ADVANCED SCLERAL OPTICS

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DISCLOSURES

• President: EyePrint Prosthetics
• Grant: Mojo Vision
WHERE DOES BLUR COME FROM?

- Tear film
  - Stability
- Contact Lens Centration
- Cornea Shape
  - Front and back
- Lens
  - Crystalline lens
  - IOL
    - Placement
    - Toric
    - Multifocal
TEAR FILM

• Quality of blink
• Quality of tears
• Quantity of tears
Surface Wettability

- Inadequate wettability
  - decreases comfort
  - diminishes visual clarity
  - affects a patient’s overall lens wearing experience
  - increases chair time/ # of patient visits and cost.
Surface Wettability

- All Gas Permeable (GP) materials start out hydrophobic.
  - any exposed silicone in a lens has the potential to be non-wetting.
  - excessive lipids in the tear film may deposit onto the lens to create a foggy, hydrophobic surface.
Who is susceptible to Non-wetting

- Ocular surface disease patients
  - Ocular rosacea/ meibomian gland dysfunction
  - Filamentary keratitis
  - Systemic disease: GVHD, Sjogren, OCP

- Patients suffering from exposure
  - Incomplete blink congregates debris into one area where it tends to build up

- Women
  - Makeup
  - Skincare regime

- Other culprits
  - Handsoaps with moisturizing agents
  - Poor plunger hygiene
  - Older blocking compounds such as pitch
Meibum

- Decrease in the quantity of secretion occurs with age
  - fewer orifices freely expressing meibomian secretions
  - not accompanied by an increased opacity or viscosity of the secretions
- Changes in secretions represent markers of disease
- Assessed indirectly by compressing the tarsal plate locally in relation to individual groups of orifices.
  - may be performed with finger pressure, a cotton tip, or a glass rod or with the Korb expression device
  - Nasal more active than temporal
Meibum Quality

- Clear (i.e., normal).
- Cloudy: diffusely turbid fluid secretions.
- Granular: usually turbid fluid secretions, but contains particulate matter. The color of these secretions varies from whitish-gray to yellow.
- Inspissated: a semisolid plug or a substance of toothpaste-like consistency; may be extruded as a plug or curled thread. Expression is usually delayed or requires extra pressure. The material contains keratinized epithelial cells.
Troubleshooting

- Changing contact lens care regime
  - Ensuring proper solutions are being used
  - Incorporating enzymatic protein cleaners / Menicon Progent
- Changing makeup and skincare regime
  - No paraben waxes
- Changing hand soaps
  - Recommend clear hand soaps
- Lid hygiene
- Changing scleral lens material
  - Wettability vs Dk
    - Less silicone
- Improve plunger hygiene
  - Clean plungers with alcohol wipe
    - Ensure that alcohol dries prior to use
    - Apply few drops of wetting solution to plunger prior to use
- Squeegee technique with moistened q-tip or plunger
  - Especially beneficial for patients with exposure related conditions
- Artificial tears
  - Demulcients vs Emollients
  - Surfactants
- Re-surface treatment
  - Plasma
  - HydraPEG
Current Wetting Treatment Options

- Viscosity agents: necessary for reducing surface tension, increasing lubricity and treating dry surfaces.
  - methylcellulose (found in most GP solutions)
    - short substantivity (the amount of time the agent lingers on the eye and contact lens).
    - increasing amounts of methylcellulose have been associated with negative patient tolerance, including blurred vision or crusting of lashes.
  - HP-Guar
    - exhibits intermolecular hydrogen bonding in the presence of borate ions, which results in polymer chain aggregation and increased viscosity. PH levels affect the cross-linking between HP-Guar and borate. This system is less viscous in the bottle (pH of 7.0) and when handling, thus providing a more liquid feel during manipulation of the lens. This fluidity also provides an effective solution stream during the rinse step. The lower-viscosity-feel eliminates the desire for a water rinse prior to insertion.
Plasma Treatment

What is it?
- High energy oxygen plasma, with equal number of +/- ions, bombards the lens surface, transferring energy from the plasma to the solid.
- Cleans and oxidizes the surface
  - Creates reactive oxygen species that are able to interact with water, making the surface hydrophilic.
  - Changes surface properties up to angstroms to 10µm, without changing the bulk properties of the material.
Plasma Treatment

● How long does it take?
  ● About 4 minutes

● How long does it last?
  ● can last from a few minutes to a few months.
  ● do not modify, polish, or use abrasive cleaners.
POLYETHYLENE GLYCOL (PEG)

Properties of PEG: Lubricious, viscous, dependent on the length of the polymer and treatment of the surface
Polyethylene Glycol (PEG)

- Separates the lens material from the tear film
- Optically-clear coating encapsulates the core contact lens with a mucin-like hydrophilic shell.
Tangible HydraPEG

• Initial Lab Application
  • Plasma treat the surface
  • Cleans and activates the surface
  • Soak lens in the Tangible Hydra-PEG polymers
    • 90 minutes

• In Office Application
  • BOOST
  • Clean lens with Tangible Clean
  • Mix 2 solutions
  • Sit for 30 minute
  • Rinse with Tangible Clean
HydraPEG

● How long does it last
  ● Variable long term performance

● Solution dependent:
  ● Tangible, Clear Care, Unique Ph
  ● Tap Water, Progent, alcohols remove it

● Shorter duration of effectiveness for heavy depositor or lagophthalmos patients
WHY DO YOU NEED TO UNDERSTAND HOA’S

• Improves outcomes and incomes
• Makes you a better doctor
• Connects you to the patient
• Keeps you out of trouble OR gets you out of trouble
QUALITY VS QUANTITY OF VISION

• After correcting the tear film, the optical centration, LOA’s and evaluating for diffuse scatter:

• HOA’s are the reason patients still don’t see well with their best refraction

“Zernikes” are the mathematical way to describe optical distortions but the pupil/ line or sight is the element you need to understand.
RECOGNITION OF HOA – ONCE LOA AND CENTRATION ACHIVED

• Blur and Double Vision
  • Caused by Coma

• Glare and Halo
  • Caused by Spherical Aberration

• Starbursts and Comet Trails
  • Caused by Trefoil
COMMON LOCATION OF HOA

- Coma
  - Corneal (decentered ablation, keratoconus, asymmetric CT)
  - Lens (tilted IOL or decentered toric)
- Spherical aberration
  - Cornea (small ablation zone)
  - Lens (Lenticonus or DLS)
- Trefoil
  - Cornea (RK surgery)
  - Lens (decentered rhexitis)
QUANTIFY HOA

- HOA’s are 3rd order and above
- HOA are not correctable with LOA’s
HOA AND SCATTER ARE DIFFERENT THINGS!
OPTICS
LOA’s and Centration

• Over refract GP lens
• Order sphere lens if initial cylindrical over refraction is less than 0.75D
• Incorporate all toricity in final lens power order
  • Typically can get a more precise over refraction once optics are centered
  • Front surface toric
OPTICAL ALIGNMENT MEASUREMENTS

- **Angle Alpha** is the distance from the VA to the optical center of the cornea.
- **Angle Kappa** is the distance from the VA to the center of the pupil.
GOOD ALIGNMENT WITH LOW ANGLE ALPHA
HIGH ANGLE ALPHA
CENTERING OPTICS

WTR, VA on power meridian

ATR, VA not on power meridian
SEPARATING CORNEA FROM THE LENS

• Enables Assessment of the Quality of Vision for the Components of the Eye
• Know how they combine for overall vision
DYSFUNCTIONAL LENS SYNDROME (DSL)
What is an RMS Value? = Optical fingerprint

- the deviation between the actual and the ideal wavefront
- The higher the number the more deviation

Things that affect RMS values?

- Pupil size
- Accommodation
- Cataract state
- Lens centration
• Tear film
  • Stability
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    • Multifocal