



SCLERAL LENSES TO THE RESCUE IN THE MANAGEMENT OF OCULAR SURFACE DISEASE

Lindsay B. Howse, OD
drindsayhowse@gmail.com



FINANCIAL DISCLOSURES

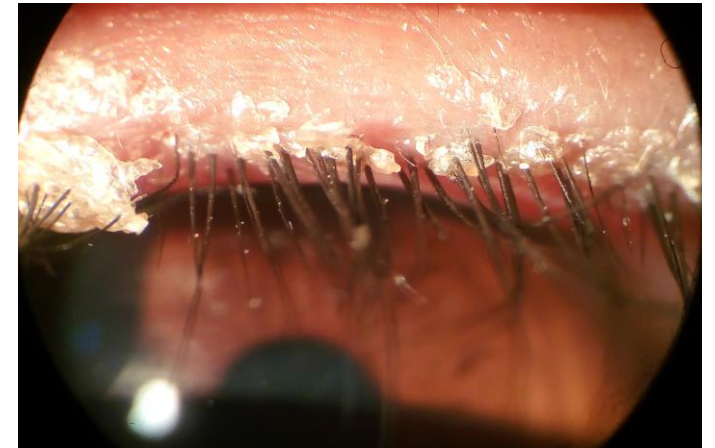
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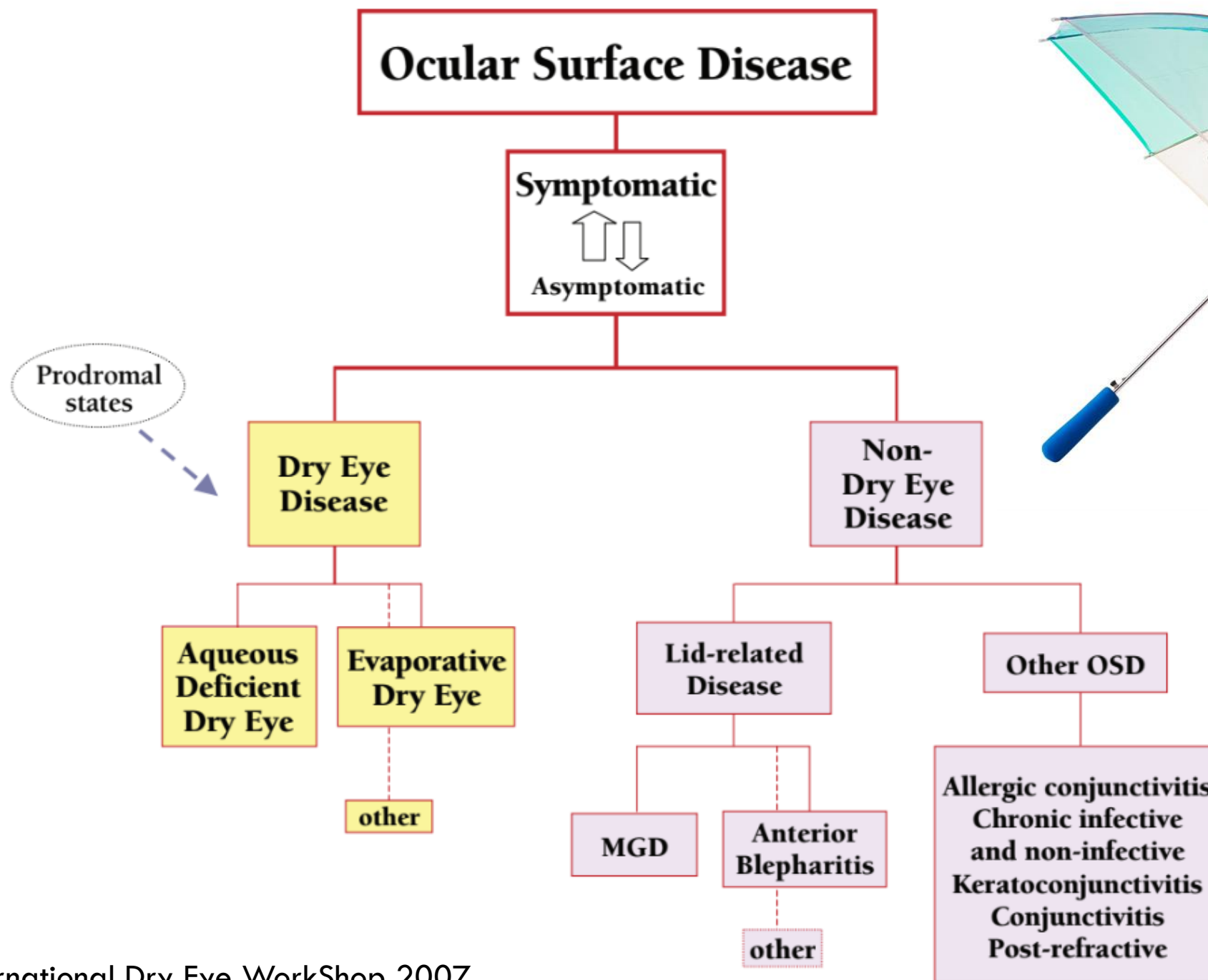
OUTLINE

- Overview of OSD & Dry eye
 - Definition
 - Types of OSD
 - Current OSD management options
- Role of Scleral CLs in managing OSD
 - Benefits
 - Case examples
 - Short-term effects
 - Long-term effects
- Fundamentals of Scleral CL fitting
 - Tips and tricks for an ideal fit

OSD is “clinical damage to the intrapalpebral ocular surface or symptoms of such disruption for a variety of causes”. (AOA Optometric Clinical Practical Guidelines)

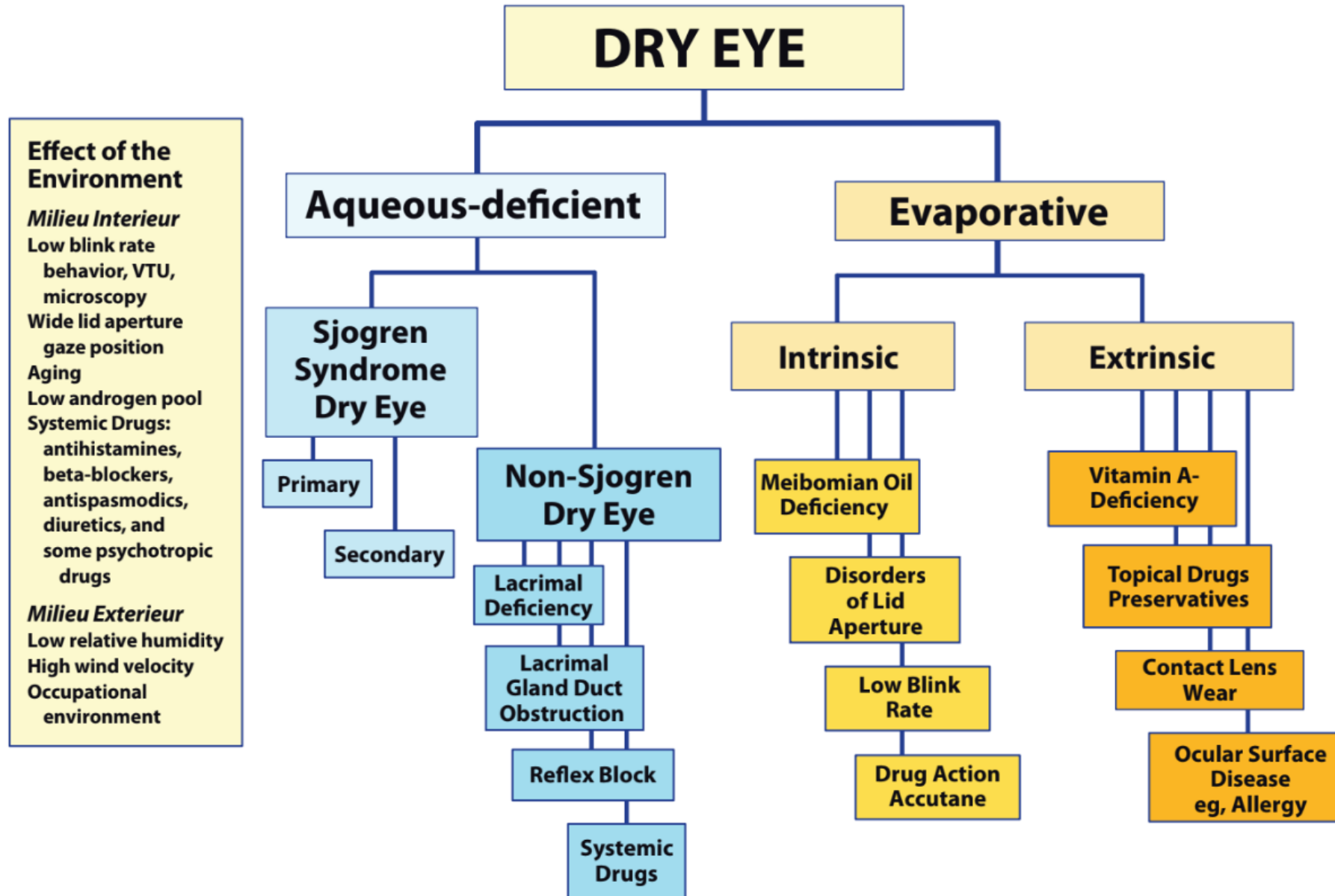
WHAT IS OCULAR SURFACE DISEASE?





“Dry eye is a multifactorial disease of the tears and ocular surface that results in symptoms of discomfort, visual disturbance and tear film instability with potential damage to the ocular surface. It is accompanied by increased osmolarity of the tear film and inflammation of the ocular surface”. (International Dry Eye Workshop 2007)

WHAT IS DRY EYE DISEASE?



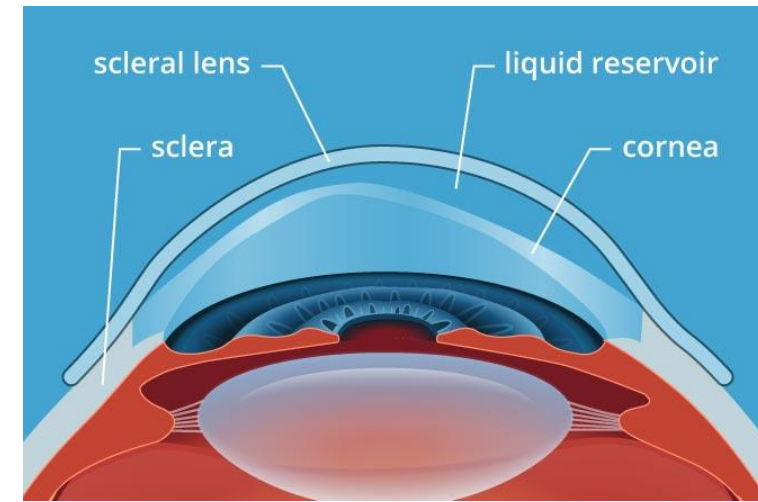
TOOLS FOR MANAGING OSD/DRY EYE

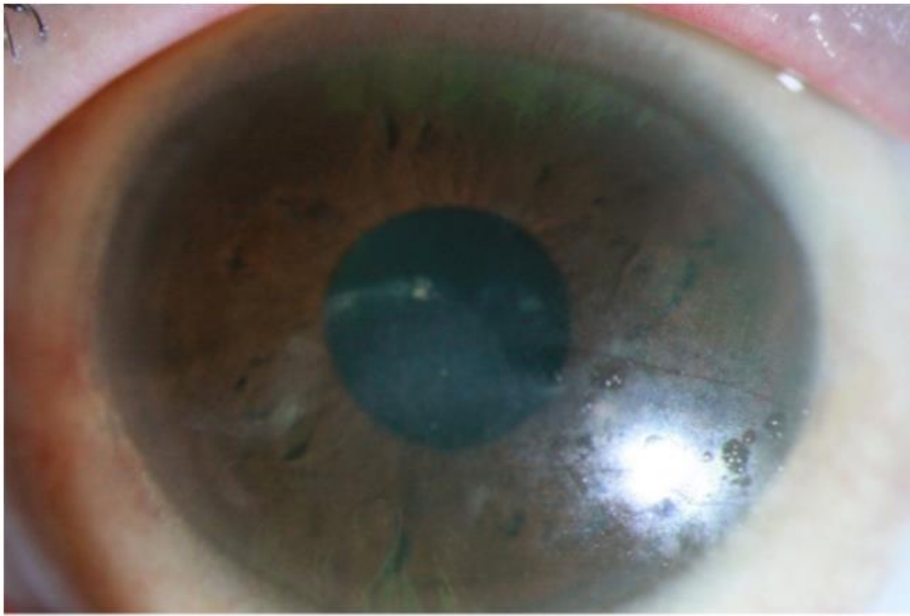
- Mild/Moderate Disease:
 - Environmental modifications
 - Artificial tears
 - Hot compresses
 - Omega-3 supplementation
 - Punctal plugs/punctal cautery
 - Steroids
 - Cyclosporine A
 - Lifitegrast
 - Tetracyclines
- Severe Disease:
 - Autologous serum tears
 - Bandage soft contact lenses
 - Amniotic membranes
 - Surgical intervention (Tarsorrhaphy)
 - Scleral Contact Lenses



SCLERAL LENSES FOR OSD

- Support ocular surface with fluid reservoir
- Prevent desiccation due to exposure (ex: Bell's palsy, lagophthalmos, TED, lid trauma)
- Protects cornea from microtrauma on blink (ex: Entropion, Trichiasis, Steven-Johnson syndrome)
- Medication reservoir (Viscous artificial tears, Autologous serum tears, Antibiotic)
- Improved visual acuity by vaulting corneal irregularities
- Improved symptoms and ocular comfort (Alipour et al 2012)
- Decrease frequency of artificial tear usage

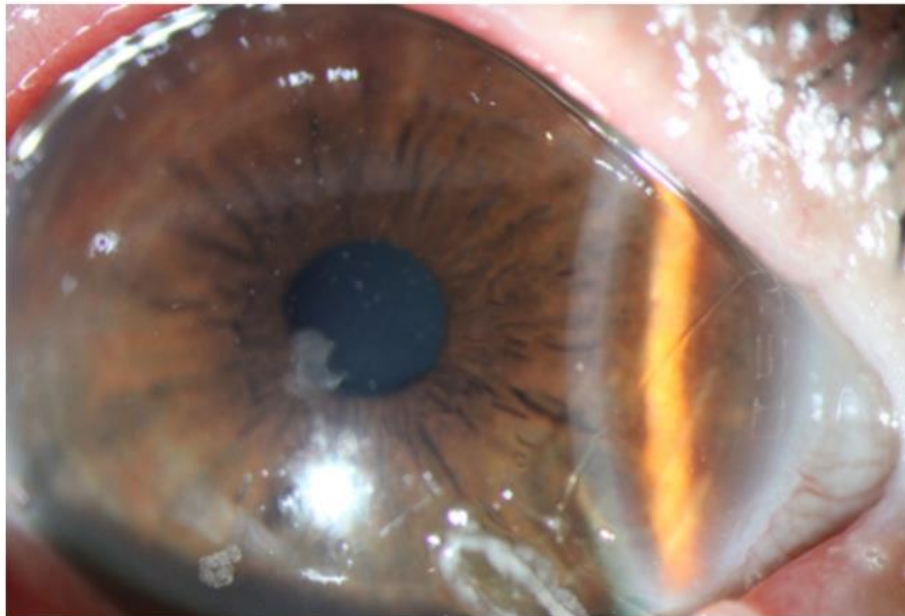




Herpetic neurotrophic keratopathy



Chemical burn



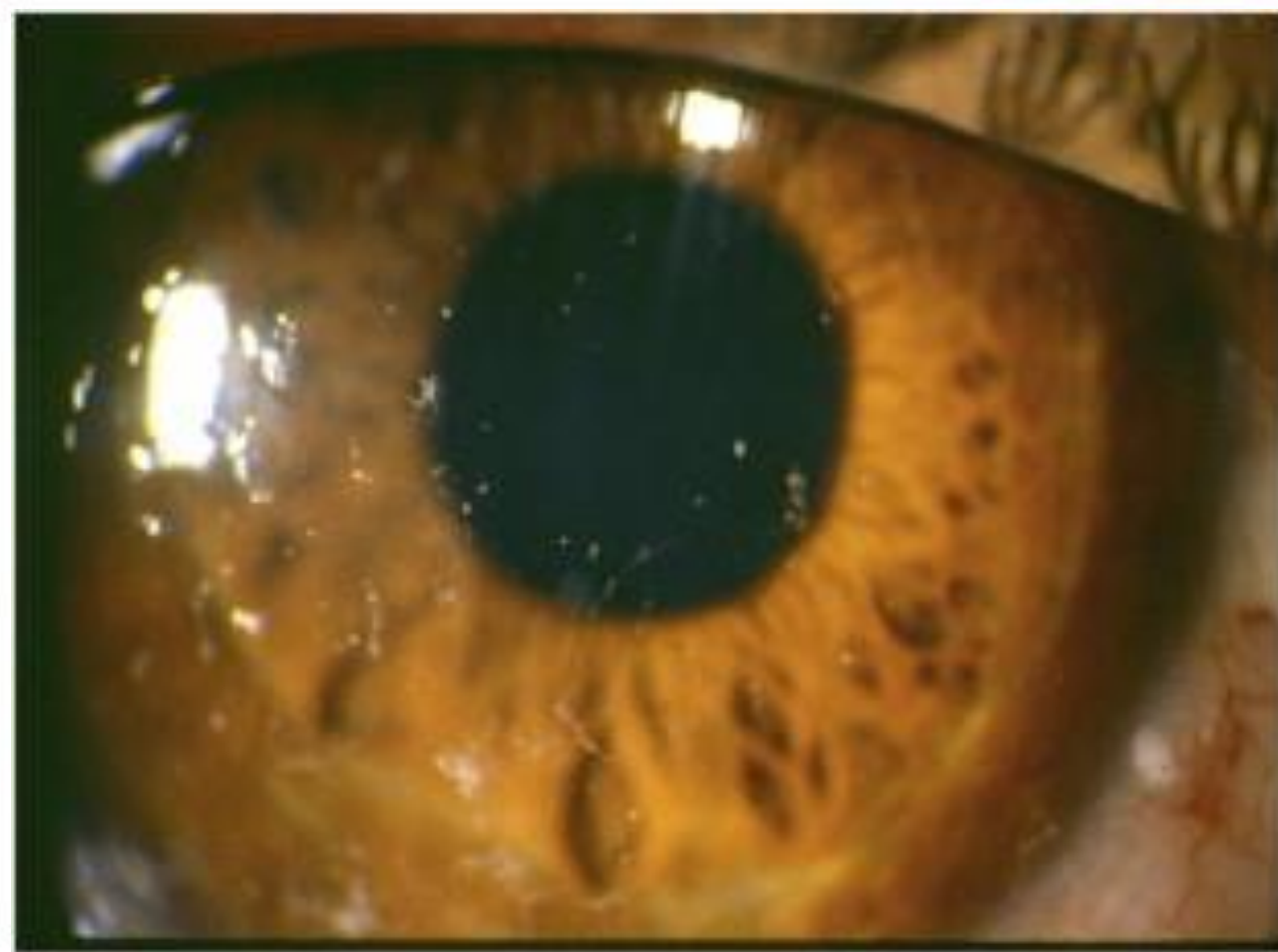
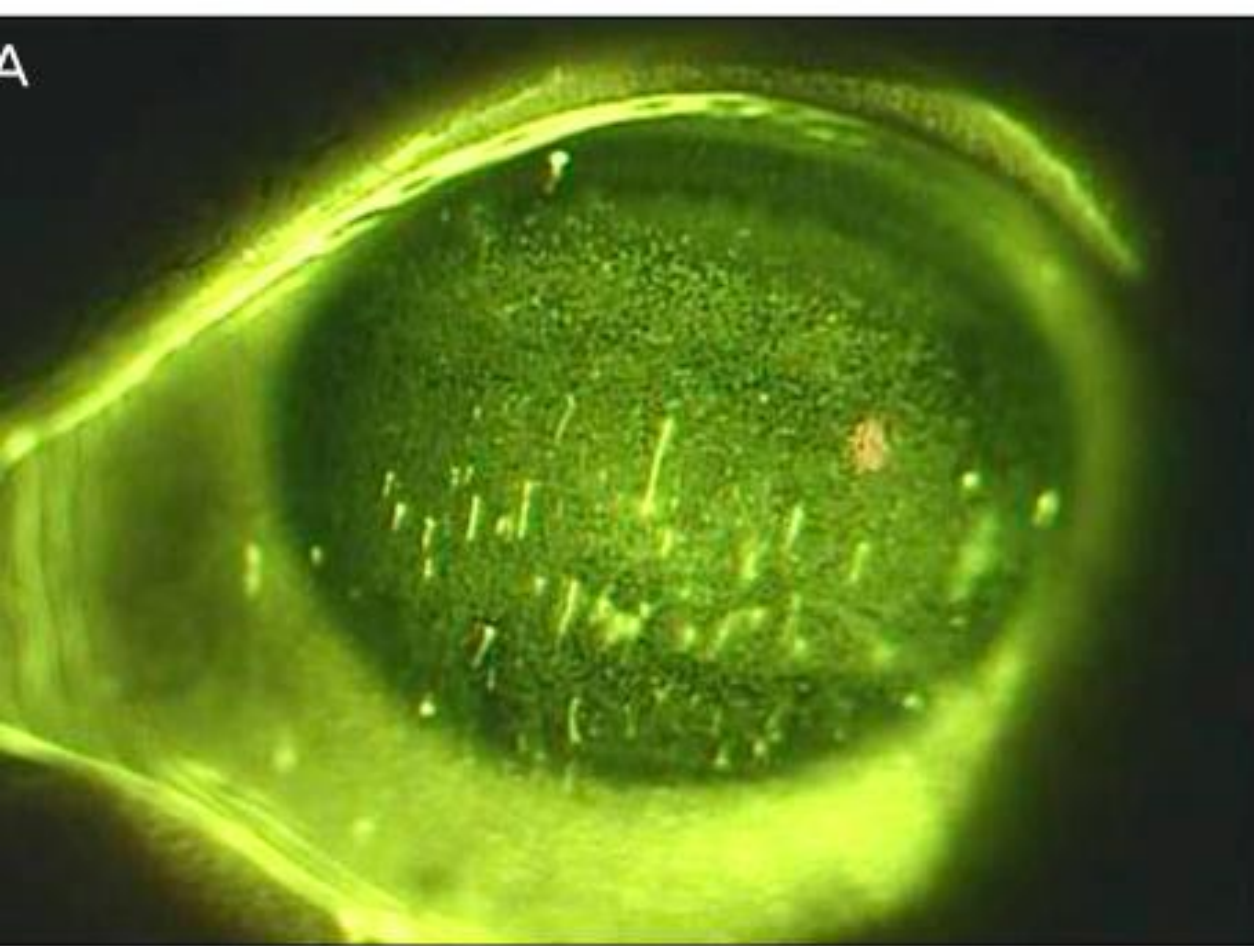
Stevens Johnson syndrome



Graves Disease



CASE EXAMPLES

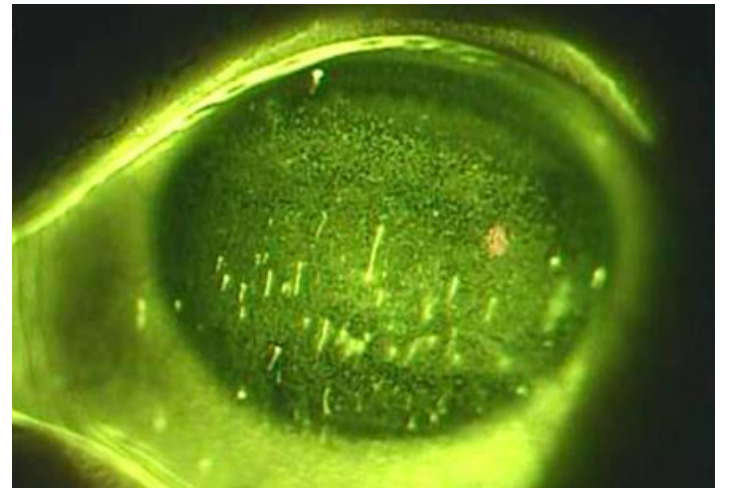
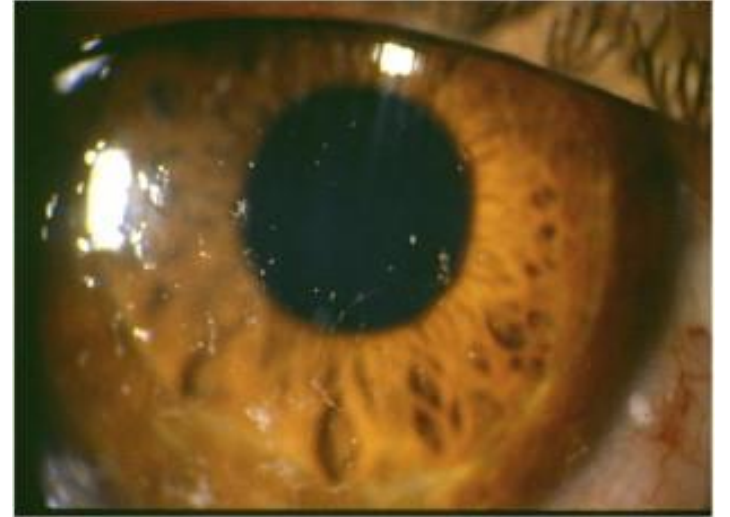


CASE 1: FILAMENTARY KERATITIS

Case from Samantha Rao, OD
Nassar et al. 2013

CASE 1: FILAMENTARY KERATITIS

- 60 yo Hispanic female
- CC: Constant pain and poor fluctuating vision OU
- H/O chronic filamentary keratitis and SLK OU
- Current tx:
 - Restasis BID OU
 - Autologous serum tears QID OU
 - Preservative free tears q1H OU
 - Office visits to manually remove filaments



CASE 1: FILAMENTARY KERATITIS

- Fit with Zenlens Prolate scleral lens OU

Reduction in corneal staining and filaments at 1 week follow-up; zero filaments at 2 months

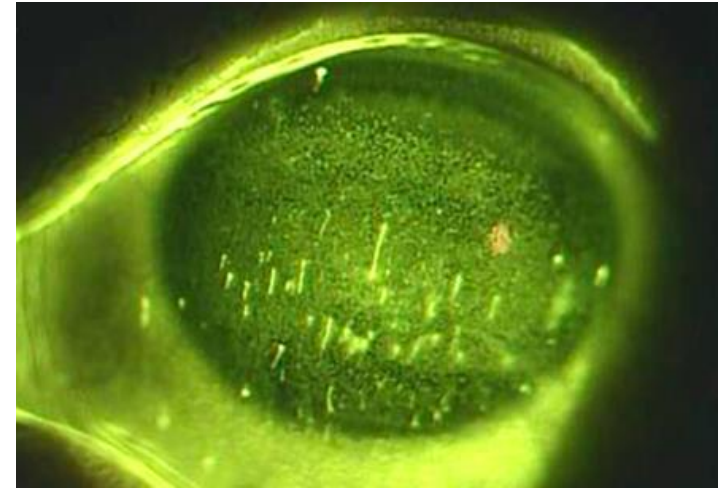
Vision before and after 2 months of lens wear

- OD 20/80 → **20/60**
- OS 20/70 → **20/40+**

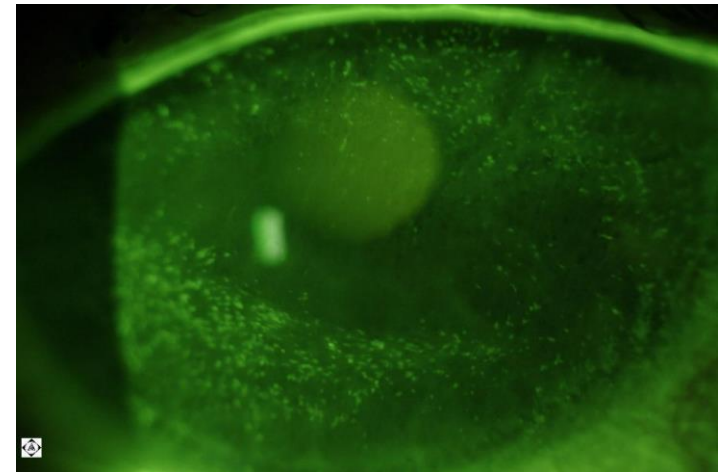
Wearing time 12 hours

Patient **asymptomatic** while wearing lenses

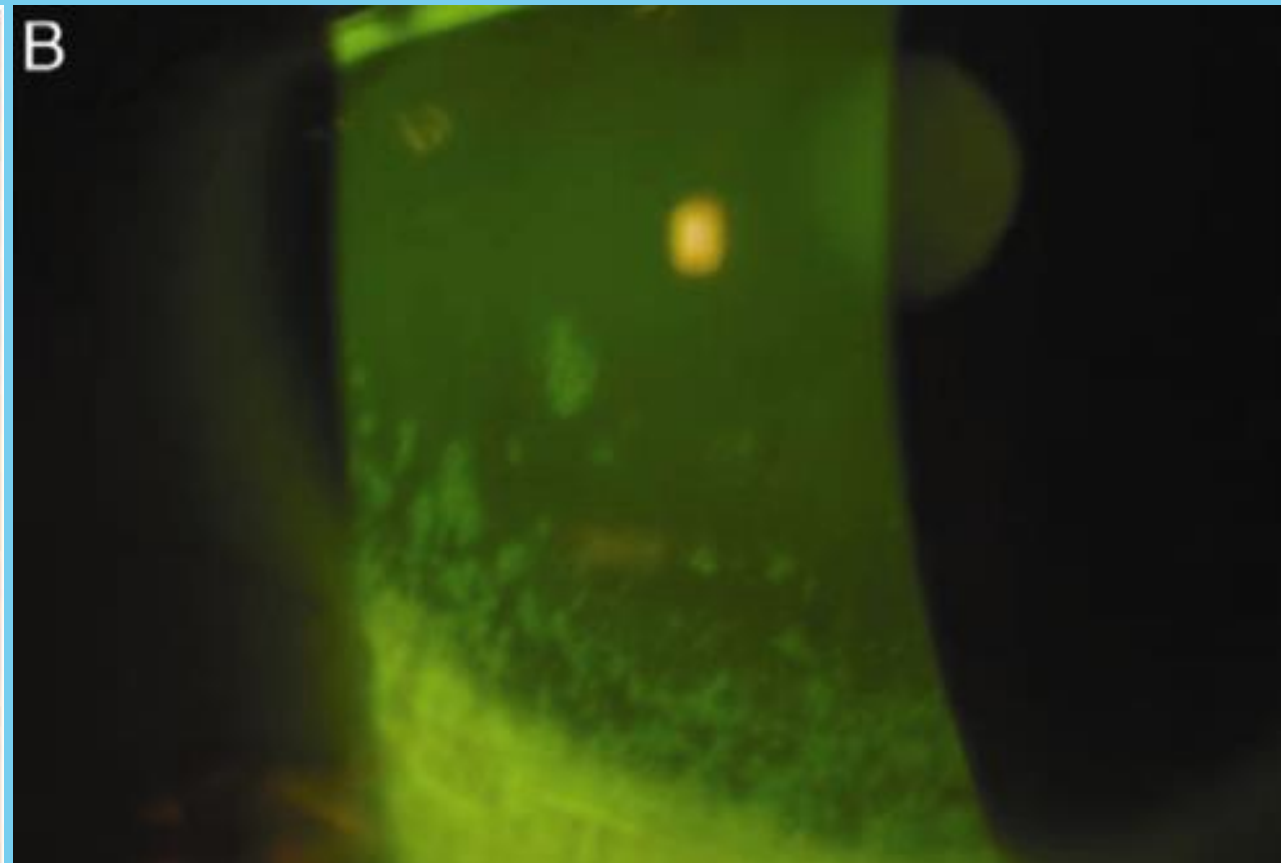
- Patient now able to drive
- “I forget to take my drops now”



Before scleral lens wear.



After 2 months scleral lens wear.



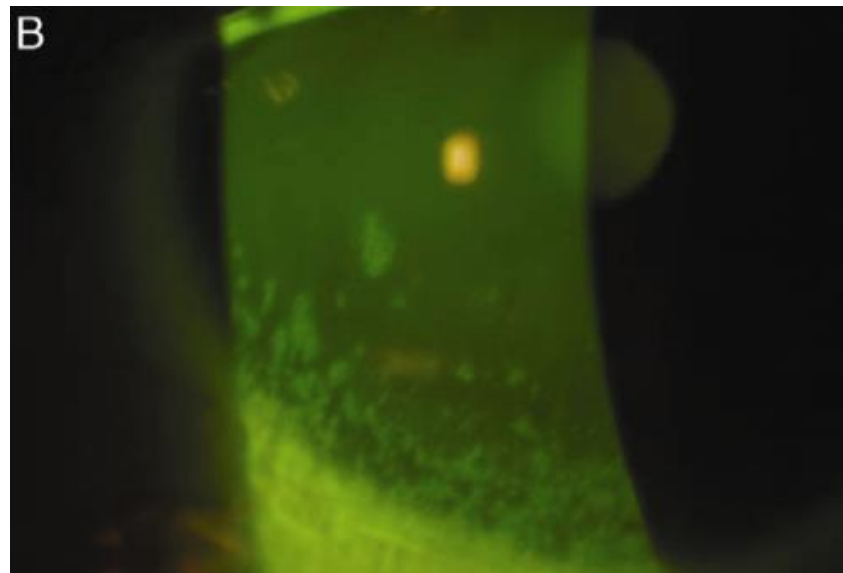
CASE 2: GRAVES OPHTHALMOPATHY

CASE 2: GRAVES OPHTHALMOPATHY

- 48 yo Caucasian male
- CC: Blur at distance and near with his current hybrid lenses, double vision at the end of the day and significant redness and irritation that did not improve with traditional supportive dry eye therapy.
- H/O: Graves ophthalmopathy for the past 13 years (status post-thyroidectomy)
- Pt failed all other lens modalities and was concerned that his vision and ocular discomfort would interfere with his ability to continue working.

CASE 2: GRAVES OPHTHALMOPATHY

- Entering ccVA with hybrid lenses: 20/30 OD, 20/50 OS.
- Refraction:
 - OD: -5.50-4.50 x 82 20/80
 - OS -1.00-3.00 x 115 20/200
- Topography showed the patient also had keratoconus OU
- EOMS full with no restriction, mild proptosis OU
- SLE/Dry eye workup:
 - 2+ diffuse NaFl staining, 3+ conjunctival lissamine staining
 - Schirmer scores without anesthetic were 13mm OD and 18mm OS



CASE 2: GRAVES OPHTHALMOPATHY

- Tx: Restasis 0.5% BID OU, Lotemax 0.5% BID OU, preservative-free AT QID, preservative-free ung qHS.
- 15.8mm Mini-Scleral Design (Blanchard) CL was fit with Boston XO2 material
- NaFl cornea staining went from 2+ to trace after 3 weeks of wearing the lenses
- Vision before and after 5 months of lens wear
 - OD 20/30 → **20/25**
 - OS 20/50 → **20/25**
- Patient noted increase in clarity and quality of his vision after wearing lenses for 5 months

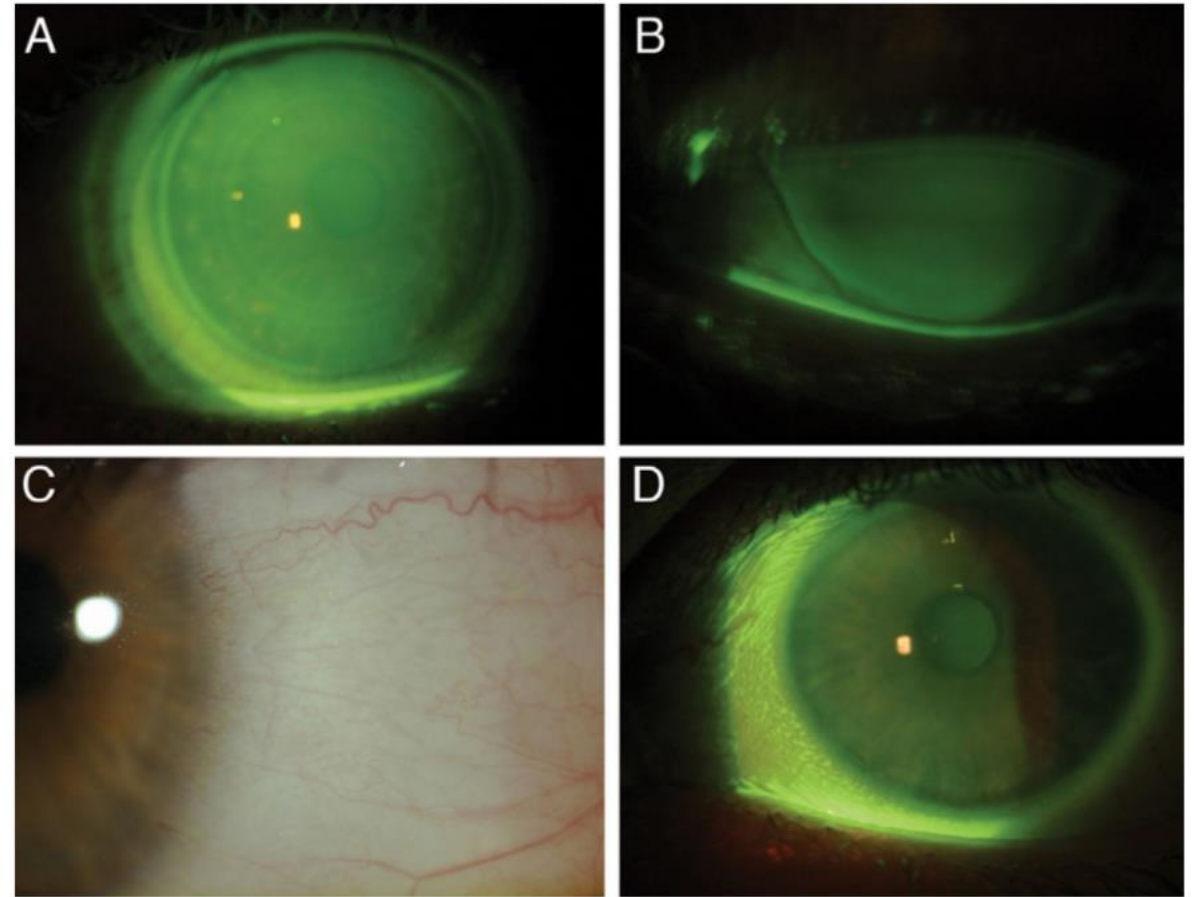
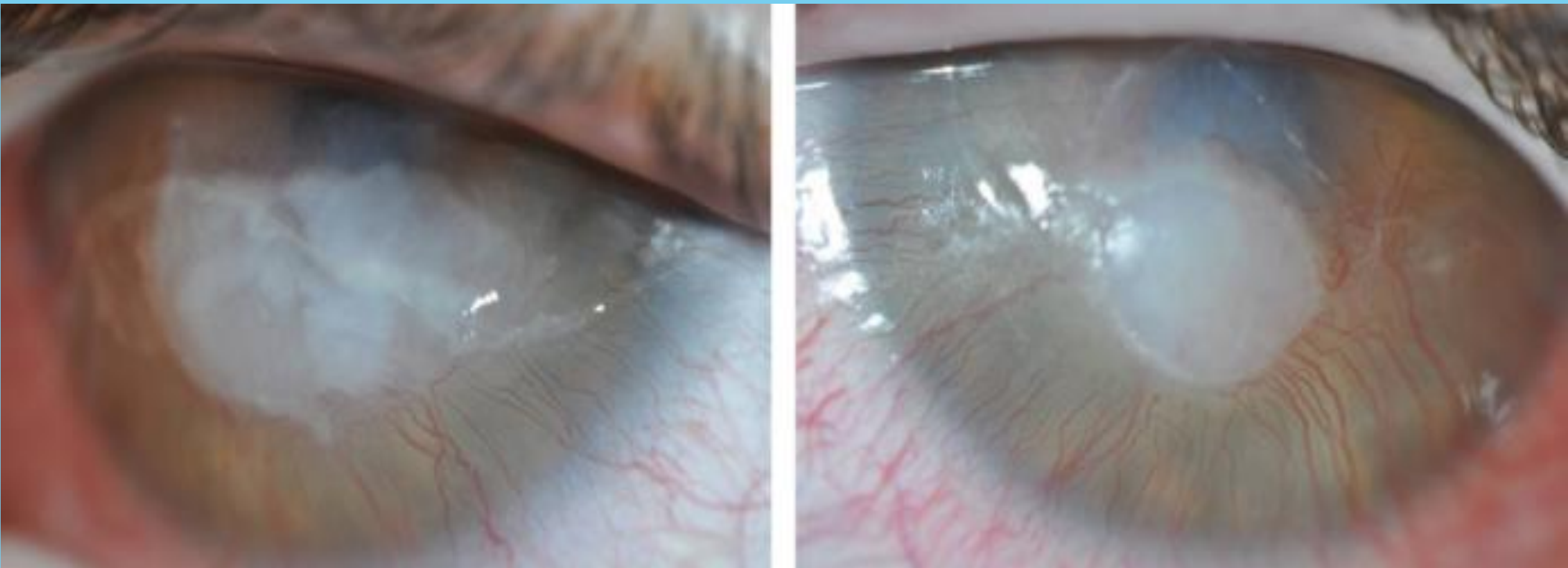


Figure 3 Final MSD lenses of the right and left eye. Lissamine green and sodium fluorescein staining post-MSD fit.

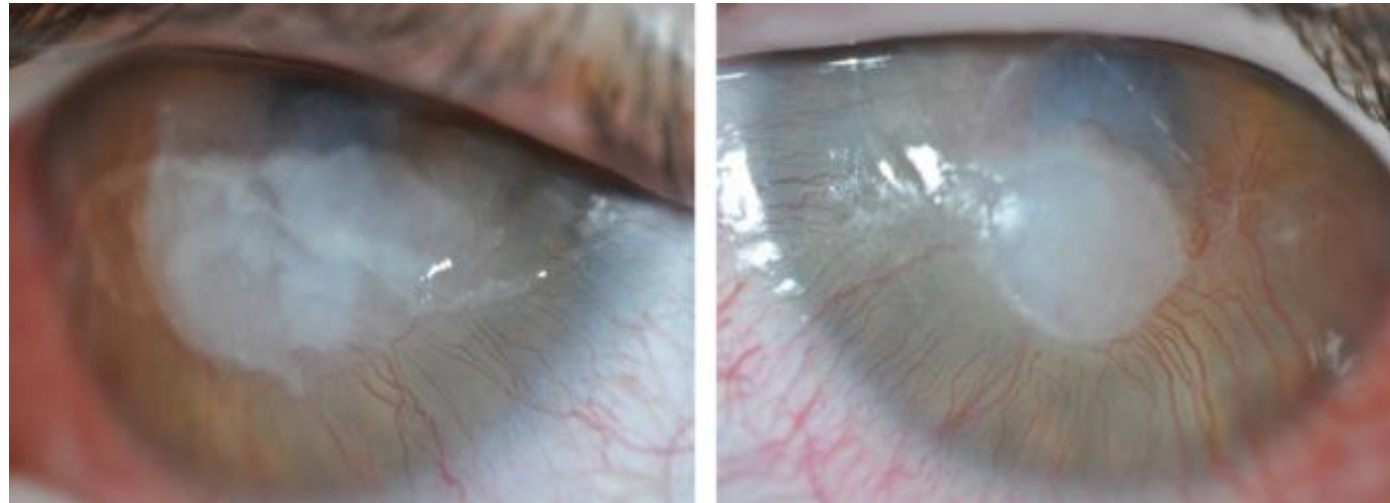


CASE 3: EXPOSURE AND NEUROTROPHY KERATOPATHY

BILATERAL EXPOSURE AND NEUROTROPHIC KERATOPATHY

Exposure keratopathy = dry of the cornea with subsequent epithelial breakdown

- Can lead to significant visual loss due to corneal scarring, neovascularization, stromal thinning, ulceration and ultimately perforation.
- Exposure arises from incomplete or inadequate lid closure
- Tx options: AT q1h, botox?, tarsorrhaphy, amniotic membrane grafts, SCL, gold eyelid weights
- Goal: restore corneal integrity which stabilizes corneal thinning and minimizes the risk of corneal perforation.



CASE 3: EXPOSURE AND NEUROTROPHY KERATOPATHY

- 14 yo Caucasian female
- CC: Constant ocular discomfort and severely reduced vision OU
- H/O low grade astrocytoma at age 4.
 - Tx with surgical de-bulking and radiotherapy.
 - Bilateral V, VI, VII, and VIII CN palsies
 - Bilateral exposure and neurotrophic keratopathy
 - CN V → anesthetic corneas and bilateral neurotrophic ulceration
 - CN VII → lagophthalmos, neovascularization and keratinization of the inferior cornea, reduced tear production
- Prior and current tx:
 - Frequent preservative free artificial tears, gels and ointments
 - Botox injections to upper lid
 - Temporary tarsorrhophies
 - Amniotic membranes
 - Punctal plugs
 - Lid Taping
 - Gold eyelid weights
 - Soft Bandage CLs

CASE 3: EXPOSURE AND NEUROTROPHY KERATOPATHY

- Pt was fitted with Innovative Scleral CLs
 - Refraction not possible (Retinoscopy obstructed by corneal opacities, communication problems)
 - Ordered non-fenestrated, high dk, plano CLrx
- Preservative-free saline was used to fill lenses prior to insertion. Also added drop of preservative-free Celluvisc 0.5% for comfort.
- Pt was instructed to use artificial tears over lenses QID OU
- After 6 months of wear, central corneal clarity had improved so prescription was able to be included in lenses.

CASE 3: EXPOSURE AND NEUROTROPHY KERATOPATHY

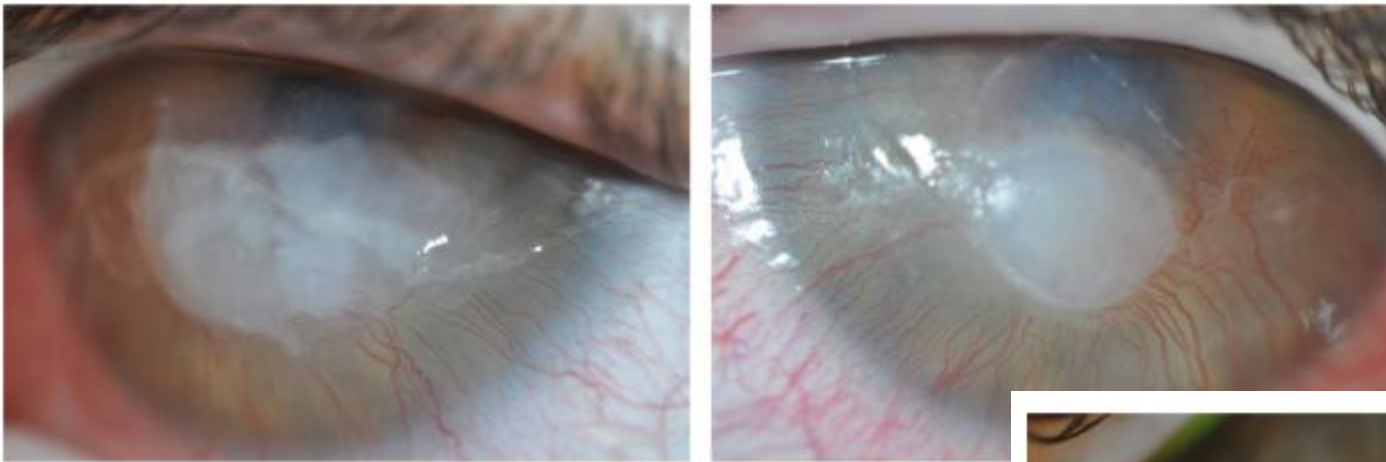


Fig. 1. R and L corneas on referral to contact lens clinic.

BEFORE:

OD: 20/1600 (1.9 logMAR)

OS: 20/1449 (1.86 logMAR)

AFTER 6 months:

OD: 20/160 (0.9 logMAR)

OS: 20/100 (0.7 logMAR)

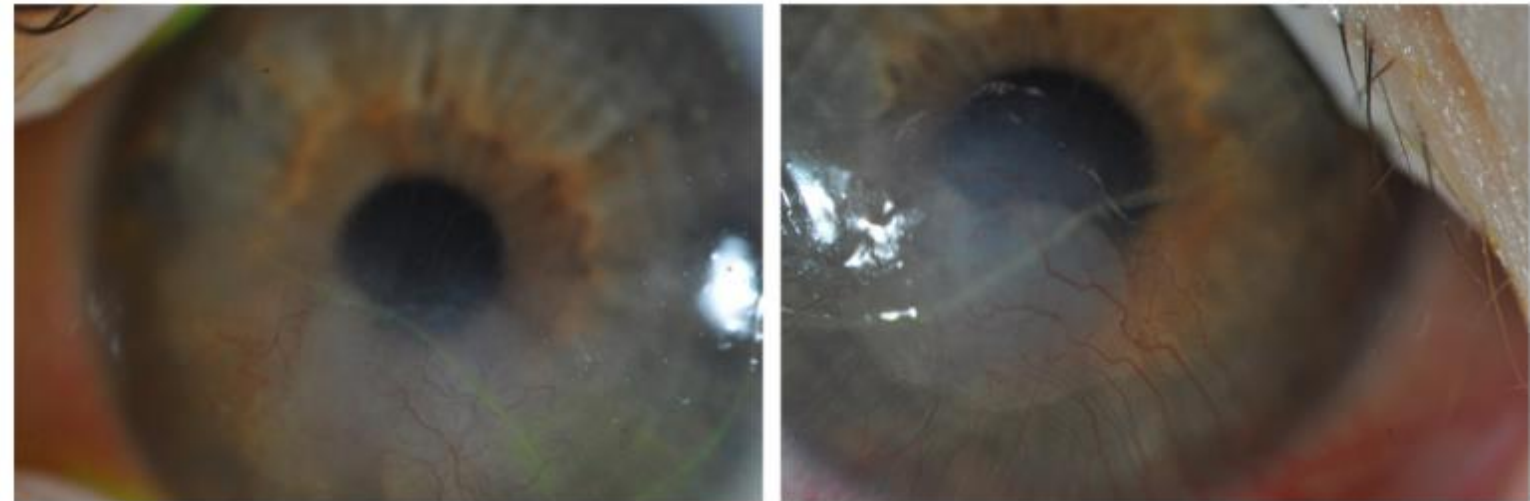


Fig. 3. R and L corneas at 6 months of scleral lens wear (imaged without lenses).



SHORT & LONG TERM EFFECTS OF SCLERAL LENSES ON OSD/DRY EYE



SHORT TERM EFFECTS OF SCLERAL LENSES ON DRY EYE BIOMARKERS (8 HOURS OF WEAR)

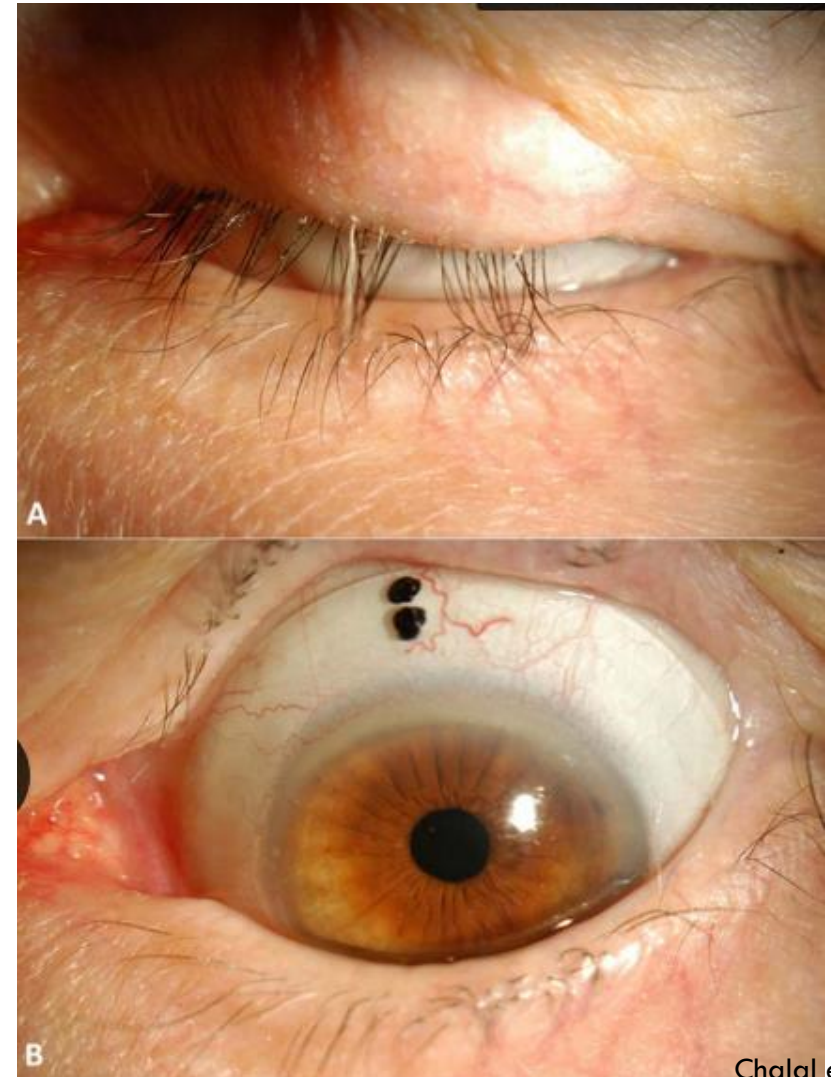
- Evaluated important biomarkers before and after 8 hours of scleral lens wear in 26 keratoconus patients.
 - Ocular Surface Disease Index (OSDI) questionnaire
 - Schirmer test without anesthetic
 - TBUT
 - Matrix metalloproteinase 9 (MMP-9) concentration
 - Osmolarity
 - Diadenosine tetraphosphate (Ap4A) concentration
- No change in Schirmer test and TBUT
- Statistically significant decrease in:
 - Tear osmolarity
 - Ocular surface disease Index (OSDI) symptom score
 - Ap4A concentration
- Significant rise in MMP-9 concentration

SHORT TERM EFFECTS OF SCLERAL LENSES ON DRY EYE BIOMARKERS (8 HOURS OF WEAR)

- Short term scleral lens wearing improves the symptoms and some signs of dry eye (osmolarity and Ap4A concentration)
- Increase in MMP-9 concentration could be caused by tear film stagnation and use of preserved saline.

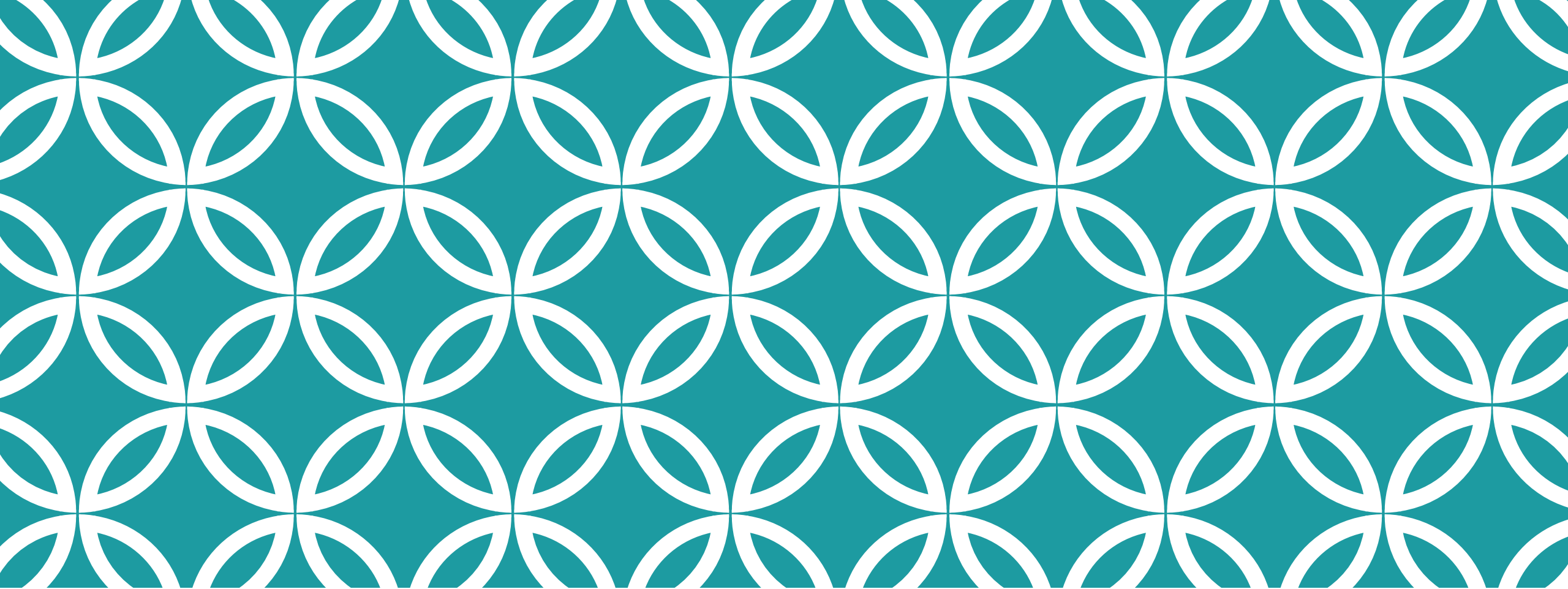
LONG TERM GOALS OF SCLERAL LENSES ON OSD

- Decrease in discomfort and dry eye symptoms
- Decrease frequency of artificial tear usage
- Improvement of visual acuity



LONG TERM EFFECTS OF SCLERAL LENSES ON OSD

- Study to investigate the utility of PROSE scleral lenses in patients with exposure keratopathy, 5 year outcome
 - Measured visual acuity, visual function (OSDI), corneal staining
- 18 eyes included in the study (exposure keratoconjunctivitis, lagophthalmos, ectropion, lid retraction) were fitted with PROSE scleral lenses
- VA improved (20/80 to 20/25)
- OSDI scores improved from 56.54 to 24.98
- Corneal staining decreased from 2.17 pre-PROSE to 0.64 post-PROSE
- **CONCLUSION:** Scleral CL therapy effective in patients with exposure keratopathy who had failed conventional therapies

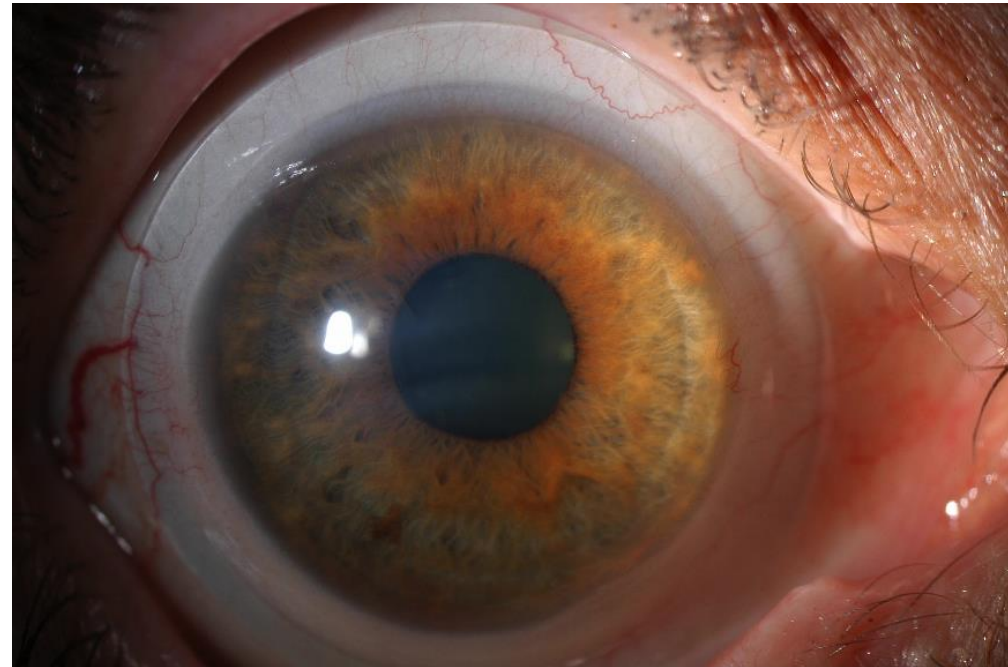


SCLERAL LENS FITTING BASICS



IDENTIFYING CANDIDATES FOR SCLERAL LENS WEAR

- Failure with most conventional dry eye treatment protocols
- High level of motivation
- Good manual dexterity to insert and remove lenses



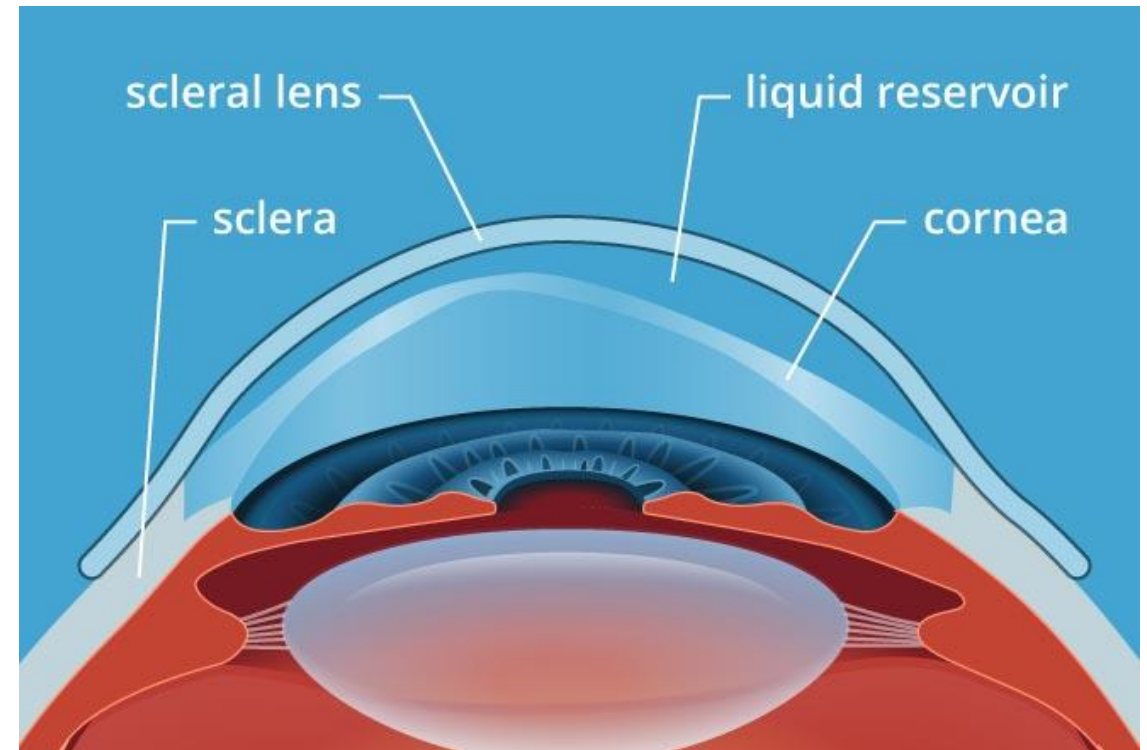
IMPORTANT STEPS PRIOR TO FITTING LENSES

- Complete evaluation of the ocular surface
 - Identify the type of dry eye
 - Vital dye staining, Schirmer test, TBUT, tear osmolarity, etc.
 - For post-graft patient, consider endothelial cells count
- Address lid disease (MGD, Bleph)
 - Lid hygiene, warm compresses
 - Prevent excess debris in tear reservoir
- Set goals
 - Improve comfort, improve vision
 - Surface protection
 - Reduce frequency of artificial tears.



SCLERAL LENS FITTING GOALS

1. Choose appropriate lens **diameter** to vault the cornea completely
2. Ensure **sufficient limbal clearance** with no bearing
3. Appropriate **sagittal depth** so there is no areas of touch on the cornea, and 50-100 microns of clearance after the lens settles
4. Check peripheral alignment of the lens landing on sclera. Goal is that the lens lands evening on the sclera 360.



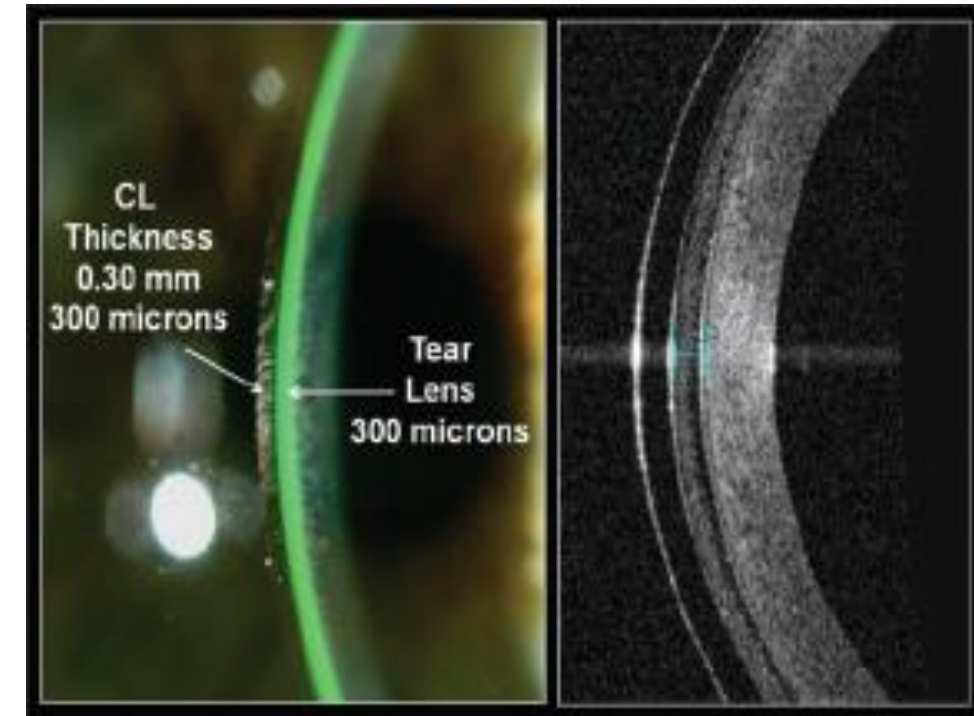
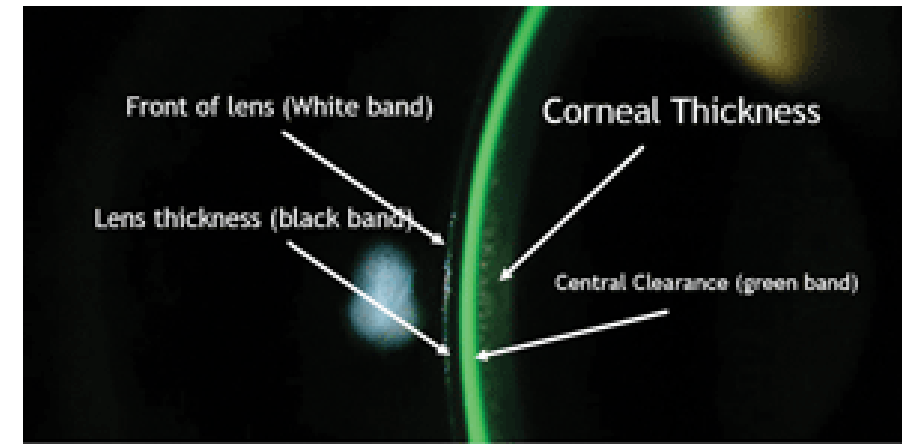
INITIAL LENS SELECTION

- Select appropriate diameter
 - Measure corneal diameter (HVID) and interpalpebral aperture (IPA)
 - Start with lens that will provide a minimum of 1.5 mm coverage beyond the limbus in all quadrants
 - Go larger if severe OSD and corneal irregularity
 - Keep smaller if small IPA, I&R difficulty, post-graft pts
- Select starting sagittal depth
 - Manufacturer's suggested starting lens
 - Can choose based on AS-OCT, Topography or Keratometry values

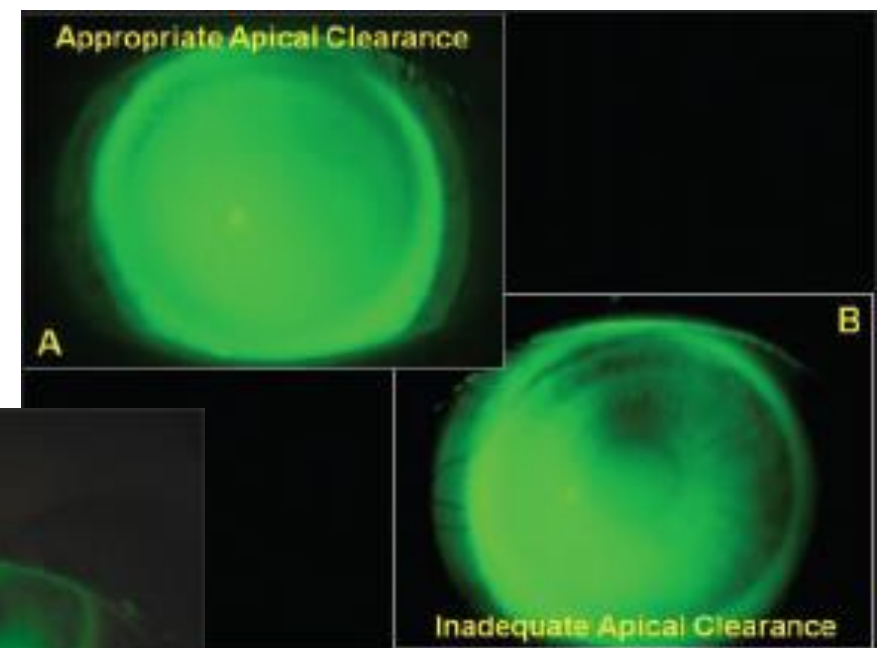
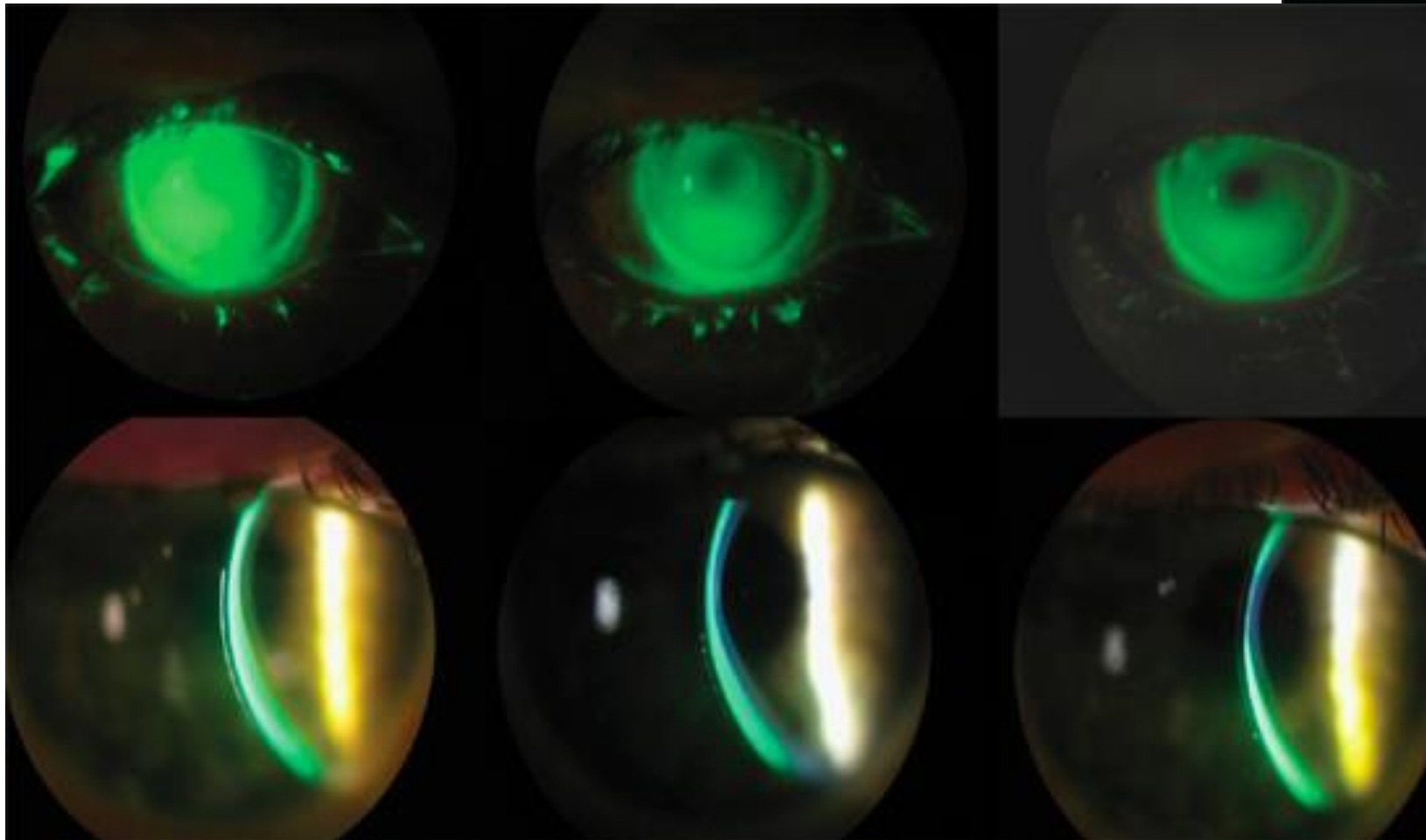


CENTRAL CLEARANCE

- Goal for initial clearance: 250-400 microns
- Goal for clearance after settling: 150-250 microns
 - Mean settling ranges from 63 - 130 microns depending on stud
 - Higher vault and smaller diameter lenses tend to settle more



CENTRAL CLEARANCE



LIMBAL CLEARANCE

- Goal for initial clearance: 100-150 microns
- Goal after settling: 50-100 microns
- Assess fluorescein coverage at limbus with diffuse white light, then measure with optic section.

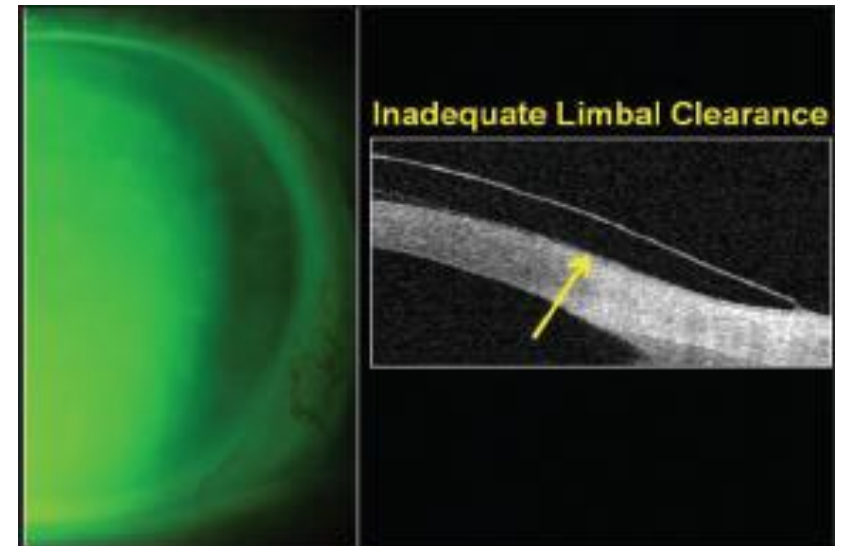
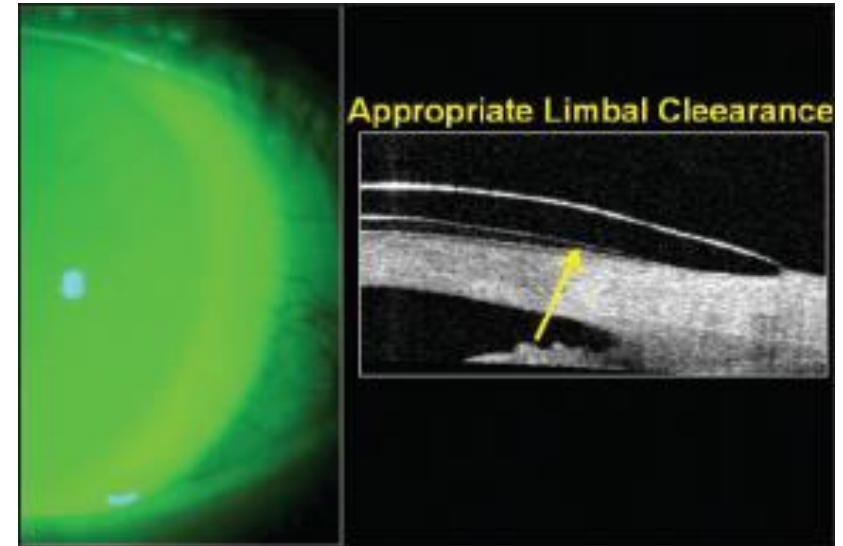
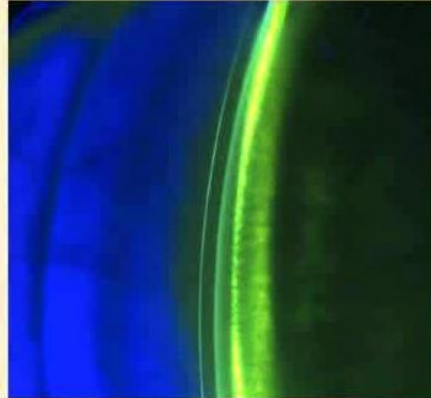
No clearance



50-100 clearance





100-150 clearance

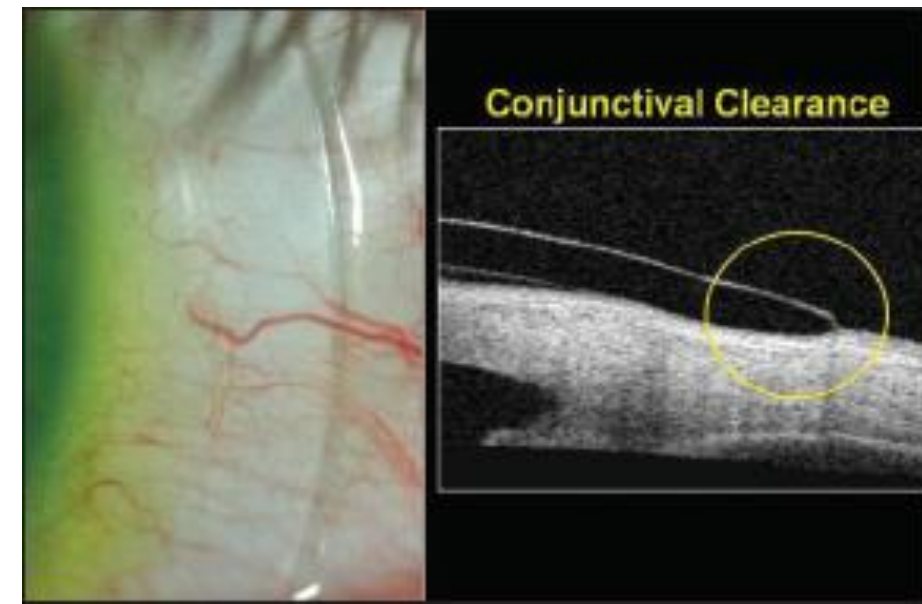


LANDING ZONE

Goal: Even alignment with sclera 360

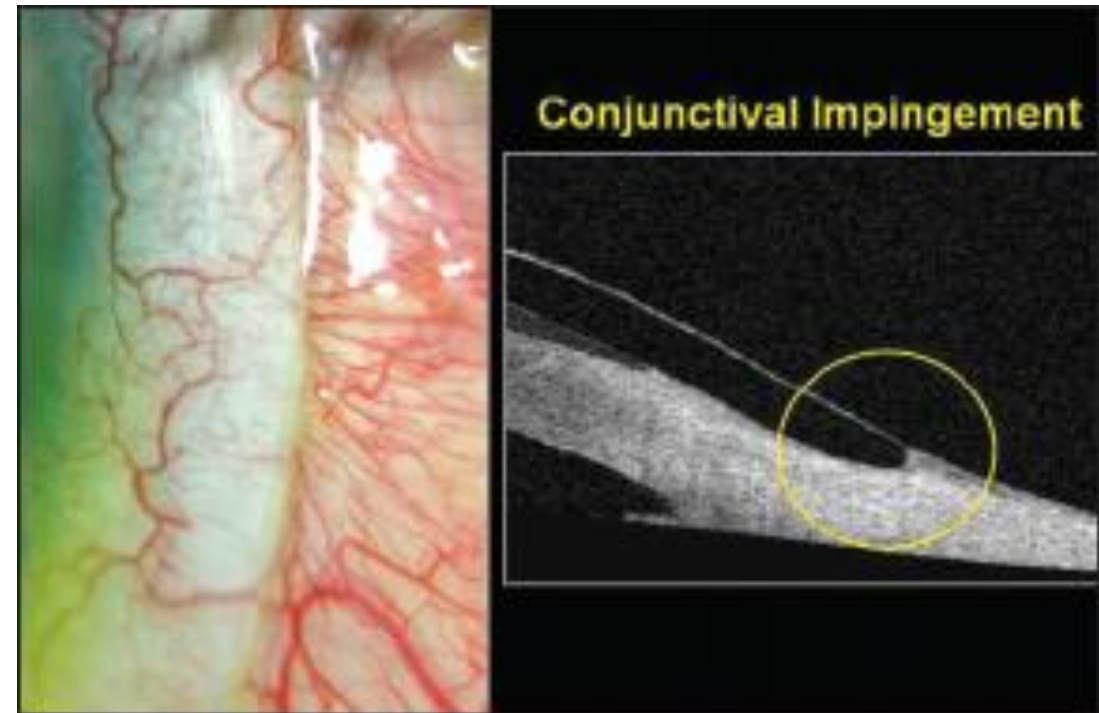
- Too loose?  Discomfort, excessive movement, debris
- Too tight?  Discomfort, compression, impingement, redness, impression ring

(+) Spin test



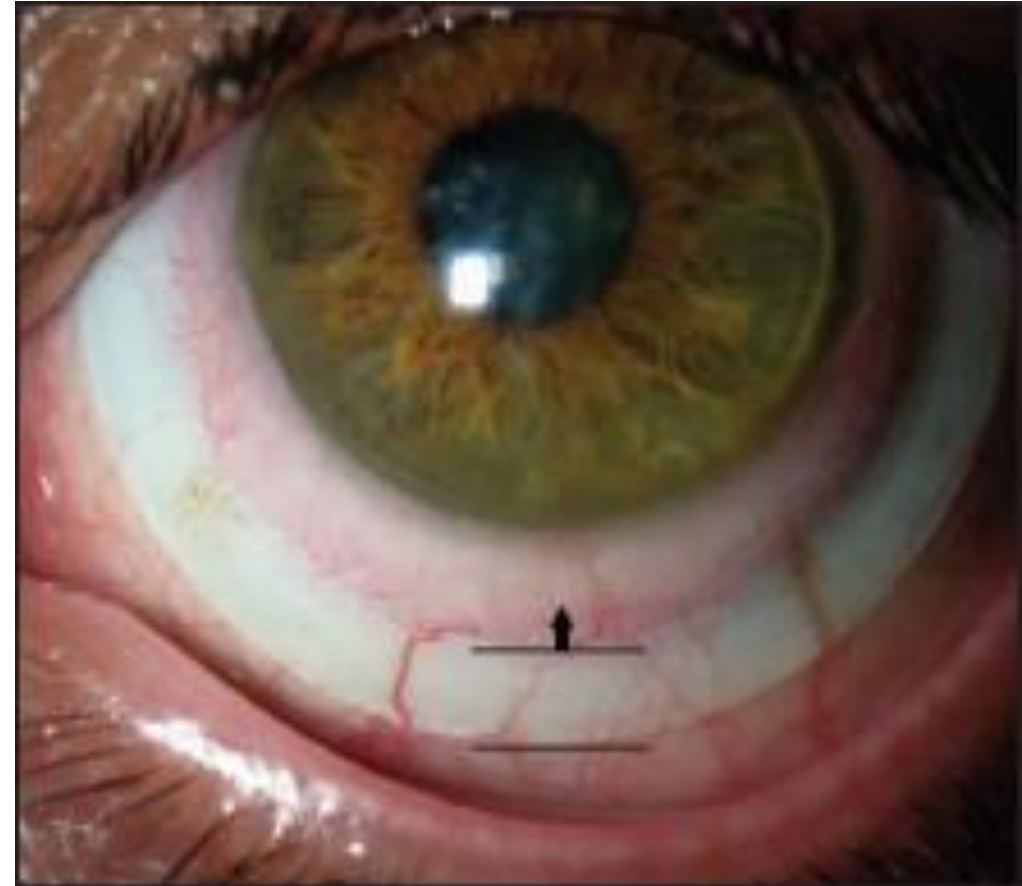
IMPINGEMENT

- Focal impingement upon the conjunctiva by the outermost lens edge
 - Typically causes blanching of blood vessels
 - May cause conjunctival indentation staining
- Solution
 - Flatten edge
 - May necessitate toric peripheral curves



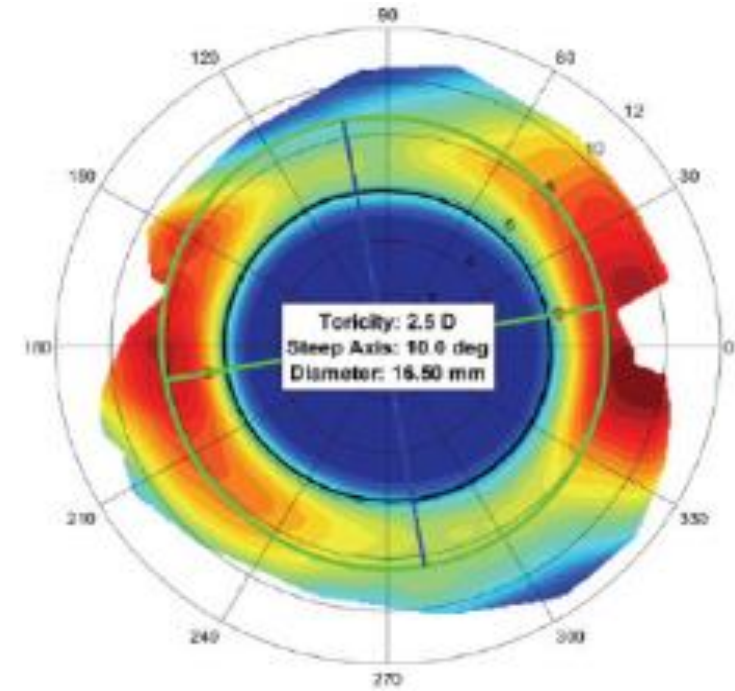
COMPRESSION

- Band of vessel blanching due to excessive focal bearing of lens weight
 - Often have adjacent conjunctival hyperemia
- Solutions
 - Flatten peripheral curves more gradually

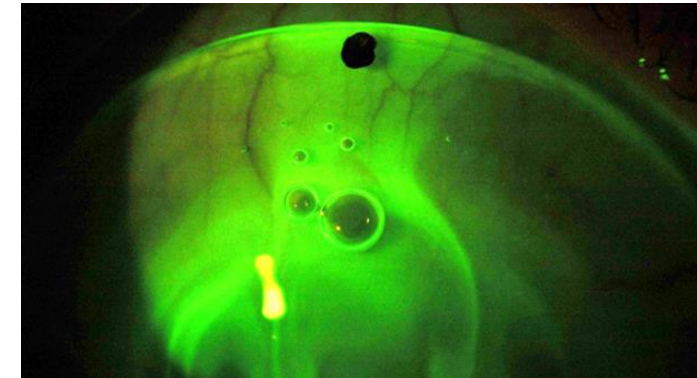


SCLERAL TORICITY

- Toricity is often more pronounced in the scleral area compared to the limbal area, irrespective of corneal toricity
 - Shape of anterior sclera and limbus is often tangential rather than spherical
 - Toricity is often greater beyond 15.0 mm
- Toric peripheral curves may be needed in 60-90% of patients

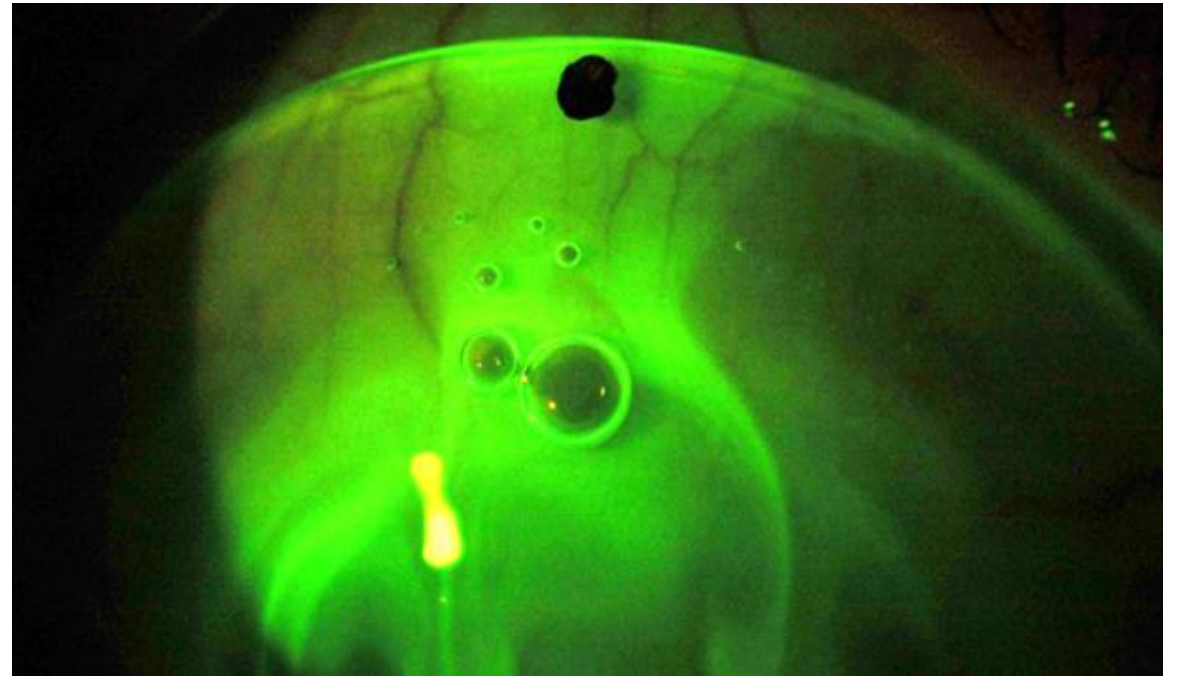


Visionary Optics sMap 3D.



INDICATIONS FOR TORIC PERIPHERY

- Compression, impingement or edge lift in only one meridian
- Excessive lens rotation or movement
- Edge bubbles in one quadrant or meridian
- Excessive debris under lens

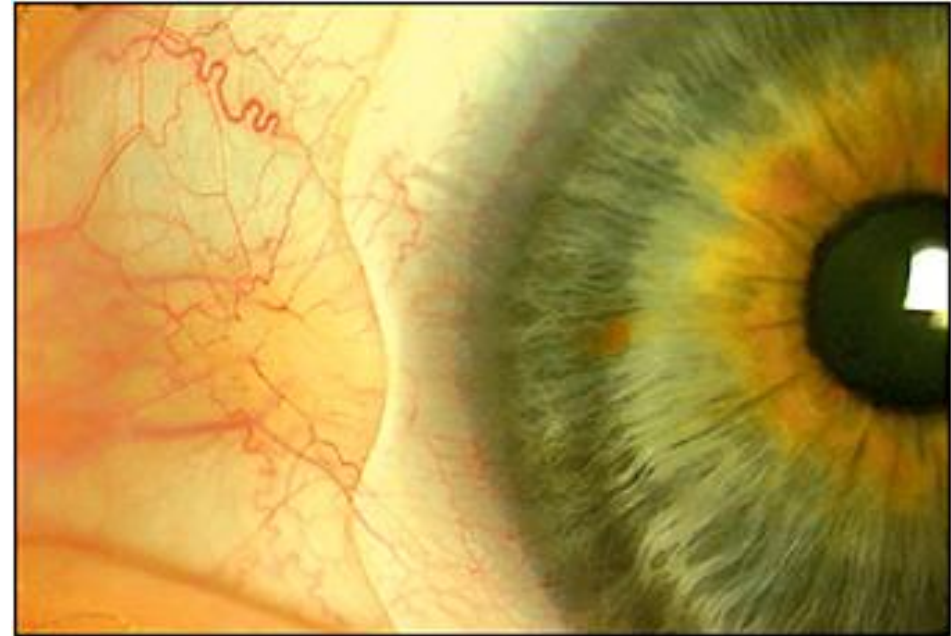


TROUBLESHOOTING: “FOGGING”

- Symptom: Vision becomes cloudy over the course of the day
 - Resolves with cleaning and re-insertion
- Solutions:
 - Adjust any quadrants of tight or loose edge profile
 - Lid hygiene
 - 1+ drops Celluvisc or other non-preserved artificial tears into lens reservoir
 - Patient removes lens, cleans and re-inserts midday

SPECIALIZED MODIFICATIONS

- Front Surface Toric
- Multifocal
- Notching
 - Pinguecula
 - Filtering bleb

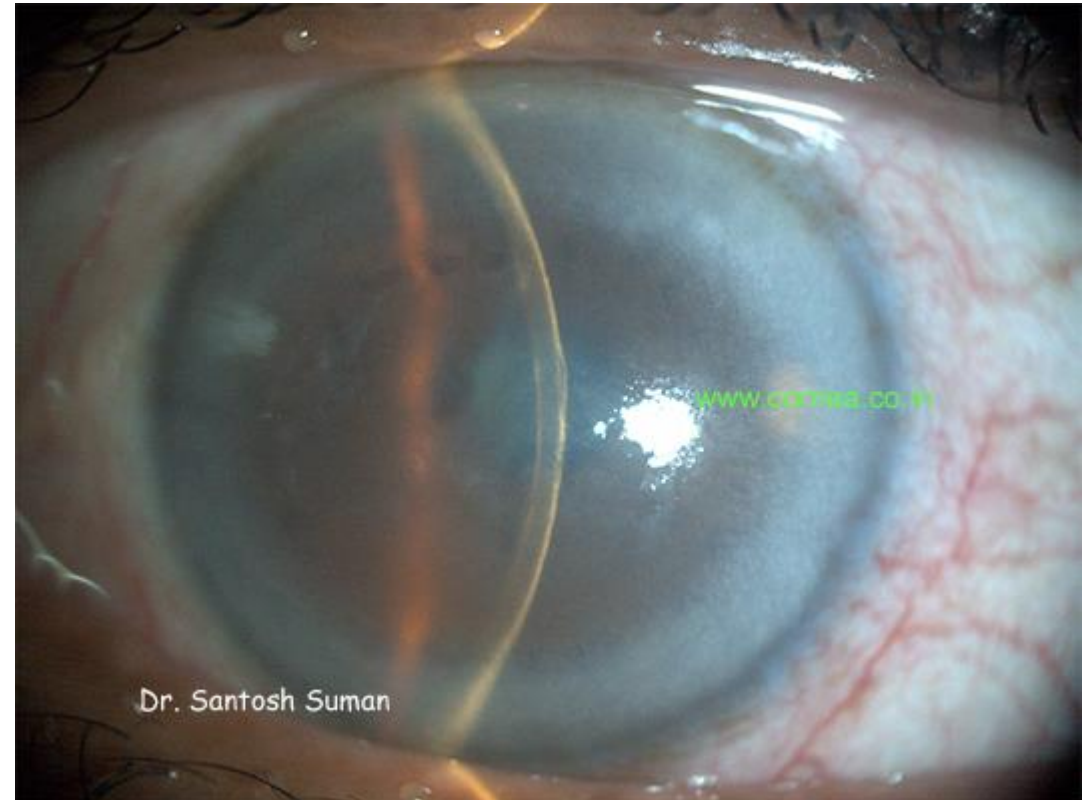


SURFACE TREATMENTS

- GOAL: Enhance hydrophilicity of lens surface to improve wettability and comfort
 - **Plasma Treatment**
 - Deep cleaning to remove bonded organic contaminants
 - Lasts weeks to months
 - **Tangible Hydra-PEG**
 - Covalently bonded polymer coating
 - Optimizes wettability, lubricity, tear film stability and deposit resistance
 - Lasts months to years
- Care of treated lenses
 - Always store treated lenses wet
 - Avoid abrasive cleaners

POTENTIAL COMPLICATIONS

- Microbial keratitis
- Limbal stem cell deficiency
- Bullous keratopathy
- Hypoxia
 - Corneal edema
 - Neovascularization



FITTING GOALS TO MINIMIZE LONG TERM COMPLICATIONS

Most modern scleral lenses will lead to some level of hypoxia-induced corneal swelling.

To minimize hypoxia-induced corneal swelling:

- Highest dk available (>150) lens
- Maximal central lens thickness of 250um
- Clearance that does not exceed 200um

CL DISPENSING, TRAINING & FOLLOW UP

- Insertion and removal training
 - Scleral Lens Society video
- Start limited wearing schedule
- Follow-up
 - Ensure patient has worn lenses for a minimum of 4 hours prior to visit
 - Assess fit and measure clearance with slit lamp or AS-OCT



Scleral Lens Society Video

CL INSERTION & REMOVAL

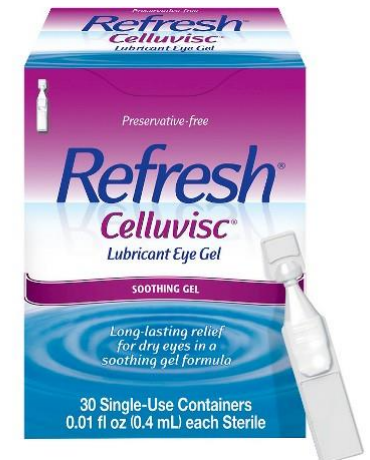
- Insertion
 - DMV Scleral Cup
 - SeeGreen lighted plunger
 - Stand
 - EZI Scleral Lens Applicator
 - Tripod method (fingers)
- Removal
 - DMV GP Lens Remover



Scleral Lens Society Video

SCLERAL LENS CARE

- Non-preserved saline for lens reservoir
 - **Lacripure**
 - FDA-approved for ocular use
 - **Addipak** (off-label)
 - Modudose nasal inhalation saline 0.9%
 - **PuriLens** (off-label)
 - Buffered saline, 4 oz bottle
- For OSD, consider adding 1 or more drops of non-preserved artificial tears to reservoir



SCLERAL CL CLEANING

- Disinfection and storage
 - ClearCare (may need larger case)
 - Multi-purpose GP solution
 - Boston Simplus (avoid Advance)
 - Lobob Optimum
 - Unique pH
 - MeniCare
- Extra-strength cleaners
 - Progent
 - Lobob Extra Strength
 - Lobob SofPro 2 (in-office only)



Dryeyeshop.com

TAKE HOME POINTS

- Consider scleral lenses for OSD patients whose symptoms are not controlled on conventional therapy.
- When fitting scleral lenses, first achieve adequate central vault, then address limbal clearance, then edge profile.
- Settling can turn a great fit into a tight fit - always assess lens after a minimum of 4 hours.
- Review proper disinfection, filling and handling at every visit.
- While complications are rare, monitor scleral lens patients closely.

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