The Not-so-Sexy
GP Fitting Lecture

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Disclosure

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Lens market

- There are 40 million contact lens wearers in the United States in 2011.
  - 38 million soft
  - 2 million GP
- 49% of the glasses wearing population between the ages 21 and 40.
- The worldwide contact lens market is now (2019) estimated at $9 billion, while the U.S. market is estimated at $3 billion.
Material Classes 2019

http://www.clspectrum.com  January 2020
Lens Type

- **Corneal**: 75%
- **Scleral**: 13%
- **Ortho-K**: 8%
- **Hybrid**: 5%
Resources

- GPLI.info
- Click N’ Fit
- GP Fitting, Evaluation and Problem Solving
- Fluorescein Pattern Identification Guide
- GP toric and Spherical Lens Calculator
- Webinars
- Scleralens.org
GP Advantages

- Crisp vision
- Easy to handle
- Good life span
- Good oxygen transmission
- Inexpensive

- Less dryness
- Custom lens designs
- Can polish/modify
- Easy to care for
- Few complications
GP Disadvantages

- Initially less comfortable
- Foreign body sensations
- Increased fitting time
- Difficult with sports and intermittent wear
- Longer adaptation time
- Lens adherence
- 3-9 staining
- Corneal warpage
- Dislodge more easily
The Cornea Needs Oxygen

- **Energy**
  - Cellular division
  - Synthesis of proteins, lipids, etc.
  - Construction and maintenance of junctional attachments
  - Cellular chemical balance (pH and osmotic)
  - Programmed cell maturation
  - Repair
Material Permeability (Dk) and Transmissibility (Dk/T)

- $D =$ diffusion coefficient
- $k =$ solubility coefficient
- $T =$ thickness of lens material

Must have a Dk of 125 to have no corneal swelling in a closed eye state
DK and Lens Selection

Low Dk = 25-50 (daily wear myopes, bitorics)
High DK = 51-99 (hyperopes, multifocals, Keratoconus)
Hyper DK >100 (extended wear, sclerals, ortho K)

Bottom line: consult your lab
Designs

- Spherical
- Ortho K
- Myopia Control
- Front toric
- Back toric
- Bitoric
- Bifocal
- Keratoconus
- Elevation Specific
How Do You Decide What to Fit?

SUBJECTIVE AND OBJECTIVE INFORMATION
Factors Influencing Contact Lens Wear

- Patient wearing schedule, care habits, corneal physiology
- Lens material
- Lens design
- Skill of the doctors: design and fit
Case History

- Listen to what the patient has to say and how the patient says it.
- Add to the history throughout the examination.
Case History

- Reason for visit (new lenses, solve problem, spec Rx)
- Needs and expectation
  - When? (all day, EW, sports, at night)
  - Where? (environment: dusty, drafty, computer, lighting?)
  - Why? Cosmetic, aniso, KCN, a friend wears?
Case History

- Motivation
- Cosmesis
- Cost (discuss with patient: exam $ and material refund policy)
- Previous contact lens wear
Look at Numbers

- Check K’s and refraction
  - Smooth vs. distorted
- How much astigmatism?
- Does corneal astigmatism = refractive astigmatism?
Exam Findings

- External exam:
  - Hygiene/ manual dexterity/ cosmetics
  - Lids: position, size of aperture, tension, blink rate and quality

- Slit lamp findings
  - Preexisting conditions, scars, staining, bleph, tear quality
Things to Consider

- How much corneal cyl?
- How much spec cyl?
- What is the Residual astigmatism for an RGP? SCL?
Residual Astigmatism

- Corneal cyl + lenticular cyl = refractive cyl
- $K$ reading = corneal cyl
- Refraction = refractive cyl
- Lenticular = residual astigmatism
Residual Astigmatism Example

- $K = 41.00/42.00 \ @ \ 090$
- $MR = -4.00 +1.00 \times 090$

- $\text{spec cyl} - \text{corneal cyl} = RA$
- $1.00(\text{WTR}) - 1.00(\text{WTR})$
- $RA = 0$
Residual Astigmatism Example

- $K = 42.50/44.50 \@ 090$
- $MR = -6.00 +3.00 \times 180$
- $3.00(\text{ATR}) - 2.00(\text{WTR})$
- $RA = 5D \text{ (ATR)}$
Contact Lens Design and Terminology

- Diameter (OAD)
- Optic zone (OZD)
- Base curve (BC)
- Peripheral curves (PC)
- Center thickness (CT)
- Back vertex power (BVP)
RGP’s Are Accessed With FL
The Most Common Cause for D/C GP Lens Wear is Discomfort
Significance of Good Initial Vision

- Better vision = less lens awareness
- Emperical vs inventory Fitting
Presentation of Lenses

- Gauge patient reaction to ocular testing
- Don’t use negative phrases
  - “Discomfort, pain, intolerance, failure”
- Don’t be tentative in GP description
- Offer realistic expectations:
  - Initial lens awareness
  - Moves more, lid interaction
  - 1-2 weeks adaptation
- Fewer complications, more long term data, more O2
Topical Anesthetic?

- Initial Comfort
- Less reflex tearing
- Less chair time
What Should You Consider In Lens Design?

- Ease of fitting
  - trial sets
  - Simple fitting guide
- Minimal fitting time
- High first fit success
- Minimal corneal insult
- Increased patient comfort
- Repeatable replacements
Fitting a Lens

- Total Diameter
- Base Curve
- Peripheral Curves
- Power
Diameter

- Optimum:
  - Hang off top lid
  - Be well clear of lower limbus
  - Locate centrally
Best Options for Inferior Cones

- Small and Flat (low sag)
  - Will ride high
  - May have inferior lift off
- Large Diameter
  - Forced centration
  - Covers pupil better, less flare
  - Peripheral geometry of concern
  - More lower lid interaction
- Reverse Geometry
Changing Diameter

Lower sag depth

Higher sag depth

7.9

8.7

9.5
Lid Location

Post ptosis surgery
Fitting a Lens

- Total Diameter
- **Base Curve**
- Peripheral Curves
- Power
Choosing a Base Curve

- ½ D flatter than flat K, add ½ Corneal cyl
- 3-4 mm Rule
- Yellow Rule
- Reference Sphere
- .2mm Flatter than Average K
- Fit steep K
What works?

- Remind patient that you are putting the first lens on the eye to get **yourself** orientated.
- The patient won’t be able to see and the lens will likely be uncomfortable.
Base curve should be evaluated with the lens centered
Flat lenses (low sag) ride high, steep lenses (high sag) ride low

6.25mm BC

5.7mm BC
Evaluating the Base Curve

Lower sagittal depth
7.4mm

7.00mm

Greater sagittal depth
6.6mm
Pooling at Base of Cone

- High Sag
- Flatten Base Curve
- Decrease Diameter or Optic Zone
- Flattening the peripheral curves
Bubbles Under the Lens

- Low sag
  - steepen base curve
  - Steepen PC
  - Increase OZ or diameter
Increased OZ
Steeper PC’s
Fitting a Lens

- Total Diameter
- Base Curve
- **Peripheral Curves**
- Power
Edge Lift

- Most important factor for a comfortable fit.
- Ideal Edge Lift = fluorescein band width of 0.6 mm to 0.8 mm wide
Peripheral Curves

- Flat PC’s
  - Lower sagittal depth
- Standard PC’s
- Steep PC’s
  - Increased sagittal depth
Don’t try to adjust peripheral curves by changing the base curve.
Peripheral Curve Adjustment

Natl lens
8.0
10.3
STD PC’s

Natl lens
8.0
10.3
Flat PC’s
Adherence

- Make peripheral curves flatter and wider
- Flatten BC
- Reduce the optic zone
Inferior lift off

Increased OZ
Steeper PC’s
Lens Location

- **Riding High**
  - Reduce diameter
  - Steepen base curve
  - Reduce edge lift

- **Low Riding**
  - Increase diameter
  - Flatten base curve
  - Increase edge lift
Fitting a Lens

- Total Diameter
- Base Curve
- Peripheral Curves
- Power
POWER

- Over scope
- Refine in +/- 0.50 & +/- 0.25 steps
- Final lens power = trial lens + over refraction
- vertex > 4.0 D over Rx
Pearls

- Finish refraction with lights on.
- Reassure patient if VA is not optimum at initial fitting. (tearing)
- VA often improves over first few weeks wear.
- Educate patient about VA expectations. (night driving)
A lens which slides or is tipped or tilted on the cornea can induce significant amounts of unwanted cylinder.

A tilted lens can cause distorted and fluctuating vision.

The steeper secondary curve such as a reverse geometry lens, can help prevent lens tilt by centering the lens horizontally and vertically.
Correction of Residual Astigmatism

- Over Spectacles
  - A/R coat
  - Photochromic
  - Prescription sunglasses
- Front Surface Toric
- Peripheral Toric
- Large Diameter
- Reverse Geometry
Front Surface Toric

- Increase diameter 0.3 mm
- Incorporate prism ballast
- Truncation if required
Summary

- Select base curve based on the fitting algorithm of your choice
- Place lens on eye and determine sagittal depth
  - Flat lenses ride high
  - Steep lenses ride low
- Only evaluate overall sagittal depth with the lens centered on the cone
Sagittal Depth

- Decrease
  - Decrease diameter or optic zone
  - Flatten BC
  - Widen/flatten PC’s

- Increase
  - Increase diameter or Optic Zone
  - Steepen BC
  - Narrow/steep PC’s
Summary

- Diameter/ OZ
  - Optimize centration
  - Minimize lid interaction
  - Increase diameter: increase sag
  - Decrease diameter: decrease sag
Summary

- Base Curve
  - Greatest effect on sagittal depth
  - BC changes do not adjust peripheral curves
  - Gracing touch over cone
Summary

- Peripheral curves and edge lift
  - Effects comfort
  - Determine the appropriate PC’s after the diameter and base curve have been selected
  - Alter diameter and base curve before doing quadrant specific designs
Most Importantly

- Don’t make too many changes all at once
  - Large fitting sets are helpful
  - Practice altering once parameter at a time to learn how each change impacts the overall fit
- Remember, these are general principles and each lens will have its own specific nuances.
Never assume the patient understands the directions