GP LENS UPDATE

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AFFILIATIONS

• Contact Lens Manufacturers Association: Consultant and Executive Director, GP Lens Institute

GP LENSES IN 2014

• 10% of fits and refits (including hybrids): Nichols, January, 2014, CLS
• Five Major Areas
  ■ Sclerals
  ■ Orthokeratology/Corneal Reshaping
  ■ Lens Materials
  ■ Lens Designs/Manufacturing Technology
  ■ Educational Resources

ADVANCEMENT ONE:

SCLERAL LENSES

THE FUTURE OF GPs (Yes: the Future is Bright!) GP Update: Oct., 2013 CLS

• Poll of the GP Lens Institute Advisory Committee as to greatest GP advancement in 2013 and beyond (28 responses):
  ■ Scleral Lenses (notably corneal/mini) (N = 19); for healthy eyes (N = 8: 5 for MFs)
  ■ Orthokeratology (N = 9)
  ■ Hybrid (N = 3)
  ■ Irregular Cornea (N = 2)

Impact of Scleral Lenses: David Bland, Director of Global GP and Custom Soft Lens Business, Bausch + Lomb

“Our annualized growth rate for large diameter buttons since 2006 is 50%. It is the single largest growth category we have seen in GP lenses.” (Contact Lens Spectrum, Oct., 2012)
GP SCLERAL LENS CATEGORIES
(SINDT, CLS Oct., 2008) (with Dr. Rob Breece)

- Corneo-Scleral: 12.9 - 13.5mm
- Semi-Scleral: 13.6 - 14.9mm
- Mini-Scleral: 15.0 - 18.0mm
- Full Scleral: 18.1 - 24+ mm

CASE VB

- 16 incision RK OU in 1990s
- OD: History of retinal detachments; ultimately vitrectomy/loss of vision
- Wearing spectacles with balance lens OD
- Initially fit Intralimbal (11.2mm): excessive movement, midperipheral bearing with excessive edge lift

Acknowledgements

- This was a multi-site clinical study
  - University of Montreal
  - Illinois College of Optometry
  - Ferris State University- Michigan College of Optometry
  - University of Missouri- St Louis College of Optometry
- Co-authors
  - Amy DINARDO-LOTOCZKY OD. MBA. FAAO
  - Jennifer S. HARTHAN. OD. FAAO
  - Bruce W. MORGAN. OD. FAAO
  - Renee E. REEDER. OD. FAAO (Dipl)

Purpose

- To validate the clinical performance of a new large diameter rigid gas permeable lens in a group of subjects with low-to-moderate (0.75D to 2.75 D) refractive astigmatism.
- To demonstrate whether soft toric or large diameter rigid gas-permeable (LRGP) contact lenses offer the best option for the correction of this refractive error
Methods

- Multi-site, cross-over, randomized study.
- Forty (10/site) healthy soft contact lens wearers, non symptomatic, were randomly assigned to Group A or Group B
  - A: Fitted with a soft toric first and a large GP second
  - B: Vice-versa
- Lenses used
  - Comfilcon A Toric lens (Cooper Vision)
  - Tyro 97, 14.3mm diameter GP lens (Blanchard)

Results

- Both lenses presented similar results for visual acuity (high and low contrast), and for ocular health outcomes

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<thead>
<tr>
<th></th>
<th>LRGF</th>
<th>Soft Toric</th>
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<tbody>
<tr>
<td>Visual Acuity (Hx) **</td>
<td>0.1 (0.1)</td>
<td>0.1 (0.1)</td>
</tr>
<tr>
<td>Visual Acuity (Lx)</td>
<td>101 (101)</td>
<td>101 (101)</td>
</tr>
<tr>
<td>dip ***</td>
<td>0.02 (0.02)</td>
<td>0.02 (0.02)</td>
</tr>
<tr>
<td>Bulbar Symmetry **</td>
<td>102 (102)</td>
<td>102 (102)</td>
</tr>
<tr>
<td>GPC **</td>
<td>1.0 (0.0)</td>
<td>1.0 (0.0)</td>
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** Wilcoxon Signed Rank Test
*** Mann-Whitney U Test

- No statistical difference in COMFORT
- No difference for vision while performing day-to-day tasks.

Results – Subjective evaluation(2)

- Soft lenses considered easier to handle
- But LRGP are overall preferred for vision
- 52% will remain in LRGP for the future.

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<thead>
<tr>
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<th>Soft</th>
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<tr>
<td>PREFERRED VISION</td>
<td>27</td>
<td>9</td>
</tr>
<tr>
<td>LENOS OF CHOICE FOR THE FUTURE</td>
<td>19 (32.7%)</td>
<td>17 (47.3%)</td>
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SCLERAL LENS SETTLING RATES

- Scleral lenses reduce in central vault over time due to the lens periphery sinking into the soft conjunctival tissue
- You have to account for this after initial evaluation
- How much do they settle?
  Mountford(2014) found an avg. of 146 microns after 1 month with range from 50 – 250.
A Comparison of the Rates of Short-Term Settling of Three Scleral Lens Designs
Kauffman, Gilmartin, Bennett & Bassi (presented at the Annual Meeting of the AAO, Oct., 2013)

- Evaluated settling after 8 hours with Onefit (14.3mm OAD), msd (15.8mm OAD), and Jupiter (18.2mm OAD)
- After 8 hrs. Onefit (113.7), msd (133.7), and Jupiter (88.1) microns settling
- Settling rates were greatest shortly after insertion and slowed down significantly after 4 hours

Evaluation of settling after 8 hours with Onefit (14.3mm OAD), msd (15.8mm OAD), and Jupiter (18.2mm OAD)

- Settling rates were greatest shortly after insertion and slowed down significantly after 4 hours.

**GP SCLERAL MULTIFOCAL LENS DESIGNS** [from Messer B, Barnett M (2013); Woo S (2013), Bennett (2013)]

- **Laboratory**
  - Acculens
  - Comfort SL Plus
  - Art Optical
  - Advanced Vision Technologies
  - Blanchard Contact Lens
  - Dakota Sciences
  - Essilor
  - GP Specialists
  - Lens Dynamics
  - Metro Optics
  - TruForm Optics
  - Valley Contax
  - Stable 16 Near

- **Lens Design(s)**
  - Maxim Plus
  - SO2Clear Progressive
  - iSight Scleral
  - Dyna Semi-Scleral
  - SO2Clear Progressive
  - Digiform, Truscral
  - Custom Stable 15 Near, Custom

**So2Clear Multifocal Lens (Dakota Sciences/Art Optical)**

- Center Near, Front
- Aspheric Allows for Vision at all distances. Strength of add and size of add are customizable to the individual patient.

- **Center Add Power +3.50**
  - Add Zone = 2.25 mm
- **Center Add Power +1.88**
  - Add Zone = 1.50 mm

**PATIENT EB: ONEFIT MF**

**Difference From Initial Fit**

![Graph showing difference from initial fit over time.](image-url)
SCLERAL LENS DECENTRATION
(GSLS article, April, 2014 CLS)

- As reported by Patrick Caroline at the January Global Specialty Lens Symposium there is a tendency for scleral lenses to decenter temporally or int-temp due to factors such as mass, effects of upper lid and scleral anatomy
- The greater elevation of the nasal sclera tends to result in the temporal decenteration
- The introduction of toric peripheries and decentered optical zones can reduce this problem.

SCLERAL RING

Insertion Bubbles

Large DMV Size 8 O-ring

Ezi Scleral Lens Applicator

- From ezibyqcase.com
- Comparison study with size 8 o-ring and suction cup, the scleral ring was significantly easier for insertion
- Paper by Woo SL, Bennett ES presented at the Academy meeting in Phoenix, Oct., 2012

COMPARISON OF THREE DIFFERENT METHODS OF SCLERAL RIGID GAS PERMEABLE(GP) LENS INSERTION (presented at Annual Meeting of AAO, October, 2012)

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Havasu Eye Center- Lake Havasu, AZ
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Assistant Dean, Student Services & Alumni Relations
University of Missouri-St. Louis College of Optometry
PURPOSE OF STUDY

• The goal of this study was to compare three conventional methods of inserting scleral lenses:
  1. A large DMV plunger (i-promotions)
  2. A size 8 o-ring (any hardware store)
  3. Ezi Scleral Lens Applicator (Q-case, Inc.)

RESULTS

Average forced choice - ranking the ease of insertion from 1 (easiest) to 3 (hardest)
- Scleral ring: 1.44
- DMV plunger: 2.22
- O-ring: 2.33

Separate visits ranking ease of insertion from 1 (easiest) to 10 (hardest):
- Scleral ring: 1.50
- DMV plunger: 2.60
- O-ring: 2.70

ADVANCEMENT TWO:

CORNEAL RESHAPING

Earl Smith 2005

Eye growth may possibly be retarded, or halted through:
“A precise and pre-determined optical system at the corneal plane that will manipulate the peripheral optics of the eye.”

Can We Correct Peripheral Refractive Error?

Optical aberrating optics across the pupil in which:
- the central zone is flattest (greatest minus power)
- with increasing plus in the mid- periphery of the pupil.
- Answer: An orthoK lens design
- First design introduced by Paume at Global Specialty Lens Symposium, Jan, 2011

OOK and Myopia Control

- Several studies have confirmed that overnight orthokeratology causes peripheral myopia defocus and this may, therefore, provide a potential mechanism for myopia control.
  - Lang and Swarbrick (2011)
How do you feel GP materials have improved in the last 10-15 years? (N = 31) GP Update Oct. 2012 CLS

- Oxygen Permeability: 14
- Stability/flexural resistance: 11
- Wettability: 10
- Manufacturing Quality: 5

GP Materials: Fluoro-Silicone/Acrylate

- Combined fluorine with other ingredients (wetting agents, cross-linking agents, methyl methacrylate & "silicone") to enhance mucin interaction with lens surface = wettability & stability; increase Dk (versus S/A)

  - Materials can be divided by Dk:
    - Low Dk = 25 - 50
    - High Dk = 51 - 99
    - Hyper Dk = ≥ 100

Low Dk GP Materials (www.gpli.info)

- Boston ES (B + L): 18 (ISO/Fatt)
- Optimum Classic (Contamac): 26 (ISO/Fatt)
- AccuCon (Innovision): 25 (revised Fatt)
- FLOSI (Lagado): 26 (ISO/Fatt)
- Paragon Thin (Paragon Vision Sciences): 29 (revised Fatt)
- Fluoroperm 30 (Paragon Vision Sciences): 30 (revised Fatt)
- SGP 3 (Lifestyle Co.): 43.5 (CLMA standard)
- Boston Equalens (B + L): 47 (ISO/Fatt)
- Hydro2 (Innovision): 50 (revised Fatt)

High Dk GP Lens Materials (www.gpli.info)

- ONSI-56 (Lagado): 56 (ISO/ANSI)
- Paragon HDS (Paragon Vision Sciences): 58 (revised Fatt)
- Boston EO (B + L): 58 (ISO/Fatt)
- Fluoroperm 60 (Paragon Vision Sciences): 60 (revised Fatt)
- Optimum Comfort (Contamac): 65 (ISO/Fatt)
- Boston Equalens II (B + L): 85 (ISO Fatt)
- Fluoroperm 92 (Paragon Vision Sciences): 92 (revised Fatt)
- TYRO-97 (Lagado): 97 (ISO/ANSI)
Hyper Dk GP Materials (www.gpli.info)

• Boston XO (B + L): 100 (ISO/Fatt)
• Paragon HDS100 (Paragon Vision Sciences): 100 (ISO/Fatt)
• Optimum Extra (Contamac): 100 (ISO/Fatt)
• Optimum Extreme (Contamac): 125 (ISO/Fatt)
• Boston XO2 (B + L): 141 (ISO/Fatt)
• FluoroPerm 151 (Paragon Vision Sciences): 151 (revised Fatt)
• Menicon Z (Menicon): 163 (ISO/DIS) 189 (Fatt)

HIGH REFRACTIVE INDEX MATERIAL BENEFITS

• 12-15% thinner at the junction for minus lenses
• 20 - 30% less mass
• Potential improvement in centration and comfort
• Presbyopic lens correction

PLASMA TREATMENT

• Most ECPs believe it is "coating" (i.e., car wax): actually utilizes electrical energy to change electrical structure of lens surface
• Very popular as the treating of GP polymers with plasma is a very effective cleaning method to remove any remaining residues (i.e., oils, solvents, waxes) from the manufacturing process.
• Significantly reduces surface wetting angle
• Most materials are now being promoted as plasma treated

Plasma Treatment: Is it Worth It? Results of a Survey (Jan 2011)

• GP Lens Institute Advisory Committee surveyed (31 responses)
• What % of lenses Plasma Treated: 48% PT > 60% of lenses (vs. 20% in 2008); 58% PT > 40%
• 90% indicate initial wettability better (versus 56% in 2008)
• 50% indicated it lasts longer than 3 months; 23% > 6 months

HIGH INDEX MATERIALS

• OptimumHR (Contamac)
  Hirafocon A: DK = 50  SG = 1.04  IOR = 1.51
  Hirafocon B: DK = 50  SG = 1.04  IOR = 1.53

  Paragon HDS HI (Paragon)
  DK = 22  SG = 1.12  IOR = 1.54

Other GP lens materials have Specific Gravity values between 1.10 - 1.27 and IOR values between 1.42 - 1.47

INCREASED ADD POWER

• At 2.5mm away from center, posterior aspheric in conventional RI provides 1.75D add
• At 2.5mm away from center, posterior aspheric in high RI provides 2.12D add
• At 2.5mm away from center, anterior aspheric in high RI provides 2.36D add
Hybrids Today and Near Future

- Several lens designs available from SynergEyes to custom fit a broad spectrum of patients with both normal and irregular corneas.
- Next generation materials and lens design for normal cornea patients include Duette™ and "Duette™ Multifocal.
- Recent introduction of UltraHealth™ for irregular cornea patients.

ADVANCEMENT FOUR:
IMPROVEMENTS IN LENS DESIGNS AND MANUFACTURING TECHNOLOGY

- Ultrathin Designs
- High Add Multifocal Designs
- Quadrant-Specific
- Dual Axis

ADVANCEMENT FIVE:
EDUCATIONAL RESOURCES

- GP Lens Institute (www.gpli.info)
- Scleral Lens Education Society (www.scleralens.org)
- Orthokeratology Academy of America (www.orthokacademy.com)
- www.contactlenssafety.org

Lens Types/Lens Replacement and Wearing Schedules/Safety

1. What is the healthiest type of CL?
2. Is it okay for me to replace my lenses when they start bothering me?
3. How often should I replace my lens if I occasionally wear it?
4. What is the danger in wearing CLs longer than prescribed time?
5. What can I do to make sure I’m wearing CLs as safely as possible?
6. What are the most serious complications and how do they happen?
7. Who are most likely to have eye infections? How often do they occur?
8. Does sleeping in contact lenses affect my risk for infection?
9. How have new lens types (i.e., Si-Hy’s/daily disposables) impacted infection rates?
10. What are the most common organisms associated with infection?
11. What organisms are most dangerous to the eye?
12. When should I call my doctor when I think I have a problem?
13. When I call my doctor to report a problem they usually tell me to come in. Why can’t my doctor simply prescribe me something over the phone?
14. What can I do if my eyes are dry and the CLs feel filmy and uncomfortable?
15. Can I wear my CLs if I am taking prescription medications?
16. If I wear CLs why should I also have a pair of spectacles?
17. How often should CL wearers see their eye doctor?
Contact Lens Care
1. What is the best CL care system?
2. Do I need to rub my lenses when I take them out?
3. Are my solutions good for an indefinite period of time? (i.e., past the expiration date)
4. Can I use any lubricants and red eye drops with my CLs?
5. I only wear my lenses occasionally. How should I store them in the meantime?
6. What are the proper steps to follow each time I remove the CL from my eye?
7. I dropped the CL on the floor & I don’t have time to run an entire care cycle. What do I do?
8. Is it okay to use tap water to rinse, insert or store my lenses?

Care for Lens Cases
1. How often should I replace my case?
2. Do I need to replace my case if it looks clean?
3. How should I clean my CL case?
4. How should I store my CL case when I’m not using it?
5. How much solution should I put in my case?
6. Is there any problem with each night simply adding to the solution already in my case?
7. Where should I store my case at night?

CL Wear in Various Environments
1. Should I be concerned about wearing my CLs on an airplane?
2. Should I be concerned about wearing my CLs in the care with the vent blowing in my face or wind coming from the window?
3. Is it safe to shower in CLs?
4. Is it safe to wear my CLs in the bathtub or the hot tub?
5. Is it safe to swim in CLs?
6. Is it safe for pregnant women to wear CLs?
7. At what age can children begin wearing CLs?
8. Can I wear my friend’s CLs? What if I clean them before I put them in?
9. Are there any problems with wearing the “Circle” lenses?
10. Is a CL wearer more likely to suffer from computer vision problems?
11. Is it safe to sleep in CLs?
12. Is it okay to nap in my CLs for 20-30 minutes?
13. Are there any problems with wearing eye make-up with my CLs?
14. Are there any recommendations to help wearers who suffer from allergies?

Purchasing Contact Lenses
1. Why can’t decorative CLs be purchased on the internet or in the drug stores without a current prescription?
2. Are contact lenses that dispense medication readily available?
3. Does it matter where (or from whom) I purchase my CLs?
Bitoric Empirical Calculators
- Mandell-Moore Guide: easy empirical method of determining base curve radii and powers
- GP Toric and Spherical Lens Calculator
- Both are available from the GP Lens Institute at: www.gpli.info

Case
- Spectacle Rx
  - 4.00 – 4.00 cx 180
- Corneal Measurements
  42.50/46.00 @ 90

The rest of the design
- -3.50/-6.50 7.99/7.46mm (BCR)
- SCR: BCR + 1 = 9.00/8.50
- PCR: SCR + 2 = 11.00/10.50
- Material: Same as spherical
- Diameter: Same as spherical
Toric and Spherical Calculators

Rx: -1.00-3.00 X 180
K*: 41.00/44.00 @ 090
tear lens
OAD: 9.2 mm

Contact Lens

-3.25
-1.00
-0.75
43.25
41.00
44.00
40.00

Order:
BC: 41.00 (8.23mm)/ 43.25 (7.80mm)
BVP: -1.00/ -3.25
Difference in base curve (D): 2.25 D
Difference in lens powers: 2.25 D
Conclusion: Spherical Power Effect Design

SUMMARY

- GP lenses will continue to represent an important component of successful contact lens practice today and well into the future. The continuing introduction of innovative large-diameter, reverse geometry, corneal reshaping, and multifocal designs will meet the needs of both young and old patients who desire good quality vision at all distances, comfort, and convenience.