Scleral Lens Management and Video Grand Rounds

Karen Lee, OD & Maria Walker, OD, MS
In the past year, Dr. Lee has received no research funding or honoraria from any companies.

In the past year, Dr. Walker has received research funding or honoraria from the following companies:
Ocular Dynamics
Vision Path, Inc

This talk does not contain information regarding the aforementioned companies.
Scleral Contact Lens Complications

- Application / Removal difficulties
- Non-wetting/Front surface debris
- Lens Bearing
- Corneal Edema
- Epithelial Bogging
- Scleral lens discomfort / Inflammation
- Conjunctival Prolapse
Application Considerations

Must discuss prior to initiating fitting!

• Patient dexterity
  – Arthritis, Parkinson’s tremor
• Eyelid apertures
• Mental capability
• Visual status
• Family support, caretaker
Lens Application Tips

- Easy fixation targets
Lens Application Tools

SeeGreen lens inserter
By: Dalsey Adaptives

EZi lens applicator
By: Q-case
Troubleshooting

- Difficulty with removal
- Lessen amount of reverse geometry
- Increase lens center thickness
- Loosen or flatten peripheral curve system
- Tight lens induced by patient?
“The daily insertion and removal of a device was not excessively difficult or time consuming, with all patients, regardless of age or diagnosis...spending less than 5 mins for each task by week 5.”
Care Product Challenges

A Unique ScCL Solution is Needed

- Sterile
- Safe
- Preservative Free
- Nutrients
- pH balance
Care Product Challenges

- Product availability
- Financial burden
- Poor patient compliance
- Ocular sensitivity may vary greatly from patient to patient
Lens Cleaning
Corneal Epitheliopathy with ScCL

Preservative toxicity
- Cleaning solutions
- Medications

Improper lens hygiene
- Inadequate tear exchange

B. Severinsky et al 2014
General Fitting Obstacles

- Excessive apical clearance
- Apical touch
- Limbal touch
- Excessive limbal clearance
- Edge lift
- Impingement vs compression
- Midperipheral touch
Troubleshooting Central Clearance

- Apical touch
  - Centrally: increase OAD or steepen BC
  - Mid-peripherally: increase reverse geometry

- Excessive vaulting/clearance
  - Decrease OAD or flatten BC
  - Lessen reverse geometry
Excessive Apical Clearance
Excessive Apical Clearance
Apical Touch
Scleral Lens Vaulting Rule:
Vault as little as possible over the highest corneal elevation...to avoid excess clearance elsewhere
Limbal Clearance

Appropriate / Excessive? Limbal Clearance

Inadequate Limbal Clearance
Epithelial breakdown
Troubleshooting Limbal Bearing

- Increase OZD or limbal curve widths
- Steepen limbal curve
- May need to flatten BC to maintain central sagittal depth

Photo courtesy of Greg DeNaeyer, O.D.
Impingement

Photo credit: Randy Kojima and Pat Caroline
Excess Scleral Lift
Midperipheral Touch
Midperipheral Touch
Uneven Scleral Bearing
Scleral Mapping

20.0 mm Chord
sMap 3D by Visionary Optics

- Topographer with more than 22mm range
- Over 1 million measurement points with 10um precision
- Data collected in three gazes
- Greater back surface customization
Toric Scleral Design
BostonSight PROSE

- Prosthetic Replacement of the Ocular Surface Ecosystem
- FDA approved in 1994
- Restores visual function, supports healing, reduces symptoms and improves quality of life
- Available at top-ranked academic medical centers
- Offers financial assistance for patients who qualify
Gradual Vision Decline With Lens Wear

Possible causes:

- Poor surface wettability
- Late forming bubbles
- Midday Fogging (MDF)
- Corneal edema
Poor Surface Wettability

Possible causes:

• Make-up or face cream
• Hand soaps with moisturizing agents or aloe
• Plunger hygiene
• Lid disease

Treatment tips:

• Squeegee front surface
• Change care system
• Change lens material or defective lens
• Apply wetting solution to plunger surface before use
Late Forming Bubbles

Photo credit: Dr. Schendowich
### Midday Fogging (MDF)

<table>
<thead>
<tr>
<th>Time</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>OCT</td>
</tr>
<tr>
<td>4h post</td>
<td>application</td>
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<tr>
<td>8h post</td>
<td>application</td>
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**What is it?**

**How do we eliminate it?**
Protein

No MDF: 2.80 ± 1.21 ug/ul

MDF: 5.89 ± 2.62 ug/ul
Lipid

No MDF: $0.0019 \pm 0.0029 \, \mu g/ul$

MDF: $0.0074 \pm 0.0079 \, \mu g/ul$
Midday Fogging

- Related to...
  - Dry eye disease (Abnormal lipid profile?)
  - Allergies
  - Excess apical and limbal clearance
  - Tight peripheral edge
  - Reduced tear exchange?

Effect of non-nutritious saline solution??

Is Inflammation involved??
Mitigating MDF

Use High Viscosity PFAT

 Decrease Limbal Clearance

 Manage Allergies

 Decrease Apical Clearance

 Maximize Tear Exchange

 Toric Scleral Design

 Treat Inflammation...

 Decrease Limbal Clearance


High Risk Patients

Cell count less than 500 cells/mm²
Post PKP
Scleral Lenses in PKP patients

• Retrospective review of 33 patient records
• Monitored sclerals over 5 year period
• 2 patients d/c lens wear due to lens discomfort
• 12 out of 31 (39%) experienced “serious graft complications”
  – Microbial keratitis (2)
  – Graft rejection (8 controlled with steroid, 2 re-grafted)
• Total failure rate: 19.4%
EM3000 Specular Microscope
High DK Scleral Materials

- Paragon, Menicon Z  \( \text{Dk} = 163 \)
- B + L, Boston XO\(_2\)  \( \text{Dk} = 141 \)
- Contamac, Optimum Extreme  \( \text{Dk} = 125 \)
- B + L, Boston XO  \( \text{Dk} = 100 \)
- Paragon HDS 100  \( \text{Dk} = 100 \)
- Contamac, Optimum Extra  \( \text{Dk} = 100 \)

Low Tear Reservoir Thickness

\(< 200 \text{ is ideal}\)
How much is too much?

- Monitor carefully for corneal edema
- 50um of swelling is considered significant
- Determine adequate wearing schedule
“Benign” Scleral Lens Issues

- Epithelial bogging
- Conjunctival prolapse
Epithelial “Bogging”
Epithelial “Bogging”

- Cause unknown

- Potential etiologies:
  - Loss of glycocalyx layer
  - Epithelial edema
  - Osmotic imbalance
  - Lack of epi cell sloughing

- Non-nutritious saline effect?

- Related to tear exchange?
Conjunctival Prolapse

Prolapse

Recessed Prolapse
Change fitting relationship to equalize clearance

Prolapse
Roadblocks and Speed Bumps

- Pinguecula
- Pterygium
- Symblepharon
- Surgical interventions
  - Ahmed valve
  - Trabeculectomy
  - Scleral buckle
Pinguecula, Cysts and Pterygium

- Patient history is key
- Possible solutions:
  - Notching and truncation
  - Avoid with smaller OAD
  - Vault over
Symblepharon and Post-Surgical

Must monitor very very carefully

• Possible complications

• Symblepharon
  – Avoid or minimize interaction to prevent
Special Consideration

Bleb

Trabeculectomy
We cannot save them all

Possible complications

• Thinning conjunctival tissue
• Risk of perforation
• Risk of elevated IOP
Therapeutics Beneath a Scleral Device

- BostonSight PROSE device is a prosthetic scleral device
- Persistent epithelial defects
- Non-BAK preserved fourth-generation fluoroquinolone into the tear chamber prior to device application
- Two devices designed one for daytime wear and one for nighttime wear
Treatment of Refractory Persistent Corneal Epithelial Defects: A Standardized Approach Using Continuous Wear PROSE Therapy

Jessica B. Ciralsky, MD, Kristin Ow Chapman, MD, Mark I. Rosenblatt, MD, PhD, Priyanka Sood, MD, Ana G. Alzaga Fernandez, MD, Michelle N. Lee, OD, and Kimberly C. Sippel, MD

Treatment of Persistent Corneal Epithelial Defect With Extended Wear of a Fluid-ventilated Gas-permeable Scleral Contact Lens

PERRY ROSENTHAL, MD, JANIS M. COTTER, OD, AND JULES BAUM, MD

Dry Eye and Ocular Surface Disease

Management strategies for persistent epithelial defects of the cornea

Lee R. Katzman, MD; Bennie H. Jeng, MD*

SCLERALS FOR OSD

Scleral Lenses for Severely Diseased Eyes

The eyes that can benefit the most from scleral lens wear are often the most difficult to fit.

BY KAREN CARRASQUILLO, OD, PHD, FAAO, & GREGORY W. DENA EYER, OD, FAAO
Live Fitting of Post-RK Scleral Lens Wearer
Post – RK Scleral Lens Wearer