EUROPEAN CONTACT LENS SOCIETY OF OPHTHALMOLOGISTS

Problem Solving in Soft Contact Lenses

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ECLSO Congress, September 2-3, 2022

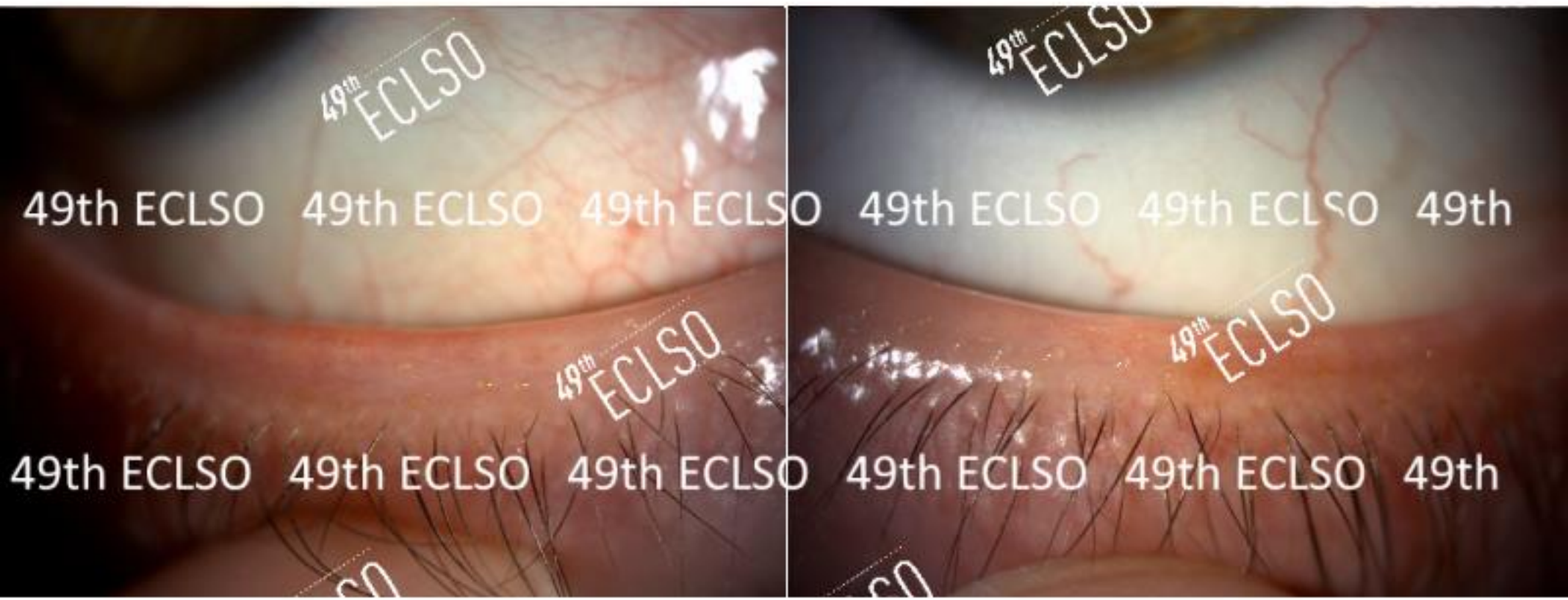
- I have no conflicts of interest to declare

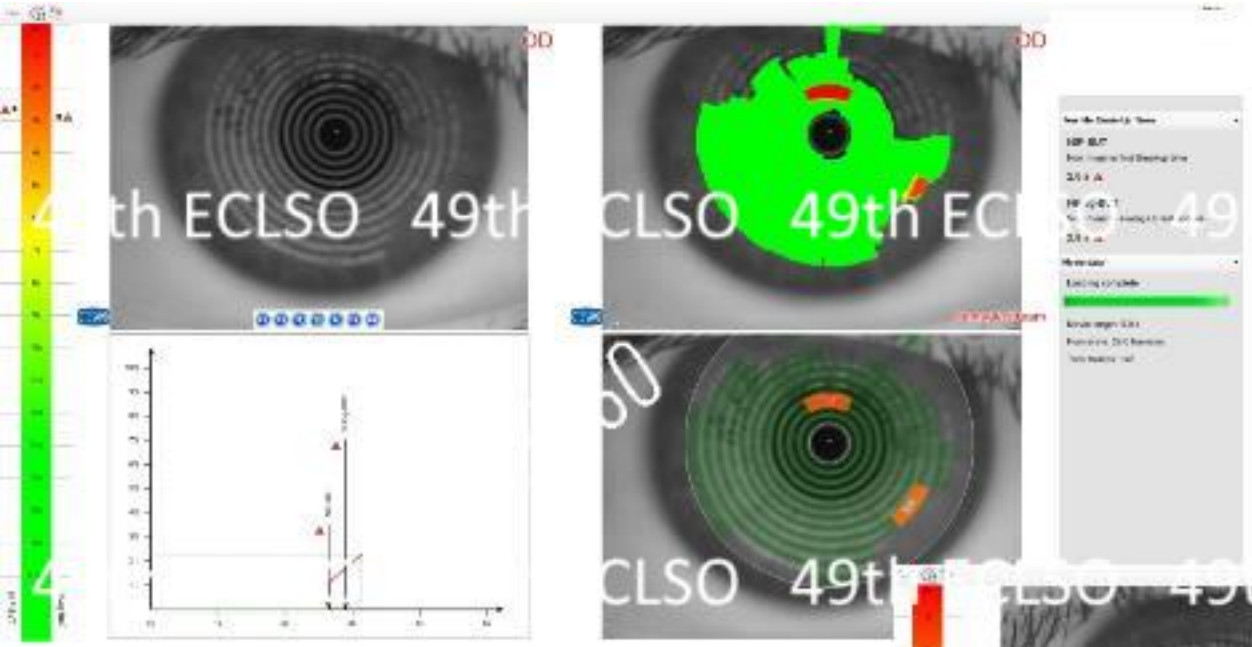
Problem Solving in CLs

- CL discomfort
- CL-Associated/induced DED
- CL and allergy
- Inflammatory/infectious problems

35 y/o F

Soft lens wearer-15 years, replaces her lenses monthly
Cannot wear daily - stinging, redness and discharge

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CLSO 49th ECL
CLSO 49th


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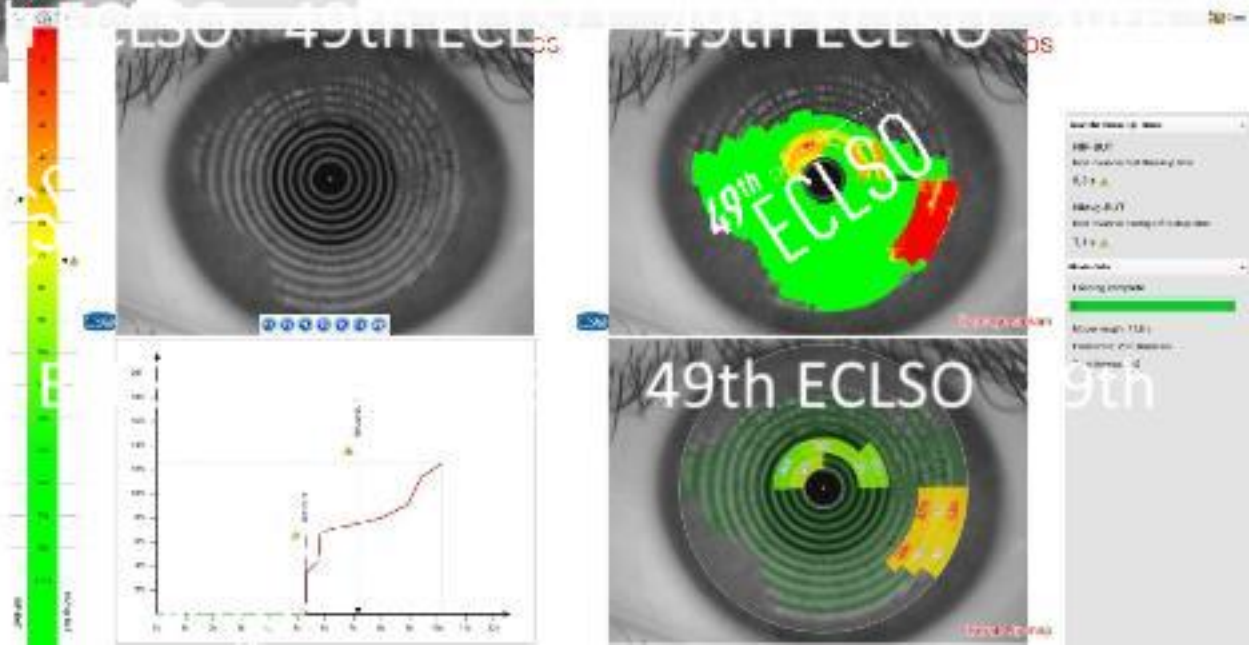
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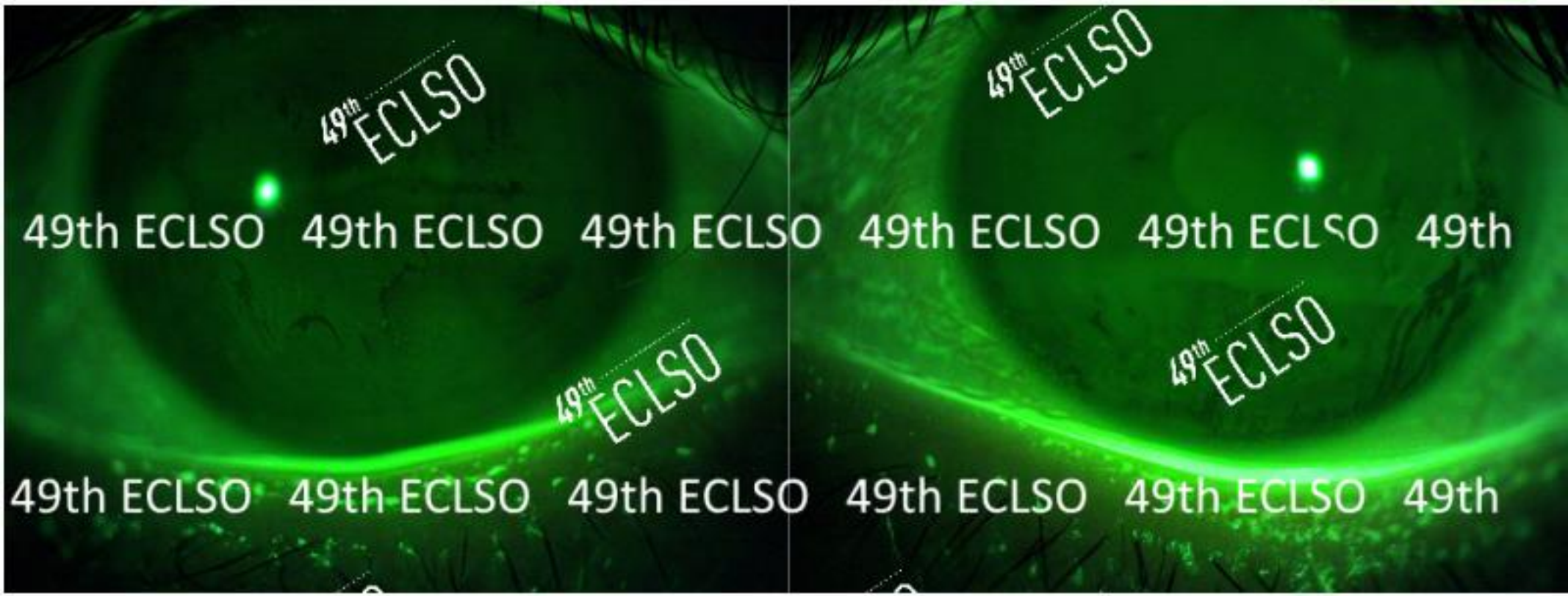
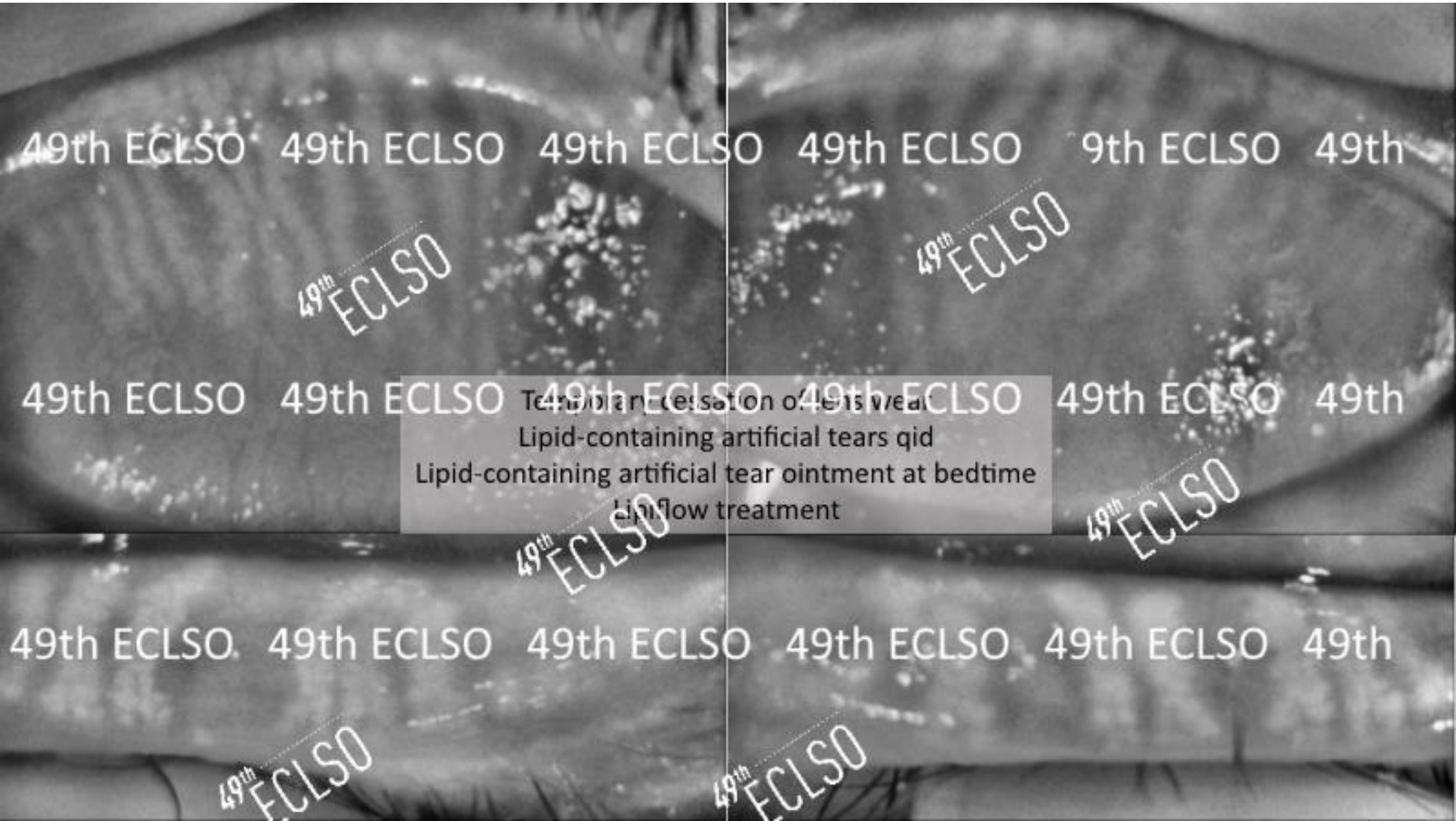
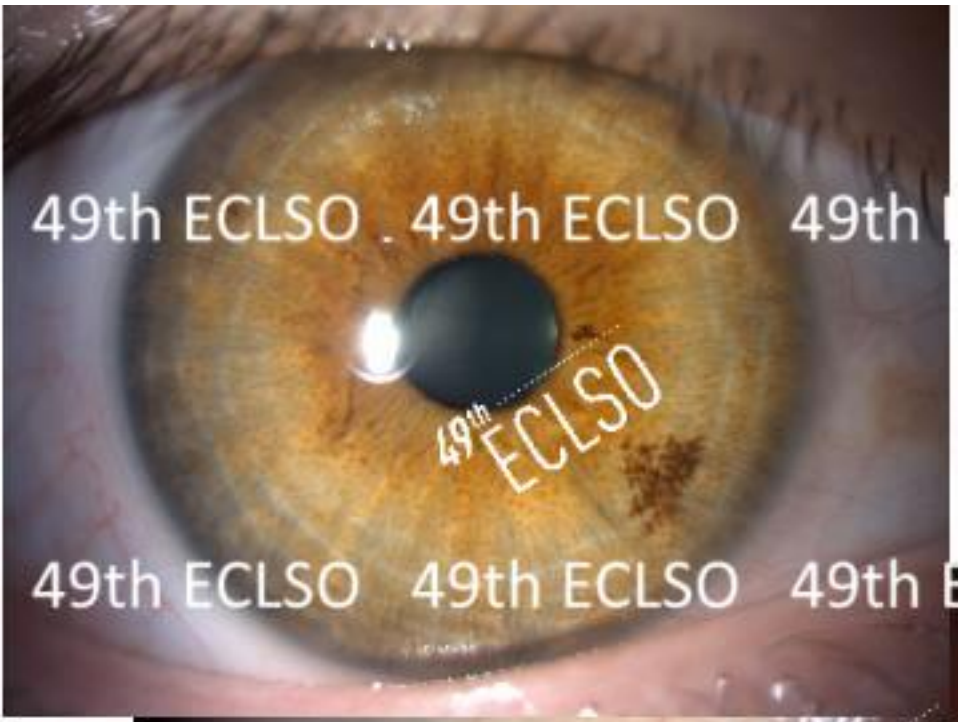


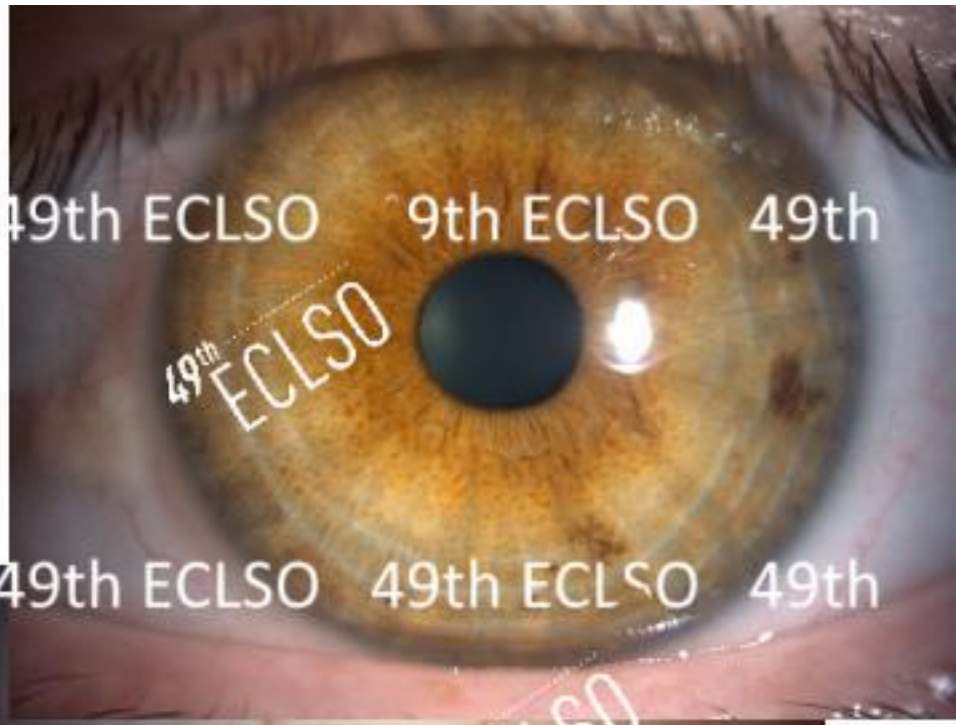
BUT: 3 sec
Schirmer I: 13 mm/5 min

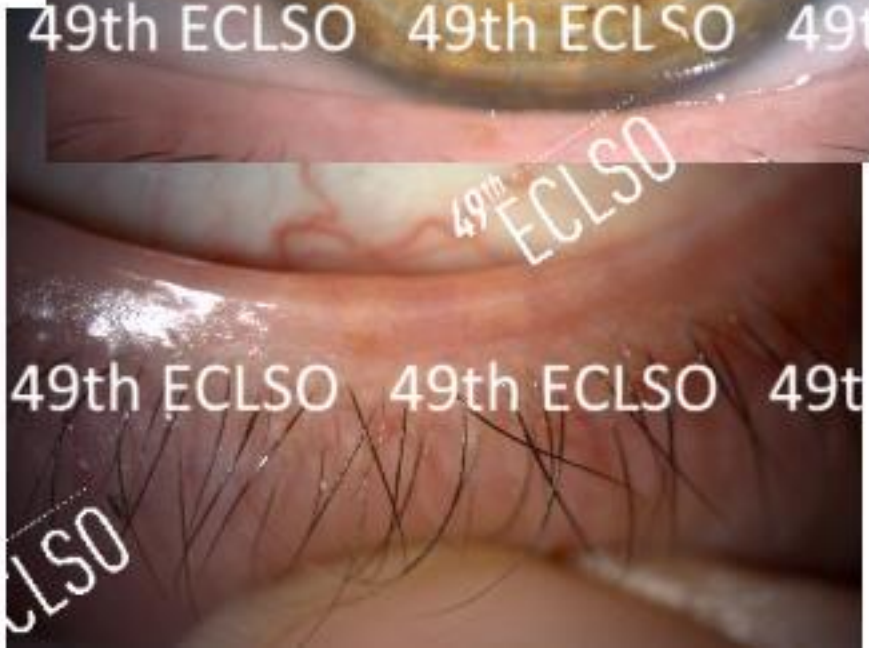
BUT: 2 sec
Schirmer I: 11 mm/5 min

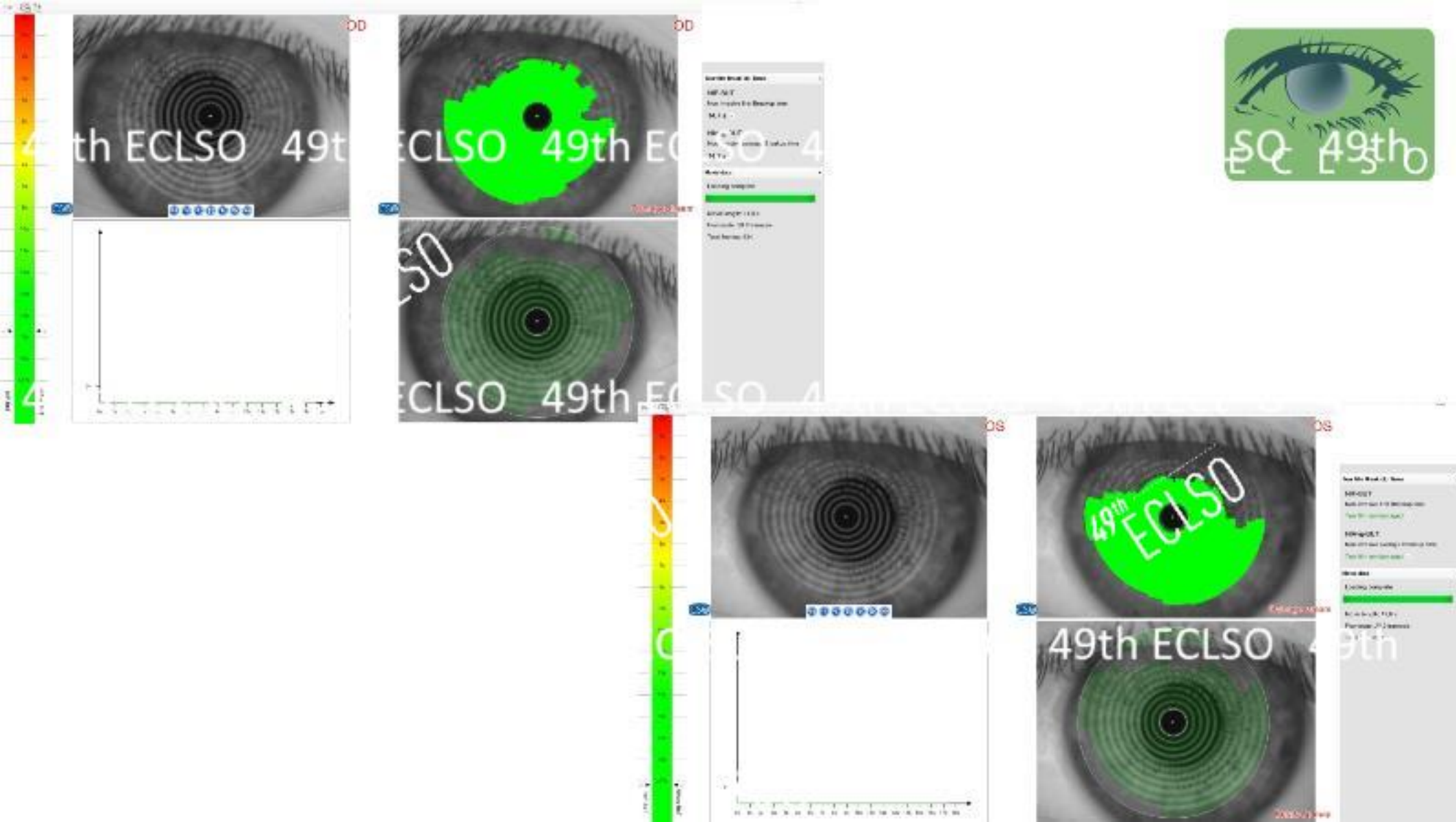

Temporary cessation of lens wear
Lipid-containing artificial tears qid
Lipid-containing artificial tear ointment at bedtime
Lid flow treatment



Post-Tx
Month-2



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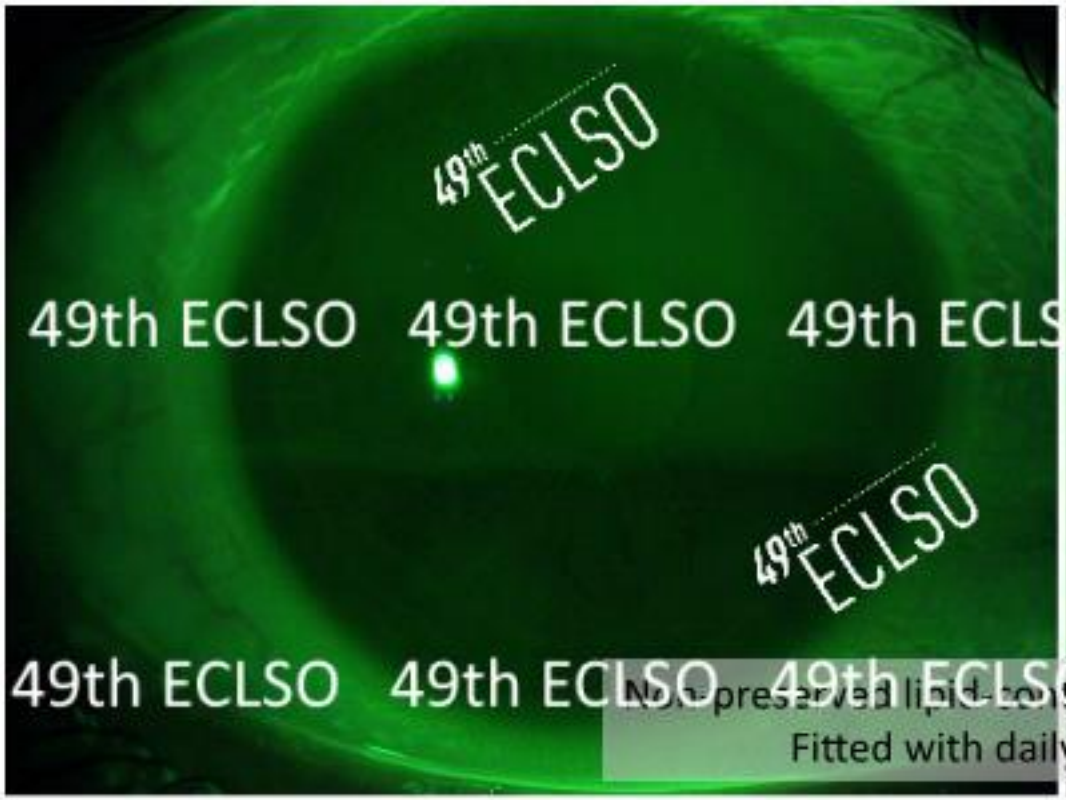
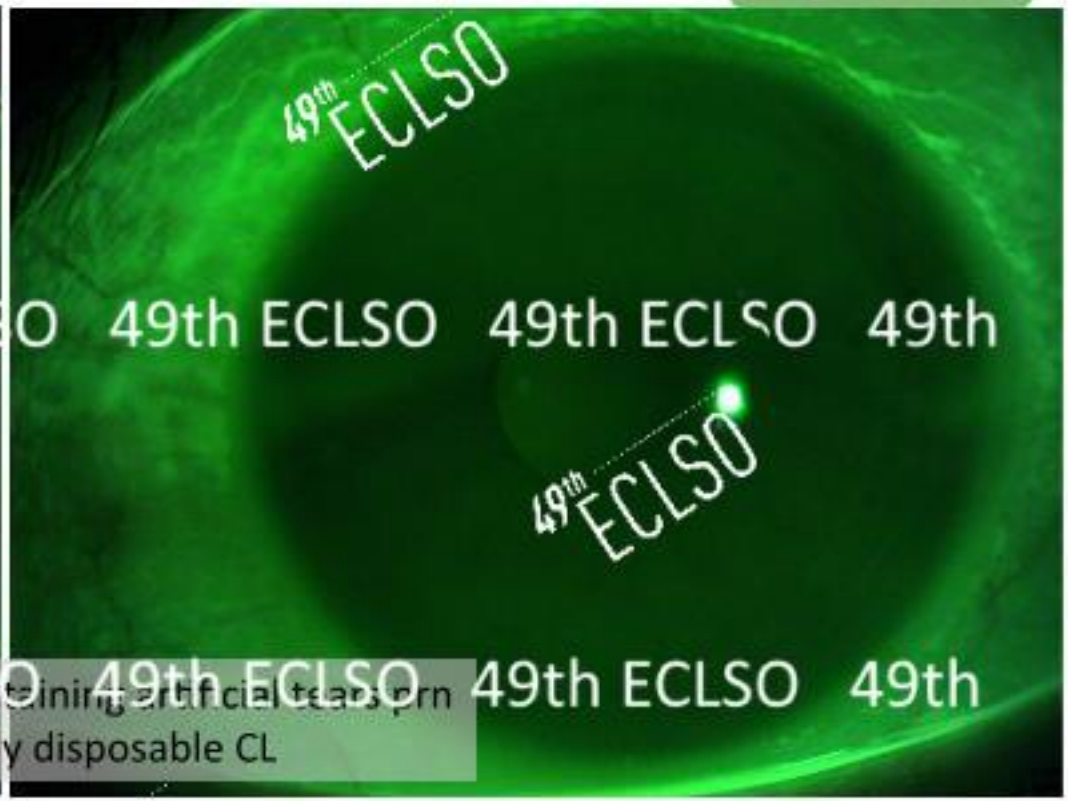


Non-preserved lipid-containing artificial tears prn
Fitted with daily disposable CL

BUT: 9 sec
Schirmer I: 13 mm/5 min



BUT: 10 sec
Schirmer I: 11 mm/5 min

CL Wearers

- Number of CL wearers:
  - >140 million worldwide
  - ~45 million in the U.S.
  - 17% of U.S. population>25 years old
- 90% soft CL wearers

Cope JR et al. MMWR Morb Mortal Wkly Rep. 2017

Contact Lens (CL) Dropout

- 12.0% and 27.4% (pooled mean = 21.7%) discontinue CL wear
- The top cited reasons:
  - Discomfort in established CL wearers
  - Visual problems in neophyte CL wearers

Pritchard N, et al. Int Cont Lens Clin 1999
Pucker AD & Tichenor AA. Clin Optom 2020

Special Issue

The TFOS International Workshop on Contact Lens Discomfort: Report of the Definition and Classification Subcommittee

Kelly K. Nichols,[1] Rachel L. Redfern,[1] Jean T. Jacob,[2] J. Daniel Nelson,[3] Desmond Fonn,[4] S. Lance Forstot,[5] Jing-Feng Huang,[6] Brien A. Holden,[7–9] Jason J. Nichols,[1] and the members of the TFOS International Workshop on Contact Lens Discomfort

DEFINITION OF CLD

Contact lens discomfort is a condition characterized by episodic or persistent adverse ocular sensations related to lens wear, either with or without visual disturbance, resulting from reduced compatibility between the contact lens and the ocular environment, which can lead to decreased wearing time and discontinuation of contact lens wear.

TFOS Workshop on Contact Lens Discomfort IOVS 2013;54

CL Discomfort

- 31%–58% of lens wearers classified as symptomatic using standardized questionnaires – 25% moderate to severe

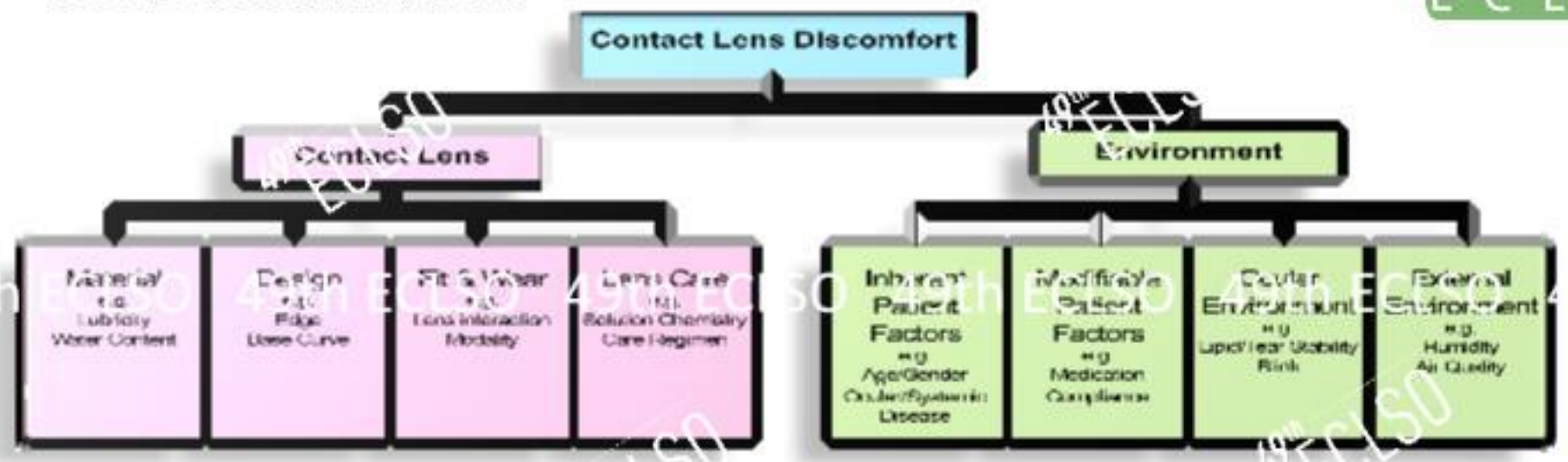
Stapleton Cont Lens Ant Eye 2021

- However, 23% of CL wearers with dry eye symptoms do not exhibit typical clinical signs of dryness

Young G, et al. Optom Vis Sci 2012

CL Discomfort

CL Discomfort



http://www.tearfilm.org/pdfs/CLD/slides/TFOS%20CLDW%20-%20Definition%20&%20classification.pps.

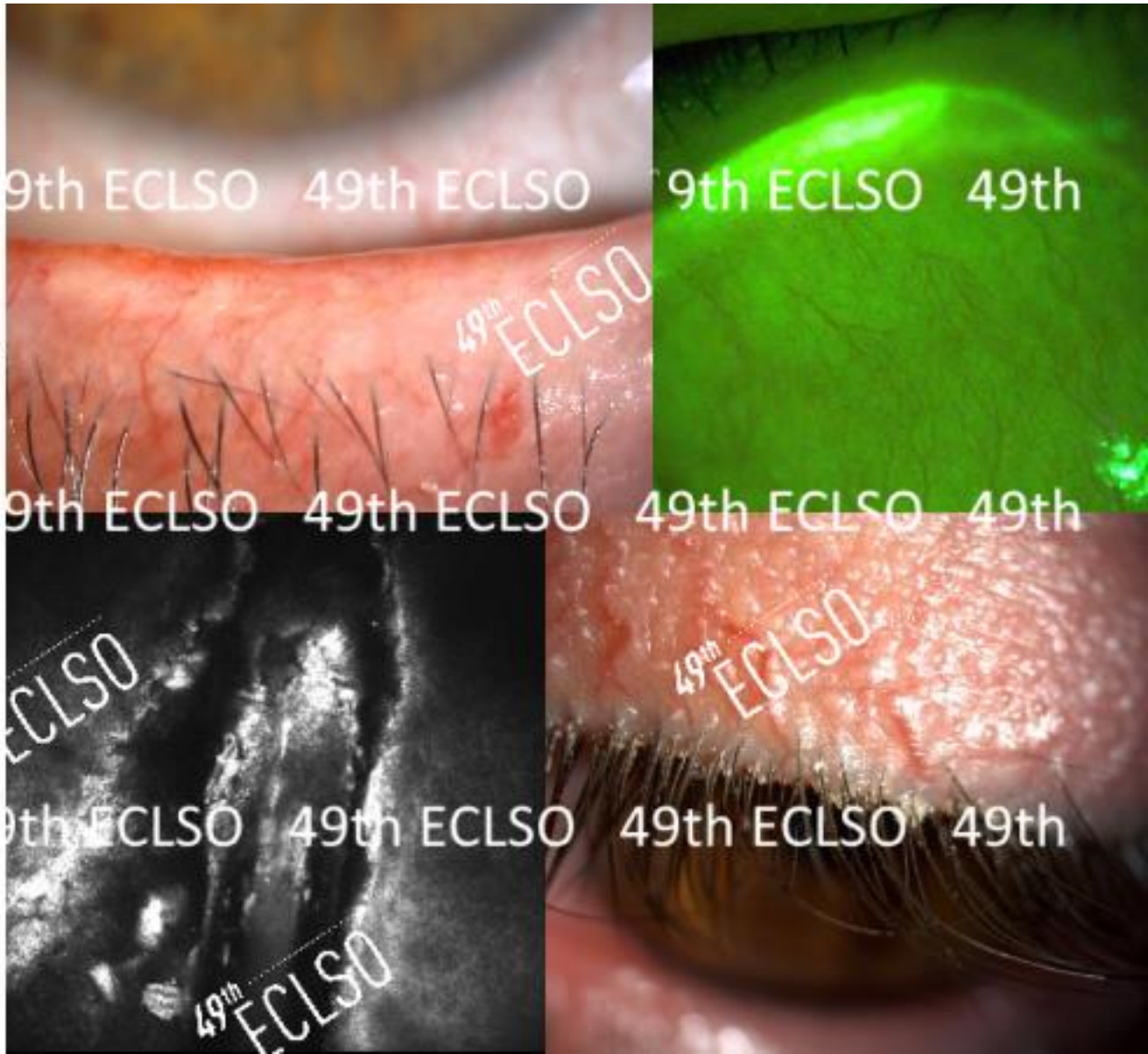
CL Discomfort

CL-Related Factors

- Greater discomfort has been reported with
  - higher water content hydrogels
  - higher modulus materials
  - Poor fit (centration/movement)
    (loose fit/flat BC/Inferior CL decentration!)
- Material (hydrogel vs SiHy) / Design / Care solution?
- Lens replacement schedule?
- Wettability? Surface deposits?
- Bioburden?

CL Discomfort
Patient-Related Factors

- No conclusive evidence for
  - LWE
  - Inflammation
  - Tear film osmolarity
- Some evidence for
  - LIPCOF
  - Demodex
  - Ocular surface mucins
  - Neural changes
- Definitive evidence for
  - MGD



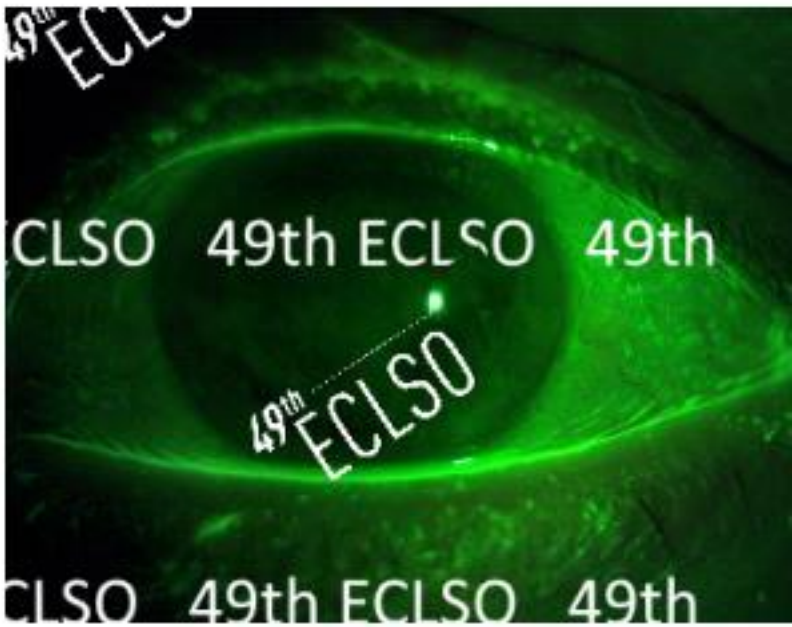
Patient-Related Risk Factors
Lid parallel conjunctival folds (LIPCOF)

- Proposed as a feature of CLD
- Alone or in combination with decreased NIBUT, LWE, MUC5AC activity

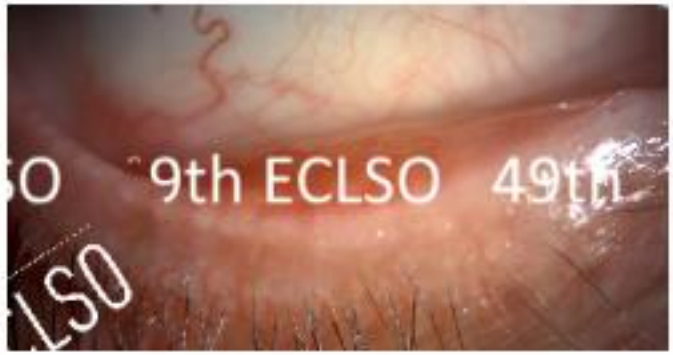
Pult H, et al. Optom Vis Sci 2008
Pult H, et al. Optom Vis Sci 2009
Berry M et al Optom Vis Sci 2008
Pult H, et al. Eye 2011

- Correlated with the duration of contact lens wear

Best N, et al. Cont Lens Ant Eye 2013
Veliksar TA et al. J Ophthalmol (Ukraine) 2018



Patient-Related Risk Factors
MGD



- Worse meibum quality
- Displacement of mucocutaneous junction
- Foam at the meibomian gland orifice

} associated with discomfort

Cox SM et al. Optom Vis Sci 2016
Siddireddy JS, et al. Cont Lens Ant Eye 2018

- CL dropouts vs successful wearers
  - MG plugging and worse meibum quality in dropout group
  - No difference in MG atrophy on meibography

Pucker AD, et al. Cont Lens Ant Eye 2019

- Primary reason of CL discomfort (14%) – MGD
- MGD present in 86% of patients concurrent to other causes of CLD

Young G, et al. Optom Vis Sci 2012

CL & Dry Eye

The Ocular Surface 15 (2017) 366–403

Contents lists available at ScienceDirect

The Ocular Surface

journal homepage: www.theocularsurface.com

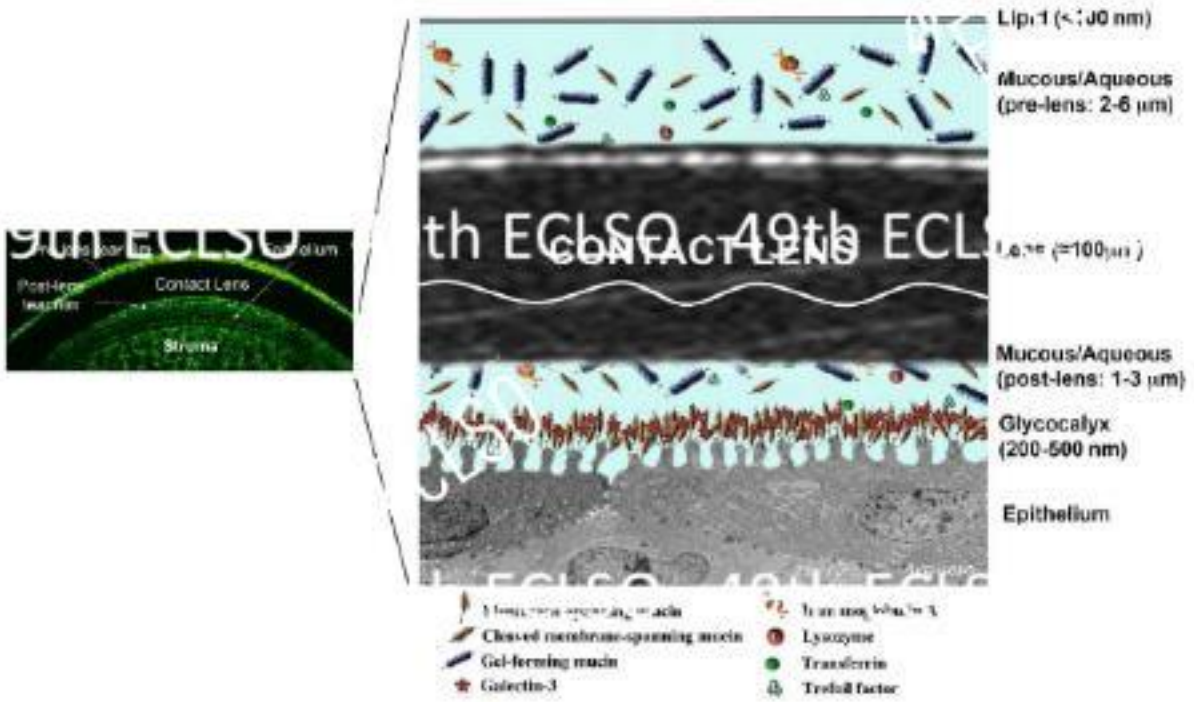
TFOS DEWS II Tear Film Report

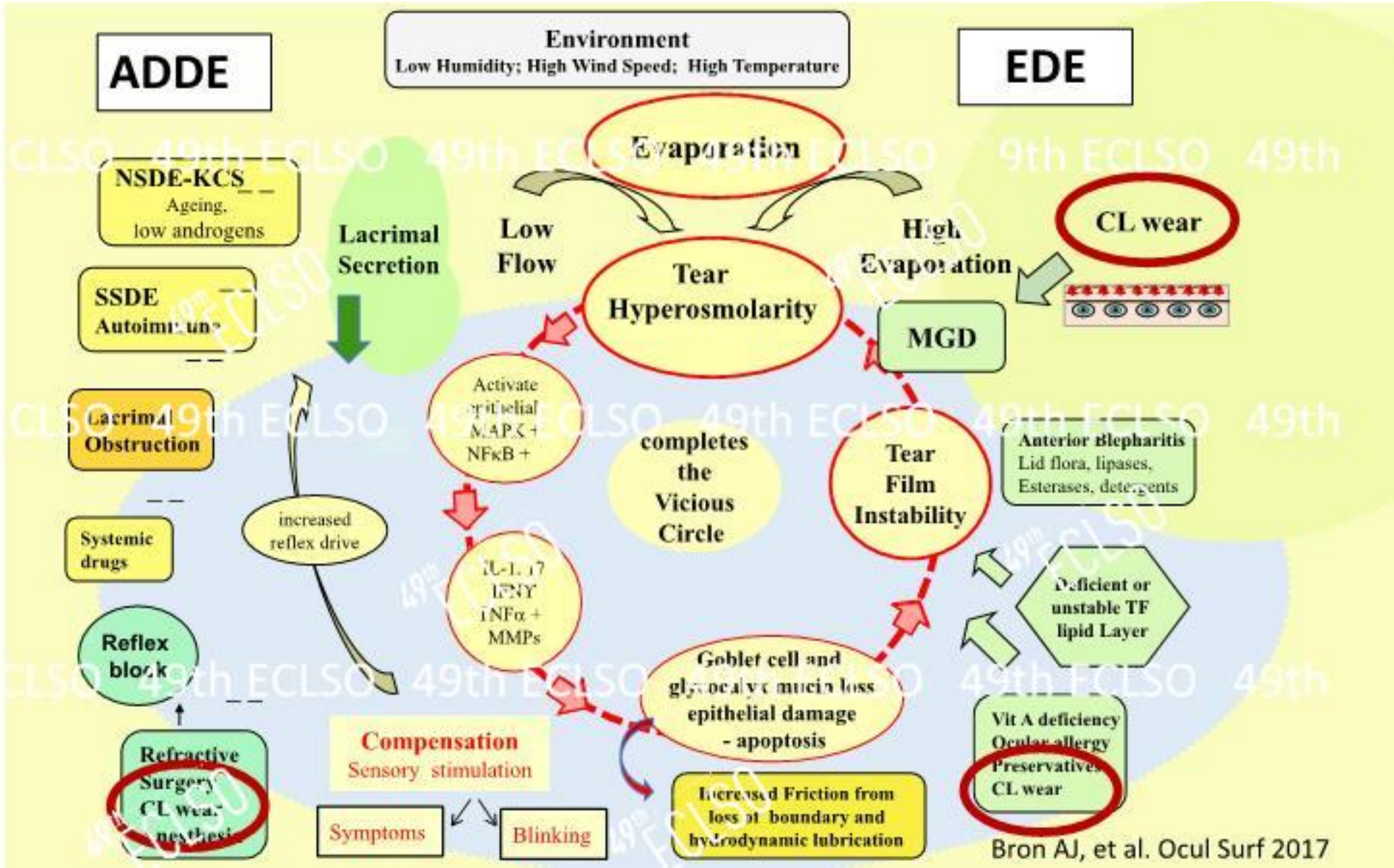
Mark D.P. Willcox, PhD, DSc [a, 1, *], Pablo Argüeso, PhD [b], Georgi A. Georgiev, PhD [c], Juha M. Holopainen, MD, PhD [d], Gordon W. Laurie, PhD [e], Tom J. Millar, PhD [f], Eric B. Papas, BScOptom, PhD [a], Jannick P. Rolland, PhD [g], Tannin A. Schmidt, PhD [h], Ulrike Stahl, BScOptom, PhD [i], Tatiana Suarez, PhD [j], Lakshman N. Subbaraman, BS Optom, PhD [i], Cigür Ö. Uçakhan, MD [k], Lyndon Jones, FCOptom, PhD [i]

- Contact lenses increase the risk of DED 2-3 fold

Willcox MPDP, et al. TFOS DEWS II Ocul Surf 2017

Contact Lens – Tear Film Interaction




ADDE
Environment
Low Humidity; High Wind Speed; High Temperature
EDE
Evaporation
NSDE-KCS
Ageing,
low androgens
Lacrimal Secretion
Low Flow
High Evaporation
CL wear
SSDE
Autoimmune
Tear Hyperosmolarity
MGD
Activate epithelial MAPK + NFκB +
Lacrimal Obstruction
completes the Vicious Circle
Tear Film Instability
Anterior Blepharitis
Lid flora, lipases, Esterases, detergents
Systemic drugs
increased reflex drive
IL-1, 17 IFNγ TNFα + MMPs
Deficient or unstable TF lipid Layer
Reflex block
Goblet cell and glycocalyx mucin loss epithelial damage - apoptosis
Vit A deficiency
Ocular allergy
Preservatives
CL wear
Refractive Surgery
CL wear
anesthesia
Compensation
Sensory stimulation
Increased Friction from loss of boundary and hydrodynamic lubrication
Symptoms
Blinking
Bron AJ, et al. Ocul Surf 2017

CL & Dry Eye

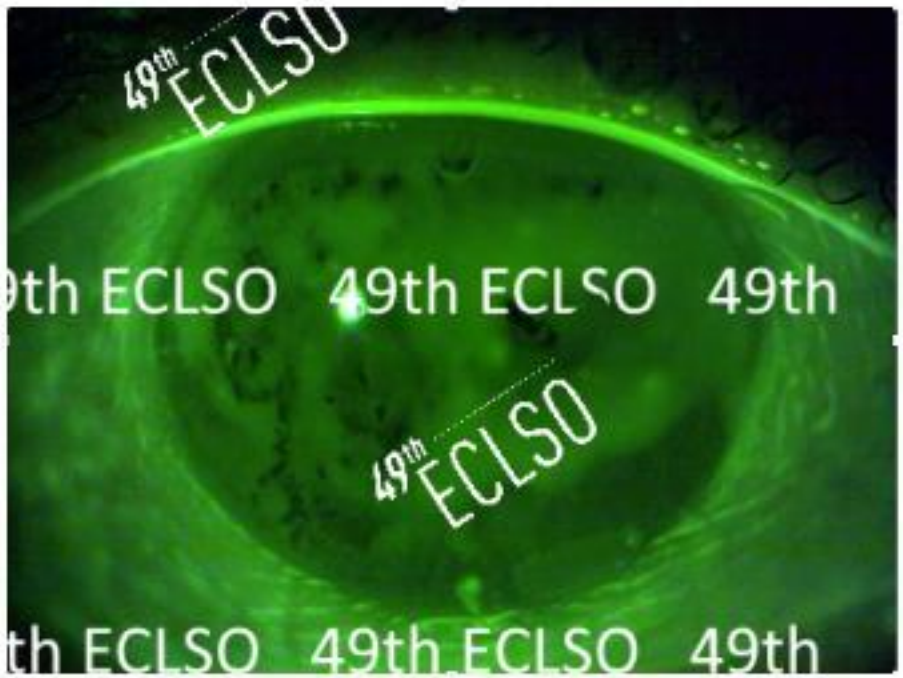
CL-Induced DED ≠ CL-Associated DED

[CLIDE] [CLADE]

Bron AJ, et al. Ocul Surf. 2017

CL-Induced DED (CLIDE)

- S&S of dry eye during CL wear in patients with no S&S before CL wear
- Refers to symptomatic CL wearers who become asymptomatic after contact lens removal



Signs & Symptoms of CLIDE

- Variable severity
- Increase with prolonged CL wear
- Symptoms:
  - Blurry vision
  - Foreign body sensation
  - Dryness, eye strain
  - Discomfort

Guillon M, Maissa C. Optom Vis Sci 2005
Kastelan S, et al. Coll Antropol 2013
Li W, et al. Cont Lens Anterior Eye 2018
Nichols JJ, et al. Invest Ophthalmol Vis Sci 2005

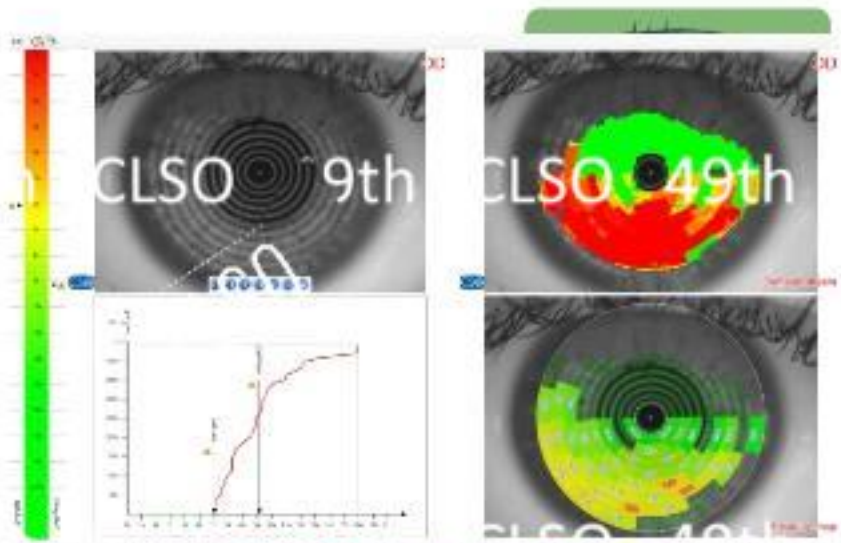
Signs & Symptoms of CLIDE

- Reduced tear breakup time
- Decreased tear meniscus height
- Corneal epithelial staining
- Increased blink rate
- Tear hyperosmolarity

Chen Q, et al. IOVS 2010
Cerry M, et al. Cornea 2012
van der Worp E, et al. Optom Vis Sci 2008

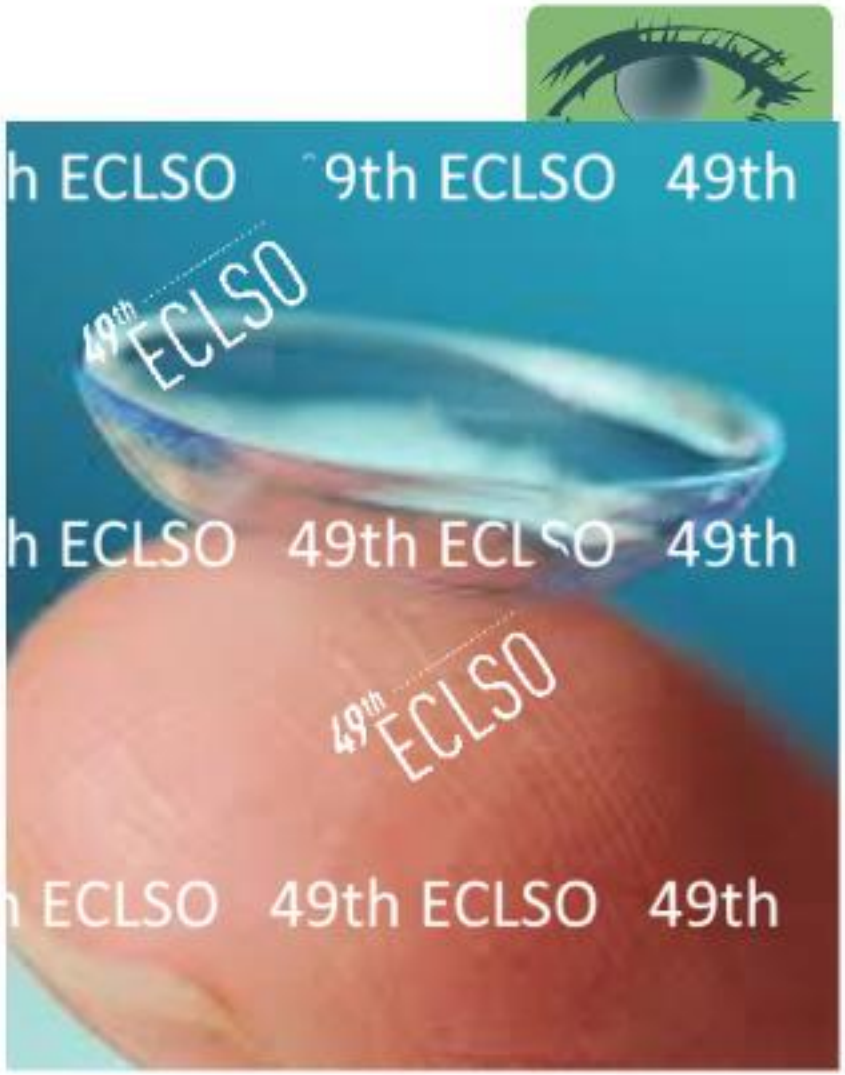
- Ocular surface and lid wiper inflammation

McMonies CW, et al. 2018
Mann A, et al. Exp Eye Res 2013
Stapleton F, et al. Cont Lens Ant Eye 2021



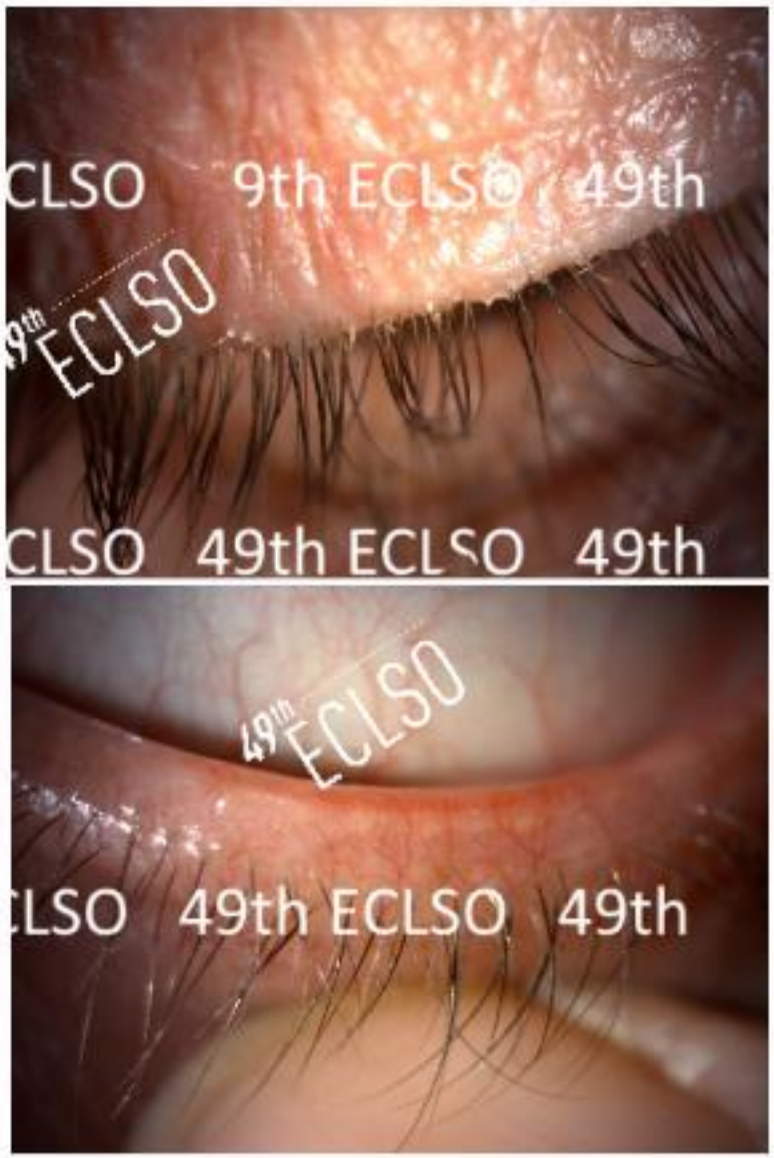
Management of CLIDE

- Restore the homeostasis of the ocular surface and tear function
- Temporary cessation of lens wear
- Addressing any blepharitis/MGD
- Switching to SiHy contact lenses or DD
- Using CL with better wettability
- Rewetting drops
- Rx similar to TFOS DEWS II



MGD & CL Wear

- Mostly asymptomatic – initial examination!
- Advise proper treatment before/ at the time of CL fitting
- Complete blinking exercises
- Regular follow-up



CL-Associated DED (CLADE)

- The existence of signs and symptoms of dry eye during CL wear
- Refers to pre-existing dry eye among contact lens wearers who are symptomatic regardless of contact lens wear

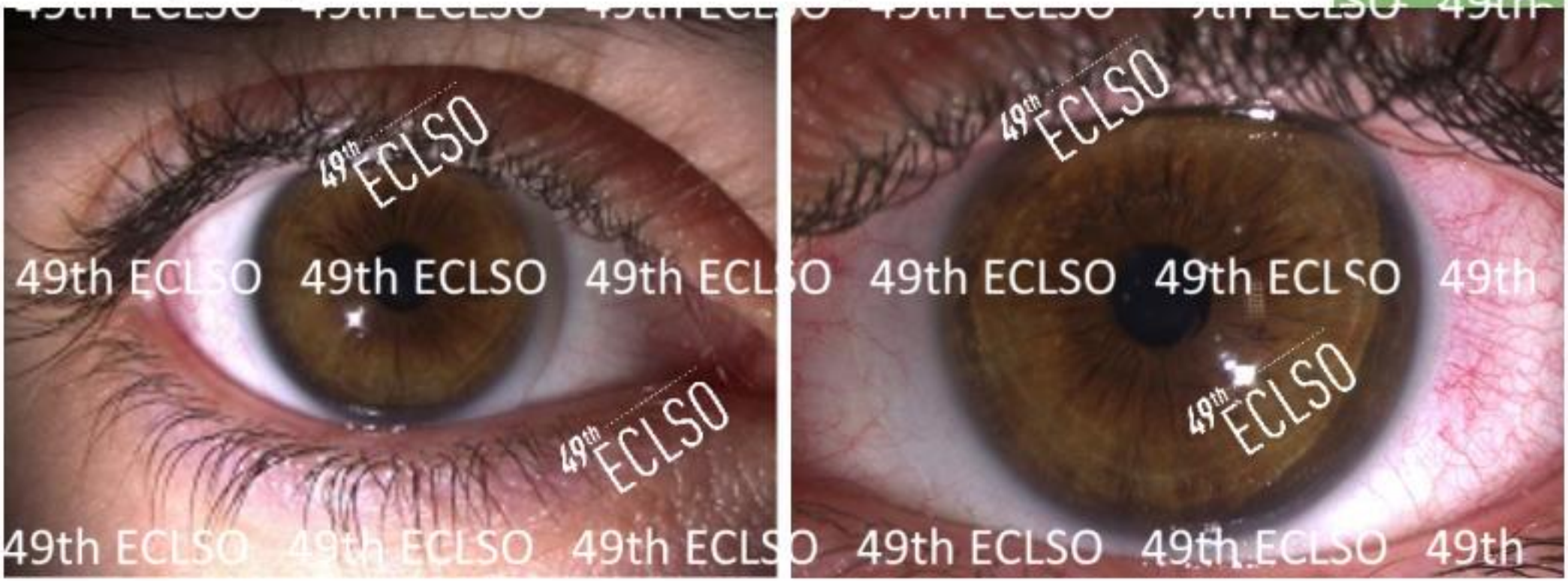
CL-Associated DED (CLADE)

- Among 415 CL wearers (who were not pre-screened for DED) factors related to dry eye status in multivariate modeling;
  - female sex
  - lenses with higher nominal water content
  - rapid pre-lens tear film thinning time
  - frequent usage of OTC pain medication
  - limbal injection
  - increased tear film osmolality

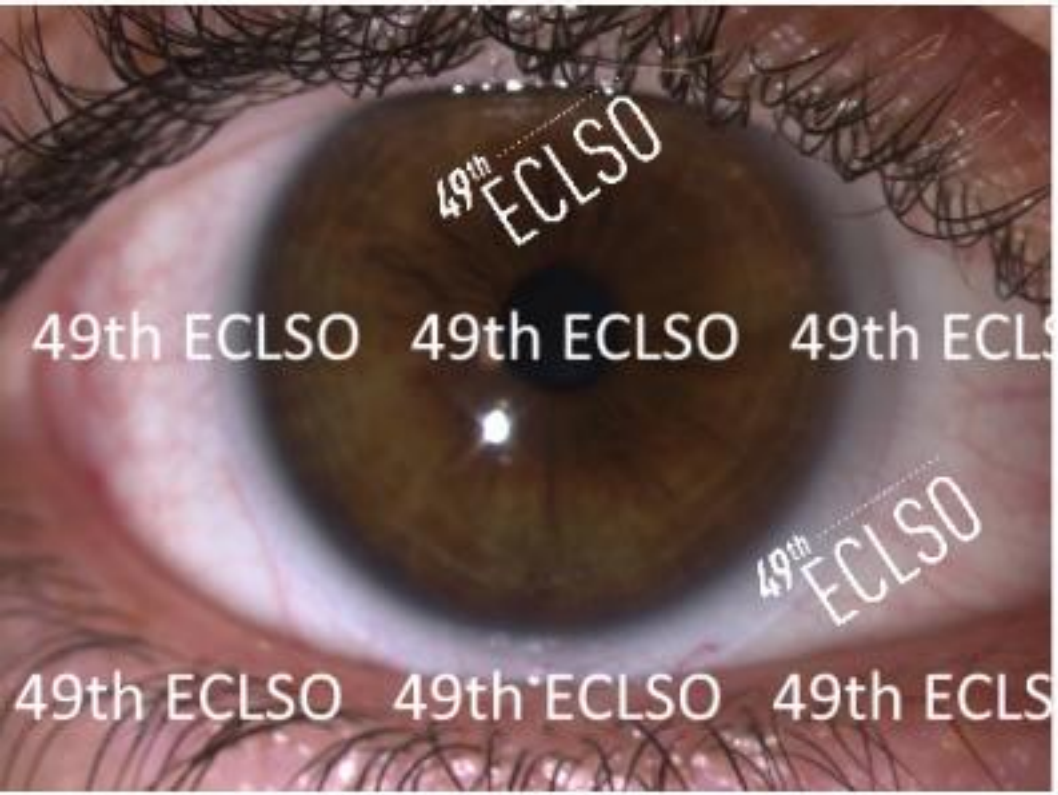
Nichols JJ & Sinnott LT. IOVS. 2006

CLs and Allergy

30 y.o. male, frequent replacement CLs for 1.5 years
c/o stinging, burning, itchy eyes, mucous secretion and constantly feeling the movement of his CLs on the eye



Indicates replacing them every 2 months, occasionally sleeping with CLs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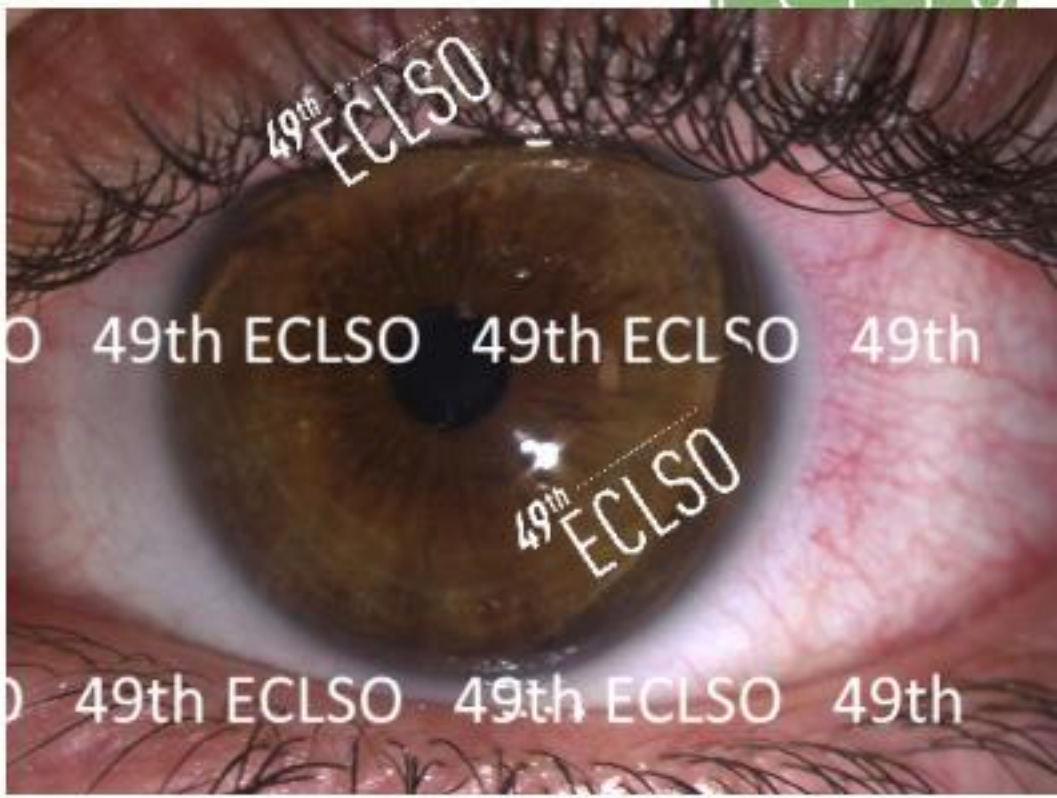
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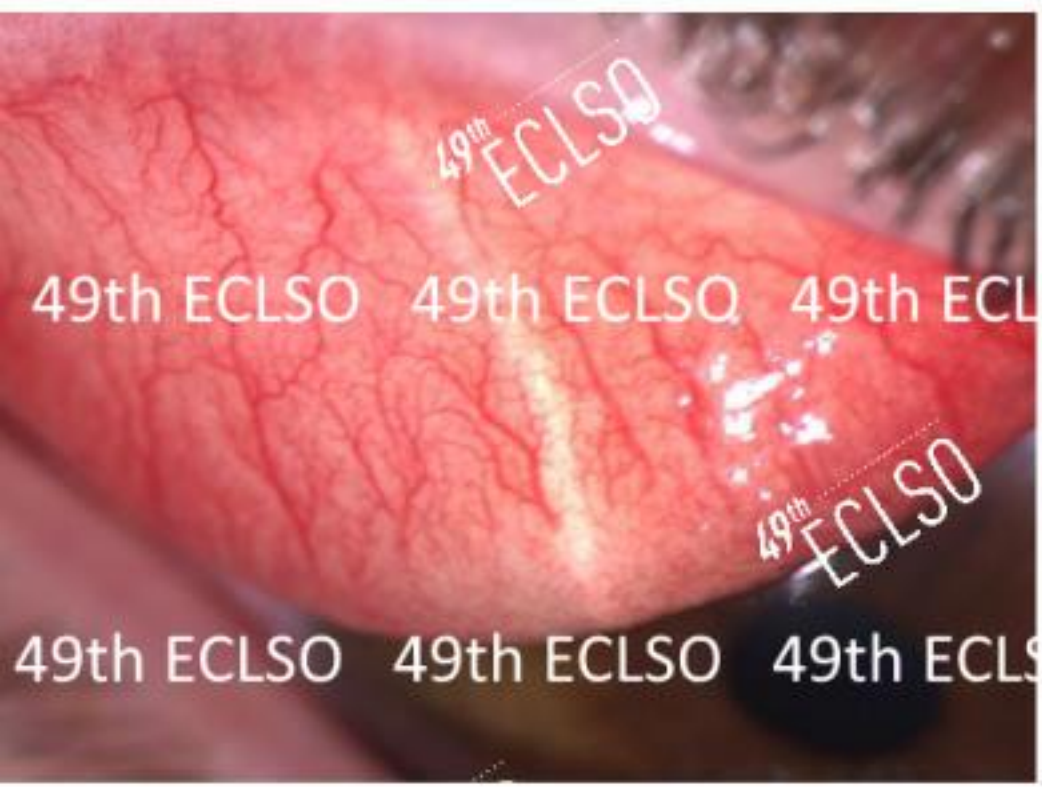
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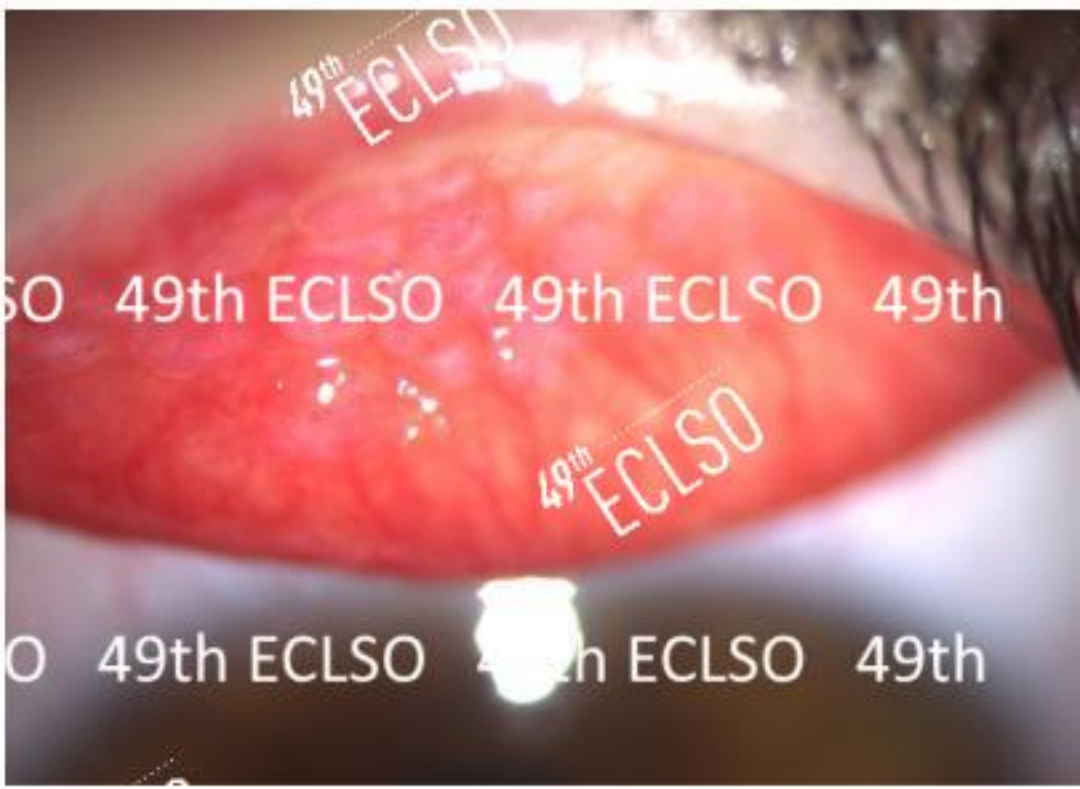
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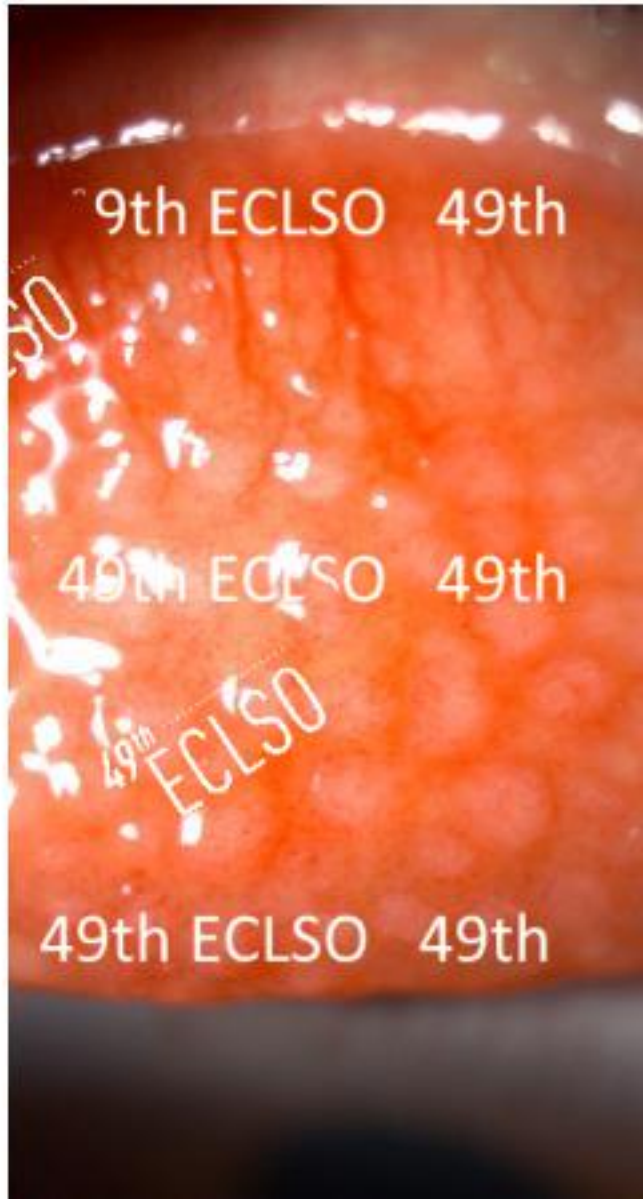
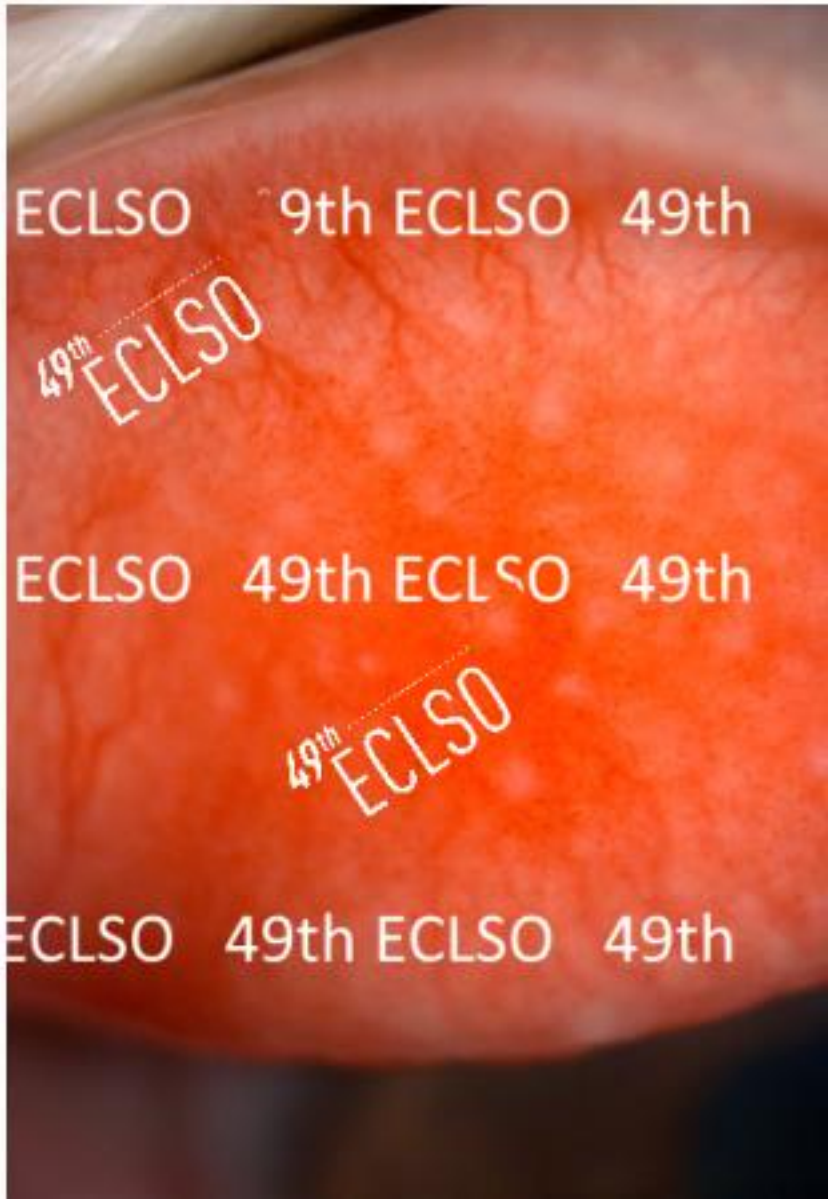
CL-induced Papillary Conjunctivitis (CLPC)
Giant Papillary Conjunctivitis (GPC)

- Chronic conjunctivitis that occurs in CL wearers
- Incidence: 1.5 to 47.5% (lens type/wear modality)
- Mechanism:
  - Mechanical trauma to superior tarsal conjunctiva by the CL
  - Immunologic response to deposits on the CL surface
    - bio-deposits of denatured protein
    - Microbiome??
- Pathogenesis: ?
  - Type IV hypersensitivity - Th2 lymphocyte mediated response to mechanical trauma
  - Type I hypersensitivity – may get aggrevated during allergy season



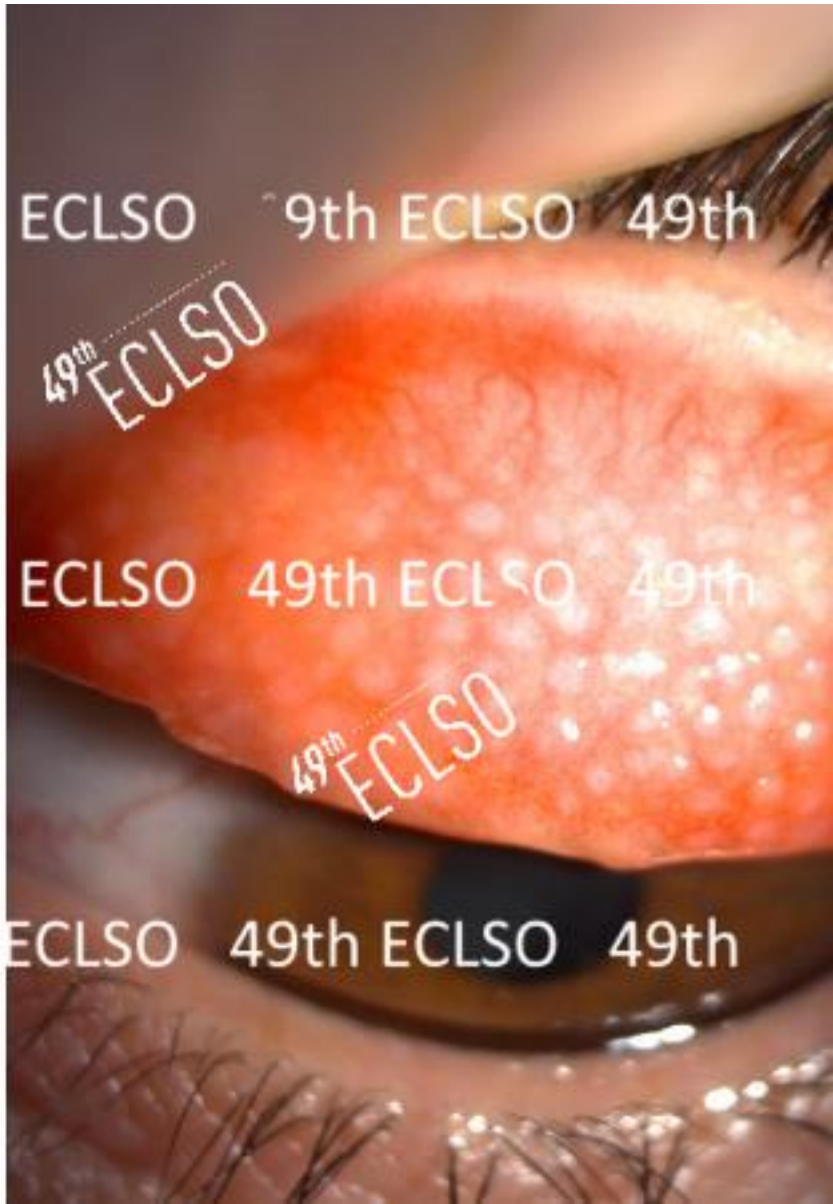
GPC

- Risk Factors:
  - Soft lens / extended wear/ >4 weekly replacement / h/o atopy
- Symptoms:
  - Asymptomatic
  - Misfitting CL / itching / mucin secretion
- Signs:
  - Papillary hypertrophy (>0.3-0.4 mm) of upper tarsal conjunctiva (local/diffuse)



GPC-Management

- Temporary d/c CL
- Topical Rx:
  - Dual-acting agents (Mast cell stabilizer+Antihistamine)(MCS+AH)
  - Soft steroids
  - Preservative-free artificial tears
  - ±CsA
- CLs should be clean and free from deposits
  - No extended-wear
  - Preservative-free care solution/ H_2O_2-based regimen
  - Daily disposables
- Follow-up!




Post-Rx 6 months
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Solution Hypersensitivity

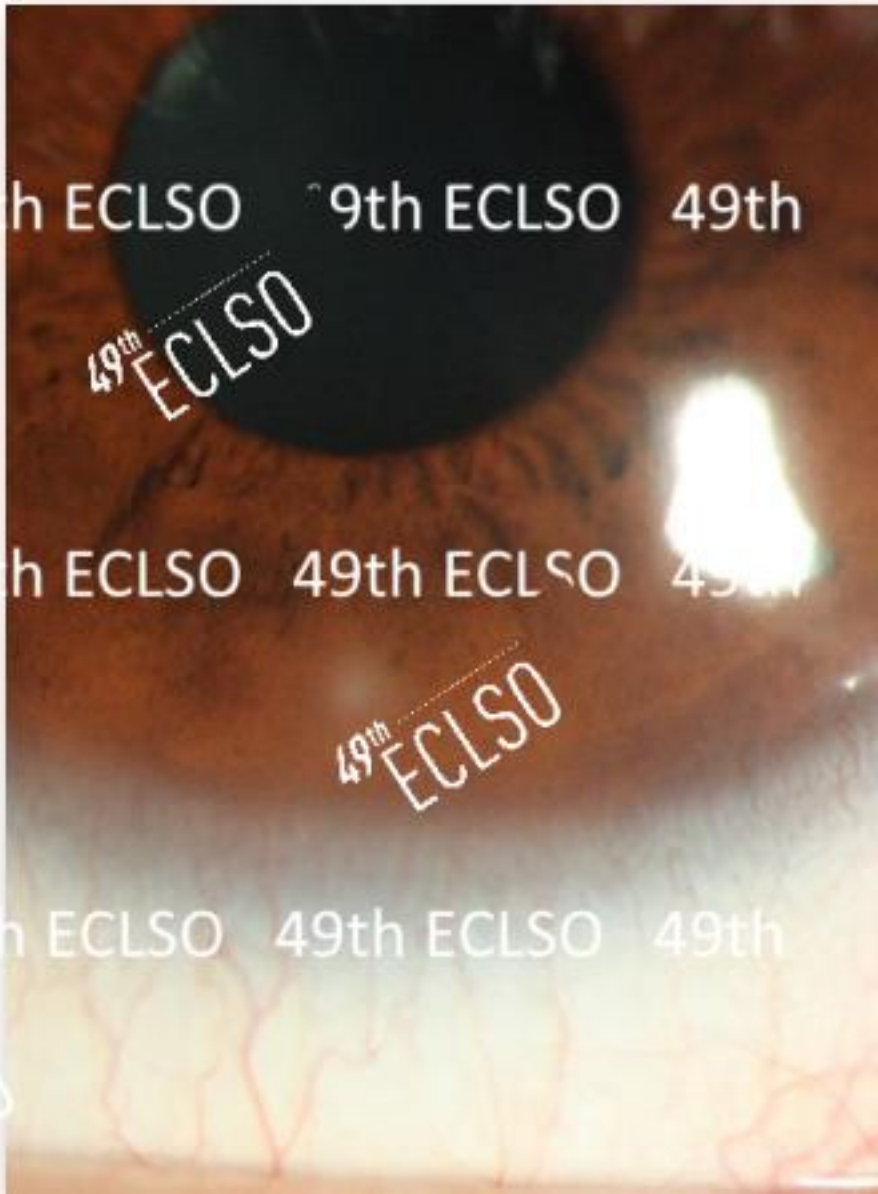
- Type IV hypersensitivity to preservatives in CL care solutions (thimerosal/chlorhexidine/BAK)
- Risk factors: h/o atopy, allergy, eczema
- Redness/irritation/itchiness
- Bulbar/palpebral conjunctival hyperemia ± follicular hypertrophy
- ± lid eczema
- Management:
  - Temporary d/c lens wear
  - Preservative-free artificial tears – directions on lens care!!
  - Shift to H_2O_2-based regimen
  - Daily disposables

Inflammatory/Infectious Problems with CLs

Corneal Infiltrative Events (CIE) / Sterile Infiltrates

- Non-progressive, self-limiting inflammatory response
- Less severe than MK
- 100x more frequent than MK
- 2x more frequent with SiHy
- 2-6x more frequent with EW/CW
- Etiology
  - Infection with microorganisms
  - Innate/adaptive immune response to bacterial antigens

Poggio EC & Abelson M. 1993; Stein RM, et al. 1988; Aasuri MK, et al. 2003; Keay L, et al. 2009; Szczotka-Flynn L, et al. 2013



CIE
Risk Factors

Non-modifiable

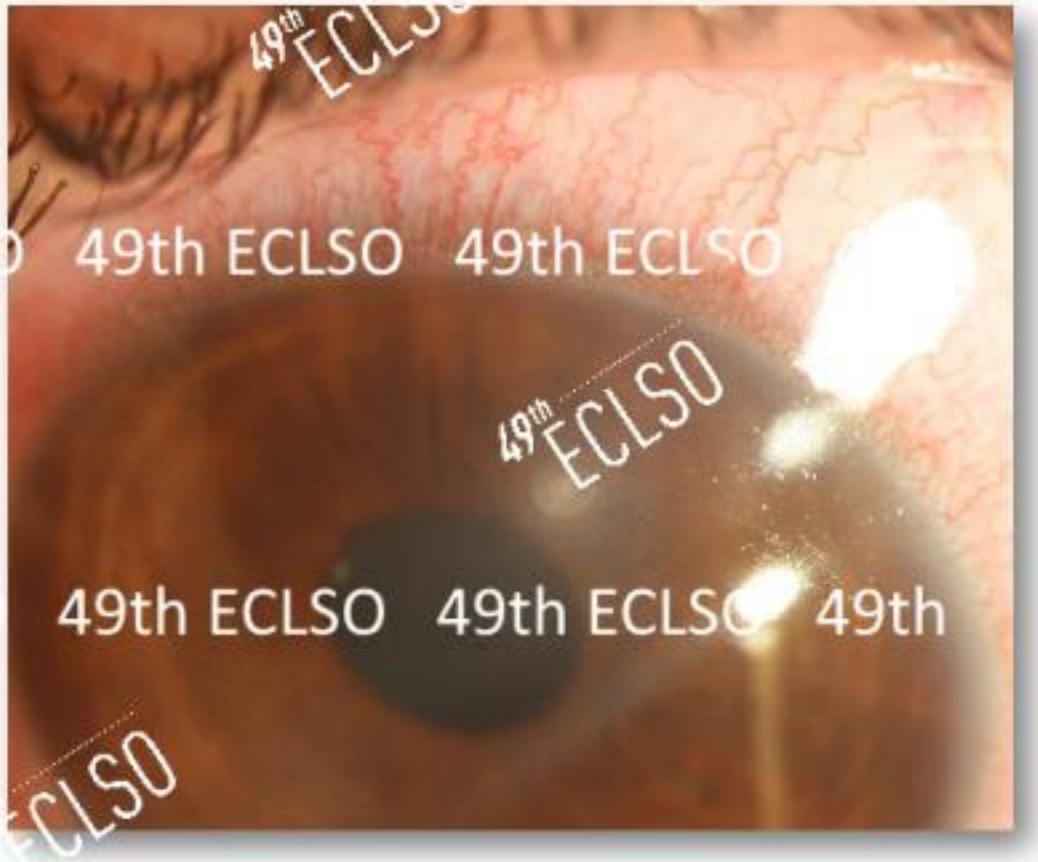
- Male gender
- Prior h/o CIE
- 15-25 and >50 y.o.
- New wearers and very experienced wearers
- Healthy patient

Modifiable

- Extended-wear
- Bioburden/colonization on lids
- Multipurpose solutions
- SiHy
- Smoking
- Old lens storage case

Corneal Infiltrative Events (CIE) / Sterile Infiltrates

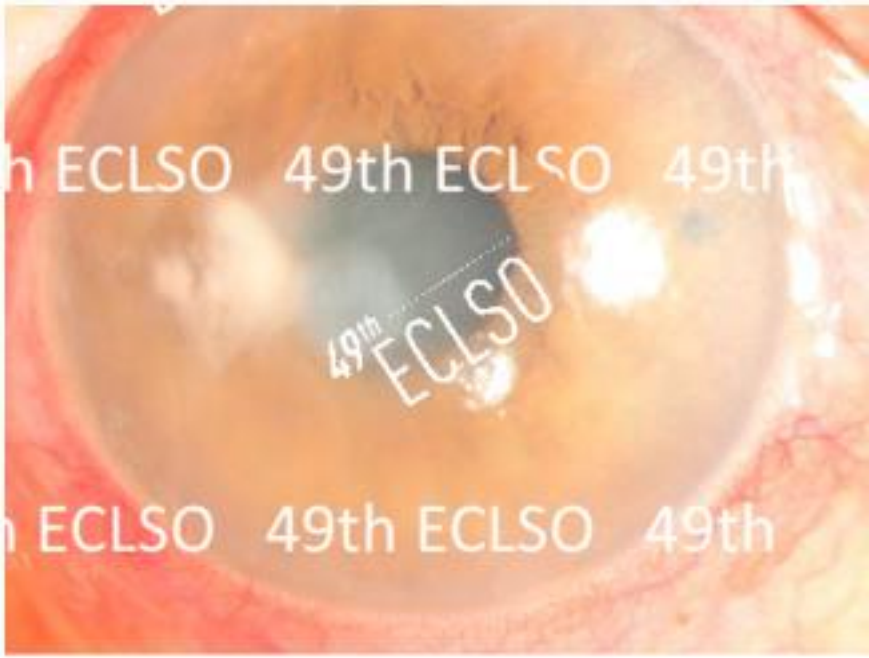
- No lid edema
- Low grade infiltrates
  - Small (<1 mm)/peripheral
  - +/- epi defect
  - No-min AC reaction, no secretion
- Little/no pain, mild photophobia
- Most (1/3 to 1/2) culture positive!! even if <1 mm
- Rx: antibotics (fluoroquinolone) + soft steroids + F/U!!



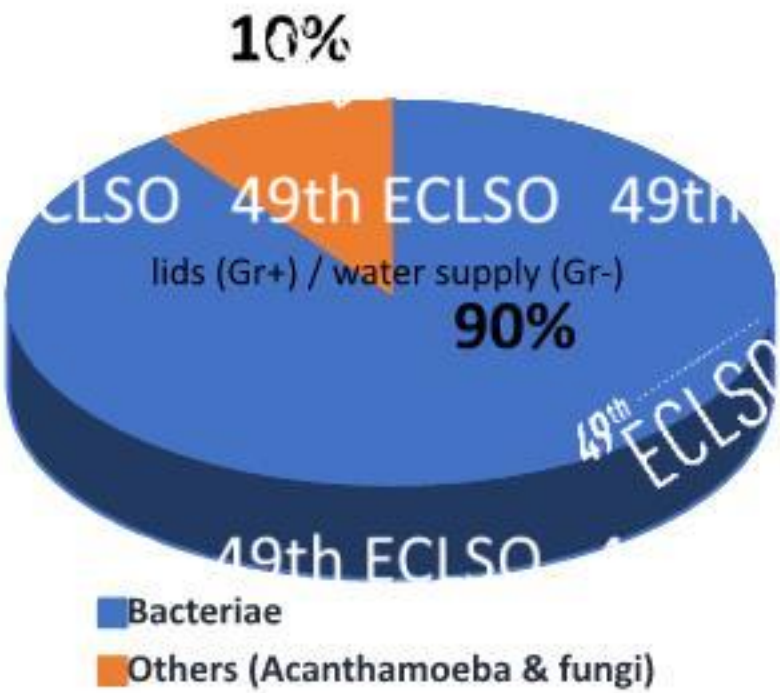
Donshik PC, et al. 1995; Stein RM, et al. 1988; Szczotka-Flynn L, Chalmers R. 2013

CL-related Microbial Keratitis

- Incidence:
  - Daily soft CL wearers: 2-4/10 000
  - Overnight soft lens wearers: 20/10 000
- Hydrogel = SiHy
- Ortho-K wearers: 13.9/10 000 patient years
- Daily disposable lens wear results in less severe infection
- Cosmetic lens wearers are at 12.3x more risk - infrequently dispensed by eye-care professionals

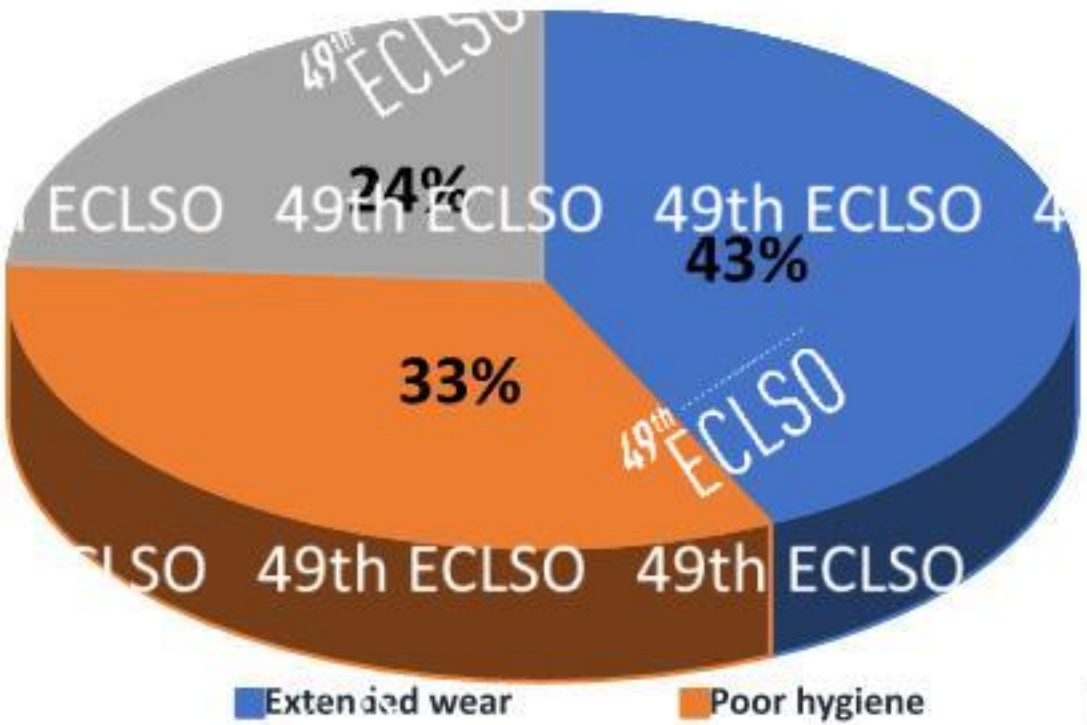


Microorganisms



- Gr-
  - Ocular surfaces of CL wearers have ↓ Gr+ and ↑ Gr- populations
  - Pseudomonas aeruginosa - most prevalent pathogen in CL-related MK in most regions
  - Antibiotics need to provide adequate activity against Gr-
- Gr+
  - More prevalent in temperate climates such as Australia and France
  - Include; coagulase-negative Staphylococcus (including Staphylococcus epidermidis), Staphylococcus aureus and Streptococcus pneumoniae
- Others: Acanthamoeba & fungi

Risk Factors



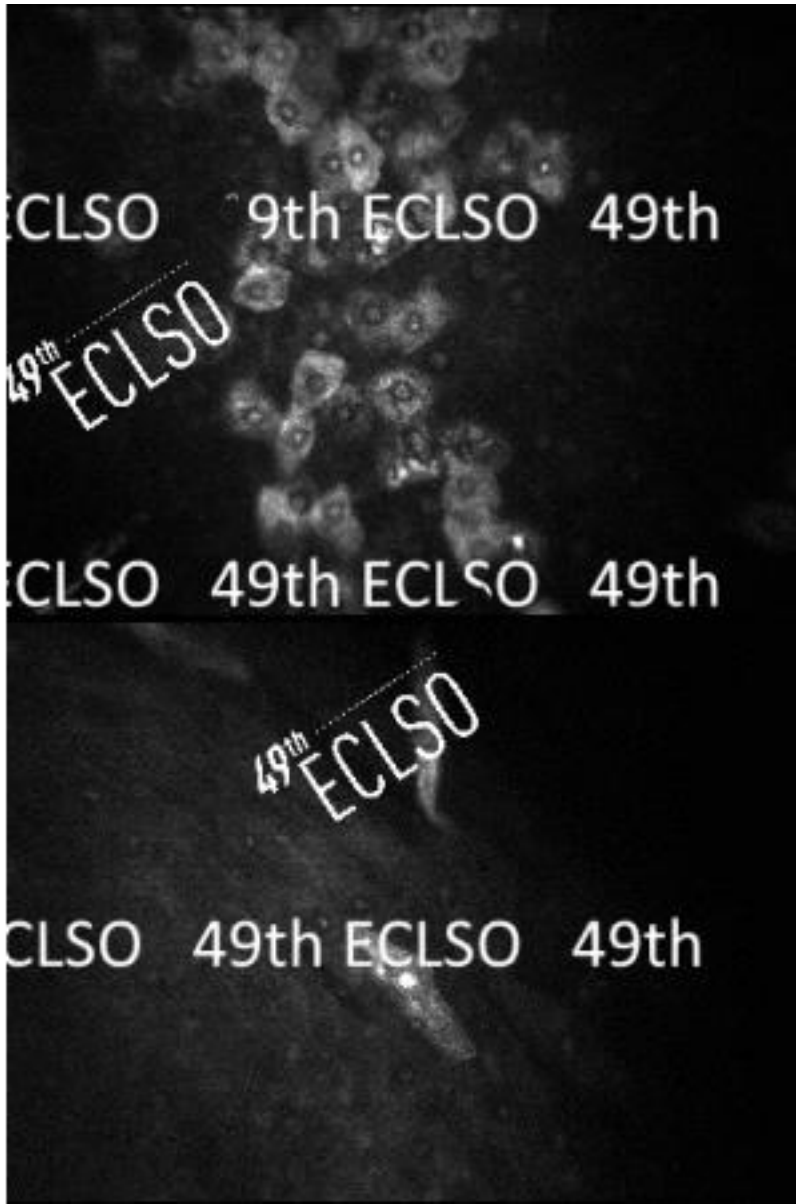
- Major risk factors:
  - overnight wear
  - poor hygiene
- Other risk factors:
  - smoking
  - showering in lenses
  - male sex
  - young age
  - high SES

Schein OD, et al. 1989; Dart JK, et al. 1991 ; Schein OD, et al. 1994 ; Stapleton F, et al. 1995; Dart JK, et al. 2008 ; Stapleton F, et al. 2008 ; Edwards K, et al. 2009

Pathogenesis

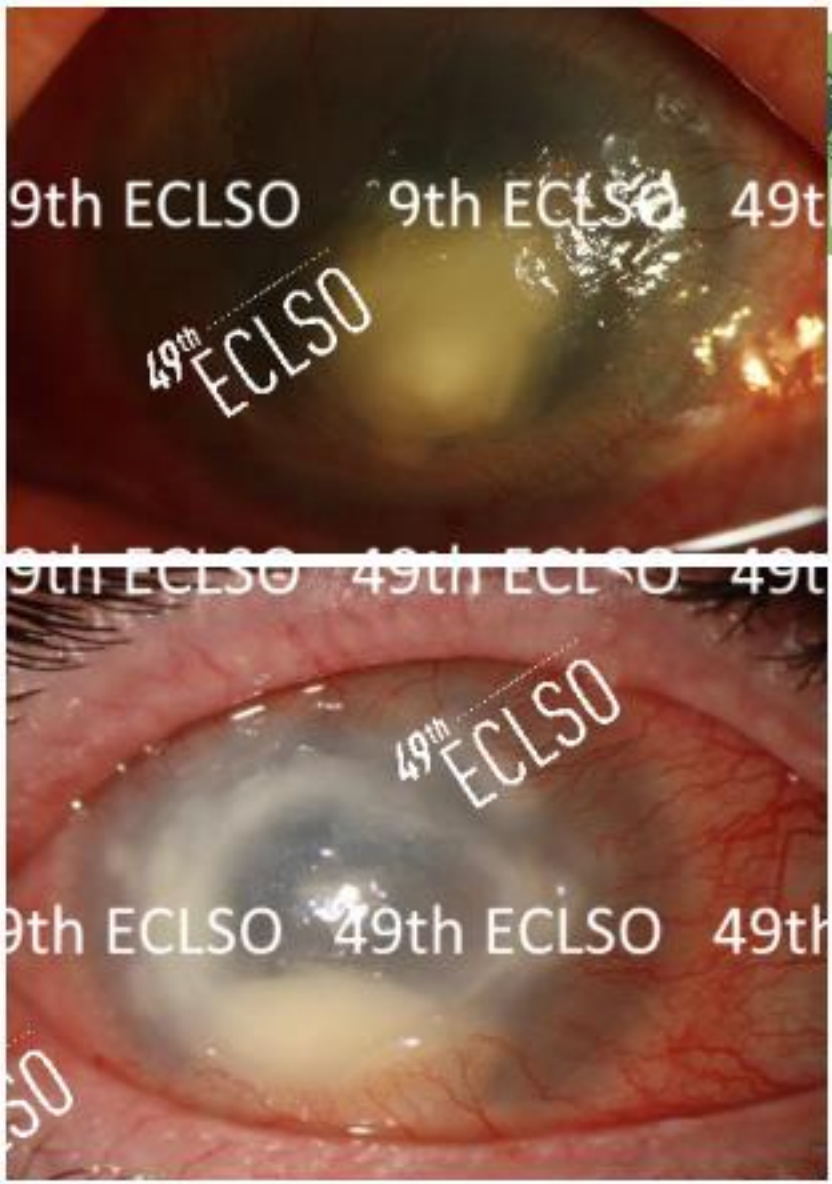
- Epithelial desquamation ↓ with all wear schedules
- Stagnation of tear film ⇒ subclinical inflammation with increased microorganisms/debris

  ⇒ easier microbial adherence to surface
- Increased resistance to treatment with biofilm formation



Microorganisms and Management

- Fungal
  - Filamentous/candida
- Acanthamoeba
  - 85-90% CL wearer
  - Water supply
- Serratia marcescens (4.7%-53%) / enterobakter / E.coli / Klebsiella
- Rx: early empirical broad-spectrum antimicrobials + soft steroids after 48 hours (except fungal keratitis) + adjuvant Rx (CXL)

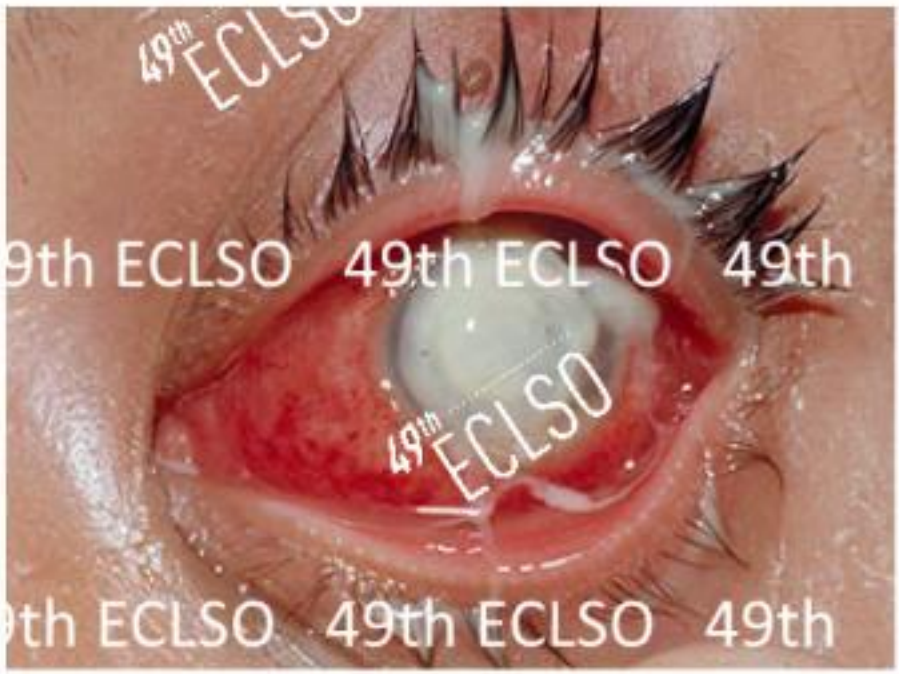


Prevention

- Avoidance of overnight wear
- Attention to hygiene
- Daily disposable lenses (no decrease in absolute risk but mild disease)
- Early presentation to ECP

Prognosis

- Microorganism
- Time to starting treatment



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Thank You