Refractive Lens Exchange in the Glaucoma Patient

Richard B. Mangan, OD, FAOO

Case #1

A 66yo caucasian female presents with a chief complaint of intermittent blurred vision especially when reading. She used to wear contact lenses, but had to stop b/c of dry eyes. She uses Systane Balance prn. She has also been told that she is a suspect for glaucoma. She is concerned that her vision is related to the development of cataracts and was referred by her primary care optometrist for an opinion on the best way to manage her vision complaints.

Ocular Co-Morbidity

Ocular Surface Disease
- 15% in those 65 or older
- Leading cause of patient visits to eye doctor
- 60% of patients with SEVERE OSD also have glaucoma
- Est. Annual DCOT: $1,250 w/o Restasis

Glaucoma
- 7% in those 65 or older
- 2nd Leading cause of blindness
- 60% of patients being treated have OSD symptoms
- Estimated Annual DCOT: $2,200

Questions

- Should patients with glaucoma be treated differently than non-glaucomatous patients with respect to RLE? PC-IOL’s?
- How does OSD impact our outcomes?
- How important is asphericity?
- Do Blue Blocking lenses affect Visual Fields?
- What strategies can we employ pre, intra, and post-operatively to ensure the best possible outcome.

Baby Boomers

The average current life span today is 77. By 2030, nearly 71 million people will be age 65 and over, accounting for roughly 20% of the total US population and have an average life expectancy of 85.

Top 10 “Baby Boomer” Characteristics

- Staying Fit
- Staying in the workforce past age 65
- Recreationally drawn to water
- Enjoying Music
- Dating
Top 10 “Baby Boomer” Characteristics

- Staying Fit
- Staying in the Workforce past age 65
- Recreationally drawn to water.
- Enjoying Music
- Dating
- Volunteering
- Spiritual & Social Pursuits
- DIY Home Improvement
- Exploring Tech
- Extreme Sports

Keep 'Em Laughing
JeanneRobertson.com
How the Eye Care Industry Characterizes the Boomer generation

- Approximately 77 million Americans between the ages of 50 & 68.
- Control over 80% of personal financial assets.
- Are responsible for up to 50% of the discretionary spending power in the US.
- Approximately 30% of all elective procedures involve baby boomers.
- Interested in "Cutting-Edge" Technology and willing to pay out-of-pocket for it.
- Impatient, less tolerant than previous generation.
- The previous LASIK factor - Expectations are HIGH...and often unrealistic!
Cataract surgery age is on the decline.

- Why? Nutritional issues? Medication side-effects? No...it’s the Boomers!
  - Greater awareness & knowledge of cataract surgery (i.e. computer/internet savvy, peer-to-peer interactions, etc)
  - Cataract surgery is perceived to be safer and more predictable.
  - Active lifestyle boomers are looking to reduce their dependency on glasses.
  - Aging LASIK patients are becoming less satisfied with their vision and often are impatient about waiting to “restore” their youthful glasses-free vision.

Case #1

- A 66yo caucasian female presents with a chief complaint of intermittent blurred vision especially when reading. She used to wear contact lenses, but had to stop b/c of dry eyes. She uses Systane Balance prn. She has also been told that she is a suspect for glaucoma. She is concerned that her vision is related to the development of cataracts and was referred by her primary care optometrist for an opinion on the best way to manage her vision complaints.

Case #1: Pertinent Exam Findings

- Ocular Surface
  - Rapid TBUT (3 Sec OD, OS)
  - Normal Blink Reflex (q7-8 sec) with complete closure
  - Mild Lid telangiectasia w/ Frothy Tear Film
  - Trace SPK OU

- Lens
  - Trace NS OU
  - +1.00 DS OU w/ +2.25 Add
  - BCVA: 20/20 each eye
  - BAT: 20/25 each eye
  - AC: Deep / Quiet
Case #1 Pertinent Exam Findings

- **Optic Nerve**
  - IOP: 26, 25; PACH's 524, 514
  - Vertical C/D Ratio: OD: 0.65 OS: 0.60
  - Gonio: D35rf0 OU; NO PAS, No Rubeosis

-NFL Analysis: Slight progression on TSNIT analysis OU
- Visual Field Analysis: No pattern defect, either eye. MD: -2.5 OD, -2.2 OS

**DX:** Uncontrolled Early Open Angle Glaucoma

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Case #1

- Prior to entering the room to review your findings with the patient, your technician tells you that the patient is requesting generic medication if you decide drops are warranted. Sound Familiar?

- Your goal is a 25%-30% reduction in IOP. Do you:
  - Give in to her request and prescribe a generic?
  - Are you “disinclined to acquiesce to her request” and insist on a preservative free glaucoma drop or SLT?
  - Take the time to educate the patient and let her make an informed decision?

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Patient Education Pearls

1. Cost vs. Value: Don’t Make Assumptions on the Judge
2. Frame Best Options for Patient
3. The Psychology of MIGS / Hope
4. Set Realistic Expectations

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7 Ways to Reduce BAK Exposure in Clinic

- Treat their Lid Disease
- Use or Switch to non or transiently preserved tears.
- Use or Switch to non-preserved glaucoma drops.
- Use or Switch to BAK-free glaucoma drops.
- Use combination agents in place of single-agent equivalents.
- Switch to a drop within a drug classification containing less BAK.
- Consider SLT as first line treatment option.

<table>
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<th>BAK %</th>
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<tr>
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<tr>
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</table>

What if our patient had clinically significant cataracts?

Surface Optimization - Really?
What is the number one cause of refractive surprise after cataract surgery?

- Error in measuring:
  - Axial Length
  - Corneal Power
  - A-Constant
  - Refraction

Answer: Corneal Power

A patient with a poor tear film has an inaccurate corneal topography resembling forme fruste keratoconus (A). After 1 week of Restasis and AzaSite therapy, the tear film improved (B).

William Trattler, MD — MAY 2009 | Cataract & Refractive Surgery Today

Severity Level

1
2
3
4

- Education
- Environmental changes
- Preserved tears
  - Add: Unpreserved tears
- Gels
- Cyclosporine A
- Topical steroids
- Omega-3 fatty acids
- Add: Tetracyclines
- Punctal plugs (control inflammation first)
- Add: Systemic anti-inflammatory agents
- Moisture goggles
- Surgery

7 Ways to Reduce BAK Exposure in Clinic

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<th>Dosage</th>
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<tr>
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Same patient with CSC's!

Would you recommend a Multifocal IOL in this patient?

Do MFIOL's affect routine glaucoma tests?

- What should we expect with respect to its affect on Visual Field analysis?
- What should we expect with respect to its affect on OCT?
ABSTRACT

PURPOSE: To determine the effect of ReSTOR Multifocal IOL lenses on FDT Visual Field Perimetry in patients with glaucoma.

SETTINGS: Private Practice - Chicago Glaucoma Consultants: Chicago, IL

METHODS: This prospective study included 13 patients (25 eyes): Patients had varied ocular history (3 with glaucoma, 3 glaucoma suspects, and 7 without "high risk" for glaucoma). All with phacoemulsification with AcrySof ReSTOR Natural IOL (Alcon) implantation. Participants underwent Frequency-doubling perimetry (FDT) Humphrey Matrix 24-2 (Carl Zeiss Meditec Inc.) testing before and after cataract extraction. The MD and the PSD were recorded along with considerations for accurate test taking. Changes in visual acuity using LogMAR, IOP, and visual complaints post ReSTOR intraocular lens implantation were also noted.

RESULTS: No significance with data.

CONCLUSIONS: Patients with well controlled glaucoma can enjoy the benefits of the ReSTOR lens without compromising their treatment. FDT visual field testing remains consistent and accurate after placement of the ReSTOR IOL.

PARTICIPANTS:

- Sixteen eyes of 16 patients with a diffractive MFIOL (median age, 64 years), 18 phakic eyes of 18 healthy individuals serving as controls (median age, 62 years), and 12 eyes of 12 patients with a monofocal IOL (median age, 64 years) were included.

Conclusion: Reports a reduction in visual sensitivity of up to a 2 dB as measured by standard automated perimetry in patients with a multifocal IOL compared with phakic controls.
The impact of multifocal intraocular lens in retinal imaging with optical coherence tomography

- Cross-Sectional Study: 23 eyes MFIOL; 27 eyes Aspheric Monofocal; OCT with Heidelberg Spectralis.
- This study demonstrates that OCT measurements in the macular area are not affected by the optical design of diffractive MFIOL. These measurements were comparable to those performed in patients implanted with monofocal aspheric IOL. However, MFIOL reduces OCT image quality by more than 3 dB. This reduction was statistically significant.


Severity of Visual Field Loss and Health Related Quality of Life

- A loss of 1dB per year is considered a moderate rate of disease progression.
- Several studies have investigated the association between VFL and questions concerning completion of daily activities such as the ability to read or watch television, issues of mobility including walking or driving, and frequency of falls.

- 5,213 Participants
- A lower QOL score was observed with only a -2dB or worse if in both eyes.
- A 4-5 dB worsening corresponds to a 2 line drop in visual acuity when it comes to QOL scores.

Let's table to MFIOL discussion for a minute...
Effect of aspherical and yellow tinted intraocular lens on blue-on-yellow (SWAP) perimetry

- 25 patients (50 eyes) received aspherical intraocular lens (Akreos AO) in one eye and spherical intraocular lens (Akreos RT) in the fellow eye.
- Primary Outcome Measure: Contrast Sensitivity

- 27 patients (54 eyes) received ultraviolet and blue light filter (yellow tinted) IOL implantation in one eye and an acrylic ultraviolet (non-tinted) filter IOL in the fellow eye.
- Primary Outcome Measure: MD & PSD from Blue on Yellow Perimetry

Conclusions:
1. Contrast sensitivity was better under mesopic conditions with aspherical intraocular lens.
2. Blue-on-yellow perimetry did not appear to be affected by aspherical or yellow tinted intraocular lens.

What Is 20/20?
Defining Clarity

- The Snellen test is not sensitive enough to detect declines in the quality of our vision.
- Well-lit, high-contrast images are inconsistent with many real-world visual tasks.
- A person with reduced functional vision can read the letters on the chart, but may not see clearly in low light conditions.

Young Adult Eye

- Crystalline lens has negative SA
  - Power decreases from center to edge
- Cornea has positive SA
  - Power increases from center to edge

Aging Adult Eye

- Crystalline lens develops positive SA with age, which increases depth of field
- Over time, the crystalline lens no longer offsets the SA of the cornea and eventually adds to it

SA, spherical aberration.
Optic Design Strategies

Positive SA
- Power increases from center to edge
- Conventional

Negative SA
- Power decreases from center to edge
- Tecnis AcrySof IQ

"Zero" SA
- Power constant from center to edge
- SofPort® AOV

Residual Spherical Aberration Decreases Image Quality

<table>
<thead>
<tr>
<th>Lens</th>
<th>Wavefront Error (mm)</th>
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<tr>
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*Data on File. Advanced Medical Optics, Inc.

The point spread function (PSF) is the shape of a single, concentrated ray of light as it is projected through a lens. PSF is used to describe the distortion caused by aberrations in an optical system.
Comparison of Depth of Field

Conventional IOL
Best
Zero SA IOL
Very good
Negative SA IOL
Worst

D, diopters. Simulated visual images

What would you recommend for our patient?

Conventional IOL
Best
Zero SA IOL
Very good
Negative SA IOL
Worst

D, diopters. Simulated visual images

Case 3: Same patient except:
Decentration of an IOL

- An IOL centered perfectly in the capsular bag and/or behind the pupil is likely to be decentered to the visual axis.
- Mean decentration values:
  - Between pupil and visual axis = 0.37 mm (±0.24)\(^1\)
  - Between IOL and pupil = 0.36 mm (±0.25)\(^2\)
- Decentration induces aberrations in IOLs with positive or negative SA.
- Tilt can also cause coma aberrations in these types of IOLs.


CIR's

- Softport AO (Silicone)
- Akreos AO
- enVista IOL
  - FDA Labeled “No Glistenings”
  - Neutral Aspheric Design
  - Minimal FCPO
- Crystalens
- Trulign Toric

Bausch & Lomb Neutral Aspheric Implants
Capsular tension ring implantation enhances outcomes of accommodating IOL

A surgeon reports significantly improved intermediate and near visual acuity when capsular tension ring is implanted along with premium IOL:

- Mean monocular uncorrected distant vision with the CTR was 20/25 or better in 52% of eyes and 20/20 or better in 31% of eyes. Without the ring, results were similar: 56% of eyes achieved 20/25 or better and 28% achieved 20/20 or better.
- Intermediate vision with the ring was 20/25 or better in 94% of eyes and 20/20 or better in 81% of eyes. Without the ring, only 70% of eyes achieved 20/25 or better and 41% achieved 20/20 or better.
- For near vision, J2 and J1 were achieved in 74% of cases that underwent ring implantation, whereas in the group without the ring, 56% were able to read J2 and 28% achieved J1.

Reducing Astigmatism

- On-axis clear corneal incision (0.75D to 1.00D)
- Limbal Relaxing Incisions
- Laser Vision Correction
  - mLASIK
  - LASIK
  - Surface Ablation
- Toric IOL
  - Staar Toric
  - Acrysof Toric
  - Trulign Toric
- Combination of Procedures

Trulign Toric
Deciding Factors

- Level of glaucomatous nerve damage
- Age
- Type of glaucoma (e.g., POAG, NTG, Narrow Angle, PXF)
- Patients goals / expectations

How to choose an aspheric IOL

Study: Monovision vs. Multifocal

- 212 Patients who had bilateral cataract surgery were randomly assigned preoperatively to receive either:
  - Monovision with the Akreos monofocal aspheric IOL (B&L) with the near eye targeted to -1.25, or
  - Tecnis ZM900 3-piece multifocal
Study: Monovision vs. Multifocal

- Patients were assessed at 4 months post-op for the following parameters:
  - Spectacle independence
  - Subjective dysphotopsias
  - Unaided binocular visual acuity at:
    - Distance
    - Intermediate
    - Near
  - Contrast sensitivity
  - Stereoacuity
  - Light scatter
  - Higher Order Aberrations

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<td>26%</td>
<td>71%</td>
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<tr>
<td>Binocular/Unaided Distance VA</td>
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<td>Near</td>
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<td>Overall Patient Satisfaction</td>
<td>85%</td>
<td>81%</td>
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Subjective dysphotopsia questioning revealed that multifocal patients reported far more "annoying" or "debilitating" glare or dazzle than monovision patients (43% vs 18%).

IOL exchange (ie, multifocal out, monofocal in) was performed in 6 multifocal patients but no monofocal patients.

The reason for IOL exchange was dissatisfaction with image quality in 5 of the 6 exchanged multifocal patients.
Back to our case...

Intra-operative Ways to Reduce BAK Exposure

- Intra-camerally instill a preservative-free dilation mixture in place of topical dilating agents (PF lidocaine 2% and 1:1000 epinephrine).
- Off-label Intra-cameral alpha-agonist.
- Use PF Lidocaine jelly
- No Drop Cataract Surgery
- MIGS (i.e., iStent)

No Drop Cataract Surgery
MIGS (i-Stent)

Pre-op
- PG's and CME?
- Trial Frame Distance, Document Near VA
- Punctal Occlusion Debate
- Axial length changes from decreased IOP after surgery.
- Establish Realistic Expectations

Post-op
- Pre-op IOP Spikes
- Re-establish Baseline IOP
- Special Testing
- Visual Fields
- NFL Analysis
- The 7 C's

ICE (I-stent, Cataract Extraction, ECP)

Pre-op
- PG's and CME?
- Trial Frame Distance, Document Near VA
- Punctal Occlusion Debate
- Axial length changes from decreased IOP after surgery.
- Establish Realistic Expectations

Post-op
- Pre-op IOP Spikes
- Re-establish Baseline IOP
- Special Testing
- Visual Fields
- NFL Analysis
- The 7 C's

Additional Pearls as it relates to RLE and the Glaucoma Patient

Pre-op
- PG's and CME?
- Trial Frame Distance, Document Near VA
- Punctal Occlusion Debate
- Axial length changes from decreased IOP after surgery.
- Establish Realistic Expectations

Post-op
- Pre-op IOP Spikes
- Re-establish Baseline IOP
- Special Testing
- Visual Fields
- NFL Analysis
- The 7 C's
The 7 C’s - typical causes why patients are dissatisfied with the MFIOL.

1. Consecutive Treatments
2. Cylinder & Residual Refractive Error
3. Capsular Opacification
4. Cystoid Macular Edema
5. Corneal & OSD
6. Centration of the IOL
7. Circumference of the Pupil relative to the IOL.

In Conclusion

- Diffractive Multifocal IOL’s are OK with proper informed consent in OCHTN & MILD Glaucoma.
- Don’t take the ocular surface for granted.
- Aspheric designed lenses improve contrast sensitivity and are ideal when quality of vision is most important.
- Neutral aspheric monovision provides a slightly improved depth of focus.
- Utilize surgeons that are experienced with Malyugan & Capsular Tension Rings.
- No Drop Cataract Surgery + i-Stent are novel approaches to dealing with the co-morbidity of OSD, Glaucoma & Cataracts.
- Dr. Mangan can be reached at eyeam4uk@gmail.com
- Customize OR Music for the Boomers

15 Most Influential Songs During The BBE

- Elvis Presley (Jailhouse Rock)
- Buddy Holly (That’ll Be The Day)
- Danny and the Juniors (At the Hop)
- Chuck Berry (Johnny B. Goode)
- Ray Charles (What’d I Say)
- Chubby Checker (The Twist)
- The Beatles (I Want to Hold Your Hand)
- Martha and the Vandellas (Dancing in the Street)
- Rolling Stones (Satisfaction)
- Bob Dylan (Like a Rolling Stone)
- The Beach Boys (Good Vibrations)
- Aretha Franklin (RESPECT)
- The Doors (Light My Fire)
- The Beatles (A Day in the Life)
- Marvin Gaye (What’s Going On)
Tim Hawkins – “Old Rock Star Songs”

Eye Visit