Scleral Lenses, Amniotic Membranes, and Bandage Lenses in Dry Eye Disease

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Financial Disclosures

• Shire, Allergan, Bausch & Lomb SVP, Precision Technology
Treat Dry Eye

- Hylo/Thealoz drops/gel q1h
- Restasis
- Xiidra
- Autologous serum
- Moisture goggles
- Ointment before bed
- Pred Forte 1% qd OU
- Omega 3
- Tacrolimus
- Lipiflow, IPL
- Tarshorrhaphy
- Systemic meds
What do all of these have in common

• Protect the ocular surface from the environment
• Pain and symptom management
• Allow the epithelium to heal
• But each of them have their own individual properties......
When would I fit a Scleral Lens for OSD?

- Ocular Surface Disease – varying severity
  - Severe Dry Eye
  - Sjogren’s Disease
  - Stevens Johnson Syndrome, OCP
  - GVHD
  - Neurotrophic Keratitis
  - Neuropathy
  - Exposure keratopathy
  - Persistent Epithelial Defects
  - Limbal Stem Cell Deficiency
Why fit scleral lenses on these patients

- To correct vision
- To provide a mechanical barrier between the cornea and the environment while correcting vision
- Fluid chamber to the ocular surface
What is a Scleral Lens?

• Vault the cornea and limbus while maintaining a fluid reservoir
• Supported entirely by the sclera
• Range from 14-20 mm
• Designed to fit both prolate and oblate corneas
Do I have the patient base?

- Ophthalmology
- Oncology
- Rheumatology
- Website
Diagnostic Lenses
Fitting a Scleral Lens

- Start with preliminary testing
- Are they wearing glasses or contact lenses
- Topography
- Habitual VA, HVID
- Slit Lamp Exam, use Fl
- Endothelial Cell Count
- Diagnostic Lens Fitting
- NEW: IOP, VF, ON OCT
Choosing the first lens

- Choose Design and Diameter
- Diameter – at least 2 mm larger on each side than HVID, but for dry eye fit MUCH BIGGER
- Follow the fitting guide
- Sagittal Depth - Greater than Sagittal height of eye
Where to Start?

- DMV plunger
- Fill with 0.9% NaCl inhalation vials
- Insert Fl into the lens
- Most important assessment of final lens:
  - Get lens on Eye!!
Putting the Lens on the Eye
Fitting a Scleral Lens

- Corneal Zone
  - 300 microns of corneal vault
- Peripheral corneal zone
- Limbal Zone
  - Limbal clearance
- Scleral/Landing Zone
  - Haptic alignment
SCLERAL LENS FIT SCALES

To accurately estimate the amount of vaulting (clearance) underneath the posterior surface of a scleral lens necessitates a reference point for comparison. Although some have suggested corneal thickness for the reference, we prefer the center thickness (CT) of the lens itself which will be listed on the manufacturer’s invoice. In each of the examples below, the CT is 0.30mm (300 microns). In most scleral lens designs, the ideal amount of clearance is about 300 microns.

- Front Surface of Lens
- Clearance 300 Microns
- Center Thickness (CT)
- Corneal Thickness
- 50 Microns
- 150 Microns
- 500 Microns
- 600 Microns
Lens Settling

- Expect the lens to settle by 100 to 200 µ
- Try not to rush through the settling time, each patient is different
- More settling with OSD
195 μm in cornea
Landing Zone

- Align the landing zone to rest on the sclera without impingement, compression or flare
Edge Lift

- Sclera
  - Nonrotationally symmetric
- Haptic
  - Spherical
  - Back Toric
    - 2 D - Mild
    - 4-6 D - Severe
  - Quadrantial changes
Limbal Clearance

**LIMBAL VAULTING**

- None
- Good
- Moderate

Authors: Josh Lotoczky, OD; Chad Rosen, OD; Craig W. Norman, FCLSA

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Ordering a lens

- Power
- Dk
- Centre thickness
- Material
- Surface treatment
Dk/Centre Thickness

• High Oxygen Materials
Surface Treatments

*courtesy of Pat Caroline and Craig Norman*
Troubleshooting

- Bubbles
- Compression
- Edge lift
- Limbal bearing
- Residual astigmatism
- Fogging/Surface wetting issues
- Reservoir Debris
Bubbles

• Bubbles
  • Insertion issue
    • Elderly patients, dexterity issues
  • High edge lift
  • Movement
  • Looking for bubbles
  • Increased lens awareness
Compression

- Lens Compression
  - Pain/irritation
  - Decrease wear-time
- Flatten PC
- Decrease Diameter
- Toric PC
- Quadrantal Design
Edge Lift

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Limbal Bearing

- Limbal Bearing
  - Increase diameter
  - Increase limbal clearance
  - Flatten Lens BC
- Lens Decentration
Residual Astigmatism

• Residual astigmatism
  • Lens Flexure
    • Over Ks or Topos
  • Lenticular
    • Over spectacles
    • Front Surface Toric
Fogging

- Manage lid disease if possible
- Rinse the eye with saline prior to insertion
- Change material: Hydra-PEG
- Windshield wiper: Optifree Puremoist Hydraglyde
- Review cleaning methods
- Progent – remove protein
- Mucomyst
Reservoir Debris

- Debris from ocular surface
- Check peripheral corneal and limbal clearance
- High movement or too tight
- Use highly viscous solution
Scleral Lenses for Dry Eye

- To correct vision
- To provide a mechanical barrier between the cornea and the environment while correcting vision

**TO GIVE THEM THEIR LIFE BACK**
Amniotic Membrane

- Amniotic membrane taken from the most inner layer of placenta after caesarian section
- Fetal environment blocks inflammatory mediators

• Courtesy of Differencebetween.net
Amniotic Membrane

• Amnion consists of the epithelium, thick basement membrane and avascular stromal matrix
• BM of amnion is similar in composition to the conjunctiva
Amniotic Membrane

• Anti-inflammatory
• Controls angiogenesis
• Anti-scarring
• Wound healing
• Anti-microbial properties
4 years later
Biological activity

- HCA-PTX3 is responsible for cell regeneration
- Promotes epithelialization and cell differentiation of the ocular surface while excluding inflammatory cells
- For this reason, AM helps support and regenerate limbal stem cells
- Regenerates nerves
- Immunomodulatory effect so tissue rejection is rare
- Reduces pain
Uses

- Graft – used as a scaffold for re-epithelialization
- Overlay- Bandage lens
- Layering technique – Multiple layers

- The more inflammation, the more quickly it dissolves
Indications

- SJS, OCP
- Reconstruction of conjunctiva
- Limbal stem cell deficiency
- Corneal ulcer
- Persistent epithelial defects
- Chemical burns
- Symblepharon
Disinfection

• Allogenic tissue has the risk of infection transmission
• Donors are screened for infectious disease
• Placenta is cleaned with balance salt solution, streptomycin, neomycin, amphotericin B
Cryopreservation

- Involves cryomedium with (glycerin: DMEM 1:1)
- Storage temp of -75 to -85 C
- Max storage of 12-24 mos
- If professionally procured and preserved, properties are retained
- Quick freezing maintains structural integrity of the tissue and biological function of fresh amnion
- Retention of key cytokines, high MW proteins and other active proteins that reduce angiogenesis, inflammation, and scarring (Desai, 2014)
Prokera (BioTissue)

• Prokera-High profile, smaller diameter

• Prokera Slim- Low profile (comfort ring), larger diameter

• Prokera Plus- Multiple Layers, small diameter, higher profile

• Distributor in Canada Bright Optical
<table>
<thead>
<tr>
<th>Mild to Moderate Conditions such as:</th>
<th>Moderate to Severe Conditions such as:</th>
<th>Severe Conditions such as:</th>
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<tbody>
<tr>
<td>Keratitis (Microbial, HSV)</td>
<td>Neurotrophic PED</td>
<td>Chemical Burns</td>
</tr>
<tr>
<td>Common Dry Eye</td>
<td>Corneal Wounds</td>
<td>Stevens-Johnson Syndrome</td>
</tr>
<tr>
<td>Recurrent Corneal Erosions</td>
<td></td>
<td>Severe Corneal Ulcers</td>
</tr>
<tr>
<td>Corneal Ulcers/Wounds</td>
<td></td>
<td>Severe Corneal Wounds</td>
</tr>
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Courtesy of Biotissue
Prokera Insertion

- Ships in a nanofreezer
- Soaking in glycerine and ciprofloxacin
- Rinse with buffer saline
- Use gloves
- Some may need tape tarsorrhaphy
- Debride dead tissue

Courtesy of Biotissue
1. Apply topical anesthesia
2. Hold the upper eyelid
3. Ask the patient to look down
4. Insert the PROKERA® into the superior fornix
5. Pull lower eyelid down and slide the PROKERA® under the lower eyelid
6. Check centration under the Slit Lamp

* Apply appropriate medications (As Needed)
1. Apply topical anesthesia
2. Pull the lower eyelid down
3. Lift the lower edge of PROKERA® using a Q-Tip or forceps
4. Ask the patient to look down
5. Apply gentle pressure on the upper eyelid
6. Slide the PROKERA® out

Courtesy of Biotissue
Possible complications with Prokera

- Discomfort or FB sensation if done on insertion
- Corneal abrasion on removal
- Patient discomfort with symblepharon ring
- Ejection of the symblepharon ring
- Increase discharge
- Pain from not rinsing membrane properly
Contraindications for Prokera

- Shunt or bleb
- Allergy to Ciprofloxacin or Amphotericin B
Dehydration of Amniotic Membrane (AmbioDisk, BioDOtpix)

- Only approved for wound coverage
- Come in 9, 12, 15 mm diameters
- Can trim to fit size
- Longer shelf-life and does not need to be frozen
- Lid speculum need for insertion
- Disintegrates within 5-7 days
- Not available in Canada

*courtesy of IOP Ophthalmics
**courtesy of Integra LifeSciences
Complications with Dehydrated AM

- Contact lens fitting too tightly or too loose
- Ejection of AM from underneath the CI
Drops
Factors that may affect would healing

- Age
- Metabolic diseases: Diabetes, Inflammatory, Auto-immune diseases
- Poor diet
- Stress
- Obesity
- Alcohol and illegal substance use
- Medications: NSAIDs, ASA, Steroids, Chemotherapy
Bandage Soft Lenses
Case #1

- 50 year old Caucasian male presents with a history of an acoustic neuroma. During surgery there was damage to CN 7. He was referred for severe exposure keratitis and relief of pain OD.
Case #1

Prokera or Scleral Lens?
Case #2

- 32 year old Asian female travelled to Jamaica. She was feeling under the weather for the last 2 days of her trip and took cold medication. When she got on the plane to go home, she felt like her body was on fire. Her body erupted in blisters. The ambulance was waiting for her at Pearson Airport to rush her to Toronto General Hospital where she spent the next 3 months.
Skin
Before Scleral Lens Fitting
Before Scleral Lens Fitting
Case # 2

- Grade 4 diffuse PEE OS prior to fitting
- Fit in 18 mm scleral lenses
- After only 2 weeks of wearing the lens, localized staining, but dramatic improvement
- VA OD 20/20 OS 20/20
Patient wanted lens to be larger
Case #3

- 73 year old Caucasian female presents with exposure keratitis secondary to radiation OD.
- Epiretinal membrane OD
- SLE revealed inferior Gr. 4 confluent PEE and lagophthalmos
- She currently is taking Ocunox hs, Lotemax bid, Autologous serum prn, Hylo prn, Liposic hs
- Entrance VA 20/200 with glasses
Amniotic Membrane
or Scleral Lens
Scleral Lens

- Two weeks later after dispense
- VA had improved to 20/50
- Great pain relief
- But after a couple of hours of wear she couldn’t see
What is going on?

- 73 year old Caucasian female presents with exposure keratitis secondary to radiation keratopathy
- Epiretinal membrane
- SLE revealed inferior Gr. 4 confluent PEE and lagophthalmos
- She currently is taking Ocunox hs, Lotemax bid, Autologous serum prn, Hylo prn, Liposic hs
Case #3

- Surface nonwetting
- Review of medications
- Treat Lid Disease
- Anything foreign on lens
- Windshield Wiper
- Change material
- Take lens out and clean
- Blepharoplasty
After Scleral lens wear

- After blepharoplasty surface she was 20/40
Case #4

- 65 year old Caucasian female with LSCD OU, 2 PKs OU, and RD OS presents for scleral lens fitting OD
- BCVA OD 20/400
Case #5

• 30 YM with keratoconus, 4 weeks after uneventful corneal collagen crosslinking
• Persistent Epithelial Defect
• BCL unsuccessful

• Courtesy of Dr. Clara Chan
Case # 6

• 28 year old Asian female presents for scleral lens fitting for LSCD. She also has sleromalacia. She was fit with a traditional scleral lens.
Case #6
Case # 6

• Currently she is wear Oasys 8.8 and has 20/200 vision in the right eye with an RGP

• Since the surgery her eye has become so sensitive that she cannot do insertion removal of her scleral lens

• VA with scleral lens and RGP is still 20/25
Case #7

- 55 year old Caucasian female presents for scleral lens fitting. BCVA was 20/200 OD, 20/400 OS.
Case #8

- 15 year old male got Drano in his eye when making Drano bombs in the forest. Referral to optometrist from OMD at Children’s Hospital in Newfoundland. He was currently on PF qid, Cyclopentolate 1% bid, Vigamox qid. OMD had been treating and felt that he would be fairly well healed by now.
Healing the cornea

We can make our patients functional again

We can give them their lives back

We can give them vision again
Question #1

What conditions should an amniotic membrane be used for?

A. Ocular surface reconstruction
B. Recurrent corneal erosion
C. Symblepharon
D. A and B
E. All of the Above
Question #2

- When should a scleral lens not be used

A. Corneal scar
B. Low endothelial cell count
C. Graft vs Host Disease
D. High myopia