



EYE SCHOOL WITH DR D



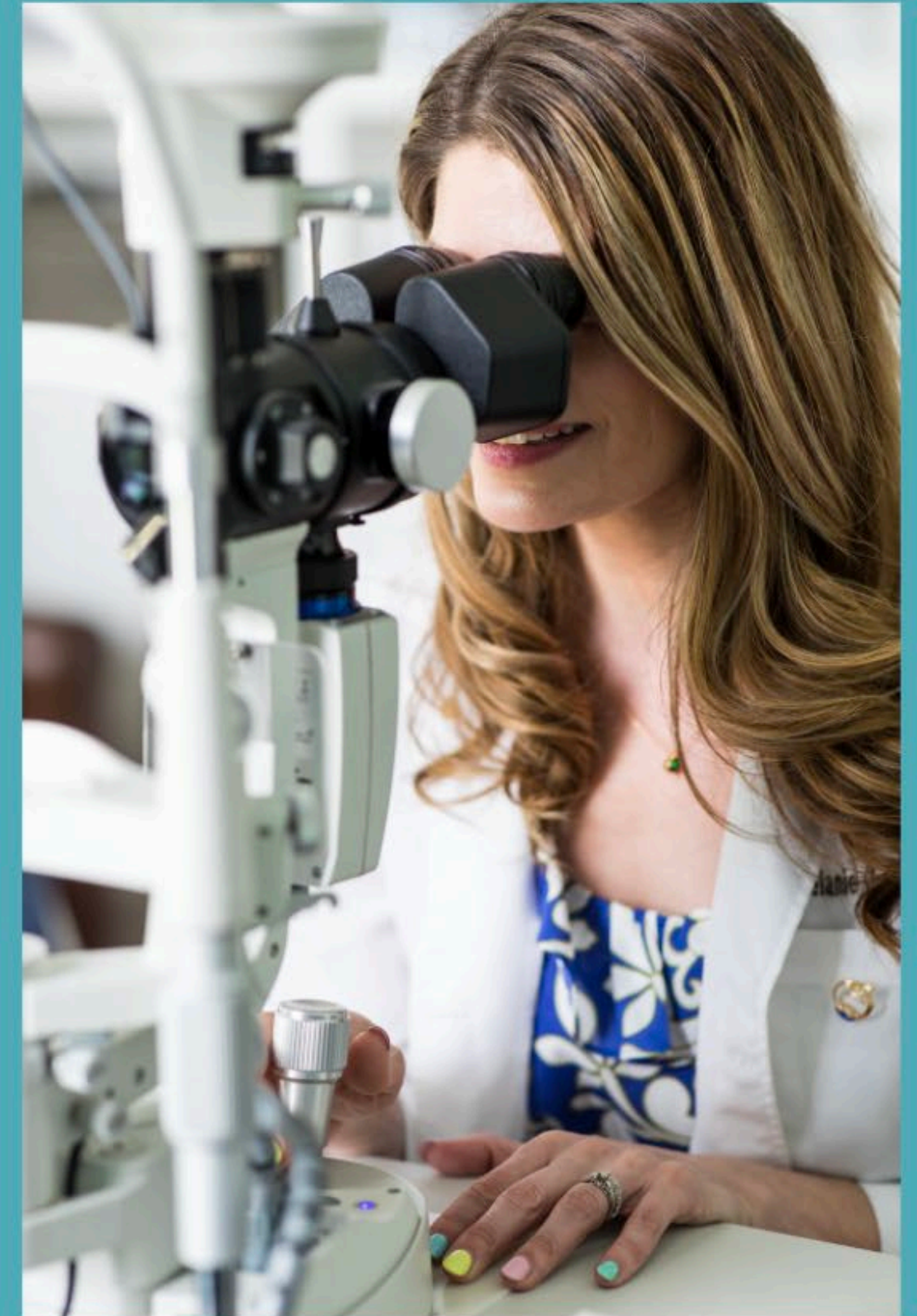
ALL ABOUT THE GLANDS



PRESENTED BY
MELANIE DOMBROWSKI, OD, MBA, FAAO

Disclosures

- Sight Sciences
- Lumenis
- Bausch and Lomb
- Alcon
- Allergan
- Eyes Are the Story
- We Love Eyes
- Dry Eye Rescue
- GoodRx
- Shamir
- Eye Love/Heyedrate
- Biotissue
- Twenty Twenty Beauty
- Foreo
-





MGD-DEWS 2010

MGD is a chronic, diffuse abnormality of the meibomian glands, commonly characterized by terminal duct obstruction and/or qualitative/quantitative changes in the glandular secretions. This may result in alterations of the tear film, symptoms of eye irritation, clinically apparent inflammation, and ocular surface disease.



EYE SCHOOL WITH DR D

FREE

Articles | March 2011

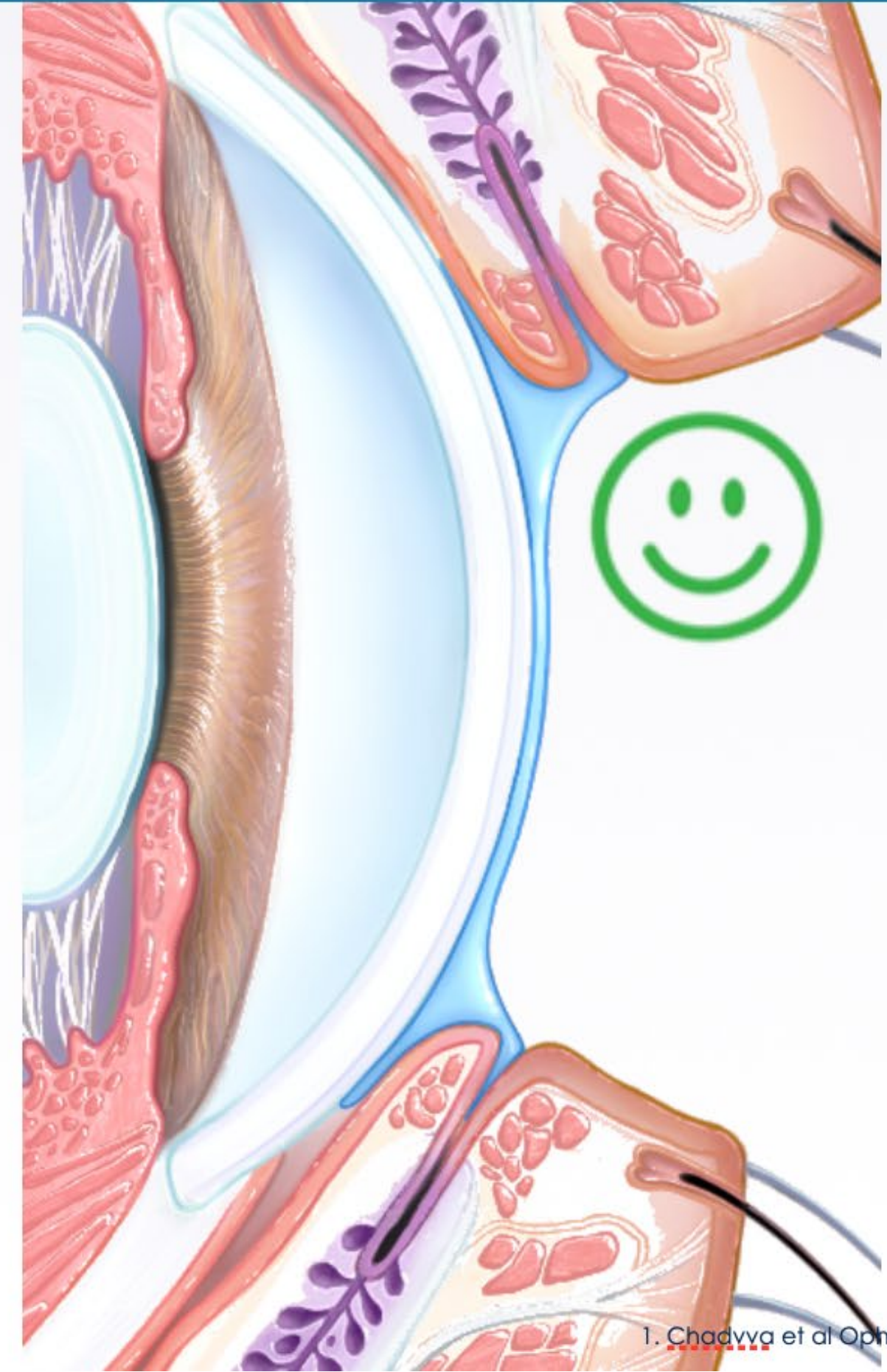
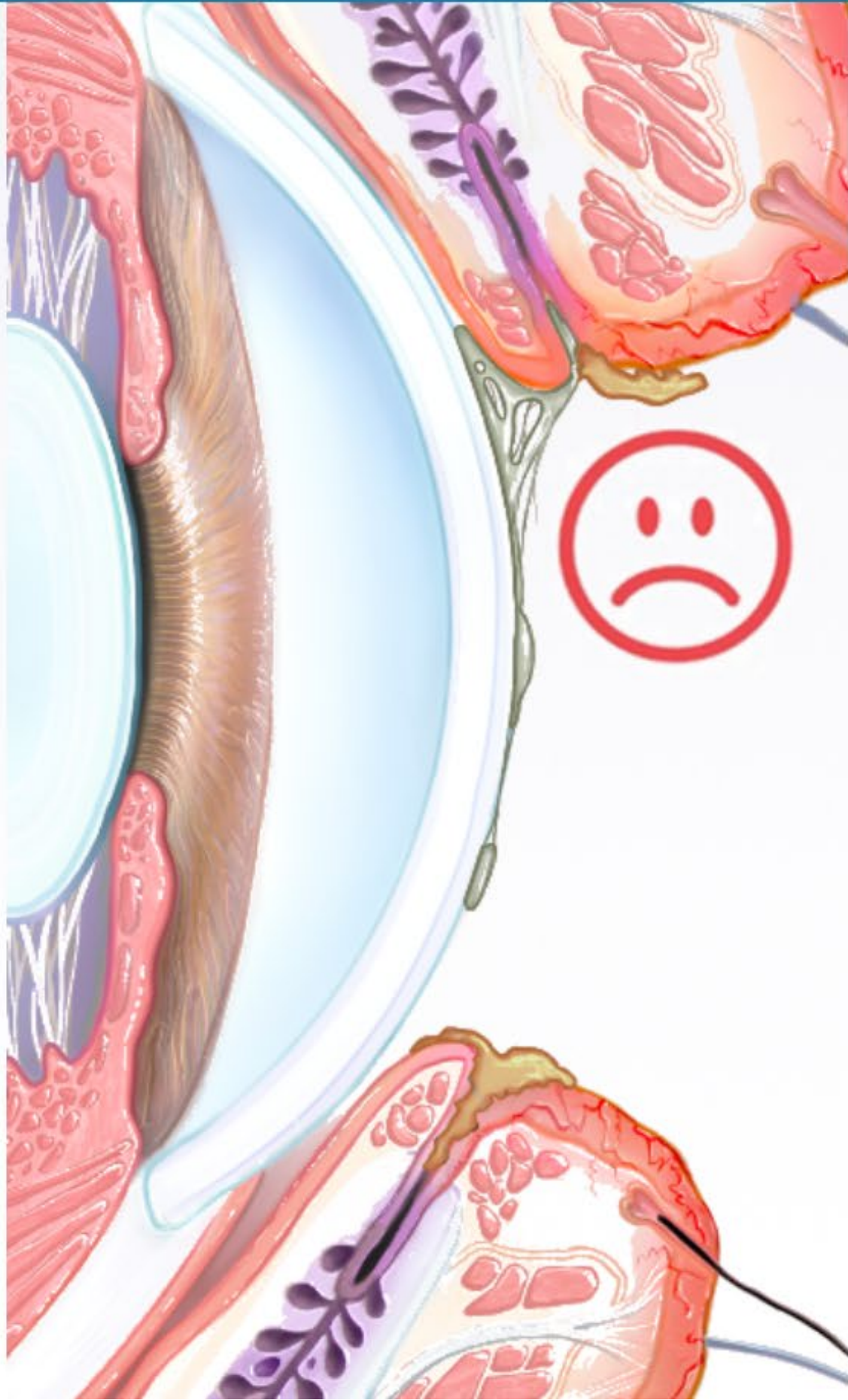
The International Workshop on Meibomia Gland Dysfunction: Executive Summary

Kelly K. Nichols; Gary N. Foulks; Anthony J. Bron; Ben J. Glasgow; Murat Dogru; Kazuo Tsubota; Michael Lemp; David A. Sullivan

+ Author Affiliations & Notes

Investigative Ophthalmology & Visual Science March 2011, Vol.52, 1922-1929.
doi:<https://doi.org/10.1167/iovs.10-6997a>

What is MGD¹?



Impact of MGD?



Meibomian gland health is integral to healthy tear film.



Gland
Obstruction
86%
of Dry Eye has an
MGD component



Challenges With Using Only Anti-Inflammatories



Anti-inflammatory prescriptions are **expensive and often require prior-authorizations**



Strict compliance is needed to achieve expected results

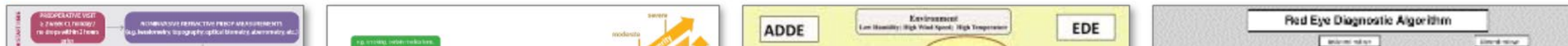


Clinical benefits from immuno-modulators seen only after **months** of therapy



Steroid **side effects** may limit their long-term use

Complex & Multifactorial....Chronic & Progressive..who can argue?



THE Ocular Surface

A JOURNAL OF REVIEW LINKING LABORATORY SCIENCE, CLINICAL SCIENCE, AND CLINICAL PRACTICE

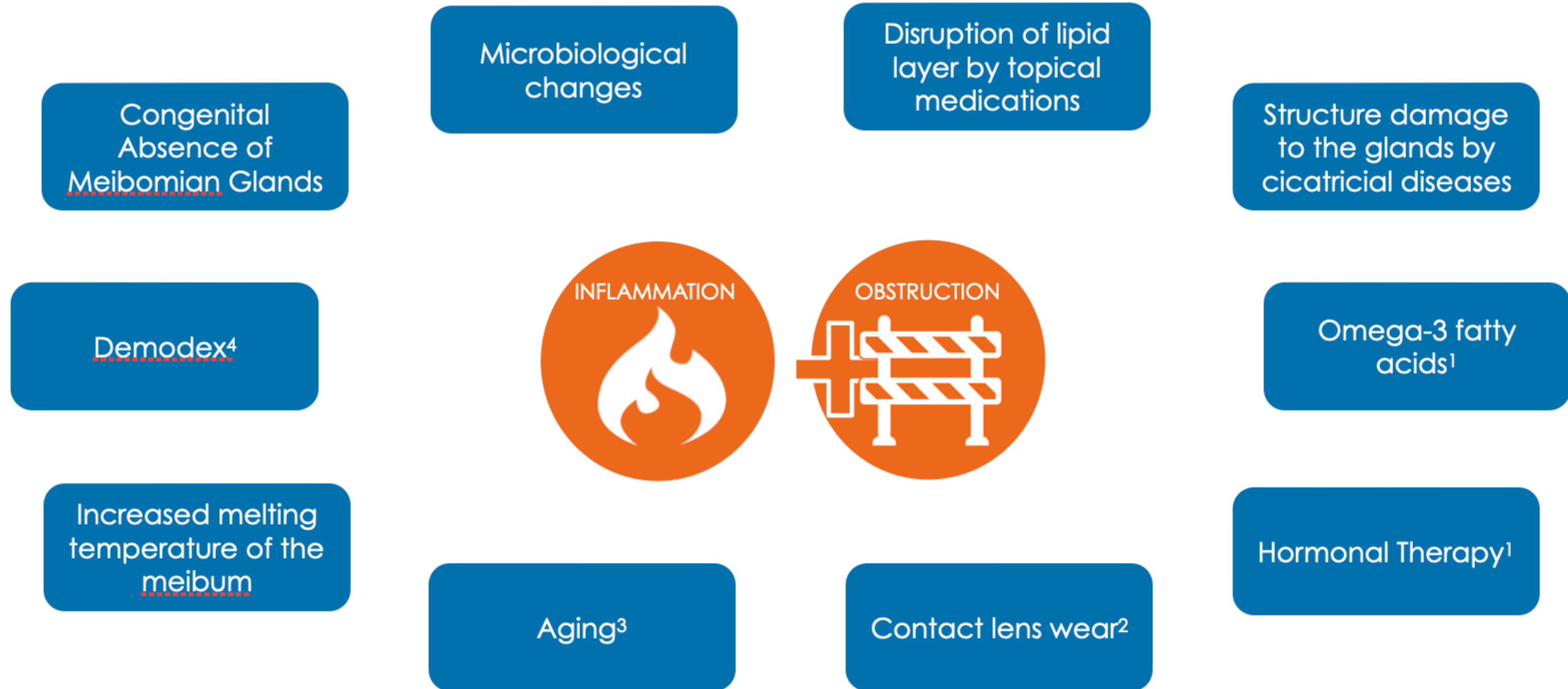
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Indexed in MEDLINE/PubMed and EMBASE

TFOS DEWS II REPORT



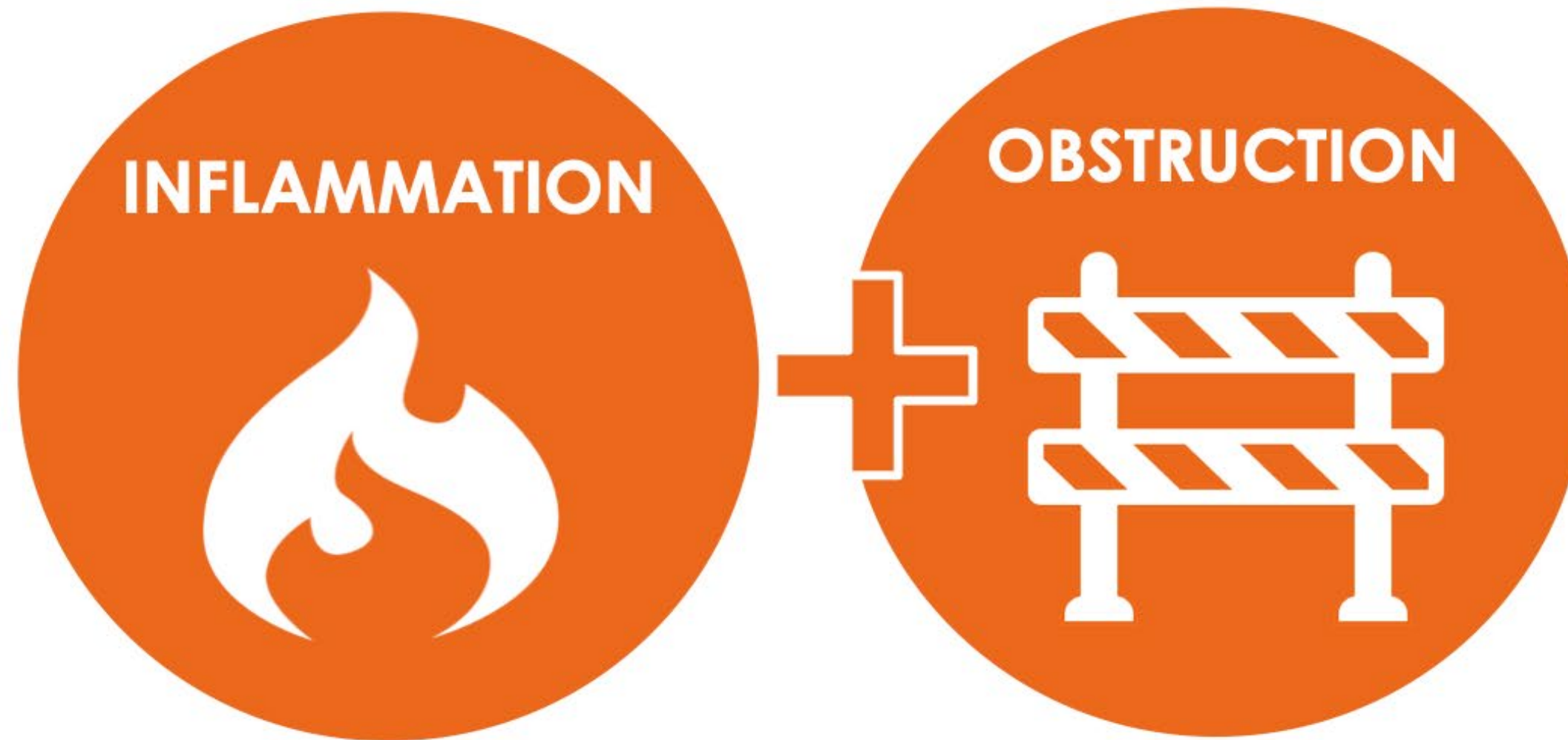
Many "Possible" Contributors To Dry Eye



The TearCare® System is intended for the application of localized heat therapy in adult patients with evaporative dry eye disease due to meibomian gland dysfunction (MGD), when used in conjunction with pressure to the eyelids to express the meibomian glands.

1. Sullivan D. IOVS. 2000. 2. Arita R. Ophthalmology. 2009. 3. Obata H. Cornea. 2002. 4. Liu J. Curr Opin Allergy and Clin Immunol. 2010.

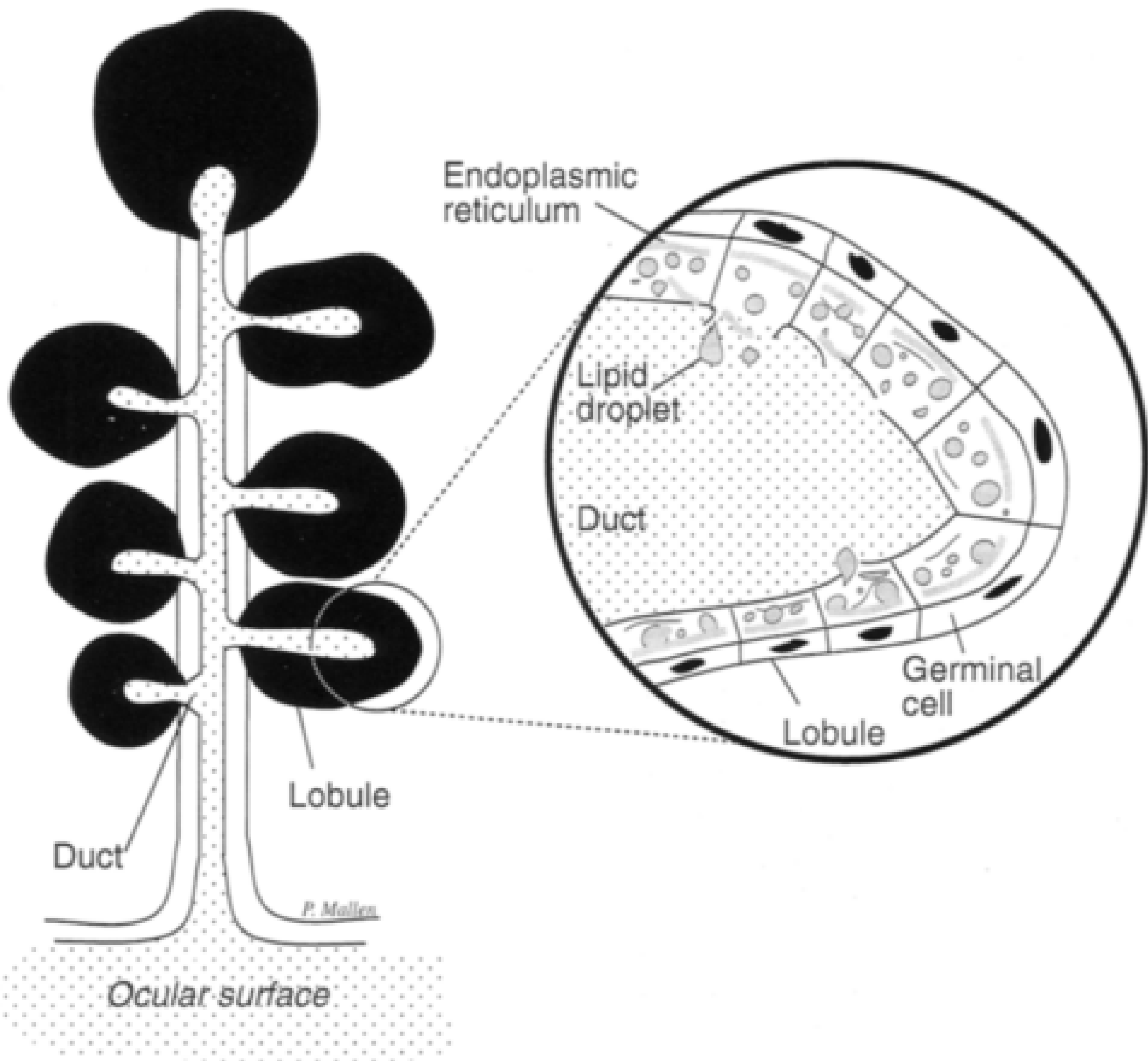
Best Action Plan Addresses Both Issues



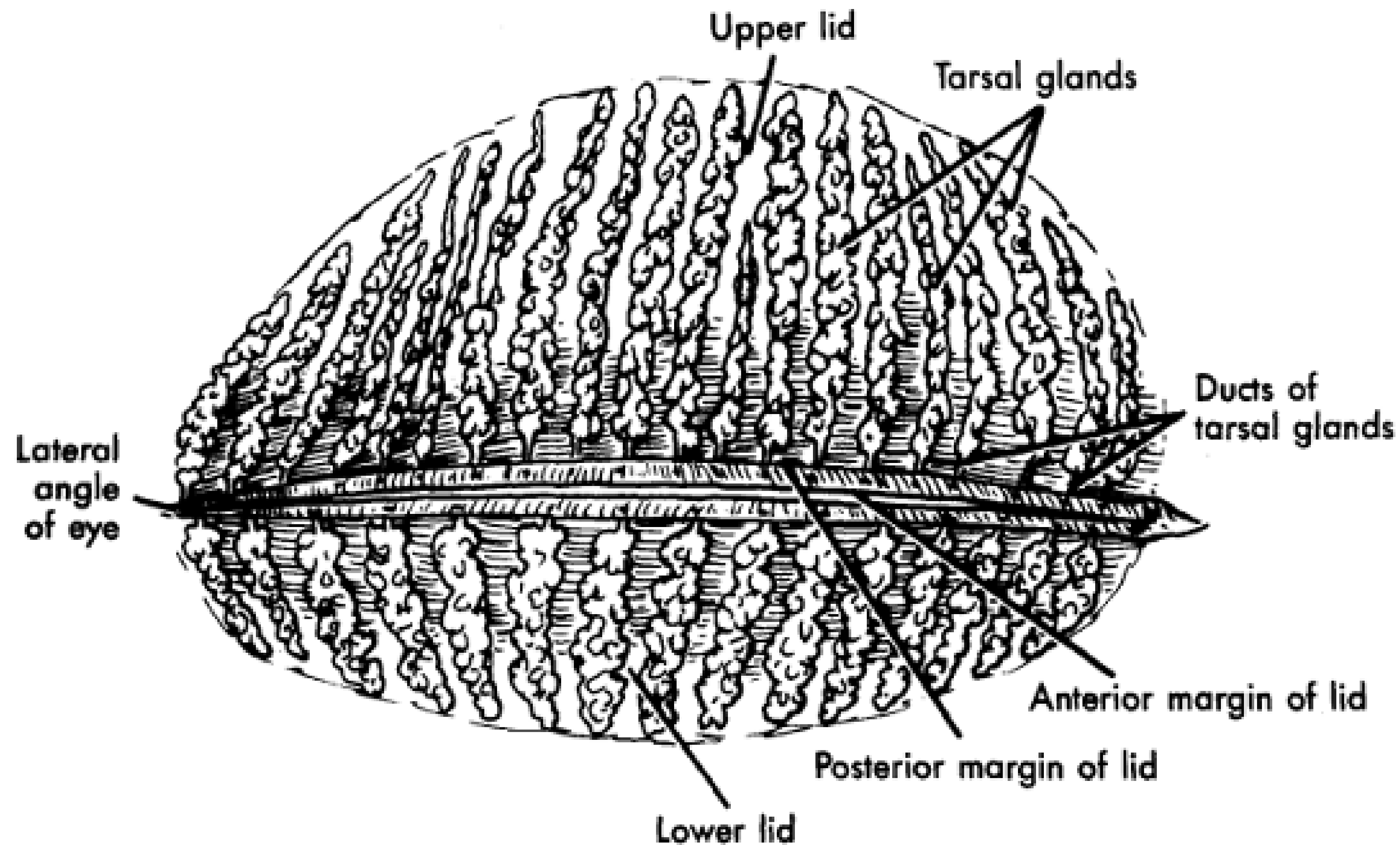
30-40 glands
along top lid



20-25 glands
along top lid



- Lobules w/ Central Duct
- Duct System that opens onto ocular surface



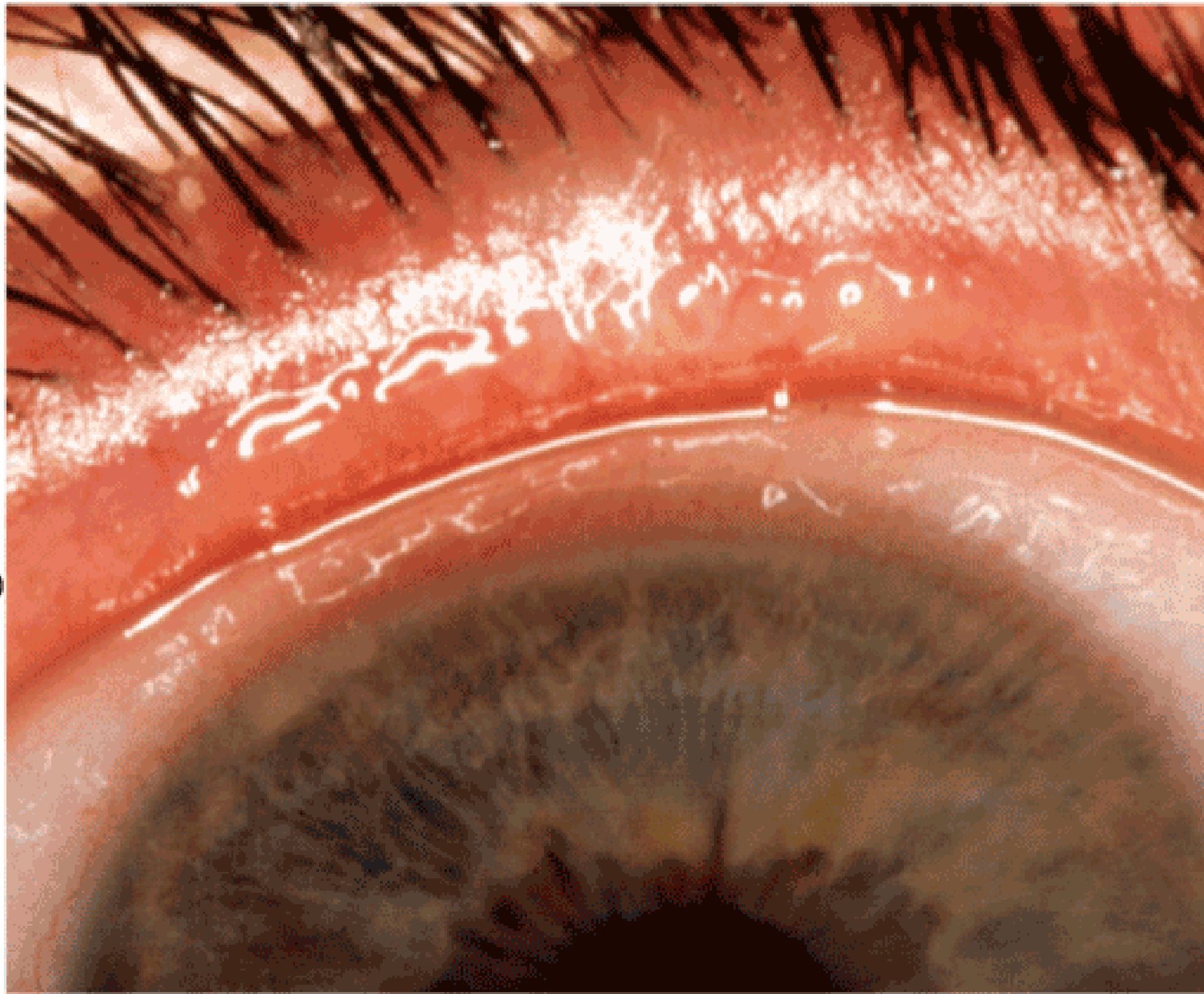
Pathophysiology

Or how glands malfunction

Dysfunctional Mg's result in:

High Delivery State

Low Delivery State

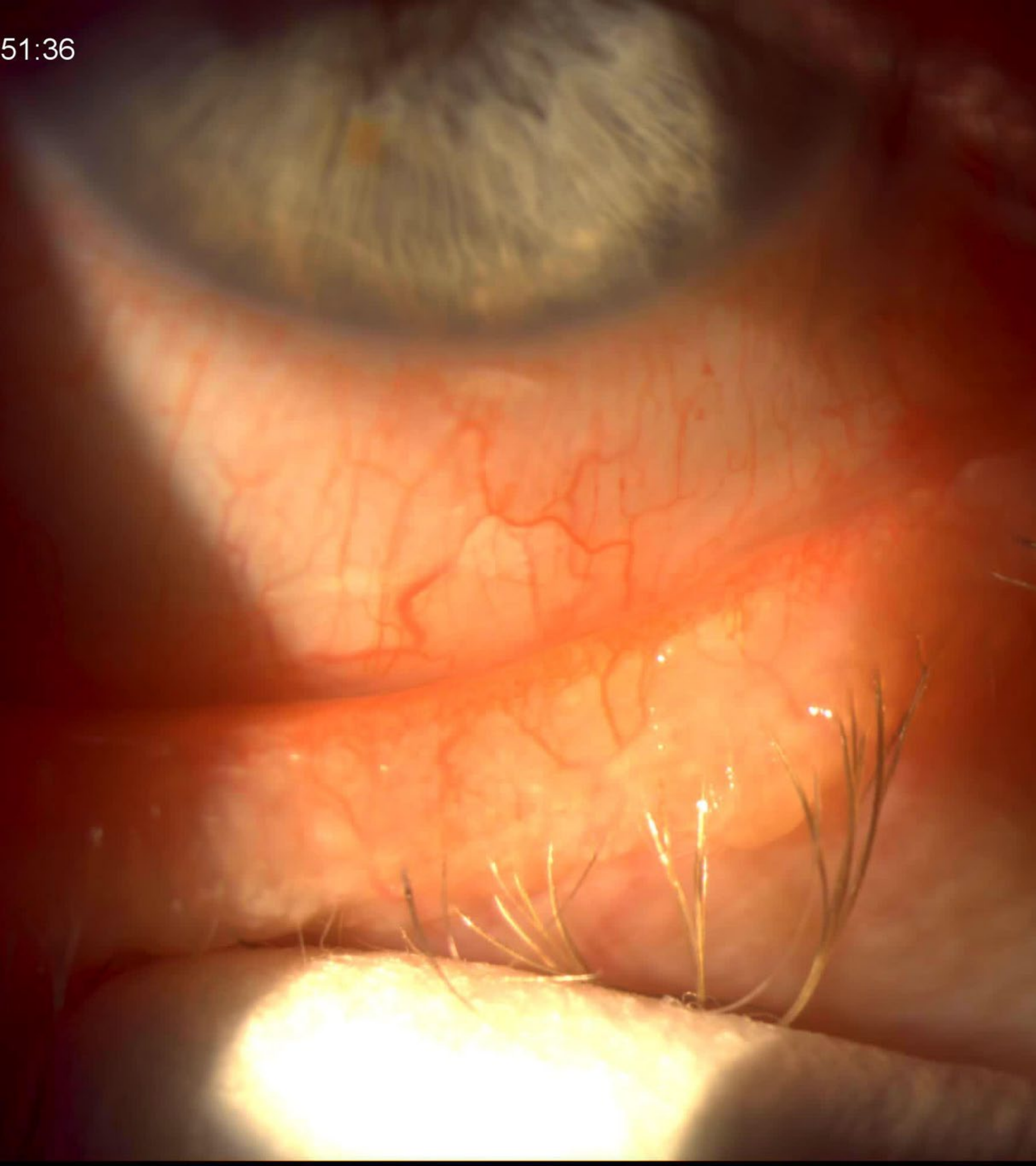


High Delivery State

Hyper-secretion

- large volume of MG lipid
- accumulates at lid margin
- usually due to systemic cause
 - seborrheic dermatitis
 - atopic dermatitis
 - acne rosacea

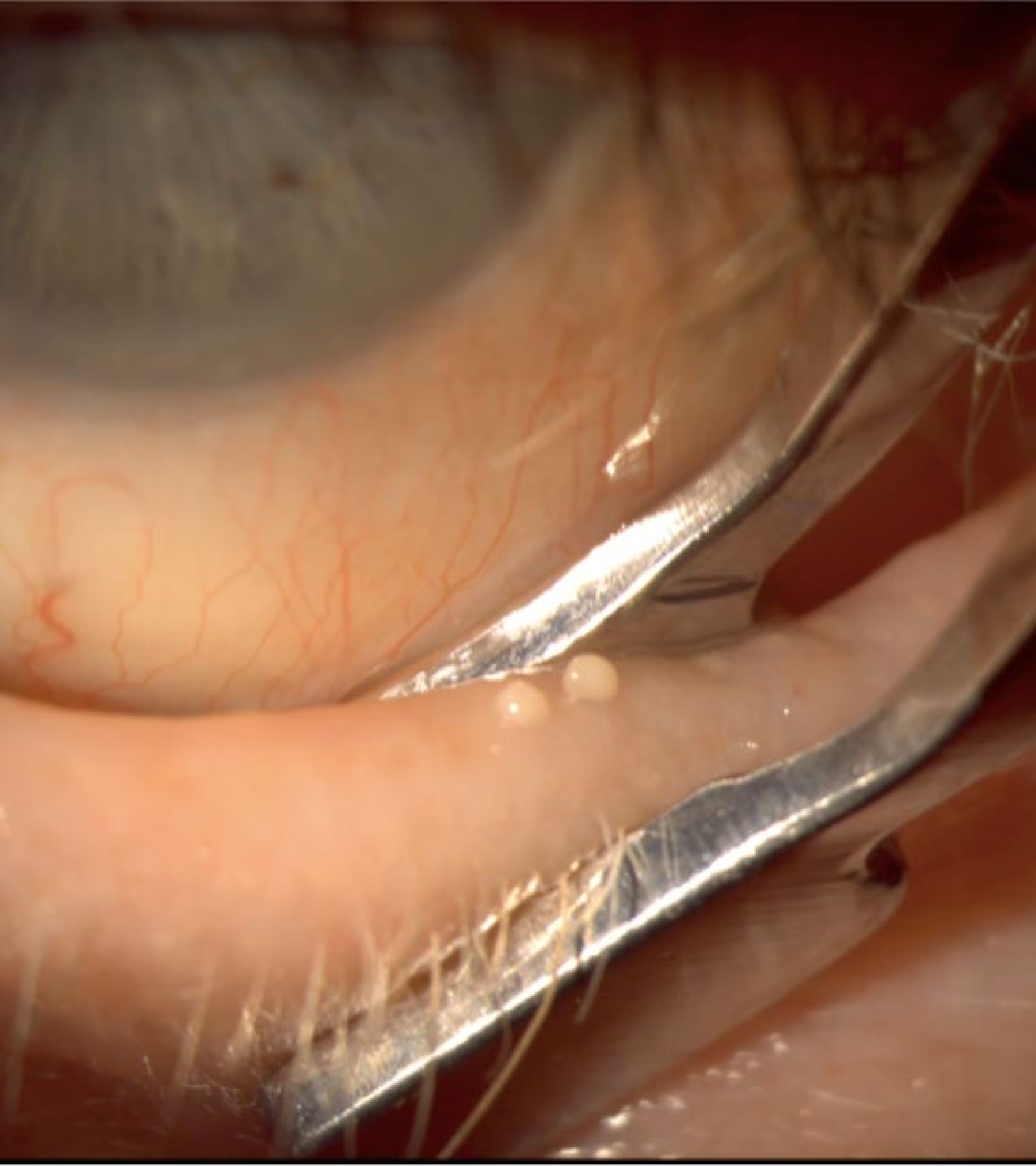
Abnormal functioning of the meibomian gland can take the form of hypersecretion, as seen here.



Low Delivery State

Hypo-secretion

- develops when MG atrophy occurs
- generalized reduction in # of functioning MG's

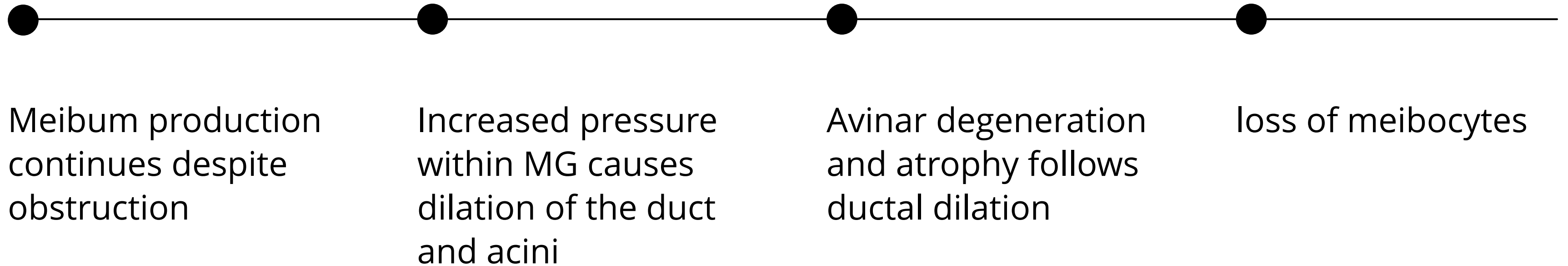


Low Delivery State

Obstruction

- most common form of MGD
- hyperkeratinization of the epithelium lining of the duct occurs
 - exact cause unknown
 - inflammatory mediators suspected

Obstruction Timeline



Stagnation results in altered lipids

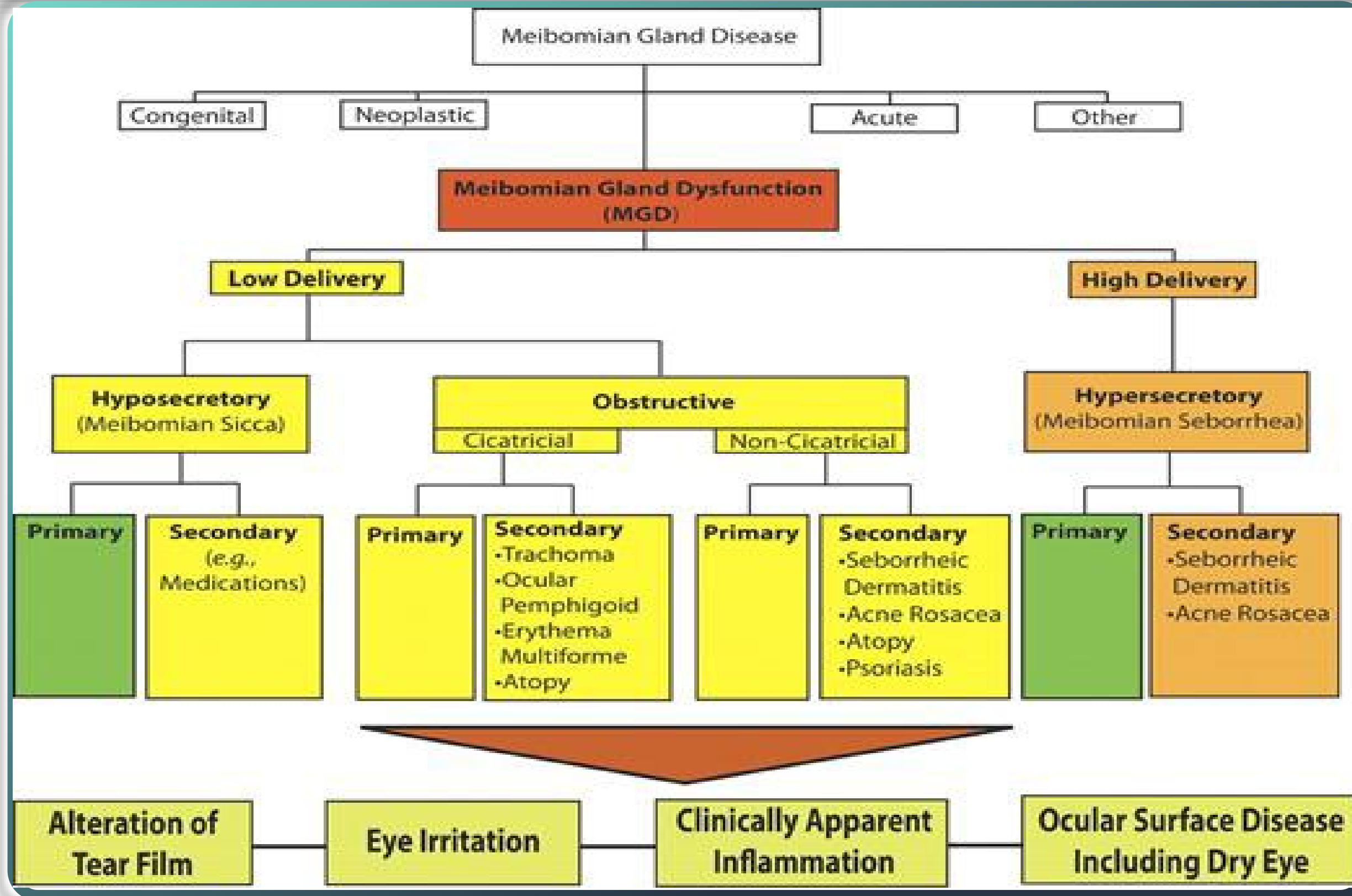
- thickening
- loss of clarity
- increased melting point
- bacterial colonization
 - staph epidermidis
 - s. aureus
 - propionibacterium acnes
 - cornebacterium
- inflammatory mediators formed & released

Cascade of Inflammation

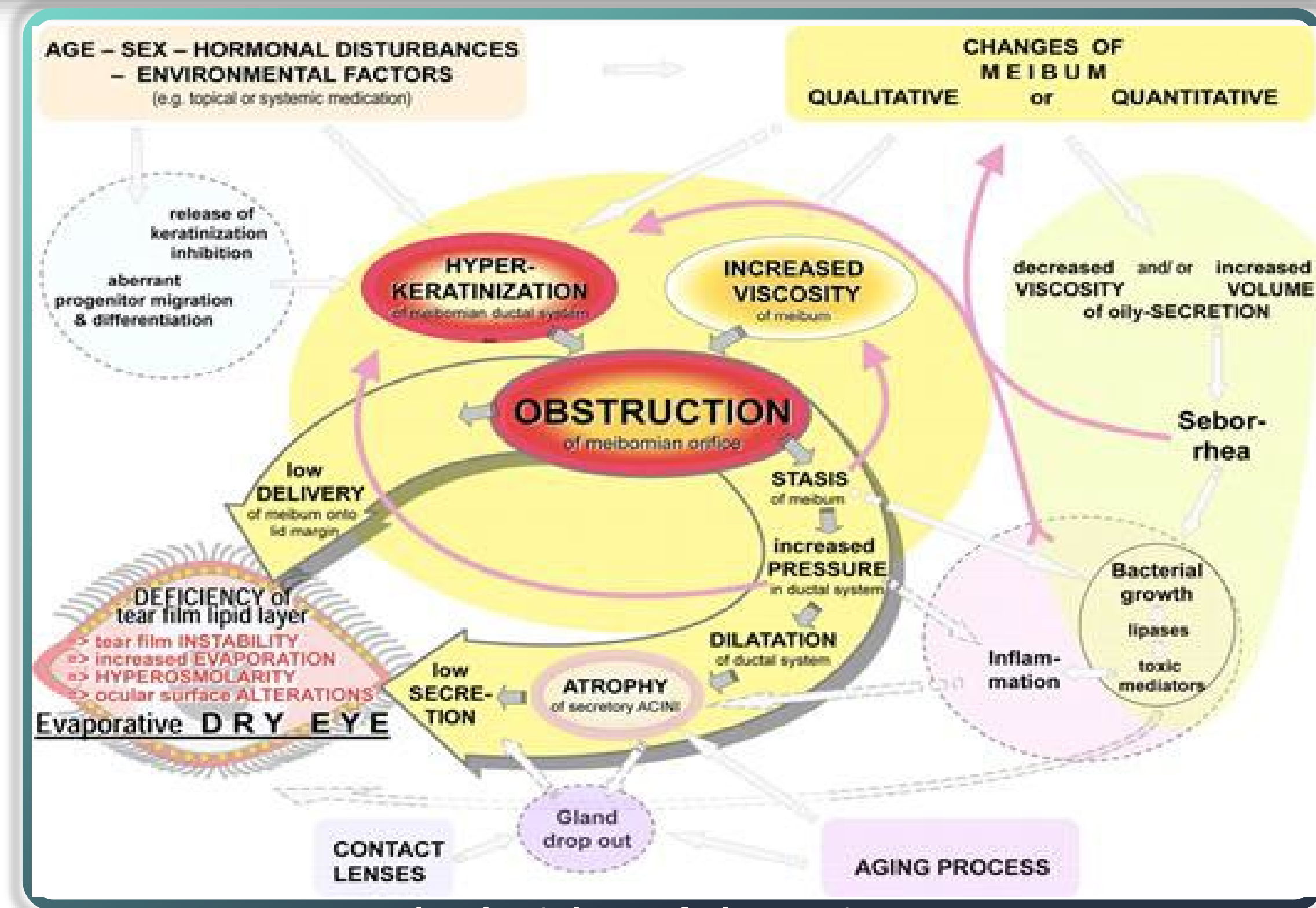
- lipolytic enzymes released by bacteria cause highly irritating free fatty acids to breakdown the lipids in the tear film
- Loss of tear film integrity occurs
- increased aqueous tear evaporation
- signs + symptoms dry eye disease



Meibomian Gland Dysfunction- Definition and Classification of MGD

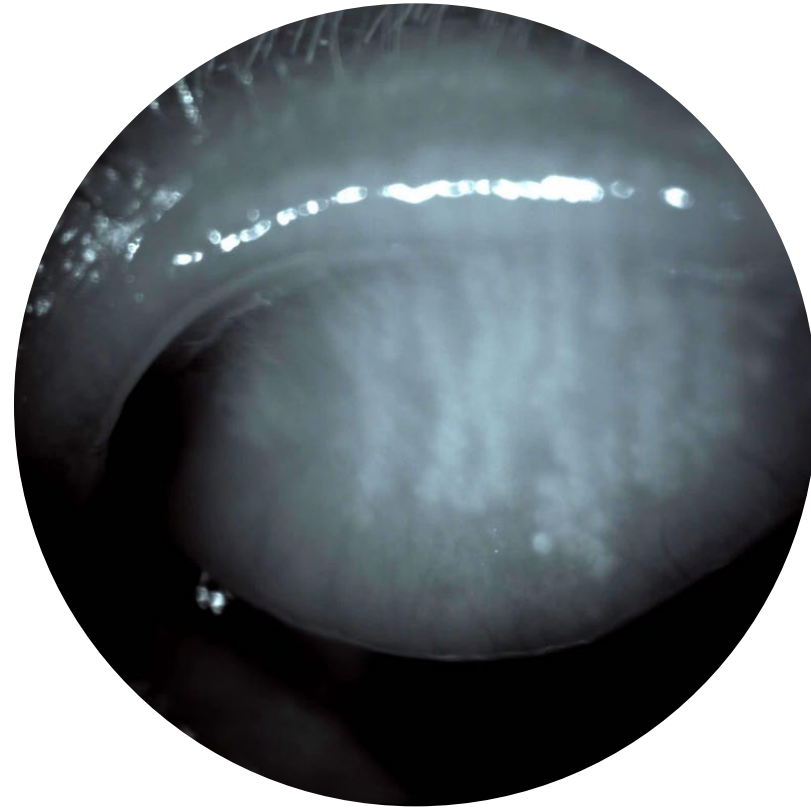


Anatomy, Physiology, and Pathophysiology of MGD



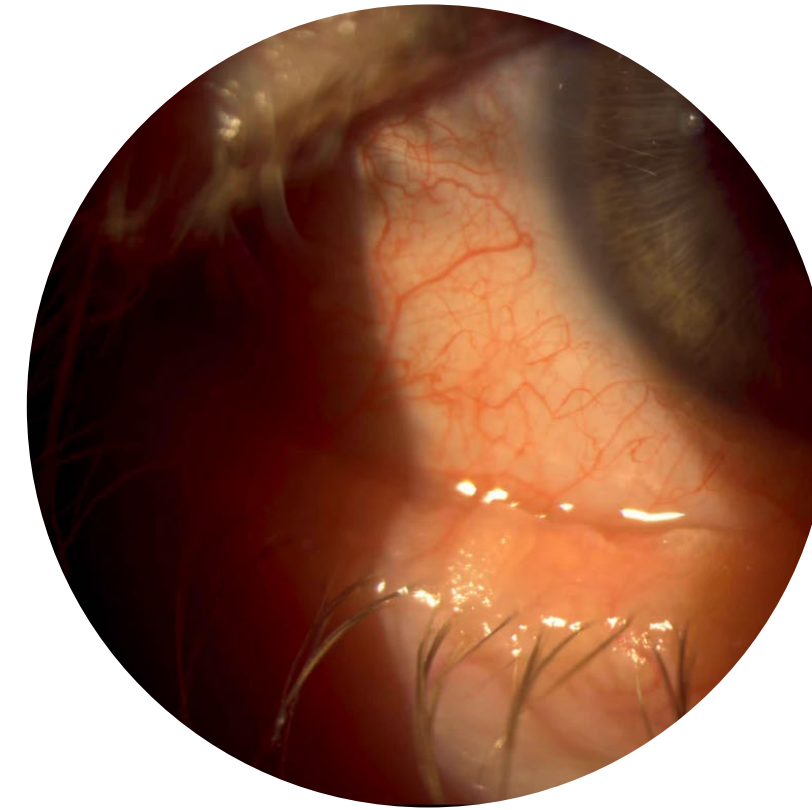
Pathophysiology of obstructive MGD

Signs of MG Distress Develop



MG Dropout

partial or complete loss of MG's



Altered MG Excretions

turbid, thickened, Milky

Lid Morphology
Changes

Plugging + Pouting

MG Changes in MGD

Clinical Appearance Varies



Eye lid margin changes

Thickening

Rounding

Notching

Telangiectasia

Lash loss

Malposition

Anterior blepharitis

Changes to the mucocutaneous junction

Change to the MG orifices

Pouting or plugging

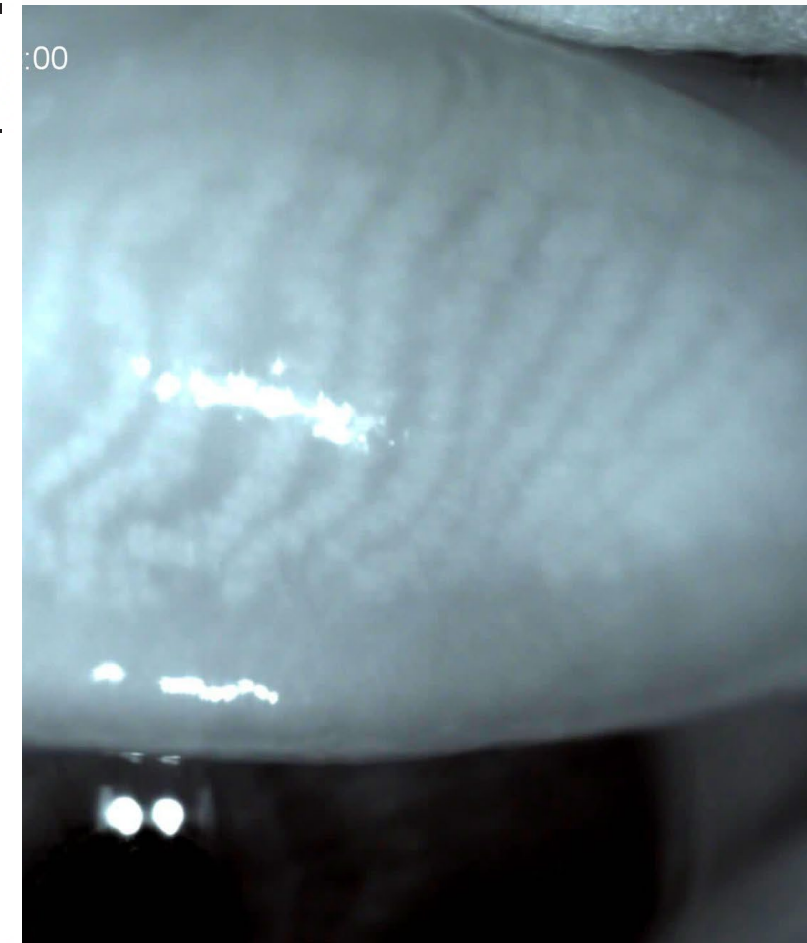
Narrowing

Loss of cuffing definition

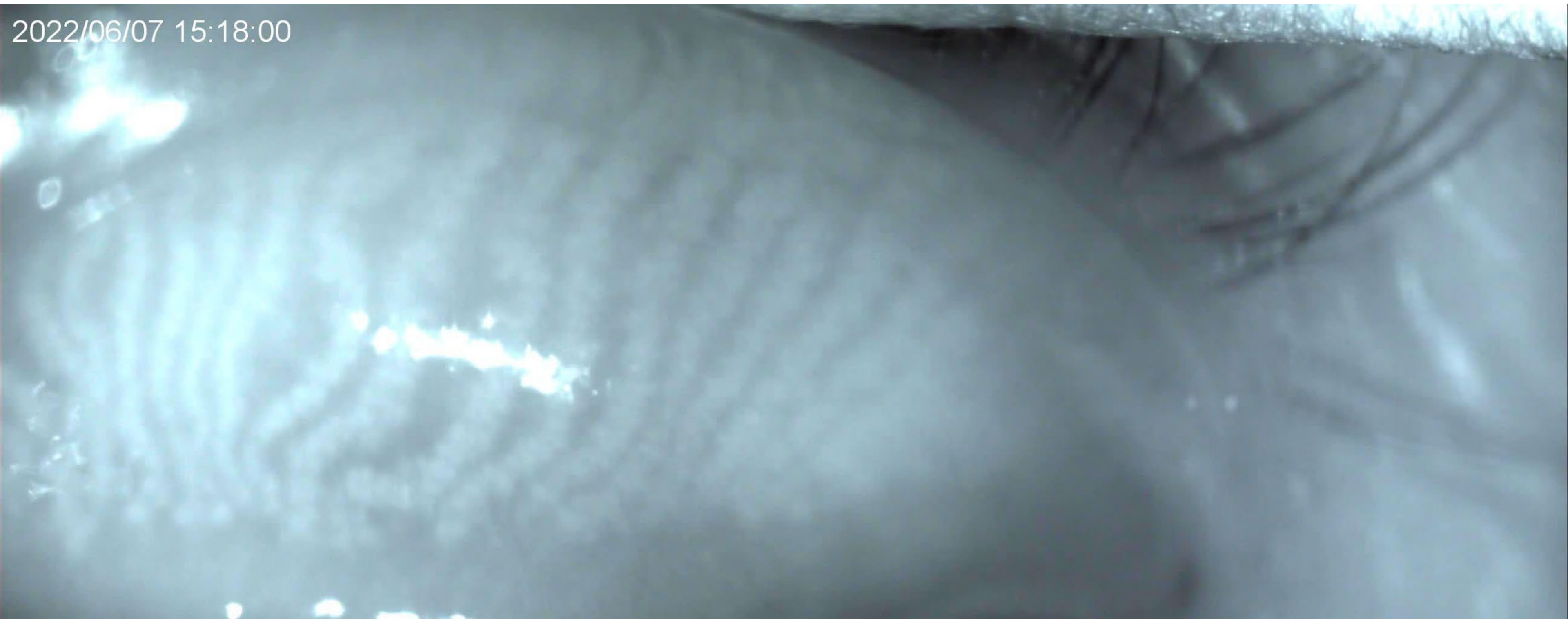
Opaque/scarred

Vascular invasion

Retroplacement

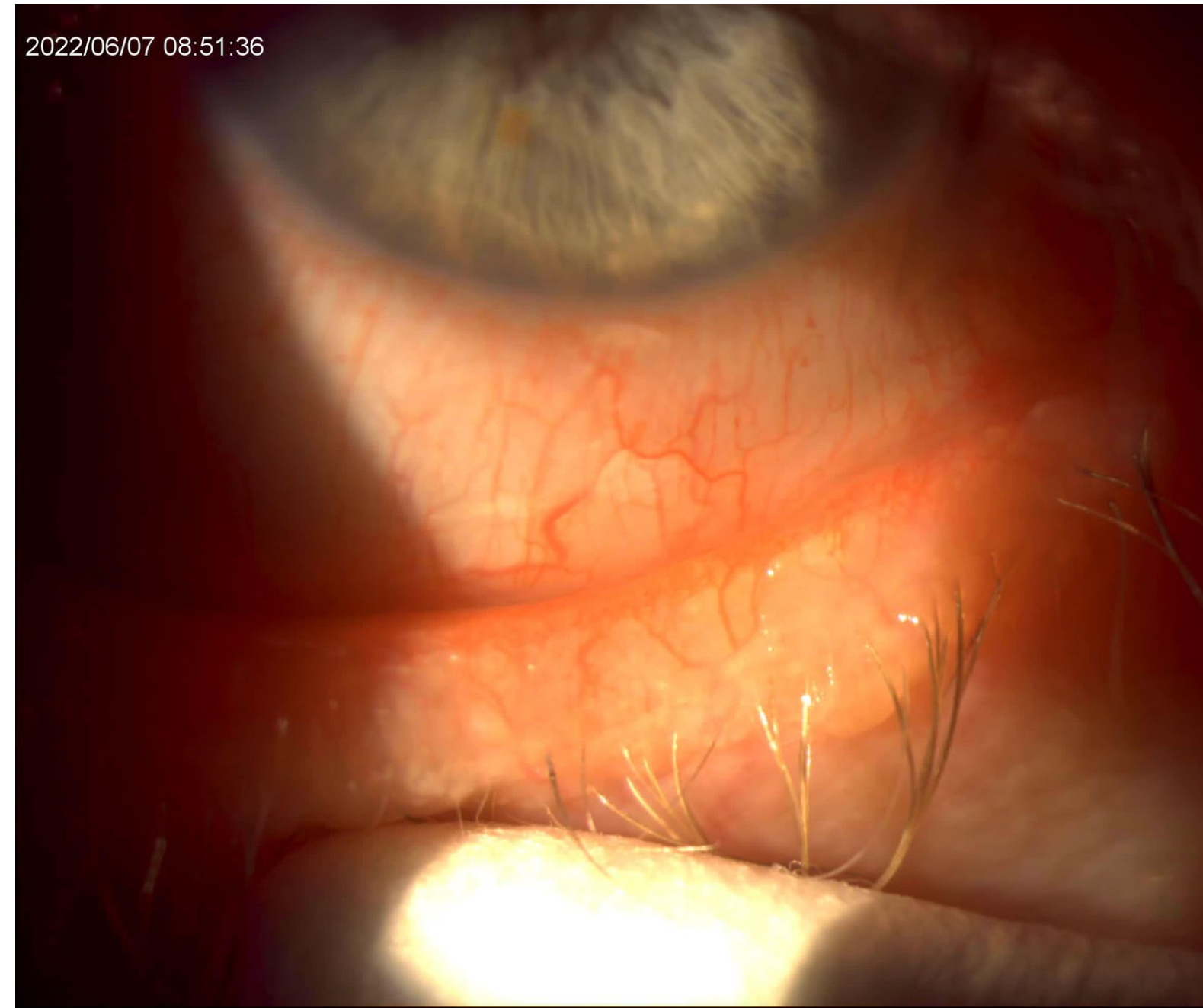


Meibography aids in Showing Dropout



MG Expression for MGD Dx

<10% of Comprehensive OD's and
OMD's regularly express glands.



My Setup

CTA's and FI strips taped to slit lamp!

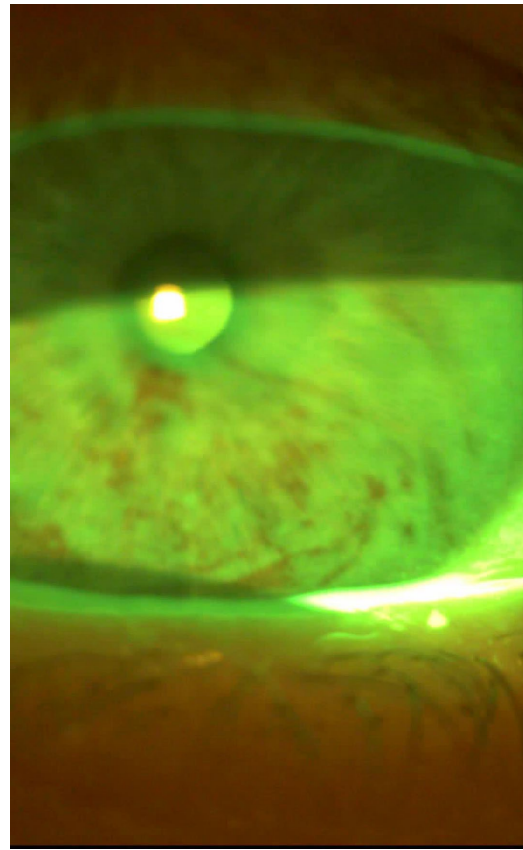


Grading scheme	Description
0	All glands patent. Clear fluid is expressed.
1	One or two glands partially obstructed. Clear to cloudy fluid is expelled on mild digital pressure.
2	Three or more partially obstructed glands. Cloudy or opaque fluid is expelled on digital pressure.
3	One or two blocked glands with many partially obstructed glands. Tear film foaming is noted along the lid margins. Inspissation noted; toothpaste-like expression with moderate to hard digital pressure.
4	Three or more blocked glands with the remaining glands partially obstructed. Meibum difficult to express, even with hard digital pressure.

MG Grading

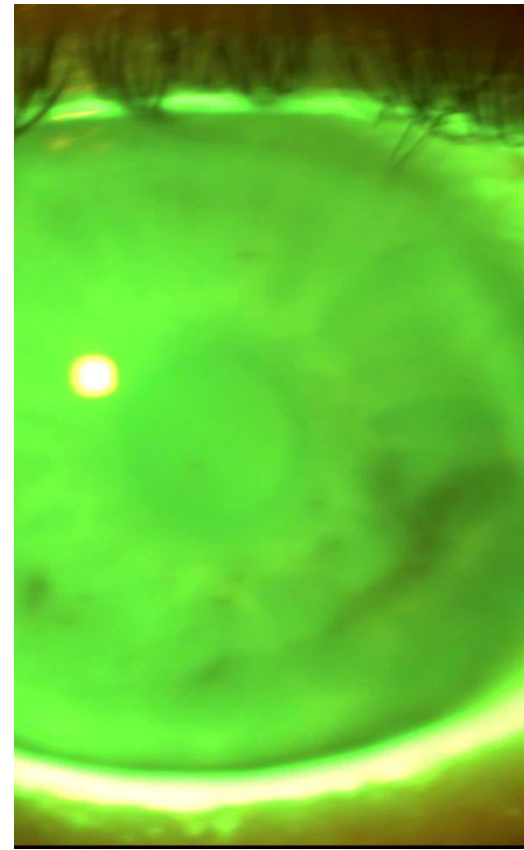
This is the scale I use to grade glands

Symptoms of MGD



ITCHING

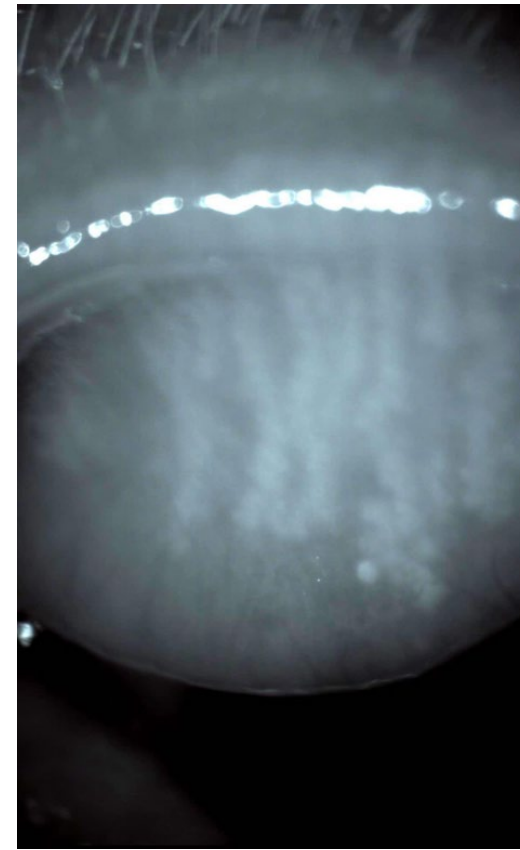
SORENESS



BURNING

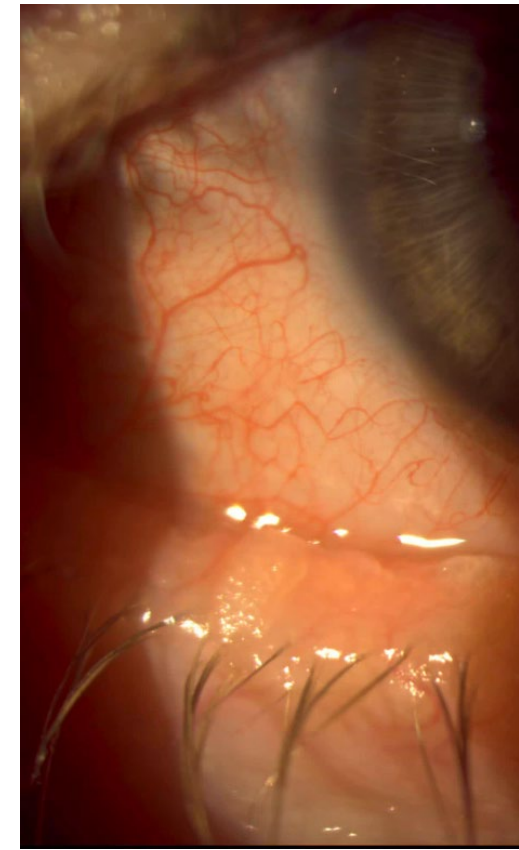
LID

EDEMA



TEARING

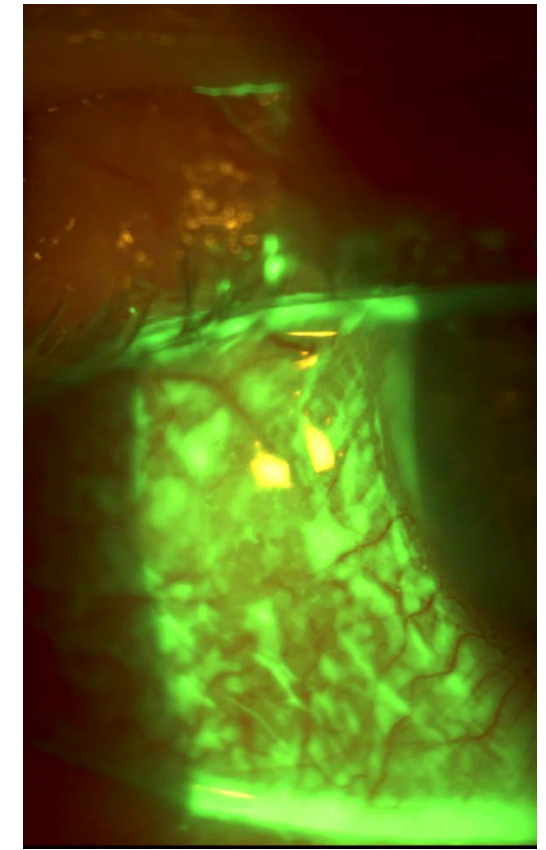
FBS



REDNESS

VISION

FLUCTUATION



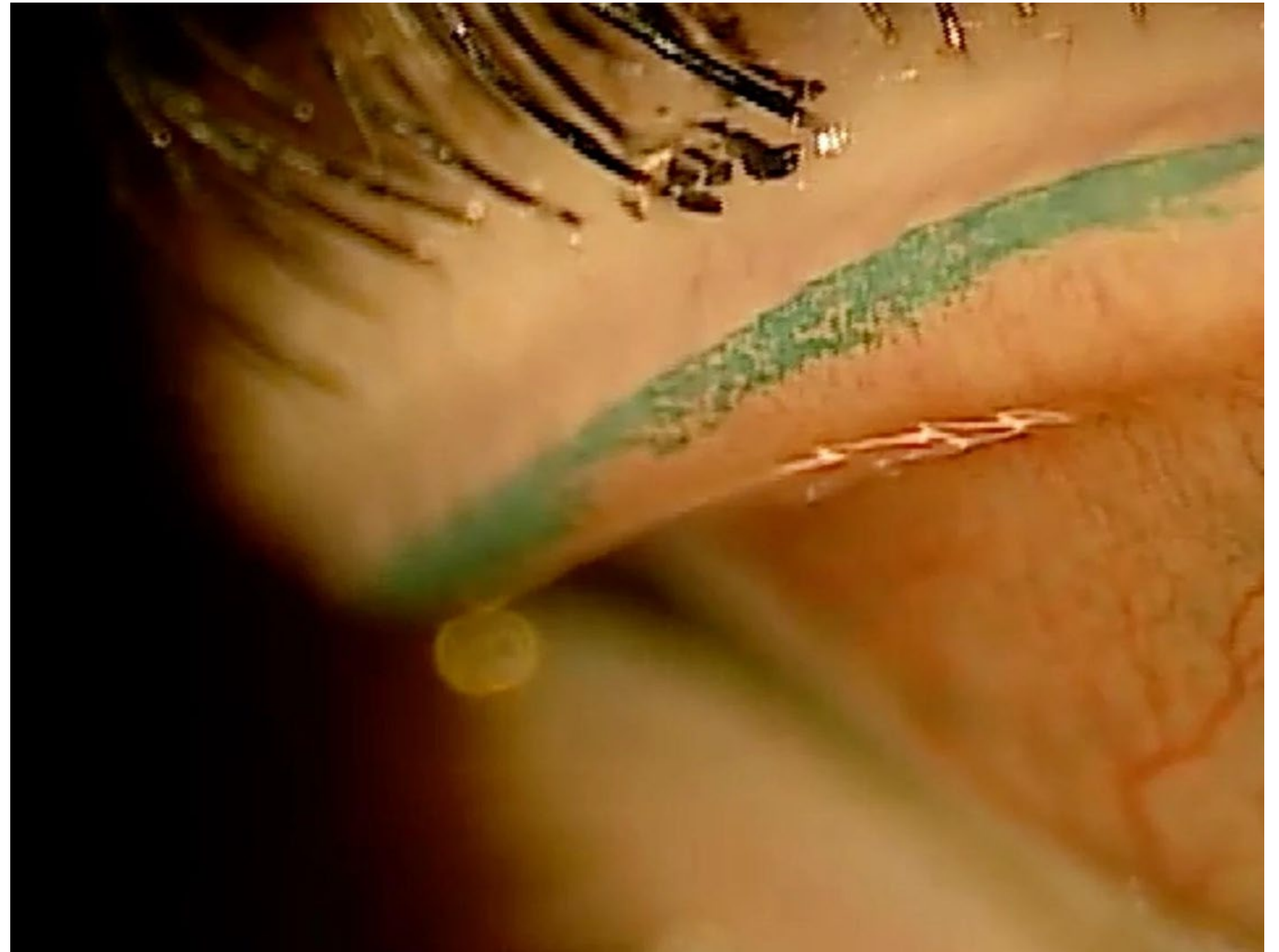
IRRITATION

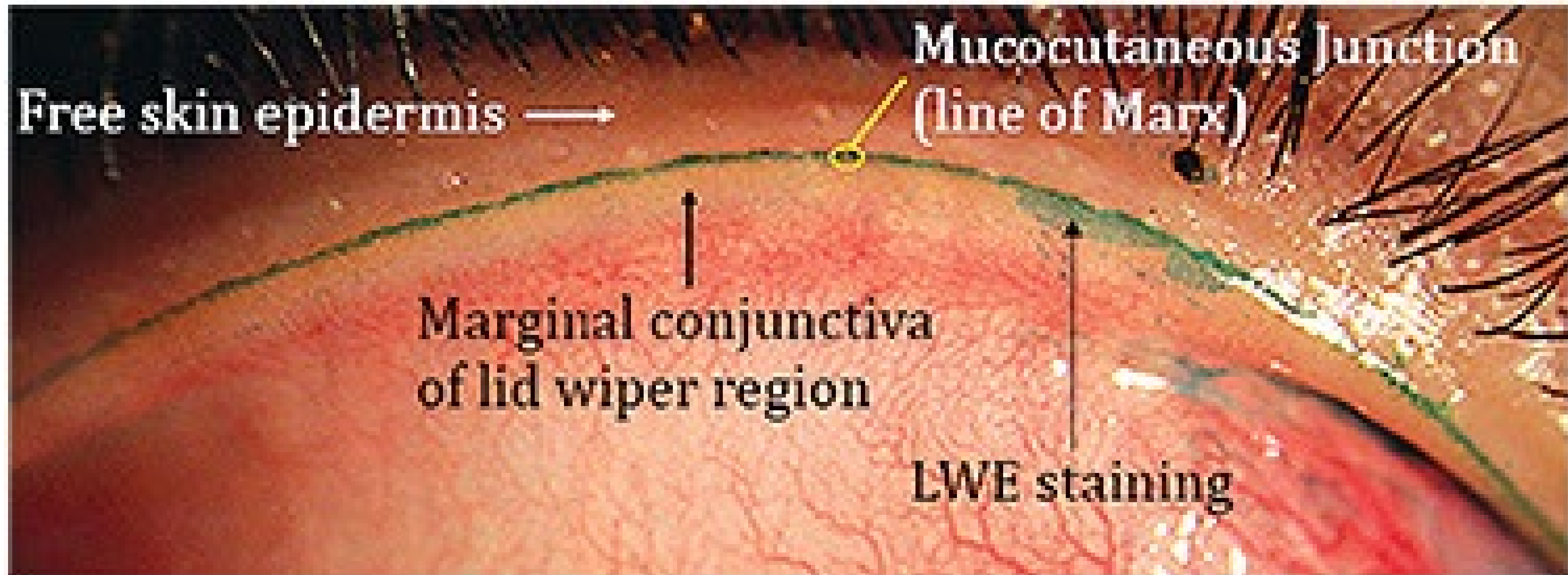
CL

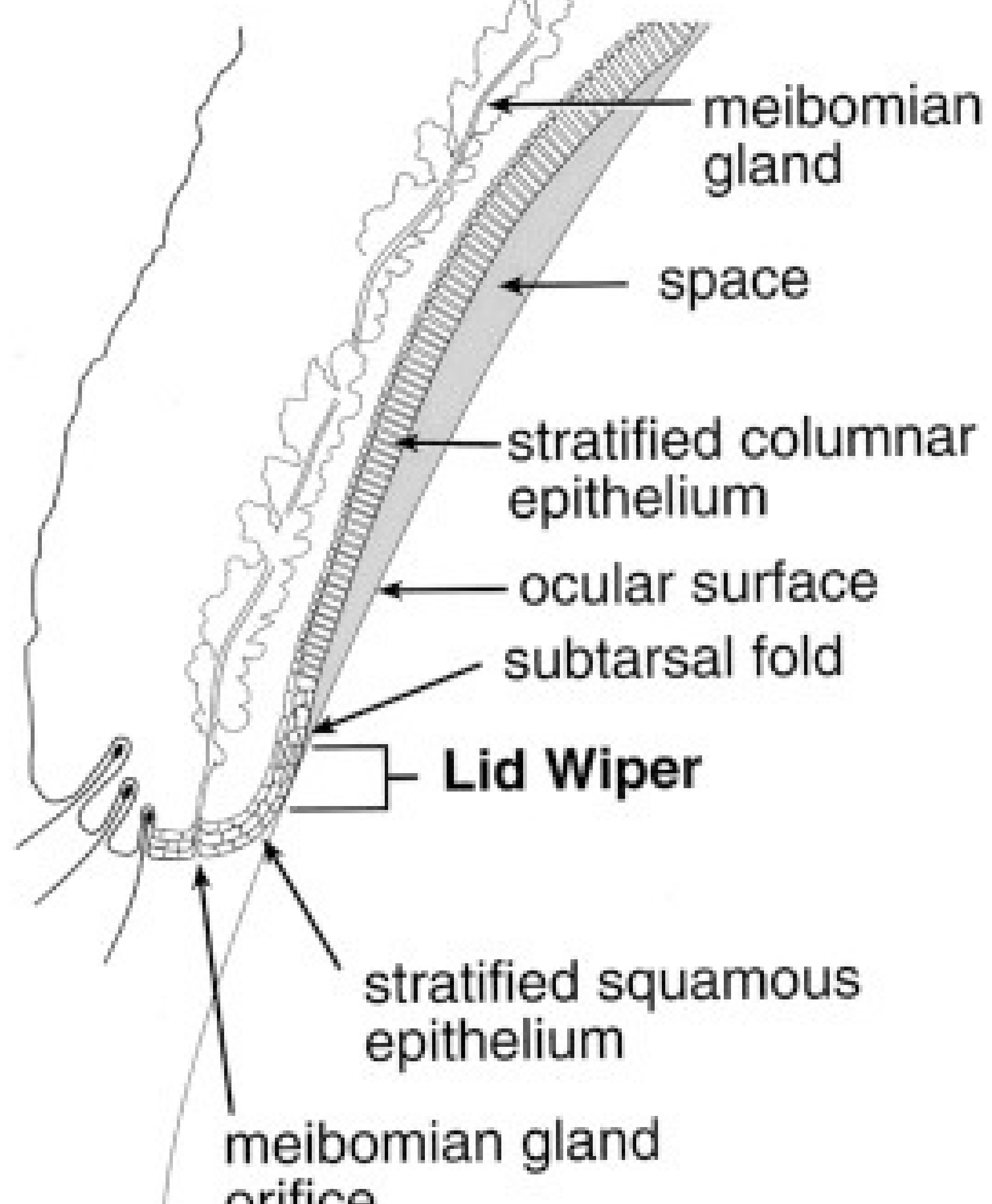
INTOLERANCE

Lid Wiper Epitheliopathy

- can occur due to MGD
- represents poor surface wetting
- contribute to irritation of superior conj + cornea
- characterized by lissamine green staining of an everted upper lid on the palpebral conjunctiva posteriorly to the superior line of Marx







Critical Clinical Tests

OCULAR SURFACE DISEASE INDEX

(rate on a scale of 4: 0= Never, 1= Rarely, 2= Sometimes, 3= Often, 4= Always)

Experienced the following?	Limited in performing the following?	Uncomfortable in the following?
Sensitivity to light? <input type="text"/>	Reading? <input type="text"/>	Windy conditions? <input type="text"/>
Gritty feeling? <input type="text"/>	Driving at night? <input type="text"/>	Low humidity? <input type="text"/>
Painful or sore? <input type="text"/>	Computer use? <input type="text"/>	Air conditioning? <input type="text"/>
Blurred vision? <input type="text"/>	Watching TV? <input type="text"/>	
Poor vision <input type="text"/>		
OSDI SCORE: <input type="text"/>		OSDI Severity: <input type="text"/>

VA sc OD 20/	<input type="text"/>	VA sc OS 20/	<input type="text"/>
VA cc OD 20/	<input type="text"/>	VA cc OS 20/	<input type="text"/>
K Sensitivity OD	<input type="text"/>	K Sensitivity OS	<input type="text"/>
Schirmer OD:	<input type="text"/>	Schirmer OS:	<input type="text"/>
Inflammadry OD	<input type="text"/>	Inflammadry OS	<input type="text"/>

Lids

Visual Assessment

☐ Ant Bleph

☐ Staph

☐ Seb

☐ Post Bleph

☐ Demodex

☐ Madarosis

☐ Tylosis

☐ Lid Apposition

☐ Lid Notching

☐ Post Migration Glands

☐ Telangiectasia

☐ Lid Dz

☐ Laxity

☐ Entropion

☐ Ectropion

☐ Lagophthalmos

☐ False Lashes

☐ Makeup Debris

Lid Notes:

Previous

Tears

TFBUT

OD

Tear Quality

OS

Tear Lake

Tear Notes

Previous

Glands

MG Structure

MG Function

RUL

RUL

Oil Quality

RLL

RLL

MG Notes:

LUL

LUL

LLL

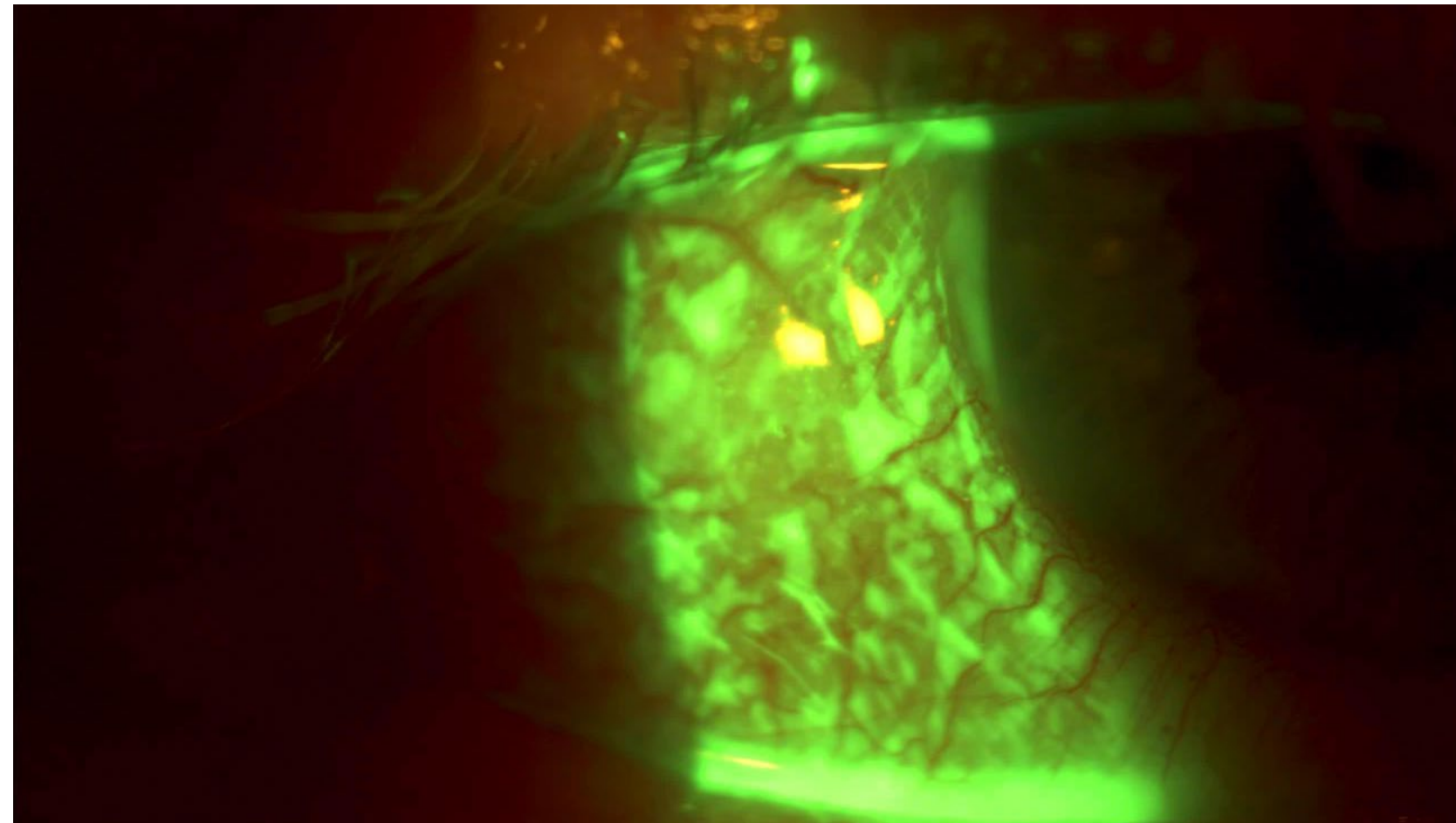
LLL

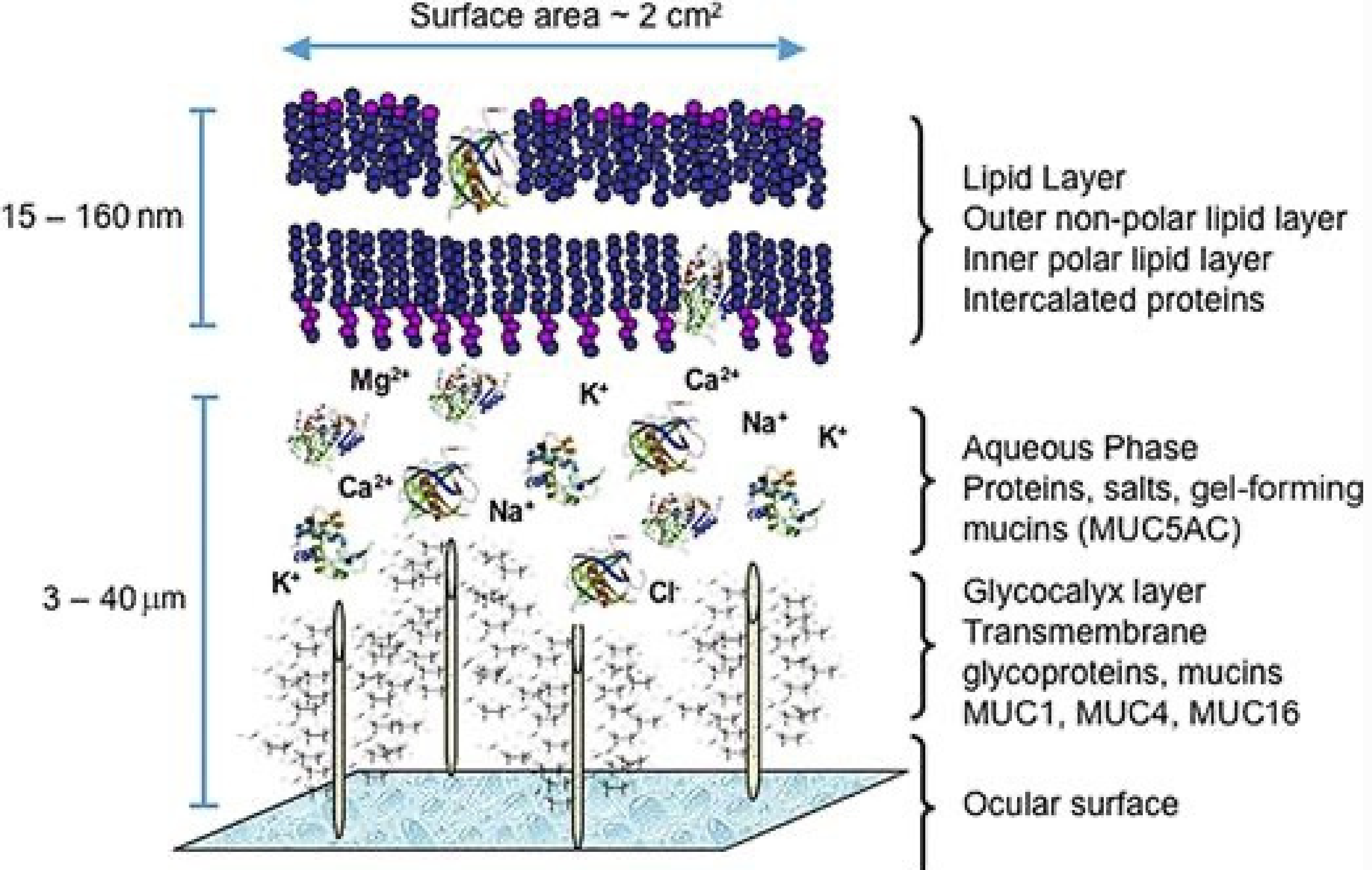
Previous

Objective test	Normative value
Expressibility of meibomian glands	All glands patent with clear fluid easily expressed
Anatomic changes to lid margin	Vascular engorgement, irregularity of lid margin, pouting and/or plugging of orifices, keratinization, displacement of mucocutaneous junction
Tear volume	Tear meniscus $> 10\ \mu\text{m}$
Meibometry	$> 300\ \mu\text{g}$ in lower lid reservoir
Tear break up time	Normal, 15–45 seconds; borderline, 10–15 seconds; abnormal, < 10 seconds
Ocular surface staining	Conjunctiva and cornea clear to NaFl and/or lissamine green/rose bengal, no displacement of Marx's line, no lid wiper epitheliopathy
Schirmer score (I/II)	Normal, $> 15\ \text{mm}$; borderline, 5–10 mm, abnormal, $< 5\ \text{mm}$; after 5 minutes
Meibography	No gland loss, gland shortening, or irregularities (quantified using various scoring systems)

Conj Staining in MGD


Eventually the whole Eye just lights up







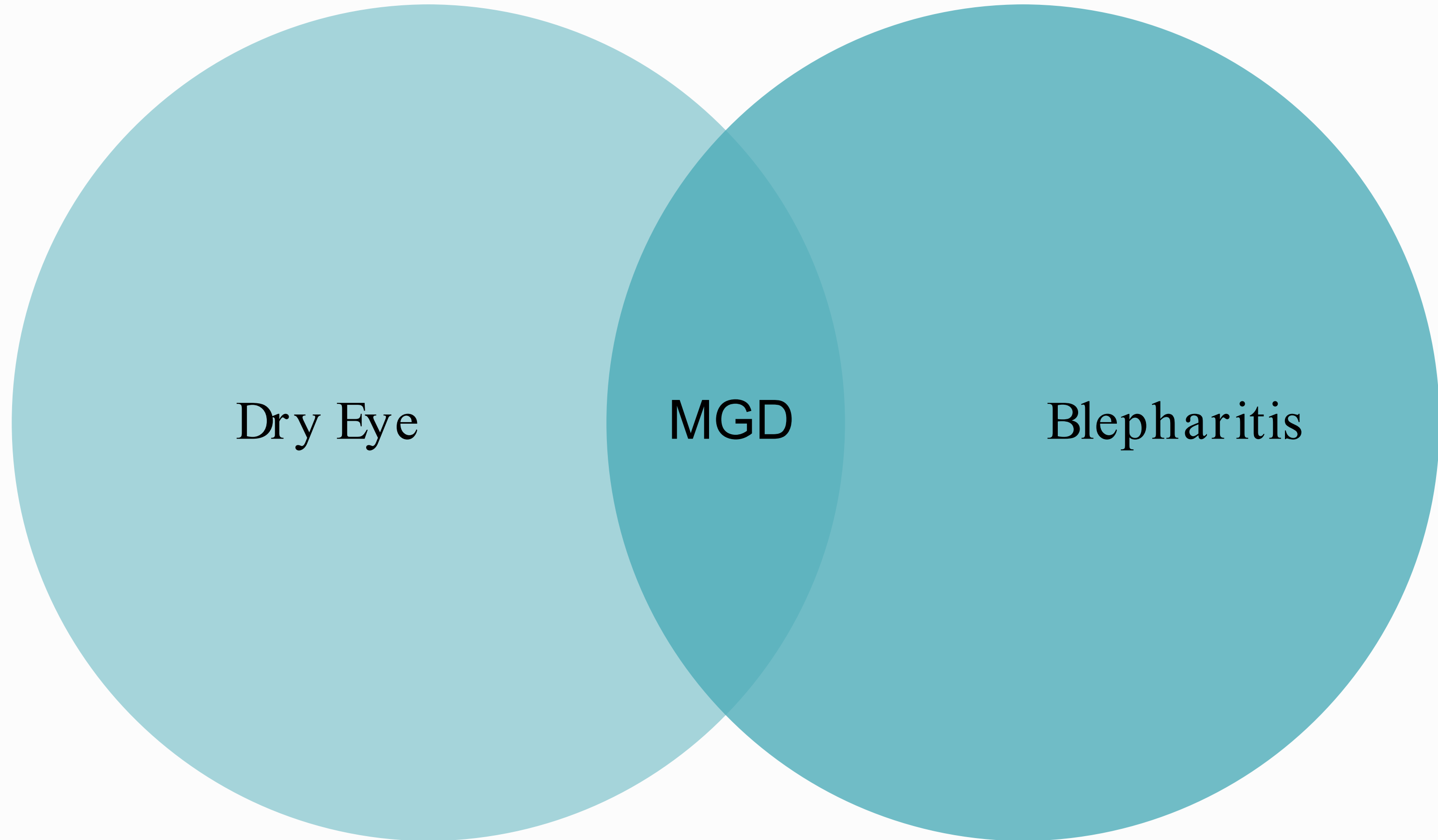
Comorbidities



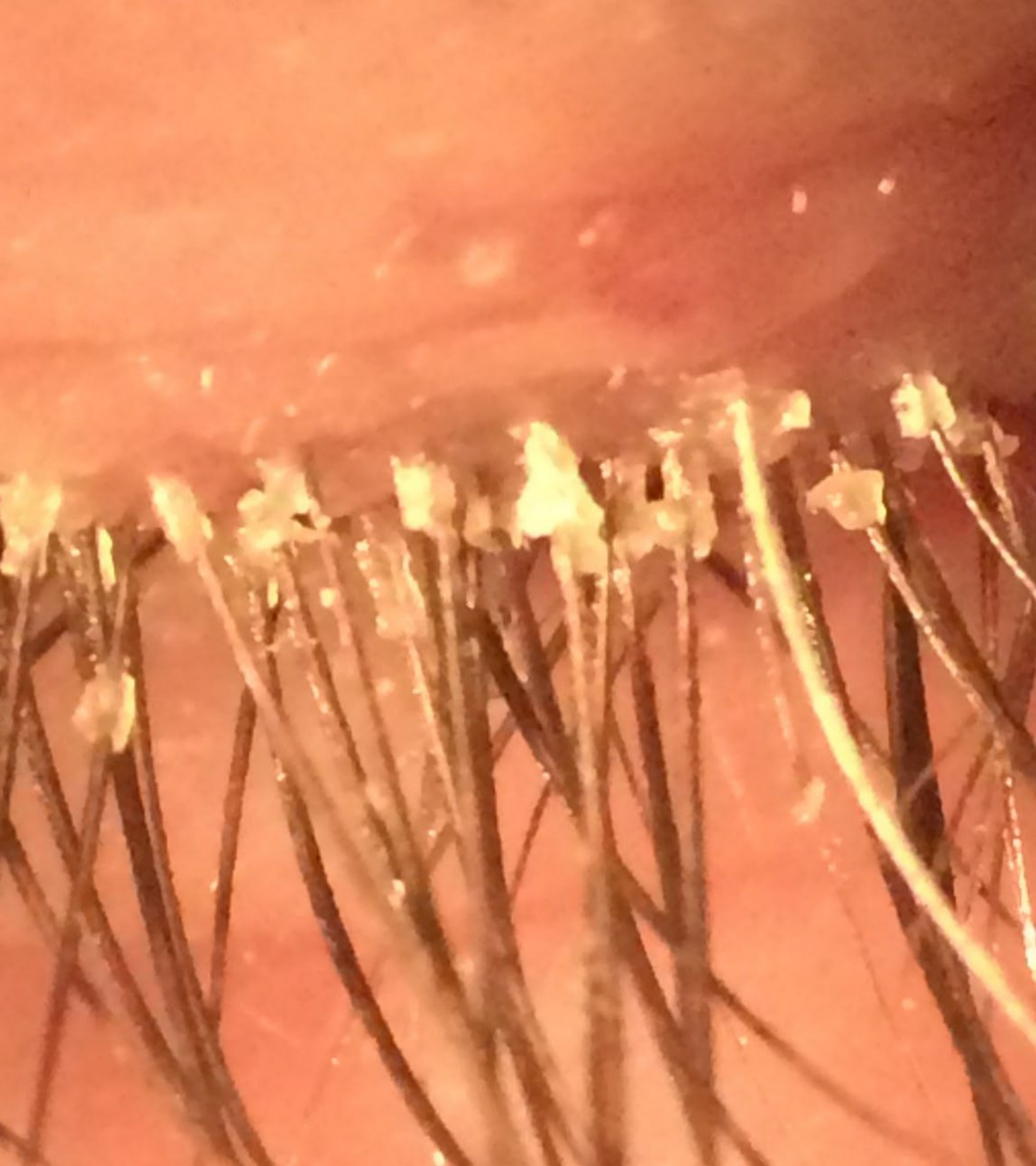
MGD rarely happens in Isolation

Closely linked to a host of other Ocular and Systemic Conditions

But are they Correlative? Causative? Coincidental?



These 3 are particularly known for their tendency to coexist + exacerbate

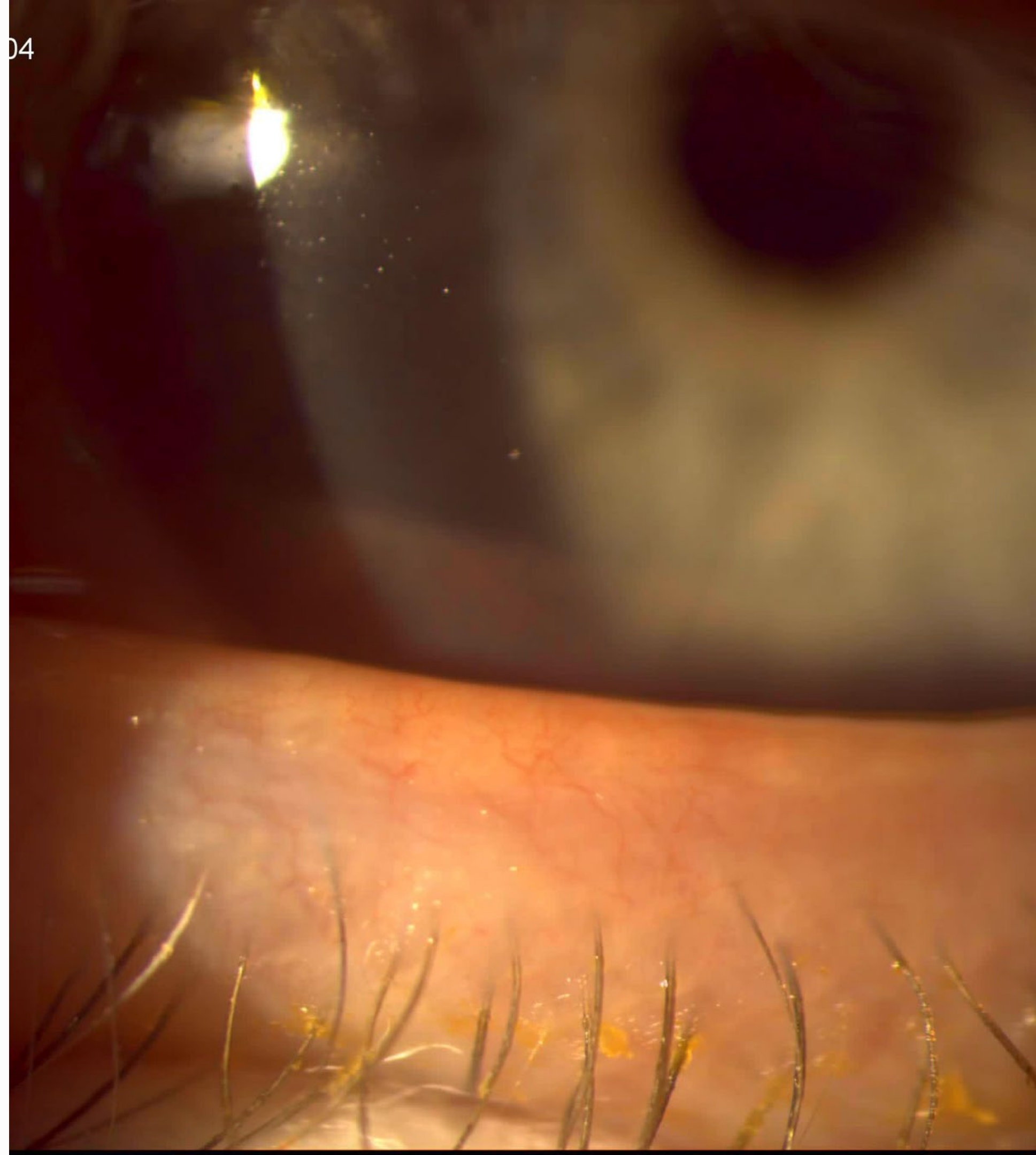


Anterior Blepharitis

higher levels of bacterial colonization
contribute to inflammation of
posterior lid margin

Posterior Blepharitis

sebborheic bleph assoc with MGD
given derivation of MG's from
sebaceous glands

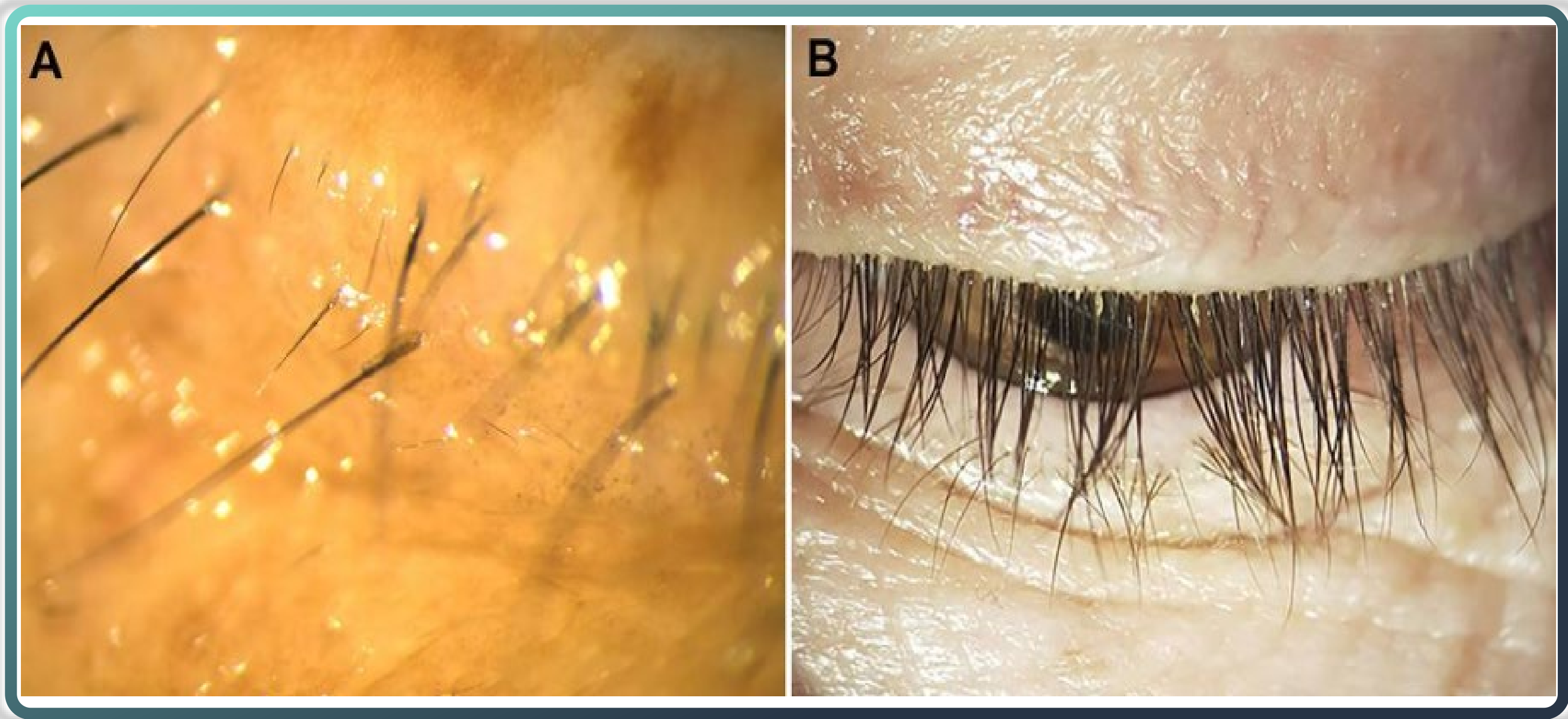




Demodex

- studies vary in terms of correlation
- likely that there is a direct or indirect role of demodex in pathogenesis

Multiple Eyelid Signs are Suggestive of Demodex Infestation- Eye Examination

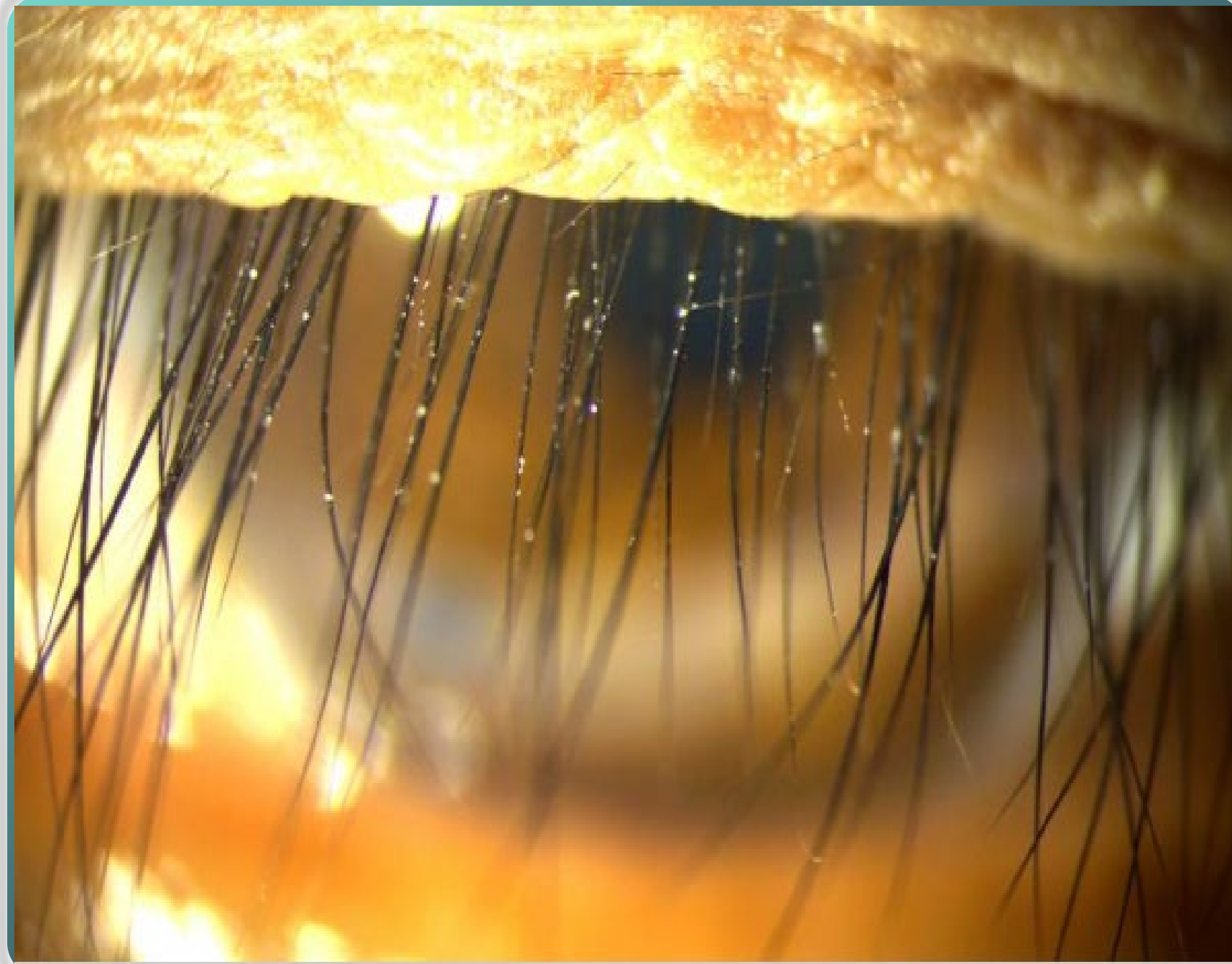


Slit-lamp photograph of cylindrical dandruff attached around the base of eyelashes.

A: Magnified view of single cylindrical dandruff at the center of the figure.

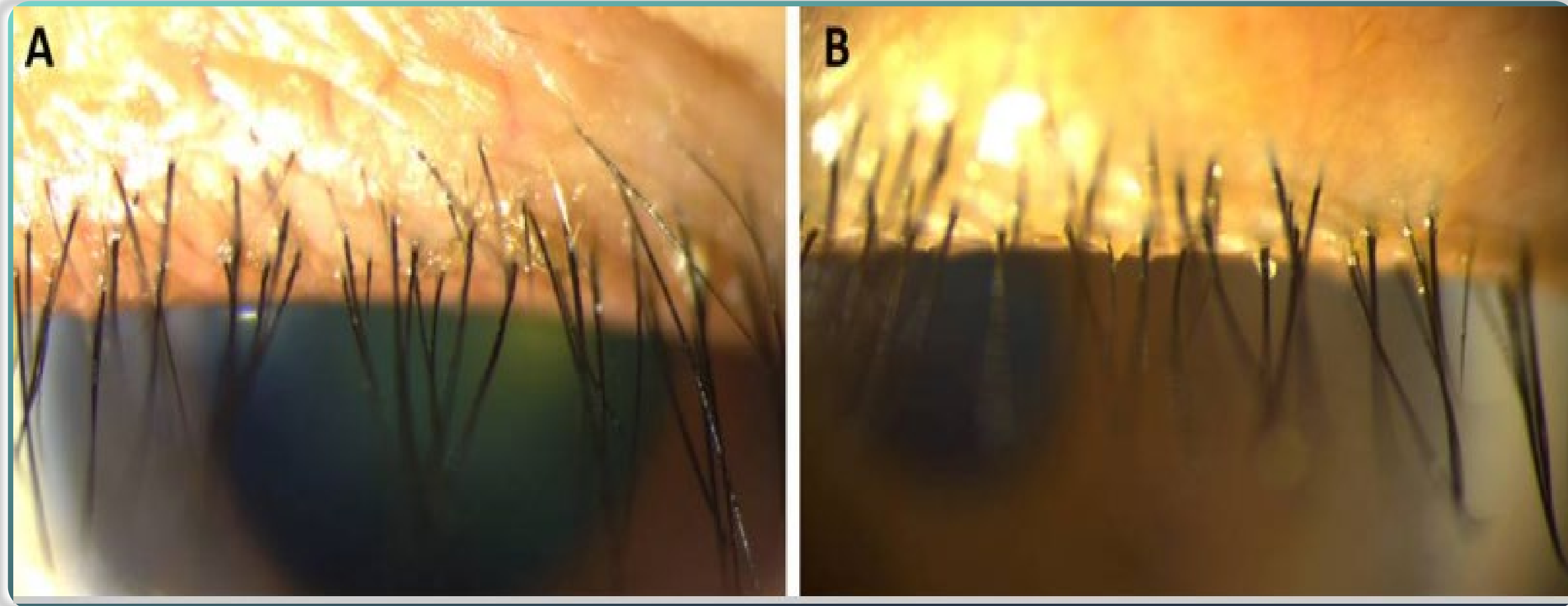
B: An overall view of a patient with multiple cylindrical dandruff adhered to the base of eyelashes.

Multiple Eyelid Signs are Suggestive of Demodex Infestation



Slit-lamp photograph of scaly debris, appeared as flakes adhered on eyelashes.

Multiple Eyelid Signs are Suggestive of Demodex Infestation



Slit-lamp photograph of waxy debris, appeared as lipid on eyelid margin and base of eyelashes

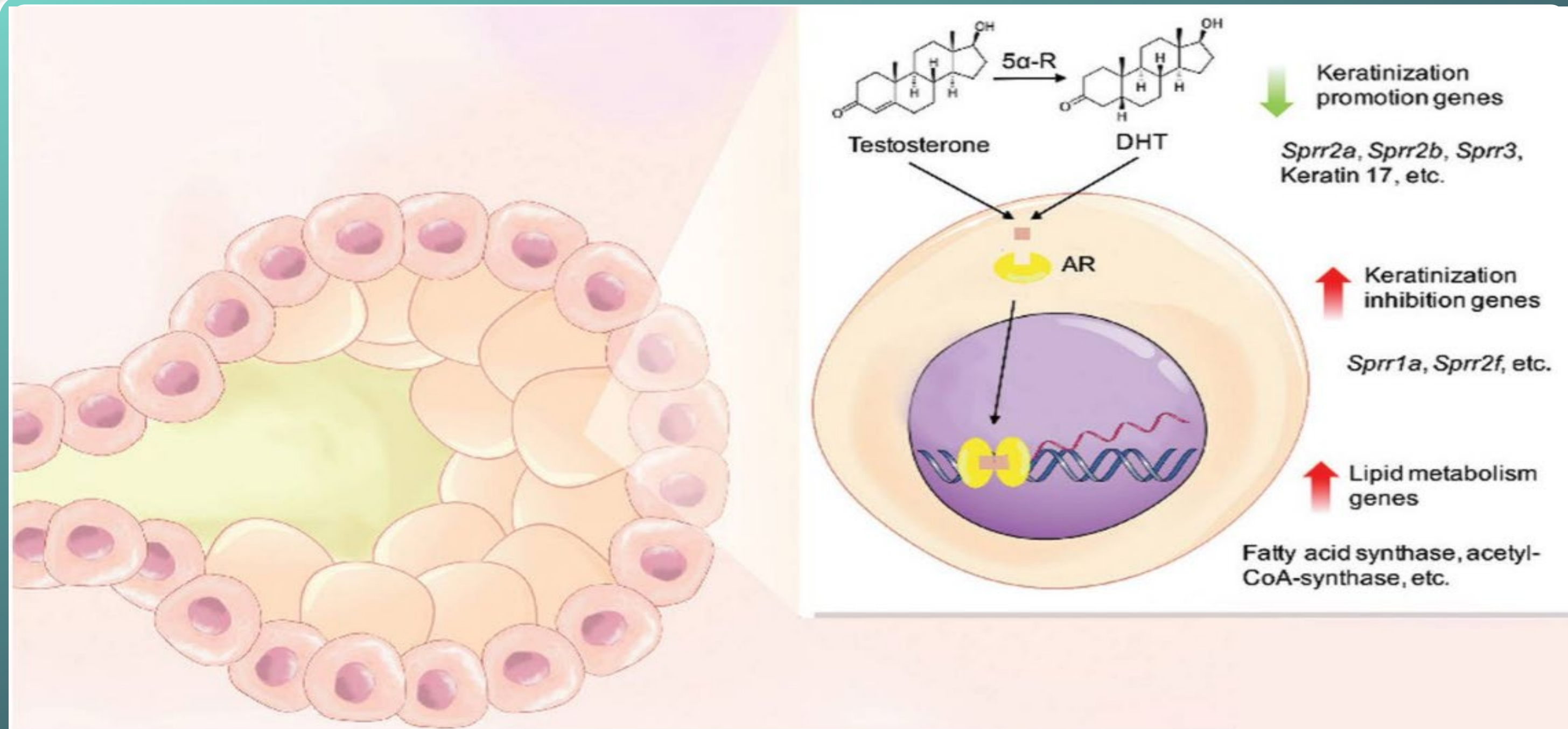
CL Wear

- greater MGD in CL wearers
- mechanical irritation of glands?
- clinically relevant in terms of CL intolerance
- MGD evaluation should be part of CL evaluations



Androgen and meibomian gland dysfunction: from basic molecular biology to clinical applications

EXPRESSION OF ANDROGEN RECEPTORS ON MEIBOMIAN GLAND



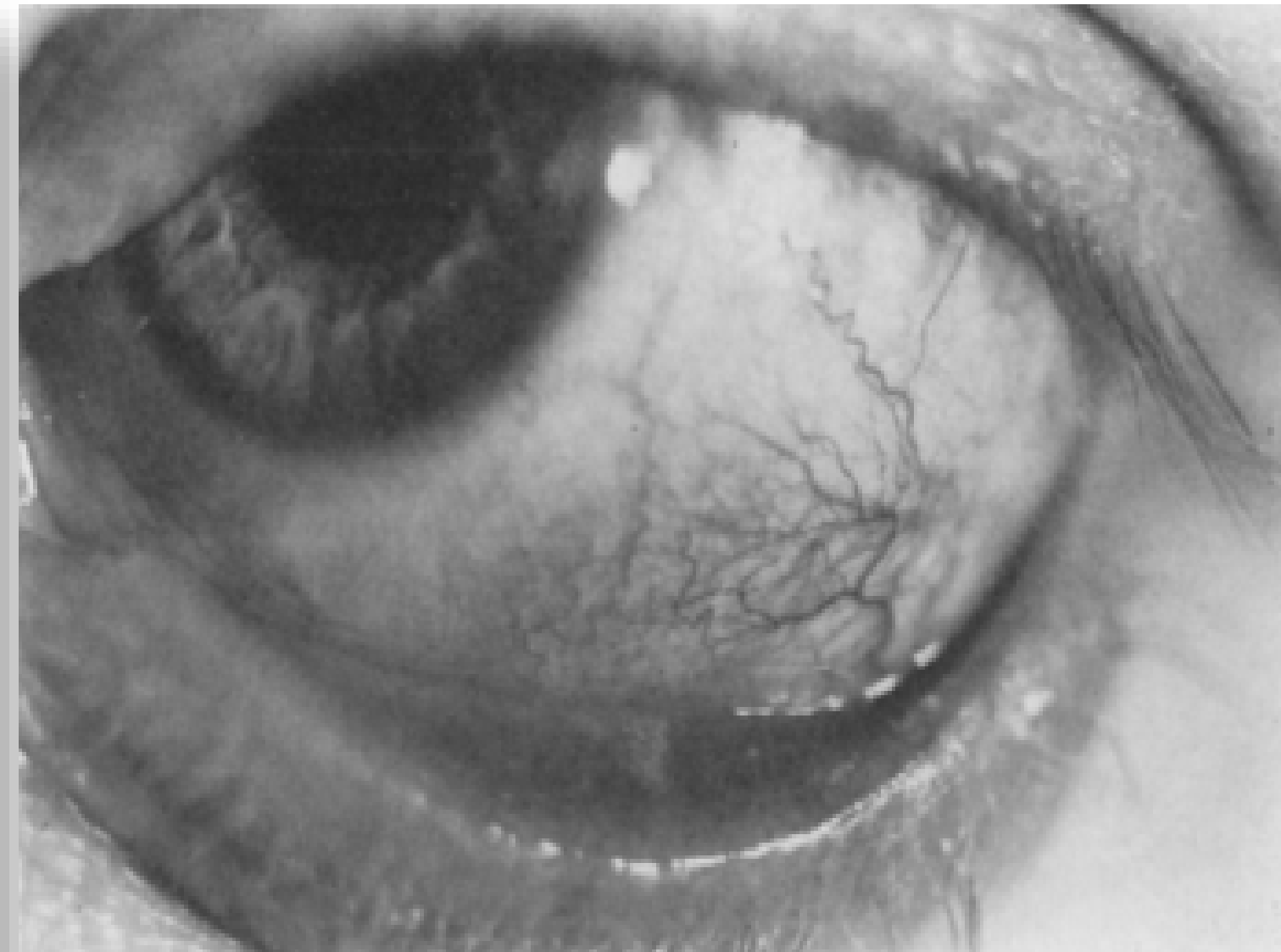
Numerous Systemic Conditions

- graft vs. host Disease
- ectodermal dysplasia
- rosacea
- androgen deficiency
- atopy
- benign prostate hyperplasia
- cicatricial pemphigoid
- lupus
- hypertension
- Parkinson's disease
- Ocular pemphigoid
- Polycystic Ovary Syndrome
- Psoriasis
- Turner Syndrome
- Stevens Johnson Syndrome

Some associated Conditions

Associated Conditions

- A. AQUEOUS DEFICIENCY
- B. ACNE ROSACEA
- C. SEBORRHEIC DERMATITIS
- D. CONTACT LENS INTOLERANCE AND GIANT PAPILLARY CONJUNCTIVITIS
- E. MISCELLANEOUS: A recent report noted a significant association of recurrent corneal erosions with meibomian gland dysfunction, suggesting that a lipid layer abnormality may contribute to this syndrome.



**Meibomian gland dysfunction
in a patient with rosacea**

Treatments

Beyond WC's!

TFOS MGD Report

Meibomian gland dysfunction

What is it, why does it occur and how may it be treated?

Report Available online

available downloads:

report overview

link to full report (IOVS)

press release

Severity
based

Approach

with cumulative approach

Evidence-Based Treatments for Meibomian Gland Dysfunction

- **Warm Compress and Self-Applied Eyelid- Warming Devices**
- **Thermal Pulsation**
- **Intense Pulsed Light Therapy**
- **Meibomian Gland Probing**
- **Topical and Oral Antibiotics**
- **Other Topical Treatments for Meibomian Gland Dysfunction**

MGD Stage 1

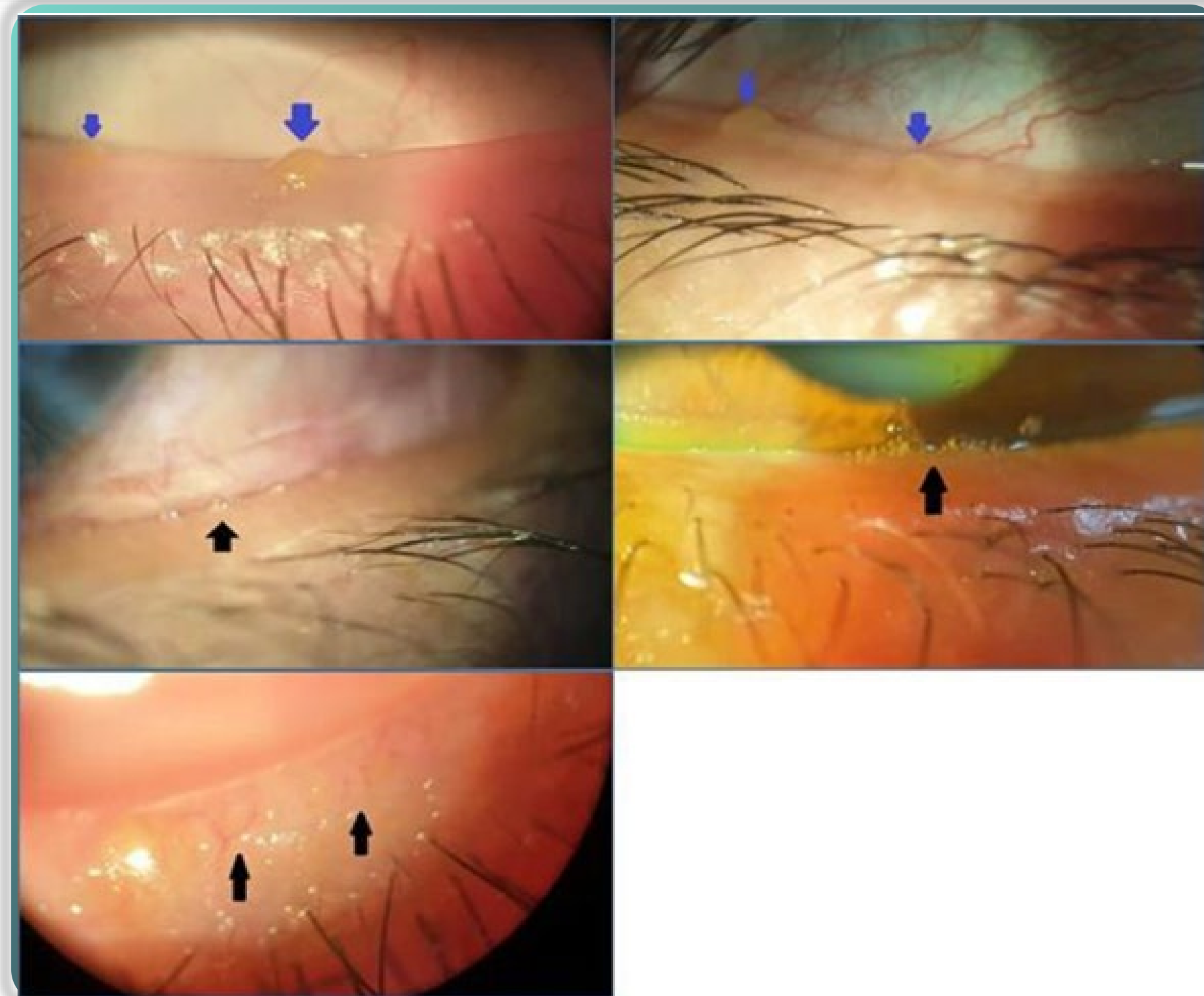
no symptoms, no ocular surface staining, minimally altered expression

- education
- lid warming (warm compress)
- lid expression (self expression)
- possible in-clinic therapeutic expression
- lid hygiene (scrubs)



Comparison of the Effect of Tea Tree Oil Shampoo With Regular Eyelid Shampoo in Meibomian Gland Dysfunction Treatment

Lower eyelid appearance indicating capping of meibomian gland orifices highlighted with blue arrows (top), foamy tear highlighted with black arrows (middle), telangiectasia highlighted with black arrows (bottom).



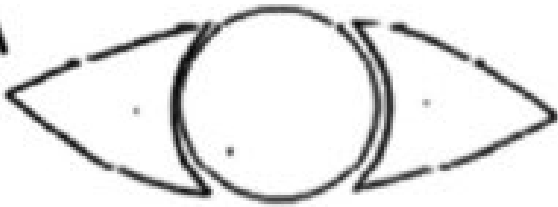
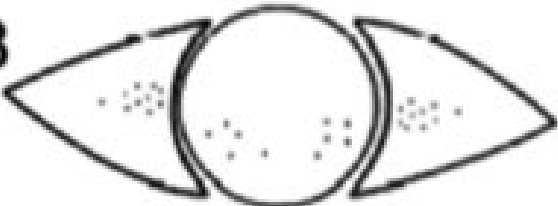
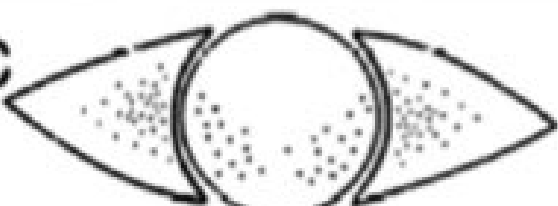



MGD Stage 2

minimal to mild symptoms, clinical
signs like staining

- All Stage 1 Recommendations
- Omega 3 Fish Oil
- artificial tears
- topical azithromycin/oral Antibiotics
- liposomal sprays
- oil emulsion tears

Oral azithromycin and oral doxycycline for the treatment of Meibomian gland dysfunction

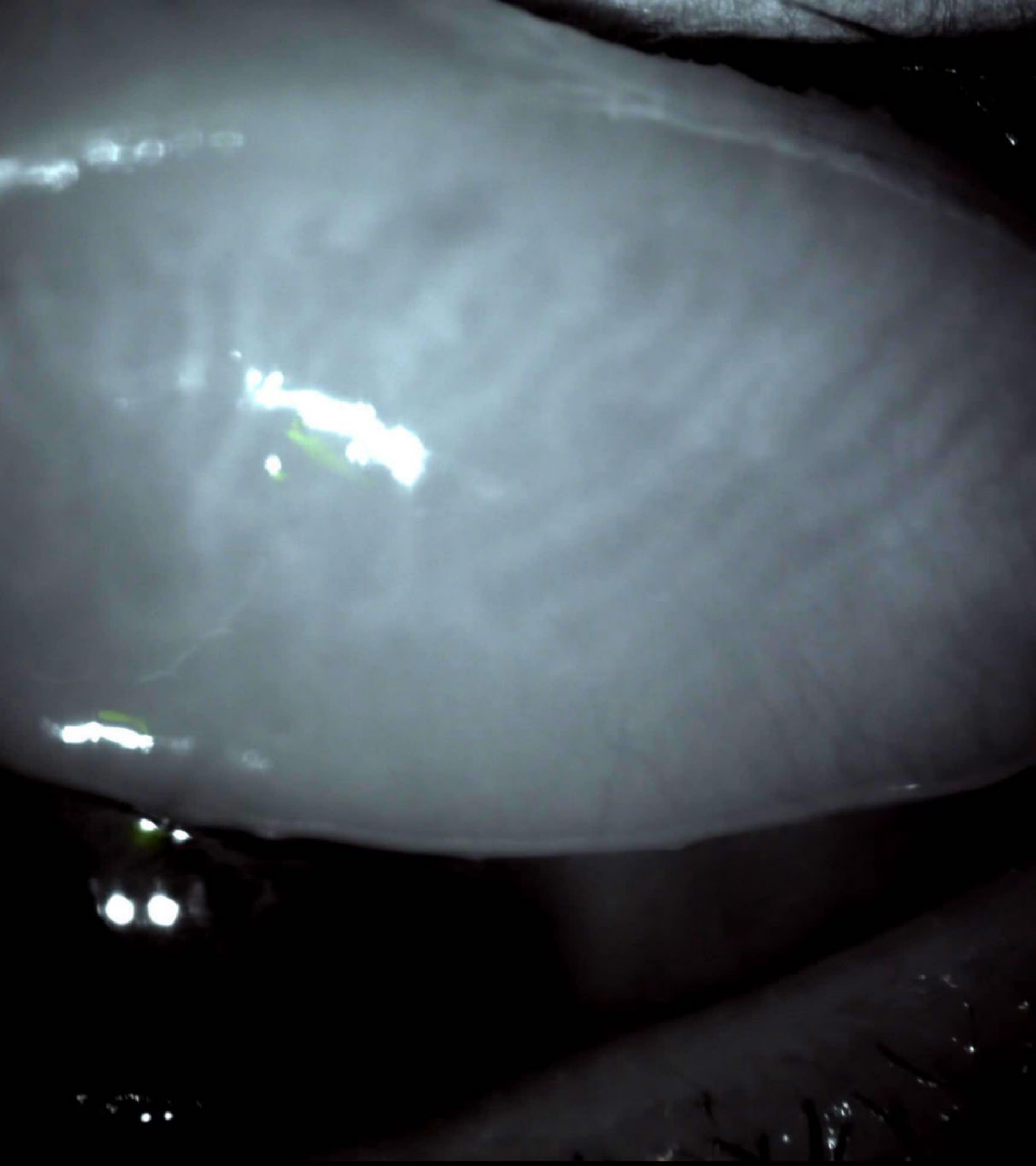
PANEL	GRADE	CRITERIA
<div>A</div> 	0	Equal to or less than panel A
<div>B</div> 	I	Equal to or less than panel B, greater than A
<div>C</div> 	II	Equal to or less than panel C, greater than B
<div>D</div> 	III	Equal to or less than panel D, greater than C

MGD Stage 3

signs + symptoms going from mild
moderate

- All Stage 1+2 Recommendation
- oral tetracycline
- topical antiinflammatory





MGD Stage 4

signs and symptoms more marked

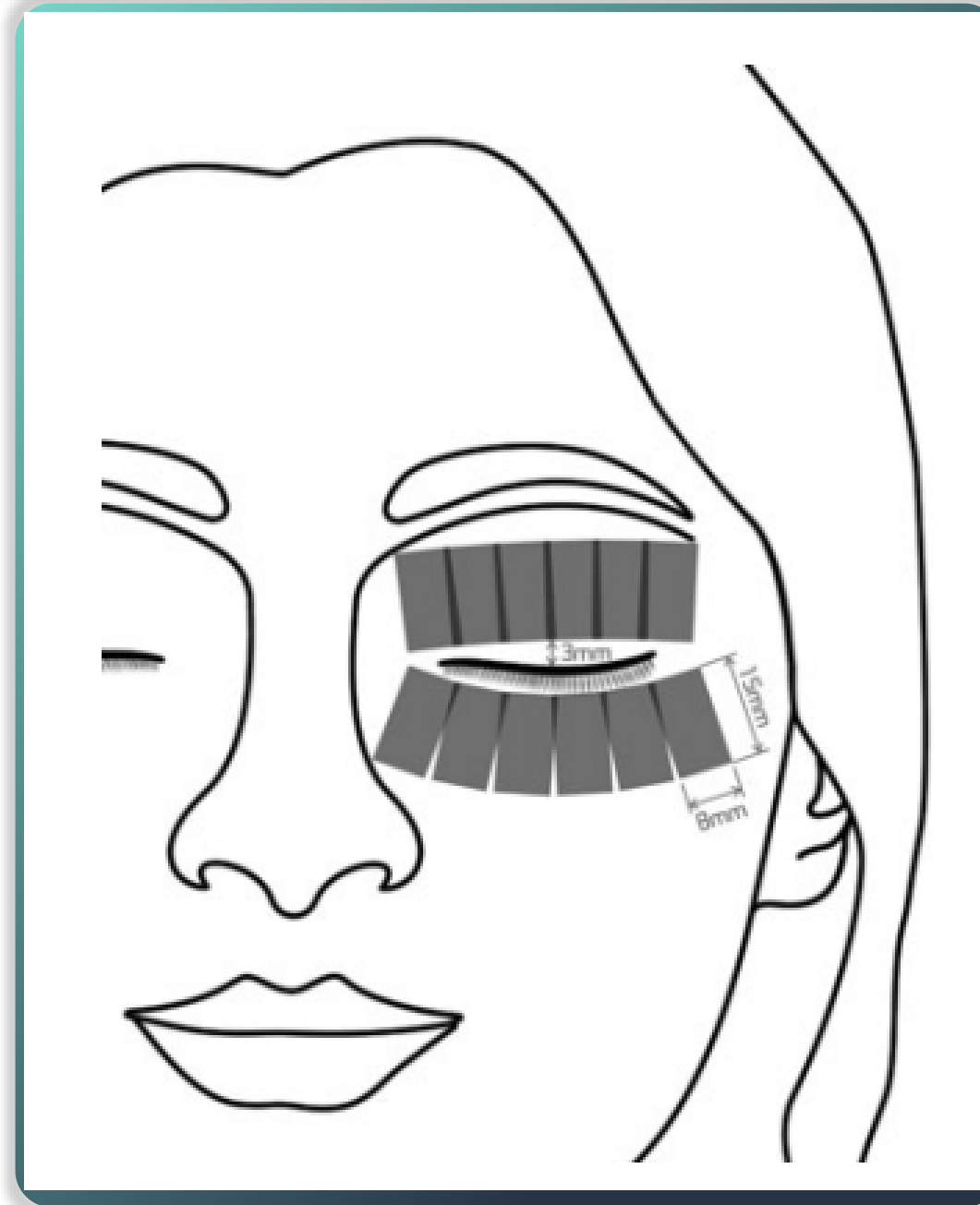
- All Stage 1,2,3 Recommendation
- topical antiinflammatories
 - steroids
 - cyclosporine/others
- Lid Margin Debridement
- Probing
- Thermal Expression
- IPL
- Radiofrequency

Intense Pulsed Light Applied Directly on Eyelids Combined with Meibomian Gland Expression to Treat Meibomian Gland Dysfunction

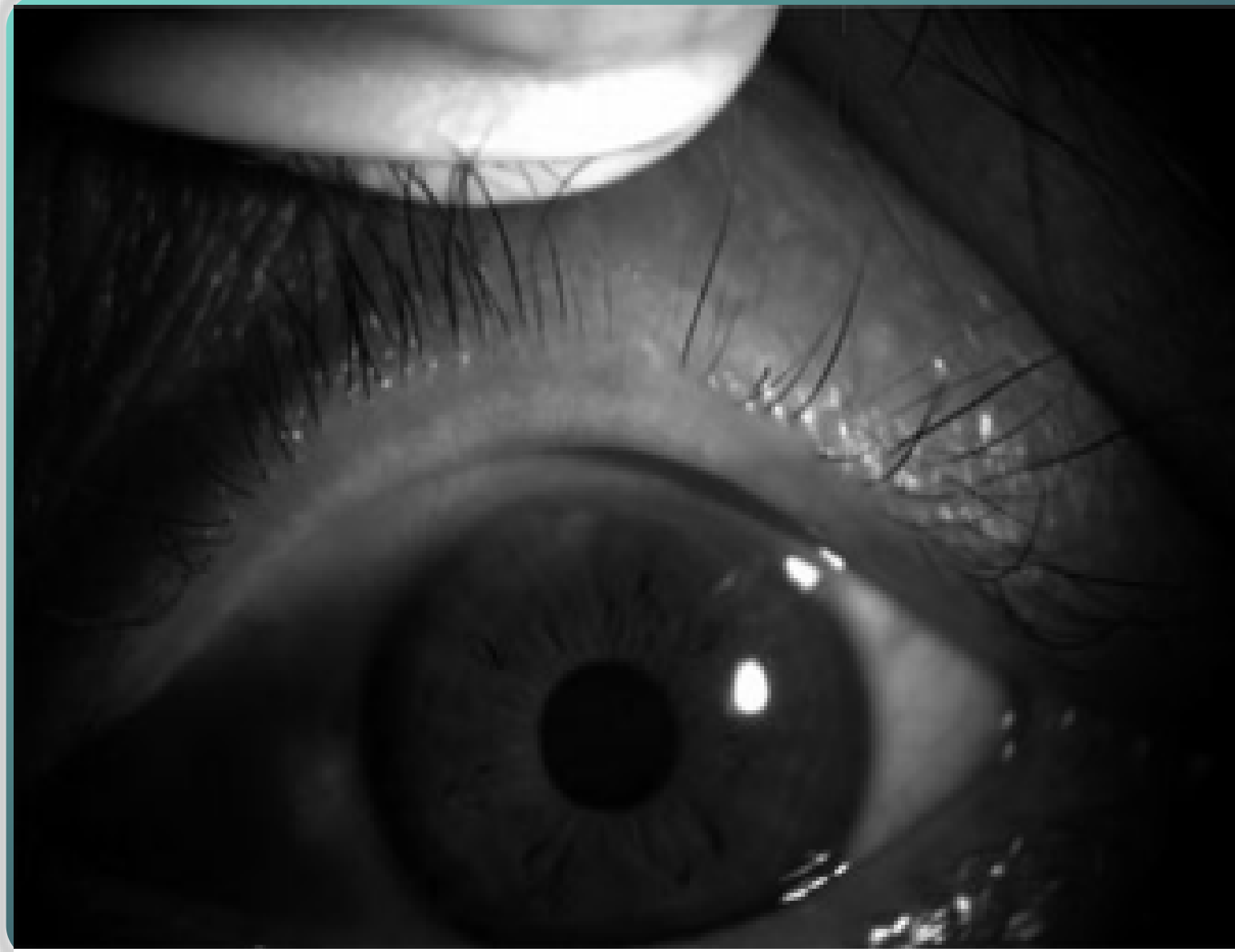


Protection of the cornea and sclera with the Jaeger lid plate placed in the conjunctival sac during IPL treatment. The Jaeger lid plate is 10 cm long with 18-mm and 22-mm curved wide blades. IPL, intense pulsed light.

Intense Pulsed Light Applied Directly on Eyelids Combined with Meibomian Gland Expression to Treat Meibomian Gland Dysfunction



Intense Pulsed Light Applied Directly on Eyelids Combined with Meibomian Gland Expression to Treat Meibomian Gland Dysfunction



Intense Pulsed Light Combined With Meibomian Gland Massage for Recurrent Corneal Erosion: a Review of Clinical Effectiveness

comparison of the correlated parameters of demodex and meibomian gland between RCES group and normal control group

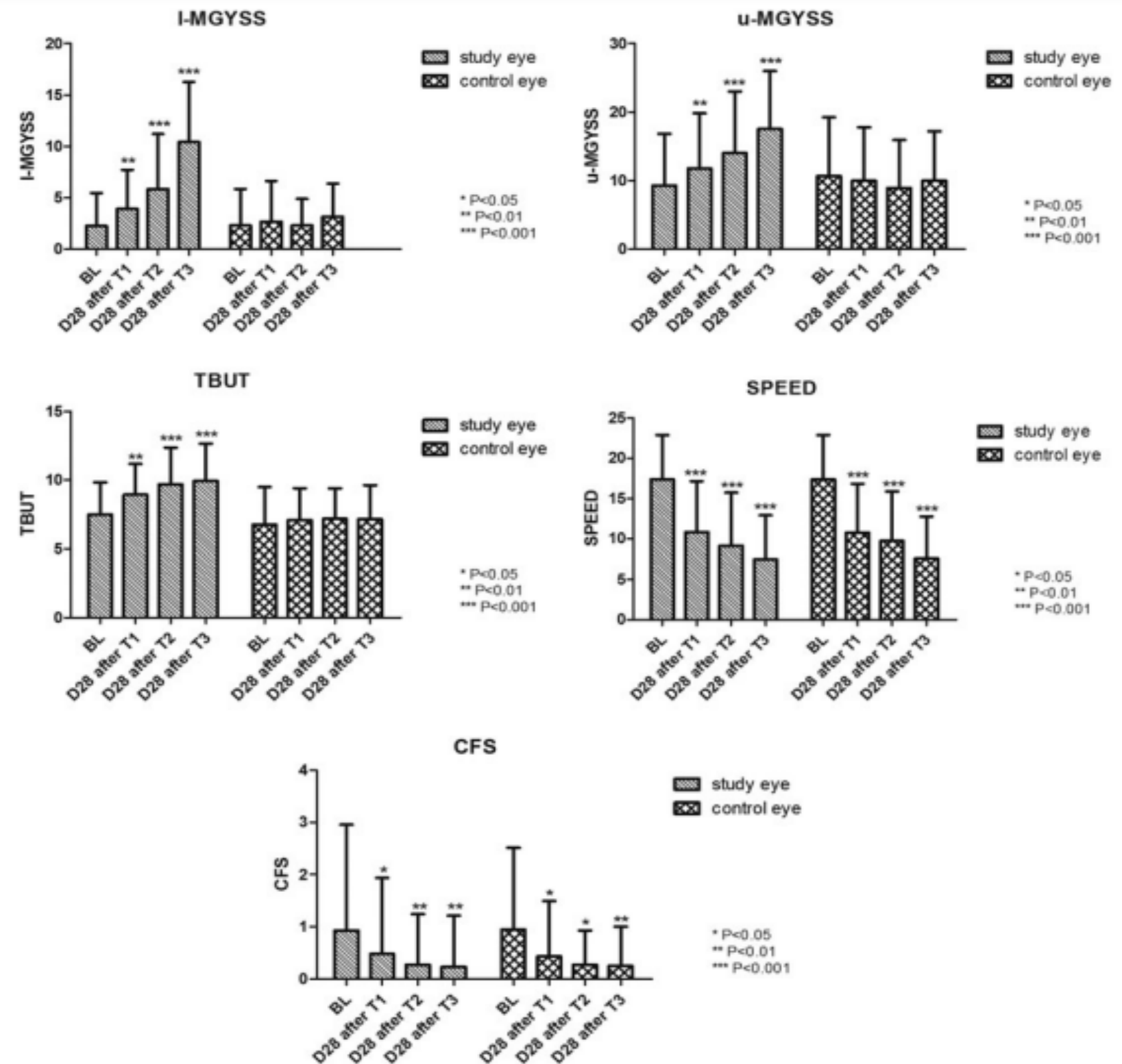
Groups	Numbers	the meibomian gland loss score [$M(Q_1, Q_3)$]*	blepharolipin score[$M(Q_1, Q_3)$]*	lid margin abnormality score[$M(Q_1, Q_3)$]	Positive rate of demodex
RCES	30	4(3.0,4.0)	15.5(11.0,16.8)	3(2.8, 3.0)	83.3%
Control	31	2(1.0,3.0)	8.0(5.5,10.0)	2(1.0, 3.0)	38.7%
Z/χ^2		$Z=-4.55$	$Z=-3.97$	$Z=-4.22$	$\chi^2 = 7.60$
P		$P<0.01$	$P<0.01$	$P<0.01$	$P<0.01$

Comparison of correlated parameters of demodex and meibomian gland before and after treatment in IPL treatment group

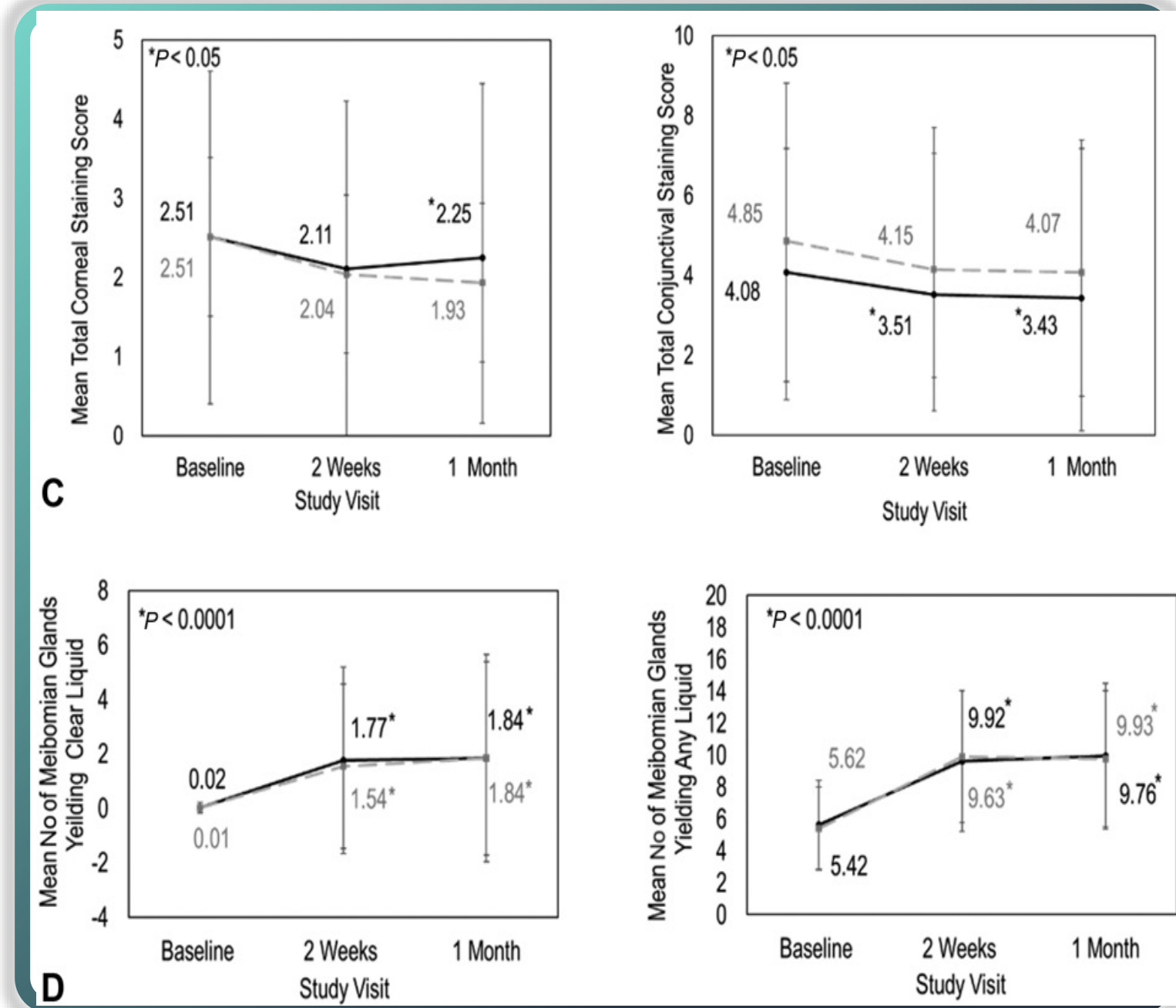
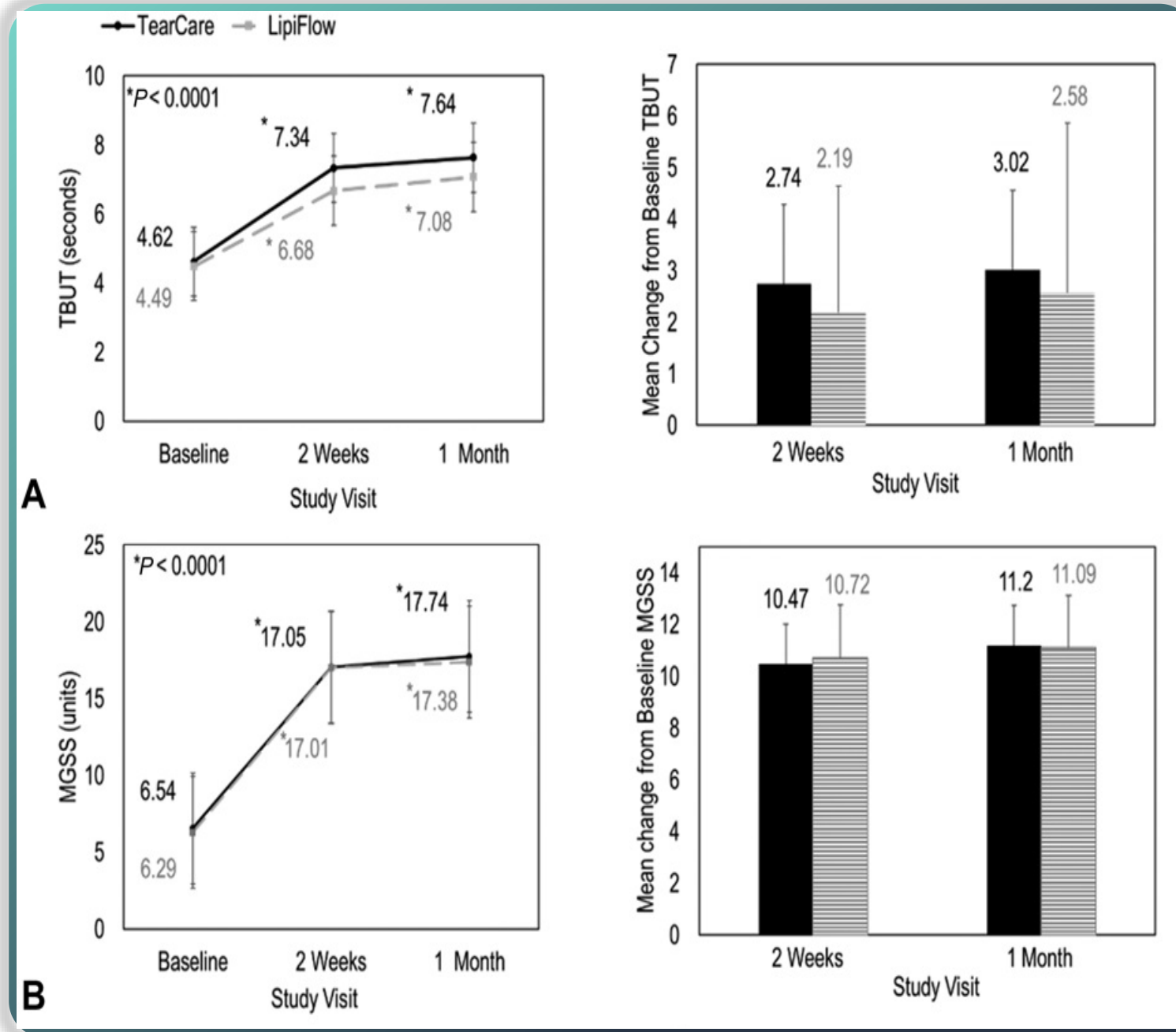
Groups	Numbers	the meibomian gland loss score [$M(Q_1, Q_3)$]*	blepharolipin score[$M(Q_1, Q_3)$]*	lid margin abnormality score[$M(Q_1, Q_3)$]	number of demodex [$M(Q_1, Q_3)$]*	Positive rate of demodex
Before	16	4.0(3,4)	16.0(10.0,17.8)	3.0(2.0,3.8)	8.0(4,9)	87.5%
After	16	4.0(3,4)	10.0(8.0,12.0)	2.0(1.0,2.0)	3.0(0,4.5)	56.3%
Z/χ^2		$Z=-2.45$	$Z=-3.31$	$Z=-3.40$	$Z=-5.01$	$\chi^2 = 3.87$
P		$P=0.01$	$P=0.00$	$P=0.01$	$P=0.00$	$P=0.11$

Intense Pulsed Light Applied Directly on Eyelids Combined with Meibomian Gland Expression to Treat Meibomian Gland Dysfunction

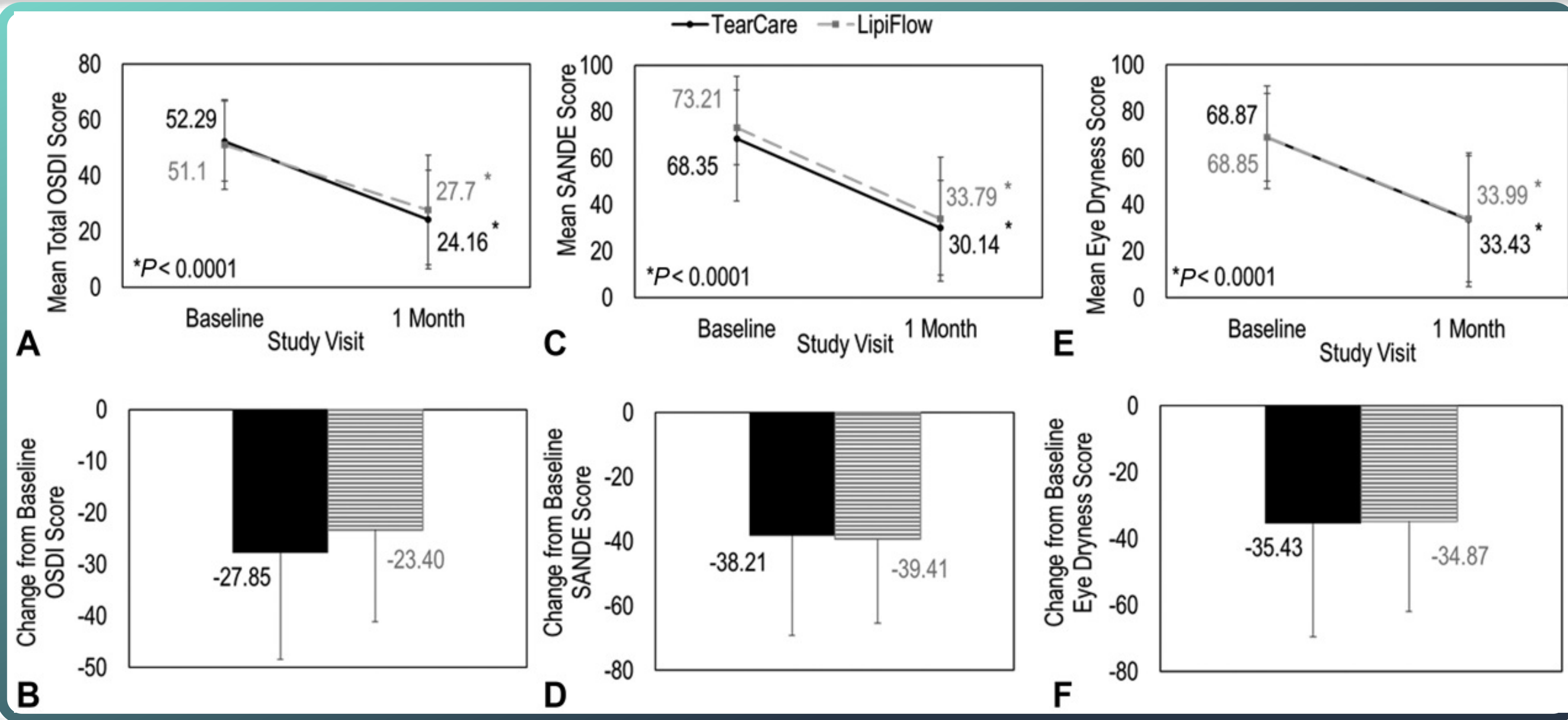
Longitudinal analysis of MGYSS, TBUT, SPEED scores, and CFS scores in the study and control eyes. (Friedman two-way analysis of variance, pairwise Wilcoxon for post hoc testing, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ compared to the baseline). CFS, cornea fluorescein staining; MGYSS, meibomian gland yielding secretion score; SPEED, standard patient evaluation of eye dryness; TBUT, tear film break-up time.



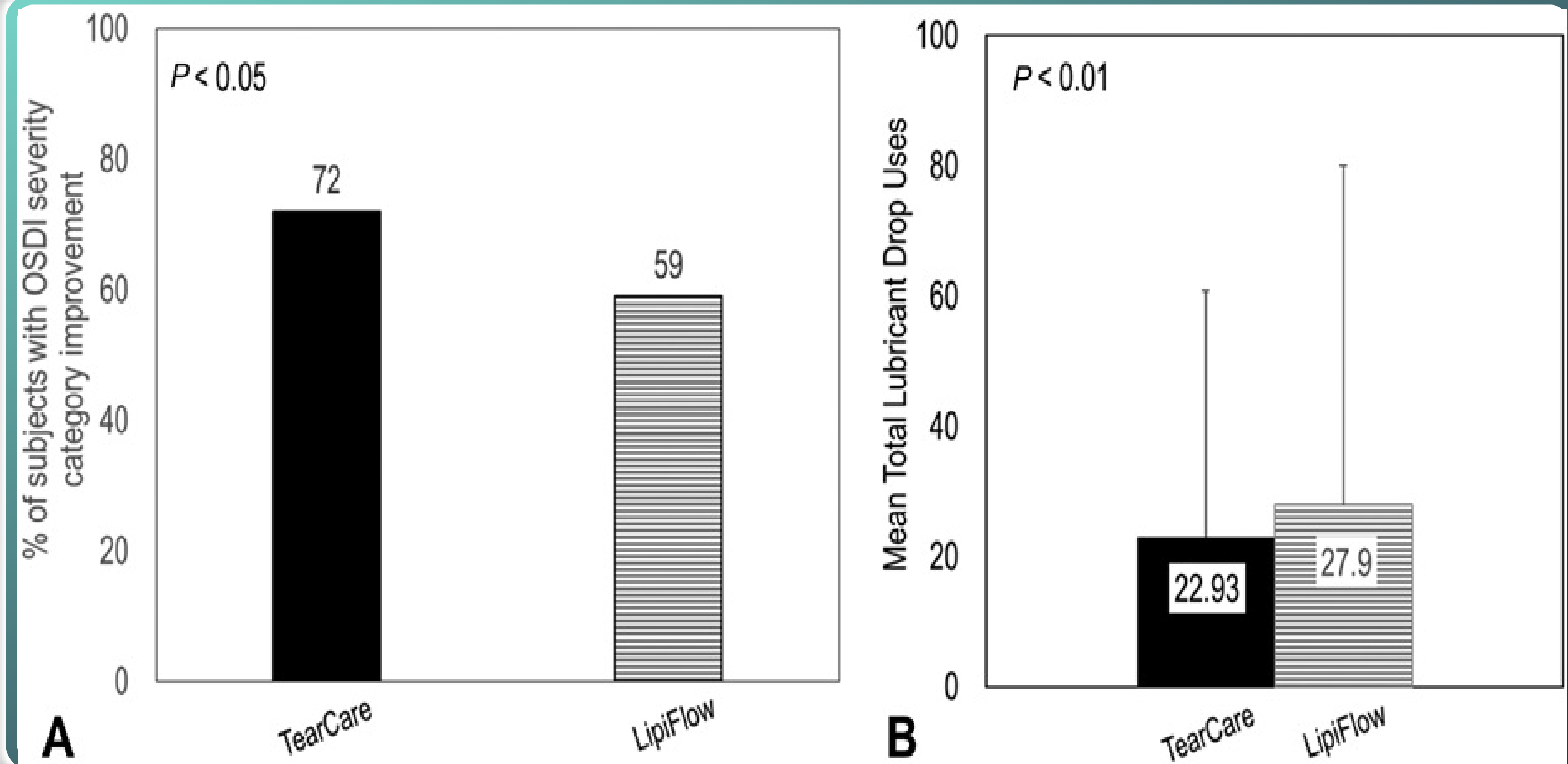
TearCare for the Treatment of Meibomian Gland Dysfunction in Adult Patients With Dry Eye Disease



TearCare for the Treatment of Meibomian Gland Dysfunction in Adult Patients With Dry Eye Disease

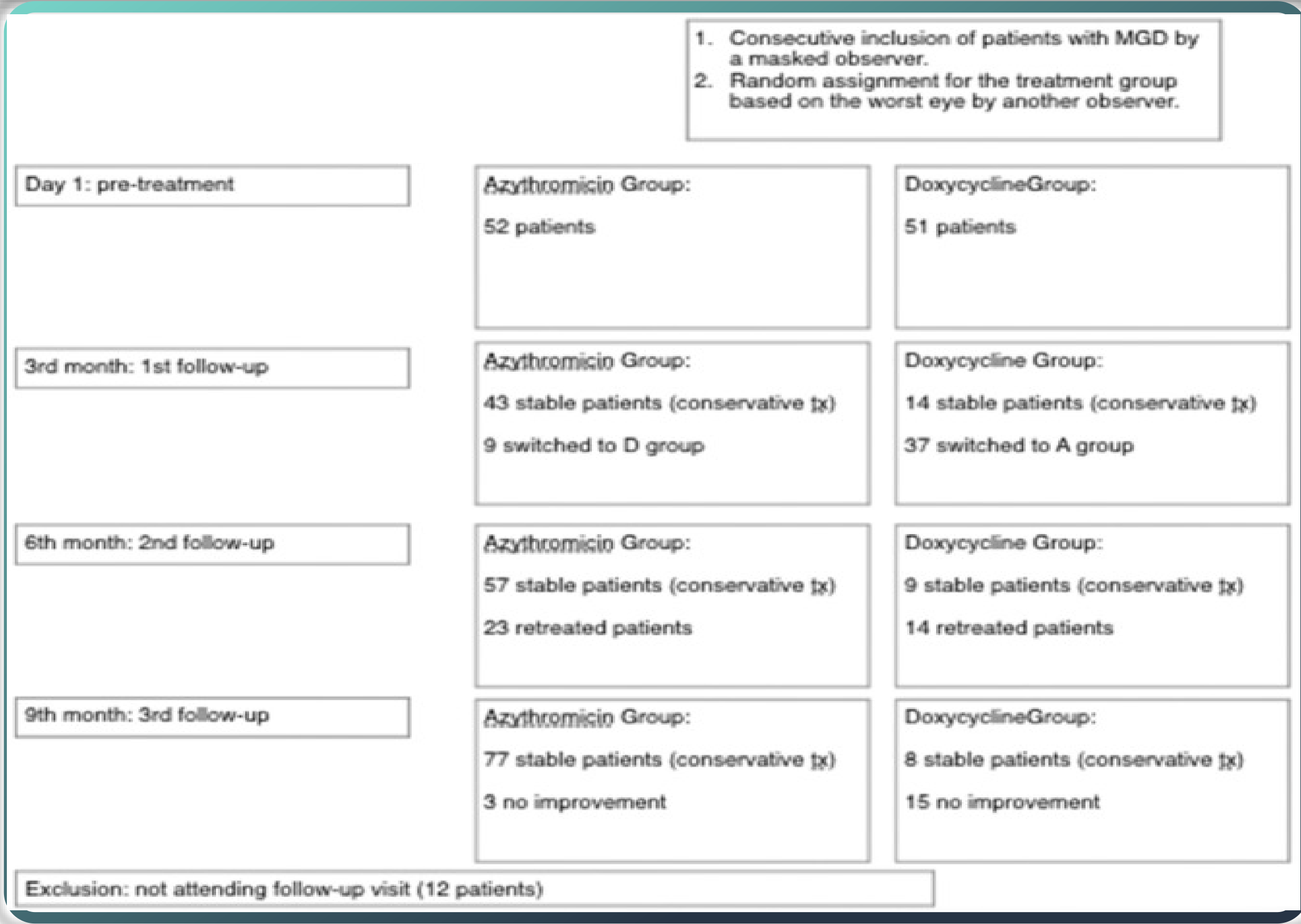


TearCare for the Treatment of Meibomian Gland Dysfunction in Adult Patients With Dry Eye Disease

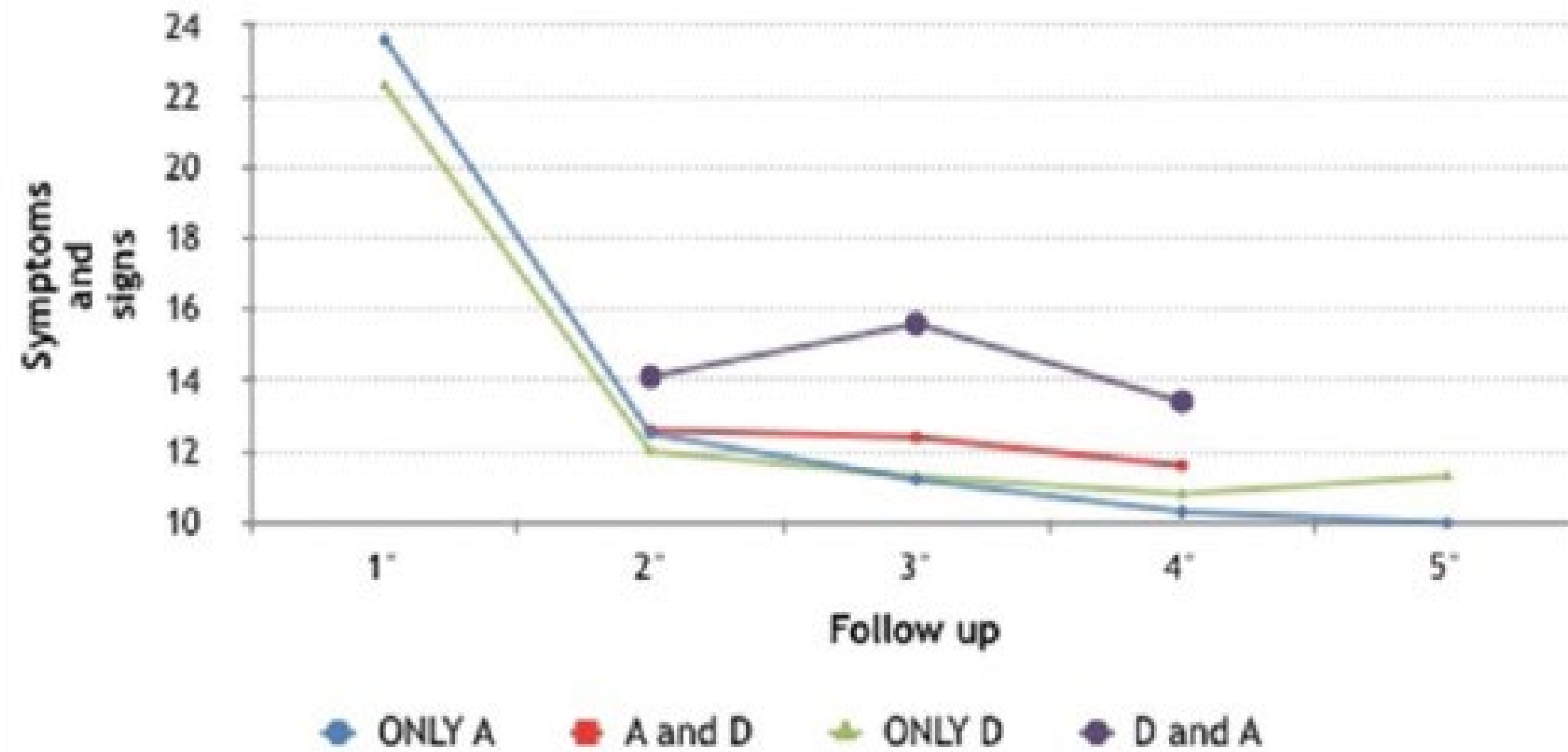


Oral azithromycin and oral doxycycline for the treatment of Meibomian gland dysfunction

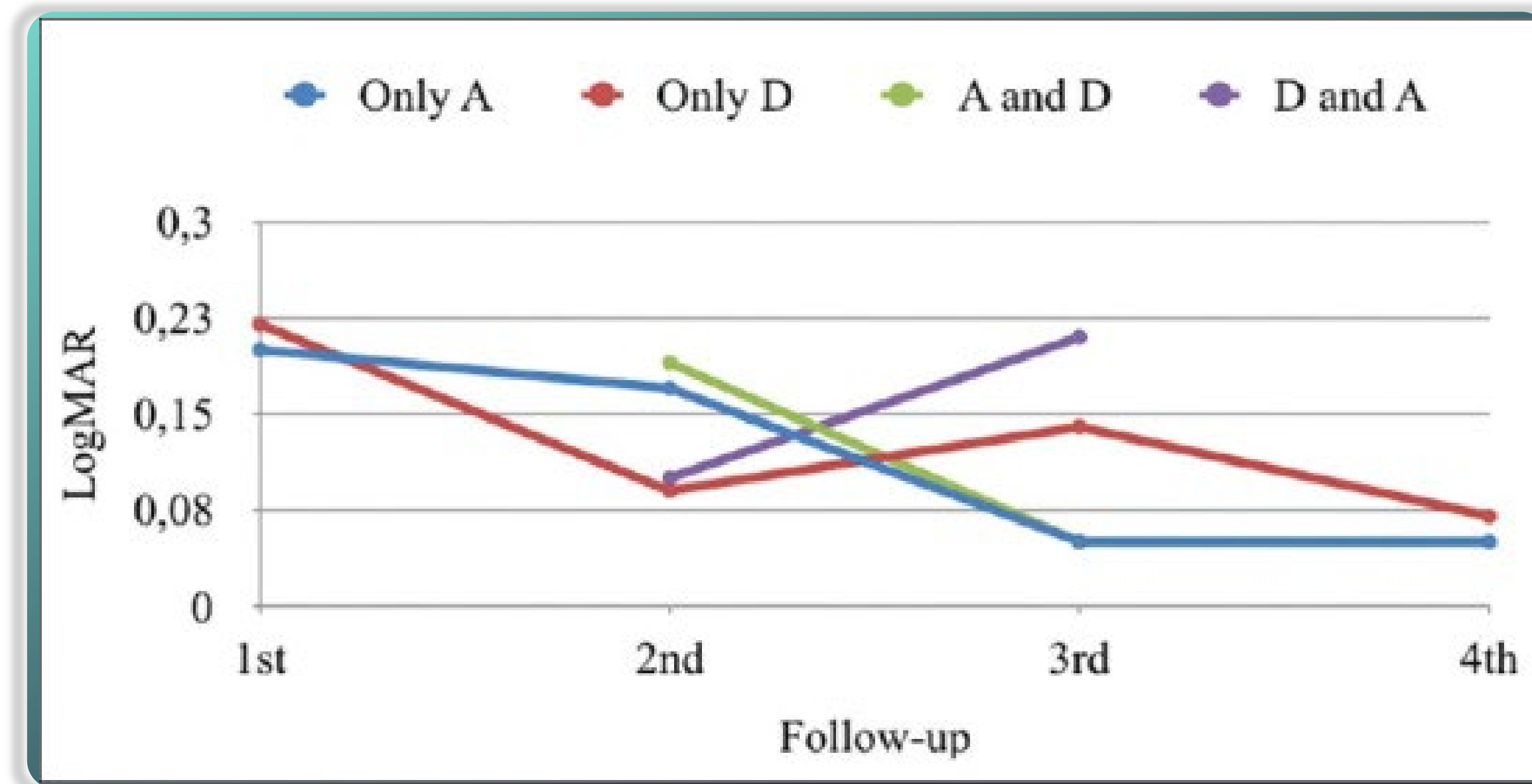
Flow diagram of participants in the trial of 5-day oral azithromycin versus 1-month oral doxycycline for treatment of Meibomian gland dysfunction at different stages: pretreatment and first (third month), second (sixth month), and third (ninth month) posttreatment visits



Oral azithromycin and oral doxycycline for the treatment of Meibomian gland dysfunction



Oral azithromycin and oral doxycycline for the treatment of Meibomian gland dysfunction



Trends in visual acuity (VA) in logMar units



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