Top 20 Scleral Lens Complications – Rapid Fire

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Disclosures

Sheila's Disclosures

- BostonSight
- CooperVision
- Eaglet
- Johnson & Johnson Vision Care
- Valley Contax
- Wave
- Pentavision
- Paragon
- Blanchard

Shalu's Disclosures

- Alcon
- AOE
- Allergan
- Bausch & Lomb
- Blanchard
- BostonSight
- CooperVision
- Eyeris
- Essilor
- FYI Doctors
- Gas Permeable Lens Institute (GPLI)
- InMode
- JJVC
- Mediprint
- Paragon Bioteck
- Scleral Lens Education Society
- Sjogren's Society Foundation
- STAPLE program
- Sun Pharma
- Tarsus
- Thea
- Topcon

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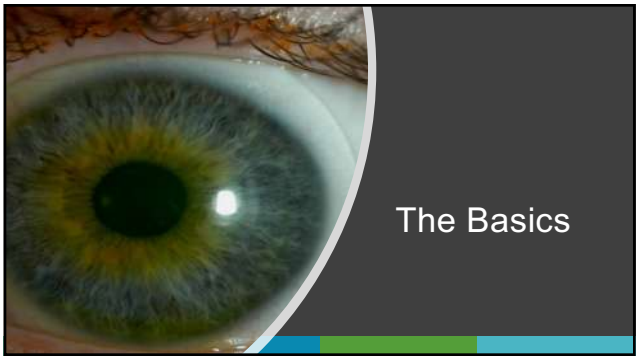

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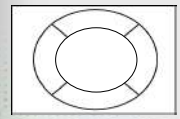
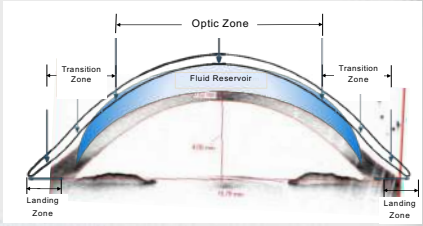
The General Design: BCLA Clear Report

- Optic Zone
- Transition Zone
- Landing Zone
  - Quad Specific Design





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The Details of the Design

- Know the zones names, sizes and capabilities
- Know your lens fitting expectations

Evaluating ideal FR Depth for optimal fit (µm)	Initial Application	30-45 Minutes	4+ Hours
Optic Zone	250-300	220-225	150-175
Transition Zone	150-175	125-150	100-125
	100-125	75-100	50-75
Landing Zone (Edge)	Aligned to Sclera	Aligned to Sclera	Aligned to Sclera

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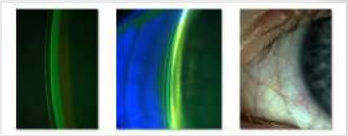
Assessing the Fit

- Fluid Reservoir
  - Cobalt Blue vs White Light
  - NaFl in the bowl
- Landing Zone
  - White Light
  - NaFl on top of the lens



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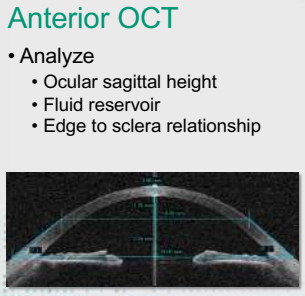
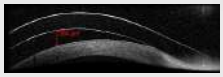
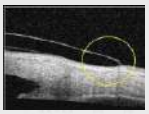
Anterior OCT

- Analyze
  - Ocular sagittal height
  - Fluid reservoir
  - Edge to sclera relationship







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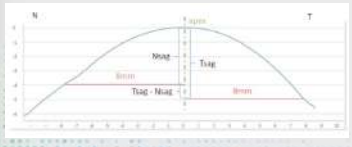
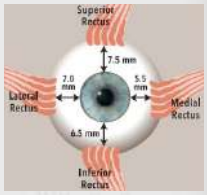
The Sclera – what do we know?

- Not spherical – Toric in nature
- Nasal side is flatter and higher
- Temporal side is steeper but lower
- Lenses naturally decenters infero-temporally





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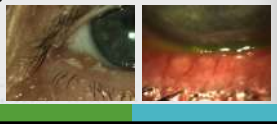
Before you start

- Understand the lens design
- Communication – set the right expectations - Vision, Time, Costs
- If hesitation exists – Wait, trial a lens
- Clean up the lids, lashes, allergies



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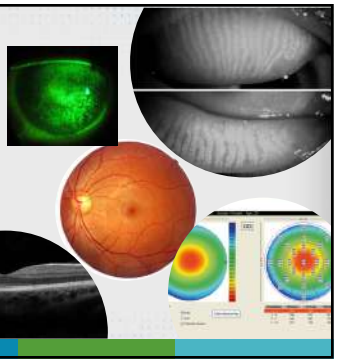
Before you start

- Full Exam needed
- Imaging & Documentation
  - Corneal staining
  - Topography
  - Ant Photography
  - Retinal Scans
  - Pachymetry
  - Meibography



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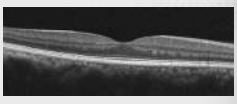
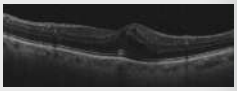
Why so many baselines?

- To Track Changes
- Are you creating a problem?
- Are you making things better?





Case: Boston Sight - ++

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#1 Insertion Issues

1. Prepare them before their dispense
2. Make them feel relaxed

YouTube Scleral

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#1 Insertion Issues

1. A large DMV plunger
2. A size 8 O-ring (any hardware store)
3. Ezi Scleral Lens Applicator (Q-case, Inc.)
4. Tripod method
5. See Green Stand
6. Telescopic Stand

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#2 Insertion Bubbles

- Poor alignment at landing zone
- Lens was tilted
- Lens not completely filled
- Loose adhesion of the lens to the eye
- Lens not inserted in one continuous motion

- Air caught in lens bowl
- Uncomfortable
- Interferes with Vision

- Teach how to identify them – Must re-insert – one attempt per fill

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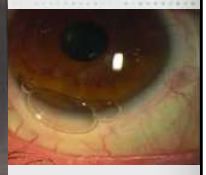

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#3 Removal – Lenses Stuck

- Causes
  - Lenses too tight at landing zone
  - Excessive fluid reservoir
    - Optic zone
    - Transition zone
  - Poor Plunger Placement
- Fixes
  - Optimize fit
  - Apply Biotrue to the plunger
  - Introduce a bubble/release suction for removal
  - Remove with plunger & fingers

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Panic Level 1000!!!

- Keep Calm
- Do not continue to pull
- Breathe
- Release the plunger
- Release the suction
- Plunger on lower part of lens

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PAIN

When & Where ?

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#4 Pain upon Application

- Causes
  - Solution sensitivity
  - Application Technique
  - Not inserting at 6 o'clock
  - Lens awareness due to poor fit
  - Aggressive Insertion
- Fixes
  - Check cleaning routine
  - Check App/Removal techniques
  - Insert at 6, change the fit to not feel the edges
  - Add Celluvisc/thickening agent to the bowl

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#5 Pain when blinking

- Patient Identifies location - clock dials
- The Edge is too flat
- Tuck the edges in
- Quadrant specific changes

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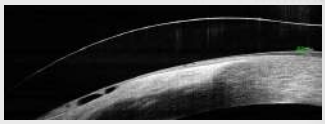
#6 Pain with eyes closed

- Touch
  - Limbus
  - Mid peripheral touch
  - Central Touch



- Fixes:
  - Find the touch and increase the sagittal height
  - If the lens is decentered it can cause touch – center the lens

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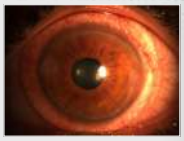
#7 Pain at the end of the day

- Tight Lens Syndrome
  - Lens gets tighter as the lens settles
  - Hard to remove lens
  - Eye feels bruised after removal
  - Redness/Chemosis



- Causes
  - Conjunctival is very spongy
  - Too much clearance – reduce central clearance
  - Edge too tight – Flatten edge
  - Too much pressure when inserting

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#8 Corneal Edema

- Causes
  - Corneal Hypoxia
  - Excessive Fluid Reservoir
    - Optic Zone
    - Transition Zone
  - Too much negative pressure
  - Thick lens
  - Poor lens material
  - Pre-existing endotheliopathy
- Clinical Signs
  - Pachymetry changes
  - Stromal Striae on biomicroscopy



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#9 Neovascularization

- Causes:
  - Corneal Hypoxia
  - Natural course of the underlying condition
  - Too much negative pressure under the lens
  - Excessive fluid reservoir
- Clinical Signs
  - Set baselines
  - Look for changes and monitor
  - Minimal – wax and wane

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#8 and #9 - Corneal Hypoxia

Fixes:

- Monitor
- Stop lens wear, Muro 128
- Optimize the edge – flatten and limbal zone
- Decrease Sagittal depth
- Decrease fluid reservoir
- Decrease Lens Thickness
- Highest DK Material
- Fenestrate
- Channels

$$\frac{Dk}{t_{Scl}} = \frac{1}{\left(\frac{t_c}{Dk_c}\right)+\left(\frac{t_c}{Dk_c}\right)}$$

- t_c = Central Post-lens tear Film Thickness
- Dk_t = Oxygen Permeability of Tear ≈ 80
- t_c = Central Lens Thickness
- Dk_c = Lens Material Permeability

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#10 Corneal Staining

Causes:

- Shallow fluid reservoir
- Solution related toxicity – cleaning/meds/drops
- Insertion Air Bubble
- Overwearing the lenses – swamp effect
- MGD

Fixes:

- Increase fluid reservoir
- Review Solutions and handling, A/R – **Pres. Free**
- Decrease wear time, remove refill solutions


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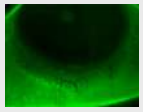
#11 Limbal Staining

Causes

- Excessive or inadequate fluid at limbus
- Mechanical irritation
- Touch at the limbus

Fixes:

- Evaluate Fluid reservoir at limbus and landing zone
- Adjust accordingly 40-100 microns
  - Increase or decrease reverse geometry
- Increase OAD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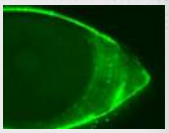
#12 Conjunctival Staining

Causes:

- Landing zone is too tight causing impingement
- Not enough coverage – Conj Exposure
- Lid marginal disease

Fixes:

- Evaluation and assessment of landing zone
- Adjusting landing zone - Flatten
- Increase OAD
- Clean up the lids



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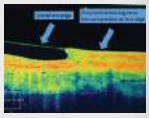
#13 Edge Compression

Compression
- Excessive bearing of peripheral curves
- No corneal staining
- Can result in rebound hyperemia
- Compression Ring upon removal
- Causes Blanching
- Edges too steep

Fixes
- Flatten landing zone
- Decrease overall diameter
- Location – may need a vault/notch



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Blanching Vs Impingement

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#14 Mid-peripheral Compression

- Excessive negative pressure near limbus
- Injection on either side of the compression
  - Rebound redness post lens removal
- Heel-toe compression
  - Harsh middle landing area

Fixes:
- Flatten the middle peripheral curves
- Quadrant specific adjustment to landing zone
- Adjust overall diameter

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#15 Conjunctival Prolapse

- Is it an issue?
- Pre-existing conjunctivochalasis
- Negative pressure under lens
- Excessive fluid reservoir at limbus

Next Steps:
Monitor for neo, adhesion after removal
- Reduce fluid reservoir
  - Transition Zone
  - Optic Zone
- Center the lens

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#16 Bubbles under the lens

Problem
- One of the edges is flat
- Find it with NaFL
- Can cause corneal staining, dimple vailing and dryness

Fix:
- Find the leak – how?
- Seal it –steepen the edge
- If out of warranty ? Use Celluvisc

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#17 Lens Decentration

Observations
- Infero-temporal decentration with lens settling
- Uneven fluid reservoir
- Superior nasal mid-peripheral touch
- Induced prism

Causes
- Inferiorly-decentered apex
- Spherical lens on asymmetric sclera
- Excessive fluid réservoir at optic zone
- Lens is heavy – high Rx
- Tight Upper lid /weight

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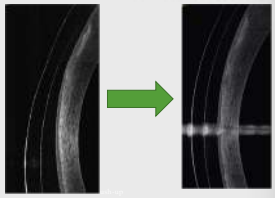
#17 Lens Decentration

Fixes

- Reduce fluid reservoir
  - Optic Zone
  - Transition Zone
- Steepen superior and inferior edge
- Dual Sagittal Depthes
- Reduce the weight of the lens

- Free Form
- Impression-based lenses



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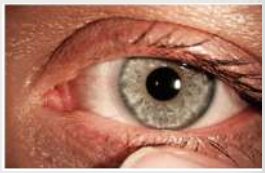
#17 Lens Decentration

- Push Up test

- If you push up and the lens doesn't move freely
  - Top is stuck
  - Steepen 6 & Flatten 12

- If you push up and the lens moves freely
  - Top is loose
  - Steepen 6 & 12



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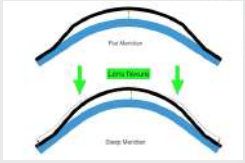
#18 Lens Flexure

The lens is bending on the eye

How to Find it
- K's over top
- Residual Astigmatism

How to fix it
- Look at the edges for a **balance fit**
- If more than 0.75D difference in K otherwise don't worry
- Increase the lens thickness?
- Recalculate the astigmatism
- Recenter the lens



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#19 Midday Fogging

Chamber Debris
- Tear exchange issue - Edge
  - Too much – too flat (mild)
  - Not enough - too steep
- Solution issues
- Mechanical issues
- Lid margin debris

Causes:
- Decreased VA
- Dry eyes

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#19 Midday Fogging

Fixes:
- Optimize fit in landing zone
- Change the solution in the bowl
  - Changes the osmolarity and pH

- Out of Warranty
  Leak – Fill the bowl with Celluvisc/Hylo Gel/Gel

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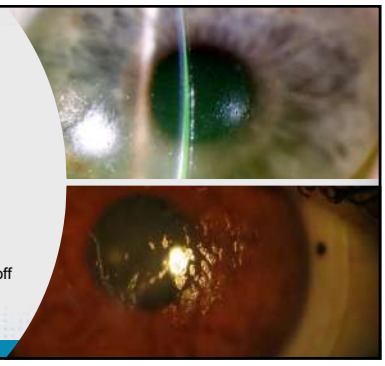
#20 Front surface Debris

- Poor Wetting of the lens
- Caused by
  - MGD previously present
  - Dry eyes - OSD
  - Poor blinking/lid issues
  - Exposure Keratopathy
  - Scratches/Coatings worn off



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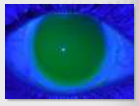
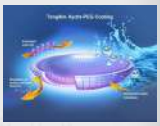
#20 Front surface Debris

Fixes:
- Clean up the lids
- Squeegee
- Hand care products
- Clean and re-apply lenses
- Rub Biotrue or conditioner onto the front surface



- Materials – Appropriate Dk
- Coatings – Plasma Tx, HPEG

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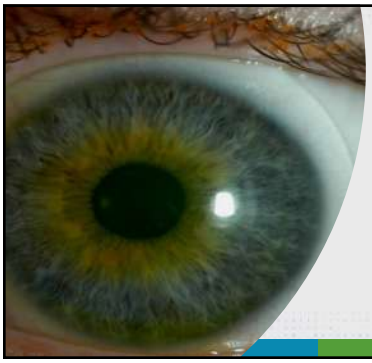

Advanced Optics

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#21 Obstacles

- Pterygium, Pinguecula, Blebs, asymmetrical conj
- Avoid or go over

- Vaults, notches, recesses, channels,




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Profilometry Devices

- Ocular Surface Imaging
- Anterior Elevation Data
- Measure the scleral upon which the lens lands
- Use individual company algorithms

- 3 Uses
  - Choose initial lens to fit diagnostically
  - Choose initial lens & edge design to order 1st lens then diagnostically fit
  - Order a free form lens

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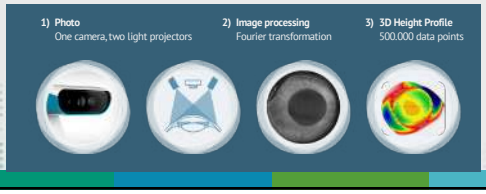
The Eaglet Surface Profiler (ESP)

- 500,000 Data points
- 2 cameras - 1 Image
- NaFl to image
- Works with many lens designs



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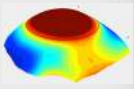
Visionary Optics sMap3D

- Works ONLY with Visionary Products
- 1M data points
- 3 image stitches together
- NaFl to take images
- 22mm Range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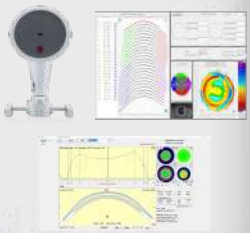
Oculus Pentacam Corneal Scleral Profile

Oculus Pentacam Cornea Scleral Profile

- (CSP - Basic), (AXL), (AXL Wave)
- Works with many lens designs
- Rotating Scheimpflug Camera
- 138,000 True elevation points
- 100 Images in 2 seconds
- 1 scan – primary gaze
- No Nafl
- 18 mm range



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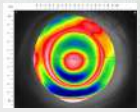
Free-Form Scleral Lenses

- BostonSight Scleral Smart 360 (Boston Sight)
- Gaudi HyperGeometric Scleral (Valley Contax)
- Latitude (Visionary Optics)
- Maxim 3D (Acculens)
- Scan Fit Pro (EyePrint Prosthetics/Synergeyes)
- Wave Scleral Lens (Wave)



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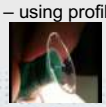
Impression Based Lenses

- Eye Print Prosthetics
  - Create a mold of the eye (No anesthetic needed)
  - Use the impression to design a computer generated scleral
  - 1-2 microns of accuracy
- EyePrint – Original Most data points, most customizable
- EyeFit - Less complex cases
- EyeScan – using profilometry to design



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#22 Poor Vision with a Perfect Fit

- 20/20 but NOT happy
- Ghosting, Shadows, Glare
- Decrease contrast sensitivity
- Scarring
- Post surgical (RK)

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Vision Better with GP lenses

- Corneal Compression with the lens
- Causing reduced myopia – better vision

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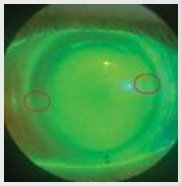
Front Torics Needed

- Residual Astigmatism
  - Actual
  - Flexure
- **Trial Frame to ensure you need it**
- Perfect the fit before add front optics
  - No Rotation
  - Stable



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Optic Zone Issues

- Pupil too large - OZ too small
  - Increase the OZ

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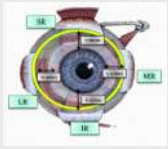
Scleral Lens Misalignment

- Center of the lens not matching center of the pupil
  - Scleral anatomy – lens down and out
  - eyelid tension
  - lens weight – larger lens, higher power
  - Deeper tear reservoir
- Improved with toric haptics
- Free form lenses
- Impression based lenses



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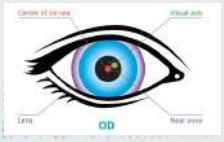
Natural Misaligned Opitcs

- Line of sight and Geometric center of the eye do not match
- LOS typically Superior Nasal
- Use photos & Topographers



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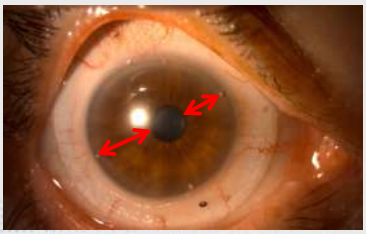
Easy to see when you look



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Effects of Misaligned MFs

- Prismatic Effects
- Higher order aberrations
- Decreased Contrast
- Poor Vision
- 3D effect of images
- Overlapping Images
- Halos around images
- Visual Disturbances
- The greater the decentration, the greater the visual disturbance

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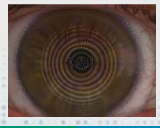
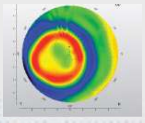
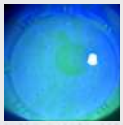
Measuring Misalignments

- Topographers
  - Placido disc projecting rings on the lens
  - Topography over the lens to determine center of the lens
- Diagnostic Lenses
  - Trial lenses with marking to determine decentration







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Measuring Misalignments

- Using Calculators
- Software – Matlab Software
- Reticle on the slit lamp

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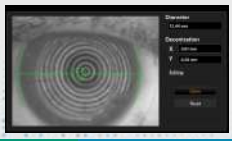
Devices to Measuring Misalignments

- Equipment
  - Pentacam
  - OVITZ
  - MYAH



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Decenter the Optics

- Align the optical Systems
- Improve Vision and 20/20 unhappiness
- All the rage

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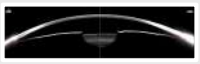
HOA Optics

- Higher Order Aberrations
- True HOA Calculation of the ocular system - Interlayer misalignments
  - Front surface of the cornea
  - Back surface of the cornea (KCN)
  - Aberrations of the Lens



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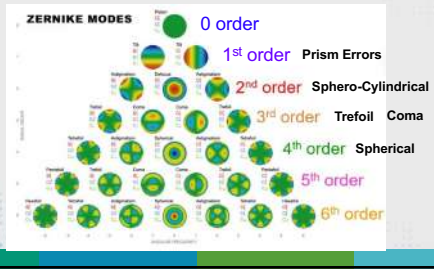
Zernike Polynomials



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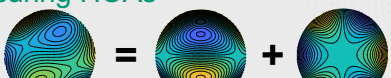
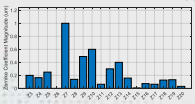
Measuring HOAs



Measured Wavefront | Coma (Z7) Component | Trefoil (Z9) Component



Single value

HOA RMS = 1.39um
(at 6 mm pupil diameter)

HOA RMS: The least-bad way to summarize all these components into a single number

- An Average – Quick Easy Low/High Aberrations, Misses Nuances - Not all aberrations affect vision

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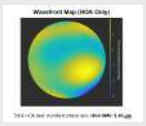
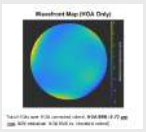
HOA Optics Outcomes





- 1-5 lines of VA Improvements
- HOA Reduction by 40-62%
- HOA & Multifocals - 1+1 = 3
- HOA & Multifocals & Decentered Optics

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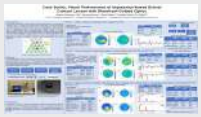
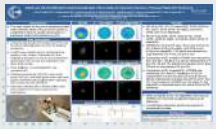
Research & Design

valleycontax

BOSTONSIGHT





EYEPRINT PROSTHETICS

Visionary Optics
uniquely specialized contact lenses

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#23 Presbyopia

- Scleral lens wearers become presbyopic too
  - Keratoconics
  - Dry Eye Sufferers
- Fitting process for multifocals is similar to soft lenses

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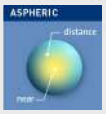
Scleral Multifocal Lens

Simultaneous Designs
- Center Near (2/3)
- Center Distance (1/3)
- Aspheric (Progressive designs)
- Concentric Rings
  - **2 - Bifocal or 3 -trifocal rings**
  - Rings can be aspheric or spherical
- Which Surface
  - Front surface
  - Back Surface
  - Dual Surface



No Translating – because they don't move

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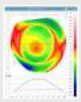
Step #1
Complete a Spherical Fit

Design your scleral Lenes
- Diagnostic Fitting
- Profilometry guided
- Free Form or Impression



Fitting Tips
- Don't over minus
- Binocular Balance
- Centered lenses – Edge Designs – Toric PCs and Quad PCs
- Stable – no spinning - Edge Designs

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Pause and think

- Re-evaluate Patient Motivation
- Good endpoint
- Lenses to come back to
  - SV + Readers
  - One lens to use with Modified Monovision

Talk to your lab
- What are the Costs
- What are the warranties
- # of redos for MF lenses
- Process – return SV lenses

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Learn everything about the MF Design

- Center Near, Center Distance or both
- Optic zone size & ability to change
- Spherical, aspheric, concentric or combo designs
- Bifocal or trifocal segments
- Front surface, back surface or dual aspheric designs
- Add power range possible

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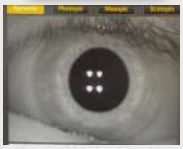
Empirical Design – What do we need?

- K's, Rx, Add power
- Eye dominance
  - Sensory dominance
- Pupil size in dim and bright lights
  - Pupil ruler, Ruler
  - Slit lamp reticule
  - Topographer
  - Pupilometer
- Send to the Lab to design the MF



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Check Vision at follow up

- **Binocular** distance, near & Computer VAs
- Start with **20/40** letters as the goal
- Have the lights on
- Use real world tasks - **phones/books**
- Check Visual **Comfort**

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Start Problem Solving

- **Binocular VAs**
- **Monocular VAs – Distance and Near**
- **Binocular Distance Over Refraction**
  - Push Plus
- **Monocular Distance Over Refraction**

- **Check the fit**
- Did it come back the same as the SV?
- K's over top – residual Astigmatism

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Fitting Guides for Scleral Lenses

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Be Creative – Work with your Lab Team

- Adjust Add Power in each eye
- Center Near, Center Distance & Combos
- Customize the Optic Zone
- Match visual goals with designs
- Communication of realistic expectations

- **Go Back to the SV lenses + Readers**

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Where to get help

- Your Lab
- GPLI - CLMA
- Scleral Lens society
- Meetings
- Associations
- Friends

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Questions?

Thank You.

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