Management of Anterior Segment Diseases and Disorders with Specialty Contact Lenses

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Financial Disclosures

- Valley Contax Inc.
  - Midwest Regional Education Consultant

Introduction

- BA in Biology, the University of Kansas, 2010
- Doctor of Optometry, The University of Houston College of Optometry, 2015
- Cornea and Contact Lens Residency, UMSL College of Optometry, 2015-2016
- Optometrist at Fairway Eye Center, Fairway, KS

Lecture Outline

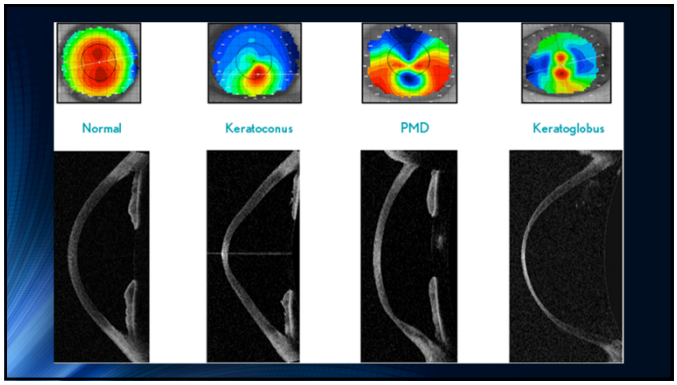
- Corneal Ectasias
  - Keratoconus
  - Pellucid Marginal Degeneration
  - Keratoglobus
  - Post Refractive Surgery
- Other Anterior Segment Irregularities
  - Scarring
  - Irregular Astigmatism
- Corneal Dystrophies
  - Epithelial Corneal Dystrophies
  - Stromal Corneal Dystrophies

Corneal Ectasias

- Keratoconus
- Pellucid Marginal Degeneration
- Keratoglobus
- Post Refractive Surgery Ectasia
  - LASIK/PRK
  - RK

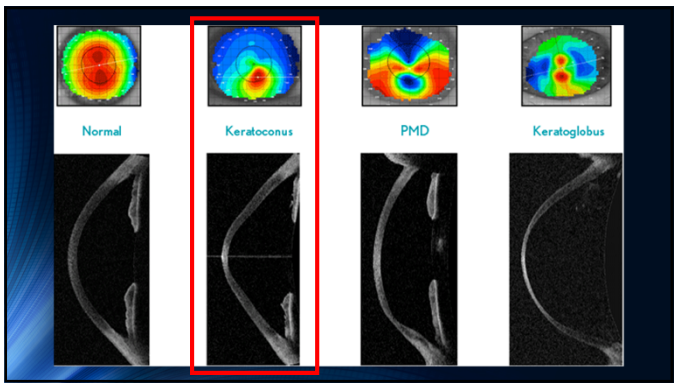
What is a Corneal Ectasia?

- **Ectasia** is defined as dilation or distention of a tubular structure or hollow organ, either normal or pathophysiologic but usually the latter.
- Corneal ectasia is the outward protrusion of the cornea caused by focal thinning and/or structural changes to the corneal tissue.
- This thinning causes the cornea to take on a non-uniform shape, which makes conventional optical correction extremely difficult.



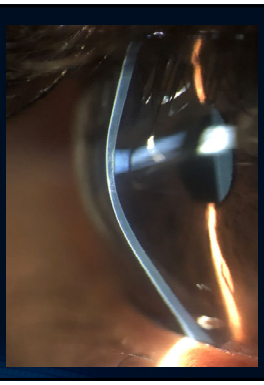
Keratoconus

- Non-inflammatory disorder of the cornea
- Results in progressive steepening, irregular astigmatism, corneal thinning, and scarring
- Exact cause unknown
- Prevalence is estimated 1 in 2000, but some studies suggest it is much more prevalent
  - Prevalence varies widely depending on geographic region
- Often bilateral and asymmetric
- Typical onset late teens to early twenties



Keratoconus

- Cornea usually thinner inferiorly but can happen anywhere on cornea
- Strong associations with atopic disease, connective tissue disorders, eye rubbing, and contact lens wear
- Tends to be progressive
- Confined to the cornea
- Can continue into middle age



Keratoconus

- Early detection and intervention is crucial for patient success
- Goal is to catch the patient early before significant irregularity and scarring is present
- Collagen cross linking should be implemented early to halt progression

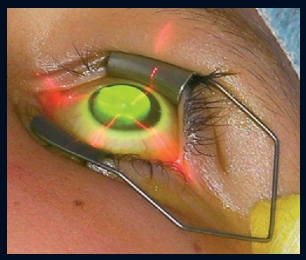


Image Source: https://www.semanticscholar.org/paper/Corneal-cross-linking--a-review.-Meek-Hayes/53370e3a65a53a6291d9508437fb09a6724f7c28

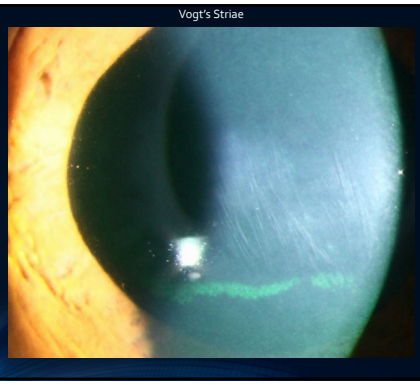
Keratoconus

- Clinical Signs:
  - Corneal steepening, especially inferior
  - Degradation and loss of Bowman's Layer
  - Scarring at level of Bowman's Layer
  - Folds in deep stroma and endothelium (Vogt's striae)
  - Iron deposits within corneal epithelium (Fleischer's ring)

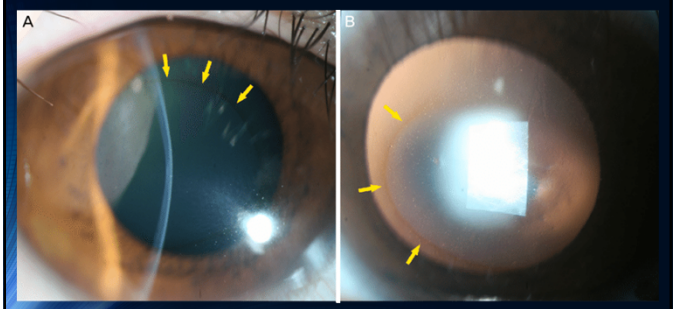
Keratoconus

- Clinical Signs:
  - Lower lid protrusion in downgaze (Munson's sign)
  - Oil droplet appearance of reflected light when shone through the patient's dilated pupil (Charleaux's sign)
  - Scissor reflex on retinoscopy
    - https://www.youtube.com/watch?v=dR8E-pOTxLU
  - Irregular mires during keratometry measurement
  - Irregular or pulsating mires during Goldmann applanation tonometry

Vogt's Striae

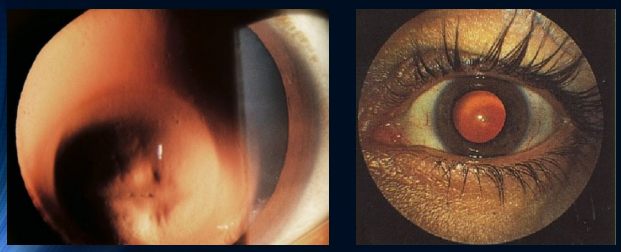


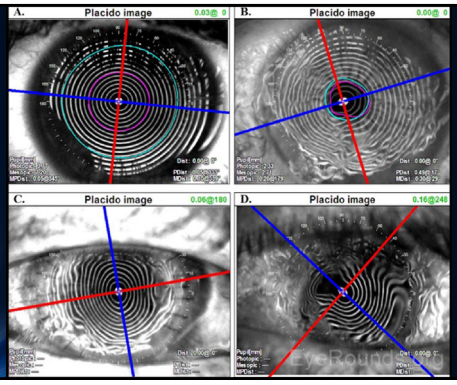
Fleischer's Ring



Munson's Sign

Charleaux's Sign





Keratoconus

- Refractive Management is Largely Case Dependent
- Spectacles
- Soft Contact Lenses
- Rigid Gas Permeable Lenses
  - Corneal Lenses
    - Spherical Lenses
      - Piggy back
    - Specialty Designs
  - Scleral Lenses

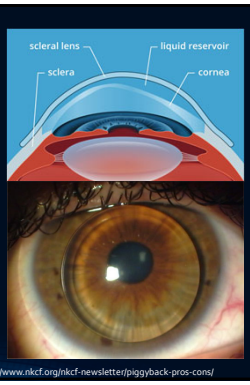


Image Sources: https://www.allaboutvision.com/contacts/scleral-lenses.htm, https://www.nkcf.org/nkcf-newsletter/piggyback-pros-cons/

Keratoconus

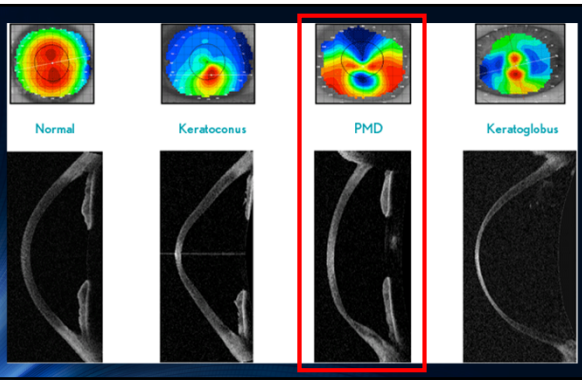
- Prevalence variable based on geographic location
  - A 1986 long term study in Minnesota showed prevalence of 54.5 cases per 100,000
    - 0.0545% prevalence
  - A 2007 study in Jerusalem showed higher prevalence of 2,340 cases per 100,000
    - 2.34% prevalence
  - A 2007 study in Denmark showed prevalence of 86 cases per 100,000
    - 0.086% prevalence
  - A 2009 study in rural India showed prevalence of approximately 2,300 cases per 100,000
    - ~2.3% prevalence
- Changing screening methods could affect number of cases detected annually for a given locale

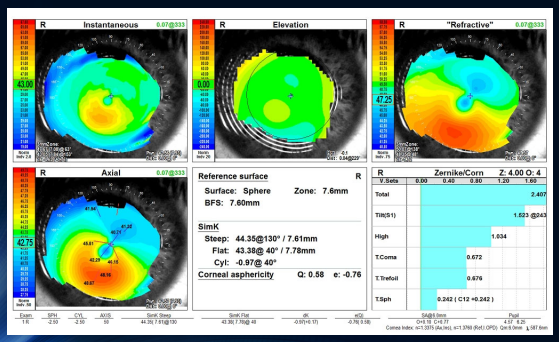
Pellucid Marginal Degeneration

- Non-inflammatory disorder of the cornea
- Similar to keratoconus, but localized to the inferior cornea
- Exact cause is unknown
- Pathophysiology also unknown, thought to be secondary to collagen abnormalities
- Corneal protrusion thought to be caused by intraocular pressure

Pellucid Marginal Degeneration

- Gets its name from meaning "transparent" or "clear"
- Ectatic portion of cornea tends to be clear despite structural change
- Diagnosis is made clinically, patients usually asymptomatic except for decline in acuity
- Area of greatest ectasia is superior to the area of greatest corneal thinning
  - "Kissing doves" or "Crab claws" topography pattern
- Similar pattern of onset and progression to keratoconus





DK. 35 yo CM.

Pellucid Marginal Degeneration

- Clinical Signs:
  - Inferior corneal thinning and steepening
  - Clear cornea at area of ectasia
  - Reduced best corrected visual acuity with spectacles and contact lenses
  - Irregular mires on keratometry
  - ***Kissing doves or crab claw topography pattern***

Pellucid Marginal Degeneration

- Refractive management similar to keratoconus
- Spectacle and conventional soft contact lens wear sometimes better tolerated in these patients
- Corneal and scleral RGP lenses are good options for these patients

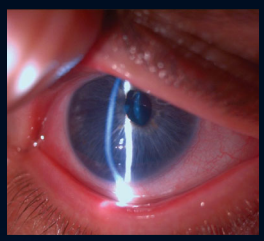


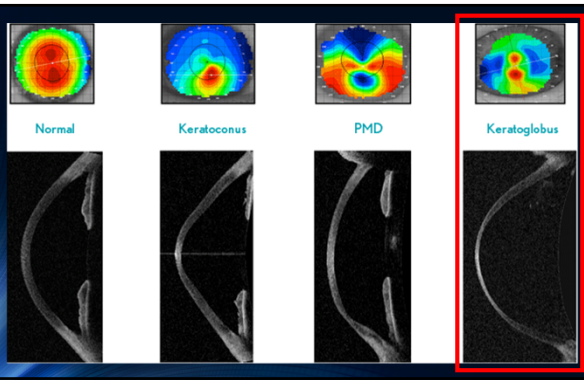
Image Source: http://www.ijo.in/article.asp?issn=0301-4738;year=2014;volume=62;issue=3;spage=367;epage=370;aulast=Hassan

Keratoglobus

- Very rare!
- Non-inflammatory disorder involving the entire cornea
- Diffuse limbus to limbus corneal thinning
- Globular corneal protrusion
- Possibly an end stage form of keratoconus
- Extreme anterior segment irregularity

Keratoglobus

- Strong association with atopic disease and eye rubbing
- Two forms of the disease exist
  - Congenital
  - Acquired
- Exact etiology unknown
  - Strong association with Ehlers-Danlos Type IV, Marfan Syndrome, Blue sclera
  - May result from defects in collagen synthesis

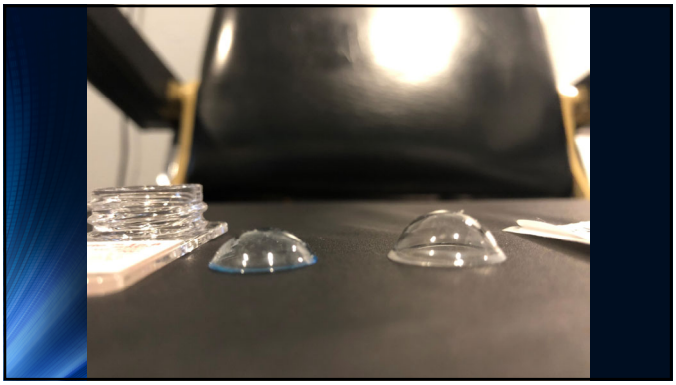


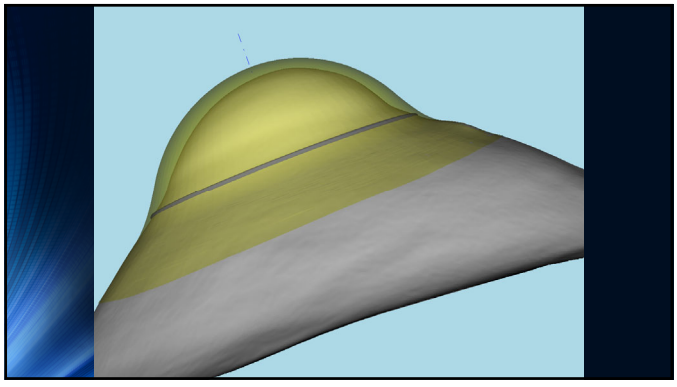
Keratoglobus

- Clinical Signs:
  - Globular corneal protrusion
  - High myopia common
  - Diffuse, limbus to limbus corneal thinning, most severe peripherally
  - Folds or breaks in Descemet's membrane
  - Diffuse steepening and irregular astigmatism on corneal topography

Keratoglobus

- Spectacles usually not an option
- Refractive correction often extremely difficult even with use of rigid gas permeable lenses
- Large diameter scleral lens with high sagittal depth is most favorable option
  - Final power determination can be extremely difficult



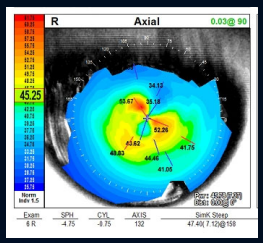


Post-Refractive Surgery Ectasia

- Structural weakening of cornea following corneal refractive surgery
- Exact cause unknown
- Can occur months to years after surgery
- Thorough preoperative screening is crucial to rule out subclinical corneal ectasia
  - Corneal pachymetry is essential
  - Scheimpflug imaging highly recommended
  - Posterior cornea is usually first to change if corneal ectasia is present
- Ultimately the surgeon is the gate keeper

Post LASIK and PRK Ectasia

- Gradual steepening of cornea
  - Can occur anywhere on cornea
- Increase in blurred uncorrected VA and irregular astigmatism
- Check topography on all refractive surgery patients
- Mid-periphery generally steeper than central cornea



JF. 36 yo WM.

Post LASIK and PRK Ectasia

- Exact incidence rate unknown but condition is relatively rare
  - Roughly 1 in 2500 with older screening technologies
  - Roughly 1 in 4,000-5,000 with newer screening techniques
- Risk Factors
  - Abnormal preoperative topography
  - Residual stromal bed thickness 250 to 300 um
  - Younger patient age
  - Asymmetry of refractive error
  - High myopia

Post Radial Keratotomy

- Steeper mid-periphery and flatter central cornea
- Corneal shape can change throughout the day
  - Diurnal IOP changes
- Hyperopic shift sometimes seen over time
- RGP lenses good option for these patients

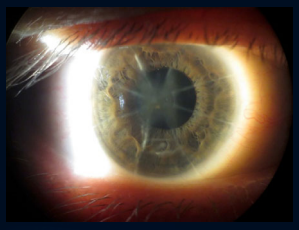


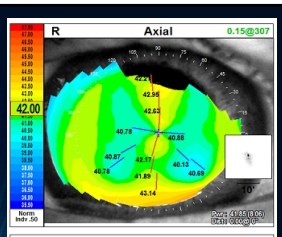
Image Source: http://rksurvivors.com/literature/small-optical-zone-rk.html

Post Radial Keratotomy

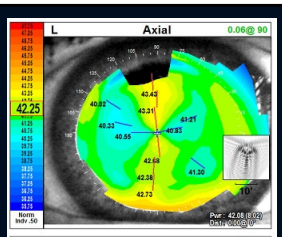
- Flat central cornea and relatively steep mid periphery makes small diameter lenses a challenge to fit and wear
- Large diameter corneal lenses are a good option
- Scleral lenses are also a great option
  - Vaulting the cornea eliminates corneal shape concerns
  - Tear lens can compensate for diurnal corneal shape changes
  - Lens handling and insertion can be challenging for older patients

Post Radial Keratotomy

- "RK is ophthalmology's thalidomide"
- "A blade with a fool at both ends"
- Patients who have undergone RK are becoming older and have other health concerns, which may make contact lens wear more difficult and clear vision more difficult to obtain
  - Arthritis, mobility concerns, cataracts, etc.



Cornea			R
	Steep	Flat	Astig
SimK	41.93@ 79° (8.05mm)	40.71@169° (8.29mm)	1.22
Corneal asphericity	Q: -0.09	e: 0.30	
Cornea SA	0.255µm @6.0mm		



Cornea			L
	Steep	Flat	Astig
SimK	42.72@ 90° (7.90mm)	40.71@180° (8.29mm)	2.01
Corneal asphericity	Q: 0.13	e: -0.37	
Cornea SA	0.854µm @6.0mm		

KW. 69 yo WF.

Fitting Considerations for Corneal Ectasias

- NO TWO CASES ARE THE SAME!!!
- Overall corneal shape must be considered
- These patients will likely have other anterior segment conditions that must be managed at the same time
  - "You can have as many diseases as you pleases"
- Often require more chair time, schedule accordingly!
- Stressful, life altering diagnosis for the patient
  - These patients, especially those are being initially diagnosed, will require thorough explanation and more hand holding

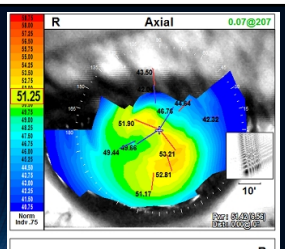
Corneal Ectasia Case Examples

Keratoconus – CS, 45 yo WF

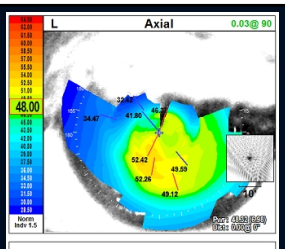
- Long standing Hx of keratoconus OU
- Reports minimal success with SCLs and corneal RGP lenses
- Reports most recent lenses fog up "almost immediately"
- Referring OD tried multiple materials with no success
- Recent Hx of MVA with associated vertigo and diplopia due to head trauma
- Hx of multiple strabismus surgeries to correct childhood ET
- Also wears prism glasses to manage diplopia

Keratoconus – CS, 45 yo WF

- Biomicroscopy
  - L/L: WNL
  - K: Inferior nasal steepening OU. Unstable tear film, reduced TBUT
  - Conj: WNL
  - Sclera: Normal
  - Iris: Normal
  - Lens: Normal
- Fundus
  - Unremarkable
- No known family history of corneal ectasia



Cornea			R
	Steep	Flat	Astig
SimK	50.75@160° (6.65mm)	46.36@ 70° (7.28mm)	4.39
Corneal asphericity		Q: -1.78	e: 1.33
Cornea SA		-0.582µm @6.0mm	



Cornea			L
	Steep	Flat	Astig
SimK	42.19@ 22° (8.00mm)	37.67@112° (8.96mm)	4.52
Corneal asphericity		Q: -0.20	e: 0.45
Cornea SA		-1.968µm @6.0mm	

Keratoconus – CS, 45 yo WF

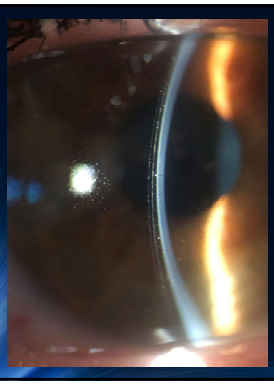
- MRx
  - OD: -6.75 -5.50 x 050 (20/25)
  - OS: -4.50 -4.75 x 155 (20/25)
  - Reports asthenopia and diplopia when spectacles are worn
- Presenting CL Rx
  - OD: Dyna Intralimbal
    - 6.96 mm/9.0 mm/-7.50 DS/Paragon HDS 100 (20/20^{-1})
  - OS: Dyna Intralimbal
    - 7.18 mm/9.0 mm/-5.50 DS/Paragon HDS 100 (20/20^{-1})
  - Reports poor comfort and lenses fog up almost immediately when worn

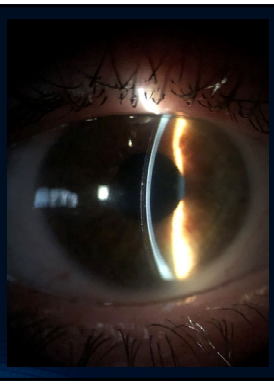
Keratoconus – CS, 45 yo WF

- Trial CL Rx #1:
  - OD: Custom Stable Elite
    - 8.23 mm/4300 um sag/15.8 mm/+0.75 DS/Optimum Extra/Hydra PEG (20/20)
  - OS: Custom Stable Elite
    - 8.65 mm/4090 um sag/15.8 mm/+2.50 DS/Optimum Extra/Hydra PEG (20/20)
  - Approximately 300 um central clearance OU
  - Slight vertical movement upon blink with moderate edge lift OS
  - Greatly improved comfort compared to presenting lenses

Keratoconus – CS, 45 yo WF

- Follow Up #1:
  - Patient reports improved vision when lenses are worn
  - Lenses still have slight vertical movement upon blink
  - Instructed on lens I&R and lens care
  - Instructed to begin daily lens wear and RTC 1-2 weeks for follow up





Keratoconus – CS, 45 yo WF

- Follow Up #2:
  - Vertical movement still present on blink
  - Reports improved comfort and vision compared to corneal RGPs
  - Has to take out lenses and refill them mid day
  - Landing zone of both lenses needed to be steepened to improve peripheral alignment
  - New lenses ordered, instructed to continue daily lens wear until remakes arrive

Keratoconus – CS, 45 yo WF

- Follow Up #3:
  - Still had vertical lens movement upon blink and tear lens debris present after a few hours of wear
  - Steepened landing zone of both lenses to improve peripheral alignment
- Follow Up #4:
  - Patient reports these lenses no longer fog up during the day
  - Lenses no longer move vertically on blink
  - Dispensed final lenses to patient

Keratoconus – CS, 45 yo WF

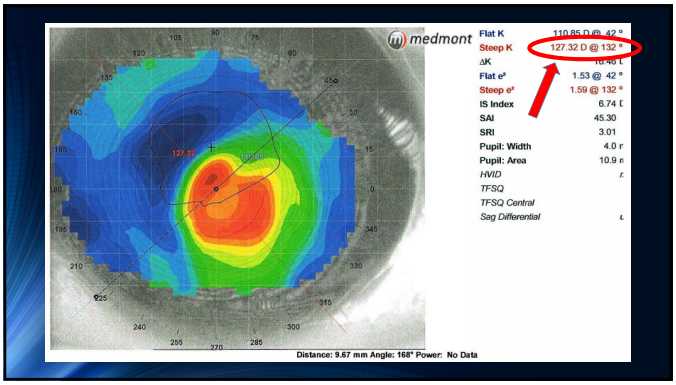
- Reported improved comfort with Hydra PEG and lenses fogged up much less frequently
- Still wears prism glasses over lenses to manage diplopia
- Sent back to referring OD for prism glasses prescribing and VT specific to her head injury.

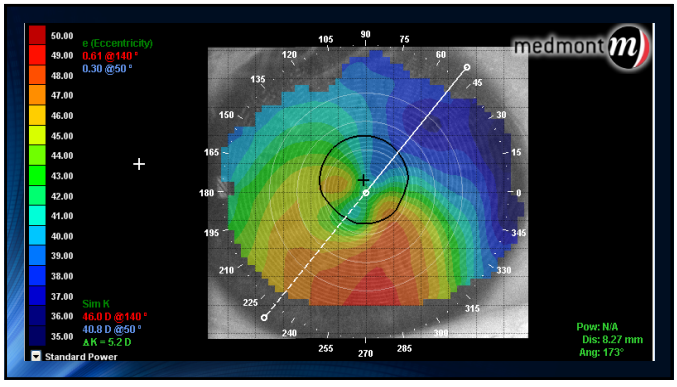
Keratoconus – JS 51 yo WM

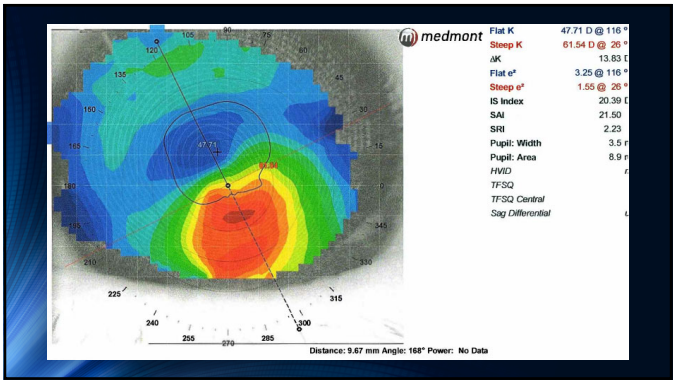
- Long term scleral lens patient at UMSL Eye Center
- Long standing diagnosis of keratoconus (OS>OD)
- No longer able to wear OS scleral lens all day due to comfort issues
- Reports good vision with current scleral lenses, but his job requires 16-18 hours of lens wear
- Has had ***LOTS*** of remakes!
- Recommended EyePrint Pro custom molded scleral lens

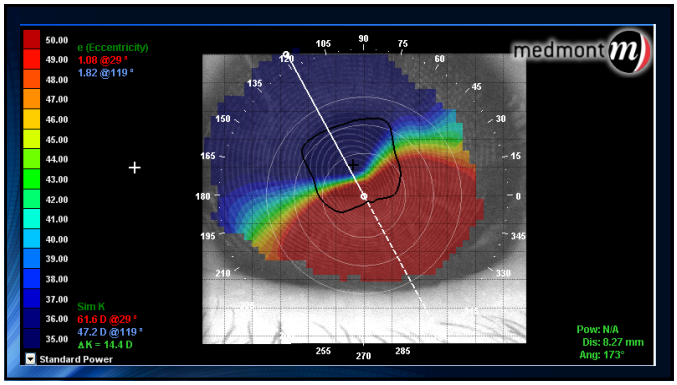
Keratoconus – JS 51 yo WM

- MRx:
  - OD: -0.50 -1.25 x 060 (20/200)
  - OS: -3.00 -3.00 x 090 (20/200)
  - Unable to wear spectacles
- Presenting CL Rx:
  - OD: Unknown Corneal RGP
    - 7.50 mm/9.5 mm/-3.25 DS/Paragon HDS (20/25)
  - OS: Essilor Jupiter (#20)
    - 7.85 mm/18.2 mm/-3.50 DS/Boston XO (20/40)
    - Only able to wear OS lens for about 6 hours before having to remove lens









Keratoconus – JS 51 yo WM

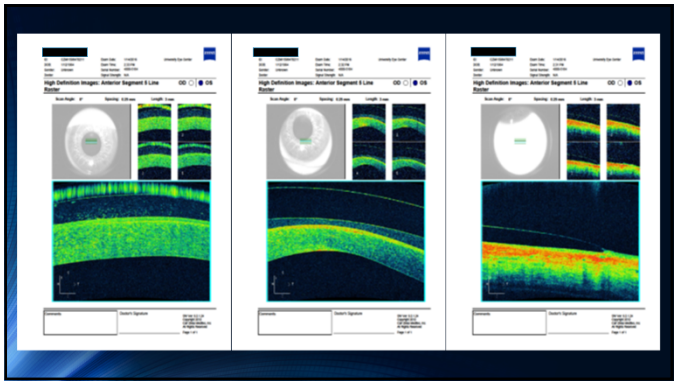
- Trial Lens #1
  - OS: Eyeprint Pro
    - 7.401 mm/18.8 mm/-6.87 DS (20/100)
    - OR: +2.50 DS (20/20⁻²)
    - Good fit with new lens and patient reported increased comfort
    - Instructed to begin daily lens wear and RTC in 3 days to check VA

Keratoconus – JS 51 yo WM

- Follow Up #1:
  - Still reports blurry DVA with current lens
  - Found +2.50 DS over refraction again and ordered new lens for him with power change
- Trial Lens #2
  - OS: Eyeprint Pro
    - 7.401 mm/18.8 mm/-4.37 DS (20/20⁻²)
    - OR: +0.25 DS (20/20⁻²)
    - Good fit with new lens
    - Reports constant monocular diplopia with new lens
    - Instructed to wear resume daily lens wear and RTC 3-4 weeks

Keratoconus – JS 51 yo WM

- Follow Up #2:
  - At next follow up patient reported diplopia no longer present
  - Comfort of new lens greatly improved compared to most recent Jupiter lens
  - Able to wear new lens 16-18 hours daily without issue
  - Lens showed ~300 um central clearance and ~100 um clearance over apex of ectasia
  - Was considering getting Eyeprint lens for OD

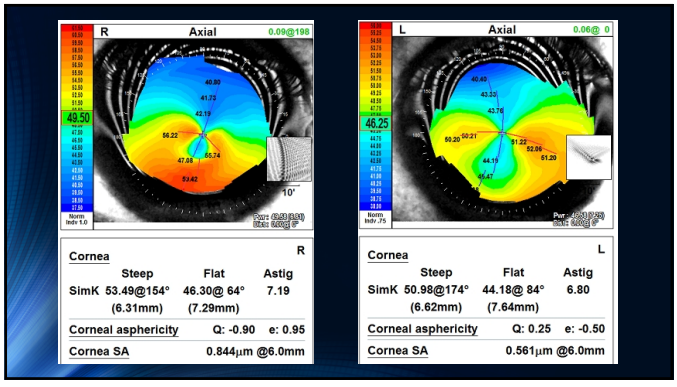


PMD – AB, 50 yo BM

- Referred from doctor in the practice for scleral lens fitting
- Long standing history of PMD (OD>OS)
- Tried corneal RGP lenses with another provider in the past but unable to tolerate them
- Currently wears spectacles but has minimal improvement in VA when worn

PMD – AB, 50 yo BM

- Presenting Rx:
  - OD: -3.00 -4.50 x 096 (20/70)
  - OS: -2.50 -4.50 x 103 (20/50)
  - Reports asthenopia and diplopia when lenses are worn
- MRx:
  - OD: -2.50 -5.75 x 060 (20/60)
  - OS: -2.50 -6.00 x 093 (20/40+1)
- Reports minimal subjective visual improvement with spectacle change



PMD – AB, 50 yo BM

- Trial CL Rx #1:
  - OD: Custom Stable Elite
    - 7.50 mm/4870 um sag/15.8 mm/-4.00 DS/Optimum Extra (20/20)
  - OS: Custom Stable Elite
    - 7.50 mm/4870 um sag/15.8 mm/-4.25 DS/Optimum Extra (20/20)
- Will use OTC readers for near work

PMD – AB, 50 yo BM

- Follow Up #1:
  - Reports improved distance vision with lenses
  - Says he can wear them all day without issue
  - Does not like to not use readers
  - Patient is an engineer and basketball coach and finds readers cumbersome
  - Discussed monovision and multifocal options and decided to try monovision

PMD – AB, 50 yo BM

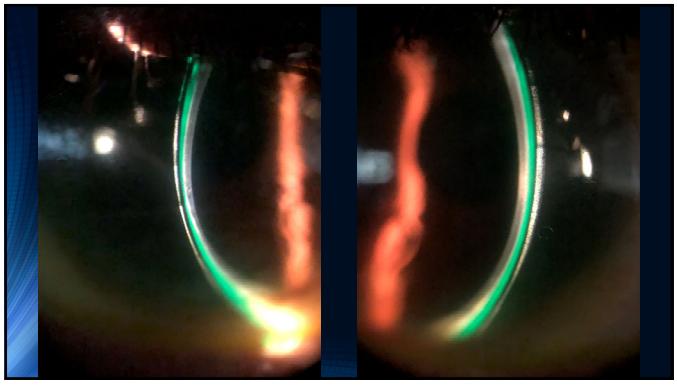
- Trial CL Rx #2:
  - OD: Custom Stable Elite
    - 7.50 mm/4870 um sag/15.8 mm/-4.00 DS/Optimum Extra (20/20)
  - OS: Custom Stable Elite
    - 7.50 mm/4870 um sag/15.8 mm/-2.75 DS/Optimum Extra (20/100)
    - NVA 20/20 OU
- Initially fit for distance OU but decided he did not want to use readers
- OD distance monovision
- Reports good all day comfort and improved VA compared to previous lenses

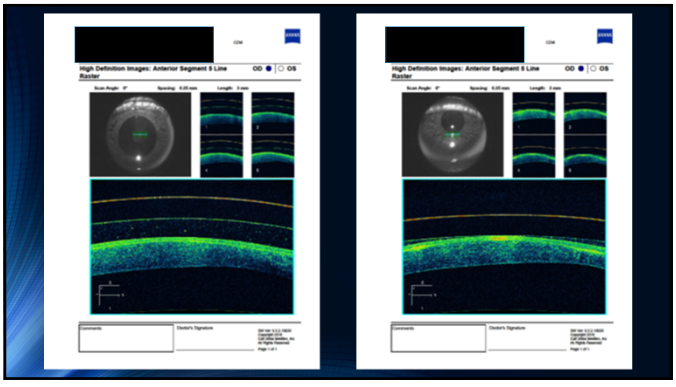
PMD – AB, 50 yo BM

- 1 Year Follow Up (8/14/19):
  - Reports he has not worn his lenses in 3-4 months due to OD discomfort
  - Reports pain, discomfort and "foggy vision" after a few hours of wear
  - Says vision is good overall with his lenses, but says his distance vision could be better
  - Recently diagnosed with cataracts, surgeon wants to have him refit before pursuing surgery

PMD – AB, 50 yo BM

- 1 Year Follow Up (8/14/19):
  - OD lens shows bearing between lens and inferior nasal cornea after insertion
  - OS lens fit consistent compared to last encounter
  - Both lenses have slight vertical movement on blink
  - Both lenses sit inferiorly on eye





PMD – AB, 50 yo BM

- SCOR Over Current OD Lens:
  - +0.50 -1.00 x 035 (20/20)
  - Lens shows 5 L rotation on eye
- New CL Rx:
  - OD: Custom Stable Elite
    - 7.50/15.8/-3.50 -1.00 x 040/Optimum Extra
    - Steepened secondary curve to get lens off inferior cornea
    - Steepened peripheral curves to improve centration and limit vertical movement
  - OS: Custom Stable Elite
    - No power changes needed
    - Steepened peripheral curves to improve centration and reduce movement

PMD – DK, 32 yo WM

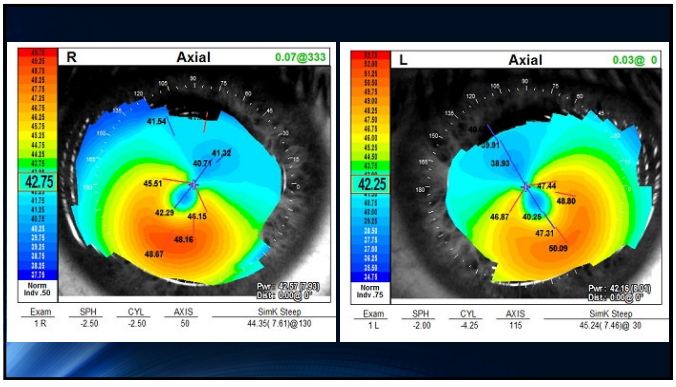
- Presented as a new patient for comprehensive exam
- Long history of spectacle and contact lens wear with minimal issues
- All other medical and ocular history unremarkable
- "I just want to get new glasses and contacts"

PMD – DK, 32 yo WM

- Presenting Spectacles
  - OD: -3.00 -0.75 x 082 (20/20)
  - OS: -2.50 -2.00 x 115 (20/40)
- Keratometry:
  - OD: 43.50/44.25 @ 130
  - OS: 42.25/45.25 @ 030
- MRx:
  - OD: -3.25 -0.75 x 082 (20/20)
  - OS: -2.00 -2.00 x 122 (20/20)

PMD – DK, 32 yo WM

- Biomicroscopy
  - L/L: WNL
  - K: Slight inferior steepening OU
    - Very subtle
  - Conj: WNL
  - Sclera: Normal
  - Iris: Normal
  - Lens: Normal
- Fundus
  - Unremarkable
- No known family history of corneal ectasia



PMD – DK, 32 yo WM

- Contact Lens Trial:
  - OD: Air Optix for Astigmatism
    - 8.6/14.2/-3.50 -0.75 x 080 (20/20)
  - OS: Air Optix for Astigmatism
    - 8.6/14.2/-2.00 -1.75 x 140 (20/20)
  - Lenses showed good centration, movement and stable rotation
- Patient elects to split time between contact lenses and spectacles

PMD – DK, 32 yo WM

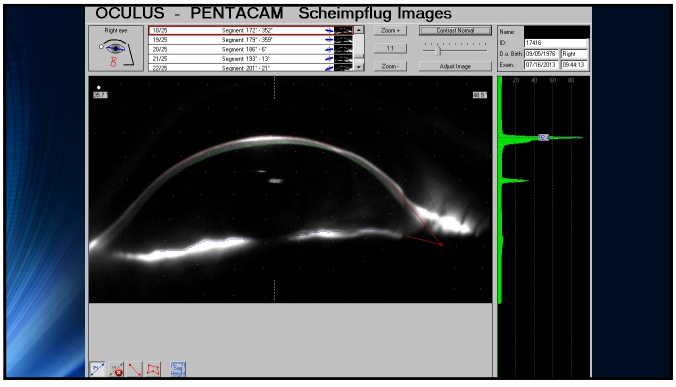
- Discussed initial diagnosis and specialty lens options with patient
- Currently not interested in rigid lens despite the chance of better vision
- Not all cases of corneal ectasia require use of specialty hard lenses!!!
- Discussed importance of close monitoring to track progression

Keratoglobus – RS, 37 yo WM

- Presented for annual exam with complaints of comfort issues with his current scleral lenses
- Reports OD lens no longer comfortable
- Unable to wear OD lens for entire day
- Symptoms began two weeks prior and have not improved
- Long history of keratoconus, diagnosed with keratoglobus in 2012
- Hydrops OS in 2009

Keratoglobus – RS, 37 yo WM

- Biomicroscopy
  - L/L: WNL
  - K: Diffuse stromal thinning with globular corneal protrusion OU. Mid-peripheral stromal scarring from resolved hydrops OS.
  - Conj: WNL
  - Sclera: Normal
  - Iris: Normal
  - Lens: Normal
- Fundus
  - Unremarkable
- Distant family history of keratoconus
- Reported extensive eye rubbing throughout childhood

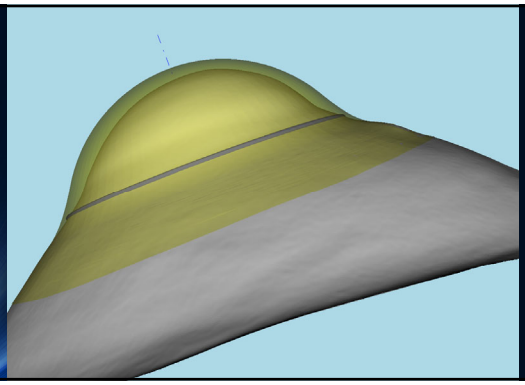


Keratoglobus – RS, 37 yo WM

- Presenting CL Rx:
  - OD: TruForm Digiform Front Toric Scleral (20/25)
  - OS: TruForm Digiform Front Toric Scleral (20/25)
- Both lenses showed adequate centration and central clearance
- OD had area of bearing between lens and inferior nasal cornea
- OD lens rotated 90 degrees CCW from desired position
  - Rotation unstable when oriented in proper position
- Discussed options and opted to go with Eyeprint Pro custom molded scleral lens

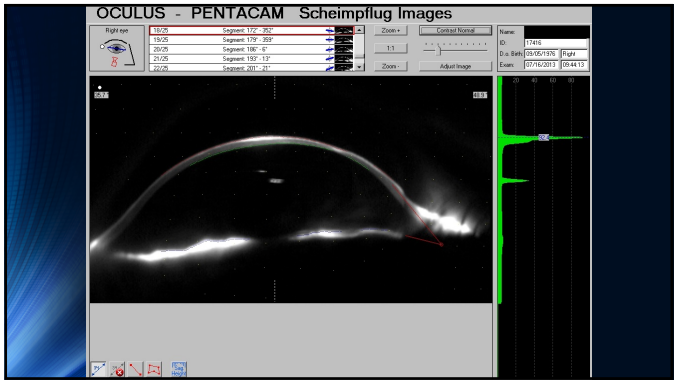
Keratoglobus – RS, 37 yo WM

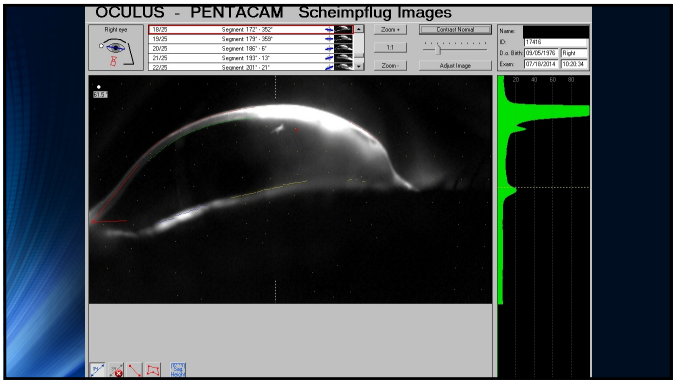
- Trial Lens Rx #1:
  - OD: Eyeprint Pro
    - 18.2 mm/6.366 mm/-15.12 -1.75 x 081 (20/25)
  - Adequate centration and central clearance, no longer had bearing on cornea
  - Patient reported good comfort and was able to wear lens for entire day
  - Still wearing TruForm Digiform lens in OS

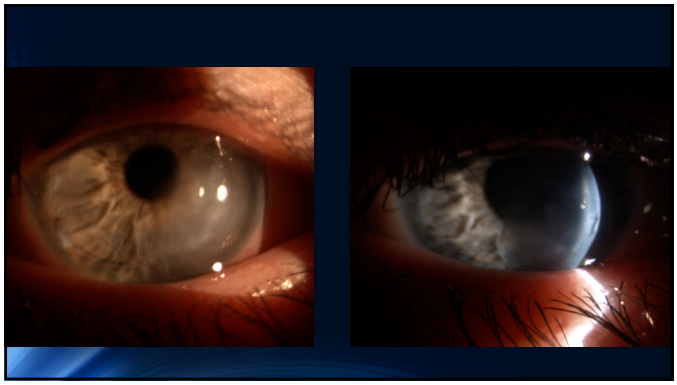


Keratoglobus – RS, 37 yo WM

- Presented to clinic a month later with complaints of extreme pain, photophobia and contact lens intolerance in OD
- OD lens showed large area of bearing between lens and inferior nasal cornea
- 3+ injection and 4+ ground glass edema OD
- Patient had developed a hydrops OD
- Did not appear to be due to lens wear
- Unable to control inflammation with topical hyperosmotics and aqueous suppressants
- Ended up needing a corneal transplant





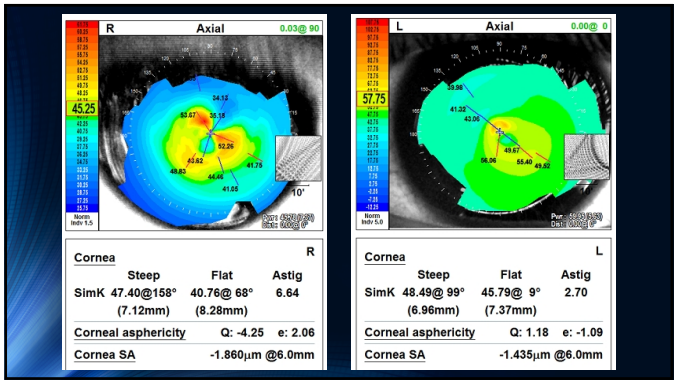


Post LASIK Ectasia – JF, 36 yo CM

- Referred from another doctor in the practice for scleral lens fitting
- Diagnosed with post LASIK ectasia OU in 2017 (OD>OS)
- Struggled with intralimbal lenses, never able to achieve comfortable all day wear
- His job requires long periods of lens wear and in search of another option than intralimbal lenses

Post LASIK Ectasia – JF, 36 yo CM

- Biomicroscopy
  - L/L: WNL
  - K: LASIK scars OU. Irregular astigmatism on topography (OD>OS)
  - Conj: WNL
  - Sclera: Normal
  - Iris: Normal
  - Lens: Normal
- Fundus
  - Unremarkable



Post LASIK Ectasia – JF, 36 yo CM

- Presenting Spectacles:
  - OD: -1.25 -1.25 x 100 (20/30)
  - OS: -1.00 -0.50 x 145 (20/60)
- Presenting CL Rx:
  - OD: Dyna Intralimbal
    - 6.62 mm/10.4 mm/-8.75 DS/Optimum Extra (20/40)
  - OS: Dyna Intralimbal
    - 7.58 mm/10.8 mm/plano DS/Optimum Extra (20/25)
- Patient unable to wear lenses for more than a few hours at a time due to poor comfort

Post LASIK Ectasia – JF, 36 yo CM

- Presenting CL Rx:
  - OD: Dyna Intralimbal
    - 6.62 mm/10.4 mm/-8.75 DS/Optimum Extra (20/40)
  - OS: Dyna Intralimbal
    - 7.58 mm/10.8 mm/plano/Optimum Extra (20/25)
- Patient unable to wear lenses for more than a few hours at a time due to poor comfort

Post LASIK Ectasia – JF, 36 yo CM

- Trial Rx #1:
  - OD: Custom Stable Elite
    - 8.23 mm/15.8 mm/+2.50 -1.25 x 130/Optimum Extra (20/30)
    - 40 degrees left rotation
  - OS: Custom Stable Elite
    - 8.23 mm/15.8 mm/+3.00 -1.75 x 050/Optimum Extra (20/30)
    - 25 degrees right rotation
- Extremely vague responses during subjective testing

Post LASIK Ectasia – JF, 36 yo CM

- Follow Up #1:
  - OD: Custom Stable Elite
    - 8.23 mm/15.8 mm/+2.50 -1.25 x 130/Optimum Extra (20/40)
    - 5 degrees left rotation instead of 40 degrees left
  - OS: Custom Stable Elite
    - 8.23 mm/15.8 mm/+3.00 -1.75 x 050/Optimum Extra (20/20-2)
    - 25 degrees right rotation as was seen at diagnostic fitting
    - VA improved slightly with +0.50 DS over OS

Post LASIK Ectasia – JF, 36 yo CM

- Trial Rx #2:
  - OD: Custom Stable Elite
    - 8.23 mm/15.8 mm/+2.50 -1.25 x 095/Optimum Extra
    - 5 degrees left rotation
  - OS: Custom Stable Elite
    - 8.23 mm/15.8 mm/+3.50 -1.75 x 050/Optimum Extra
    - 25 degrees right rotation

Post LASIK Ectasia – JF, 36 yo CM

- Follow Up #2:
  - OD: Custom Stable Elite
    - 8.23 mm/15.8 mm/+2.50 -1.25 x 095/Optimum Extra (20/20^{-1})
    - 5 degrees left rotation, stable
  - OS: Custom Stable Elite
    - 8.23 mm/15.8 mm/+3.50 -1.75 x 050/Optimum Extra (20/20^{-1})
    - 25 degrees right rotation, stable
- Instructed to continue daily lens wear and RTC in 2 weeks

Post LASIK Ectasia – JF, 36 yo CM

- Follow Up #3:
  - OD: Custom Stable Elite
    - 8.23 mm/15.8 mm/+2.50 -1.25 x 095/Optimum Extra (20/20^{-1})
    - OD lens now rotated 40 degrees right instead of 5 degrees right that was seen before
    - Tried OD Trial #1 again and no improvement in vision was seen even with proper rotation
  - No OS changes needed

Post LASIK Ectasia – JF, 36 yo CM

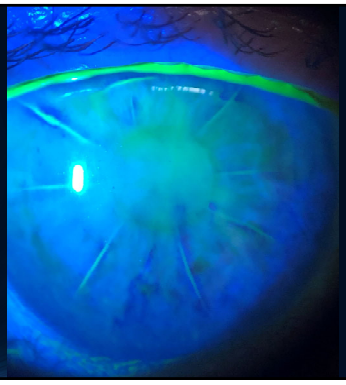
- OD Trial #3
  - OD: Custom Stable Elite
    - 8.23 mm/15.8 mm/+2.50 -1.25 x 095/Optimum Extra
- OD Refitting
  - OD: Custom Stable Elite
    - 8.23 mm/15.8 mm/+0.25/Optimum Extra (20/25)

Post LASIK Ectasia – JF, 36 yo CM

- Final CL Rx:
  - OD: Custom Stable Elite
    - 8.23 mm/15.8 mm/+0.25/Optimum Extra (20/25)
  - OS: Custom Stable Elite
    - 8.23 mm/15.8 mm/+3.50 -1.75 x 050/Optimum Extra ($20/20^{-1}$)
- Able to wear lenses all day with minimal issues.
- Still complains of symptoms of HOAs, especially in dimly lit environments

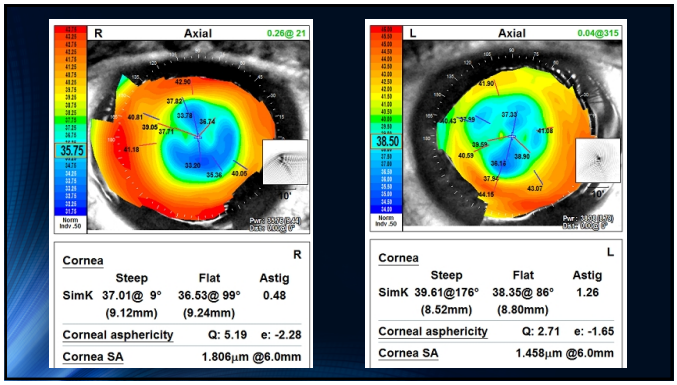
Post RK – DD, 71 yo CM

- Presented for comprehensive exam and contact lens fitting
- Had RK in 1987 and now experiences asthenopia and visual fluctuations throughout the day
- Has multiple pairs of spectacles for different times of the day
- Unable to tolerate spectacles for long periods due to diplopia and eye strain
- Has tried corneal RGP and soft lenses with minimal success



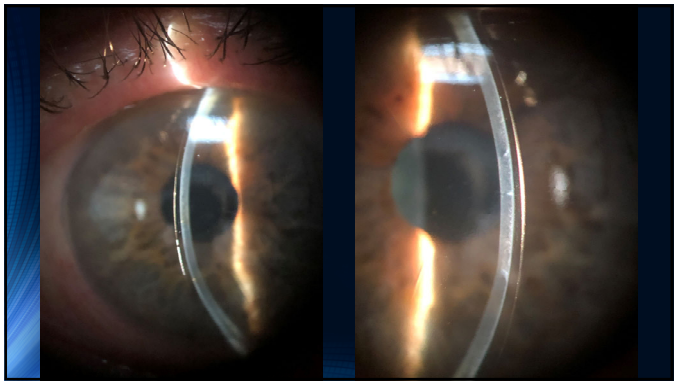
Post RK – DD, 71 yo CM

- Presenting Spectacle Rx:
  - OD: +3.00 -1.25 x 105 (20/30)
  - OS: -0.75 DS (20/25)
- MRx:
  - OD: +4.25 -0.50 x 095 (20/25)
  - OS: -0.75 DS (20/25)
- Keratometry:
  - OD: 36.50/37.25 @ 006
  - OS: 38.75/39.50 @ 176
- Biomicroscopy
  - 8 RK incisions OU
  - 1-2+ NS OU
  - All other structures unremarkable



Post RK – DD, 71 yo CM

- Trial CL Rx #1:
  - OD: Custom Stable Elite
    - 8.23 mm/4330 um sag/15.8 mm/-1.75 -1.25 x 045/Optimum Extra (20/25)
    - 20 degrees left rotation
  - OS: Custom Stable Elite
    - 8.23 mm/4330 um sag/15.8 mm/-1.25 DS/Optimum Extra (20/20)
    - 20 degrees right rotation



Post RK – DD, 71 yo CM

- Adequate central clearance and centration OU
  - 150-200 um central clearance
  - Adequate mid-peripheral clearance where cornea is steepest
- Reports good all day comfort and vision with current lenses
- Currently uses OTC readers for near

Other Anterior Segment Irregularities

- Scarring
- Irregular Astigmatism

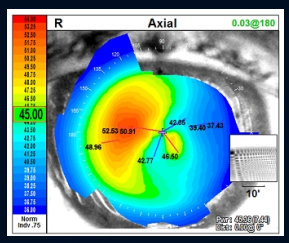
Corneal Scarring

- Widely variable depending on the nature and severity of the injury
- Caused by either corneal injury or disease
- May cause permanent reduction in best corrected visual acuity
- RGP lenses are great options for these patients

Image Source: https://webeye.ophth.uiowa.edu/eyeforum/atlas/pages/scar-of-healed-corneal-ulcer-with-calcification.html

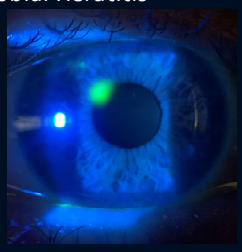
Corneal Scarring – Microbial Keratitis

- Usually focal area of irregularity
- Generally there will be irregularity associated with scarring
  - This can limit visual potential even with the use of RGP lenses
- Scars can also make achieving a stable lens fit more difficult



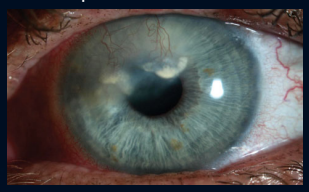
Corneal Scarring – Microbial Keratitis

- Scarring at or near the visual axis may make achieving 20/20 vision impossible
  - Under promise and over deliver
- Deeper scars will be more likely to scar and be more dense



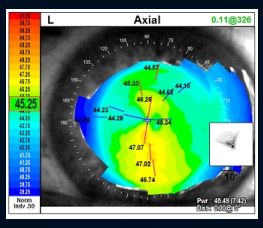
Corneal Scarring – Herpes Simplex

- Scarring will usually be irregular and correspond to area affected by dendritic lesions
- Wide variability in appearance of scarring
  - Stromal scarring and vascularization is common
- If vascularization present a high dK lens is needed



Corneal Scarring – Herpes Simplex

- Topography pattern highly irregular
- No characteristic topography pattern like other diseases
- RGP lenses often needed to manage irregularity caused by scarring



Corneal Scarring - Trauma

- Variable depending on severity and mechanism of trauma
- May not just involve cornea
  - Peripheral structures must be considered
- Extremely important to consider shape of entire anterior segment
- Custom molded scleral lens may be necessary for irregularity peripheral to cornea

Image Source: https://www.atlasophthalmology.net/photo.jsf;jsessionid=E9F39CA69F7CCF4E969A93446ECB0F7A?node=3001&locale=en

Corneal Scarring – Other

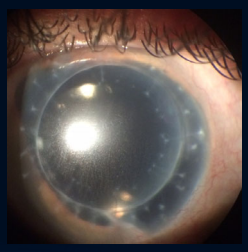
- Corneal Hydrops
  - Spontaneous rupture in Descemet's membrane
  - Disrupts corneal deturgescence
  - Pain, photophobia, stromal and epithelial edema, contact lens intolerance
  - Self-limiting and will eventually resolve on its own
  - Area of flattening will usually be present at area of swelling
  - Scarring common following resolution

Other Anterior Segment Irregularities

- Glaucoma Filtering Surgery
  - Focal raised area immediately peripheral to limbus
  - Must take care to not compress bleb
  - Custom molded scleral lens or corneal RGP lens are best options if the patient requires a rigid lens

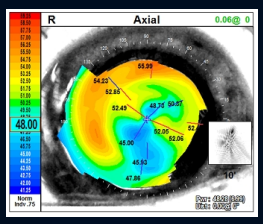
Corneal Transplants

- Irregular astigmatism widely variable in these patients
- Scleral and corneal RGP lenses good options
- Some patients do well with spectacles or soft contact lenses
- Need a high dK lens material
- Avoid graft-host junction



Corneal Transplants

- These patients require more frequent care to monitor graft integrity
- Endothelial cell count and confocal microscopy important for monitoring graft health



Other Anterior Segment Irregularities Case Examples

Corneal Scarring – PR, 61 yo WF

- Referred from another doctor in the practice for scleral lens fitting following severe central corneal ulcer OD
- In late November 2017 she presented to our clinic for evaluation of OD with complaints of pain and photophobia
- Diagnosed with central corneal ulcer OD and referred to corneal specialist for management
- Corneal specialist placed amniotic membrane on OD to aid healing
- Patient had allergic reaction to amniotic membrane making ulcer worse

Corneal Scarring – PR, 61 yo WF

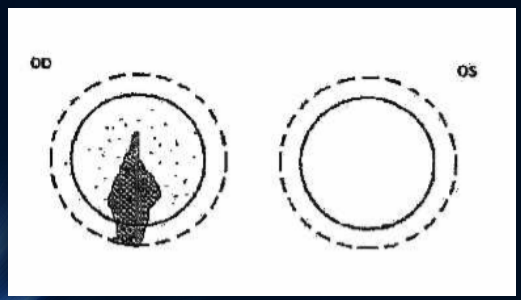
- Six days after having allergic reaction to amniotic membrane placed she had OD LASIK flap amputated
- Corneal specialist Rx'd Moxifloxacin Q2hrs, Polytrim Q2hrs, and Prolensa BID
- After resolution patient had significant central and mid-peripheral scarring OD and reported large diurnal visual fluctuations
- Discussed RGP options and decided to try scleral lenses

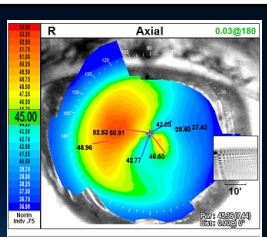
Corneal Scarring – PR, 61 yo WF

- Medical Hx:
  - Lupus, diagnosed 30 years ago
  - Anxiety Disorder
  - Sleep Disorder
- Ocular Hx:
  - Corneal scar s/t ulcer and LASIK flap amputation OD, 2017
  - LASIK OU, mid 2000's
  - Cataract Surgery OU, 2014
  - Long standing dry eye s/t Lupus
- Medications:
  - Topamax
  - Ambien
  - Clonazepam
  - Trazodone
  - Buspirone
  - Sertraline
  - Restasis
  - Lotemax

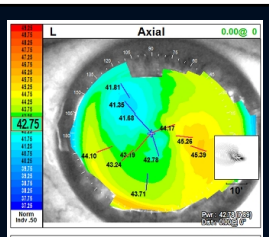
Corneal Scarring – PR, 61 yo WF

- Biomicroscopy
  - L/L: WNL
  - K: Dense central and paracentral scarring OD. LASIK scar OS.
  - Conj: WNL
  - Sclera: Normal
  - Iris: Normal
  - Lens: PCIOL OU, well centered in capsular bag





Cornea			R
	Steep	Flat	Astig
SimK	46.75@136° (7.22mm)	43.72@ 46° (7.72mm)	3.03
Corneal asphericity	Q: 1.22	e: -1.10	
Cornea SA	0.070µm @6.0mm		



Cornea			L
	Steep	Flat	Astig
SimK	43.77@ 24° (7.71mm)	42.40@114° (7.96mm)	1.37
Corneal asphericity	Q: 0.14	e: -0.38	
Cornea SA	0.580µm @6.0mm		

Corneal Scarring – PR, 61 yo WF

- MRx before ulcer:
  - OD: +0.75 -2.75 x 050 (20/30)
  - OS: -1.25 -1.25 x 110 (20/30)
- MRx after ulcer healed (Dec 2017):
  - OD: +0.75 -4.50 x 030 (20/100)
  - OS: -0.25 -1.00 x 090 (20/25)
- MRx 9 months after ulcer (July 2019):
  - OD: +1.50 -2.00 x 020 (20/40)
  - OS: -0.75 -1.75 x 120 (20/40)

Corneal Scarring – PR, 61 yo WF

- Trial CL #1:
  - OD: Custom Stable Elite
    - 8.23 mm/15.8 mm/+0.75 -1.00 x 155/Optimum Extra (20/25)
  - OS: Custom Stable Elite
    - 8.23 mm/15.8 mm/+0.50 -0.75 x 060/Optimum Extra (20/25)
  - Adequate central clearance and edge alignment
  - Patient trialed monovision in office and did not like it.

Corneal Scarring – PR, 61 yo WF

- Follow Up #1:
  - Reported successful lens wear, but OS was not comfortable after a few hours
  - Stated she was only able to wear her lenses about 6 hours at a time due to dryness
  - OS lens showed slight vertical movement upon blink and VA improved with +0.25 DS over that eye
  - Discussed autologous serum options for management of dry eye
  - Rx 20% autologous serum gtts to be used QID OU
  - New OS lens was ordered to address vertical movement and with power change

Corneal Scarring – PR, 61 yo WF

- Follow Up #2:
  - Stated eyes felt much better since adding autologous serum to her dry eye regimen
  - Unable to wear lenses for more than a few hours at a time
  - Lenses now showed significant edge lift that was not there before
  - Decided to wait on scleral lenses until she felt like her eyes had time to adjust to autologous serum therapy

Corneal Scarring – PR, 61 yo WF

- Returned 2 months later for scleral lens refitting
- Both initial lenses showed significant edge lift and vertical movement
- Anterior segment greatly improved with autologous serum therapy
- Lenses no longer fitting well due to decreased inflammation

Corneal Scarring – PR, 61 yo WF

- Trial CL Rx #2:
  - OD: Custom Stable Elite
    - 8.23 mm/15.8 mm/+1.50-1.00 x 150/Optimum Extra (20/25)
  - OS: Custom Stable Elite
    - 8.23 mm/15.8 mm/+1.00 -0.75 x 050/Optimum Extra (20/25)
  - Patient elected to use PAL lenses with plano distance and +2.50 DS add over scleral lenses
  - Landing zone of this pair of lenses was much tighter than previous pair

Corneal Scarring – PR, 61 yo WF

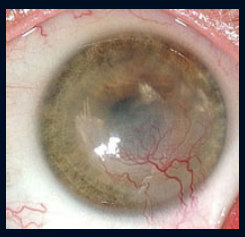
- Follow Up #1:
  - Patient reported intermittent diplopia during course of lens wear
  - Both lenses showed unstable rotation compared to initial fitting
    - OD: 50 degrees left → 70 degrees left
    - OS: 45 degrees right → 30 degrees right
  - At this point she decided to abandon scleral lens wear
- Currently getting by with spectacles only

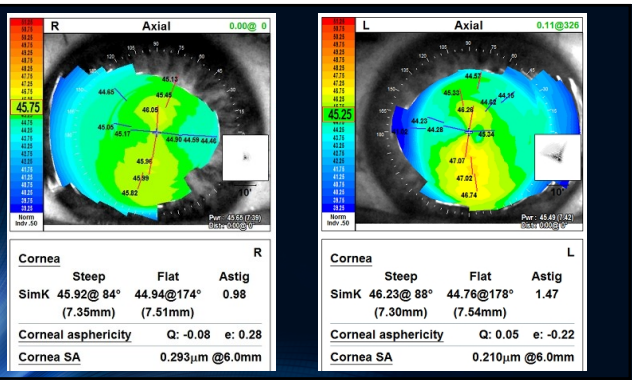
Herpes Simplex Scarring– RG, 66 yo WM

- Referred for scleral lens fitting by another doctor in the practice
- Patient is long time hybrid lens wearer OS
- Referring doctor was concerned about OS lens bearing down on scarred area of cornea
- Patient reports no significant history of corneal pathology in either eye despite dense inferior scarring

Herpes Simplex Scarring– RG, 66 yo WM

- Biomicroscopy
  - L/L: WNL
  - K: Dense area of scarring and vascularization extending from inferior limbus to mid peripheral cornea OS. OD unremarkable.
  - Conj: WNL
  - Sclera: Normal
  - Iris: Normal
  - Lens: Normal





Herpes Simplex Scarring– RG, 66 yo WM

- MRx:
  - OD: -3.50 -0.50 x 026 (20/20)
  - OS: -2.25 -3.25 x 170 (20/20)
- Presenting CL Rx:
  - OD: Biofinity Multifocal 8.6 mm/14 mm/-4.00 DS/+2.00D Add (20/20)
  - OS: Synergeyes Duette 7.3 mm/14.5 mm/ -4.00 DS (20/20)
  - Areas of bearing seen between RGP lens and area of dense scarring on inferior mid-peripheral cornea with associated staining

Herpes Simplex Scarring– RG, 66 yo WM

- Trial CL Rx #1:
  - OD: Custom Stable Elite
    - 7.85 mm/15.8 mm/-1.00 DS/Optimum Extra (20/30)
  - OS: Custom Stable Elite
    - 7.85 mm/15.8 mm/plano DS/Optimum Extra (20/25)
  - Both lenses showed 200 um central clearance and slight vertical movement on blink
  - VA decreased due to lens movement
  - Peripheral curves of both lenses were tightened

Herpes Simplex Scarring– RG, 66 yo WM

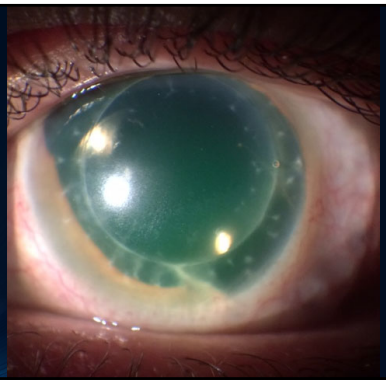
- Follow Up #1:
  - OD lens showed good central and peripheral alignment
  - OS had excessive central clearance and vertical movement upon blink after settling despite minimal fitting changes being made after diagnostic fitting
  - OS lens was remade with additional peripheral changes to improve lens alignment, no power changes needed
  - OD lens dispensed to patient and he was instructed to continue wearing hybrid while we waited for new OD lens to come in

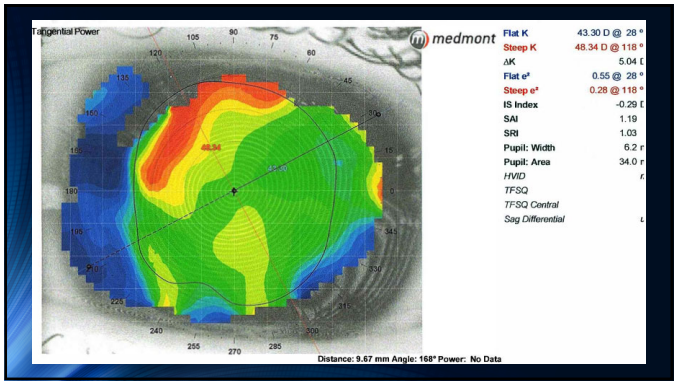
Herpes Simplex Scarring– RG, 66 yo WM

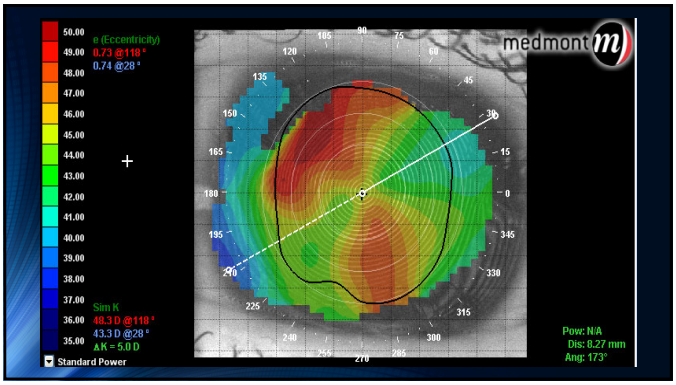
- Follow Up #2:
  - Lost track of the patient for about 6 weeks
  - New OS lens showed slight vertical movement that stabilized after settling
  - Stated he was not completely filling lens bowl with saline prior to insertion
  - Paitent re-trained in office and reported better comfort
- Follow Up #3:
  - No longer having issues inserting lenses, and comfort greatly improved
  - Able to wear lenses all day without comfort or vision issues

Trauma – DG, 25 yo WM

- Presented to UMSL Eye Center for annual exam and scleral lens fitting
- Reports comfort issues with his current OS scleral lens
- Patient suffered OS penetrating injury with broken drill bit in 2011
  - Partial Iridectomy
  - Retinal Detachment
  - Lensectomy with IOL implantation
  - Penetrating Keratoplasty
  - Taking Combigan BID OS for glaucoma s/t his injury and multiple surgeries
- Also wears custom painted soft lens for cosmesis and photophobia





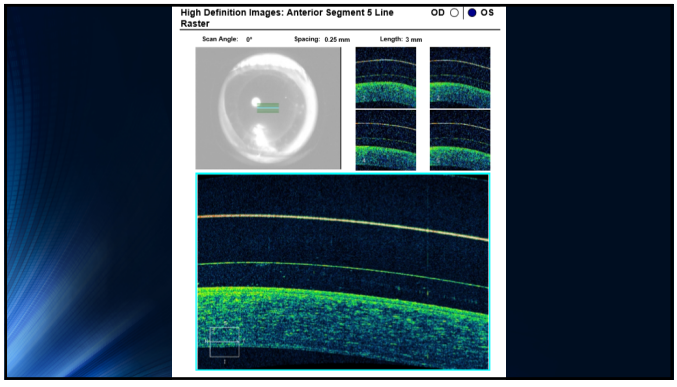


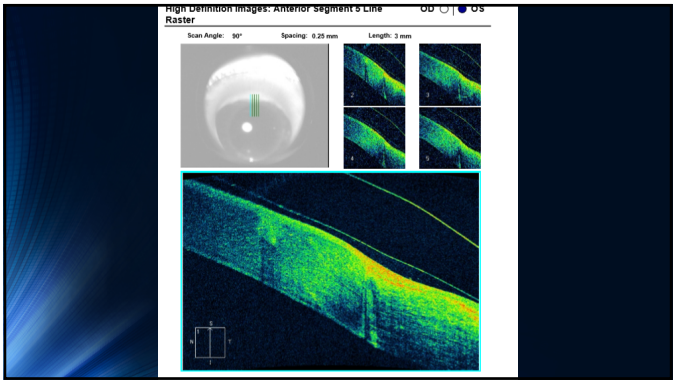
Trauma – DG, 25 yo WM

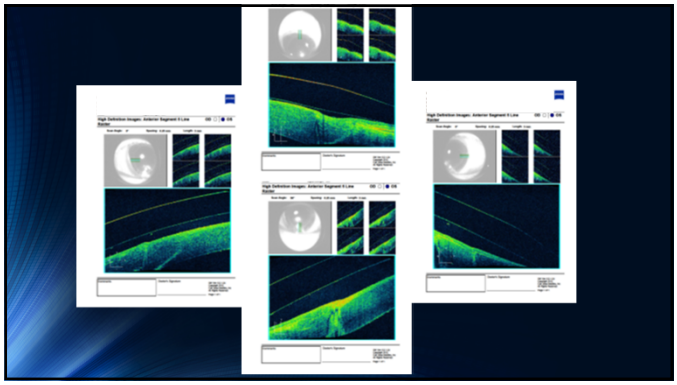
- MRx:
  - OD: plano DS (20/20)
  - OS: -5.25 -6.00 x 002 (20/30)
- Presenting CL Rx:
  - OD: None (20/20)
  - OS: Essilor Jupiter
    - 8.65 mm/18.6 mm/-1.63 DS/Boston XO (20/50)
      - ~500 um central clearance
      - Mild bearing at superior graft-host junction
      - Temporal edge lift
- Recommended Eyeprint to achieve better lens fit and comfort

Trauma – DG, 25 yo WM

- SCOR over Habitual Lens
  - OS: +0.25 -1.00 x 180 ($20/30^{+2}$)
- Trial CL Rx #1:
  - OS: Eyeprint Pro
    - 7.991 mm/17.5 mm/-5.62 -1.00 x 180 ($20/25^{-2}$)
      - ~260 um central clearance
      - ~80 um superior clearance at graft-host junction
      - Adequate graft-host junction clearance in all other quadrants
      - Good peripheral alignment in all quadrants
- Dispensed lens to patient, instructed to RTC 3 weeks







Trauma – DG, 25 yo WM

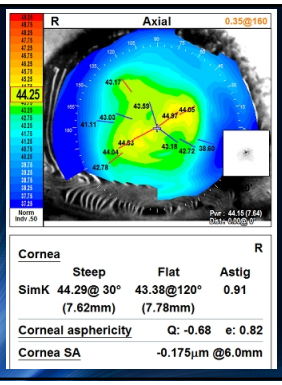
- Follow Up #1:
  - Reported improved vision and comfort with new OS lens
  - Able to wear lens up to 15 hours per day without issue
  - 20/20^{-1} VA
  - ~50 um clearance over superior graft-host junction after 4 hours of settling
  - Instructed to RTC 3 months for further follow up

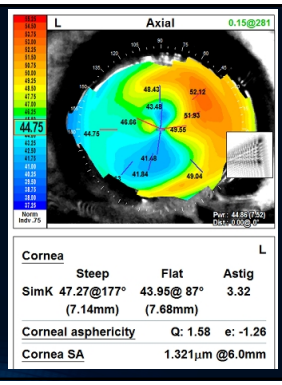
Corneal Transplant – NM, 37 yo BF

- Referred by doctor in the practice for scleral lens fitting
- Diagnosed with bilateral keratoconus in her teens
- Has had bilateral penetrating keratoplasties due to corneal scarring
- Currently being monitored by corneal specialist in the area, states he would like to redo OS sometime soon
- Wants a contact lens option that provides better comfort and vision than her current soft lenses
- Regularly travels to Kenya for her job and needs something that can be worn comfortably all day

Corneal Transplant – NM, 37 yo BF

- Biomicroscopy
  - L/L: WNL
  - K: Clear graft OD. Corneal graft with clear center and moderate opacity at graft-host junction OS.
  - Conj: WNL
  - Sclera: Normal
  - Iris: Normal
  - Lens: Normal





Corneal Transplant – NM, 37 yo BF

- MRx:
  - OD: -5.50 -0.75 x 090 (20/20)
  - OS: -5.00 -2.50 x 090 (20/50)
- Presenting CL Rx:
  - OD: Acuvue Oasys for Astigmatism
    - 8.6mm/14.5 mm/-5.00 -0.75 x 090 (20/30)
  - OS: Acuvue Oasys for Astigmatism
    - 8.6 mm/14.5 mm/-5.00 -2.25 x 090 (20/40)
  - Reports significant visual fluctuations throughout the day

Corneal Transplant – NM, 37 yo BF

- Trial CL #1:
  - OD: Custom Stable Elite
    - 7.85 mm/15.8 mm/-5.00 DS/Optimum Extra (20/20)
  - OS: Custom Stable Elite
    - 7.50 mm/15.8 mm/-7.25 DS/Optimum Extra (20/20)
  - ~350 um central clearance OU after about 20 minutes
  - Adequate clearance of graft-host junction 360 OU

Corneal Transplant – NM, 37 yo BF

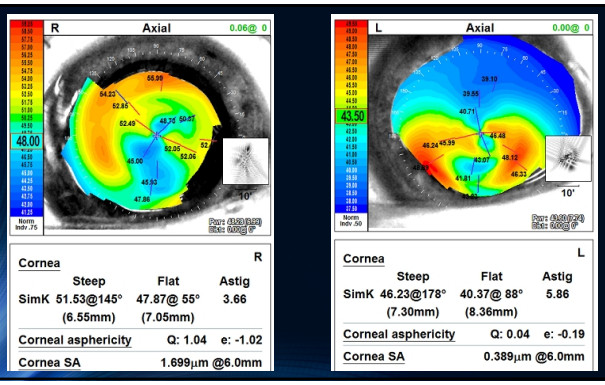
- Follow Up #1:
  - Lenses showed excessive clearance after settling
    - OD: ~500 um
    - OS: ~400 um
  - Patient reported good comfort and vision with new lenses
  - Lenses remade with flatter secondary curves to maintain clearance of graft-host junction and reduce central clearance over graft
- Follow Up #2:
  - Central clearance greatly improved compared to initial lenses
  - Able to wear lenses for full day without comfort or vision issues

Corneal Transplant – JB, 45 yo WM

- Presented for annual comprehensive exam and contact lens fitting
- Diagnosed with keratoconus in his late teens
- Corneal transplant OD in 2001 s/t scarring
- Currently fit in corneal RGP lenses OU, says "they're fine"
  - Also reports OD lens frequently dislodges and vision fluctuates constantly
- Skeptical about other forms of correction

Corneal Transplant – JB, 45 yo WM

- Biomicroscopy
  - L/L: WNL
  - K: Clear graft OD. Inferior steepening with corneal endothelial folds OS
  - Conj: WNL
  - Sclera: Normal
  - Iris: Normal
  - Lens: Normal



Corneal Transplant – JB, 45 yo WM

- MRx:
  - OD: -17.00 -7.50 x 060 (20/50)
  - OS: -12.25 -6.00 x 090 (20/30)
- Presenting CL Rx:
  - OD: Dyna Intralimbal
    - 6.75 mm/10.8 mm/-13.87 DS (20/40)
  - OS: Dyna Intralimbal
    - 8.08 mm/9.4 mm/-10.50 DS (20/30)
  - OD lens has several areas of central bearing, bubbles under lens, superior and temporal edge lift, and consistent temporal decentration

Corneal Transplant – JB, 45 yo WM

- Trial CL Rx #1:
  - OD: Custom Stable Elite
    - 7.18 mm/15.8 mm/-17.00 DS/Optimum Extra (20/25)
  - OS: Custom Stable Elite
    - 7.85 mm/15.8 mm/-11.50 DS/Optimum Extra (20/20)
  - Both lenses had ~300 um central clearance after settling
  - OD secondary curve steepened to avoid graft-host junction

Corneal Transplant – JB, 45 yo WM

- Follow Up #1:
  - Patient reported slight distance blur with current lenses
  - Over refraction improved vision
    - OD: -2.00 DS (20/20)
    - OS: -1.00 DS (20/20)
- Trial CL Rx #2:
  - OD: Custom Stable Elite
    - 7.18 mm/15.8 mm/-19.00 DS/Optimum Extra (20/20)
  - OS: Custom Stable Elite
    - 7.85 mm/15.8 mm/-12.50 DS/Optimum Extra (20/20)

Corneal Transplant – JB, 45 yo WM

- Follow Up #2:
  - Reports improved vision, especially in OD
  - No longer experiences lenses dislodging from eyes
  - Dispensed lenses to patient and instructed to resume daily lens wear

Questions?

Anterior Segment Dystrophies

- Epithelial Dystrophies
  - Anterior Basement Membrane Dystrophy
  - Recurrent Corneal Erosion
- Stromal Dystrophies
  - Lattice Dystrophy
  - Granular Dystrophy
  - Macular Dystrophy

Dystrophy vs. Degeneration

- Dystrophy
  - Usually inherited, autosomal dominant
  - Relatively early onset
  - Usually affect single layer of the cornea
  - Have distinctive patterns and severity based on the stage of the condition
- Degeneration
  - Usually the result of some disease process
    - RA, Syphilis, Crohn's, etc.
  - Usually later onset
  - Often Unilateral, asymmetric and peripheral
  - Result in thinning, deposition, or vascularization of corneal tissue

TABLE 1

List of Major Corneal Dystrophies by Layer

	MODE OF INHERITANCE	AGE OF ONSET	PATTERN	TREATMENTS
EPITHELIUM				
EBMD	Autosomal Dominant	Variable	Map, Dot or Fingerprints	BSCL, Hypertonics, curettage, PTK, ASP
Meesmann's	Autosomal Dominant	First Decade	Epithelial Microcysts	BSCL, Keratoplasty
BOWMAN'S				
Reis-Buckler's	Autosomal Dominant	First Decade	Subepithelial Reticular Opacification	BSCL, Keratoplasty
STROMAL				
Granular	Autosomal Dominant	First or Second Decade	Gray/White Opacities	BSCL, Keratoplasty
Macular	Autosomal Recessive	First Decade	Hazy Stromal Opacification	BSCL, Keratoplasty
Lattice	Autosomal Dominant	First Decade	Refractile Branching Lines	BSCL, Keratoplasty
ENDOTHELIUM				
PPD	Autosomal Dominant	First Decade	Vesticular Lesions of the Posterior Cornea	BSCL, Hypertonics, Keratoplasty
Fuchs'	Autosomal Dominant	Fourth or Fifth Decade	Guttata w/Corneal Edema	BSCL, Hypertonics, DSAEK, Keratoplasty

(BSCL) Bandage Soft Contact Lens, (PTK) Phototherapeutic Keratotomy, (ASP) Anterior Stromal Puncture, (DSAEK) Descemet's Automated Endothelial Keratoplasty

Epithelial Dystrophies

Anterior Basement Membrane Dystrophy

- Most common anterior corneal dystrophy
- Caused by over-production of basement membrane
- Pain on awakening
- Blurred vision
- Monocular diplopia

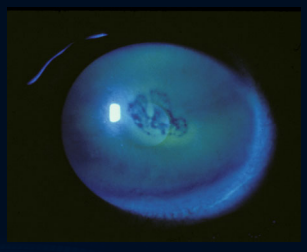


Image Source: https://webeye.ophth.uiowa.edu/eyeforum/cases/78-EBMD-treatment.htm

Anterior Basement Membrane Dystrophy

- Changes apparent in anterior cornea
- Best observed in retro illumination with dilated pupil
- Map-Dot-Fingerprint Dystrophy
  - Intraepithelial microcysts (dots)
  - Map-like greyish patches
  - Fingerprint parallel lines
- Cogan's Microcystic Dystrophy
  - Only epithelial microcysts present

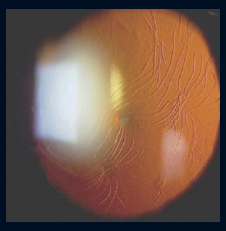


Image Source: https://www.atlasophthalmology.net/photo.jsf;jsessionid=A9AC72E8F042CCCF3472F454E65FF98?node=4170&locale=pt

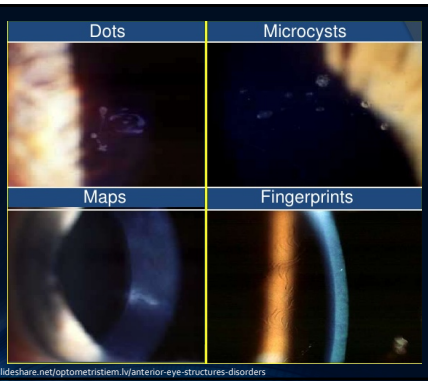
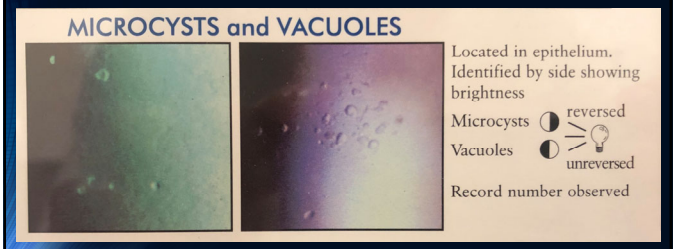
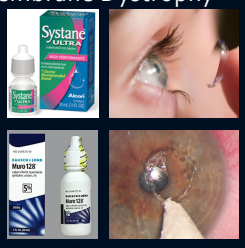


Image Source: https://www.slideshare.net/optometristiem.lv/anterior-eye-structures-disorders



Anterior Basement Membrane Dystrophy

- Usually respond well to conventional therapy
  - Topical lubrication
  - Bandage contact lens
  - Epithelial debridement
  - Topical hyperosmotics
- Some cases may require PTK or anterior stromal puncture



Recurrent Corneal Erosion

- Caused by poor adhesion between epithelium and underlying basement membrane
- Usually result from trauma
- Can recur multiple times during healing process
- Fingernail trauma is most common mechanism of trauma

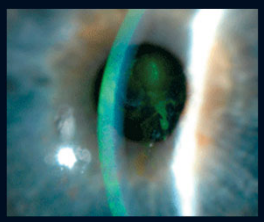


Image Source: https://www.reviewofoptometry.com/article/peeling-back-the-layers-of-rce

Recurrent Corneal Erosion

- Desmosome formation can take weeks following injury
- Weak desmosome attachment makes RCE more likely during normal course of healing
- RCEs most common upon awakening
- Frequent lubrication extremely important to minimize chance of recurrence

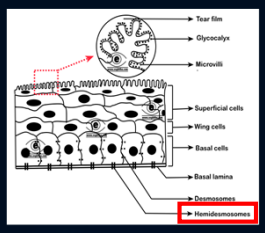
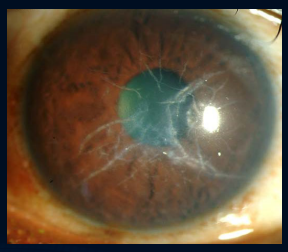


Image Source: http://eophtha.com/Anatomy/anatomyofcornea.html

Stromal Dystrophies

Lattice Dystrophy

- Autosomal dominant
- Rod-like, glassy opacities in anterior stroma
- Presents first or second decade of life
- Most common is Type 1
  - Amyloid deposits



Lattice Dystrophy

- Diagnosis made based on clinical appearance
- RCEs and anterior stromal haze may develop over time
- Treatment usually bandage contact lenses and lubrication for RCEs

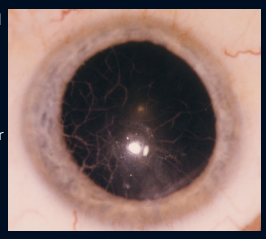


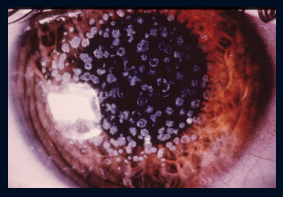
Image Source: https://disorders.eyes.arizona.edu/disorders/corneal-dystrophy-lattice-type-i

Lattice Dystrophy

- Penetrating keratoplasty is treatment of choice when acuity is significantly reduced
- Recurrence is common, and may be treated with PTK
- PTK often used before penetrating keratoplasty is considered

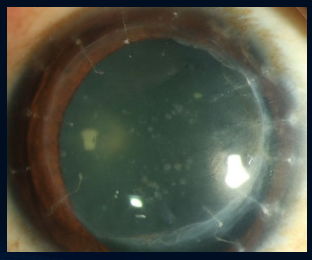
Granular Dystrophy

- Autosomal dominant
- Discrete opacities in stroma with unaffected areas being clear
- Opacities composed of hyaline
- Opacities have flaky, crumb-like appearance



Granular Dystrophy

- Diagnosis made by clinical findings
- Some patients are asymptomatic, some develop RCEs
- Some require penetrating keratoplasty to achieve good vision
- Granules can recur superficially in graft



Macular Dystrophy

- Autosomal recessive
- Faint white anterior stromal opacities
- Usually seen in first decade of life
- Opacities tend to be progressive
- Results in limbus to limbus, ground glass haze between opacities

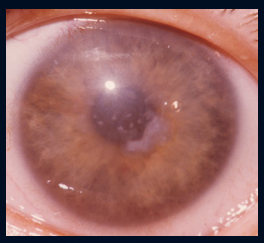


Image Source: https://disorders.eyes.arizona.edu/disorders/corneal-dystrophy-macular

Macular Dystrophy

- Mucopolysaccharide deposits
- Caused by a metabolic abnormality in keratin sulfate
- Decreased visual acuity and photophobia common by second and third decade
- Usually requires penetrating keratoplasty by fourth decade
  - Usually have good outcome and recurrence in graft is rare

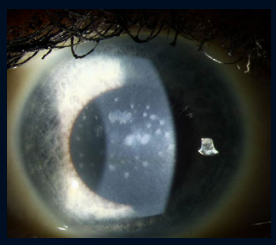


Image Source: http://www.eyerounds.org/atlas/pages/macular-corneal-dystrophy.htm

Macular Dystrophy

- Two distinct forms of the disease, Type I and Type II.
- Clinically these are indistinguishable.

Fitting Considerations for Corneal Dystrophies

- Treatment usually involves management of patient symptoms during acute episodes of corneal compromise
- Bandage contact lenses crucial for RCEs secondary to these conditions
- Constant monitoring extremely important when bandage contact lens is on the eye
  - 24 hour rule for bandage contact lenses
- Treatment may also involve use of specialty lenses to manage corneal irregularity
  - Corneal Transplants and scarring are most common

Bandage Contact Lenses

- Provides mechanical barrier
- May delay need for more invasive treatment
- High dK material is a necessity
- Currently four lenses approved for use as bandage lens
  - Acuvue Oasys
  - B&L Pure Vision
  - Air Optix Night & Day
  - UCL 55% (United Contact Lens)

Bandage Contact Lenses

- Protection
  - Mechanical barrier
  - Improved patient comfort
- Dehydration
  - Pervaporation can help "dry out" the healing defect
  - Pervaporation is evaporation or loss of fluid through a semi-permeable membrane
- Vision
  - Provides functional vision while eye is healing

Bandage Contact Lenses

- Fit of lens crucial to success
- Lenses should not have excessive movement
- Should center well and provide limbus to limbus coverage
- Lens power can be selected to provide good vision while lens is worn
  - Lens thickness and oxygen transmission must be considered
- Must reassess frequently to monitor healing process
- RGP lenses generally not a good option

Questions?

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