RIGID GAS PERMEABLE LENS ASSESSMENT AND FITTING - IT'S NOT THAT HARD

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INTRODUCTION

- Adjunct Faculty at The New England College of Optometry
- Work in 2 private practices in Massachusetts, U.S.A.
- Residency trained in cornea and contact lenses and have been in practice for 14 years
- General optometry with a focus/concentration on contact lenses and specialty contact lenses (keratoconus, post surgical, ortho-k, multifocal, scleral)
GOALS

• Brief overview of why we should use “rigid” gas permeable (GP) contact lenses.
• Review the process of selecting and fitting corneal GP lenses (small diameter lenses).
• Review what properly fit GP lenses should look like.
• Review trouble shooting GP lens fits.
POLL QUESTION # 1

• How familiar are you with the fitting process of GP lenses?

1) I have never fit a GP lens.

2) I am familiar with the process in theory, but have never fit one on an actual patient.

3) I fit them but not often enough to feel comfortable with them.

4) I fit often enough to feel comfortable fitting them.
POLL QUESTION # 2

• How often do you fit GP lenses?

  1) Never

  2) On occasions (once every few months)

  3) At least once a month

  4) Several times a month
WHY GP LENSES?

• Relatively easy to obtain globally
• Customizable = Large indication of usage
• Can provide better quality of vision
• May be more cost effective than soft lenses
• May be healthier than soft lenses
POLL QUESTION # 3

Which conditions do you use corneal GP lenses for (select all that apply)?

1) Normal corneas
2) High Refractive Error (sphere and/or cyl)
3) Post Surgical Corneas
4) Keratoconus/Ectactic/Degenerative/Irregular Corneal Disease
5) Corneal Reshaping/Ortho-K
BENEFITS OF GP LENSES

• Indications/Usage
  - Corneas with high toricity
  - Corneas with irregular surface (i.e. keratoconus, ectasia, scarring)
  - Post graft and post surgical corneas
  - Aphakia
  - Multifocal
  - Orthokeratatology

CAN BE USED FOR ALMOST ANY INDICATION!
BENEFITS OF GP LENSES

• Health Benefits –
  - Oxygen permeable – “Gas Permeable”
  - Deposit Resistant
  - Does not “dry” tear film

• Visually –
  - More precise Rx
  - Customizable
  - Optics of lens not influenced by shape of eye

• Others –
  - More durable
  - Longer life span compared to soft lenses
IS THE PATIENT APPROPRIATE FOR GP LENSES?
IF SO, THEN...
EMPIRICAL FIT
VS.
DIAGNOSTIC FIT
POLL QUESTION # 4

• Do you fit GP lenses empirically or diagnostically?

1) NO – I am unfamiliar what that is
2) NO – I only fit diagnostically
3) YES – I always fit empirically
4) YES – It depends on the situation
EMPIRICAL VS. DIAGNOSTIC

Empirical:
Pros:
- Quicker, more time efficient
- Gets lab more involved, takes any “guess work” out of the process – higher success rate
- May provide better “first impression when putting lens on eye
- “More accurate”

Cons:
- None really

Diagnostic:
Pros:
- Can see fluorescein and fitting immediately
- Can determine if any subtle changes need to be accounted for

Cons:
- More initial chair time
- Patient may get false impression about lenses from initial fit
- Requires a fitting set
SELECT YOUR LENS
STEP 1: CHOOSE SIZE AND DIAMETER

- Scleral or Intralimbal or Corneal?
- Larger diameter or smaller diameter?
- What to consider:
  - Corneal size
  - Pupil diameter
  - HVID and palpebral aperture size
  - Blink status and lid tension
  - Corneal condition and location and severity of disease
  - Tear film status
STEP 2: SELECT YOUR DESIGN

• Spherical GP
• Front Surface Toric GP
• Back Surface Toric GP
• Bitoric GP
• Multifocal (not discussing)
• Corneal Reshaping/Ortho-K (not discussing)
• Hybrid (not discussing)
STEP 3: SELECT YOUR BASE CURVE

- Keratometry or Corneal Topography?

<table>
<thead>
<tr>
<th>Corneal Cyl</th>
<th>9.0 – 9.4 mm</th>
<th>9.4 – 9.8 mm</th>
<th>&gt;9.8 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 0.75 D</td>
<td>0.25 D flatter than average K</td>
<td>0.50 D flatter than average K</td>
<td>0.75 D flatter than average K</td>
</tr>
<tr>
<td>1.00 – 1.25 D</td>
<td>On average K</td>
<td>0.25 D flatter than average K</td>
<td>0.50 D flatter than average K</td>
</tr>
<tr>
<td>1.50 – 1.75 D</td>
<td>0.25 D steeper than average K</td>
<td>On average K</td>
<td>0.25 D flatter than average K</td>
</tr>
<tr>
<td>2.00 – 2.25 D</td>
<td>0.50 D steeper than average K</td>
<td>0.25 D steeper than average K</td>
<td>On average K</td>
</tr>
<tr>
<td>2.50 D or Greater</td>
<td>Toric B.C.</td>
<td>Toric B.C.</td>
<td>Toric B.C.</td>
</tr>
</tbody>
</table>
THE CORNEA IS AN ASPHERIC SURFACE

- Central eccentricity - 0.3 to 0.7
- Flattens going from center to periphery
- May be toric
- Is asymmetric
## BACK SURFACE TORIC BASE CURVE

<table>
<thead>
<tr>
<th>Corneal Cyl</th>
<th>Flat Meridian</th>
<th>Steep Meridian</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.0 D</td>
<td>“On K”</td>
<td>0.50 D flatter</td>
</tr>
<tr>
<td>2.5 D</td>
<td>0.25 D flatter</td>
<td>0.50 D flatter</td>
</tr>
<tr>
<td>3.0 D</td>
<td>0.25 D flatter</td>
<td>0.75 D flatter</td>
</tr>
<tr>
<td>3.5 D</td>
<td>0.25 D flatter</td>
<td>0.75 D flatter</td>
</tr>
<tr>
<td>4.0 D</td>
<td>0.25 D flatter</td>
<td>1.00 D flatter</td>
</tr>
<tr>
<td>5.0 D</td>
<td>0.25 D flatter</td>
<td>1.25 D flatter</td>
</tr>
</tbody>
</table>

- Many different philosophies to determining base curve.
- Personal philosophy – I fit these lenses empirically
MANDELL-MOORE BITORIC CALCULATOR

Instructions

1. On line 1 and 2 enter the patient Keratometry readings and Spectacle Rx respectively.
2. On line 3 enter the flattest K in the box on the left side and the steepest K in the box on the right.
3. On line 4 enter the sphere power in the box on the left and the sphere power plus the cylinder power in the box on the right.
4. If the powers noted in line 4 are greater than or equal to +1.00 D an adjustment for vertex distance is entered in line 5. Vertex adjusted powers are used to complete the remaining calculations.
5. Use the Fit Factor Chart above for the values needed to be entered into line 6. The amount of curve of fit will determine the Fit Factor for the flat and steep meridians. "On K" has a 0 Fit Factor.
6. Add/Subtract the lines as noted and enter the results in line 7. These are the actual numbers that you will give the lab to manufacture your bitorics. They are referred to as dose values.

To download additional copies, please access www.gplii.info
BACK SURFACE DESIGN

Peripheral curve radius
Secondary curve radius
Base curve radius
Secondary curve width
Peripheral curve width
STEP 4: SELECT YOUR MATERIAL

- Material Properties (i.e. Silicone Acrylate Vs. Fluoro-Silicone Acrylate)
- Permeability (High dK Vs. Low dK)
- Wettability
- Surface coating/treatment (Plasma treatment, Tangible Hydra-PEG)

- Examples of materials:
  – Boston Brand (Bausch & Lomb/Valeant)
  – Optimum Brand (Contomac)
  – Paragon Brand (Paragon Vision)
  – Fluoroperm Brand (Paragon Vision)
  – Menicon Z (Menicon)
FITTING PROCESS
POLL QUESTION # 5

- Do you use of anesthetic during the fit process?

  1) Yes
  2) No
FIT PROCESS

1) Insert lenses (with anesthetic?)
2) Allow lenses to settle (at least 10 minutes)
3) Measure visual acuity and perform over-refraction – refine with phoropter but confirm with trial lens
4) Evaluate central fluorescein pattern
5) Evaluate mid-peripheral fluorescein pattern and peripheral edge lift
6) Evaluate centration and movement
7) Trouble shoot and make modifications as needed
FLUORESCEIN PATTERNS
ALIGNMENT

Source: www.gpli.info
FLATTER THAN “K”

2D Flatter

1D Flatter

Source: www.gpli.info
STeeper THAN “K”

2D Steeper

1D Steeper

Source: www.gpli.info
SPHERICAL LENS ON TORIC CORNEA

3D WTR Pattern

Source: www.gpli.info
INTERPALPEBRAL VS. LID ATTACHED

Lid Attached

Superior Fit

Central Fit

Interpalpebral

Inferior
VIDEO OF LENS MOVEMENT

• Aligned Lens: Uniform up and down movement

• Steep Lens: Straight up and down movement with quick drop down. “Riding on rails”

• Flat lens: Straight up movement with “rolling” affect on drop. “Teeter – Totter”
EDGE LIFT AND COMFORT RELATIONSHIP:

- Low Edge Lift: Feel edge on cornea / limbus, easier to obtain interpalpebral fit

- “Moderate” Edge Lift: “Best comfort” – all relative to patient

- High Edge Lift: feel edge on eye lids, easier to obtain lid attachment
LENS TOO FLAT

- Appearance: Apical bearing
- Possible changes:
  - Steepen base curve of lens
  - Increase overall diameter – effectively steepens lens
  - Increase optic zone diameter – effectively steepens lens

* ~ 1.0 mm change in diameter will make a 0.1 mm change in base curve
LENS TOO STEEP

• Appearance: Apical touch
• Possible changes:
  - Flatten base curve of lens
  - Decrease overall diameter – effectively flattens lens
  - Decrease optic zone diameter – effectively flattens lens

* ~ 1.0 mm change in diameter will make a 0.1 mm change in base curve
DON’T FORGET STEEPEN ADD MINUS, FLATTEN ADD PLUS (SAM FAP)

- Tears between lens back surface and cornea front surface will create a lacrimal lens with corrective power.
- Steeper base curve over flatter cornea – “plus power” lacrimal lens
- Flatter base curve over steeper cornea – “mins power” lacrimal lens
- ~ 0.1 mm change in B.C. radius = 0.50 D change in power

Too keep effective power the same when changing base curve:
- Steepening base curve: add -0.50 D for every 0.1 mm change
- Flattening base curve: add +0.50 D for every 0.1 mm change
- This also has to be accounted for when changing diameter
FITTING PEARLS TO REMEMBER

• Steepening the base curve steepens the peripheral curve
• Flattening the base curve flattens the peripheral curve
• Increasing lens diameter increases edge lift
• Decreasing lens diameter decreases edge lift
• Changing optic zone diameter will influence the fit
NO MOVEMENT/LENS TOO TIGHT

• Appearance: Static lens with no appearance of much edge lift. Generally no appearance of fluorescein under the lens from sealed off edges either.

• Possible changes:
  - Flatten base curve of lens
  - Decrease overall diameter – effectively flattens lens
  - Decrease optic zone diameter – effectively flattens lens
  - Flatten peripheral edge lift
EXCESSIVE MOVEMENT/LENS DROPS

- Is lens too flat (Rolling)? – effectively steepen the lens to cornea relationship
- Is lens too steep (Up and down)? – effectively flatten the lens to cornea relationship
- Do we need to achieve lid attachment? - Flatten base curve or flatten peripheral curve/edge lift to improve lens edge to lid interaction.
- Increasing diameter is another option to improve stability.
- High Rx – May need to add carrier lenticulation
MINUS CARRIER LENTICULAR:

- Anterior Optic Zone Diameter is roughly equal to Posterior OZD
- Low minus, any plus
- Decreases center thickness
  - Lenticular bowl
- Increases edge thickness
  - Enhances lid attachment
PLUS CARRIER LENTICULAR:

- Moderate to high minus
- Decreases edge thickness
- Decreases mass of lens
- Specify ET $\sim 0.12$ mm
LENS DECENTERED

- Increase diameter
- Steepen base curve and/or peripheral curve
POOR VISION

• Incorrect power
• Poor surface wettability
  *Most common issue with new lenses – waxy pitch from manufacturing process
• Improper lens position
• Ocular surface issues – dryness/SPK from conditioning solution
• Lens Flexure
• Warpage of lens (older lens)
LENS UNCOMFORTABLE

- Decrease lens movement – lid attach
- Modify edges – thin out, round
- Modify curve junctions – blend
- Lenticulate lens
- Take ocular surface into consideration
LENS CARE AND FOLLOW-UPS
DAILY CLEANING AND CONDITIONING MAINTAINS LENS COMFORT AND REDUCES LENS RELATED EYE PROBLEMS
FOLLOW-UP

• Reinforce annual evaluation of lenses to ensure continuous proper fit and vision
• Consider recommending semi annual in office deep cleaning.
  – Brief scrub with polishing solution
  – Brief rub with alcohol base laboratory cleaner
  – Progent (Menicon) soak
TIPS AND ADVICE

- Always use a wratton filter and use bright light
- Put fluorescein on LENS SURFACE, and don’t use a lot!
- If available, talk to your consultants at your lens manufacturing lab
- Don’t make too many changes at once
- My opinion, and just an opinion, larger is better!
- There is no one exact correct fit
- Don’t hesitate to recommend a rewetting agent/artificial tear to improve comfort
- Consider “piggy back” for uncomfortable lenses
- Don’t forget about hybrid lenses (if available in your area)
RESOURCES

• Gas Permeable Lens Institute (https://www.gpli.info)

• Manual of Gas Permeable Contact Lenes (Ed Bennett, Milton Hom)

• Contact Lens Spectrum (www.clspectrum.com)

• Review of Contact Lenses (www.reviewofcontactlenses.com)
THANK YOU

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