Therapeutic Contact Lenses: Management of Ocular Surface Disease

Angel Scanzera, OD, FAAO, FSLA
Assistant Professor of Ophthalmology and Visual Sciences
Question 1

What is your experience with therapeutic contact lenses?

a) Never fit a therapeutic contact lens
b) Fit bandage soft lenses
c) Fit both bandage soft and scleral lenses
Contact Lenses

- **Types:**
  - Soft
  - Rigid gas permeable (RGP)
  - Hybrid
  - Scleral

- **Uses:**
  - Refractive
  - Corneal irregularity
  - Therapeutic
Outline

- Contact lens uses and lens types
- Soft lens parameters and fit assessment
- Scleral lens overview and fit assessment
- Case review
Therapeutic lens uses

- Mechanical protection
- Corneal epithelial hydration
- Corneal wound healing
- Pain relief
- Drug delivery
When should I consider therapeutic lenses?

- Corneal abrasions/erosions/lacerations
- Severe dry eye disease (GVHD, Sjogrens, SJS, LSCD, OCP)
- Exposure keratitis (lagophthalmos, TED, Bell’s palsy)
- Persistent epithelial defects
- Neurotrophic keratitis/sterile ulcers
- Trauma (post-open globe repair, chemical burn)
- Neuropathic pain
- Chronic management of chemical burns
- Bullous keratopathy
- Leaking bleb
- Kpro

**If worn as extended wear, topical antibiotic should be considered in those with a compromised cornea**
Soft Contact Lens Details

- Polymer
  - Hydrogel
  - Silicone Hydrogel (SiHy)
- Oxygen permeability (Dk)- ability of lens to allow oxygen through to the cornea
- Oxygen transmissibility (Dk/T)- oxygen permeability based on thickness of the lens
- Power
- Base curve- measure of the curvature of the lens
- Diameter
- Daily vs. Extended wear

## Soft Contact Lenses

### Common lenses

<table>
<thead>
<tr>
<th>Brand</th>
<th>Material</th>
<th>Replacement</th>
<th>Modality</th>
<th>Dk</th>
<th>Polymer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Optix N&amp;D</td>
<td>Lotrafilcon A</td>
<td>Monthly</td>
<td>EW (30 day), DW</td>
<td>140</td>
<td>SiHy</td>
</tr>
<tr>
<td>Biofinity</td>
<td>Comfilcon A</td>
<td>Monthly</td>
<td>EW (6n/7d), DW</td>
<td>128</td>
<td>SiHy</td>
</tr>
<tr>
<td>Acuvue Oasys</td>
<td>Senofilcon A</td>
<td>1-2 week</td>
<td>EW (1wk), DW (2wk)</td>
<td>103</td>
<td>SiHy</td>
</tr>
<tr>
<td>Acuvue Trueye</td>
<td>Narafilcon A</td>
<td>Daily</td>
<td>DW</td>
<td>100</td>
<td>SiHy</td>
</tr>
<tr>
<td>Acuvue 1-day</td>
<td>Etafilcon A</td>
<td>Daily</td>
<td>DW</td>
<td>28</td>
<td>Hydrogel</td>
</tr>
<tr>
<td>moist</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proclear</td>
<td>Omafilcon B</td>
<td>Monthly</td>
<td>DW</td>
<td>27</td>
<td>Hydrogel</td>
</tr>
<tr>
<td>Specialeyes 54%</td>
<td>Hioxifilcon D</td>
<td>3 month</td>
<td>DW</td>
<td>21</td>
<td>Hydrogel</td>
</tr>
<tr>
<td>Kontur</td>
<td>Methafilcon A</td>
<td>6-12 month</td>
<td>DW</td>
<td>18.8</td>
<td>Hydrogel</td>
</tr>
<tr>
<td>Soflens 38</td>
<td>Polymacon</td>
<td>7 days</td>
<td>1 wk for DW and EW</td>
<td>8.4</td>
<td></td>
</tr>
</tbody>
</table>

Thompson TT. Tyler's Quarterly Soft Contact Lens Parameter Guide. Vol 352018
FDA approved Therapeutic Soft contact lenses

**FDA approval**

“Use as a bandage to protect the cornea and to relieve corneal pain in the treatment of acute or chronic ocular pathologies, such as bullous keratopathy, corneal erosions, entropion, corneal edema, and corneal dystrophies as well as post-surgical conditions.”

<table>
<thead>
<tr>
<th>Lens</th>
<th>Manufacturer</th>
<th>Material</th>
<th>Dk</th>
<th>Base Curve (BC)</th>
<th>Diameter (mm)</th>
<th>Powers</th>
<th>Maximum Wear Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Optix Night and Day Aqua</td>
<td>Alcon</td>
<td>Iotrafilcon A</td>
<td>140</td>
<td>8.4, 8.6</td>
<td>13.8</td>
<td>+6.00 to -10.00 D</td>
<td>30 days</td>
</tr>
<tr>
<td>PureVision</td>
<td>Bausch &amp; Lomb</td>
<td>Balafilcon A</td>
<td>91</td>
<td>8.3, 8.6</td>
<td>14.0</td>
<td>+6.00 to -12.00 D</td>
<td>30 days</td>
</tr>
<tr>
<td>Acuvue Oasys</td>
<td>Vistakon</td>
<td>Senofilcon A</td>
<td>103</td>
<td>8.4, 8.8</td>
<td>14.0</td>
<td>+8.00 to -12.00D</td>
<td>7 days</td>
</tr>
</tbody>
</table>
Therapeutic Soft Contact Lenses

- Assessing the fit
  - Centration
  - Coverage
    - Avoid limbal exposure
  - Movement
  - Patient comfort
  - Deposit formation
  - Evert upper lids and monitor for papillae
Soft Contact Lenses

• Advantages
  • Ease of fit
  • Readily available
  • Initial comfort
  • Full corneal coverage
  • Part-time or short term full-time wear
  • Inexpensive

• Disadvantages
  • Risk of infection
    • Need for prophylactic antibiotic
Question 2

• Which of the below are not a contraindication for contact lens use?
  a) Active infection
  b) Neurotrophic keratitis
  c) Poor medication compliance
  d) Poor hygiene
Soft CL Contraindications

- Active infection
- Poor compliance
- Poor access to follow-up care
- Corneal abrasion in CL wearer
- Active cicatricial?
- Active SJS?
- Poor CL hygiene
- Atopic disease

Other considerations:
- How long is the intent to treat?
- Are there other options?
- Can they wear lens during the day and use other options overnight?
History of Scleral Lenses

- 16th century - conceptualized by Leonardo Da Vinci
- 19th century - manufactured in Europe
  - First scleral shell created by Fredrich A. Muller and Albert C. Muller (Germany, 1887)
    - Material: blown glass scleral shell
- 1901 - Zeiss created first diagnostic fitting set

Fast Forward:
SCOPE study group found that scleral lenses were most often prescribed for:
- Corneal irregularity (74%)
- Ocular surface disease (16%)
- Uncomplicated refractive error (10%)

Scleral lens

• Lens type
  • **Corneo-Scleral** 12.9 -> 13.5 mm
    Corneal bearing & Scleral touch
  • **Semi-Scleral** 13.6 -> 14.9 mm
    Corneal & Scleral bearing
  • **Mini-Scleral** 15.0 -> 18.0 mm
    Scleral bearing & min. Corneal clearance
  • **Full Scleral** 18.1 -> 24 + mm
    Scleral bearing & max. Corneal clearance

• Gas-permeable
  • High Dk

• Designed to vault over cornea

• Posterior haptics rest on the sclera

Scleral Lens

- **Goal of scleral lens:**
  - Protection from mechanical forces (i.e. eyelid on blink, eye movements)
  - Maintain stable tear film on ocular surface increasing oxygen supply to cornea
  - Decrease light scatter in irregular corneas
  - Eliminate pain
FDA Approval

Prosthetic Replacement of the Ocular Surface Ecosystem (PROSE)

Indicated for therapeutic use in eyes with ocular surface disease:

- Dry eye (e.g. ocular Graft-versus-Host disease, Sjögren’s syndrome, dry eye syndrome),
- Limbal stem cell deficiency (e.g. Stevens Johnson syndrome, chemical and thermal burns, radiation)
- Disorders of the skin (e.g. atopy, ectodermal dysplasia)
- Neurotrophic keratitis (e.g. Herpes simplex, Herpes zoster, Familial Dysautonomia),
- Corneal exposure (e.g. anatomic, paralytic) that might benefit from the presence of an expanded tear reservoir and protection against an adverse environment.
Scleral Lenses

• Advantages
  • Mechanical protection
  • Full corneal coverage
  • Constant lubrication
  • Customizable

• Disadvantages
  • Cost
  • Length of fitting
  • Midday fogging
Scleral Lens Evaluation

• Assessing the fit
  • Goal
    • Central corneal vault
    • Limbal clearance
    • Scleral alignment
  • Avoid
    • Corneal/limbal touch
    • Conjunctival blanching/impingement
    • Bubble
    • Excessive edge lift/movement
SCLERAL LENS FIT SCALES

CENTRAL VAULTING

LIMBAL VAULTING

EDGE RELATIONSHIP

Authors: Josh Lotoczky, OD; Chad Rosen, OD; Craig W. Norman, FCLSA
Contact info: CraigNorman@ferris.edu
Assessing the fit
CASE TIME!
Question 3

A patient presents with a corneal abrasion. He reports being poked in the eye with a tree branch. Which of the following is NOT an appropriate treatment?

a) Topical antibiotic
b) Topical NSAID
c) Cycloplegic agent
d) Bandage contact lens
Case: Corneal abrasion

- 50 yo WM presents with sudden onset pain, light sensitivity
- h/o being hit in the eye with a book 2 hours prior, unable to open right eye
- Slit lamp findings:
  - OD: ~3.5mm H x 4.2 mm V superficial epithelial defect
Case: Exposure Keratopathy (1)

- 67 yo AA M
- History of thyroid eye disease
- s/p orbital decompression
- Ocular findings:
  - Lagophthalmos
  - Trichiasis
  - Corneal scar
  - Exposure keratopathy
- BCVA: 20/50, c/o FBS, eye pain OS
- Treatment: Extended wear SiHy lens
- Follow-up: improved symptoms, BCVA 20/25
Case: Exposure Keratopathy (2)

- 53 y/o female with new complaint of painless LUL growth x 3 months
- Baseline Vacc: 20/50
- Dx: Adenoid Cystic Carcinoma
- Underwent lacrimal gland resection
- c/o severe dryness, eye pain/light sensitivity
Case: Exposure Keratopathy (2)

- s/p biweekly radiation therapy x 8 weeks
- Treatment:
  - Daytime: Scleral Lens
  - Nighttime: ointment and moisture chamber goggles
- Corneal staining resolved, BCVA: 20/25, Improved symptoms
Question 4

What lens option should be considered for this patient?

a) Soft lens
b) Small diameter scleral lens
c) Large diameter scleral lens
d) None of the above.
Stevens Johnson Syndrome (SJS) & Toxic Epidermal Necrolysis (TEN)


Case: Exposure keratopathy (3)

- 41 yo WM with history of chemical burn OD
- History of hydrofluoric acid injury in the right eye ~2005
- s/p large partial thickness skin graft 2 days later
- Today, presents with complaint of constant dry eye and epiphora
- Other findings:
  - 20/40 vision,
  - 60% corneal thinning and dellen formation
- Previous treatments:
  - PFAT QID
  - UV blocking sunglasses
  - Erythromycin ointment QHS
  - Moisture chamber at night
Case: Exposure keratopathy (3)

- Fit in 15.0 mm commercially available scleral lens
- Treatment:
  - Daytime: Scleral Lens
  - Nighttime: moisture chamber goggles
- **Immediate symptom relief with initial insertion
- Corneal punctate epithelial erosions and dellen resolved
- BCVA improved to 20/20
K-pro

- Complications:
  - Evaporative drying
  - Surface inflammation
- Standard lens: Kontur
  - B.C. 9.8
  - Power: Plano
  - Diameter: 16.0mm
- Considerations:
  - Fit: centration, full coverage
  - Common referrals: poor lens fit, frequent lens loss or deposits, refractive adjustments, glare, photophobia
  - Tube shunt


Contact Lens Use in Patients with Boston Keratoprosthesis Type 1: Fitting, Management, and Complications

- Long-term bandage contact lenses are standard of care
- Goal: Maintain hydration & protect corneal tissue surrounding anterior plate
- Additional benefits: improved comfort, refractive correction, improved cosmesis
- Risks: lens loss, lens deposits, chronic conjunctivitis, infection
- Challenge: Proper CL fit on a patient with compromised surface

Case: K-pro

- 61 yo WF with kpro
- Previous ocular history
  - Presumed keratoconus
  - Multiple failed grafts OU
  - Status post Kpro OD
- Tube erosion
  - Required tube revision and scleral patch graft
Ocular GVHD

Extended–wear silicone hydrogel soft contact lenses in the management of moderate to severe dry eye signs and symptoms secondary to graft-versus-host disease

- 7 ocular GVHD patients with moderate to severe dry eye fit with N&D lens
- 7 night continuous wear basis
- Improved subjective symptoms and vision
- No change in fluorescein staining or tear break up time

Bandage soft contact lenses for ocular graft-versus-host disease

- Phase II clinical trial examining safety and efficacy of contact lenses for ocular GVHD
- 19 symptomatic patients
- Purevision lenses + prophylactic topical antibiotic
  - Replaced Q2-4 weeks
- Improved OSDI within 2 weeks (p=0.002) and remained stable at 3 months
- Adverse events: foreign body sensation, swollen eyelids, excessive tearing


Case: Ocular GVHD/Filamentary keratitis (1)

- 55 y/o man with h/o multiple myeloma s/p SCT 5 years prior
- c/o dryness, FBS OS>OD, intermittent pain, light sensitivity
- Baseline Schirmer’s=0, MMP 9 (+), OSDI- 25

- Slit lamp findings:
  - OD: lid telangiectasia, 1+ PEE with filaments, 2+ superior conjunctival stain
  - OS: lid telangiectasia, 2+ PEE with filaments, 3+ superior conjunctival stain

- Current treatment:
  - PFAT’s, erythromycin ung, WC BID
  - Fit with BCL
Case: Chronic Ocular GVHD Follow-up (1)

• Using daily disposable SiHy lens
• OSDI improved to 9 (baseline 25)
• Slit lamp findings:
  • Cornea clear with filaments and PEE resolved OU
Question 5

• 46 yo WM history of severe ocular GVHD presented with a non-healing epithelial defect

• What treatments would you consider?
  a) Serum tears
  b) Bandage soft CL
  c) Amniotic membrane
  d) Scleral lens
  e) All of the above
Case: Neurotrophic Keratitis

- 18 year old white male
- H/o Familial dysautonomia
- C/o frequent corneal abrasions and blurred vision OU
- BCVA: 20/400 OD, CF OS

Initial ocular findings:
- OD: Moderately severe PEE, Central epithelial defect
- OS: Moderately severe PEE, central epithelial defect, faint corneal haze, central stromal scarring

Previous treatments:
- Frequent lubrication
- 0.05% topical cyclosporine
- Partial tarsorrhaphy
- Topical steroids
- Ointment
- Therapeutic soft lenses
- Punctal Cautery
Case: Neurotrophic Keratitis

Management:
- Fit with 16.5 mm scleral lenses OU
- BCVA improved to 20/50 OD, 20/200 OS
- Epithelial defects and corneal staining resolved
Resources:

- GP Lens Institute:
  - http://www.gpli.info/

- Scleral Lens Education Society
  - https://www.scleralens.org/

Thanks!

- Ellen Shorter, OD
- Charlotte Joslin, OD, PhD
- Timothy McMahon, OD

Contact:
Angel Scanzera
ascanz@uic.edu