

Tricks and Tips for Successful Therapeutic Scleral Lens Wear in Ocular Surface Disease

Melissa Barnett, OD, FAAO, FSLS, FBCLA



TWIN CITIES
OCULAR SURFACE
DISEASE SYMPOSIUM

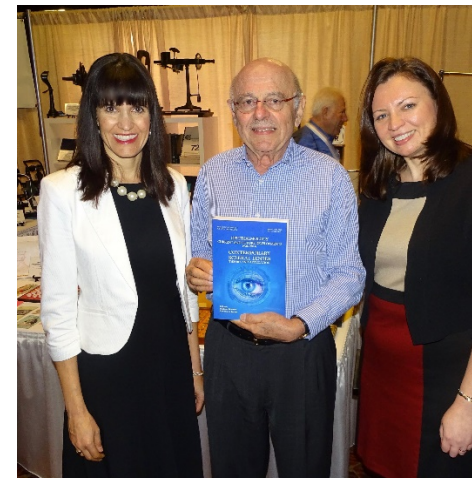
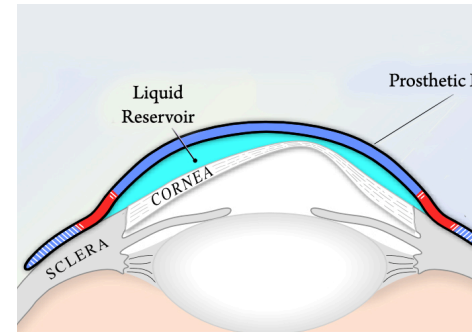
Disclosures

- Acculens
- Alcon
- Allergan
- Bausch + Lomb
- Contamac
- Coopervision
- Gas Permeable Lens Institute (GPLI)
- Johnson & Johnson Vision
- Novabay
- Ocusoft
- Paragon Biotech
- Scleral Lens Education Society
- Shire
- Sjogren's Syndrome Foundation
- STAPLE program
- SynergEyes
- Visioneering Technologies

Scleral Lenses

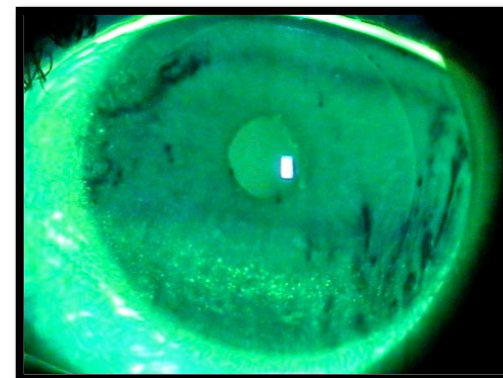
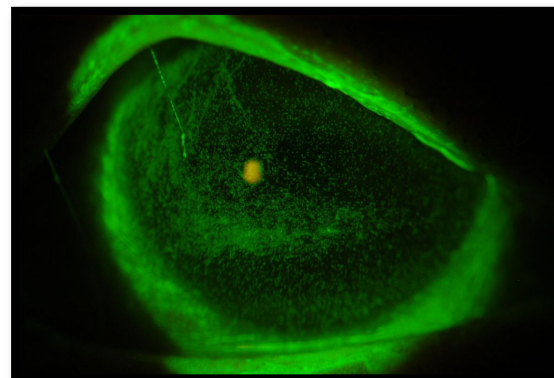
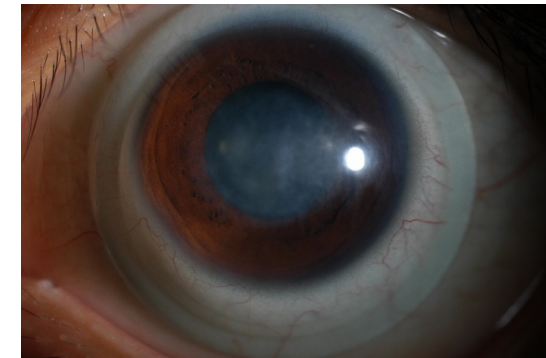
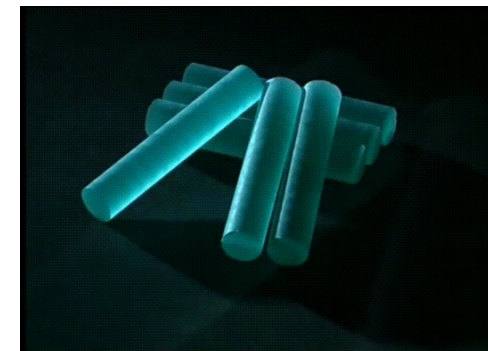
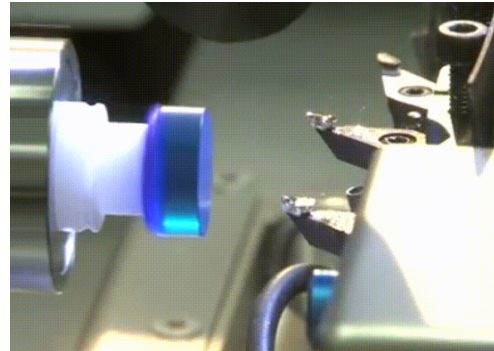
- First used in late 1800s and early 1900s
- Manufacturing process now more reproducible

- Modern scleral lenses
 - Don Ezekiel, OD
 - Ken Pullum, OD
 - Perry Rosenthal, MD Boston Scleral Lens



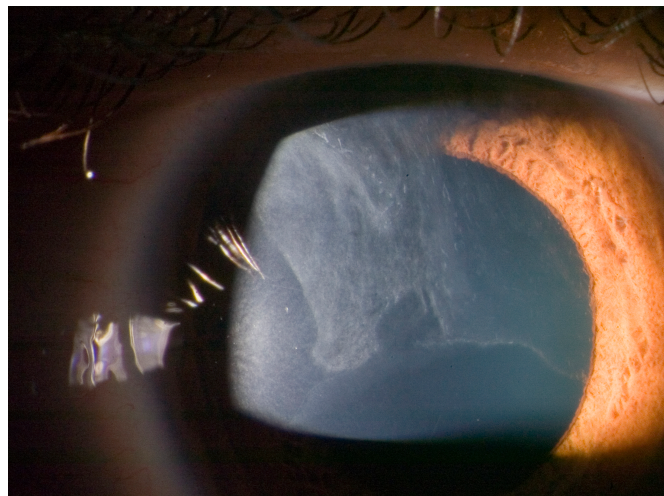
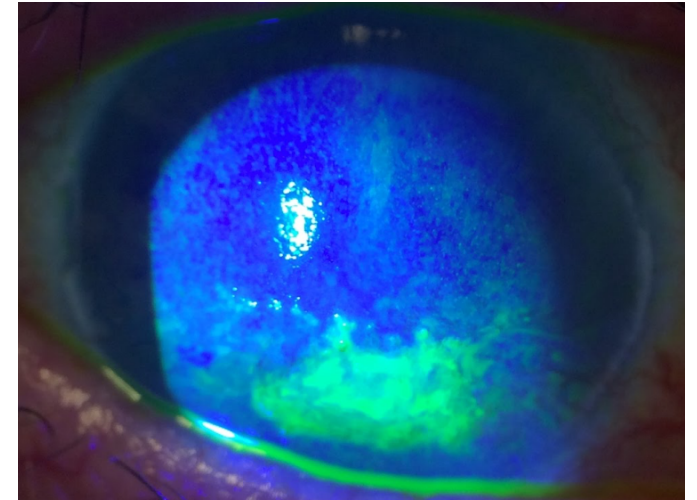
Major indications of scleral lenses

- Vision rehabilitation
- Ocular surface disease management
- Pain attenuation



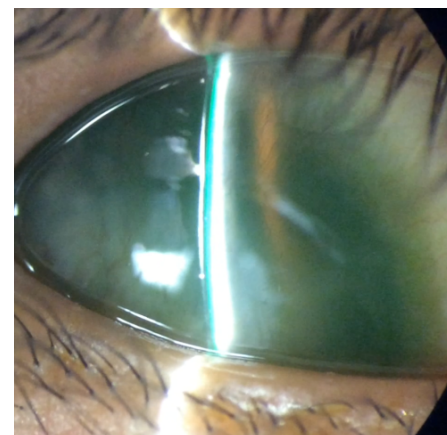
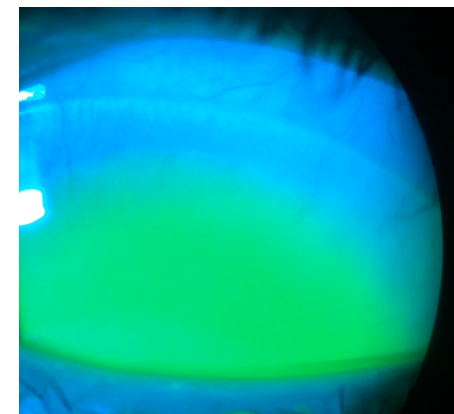
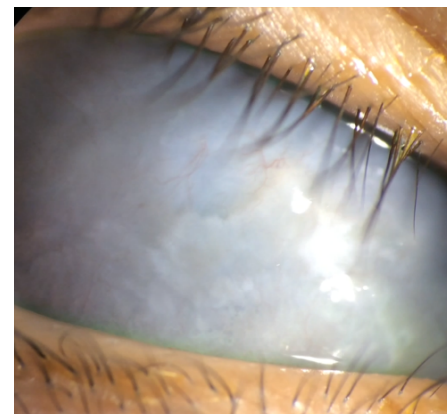
Therapeutic Scleral Lens Indications

- Undifferentiated dry eye syndrome
- Sjögren's syndrome
- Chronic graft versus host disease
- Stevens Johnson syndrome
- Grave's ophthalmopathy
- Ocular cicatricial pemphigoid
- Limbal stem cell deficiency
- Neurotrophic keratopathy
- Exposure keratopathy
- Corneal dystrophies
- S/P ocular trauma



Scleral Lenses: An Adjunctive Therapy

- Ocular Protection and Continuous Lubrication
 - Prevent mechanical damage
 - Prevent tissue desiccation
 - Promote healing
 - Disrupt the pain cycle
 - Corneal hydration



Obituary—Rigid contact lenses



[Nathan Efron](#)  

Institute of Health and Biomedical Innovation and School of Optometry, Queensland University of Technology, 60 Musk Avenue, Kelvin Grove, Queensland 4059, Australia

- “Scleral and corneal rigid lenses represented 100% of the contact lens market immediately prior to the invention of soft lenses in the mid-1960s.”
- In the United Kingdom today, rigid lenses comprise 2 per cent of all new lens fits.
- the 1998 prediction of the author that rigid lenses would be obsolete by the year 2010 has essentially turned out to be correct.
- Rigid lenses are now being fitted by a minority of practitioners with specialist skills/training.
- “Certainly, rigid lenses can no longer be considered as a mainstream form of contact lens correction.”



Contents lists available at ScienceDirect

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journal homepage: www.elsevier.com/locate/clae


Letter to the Editor

A response to Nathan Efron

I was interested to read Nathan Efron's obituary of hard lenses in the October 2010 issue of CLAE. I am happy to agree with most of his excellent analysis concerning their demise but, unlike the dead parrot, I am tempted recall instead Mark Twain's comment that *the news of [their] death is greatly exaggerated* as well asking in the spirit of Monty Python whether the good Professor would prefer *a long argument or a short argument?*

New fittings are indeed very much a specialist, minority area but there still remain around the world large numbers of perfectly successful hard lens wearers supported by numerous equally successful hard lens laboratories. After all, hard gas-permeable wearers do not generally suffer from microbial keratitis, corneal infiltrates, neovascularisation or contact lens induced papillary conjunctivitis. In addition, there are still many patients for whom

even the most complex modern soft lenses will not give satisfactory acuity.

Turning to the top ten reasons for the decline of hard lenses, we might also speculate that because the majority of contact lenses are now fitted by high street multiples commercial pressures to use disposables may largely override clinical considerations.

We hard lens practitioners, however, must *always look on the bright side* and I would predict that in another twelve years there will still be hard gas-permeable lenses albeit for a small minority of patients. Unlike the Norwegian Blue but perhaps like the proverbial 'creaking gate', they may hang longest.

Andrew Gasson

6 De Walden Street, London W1G 8RL,

United Kingdom

E-mail address: andrew@andrewgasson.co.uk

- “New fittings are indeed very much a specialist, minority area but there still remain around the world large numbers of perfectly successful hard lens wearers supported by numerous equally successful hard lens laboratories”.
- Andrew gasson

GP Annual Report 2015

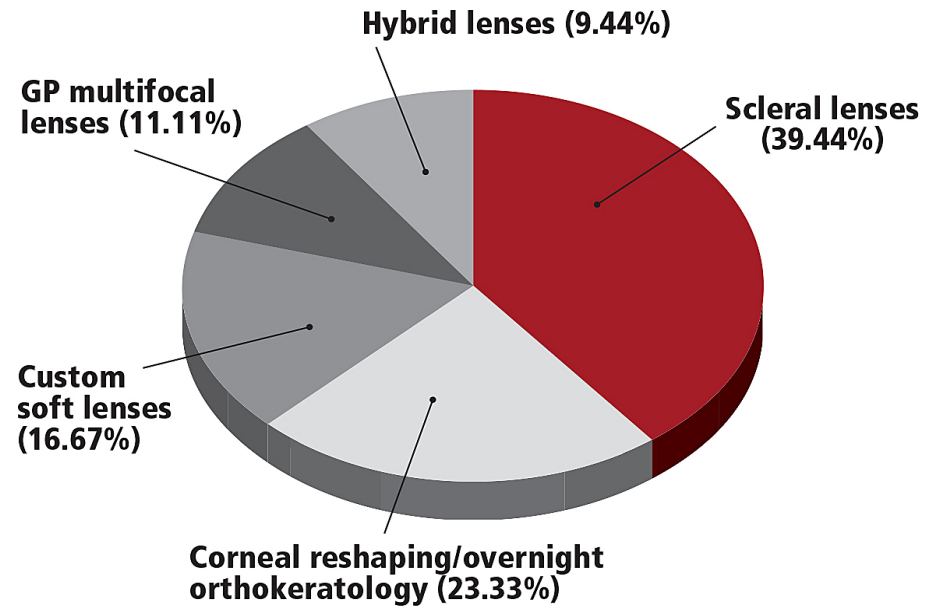
Sccleral, multifocal, and other specialty designs continue to trend up in the GP lens market.

By Edward S. Bennett, OD, MSED, FAAO

While the GP contact lens mar-

This article will also present data from *Contact Lens Spectrum's* first an-

Which do you feel has the greatest potential for growth in the next 12 months?



“The Scleral Explosion Continues”

Ed Bennett, OD, MSED, FAAO CL Spectrum October 2016

TABLE 2 IN THE LAST 12 MONTHS, SCLERAL LENS USE IN YOUR PRACTICE HAS:

ANSWER CHOICE	RESPONSE %	RESPONSE #
Decreased greatly	0.8%	1
Decreased slightly	3.2%	4
Stayed the same	14.4%	18
Increased slightly	32.8%	41
Increased greatly	25.6%	32
Not applicable	23.2%	29

CONTACT LENSES 2017

Continuing upward trends in daily disposable prescribing and other key segments maintained a healthy industry.

By JASON J. NICHOLS, OD, MPH, PHD January 1, 2018

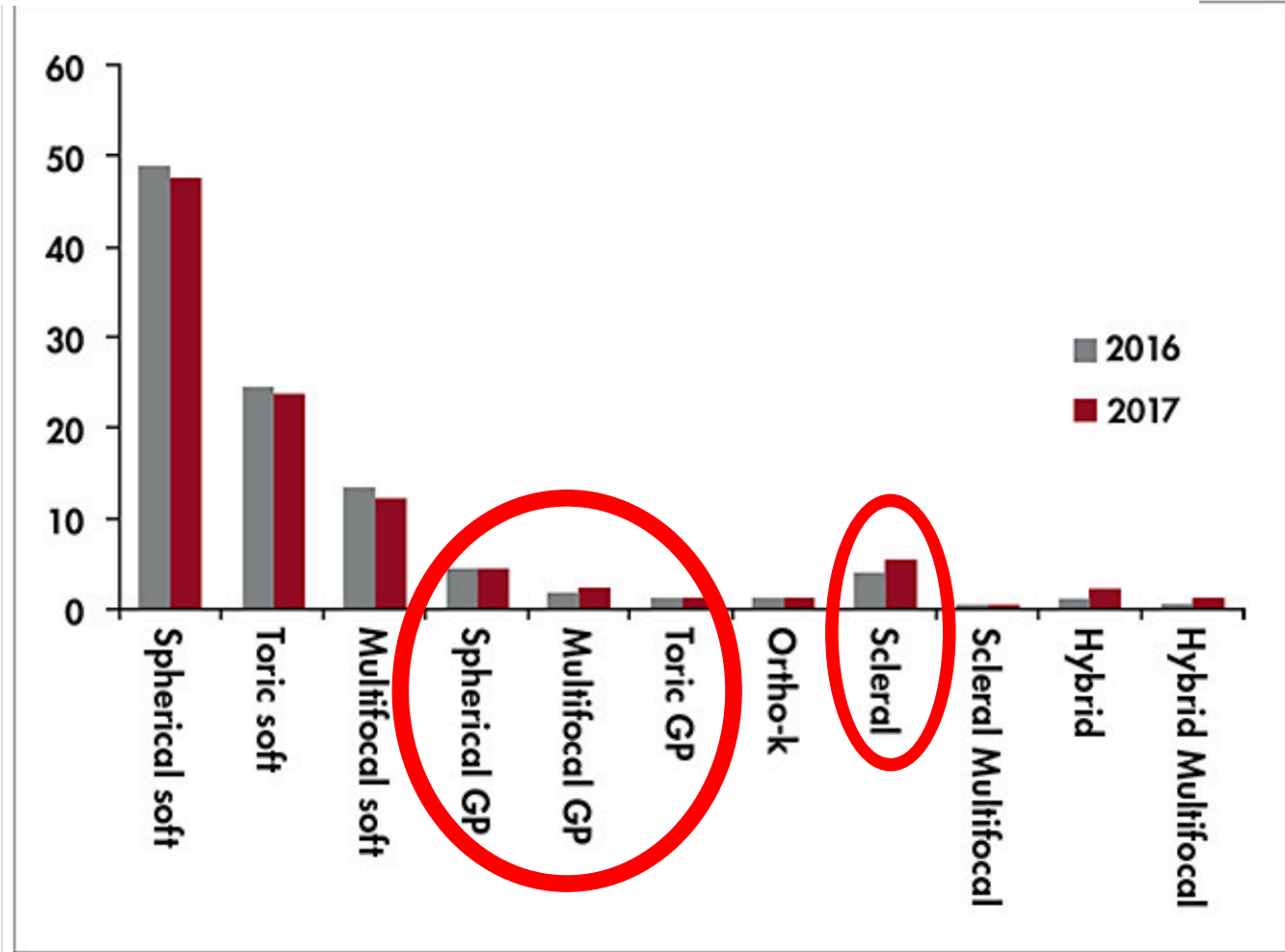
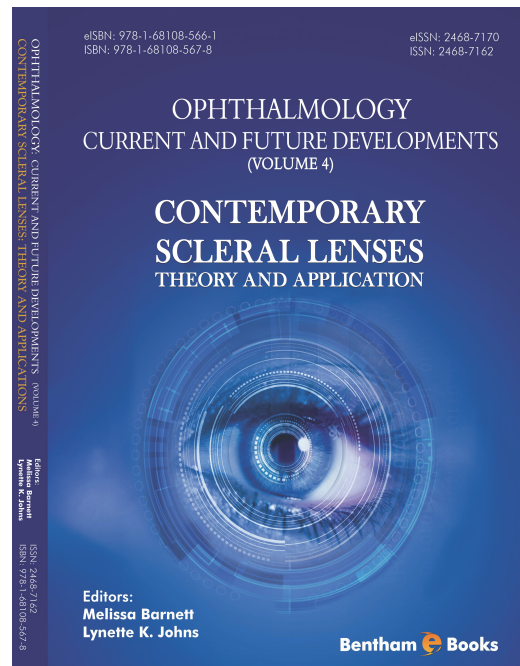


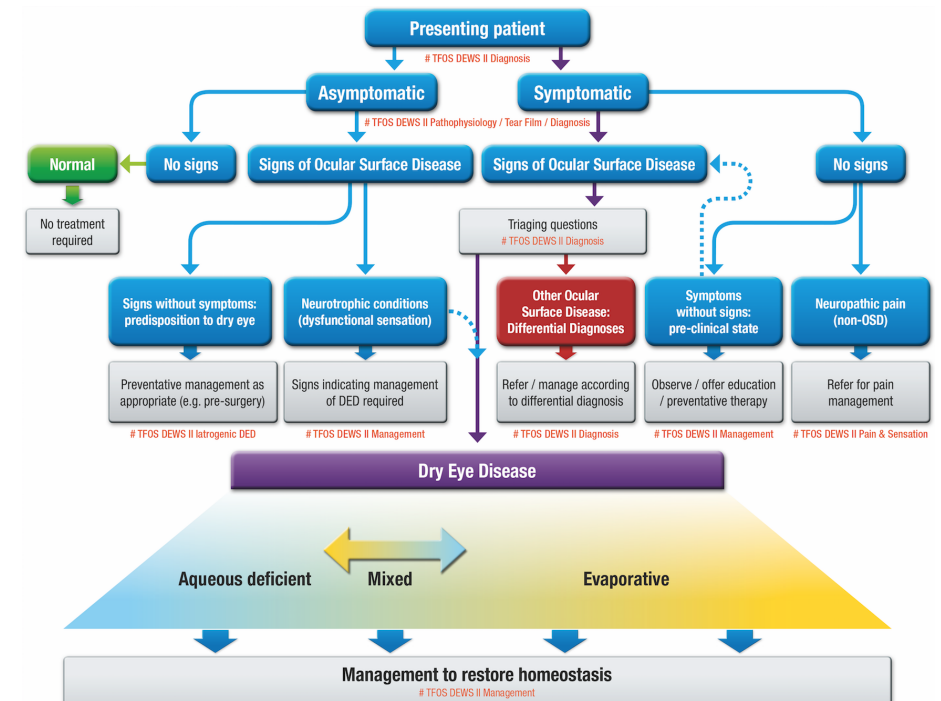
Figure 3. 2016 to 2017 contact lens fits and refits by lens designs.

Lens Type	Description	Definition of Bearing Area
Corneal		Lens rests entirely on the cornea
Corneo-scleral		Lens rests partly on the cornea, partly on the sclera
Scleral	Mini-Scleral <i>Lens is up to 6mm larger than HVID</i>	Lens rests entirely on the sclera
	Large Scleral <i>Lens is more than 6mm larger than HVID</i>	



TFOS DEWS II Report

“Multifactorial disease of the ocular surface characterized by a loss of homeostasis of the tear film and accompanied by ocular symptoms, in which tear film instability and hyperosmolarity, ocular surface inflammation and damage, and neurosensory abnormalities play etiological roles.”



DEWS II Prevalence

- DED prevalence for studies involving symptoms with or without signs 5% to 50%
- Up to 75% for studies based primarily on signs (higher and more variable rates)
- Review of 437 prevalence studies
- Prevalence of DED from 24 large studies



TFOS DEWS II Epidemiology Report

Fiona Stapleton, MCOptom, PhD ^{a,1,*}, Monica Alves, MD, PhD ^b, Vatinée Y. Bunya, MD ^c, Isabelle Jalbert, OD, PhD ^a, Kaevalin Lekhanont, MD ^d, Florence Malet, MD ^e, Kyung-Sun Na, MD, PhD ^f, Debra Schaumberg, ScD, OD ^{g,h}, Miki Uchino, MD, PhD ⁱ, Jelle Vehof, MD, PhD ^{j,k,l}, Eloy Viso, MD, PhD ^m, Susan Vitale, PhD, MHS ⁿ, Lyndon Jones, FCOptom, PhD ^o

Table 1
Summary of population based cross sectional epidemiological studies of dry eye, stratified by diagnostic criteria and racial group.

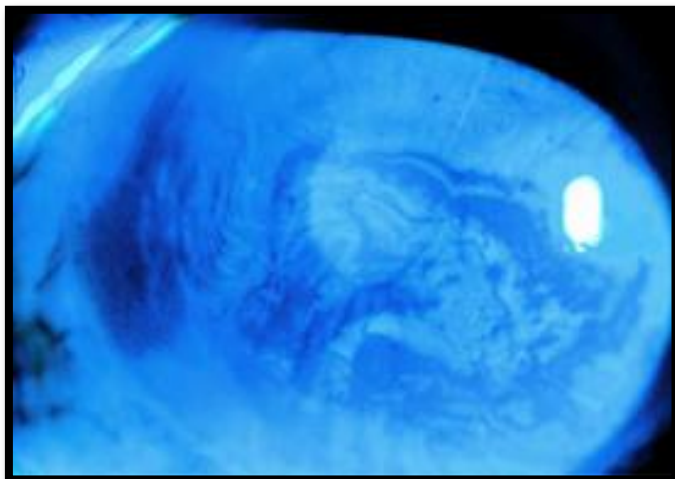
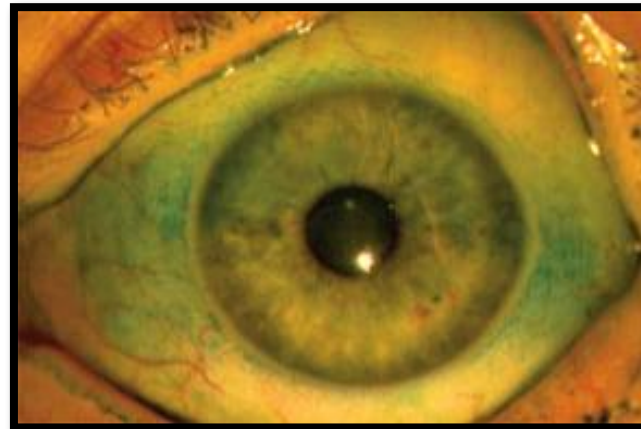
Authors	Country	N	Age (mean ± SD)	M:F (k, (n))	Race	Sampling technique	Prevalence (%) [95%CI]	Prevalence (%) [95%CI] (Symptoms only)	Prevalence (%) [95%CI] (Physician diagnosis)
Uchino 2008 [8]	Japan	3433	15–18	74:4:25:6 (2848:385)	1	Japanese high school students, 100% consent of those invited	n/a	Boys 21 (20.1–21.8); Girls 24.4 (23.9–25.0)	Boys 4.3 (3.9–4.6); Girls 8.0 (7.4–8.4)
Schaumberg 2009 [9]	USA	25444	50–99 (Median 64.4)	100% Male	3	Participants from longitudinal Physicians Health Studies I (N = 18596) and II (N = 6948)	Age adjusted 4.34 (4.1–4.6); 50–54 3.90 (3.1–4.7); All physicians in AMA invited to participate	80 > 7.67 (6.5–8.9)	Men 2.5 (1.9–3.4); Women 2.6 (1.9–3.4)
Uchino 2011 [10]	Japan	3294	≥40	40:2:53:8 (1321:1423)	1	Basic mountain town population sampled from residential registry. Self-administered questionnaire distributed and later collected from individual households	Men 22 (19.7–24.5); Women 21.6 (19.5–23.9)	Men 11.5 (9.7–13.4); Women 18.7 (16.7–20.8)	Men 2.0 (1.3–3.0); Women 7.9 (6.6–9.5)
Zhang 2012 [11]	China	1885	n/a	50:8:49:2	1	Multistage stratified random cluster sampling of Chinese high school students	23.7 (21.8–25.7)	23.1 (21.3–25.1)	1.3 (0.9–2.0)
Ahn 2014 [12]	South Korea	11666	19–95 (49.9 ± 16.7)	42:8:57:2	1	Stratified, multistage, clustered sampling method based on 2009 National Resident demographics. Weighted prevalence calculated per 5th annual Korea National Health and Nutrition Examination Survey (KNHANES V)	16 (14.6–17.3) Men > 40 10.7 (8.1–12.2) Women > 40 20.6 (18.5–22.2)	14.4 (13.1–15.7)	8.0 (7.3–8.7)
Lim 2014 [13]	South Korea	16431	≥30 (7033:9398)	42:8:57:2	1	Stratified multistage probability sampling, subjects selected from KNHANES V	n/a	All 17.7 (17.09–18.31); Men 19.8 (19.3–20.3); Women 19.44 (19.42–19.46)	All 10.4 (9.92–10.88); Men 8.80 (8.49–9.11); Women 12.60 (12.63–12.67)
Authors	Country	N	Age (mean ± SD)	M:F (k, (n))	Race	Sampling technique	Diagnostic criteria	Prevalence (%) [95%CI]	
Symptomatic disease									
Lu 2008 [14]	China	2632	≥40 (56.3 ± 12.3)	56:44	1	Stratified, clustered, random sampling	One or more symptoms of dry eye often 52.4 (50.2–54.7); Men 52.1; or all the time Women 52.9	52.4 (50.2–54.7)	
Moss 2008 [15]	USA	2414	48–91 (63 ± 10)	44:56	3	5 and 10 year follow up examinations in Beaver Dam Eye Study population	Positive response to the question, "In the past 3 months or longer, have you had dry eyes?" "foreign body sensations with itching and burning, sandy feeling, not related to allergy"	Men 21.6 (19.9–23.3); Men 17.2; Women 25.0	
Ju 2009 [16]	China	1957	40–84 (56.5 ± 9.3)	43:2:56:8 (835:112)	1	From the 4439 participants in the Beijing Eye Study 2001, a random sample of 1957 were selected	One or more symptoms of dry eye often 21 (19.2–22.8) or all the time	21 (19.2–22.8)	
Tian 2009 [17]	China	1085	20–95 (51 ± 18)	38:6:61:4 (419:666)	1	6% of the target population from Jiangning District, Shanghai, was randomly selected (1266 subjects) using randomized block methods	One or more of 6 dry eye symptoms other than (and) (dryness, irritation, burning sensation, redness, deposits, heavy eyelid sensation)	32.81 (30.08–35.66)	
Tong 2009 [18]	Singapore	3280	40–80	1576:1704	2	Age-stratified (by 10-year age group) random sample of the Malay population residing in 15 residential districts in Southwestern Singapore drawn from a random list of 16,000 Malay names provided by the Ministry of Home Affairs	One or more of 6 listed symptoms of dry eye often or all the time	6.5 (5.7–7.4); Men 8.2 (6.9–9.7); Women 4.9 (3.9–6.0)	
Guo 2010 [19]	China	1816	≥40 (54.9 ± 11.7)	53:3:46:7	1	Stratified, clustered, random sampling method in Henan County China. Native Mongolian population living at high altitude.	One or more of the 6 symptoms of dry eye 50.1 (47.8–52.4); Men 49.9 (46.8–53.1); Women 50.2 (46.8–53.6)	50.1 (47.8–52.4)	
Han 2011 [20]	South Korea	657	65–95 (72 ± 5.9)	48:2:51:8	1	10% of the population chosen through systematic random sampling based on residential rosters; 1060 invited to participate; 657 consented	One or more symptoms of dry eye often 30.3 (26.9–33.9) or all the time (dry, gritty/sandy, burning, itchy, watery/tearing, redness)	30.3 (26.9–33.9); Men 25.6; Women 34.7	

(continued on next page)

Dry Eye Prevalence

- Prevalence is much higher among women
- Aging is a risk factor
- Sex hormones are key factors
- Changing hormone levels / decreased androgens are contributory

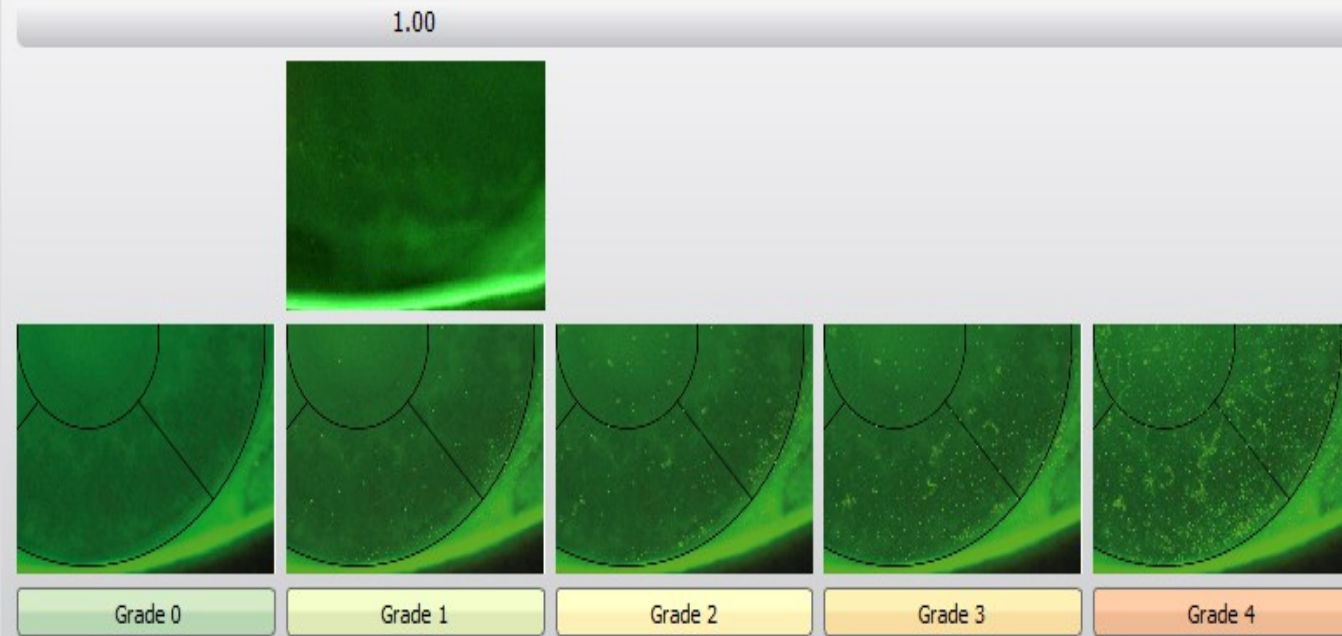
Ocular Testing



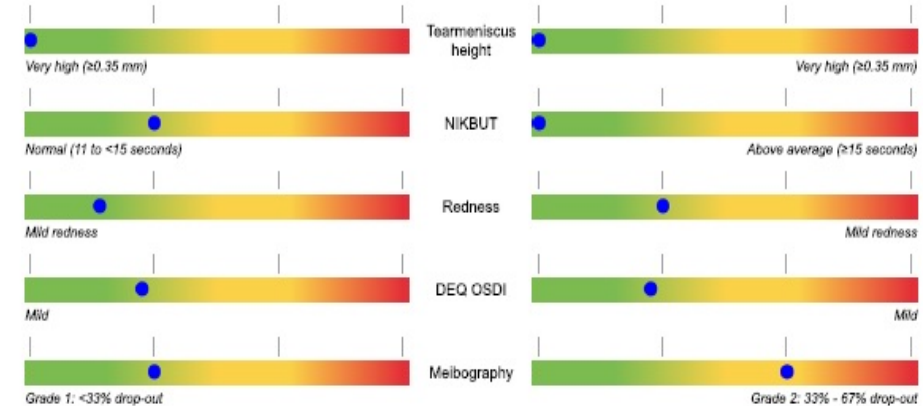
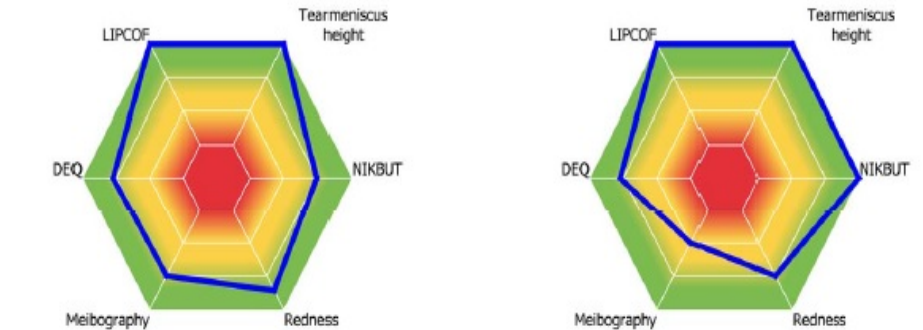
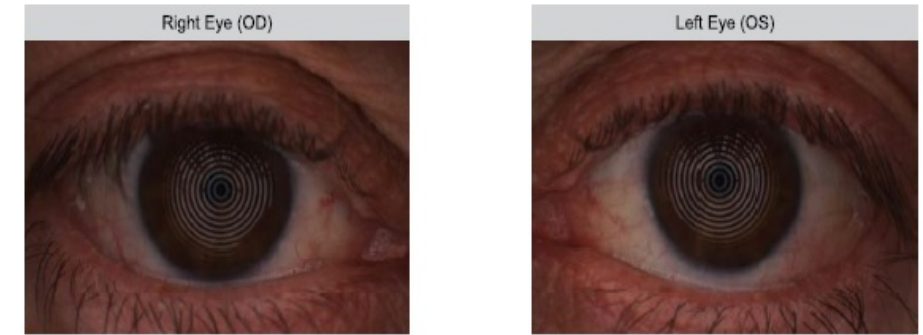
Oculus Keratograph 5M Non-Invasive Technology - Observe, Document & Grade Staining Patterns

DRY EYE REPORT

Summary of Findings
Easy to Understand



Cause	Toxic reaction to contact lens solution
Normal	Up to Grade 1
Advice	Stain with fluorescein, monitor with blue li...



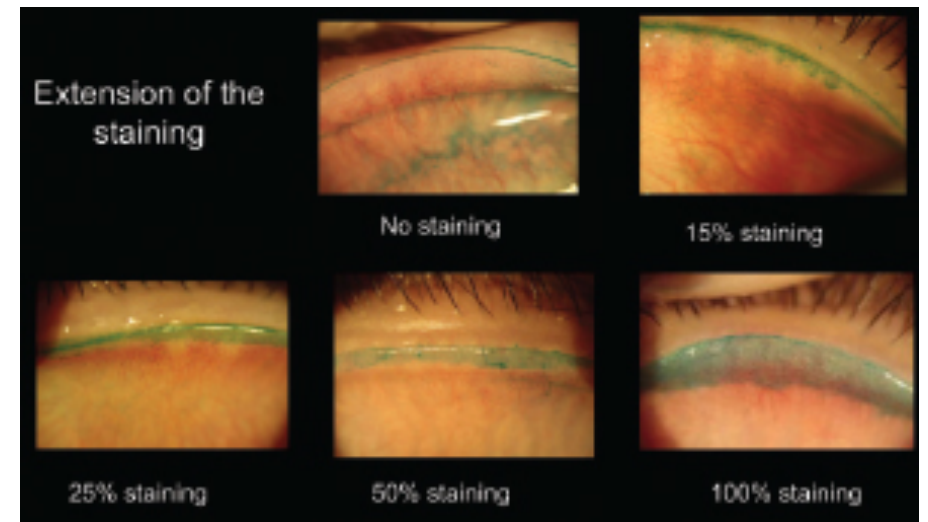
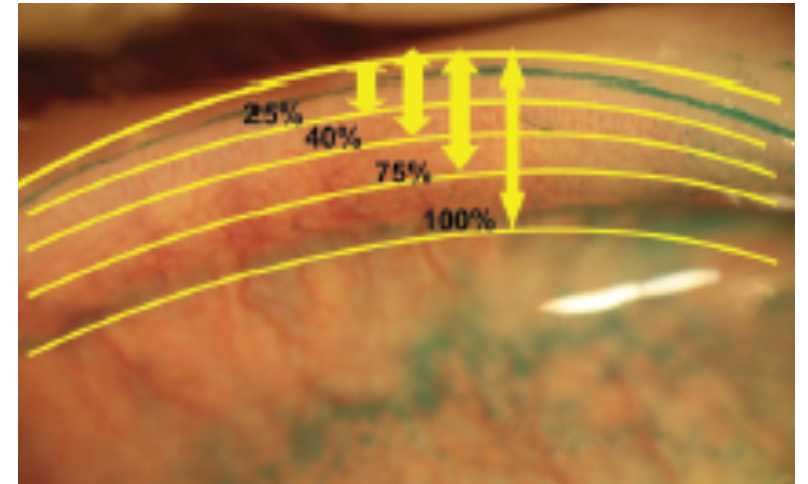
Lid Wiper Epitheliopathy

- 100 patients
- Two groups with or without dry eye symptoms
- TBUT > 10 seconds or more
- Schirmer > 10mm or more
- Absence of fluorescein corneal staining



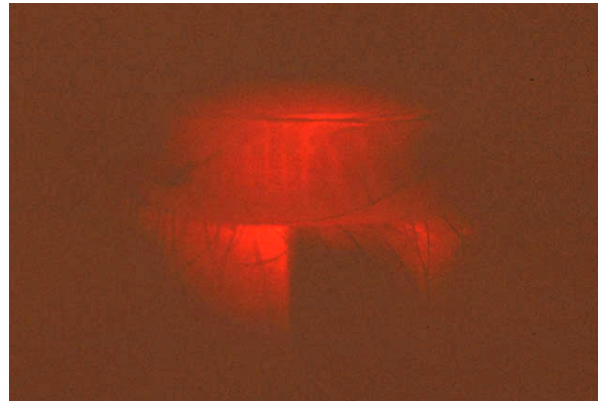
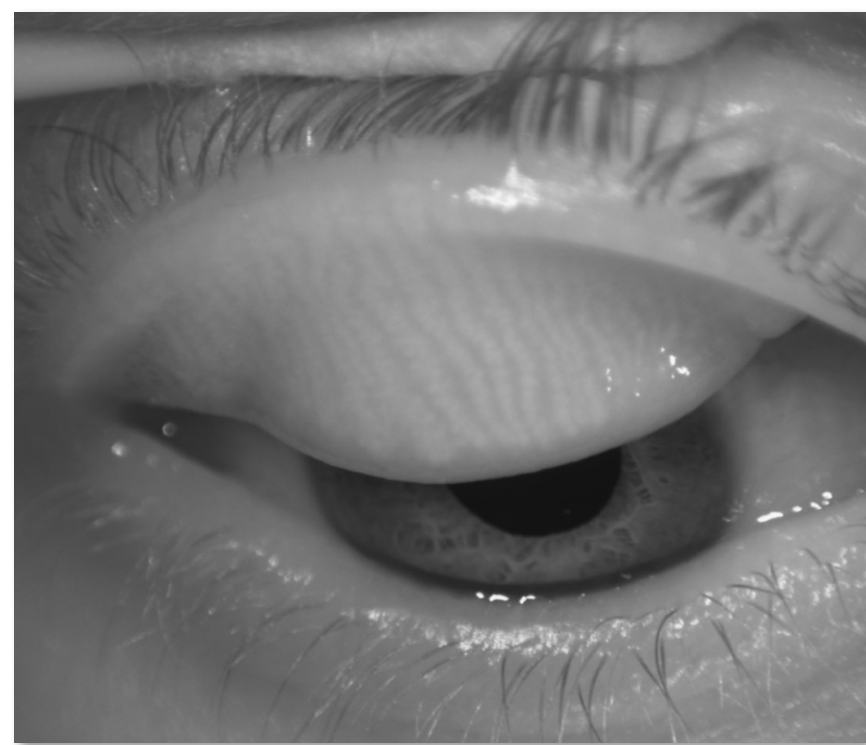
Lid Wiper Epitheliopathy

- Symptomatic patients
 - 76% staining of lid wiper
- Asymptomatic patients
 - 12% staining of lid wiper
- LWE frequent finding when symptoms of dry eye are experienced in absence of routine clinical dry eye findings



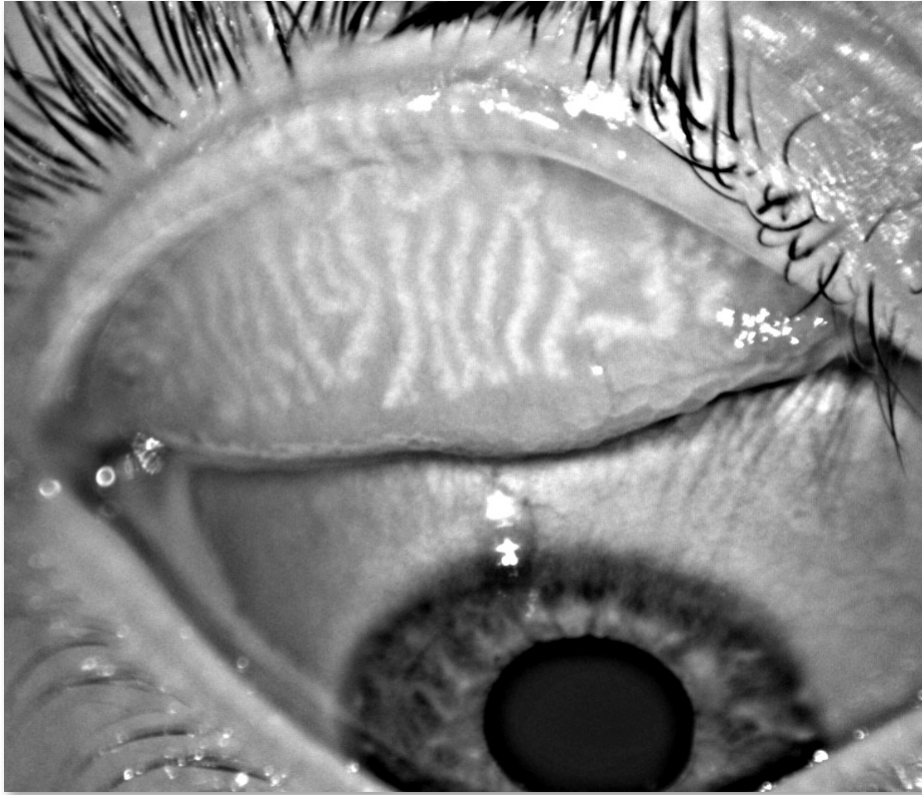
Meibomian Gland Evaluation

Normal Appearance



Meibomian Gland Evaluation

Incipient Dropout



Severe Dropout



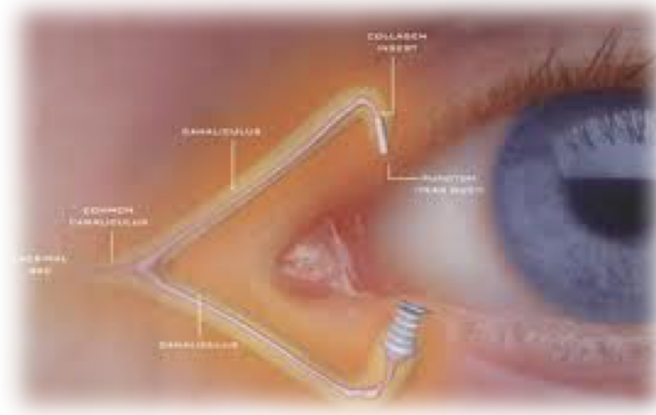
Dry Eye Treatment

- Artificial tears
- Restasis – Cyclosporine 0.05%
- Xiidra – Lifitegrast 5%
- Topical antibiotics
- Topical steroids
- Oral antibiotics – doxycycline, oracea
- Autologous serum eye drops



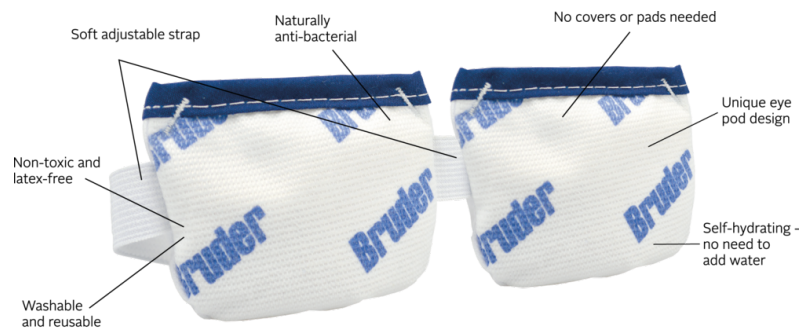
Dry Eye Treatment

- Punctal plugs
- Lacrisert
- LipiFlow
- BlephEx
- MeiBoFlo
- Moisture goggles
- Moisture sunglasses
- Liposome spray
- Homeopathic treatments
- TrueTear neurostimulation

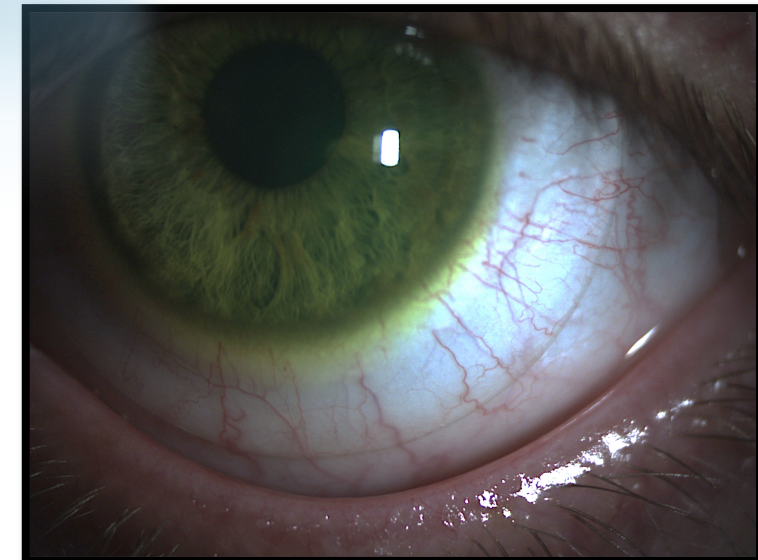


Dry Eye Treatment

- Scleral lenses
- Amniotic membranes
- Other treatments
 - Omegas
 - Systemic treatments
 - Environmental changes
 - Lifestyle changes



Item #34160
Bruder Moist Heat Eye Compress with MediBeads



- “Increasing appreciation that daily wear of a rigid gas permeable scleral lens may play an important role in the management of moderate to severe DED.”
- The use of scleral lenses for OSD is more widely reported in a variety of reviews.



TFOS DEWS II Management and Therapy Report



Lyndon Jones, FCOptom, PhD ^{a, l, *}, Laura E. Downie, BOptom, PhD ^b, Donald Korb, OD ^c, Jose M. Benitez-del-Castillo, MD, PhD ^d, Reza Dana, MD ^e, Sophie X. Deng, MD, PhD ^f, Pham N. Dong, MD ^g, Gerd Geerling, MD, FEBO ^h, Richard Yudi Hida, MD ⁱ, Yang Liu, MD ^j, Kyoung Yul Seo, MD, PhD ^k, Joseph Tauber, MD ^l, Tais H. Wakamatsu, MD, PhD ^m, Jianjiang Xu, MD, PhD ⁿ, James S. Wolffsohn, FCOptom, PhD ^o, Jennifer P. Craig, MCOptom, PhD ^p

Table 16
Staged management & treatment recommendations for dry eye disease^{a,b,c}.

- Step 1:**
- Education regarding the condition, its management, treatment and prognosis
 - Modification of local environment
 - Education regarding potential dietary modifications (including oral essential fatty acid supplementation)
 - Identification and potential modification/elimination of offending systemic and topical medications
 - Ocular lubricants of various types (if MGD is present, then consider lipid-containing supplements)
 - Lid hygiene and warm compresses of various types
- Step 2:**
If above options are inadequate consider:
- Non-preserved ocular lubricants to minimize preservative-induced toxicity
 - Tea tree oil treatment for Demodex (if present)
 - Tear conservation
 - Punctal occlusion
 - Moisture chamber spectacles/goggles
 - Overnight treatments (such as ointment or moisture chamber devices)
 - In-office, physical heating and expression of the meibomian glands (including device-assisted therapies, such as LipiFlow)
 - In-office intense pulsed light therapy for MGD
 - Prescription drugs to manage DED^d
 - Topical antibiotic or antibiotic/steroid combination applied to the lid margins for anterior blepharitis (if present)
 - Topical corticosteroid (limited-duration)
 - Topical secretagogues
 - Topical non-glucocorticoid immunomodulatory drugs (such as cyclosporine)
 - Topical LFA-1 antagonist drugs (such as lifitegrast)
 - Oral macrolide or tetracycline antibiotics
- Step 3:**
If above options are inadequate consider:
- Oral secretagogues
 - Autologous/allogenic serum eye drops
 - Therapeutic contact lens options
 - Soft bandage lenses
 - Rigid **scleral** lenses
- Step 4:**
If above options are inadequate consider:
- Topical corticosteroid for longer duration
 - Amniotic membrane grafts
 - Surgical punctal occlusion
 - Other surgical approaches (eg tarsorrhaphy, salivary gland transplantation)

- Clinical studies report success in the management of DED with scleral lenses, mini-scleral lenses and PROSE devices.

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TFOS DEWS II Management and Therapy Report

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Nicole

- 50 year old Caucasian female
- Interested in contact lenses for full time wear
- History of Sjögren's syndrome
- Dry mouth
- Ocular foreign body sensation
- Intermittent red eyes

Neurological problems,
concentration/memory-
loss (brain fog)

Dry nose, recurrent
sinusitis, nose bleeds

Dry mouth, mouth
sores, dental decay;
difficulty with chewing,
speech, taste and
dentures

Dry skin, vasculitis,
Raynaud's phenomenon

Stomach upset,
gastroparesis,
autoimmune pancreatitis

Peripheral neuropathy
(numbness and tingling
in the extremities)

Dry eyes, corneal
ulcerations, and
infections.

Difficulty swallowing,
heartburn, reflux
esophagitis

Recurrent bronchitis,
pneumonia, interstitial
lung disease

Arthritis, muscle pain

Abnormal liver function
tests, chronic active
autoimmune hepatitis,
primary biliary cirrhosis

Vaginal dryness,
painful intercourse



Large-scale Genome-Wide
Association Study (GWAS) study
3,334 Sjögren's patients
★ Non-Hodgkin lymphoma
occurs in 5-10% of primary
Sjögren's patients

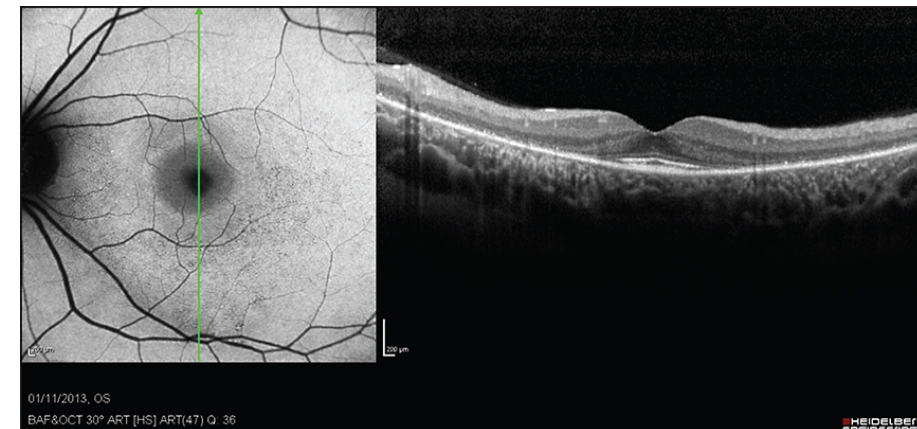
Nicole

- Wears glasses full time
- History of weekly replacement contact lens wear
- Discontinued contact lens wear due to dry eyes with contact lenses
- Budget analyst
- Computer and reading 8-10 hours / day

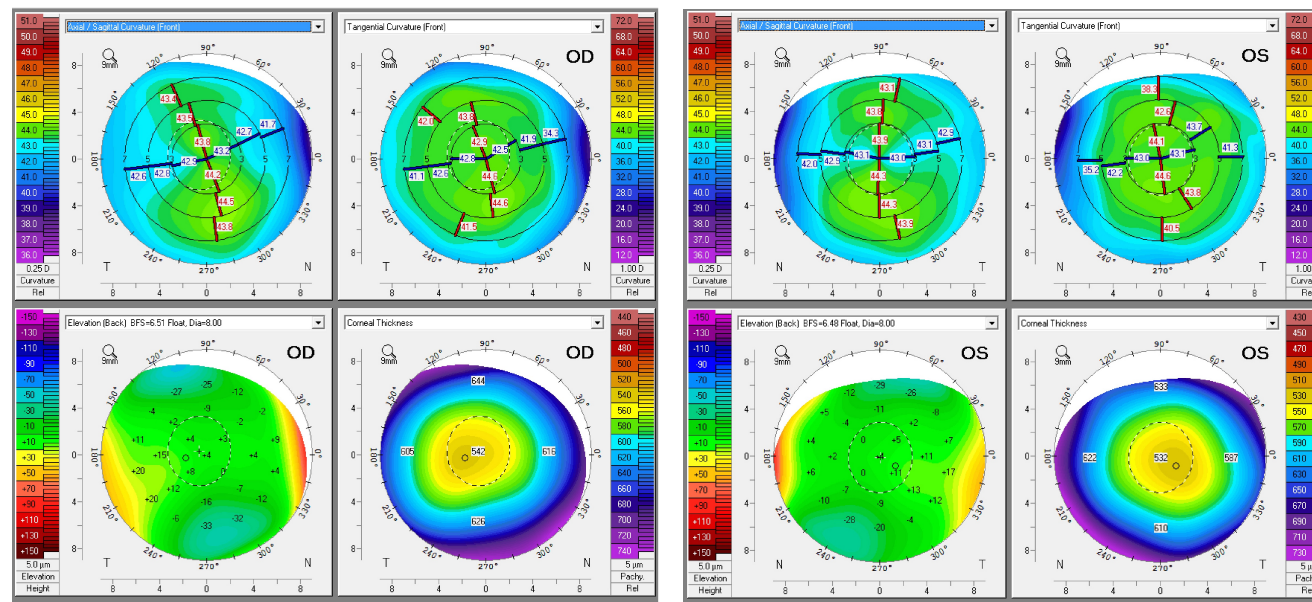
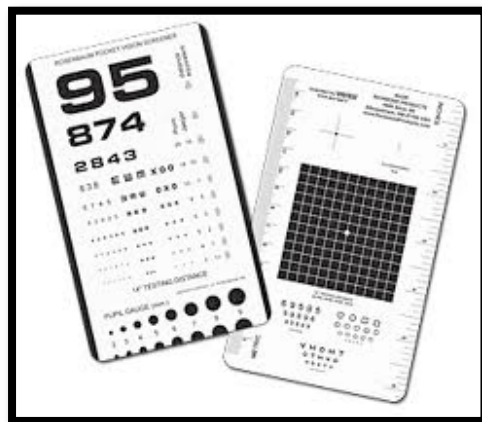


Nicole

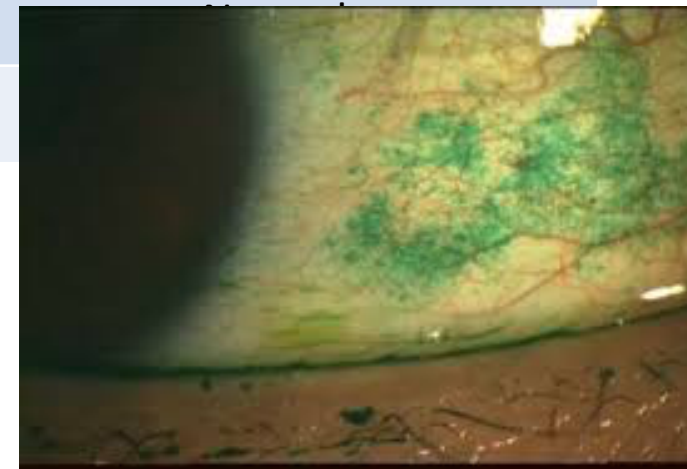
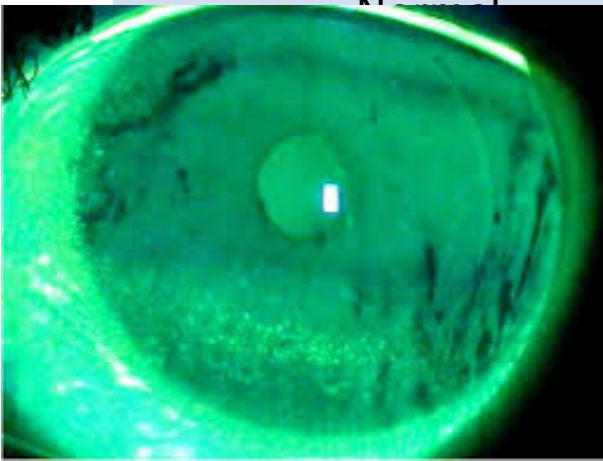
- Medical history
 - Sjögren's Syndrome
- Medications
 - Plaquenil 200 mg bid po
- Ocular history
 - Dry eyes
- Treatment
 - Cyclosporine 0.05% bid OU
 - Preservative free artificial tears PRN
 - Visine PRN
- Family history
 - Mother – rheumatoid arthritis



OD		OS
20/20	VA (glasses)	20/20-2
43.10 / 44.00 / 106	Pentacam Sim Ks	43.10 / 44.00 / 083
-4.75 20/20	Refraction	-5.50 20/20
542	Pachymetry	532
18 mmHg	IOP tonopen @ 3:42pm	18 mmHg



OD		OS
2+ mgd, irregular lid margins	L/L	2+ mgd, irregular lid margins
Trace hyperemia, 2+ NaF stain nasal and temp 1+ nasal and temp LG stain	Conj	Trace hyperemia, 3+ NaF stain nasal and temp 3+ nasal and temp LG stain
Trace inferior PEK Trace endopigment inferior paracentrally	Cornea	3+ inferior PEK at 6:00 and 3:00 Trace endopigment inferior paracentrally
Deep and Quiet	A/C	Deep and Quiet
Clear	Lens	Clear
0.15	C/D	0.15
Normal	Macula	Normal
	Peripheral Retina	



Treatment

- Sjögren's Syndrome Foundation information
- OCT of macula and 10-2 Humphrey visual field
- Continue Cyclosporine 0.05% bid OU
- Non-preserved artificial tears qid OU / PRN
- Lubricant ointment qhs OU / PRN
- Good water intake
- HydroEye Omega fatty acids
- Discussed Moisture goggles
- Avenova eyelid cleaner bid OU for two weeks, then daily OU
- Warm compresses (various options discussed)



OD	Scleral Lenses	OS
Clear distance and near vision	Vision Good	AWT 12 hours WTT 5 hours
Good	Comfort	Good
Scleral Aspheric Multifocal 41.00 / -2.00 / 16.4 / 9.2 Flattter PCs Sag 4.55	Parameters	Scleral Center Progressive Multifocal 42.00 / -3.25 / 16.4 / 9.2 Flatter PCs Sag 4.59
20/20-2 J2	VA Binoc 20/15+1 J1	20/20 J1
Plano	SOR	Plano
Good central apical clearance Good peripheral fit No blanching	Fit	Good central apical clearance Good peripheral fit No blanching

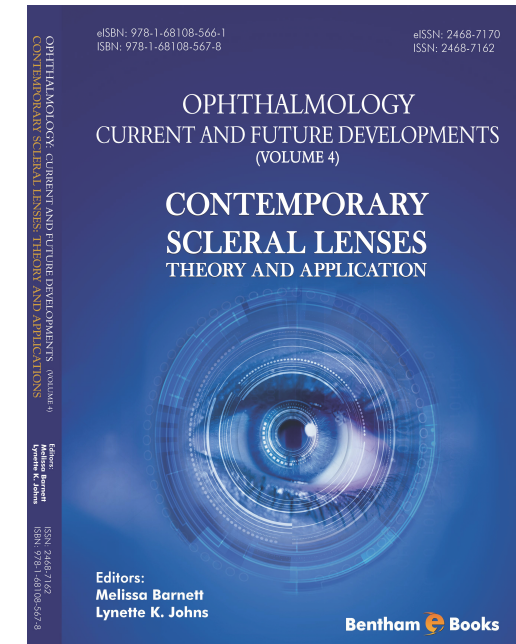
Scleral Lenses for the Regular / Normal / Non-Diseased Cornea

Langis Michaud*

École d'Optométrie, de l'Université de Montréal, Québec, Canada

Table 3. A summary of the wide range of multifocal scleral lenses that are available.

Type	Designs	Power Range	Add Range	Diameter	Base Curve
Acculens: Maxim, Comfort SL, Easy Fit	Center near Center distance	+20.00 to -20.00D cylinder to -6.00D	+1.00 to +3.50D	14.5 to 20.5 mm	Custom
Art Optical: Ampleye	Center near	Custom	+1.00 to +3.50D	16.5mm, 16.0mm, 17.0mm	6.04 to 8.44mm
Art Optical/Dakota Sciences: SO ₂ Clear	Center near	+20.00 to -20.00D in 0.25D steps	+1.00 to +3.50D in 0.25D steps	13-15mm	5.83-9.00mm
Advanced Vision Technologies: SST	Center distance	Custom	+1.00 to +3.00D	Custom	Custom
Blanchard: Onefit 2.0	Center near	+20.00 to -20.00D in 0.25D steps	Standard add of +2.25D	14.6-15.2mm	6.80-9.00mm
Essilor: Jupiter Plus	Center distance	+20.00 to -20.00D	Up to +1.75D	15-18.2mm	Custom
EyePrint Prosthetic	Center distance	Custom	Custom	Custom	Custom



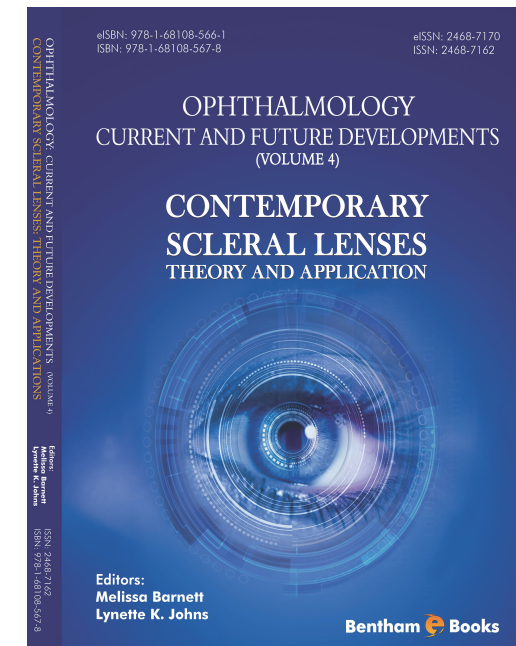
Scleral Lenses for the Regular / Normal / Non-Diseased Cornea

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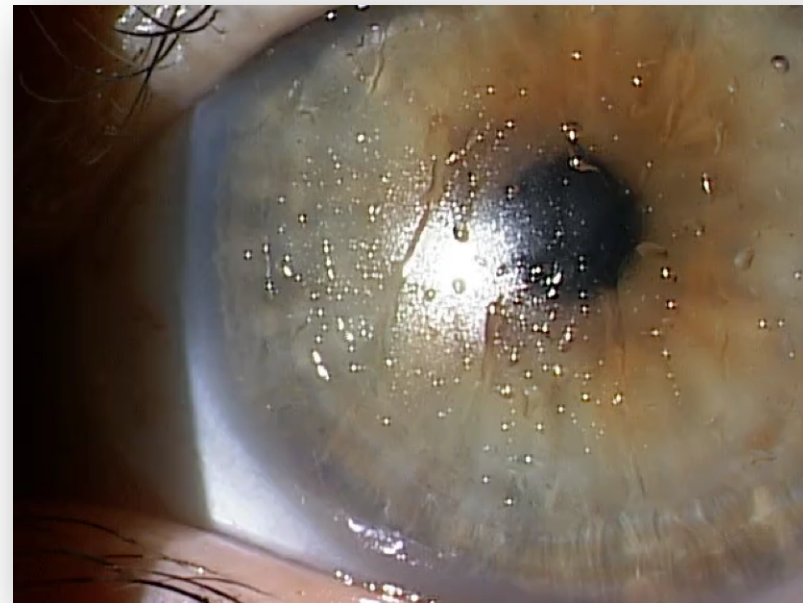
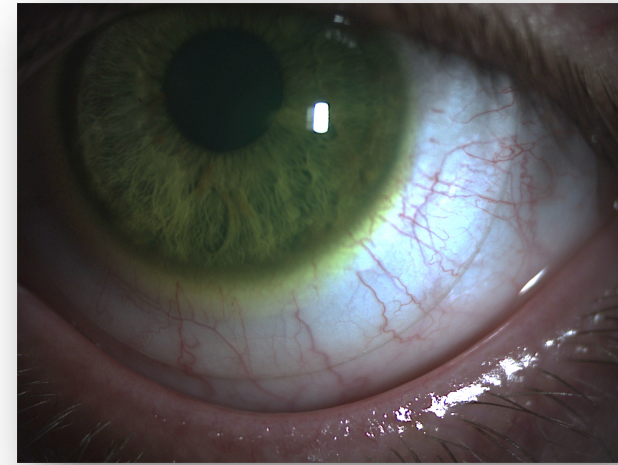
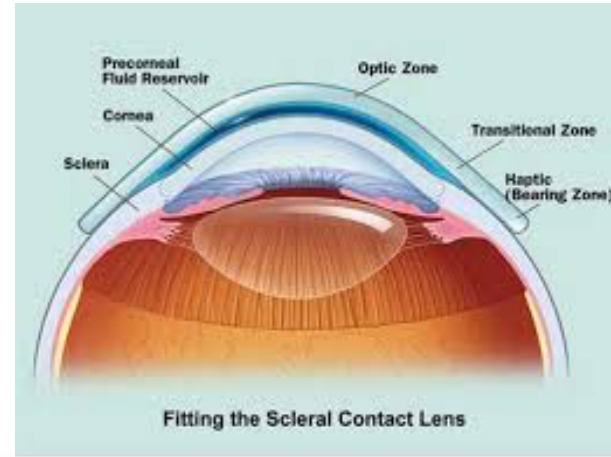
(Table 3) contd.....

Type	Designs	Power Range	Add Range	Diameter	Base Curve
Falco	Simultaneous or alternating	Custom	+0.12 to +5.00D	15-17.5mm	Custom
GP Specialists: iSight	Center near or center distance	+20.00 to -20.00D in 0.25D steps	+0.50 to +5.00D	14.2-24mm	Custom
Lens Dynamics: Dyna semi-scleral	Front aspheric	+12.00 to -20.00D	Up to +2.75D	13-16mm	5.50-8.50mm
Lens Dynamics: Dyna scleral	Front aspheric	+12.00 to -20.00D	Up to +2.75D	16.1-19mm	7.00-9.50mm
Metro Optics: InSight scleral	Center distance	Custom Cyl to 8.00D	Custom	15.2-20mm	Custom
Northern: semi-scleral	Center near for hyperopes and center distance for myopes	Custom	Up to +5.00D	14mm – 18mm	Custom
Procornea: Senso	Semi-scleral Center near or center distance	+20.00 to -25.00 in 0.25D steps	+1.00 to +2.50D in 0.50D steps	13-15mm in 0.2mm steps	6.50-9.80mm in 0.05mm steps
TruForm Optics: DigiForm	Center near	+30.00 to -30.00D	Up to +3.50D in 0.25D steps	15.0 – 18mm	Custom
Valley Contax: Custom Stable Aurora	Center near	+30.00 to -30.00D	+1.00 to +3.50D	14.8-17.8mm	Custom
Visionary Optics: Europa for Presbyopia	Center near	Custom	+1.00 to +3.50D	16.0-20.0 mm	Custom
Wave: Multifocal	Center near and center distance	+30.00 to -30.00D	Up to +5.00D	12.5-18.0mm	Custom
X-Cel Specialty Contacts: Atlantis Multifocal	Center distance	+20.00 to -20.00D	+0.75 to +4.00D	15.0 to 17.5mm	6.5 to 9.12mm



Debris and Dry Eye

Even in cases of severe dry eye, staining should be **LESS** after scleral lens wear.



Poor Surface Wettability

- Decreases vision
- Diminishes lens comfort
- Increases chair time
- Increases patient costs

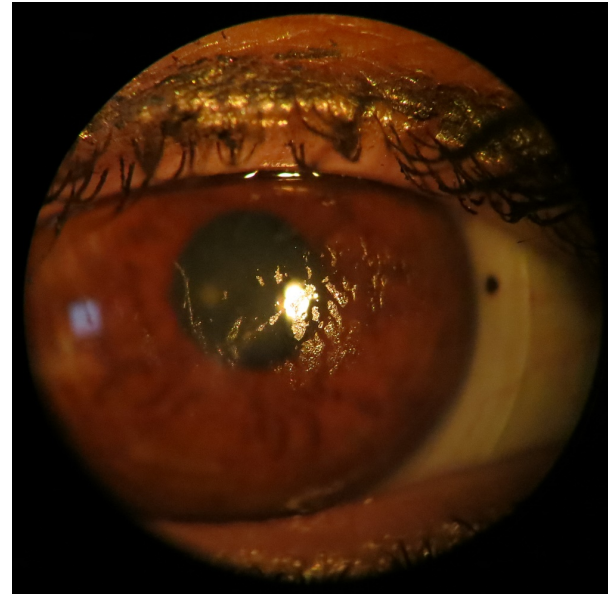
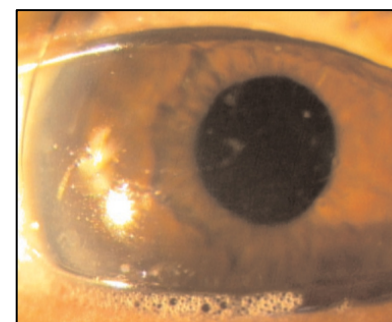
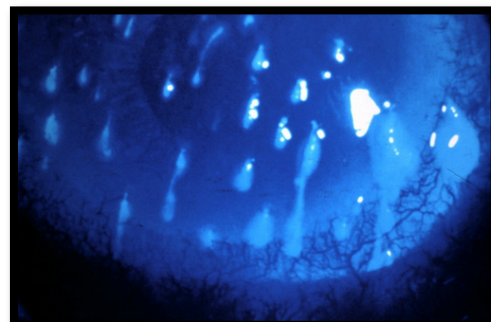
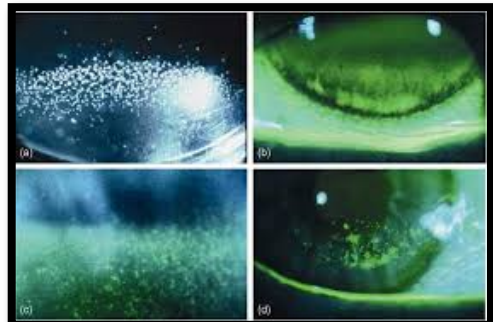


Photo Credit: Karen Lee, OD

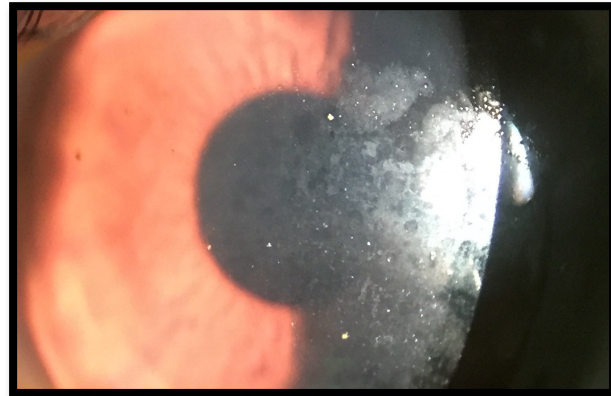
Patients at Risk

- Ocular surface disease
 - Ocular rosacea
 - MGD
 - Filamentary keratitis
- Excessive lipids in the tear film create a foggy, hydrophobic lens surface



Patients at Risk

- Exposure
 - Ptosis
 - Stroke / nerve palsy
 - Eyelid repair

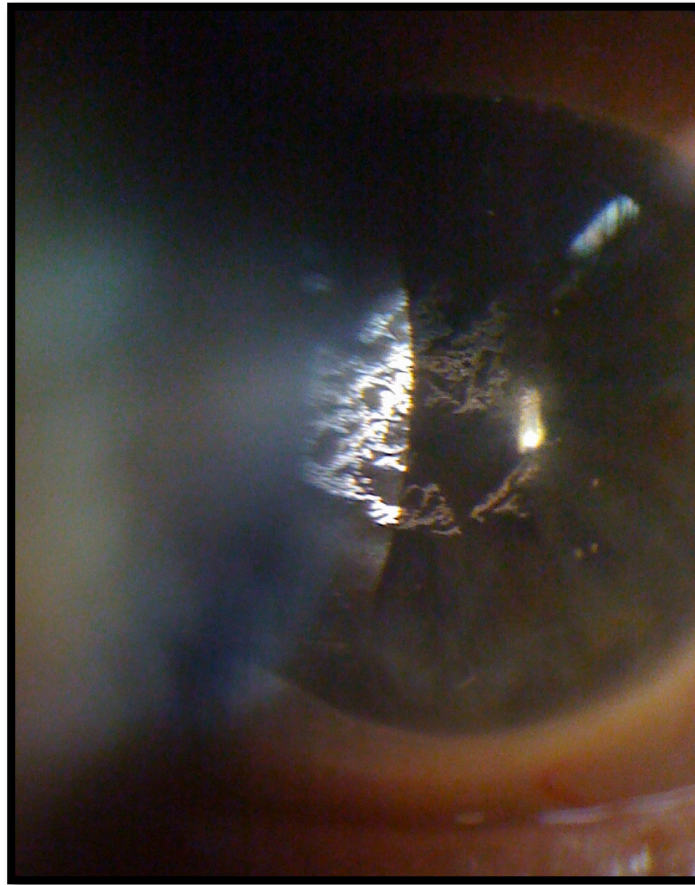


External Causes

- Poor plunger hygiene
- Makeup/Skincare regime (oil-based products)
- Hand soaps with moisturizing agents
- Older blocking compounds such as pitch
- Mechanical irritation
- Allergic or toxic reaction
- Manufacturing difficulty

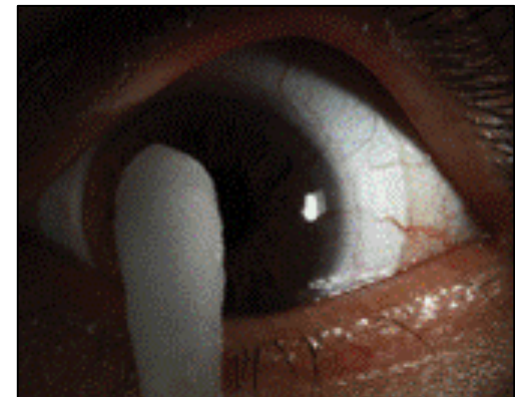


Preventing and Managing Poor Surface Wettability



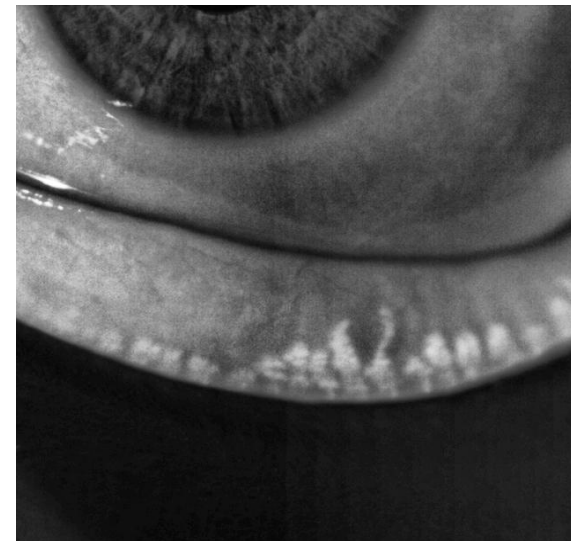
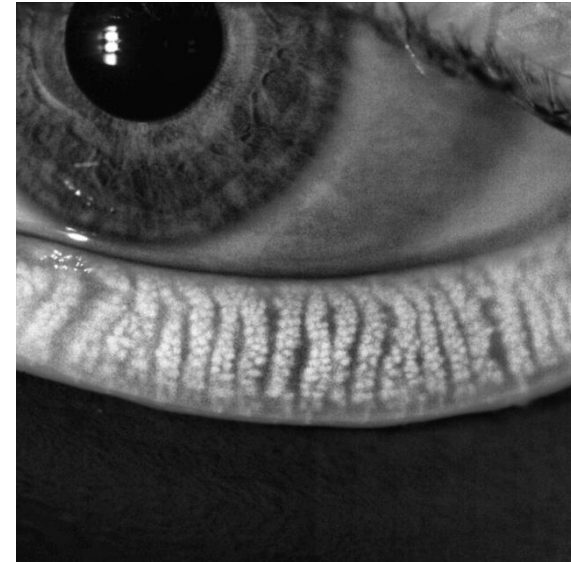
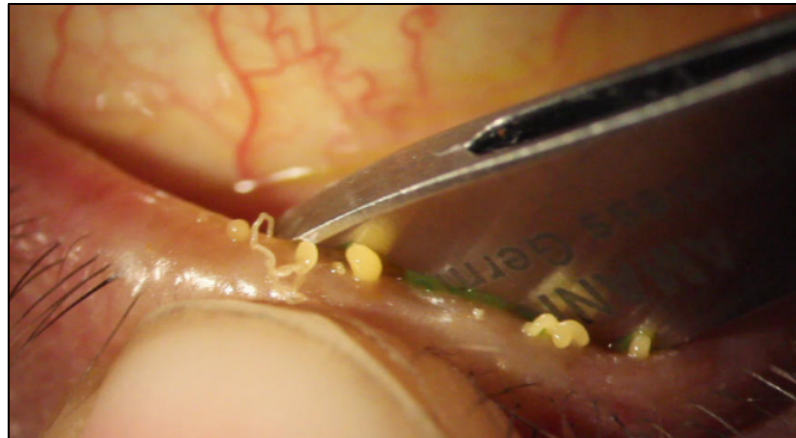
Treatment Strategies

- Increased lubrication with preservative-free artificial tears over the lens throughout the day
- Remove, manually clean, rinse and reapply
- Squeegee technique
- On-eye surface cleaning using a saline moistened cotton swab or eye shadow applicator
- Polish front surface of lenses BUT remove plasma surface



First and Foremost

- Treat and manage ocular surface disease!
- Lipids and mucins are attracted to hydrophobic GP material
- Re-evaluate care and handling of lenses
- Evaluate and treat GPC
- Change lens material
- Punctal occlusion



Prevention Through Education

- Wash hands before handling contact lenses
- Ask patients about hand soap
 - Hand soaps
 - Mild, basic hand soaps
 - Contact lens handsoap
 - Acne treatment hand soaps
- Ask patients about face and eye creams



Prevention Through Education

- Do not apply oil-based moisturizers to the eyelids
- Do not apply any makeup to the inside area of the eyelid margin (waterline) or meibomian gland orifices
- Increases risk for mgd and gland obstruction over time
- Apply creams and makeup after lens insertion
- Remove contact lenses, then remove makeup



Image O'Dell, Sullivan, Perriman
AOC January 2017

TOP 10 OCULAR SURFACE-OFFENDING INGREDIENTS



1. BENZALKONIUM CHLORIDE (BAK)
2. ALCOHOL
3. RETINOL
4. PARABENS
5. ISOPROPYL CLOPROSTENATE
6. FORMALDEHYDE & FORMALDEHYDE DONORS
7. PHENOXYETHANOL
8. BUTYLENE GLYCOL
9. ETHYLENEDIAMINETETRAACETIC ACID (EDTA)
10. ARGIRELINE (ACETYL HEXAPEPTIDE-3, LIPOTEC)

TOP 10 OCULAR SURFACE BEAUTY BLUNDERS

1. WATERPROOF EYE MAKEUP
2. EYELID TATTOOING
3. EYELASH EXTENSIONS
4. EYELASH TINTING
5. OTC EYELASH GROWTH SERUMS
6. BOTOX-IN-A-JAR
7. BOTOX FOR CROW'S FEET
8. RETIN-A
9. LOOSE EYESHADOW OR GLITTER
10. SHARING MAKEUP



Prevention Through Patient Education

- Use eyeliner pencils – sharpen them before every application
- Replace moist cosmetics (mascara) monthly
- Remove makeup daily
- Never use facial cleansers or hand soap to remove eye makeup
- Clean eye makeup brushes regularly

Solutions

- Change to peroxide based solutions
- Consider enzymatic cleaner / Menicon Progent
- If deposit-prone, alternate a daily GP lens cleaner with an extra strength or an alcohol-based daily cleaner



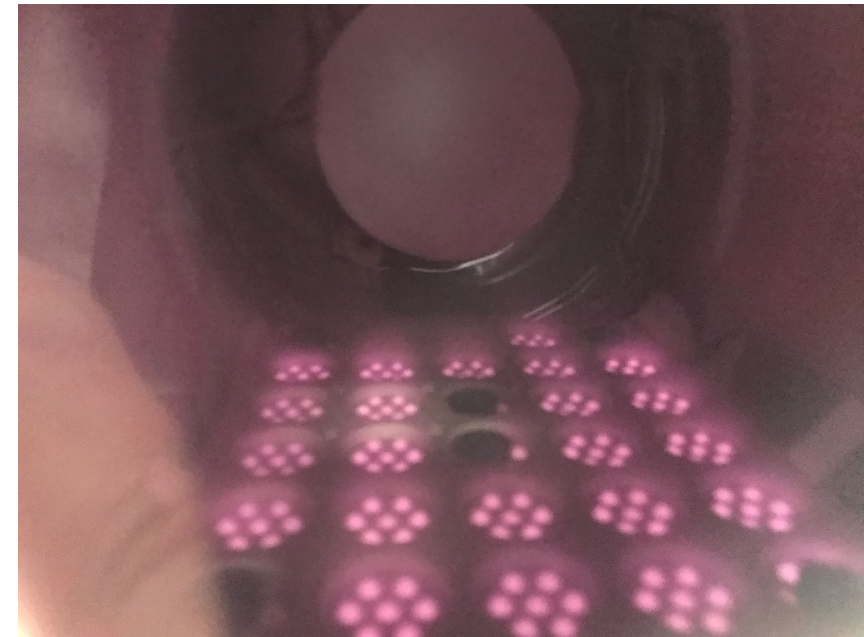
Application Solutions

Application Solutions			
0.9% sodium chloride inhalation solution	<u>LacriPure (Menicon)</u>	<u>ScleralFil (Bausch+Lomb)</u>	<u>Purilens Plus (Purilens)</u>
No buffers, no preservatives	No buffers, no preservatives	Contains buffers, no preservatives	Contains buffers
Off label	FDA approved	FDA approved	FDA approved
3ml or 5ml vials	5 ml vials	10 ml vials	4ml ounce bottle
Box of 100 vials	Box of 98 vials	Box of 30 vials	Bottle replaced every 15 days



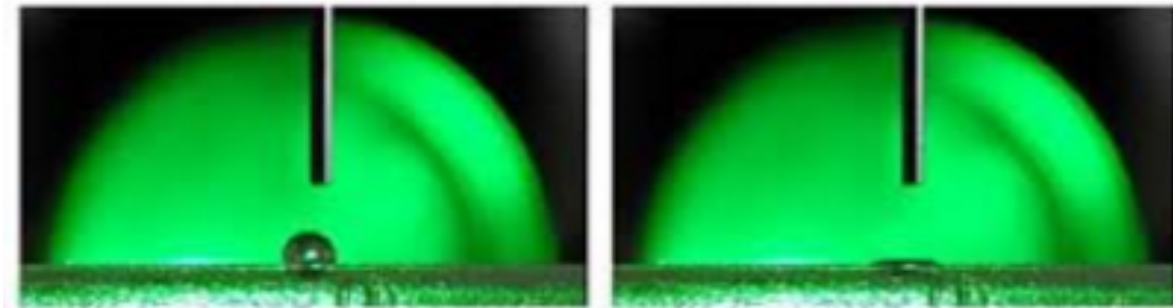
Plasma treatment

- Finished lens bombarded with high-energy radio waves in an oxygen-rich environment
- Hydrophobic surfaces become more hydrophilic
- Exotic oxygen radicals strike the surface of the lens
 - Dislodges hydrocarbons such as oils
- Molecules on the surface of the lens are rearranged
 - Carbon migrates away from the surface
 - Oxygen and nitrogen migrate toward the surface
- The lens surface becomes ionized, increasing its ability to attract liquids



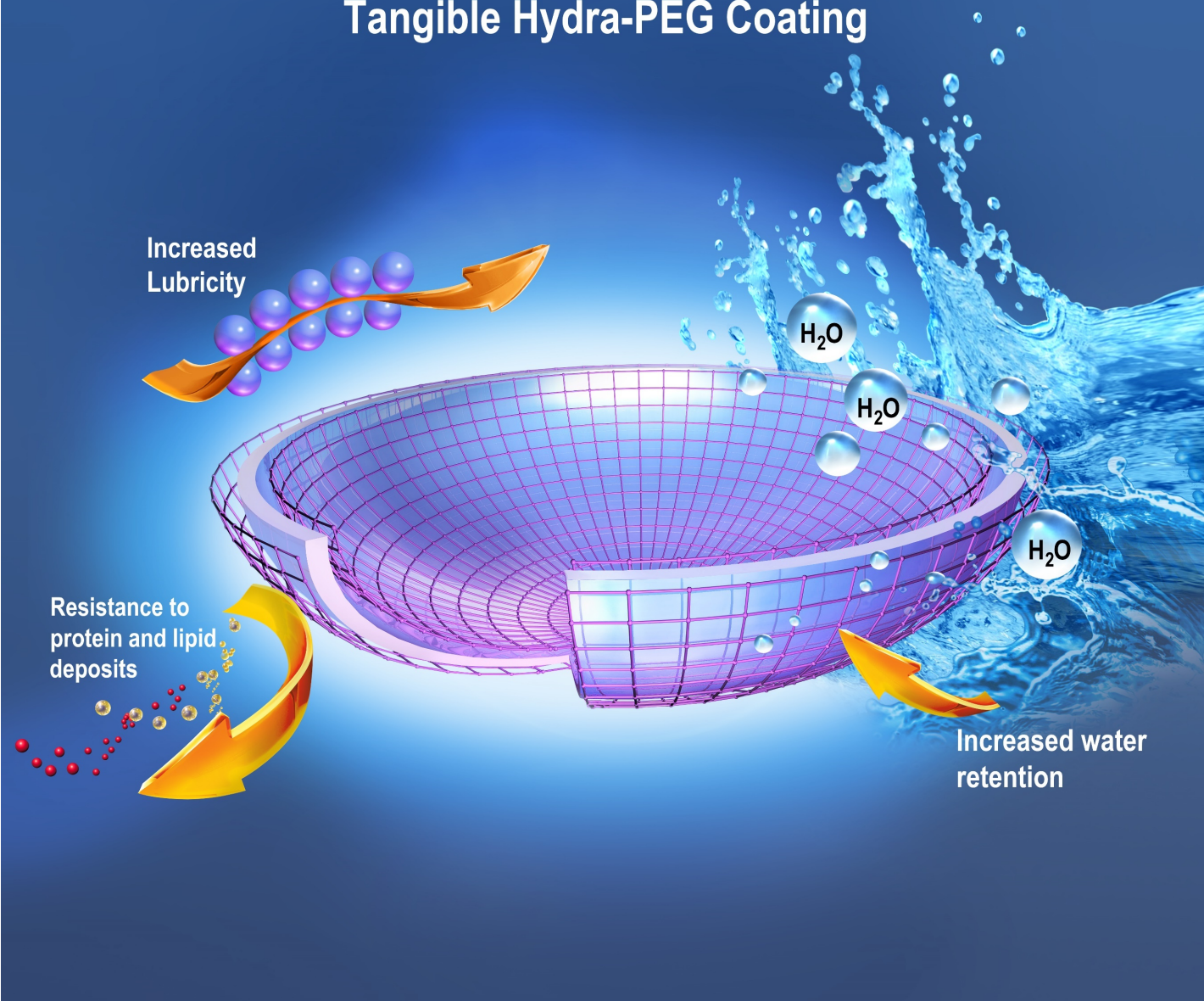
Plasma treatment

- Results in
 - Improved wetting angle
 - Improved surface tension
 - Fewer lipid, protein and bacteria deposits
- Improves surface wettability
- Less lens awareness
- Improved comfort
- Reduced fogging



Wetting angle before and after plasma treatment

Tangible Hydra-PEG Coating



**Polymer
encapsulates lens**

**Improves
wettability**

**Increases surface
water retention**

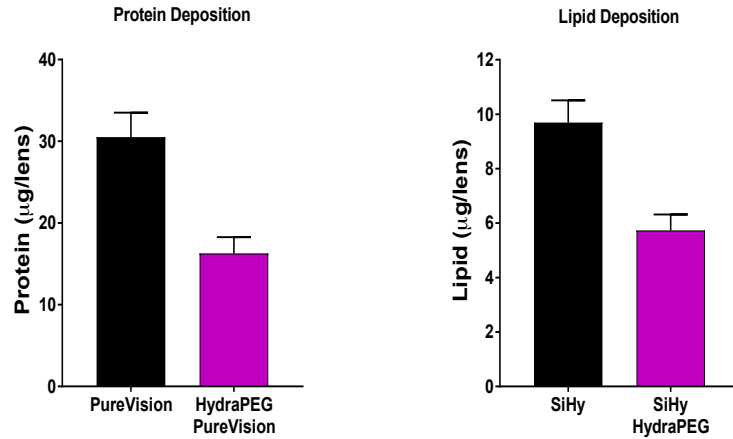
Increases lubricity

Reduces deposits

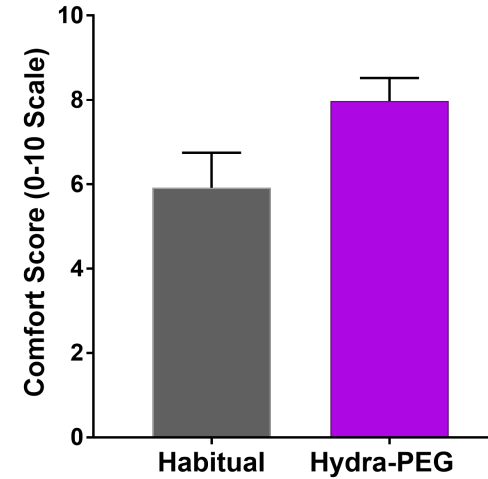
Scleral Lens Fogging and Comfort Study

- Dr. Maria Walker (Principal Investigator)
- 18 subjects
- 26 – 72 years old
- All habitual scleral lens wearers

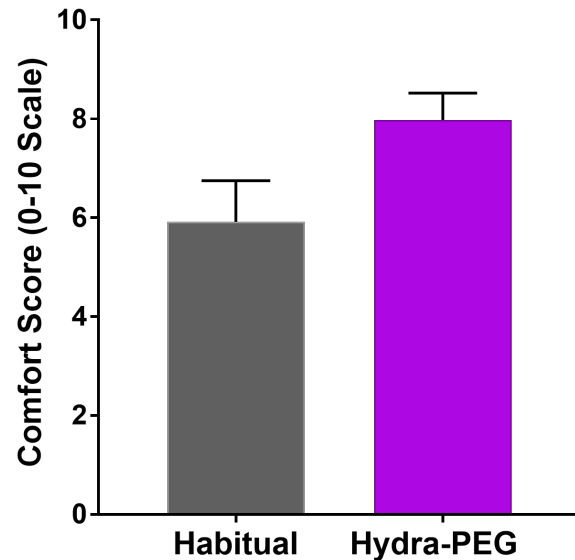
Protein and Lipid Deposition



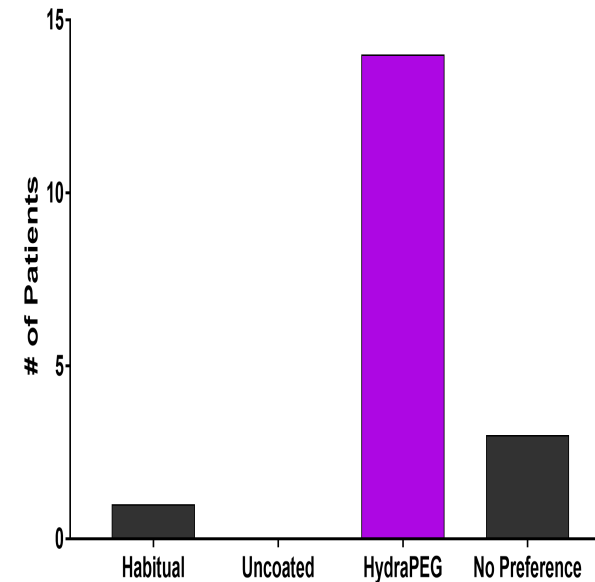
Hydra-PEG Improves End of Day Comfort



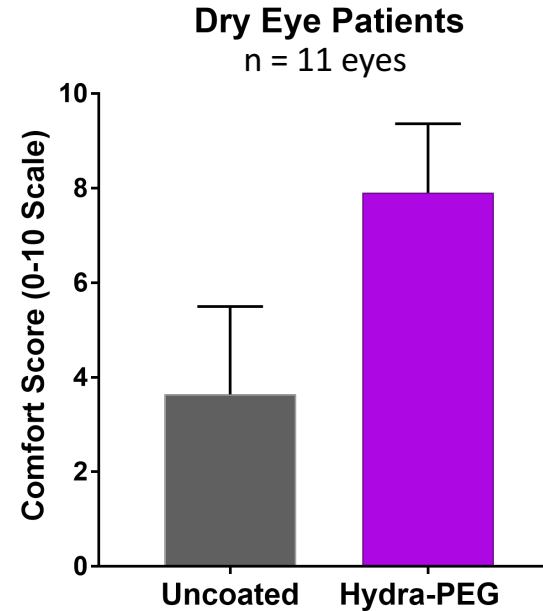
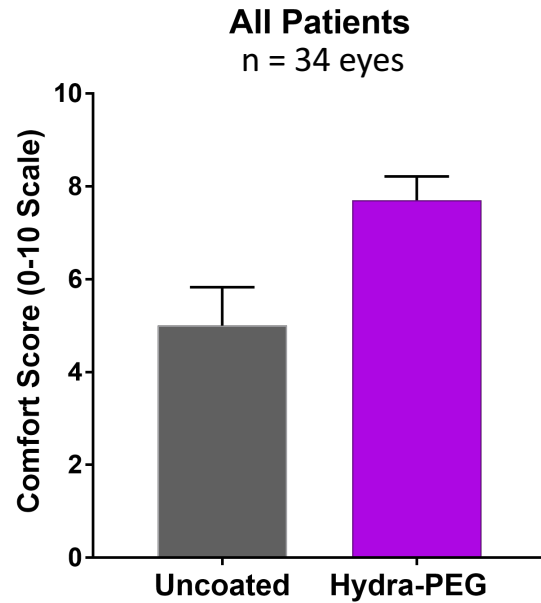
Scleral Lens Fogging and Comfort Study



Patients Prefer Hydra-PEG Lenses

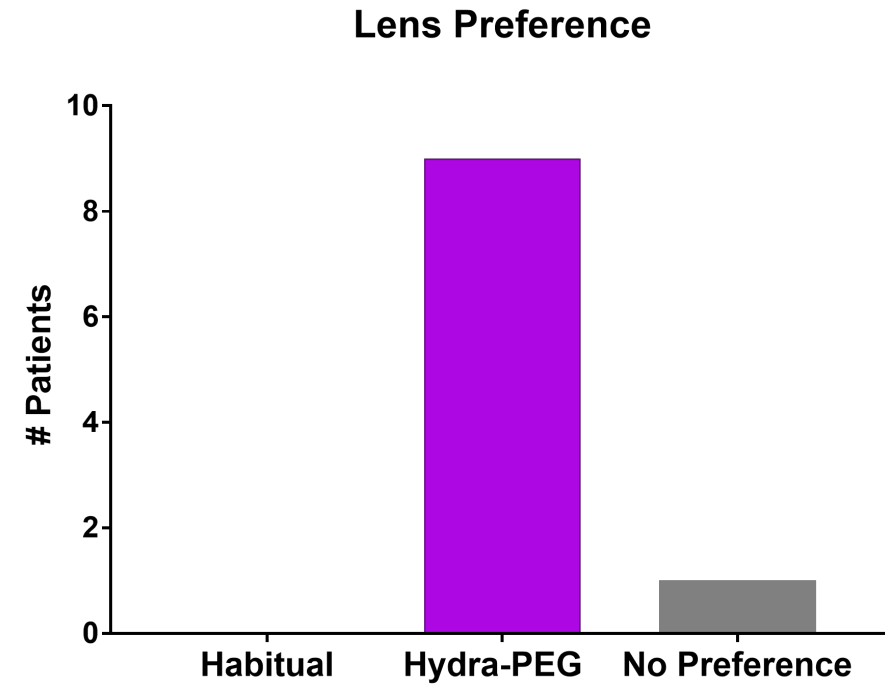
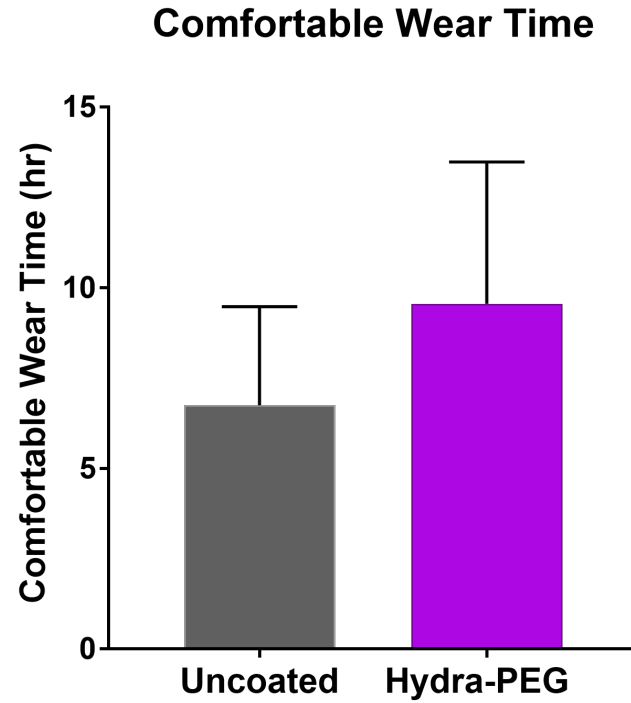


Partner Lab - End of Day Comfort Study



Falco Linsen, Switzerland

Partner Lab – Wear Time and Preference



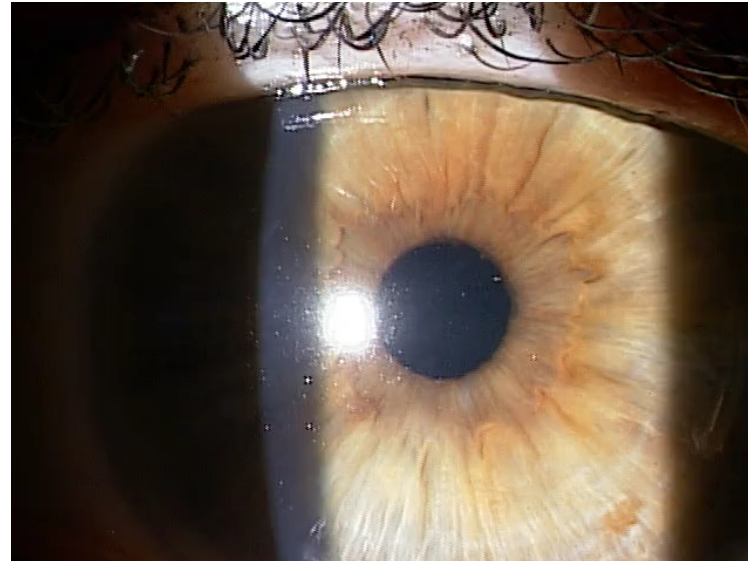
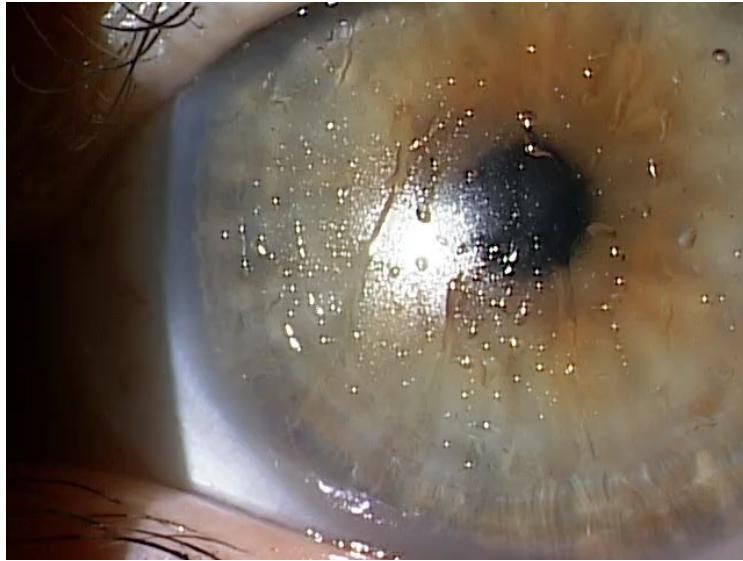


tangible™
HYDRA-PEG

Tangible™ Hydra-PEG Coating Resists Lens Deposits

All GP Scleral Lenses Dipped in Lipid/Dye Mixture

Which would you choose for your patient?



Tangible Hydra-PEG: Patient Education

- Educate patients that the Tangible Hydra-PEG surface will result in a more “slippery” lens
- May require a brief adjustment period for handling, inserting and removing the lens



Tangible Hydra-PEG: Patient Selection

- May be used by any patient
- No contraindications
- No need for fit changes
- Patients who may benefit the most:
 - Those experiencing dryness or discomfort associated with lens wear
 - Moderate to heavy depositors
 - Scleral lens wearers experiencing fogging

Compatible solutions with Tangible Hydra-PEG

- Multipurpose Solutions
 - Menicon Unique pH
 - Boston Simplus®
- Hydrogen Peroxide Solutions
 - Clear Care®
 - Clear Care® Plus with HydraGlyde®





Incompatible Solutions

- Tap water, abrasive or alcohol-based cleaners
- Abrasive Cleaners
 - Boston® Advance
- Alcohol Based Cleaners
 - Miraflo
- Others
 - Menicon Progent
 - Boston One Step Liquid Enzymatic Cleaner
 - Optimum by Lobob ESC Extra Strength Cleaner

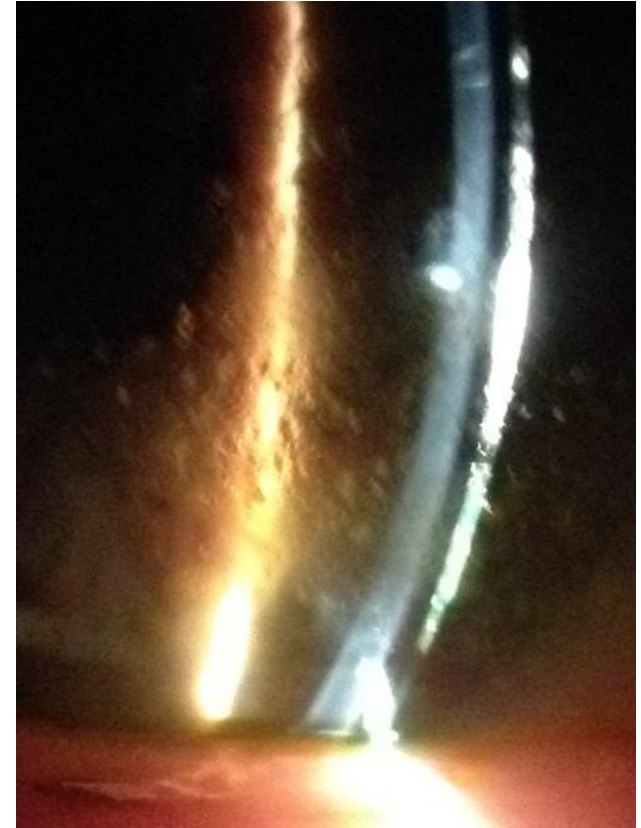


Tangible Hydra-PEG by the Numbers

- With proper care, coating lasts 12-18 months
- Hydra-PEG was launched in January 2017
 - 40,000 patients treated in 2017
 - Hydra-PEG coated lenses available from 23 global manufacturers
 - Price is minimal compared to price of lens



Before Hydra-PEG



Images Tom Arnold, OD

With Hydra-PEG

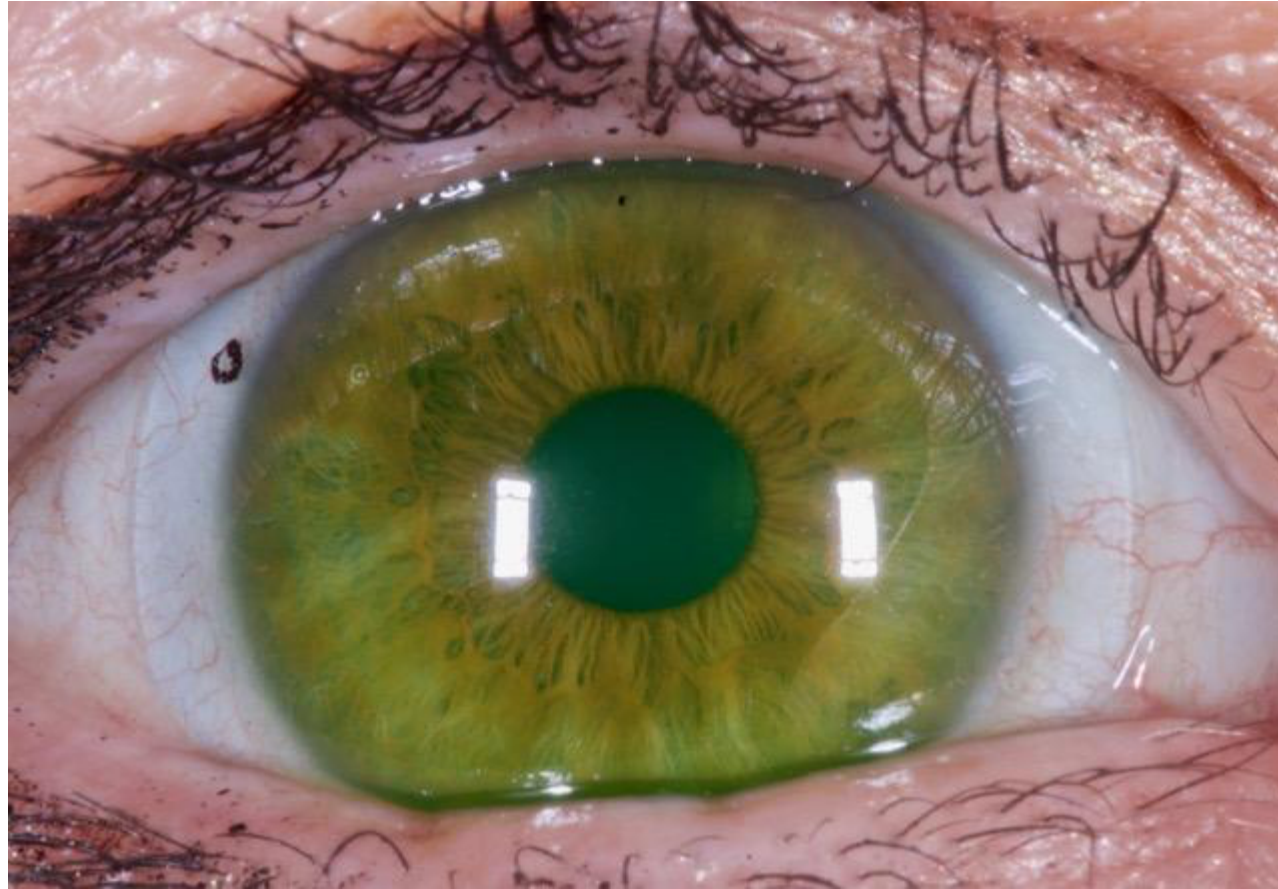
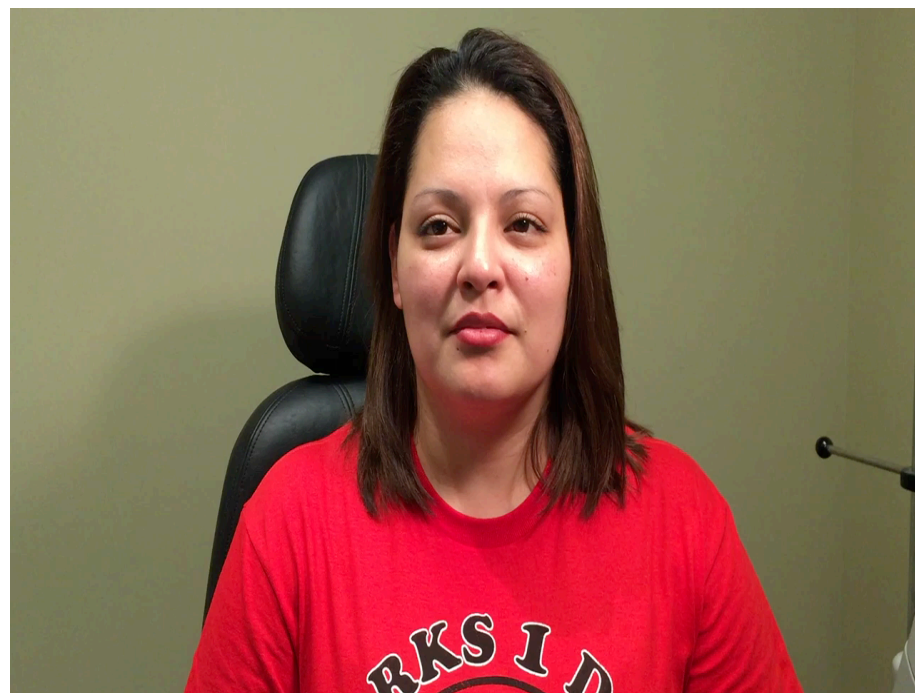


Image Tom Arnold, OD

Video Testimonials

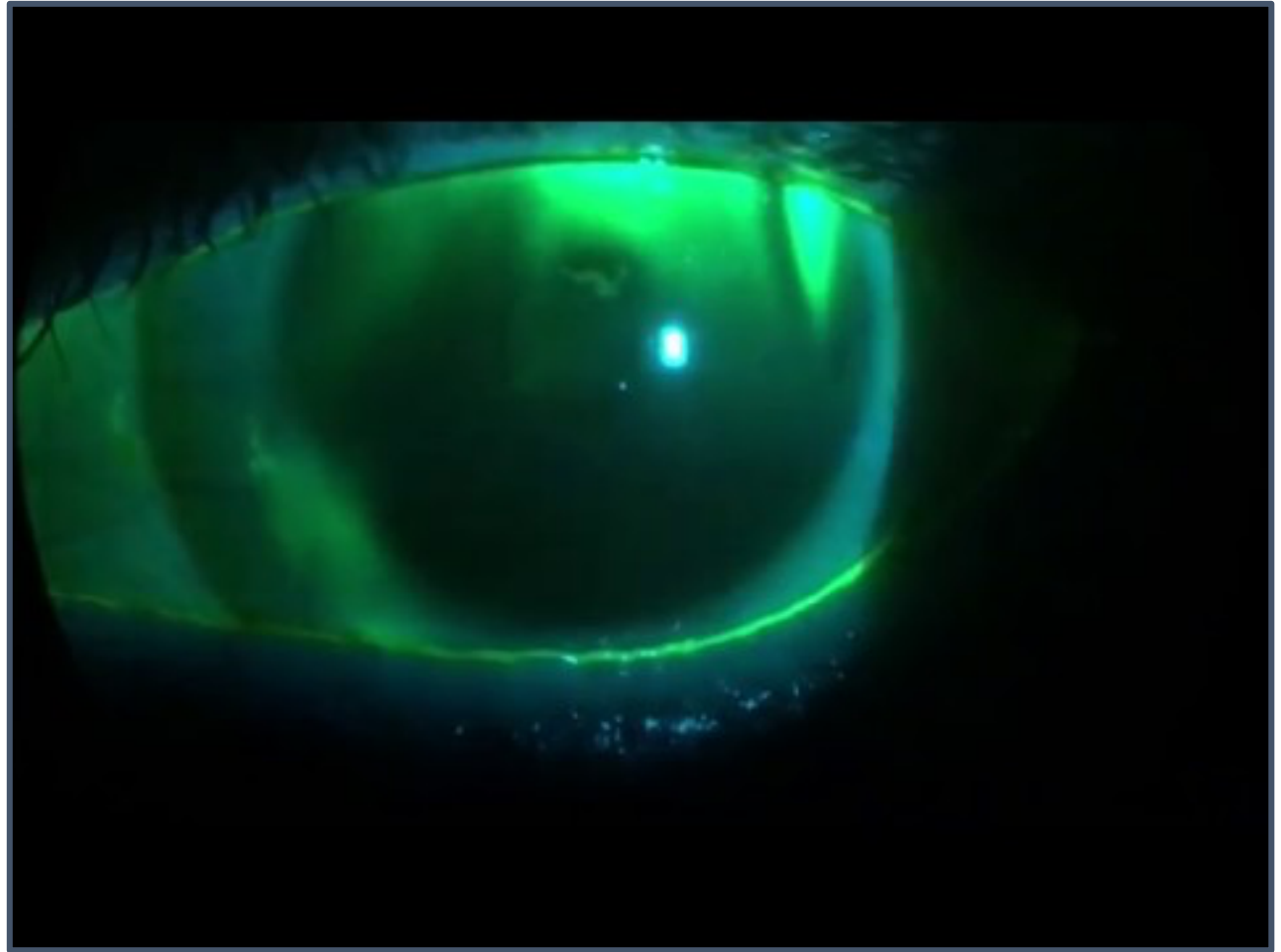
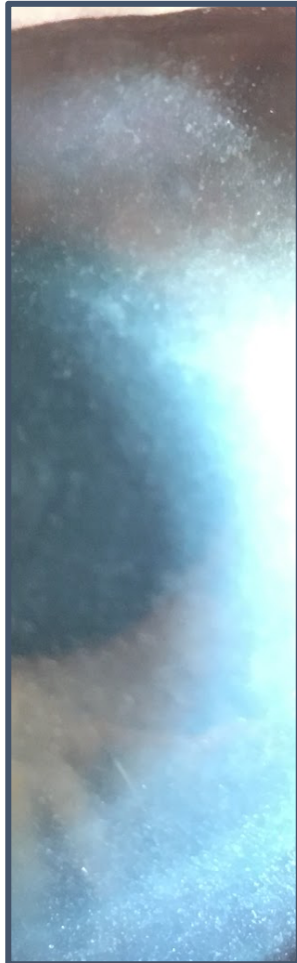


Video credit Tom Arnold



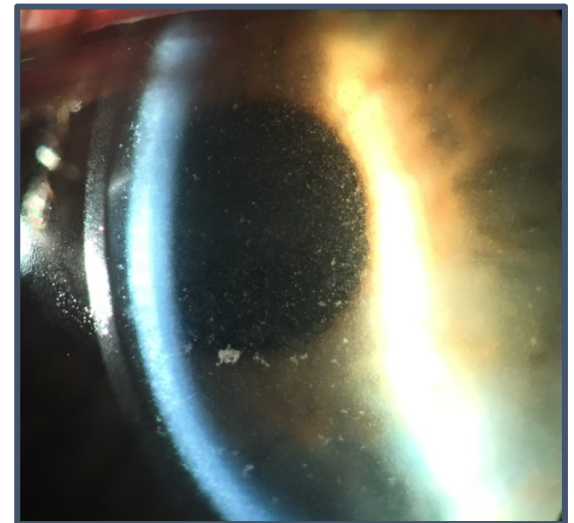
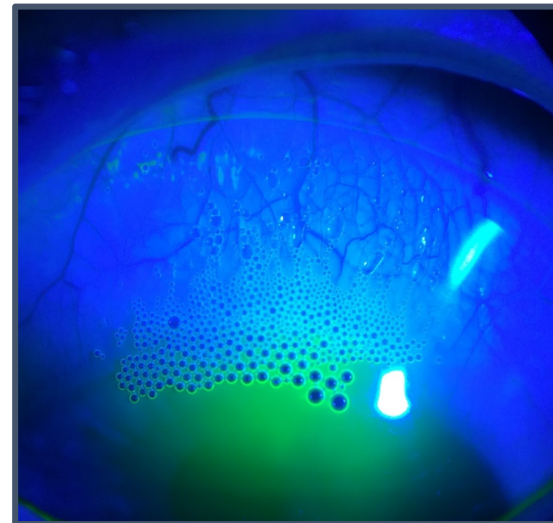
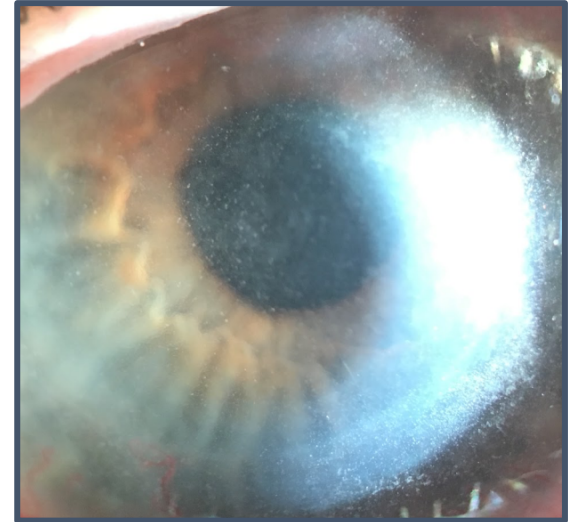
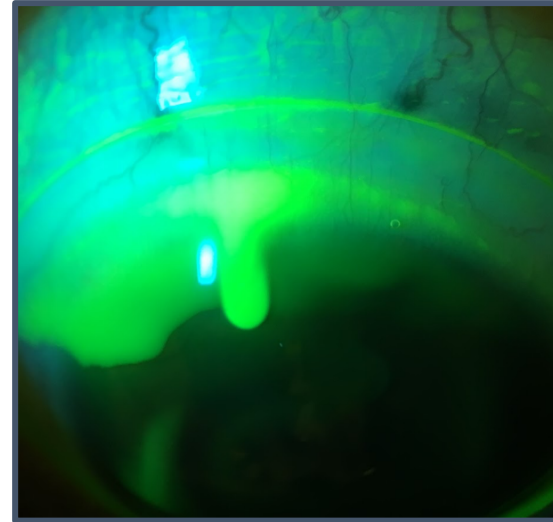
The Lens Haptic

- Tear exchange
 - Balance between healing and vision
 - Particulate build up under lens
 - Risk vs Benefit



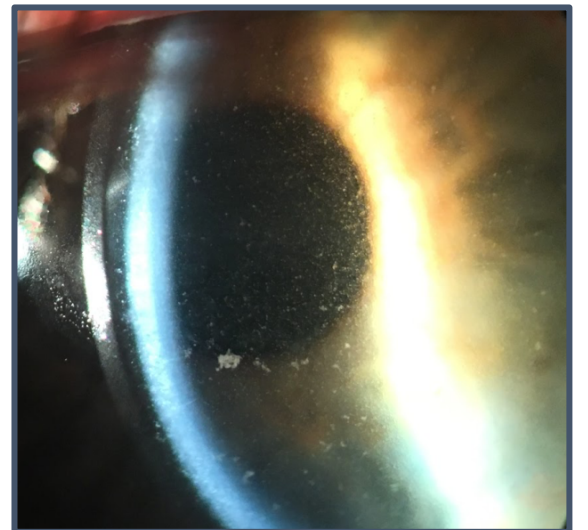
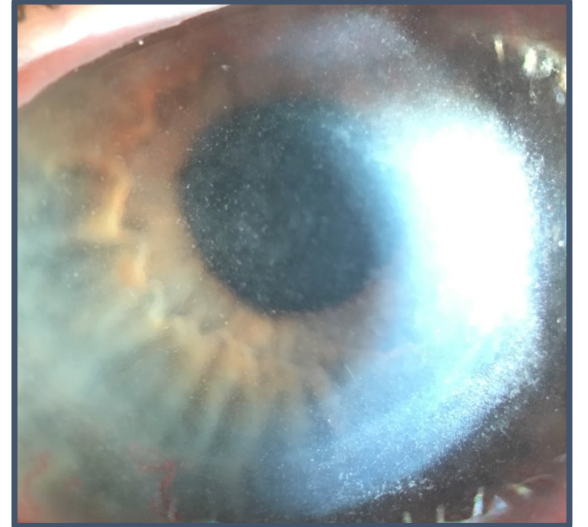
The Post Lens Tear Layer

- Chamber debris
 - Outside the Lens
 - “Frothing”
 - NaFL leakage
 - Immediate leakage
 - » Re-examine the haptic
 - Inside the Lens
 - Examine Limbal clearance
 - Understand the disease you are fitting



The Post Lens Tear Layer

- Patient complaints
 - Foggy vision
 - No flux with blink
 - Lens Awareness
 - Irritation later in wear time
 - Gradual decrease of vision
 - Particulate under lens
 - Irritation after lens removal



The Post Lens Tear Layer

- Insertion Fluid
 - With limited tear exchange
 - What's in the bowl is on the eye for the entire wear time
 - Non Preserved!
 - Non Buffer vs Buffer?



The Post Lens Tear Layer

- Insertion Fluid

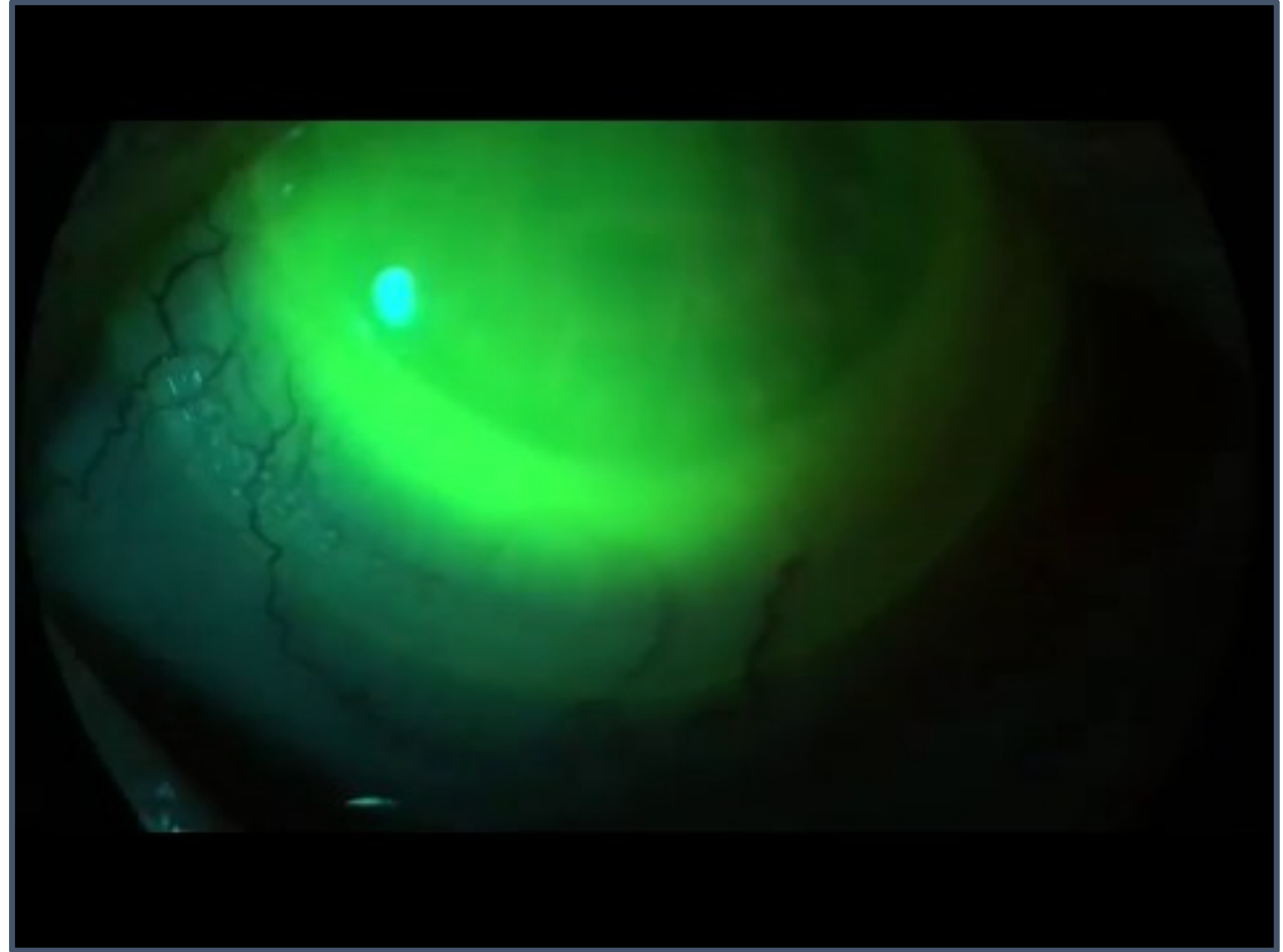
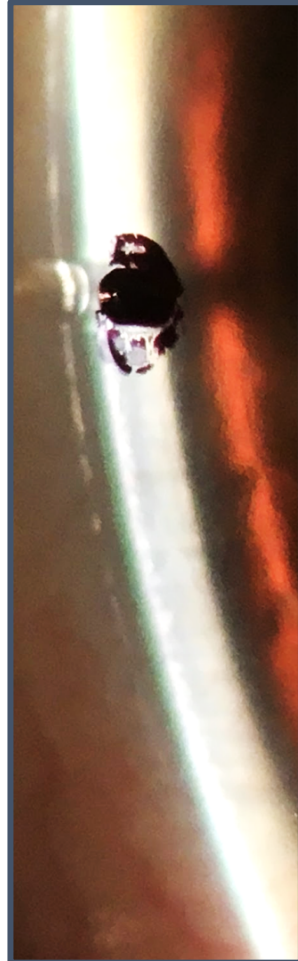
- Adjunctive fluids?

- Preservative free artificial tears
 - Autologous Serum
 - Antibiotics
 - What does the future hold
 - » Nutrient?
 - » Electrolyte rich?
 - » Oxygenated?



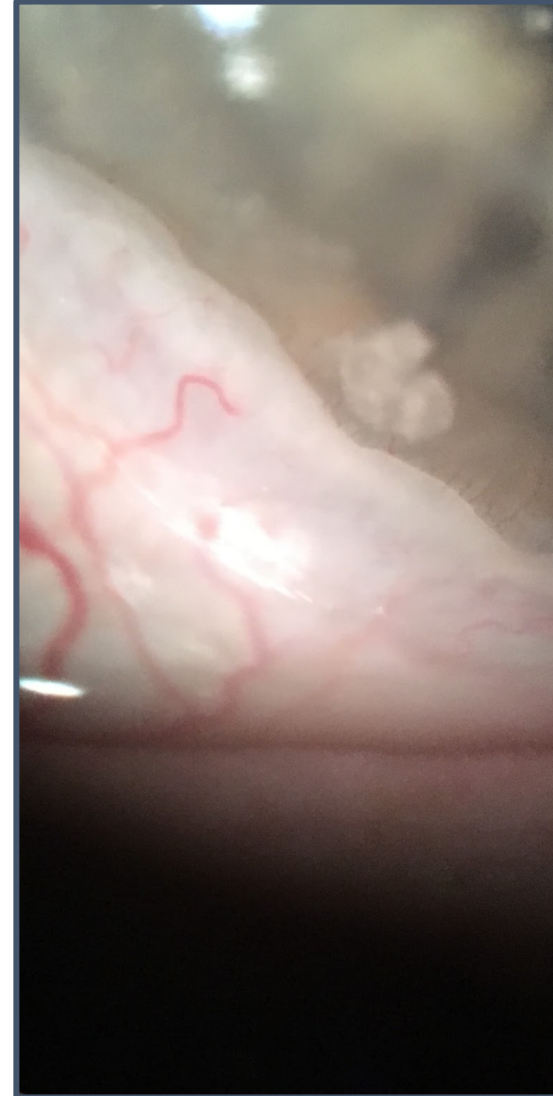
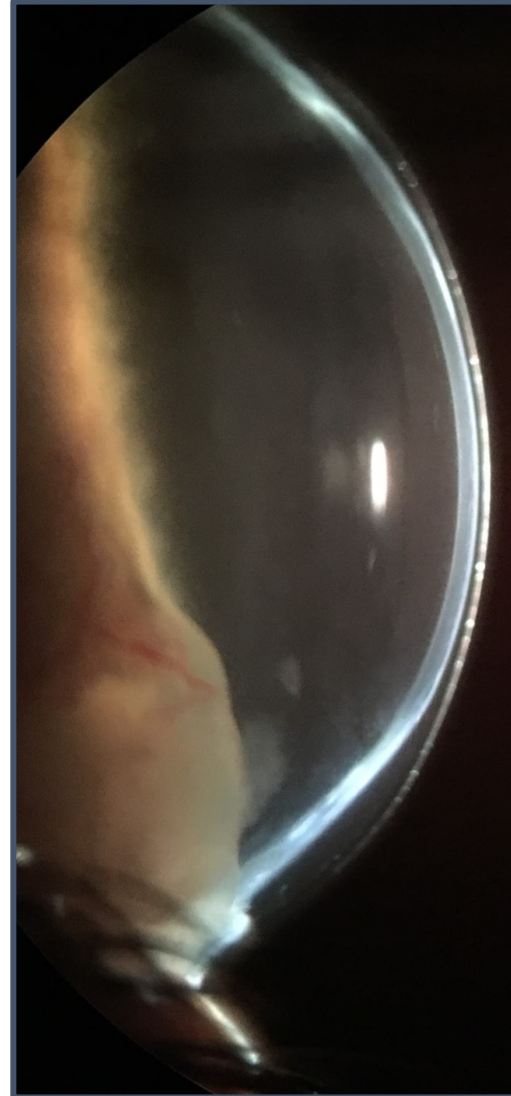
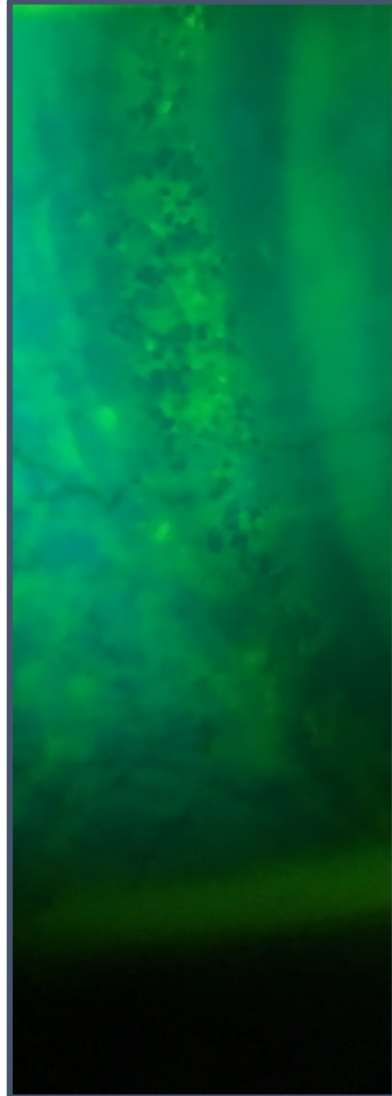
The Post Lens Tear Layer

- Corneal Clearance
 - Limbal Clearance
 - Goldie Locks
 - Enough but not too much



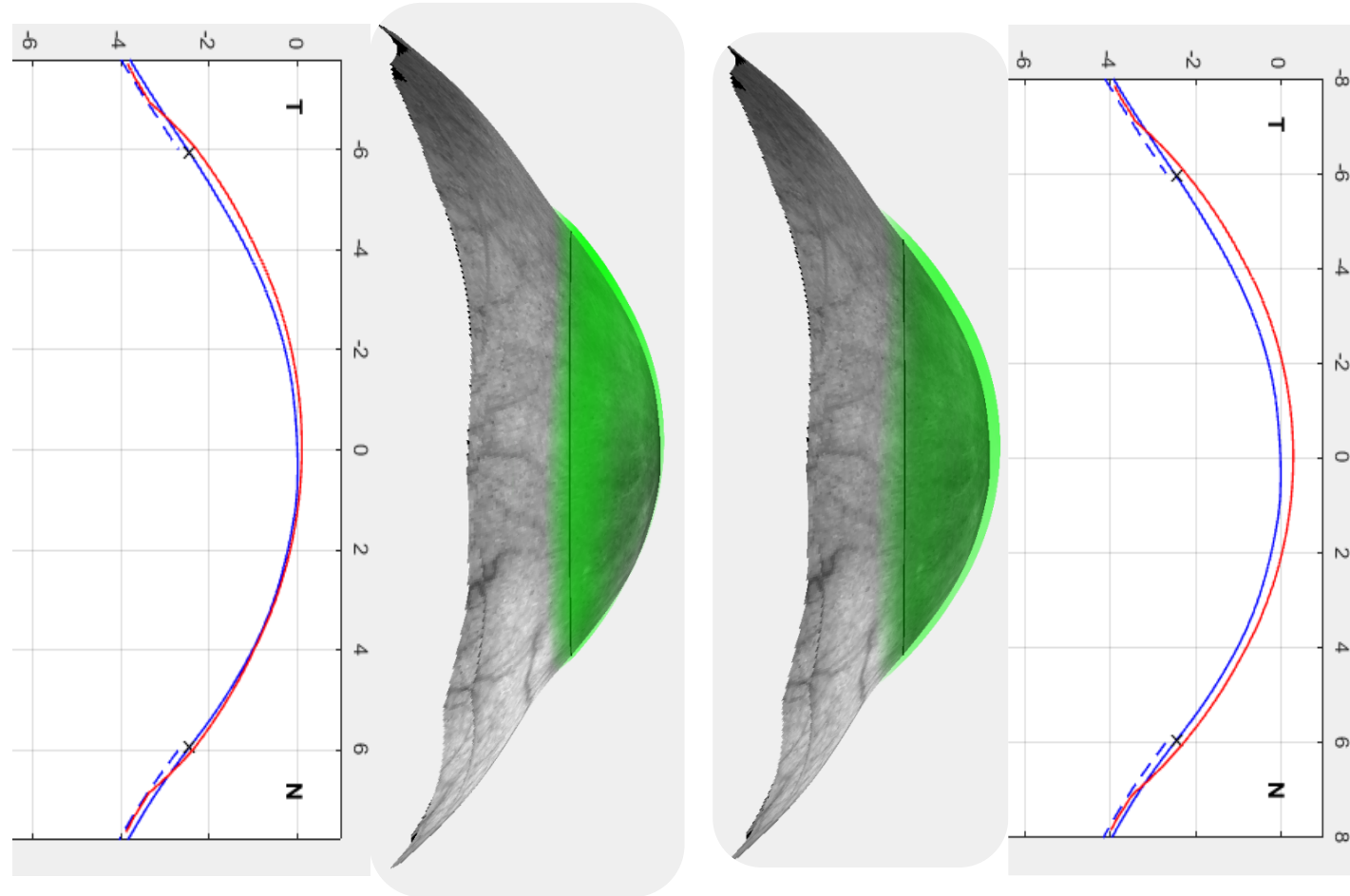
The Post Lens Tear Layer

- Limbal Clearance
 - Insufficient clearance will cause insult
 - Excessive may lead to prolapse or post lens tear reservoir debris



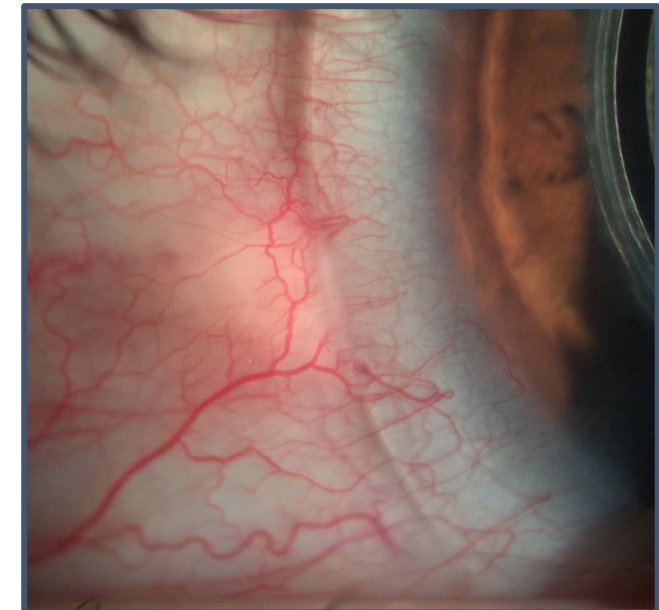
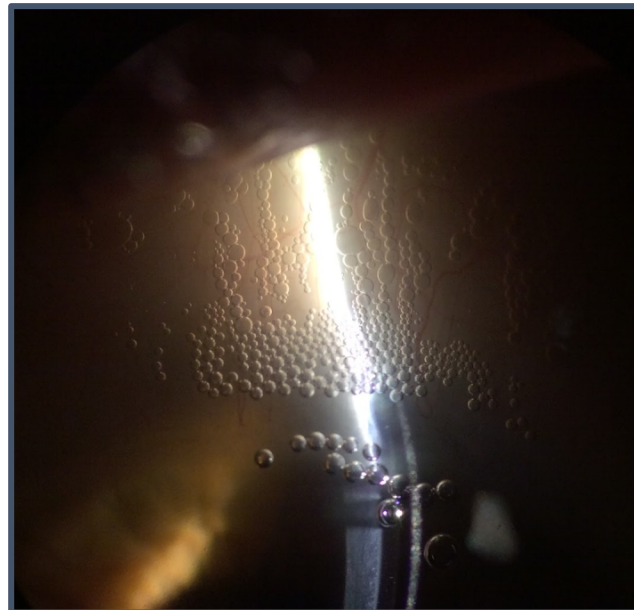
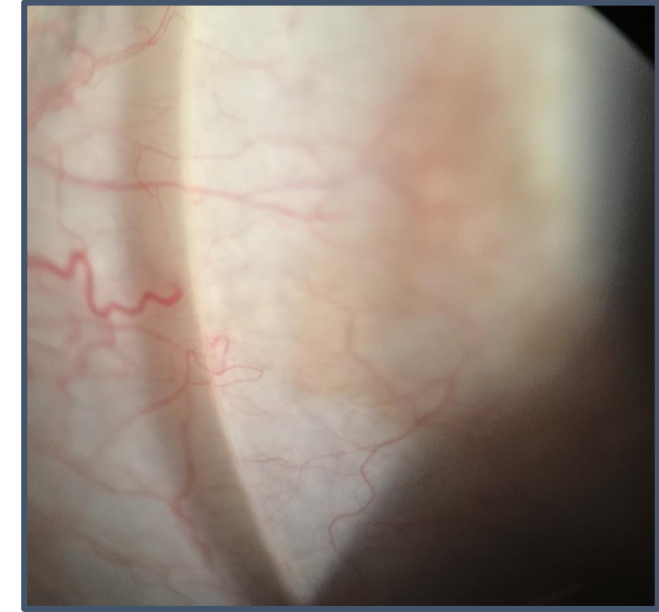
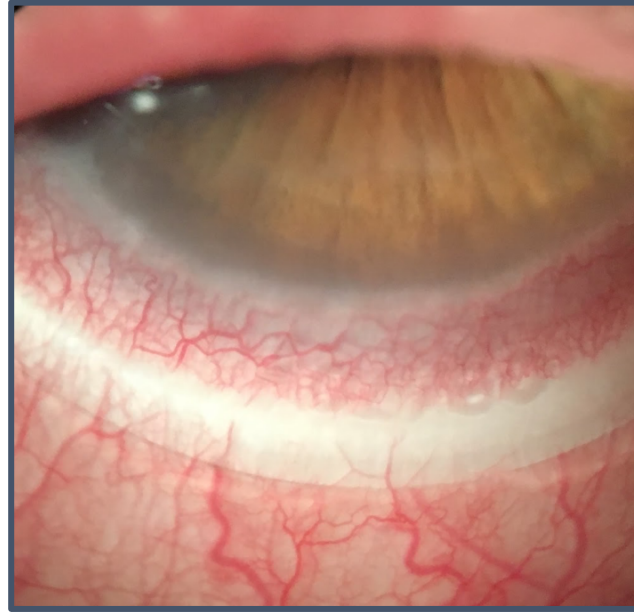
The Post Lens Tear Layer

- Corneal Clearance
 - Geometry in corneal chamber
 - Example
 - BC is constant: 45D
 - Increase BOZD 0.5mm
 - Steep mid-periph curve 2D
 - Increase vault ~200 microns



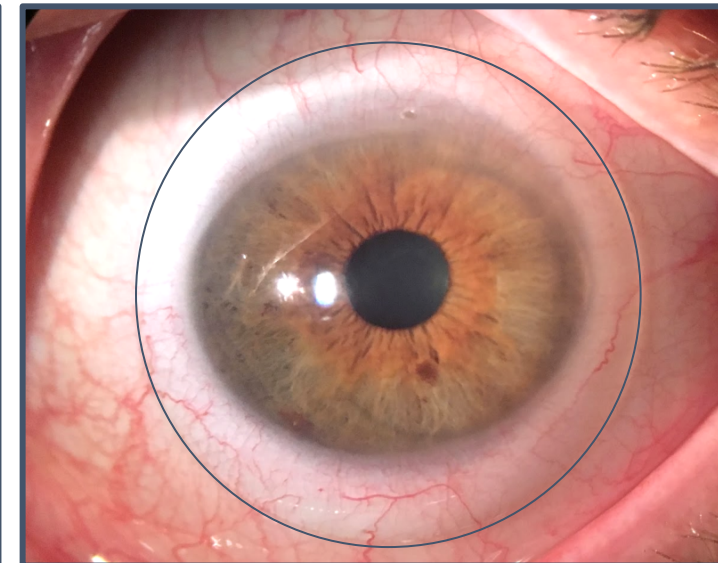
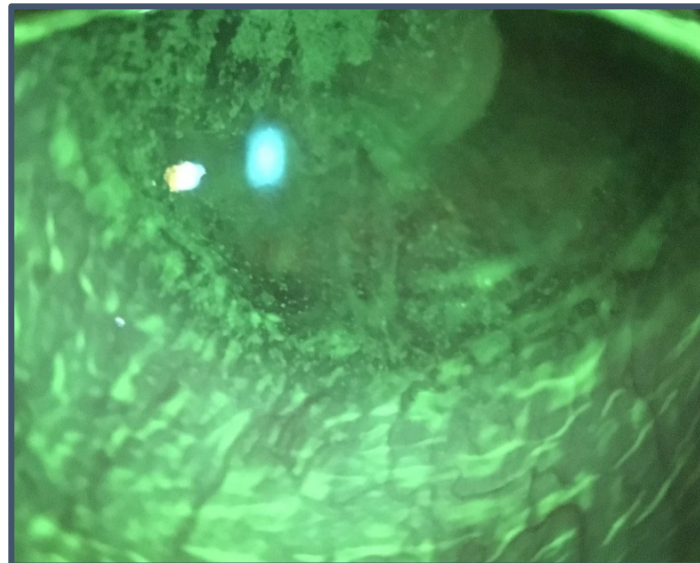
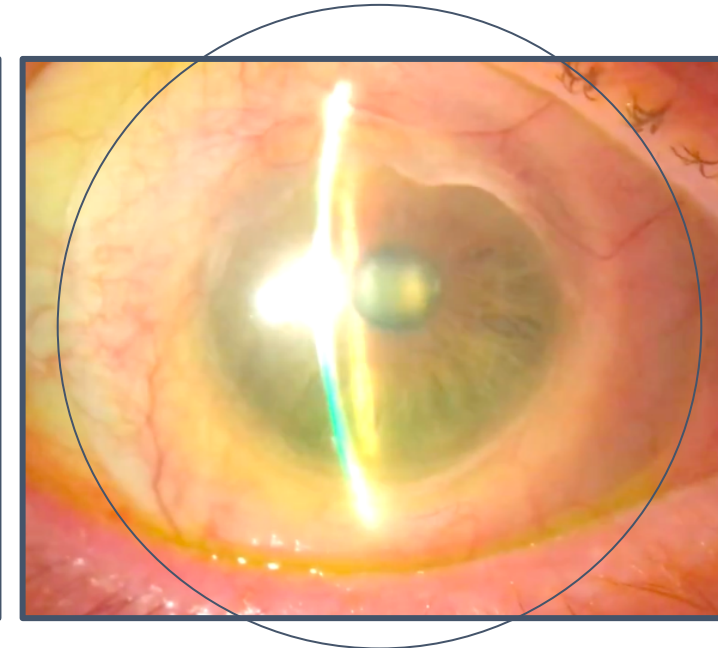
The Lens Haptic

- Patient complaints
 - Lens Awareness
 - Irritation upon insertion
 - Gradual decrease of vision
 - Particulate under lens
 - Ache after lens wear
 - Redness during or immediately after removal
 - Impression ring after removal
 - Bubbles
 - Difficulty removing lens



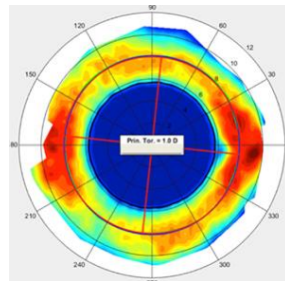
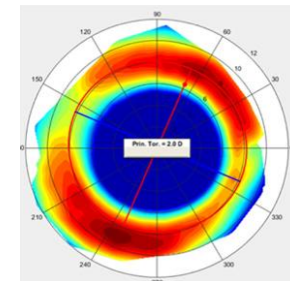
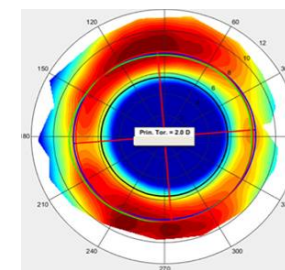
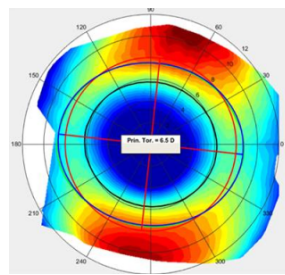
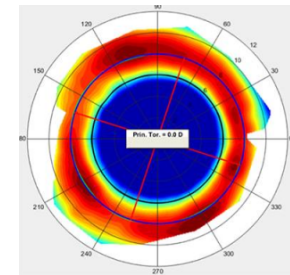
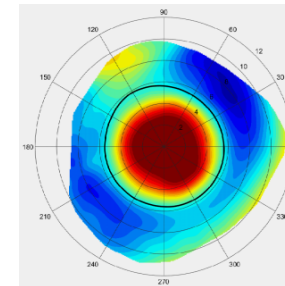
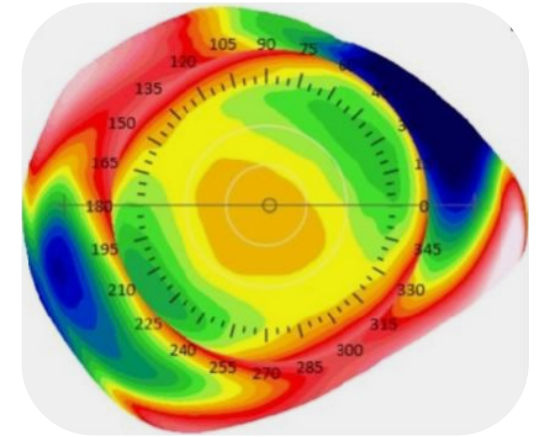
The Cornea and Ocular Surface

- Lens Diameter
 - Proportionate to the extent of the eye affected
 - More surface covered = more protection
 - Pan Ocular Surface Disease



The Lens Haptic

- Profilometry
 - Advanced scleral imaging exists to aid in understanding scleral shape
 - Eaglet ESP
 - Precision Ocular Metrology SMap3D

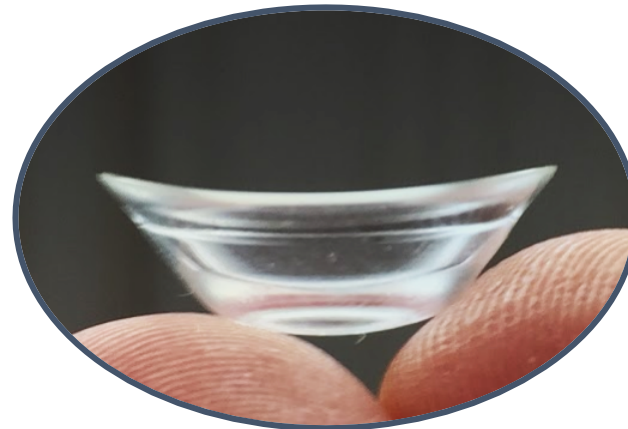


The Lens Haptic

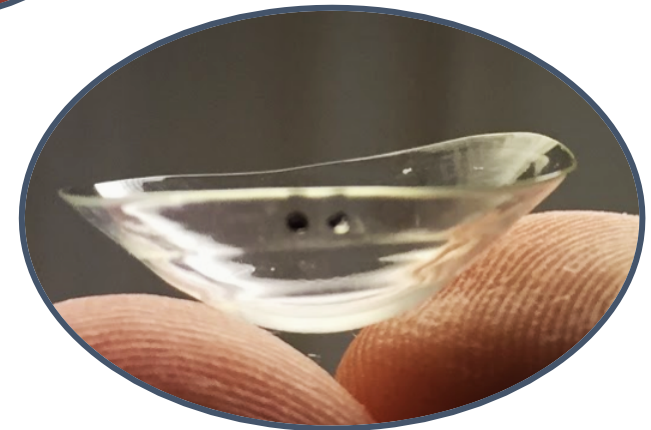
- Improve Haptic Alignment
 - Spherical (Common)
 - Same Curve 360
 - Toric (Common)
 - Vertical vs Horizontal
 - Quad (Less Common)
 - Quadrants independent
 - Octo (Rare)
 - Eight Sub Meridian
 - Elevation Specific (Very Rare)
 - Anything anywhere



Spherical
Haptic



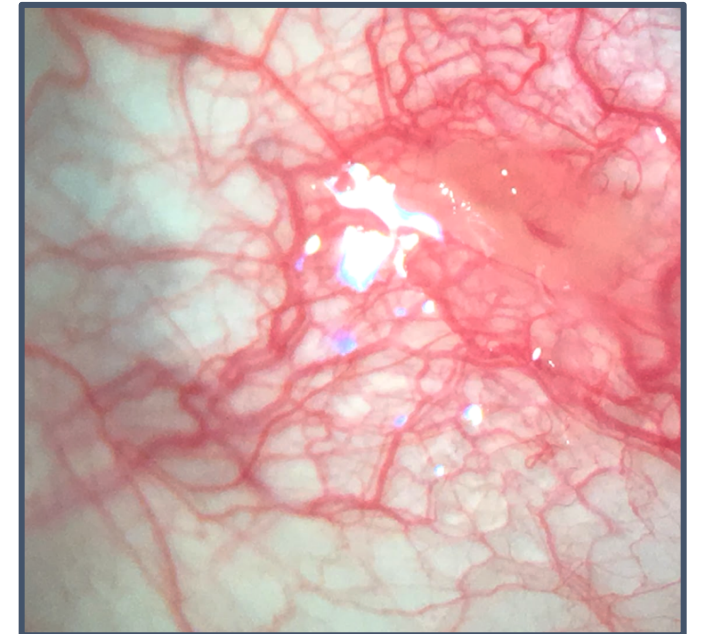
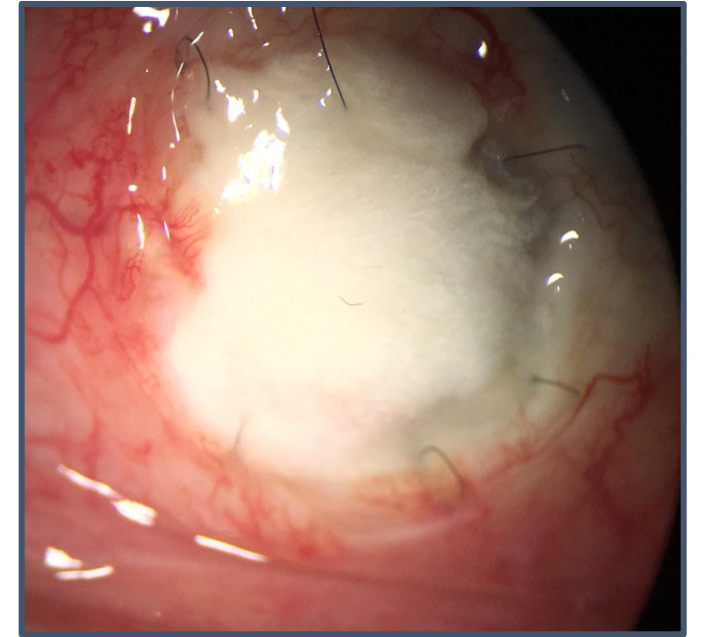
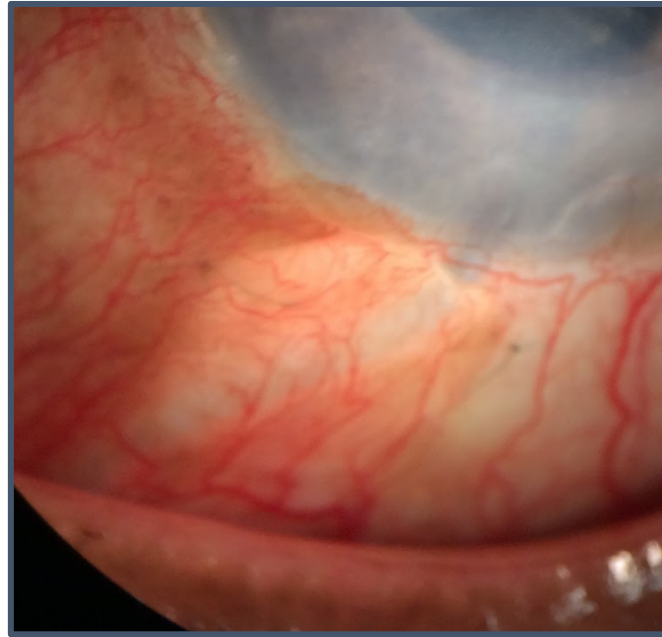
Toric
Haptic



Elevation
Specific
Haptic

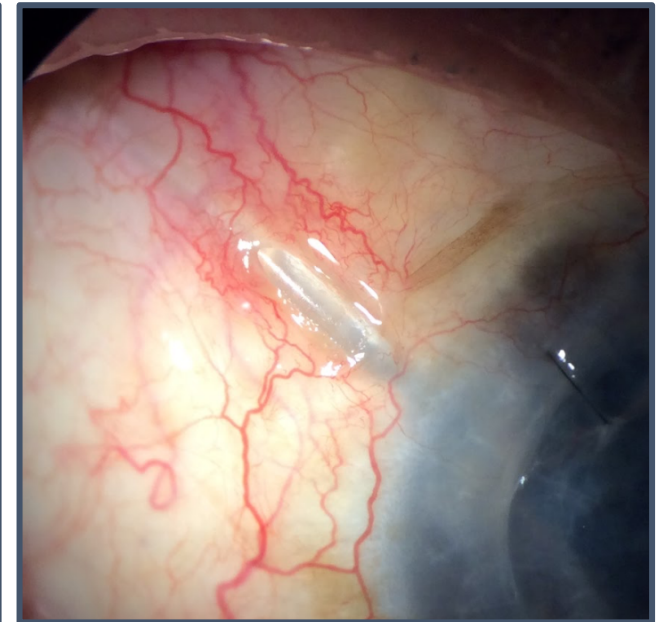
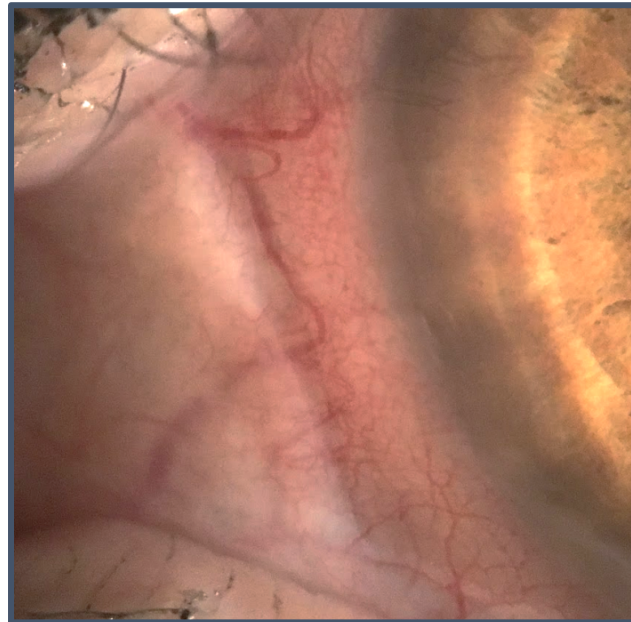
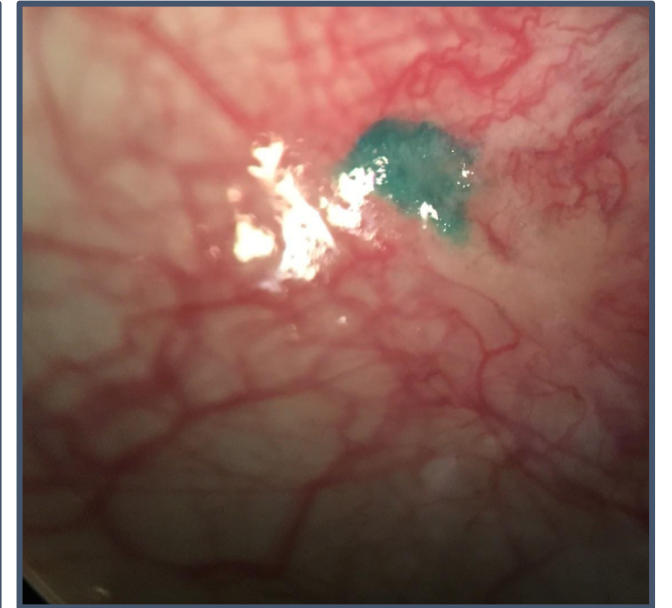
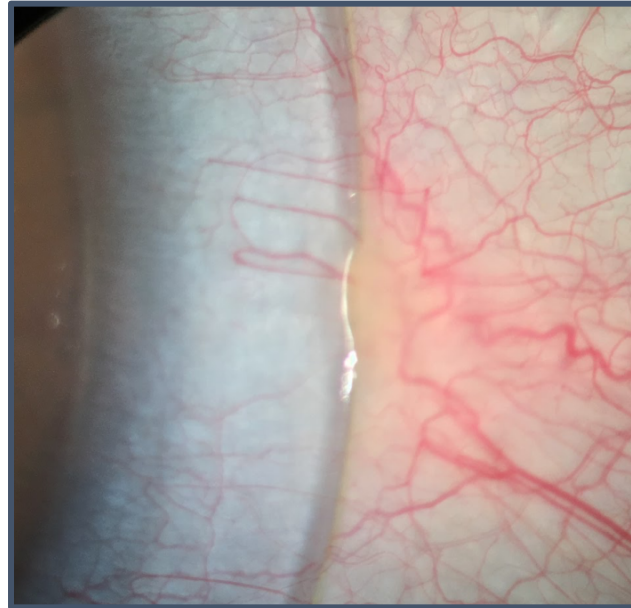
The Lens Haptic

- Unique elevations
 - Blebs
 - Shunts
 - Pinguecula
 - Tectonics
 - Scars
 - Symblepharon



The Lens Haptic

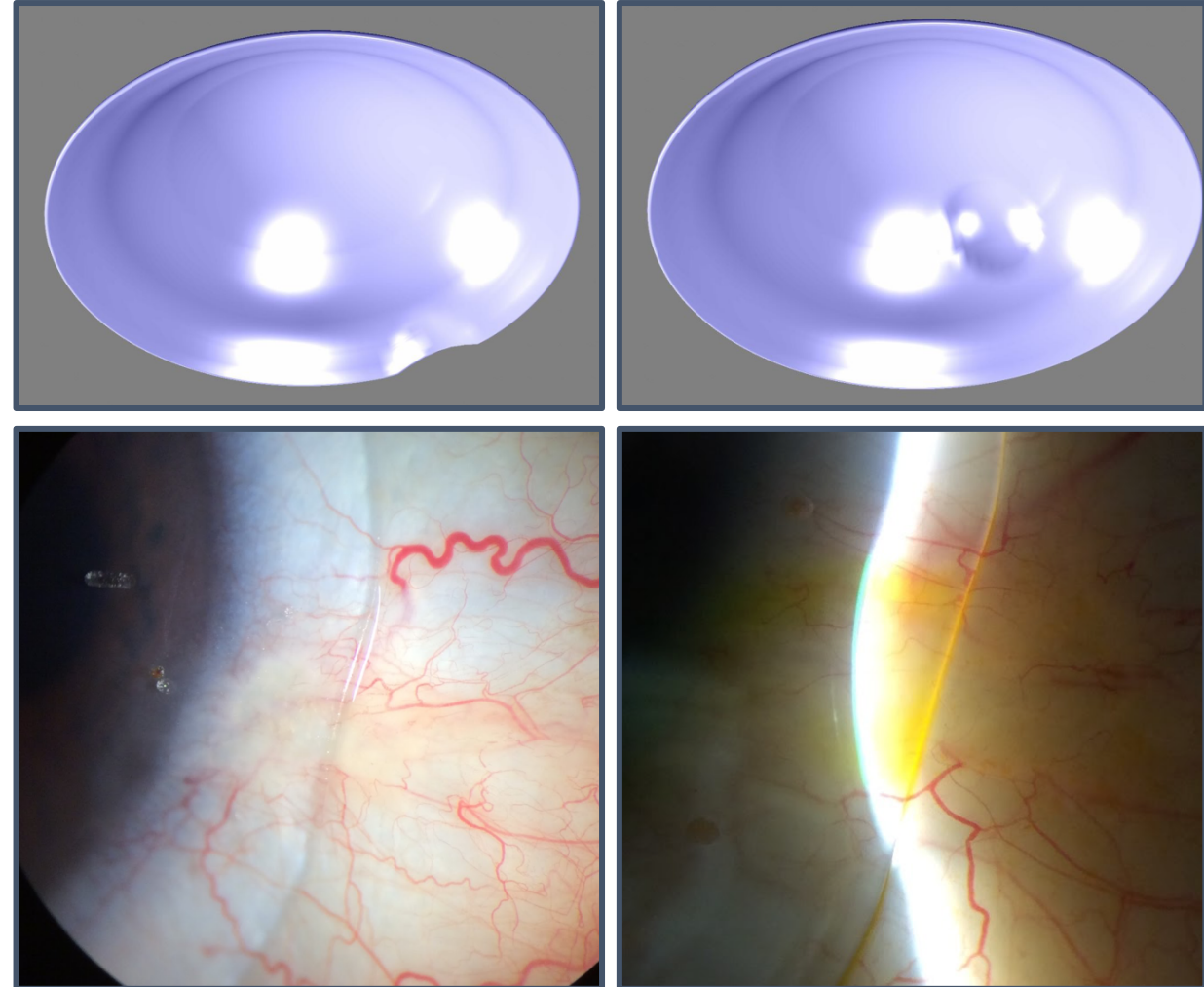
- Complications with unique elevations
 - Focal Compression
 - Conjunctival Hypertrophy
 - Erosion



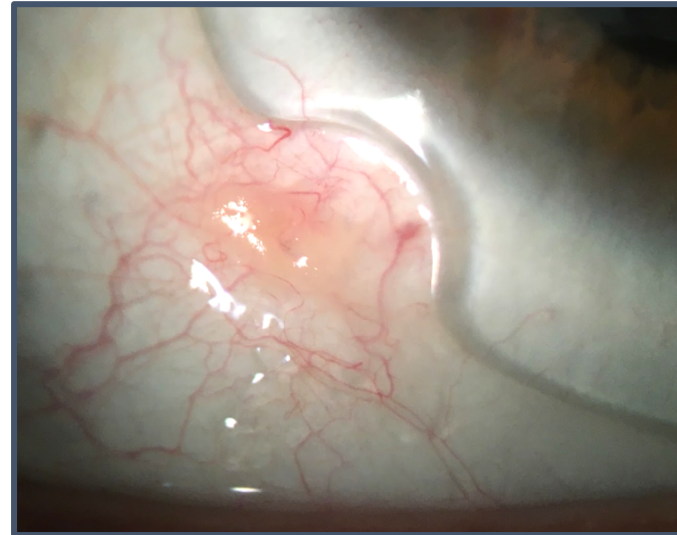
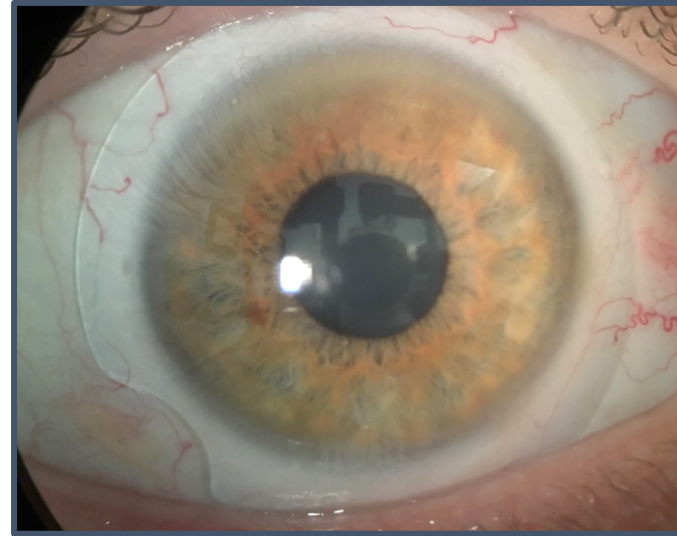
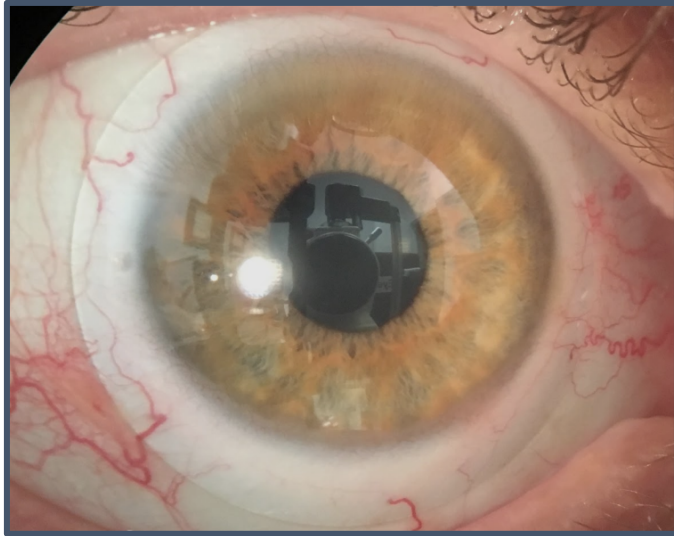
The Lens Haptic

- Advanced Haptics
 - Overcome or avoid unique elevations
 - Blebs, Shunts, Pinguecula, etc.
 - Microvault
 - Notch/Truncation
 - Quadrant Specific
 - Diameter

Micro Vault



Case Report: Notch Before and After



EyePrint Pro

- EyePrint Impression Process
 - Takes 2 minutes
 - 1 minute set up
- 1 minute on the eye
- Captures precise curvatures of the entire ocular surface
- Impression material has 1-2 micron accuracy
- Comfortable and gentle
- No anesthetic necessary



Thank you for your time and attention!