the baby boomers turned 50 in 2014 - there were 77 million people born between 1946 and 1964
• The 50+ population has $2.4 trillion in annual income, which accounts for 42% of all after-tax income in the U.S. (Consumer Expenditure Survey).

• Americans 50+ account for half of all consumer spending
  • Boomers outspend younger adults online 2:1 on a per-capita basis (Forrester, 2009).

High Expectations

• iPhones/Cloud computing
• High speed internet
• Google
• Virtual Reality
• Substantial prosperity
• Precision and accuracy
• Not looking for......
CLOSE!! But NOT quite

Bigger, Faster, Stronger

- Astigmatism treatment with CEIOL
- New Technologies
  - Femto
  - Restor 2.5 D (Lifestyle lens)
  - I stent

Astigmatism

- 50% of eyes have 1D of corneal astigmatism
- Almost 25% > 1.5 D of corneal astigmatism
- "Every 0.25 diopter of corneal astigmatism results in 1 line decrease in contrast sensitivity." - Rick Potvin, OD
Simulation

1 Diopter astigmatism  No astigmatism

Goal: Lowest Astigmatism Possible
- Can accurately treat >0.5 diopters
- Anything less than this has little impact on vision

GOAL
- Lowest astigmatism possible
- Leave more with the rule
- Leave less against the rule
Rationale: Lowest Astigmatism Possible

- ATR increases with age
- Goal slightly under correct the WTR and Overcorrect the ATR

Ignore my own SIA

- (+- 0.25 D and will increase the WTR)
- Treat 0.75 diopter and higher
- Goal to leave 0.25 diopter WTR

CORNEAL ASTIGMATISM

- Treatment is based on cornea astigmatism
- Regular astigmatism
- Repeatable axis and magnitude
  - Keratometry
  - IOL Master
  - Topography
CORNEAL ASTIGMATISM

- Keratoconus, pellucid, post-LVC POSSIBLE with definable and repeatable axis and magnitude
- Stable: > 50 years of age in these conditions with no signs of progressive ectasia

Case #1
- 60 year old with 2+ nuclear cat
- MR -1.00 -3.00 x 180 20/70
- Ks 44.00 x 44.00 steep at 90
- GOOD CANDIDATE FOR ASTIGMATISM REDUCTION

Case 2
- 70 year old with BVA 20/100 and 3+ nuclear and 1+ PSC
- MR -1.00 -2.00 x 180
- Ks 44.00 x 44.25 steep at 90
- NOT A CANDIDATE FOR ASTIGMATISM CORRECTION
REMEMBER: as opposed to LVC, it's the cornea not the refraction

Case #3
- Ks 44.00 x 46.0 steep at 180
- MR sphere -0.5 BVA 20/70
- PSC 2+
- Clear candidate for astigmatism reduction
- LIKELY TO BE UNHAPPY WITHOUT

EXAM
- Presence/Absence of cornea disease
  - Scars
  - MDF
  - Salzmann
  - Keratoconus, PMD, LASIK
EXAM

- Dilation capability
  - Toric IOL alignment marks
  - Femtolaser capture
- Zonule status
  - Lack of stability of toric IOL
- High Myopia
  - Toric IOL may rotate more

Other studies

- IOL Master: Most accurate measure of axial length
- Keratometry: magnitude and axis
- Topography: Confirmation and ruling out disorders of the cornea
  - Keratoconus, pellucid, irregular astigmatism

Options for correction

- Spectacles: Many spectacle wearing patient choose to keep
- CL: most will choose for treatment
- Toric IOL
- Femto
- Limbal relaxing incision
- Laser vision correction
TORIC IOL

- Regular repeatable corneal astigmatism $\geq 0.75$
- Definable axis
- Good dilation helps
- Range: 0.75 to 4.0 diopters

Acrylic Toric IOL are stable reliable platform
8 years of experience
1-2% rotation after surgery
Reduces astigmatism at time of CIEIOL
Can be used in combination with other methods for higher amounts

TORIC IOL procedure

- Reference marks placed pre-operatively at 3:00 and 9:00
- Axis is marked in surgery using reference marks
- After in-the-bag placement, IOL is rotated to align
Reference Mark Placement

Axis Marking

TORIC IOL procedure
- Virtual alignment devices (newer and unproven)
- Intra-operative wavefront analyzer (ORA)
Comanagement
- 99% are within 10 degrees
  - 10 degrees off reduces affect by 30%
  - Ideal position is within 5 degrees of planned
- Dilate and assess position day 1 and within 2 weeks
- Assess MR/ AR
- Ideal time to rotate IOL is at 10 days to 3 weeks.

Limbal Relaxing Incision
- Using diamond or metal blade
- Variable response as we know

Femto-second Laser Assisted Cataract Surgery
- Emerging technology
- Laser similar to the Intralase
- 4 approved platforms in the United States
- Currently use the Alcon Lensx at Blakewoods
- Presently evaluating for local surgery center
Lensx

- Uses real-time OCT technology to guide
- Incisions for phaco and corneal relaxing incisions
- Performs capsulotomy
- Lens fragmentation
- Does not replace phacoemulsification

LenSx® Laser SoftFit™ Patient Interface

- Current PI Design with extended suction skirt
- Disposable hydrogel lens insert
- Lower IOP - "shimmer increase"
- Simple docking process - better eye control, no fogging
- Improved surgical performance*

Femto Advantages

- Better reliability than LRI
- Better reliability at lower astigmatism
  - 1.00 D ATR
  - 1.25 D Oblique
  - 1.50 D WTR
- Same time as CEIOL
Femto Advantages

- Better capsulotomy centration
- Restor 2.5 D
- Less ultrasound energy
- Can be combined with Toric IOL for high astigmatism

Arcuate Cuts vs. Diamond Knife LRIs

Laser Vision Correction

- Both LASIK and PRK can be performed after CEIOL
- Non-custom: Wavefront image usually distorted by IOL
- Same contraindications as primary LVC
- Requires a second surgery
- Can correct residual sphere and cylinder
Current approach

- Regular repeatable astigmatism
- 0.75 to 1.25: femto (logistical barriers)
  - Up to 1.0 D ATR, 1.25 oblique, 1.5 D WTR
  - Lifestyle 2.5 D Restor
- > 1.50 TORIC IOL or PRK if Lifestyle
- > 5.0 diopter consider combination femto/toric

Current approach to astigmatism

- Unstable bag: Corneal procedure >> LVC after stable refraction
- Irregular astigmatism without definable axis: non-candidate
- Variable astigmatism magnitude: aim for lowest magnitude

Post OP Toric

- POD 1: dilate to assess toric position
- AR/MR to assess result
- Counsel: No sudden head movements or vigorous activity
- Especially high myopes
TORIC ALIGNMENT

Post OP Femto

- POD 1: assess LRI for infiltrates
- Otherwise same as non-femto
- Restor: encourage adaptation
- AR/MR to assess result

Current approach

- Residual astigmatism of 0.75 diopter or more
  - Determine reason: off-axis, primary undercorrection, unstable cornea
  - Rotate toric IOL if recent
  - Consider LVC if more than 3 weeks
  - 20/”happy”
TORIC IOL points

- IOL tends not to rotate after POD 1-2
- High axial myopes are more likely to have rotation
- Tends to rotate toward the horizontal alignment
- Always rotates clockwise

OPTIONS

- Leave as is
- Rotate IOL: return to OR at 2-3 weeks postop
- LVC after 6 weeks

SUMMARY

- CATARACT SURGERY IS REFRACTIVE SURGERY
- Astigmatism reduction is important to achieving this end
- Technology to reduce astigmatism reliably has improved
SUMMARY

- It is useful in pre-operative comanagement to perform Ks to identify corneal astigmatism
- It is useful to discuss refractive aim
- It is useful to discuss options for IOLs including Restor 2.5, Toric, and monovision approaches

FAVORITE New Technologies of 2015

Femtosecond laser assisted cataract surgery
- High precision for capsulotomy
- Accurate reduction of low-moderate astigmatism
- Easy for patients
- Lower energy for patients with corneal guttata

Restor 2.5 Lifestyle lens
- Central refractive zone
- Similar modulation transfer function (MTF) to monofocal IOL
- Precision in distance vision
- Depth of focus to intermediate phone, tablet, dashboard
FAVORITE New Technologies of 2015

• I Stent
  • Mild to moderate glaucoma at the time of CEIOI
  • 70% success
  • Will improve with next gen: easier placement and multiple stents for higher success rate

SUMMARY

As population ages cataract surgery volumes are increasing
As technologies advance, we can all offer our patients more
  • Astigmatism reduction: Femto, toric, LVC
  • Restor Lifestyle 2.5 lens
  • I stent to reduce eyedrop burden

SUMMARY

• The 50+ population will is savvy and will expect more
• We will all need to be ready to offer them the very best.