EOS 1902

INTERNATIONAL CONGRESS OF THE

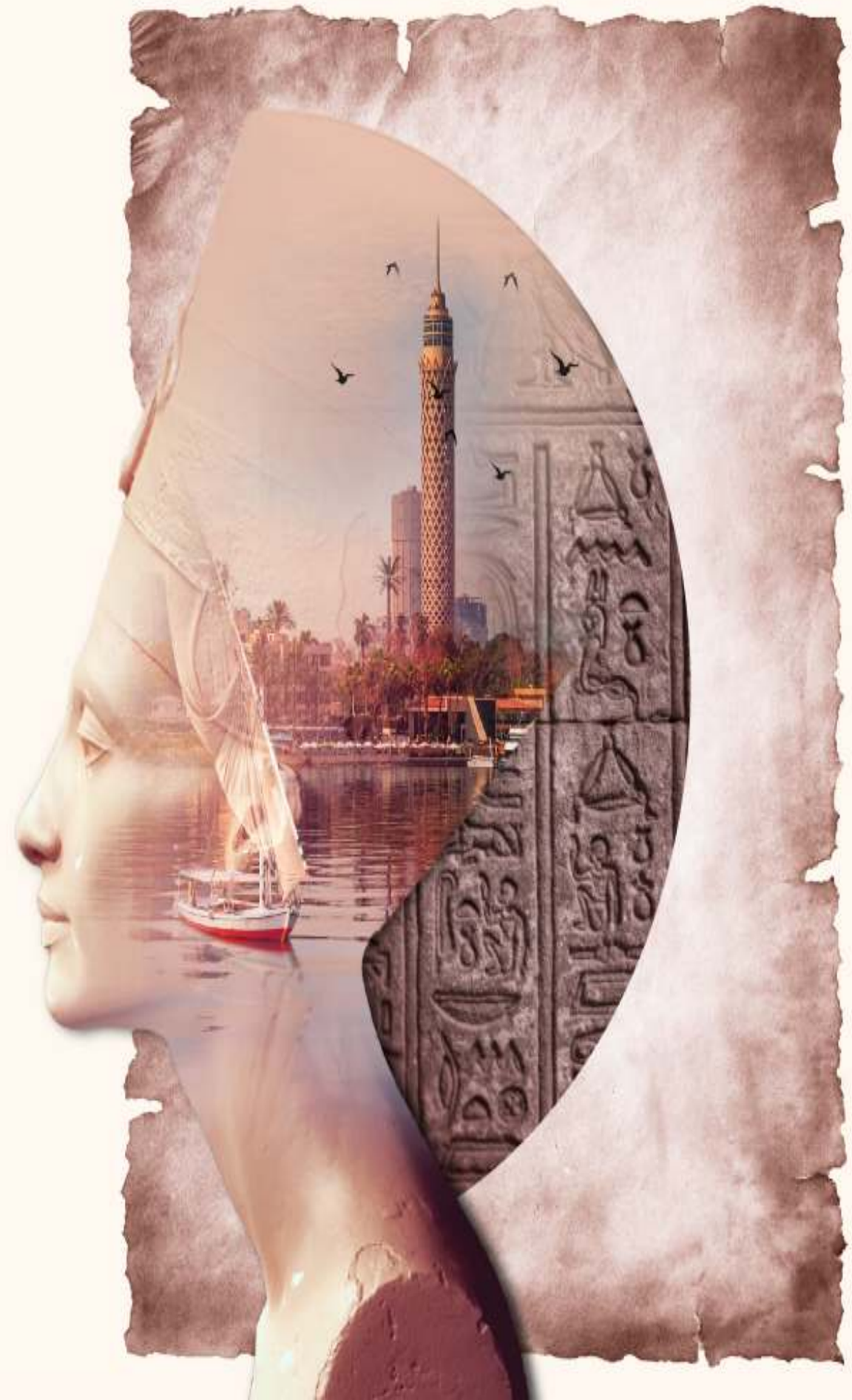
EGYPTIAN OPHTHALMOLOGICAL SOCIETY

In collaboration with: MEACO MIDDLE EAST AFRICA COUNCIL OF OPHTHALMOLOGY

EOS 2025

7-9 MAY

INTERCONTINENTAL CITYSTARS, EGYPT



Friday May 9th, 2025

DAY 3

9 MAY 2025

FRIDAY

Hall A
(Al Saraya 1)

SESSION 41

16:30 - 18:15

Ocular Surface Diseases: Medical and Surgical Aspects

Moderator Mervat El Shabrawy

16:30	How can meibography and other DED diagnostics change our clinical decisions **Amr Mounir,** *Egypt*
16:45	MGD: The core mechanism of ocular surface disease **Osama Shalaby,** *Egypt*
17:00	OSD and unhappy cataract patients **Mervat El Shabrawy,** *Egypt*
17:15	Ocular surface disease in MMP- what is beyond the usual immunosuppression modalities? **Ahmed Shalaby Bardan,** *UK*
17:30	Navigating SMILE: How the ocular surface shapes outcomes and experiences **Jonathan Edward Moore,** *UK*
17:45	Artificial intelligence in refractive surgery and OSD **Amr Gab-Alla,** *Egypt*
18:00	Discussion

Meibomian Gland Dysfunction(MGD);

The core mechanism of

Ocular Surface Disease (OSD)

Prof Dr Osama Shalaby

Professor &Head Of Ophthalmology Department

Tanta University

Clinical case

- Female, 45 years old.
- C/O: sore irritated eye, sense of eye heaviness, inability to open her eyes on awakening from sleep.
- Duration of symptoms for few months.
- Seen by multiple ophthalmologists diagnosed to have a dry eye.
- Used many types of artificial tears without improvement.
- She had negative medical & surgical history.

Clinical case

OSDI questionnaire score

OCULAR SURFACE DISEASE INDEX©

Please answer the following questions by checking the box that best represents your answer.

Have you experienced any of the following during **the last week**:

	All of the time	Most of the time	Half of the time	Some of the time	None of the time
1. Eyes that are sensitive to light?	☐	☐	☐	☐	☐
2. Eyes that feel gritty?	☐	☐	☐	☐	☐
3. Painful or sore eyes?	☐	☐	☐	☐	☐
4. Blurred vision?	☐	☐	☐	☐	☐
5. Poor vision?	☐	☐	☐	☐	☐

Have problems with your eyes limited you in performing any of the following during **the last week**:

	All of the time	Most of the time	Half of the time	Some of the time	None of the time	N/A
6. Reading?	☐	☐	☐	☐	☐	☐
7. Driving at night?	☐	☐	☐	☐	☐	☐
8. Working with a computer or bank machine (ATM)?	☐	☐	☐	☐	☐	☐
9. Watching TV?	☐	☐	☐	☐	☐	☐

Have your eyes felt uncomfortable in any of the following situations during **the last week**:

	All of the time	Most of the time	Half of the time	Some of the time	None of the time	N/A
10. Windy conditions?	☐	☐	☐	☐	☐	☐
11. Places or areas with low humidity (very dry)?	☐	☐	☐	☐	☐	☐
12. Areas that are air conditioned?	☐	☐	☐	☐	☐	☐

Scoring Instructions

Item scoring

The total OSDI score is calculated based on the following formula:

$$\text{OSDI} = \frac{(\text{sum of severity for all questions answered}) \times (100)}{(\text{total \# of questions answered}) \times (4)}$$

where the severity was graded on a scale of

0 = none of the time,
1 = some of the time,
2 = half of the time,
3 = most of the time,
4 = all of the time.

Interpretation

A score of 100 corresponds to complete disability (a response of "all of the time" to all questions answered), while a score of 0 corresponds to no disability (a response of "none of the time" to all questions answered). Therefore, change from baseline of −12.5 corresponds to an improvement by at least one category in half of the questions answered.

Subscale Scoring

Subscales scores are computed similarly with only the questions from each subscale used to generate its own score. Therefore, any subscales analyzed separately would also have a maximum possible score of 100.

The three subscales (vision-related function, ocular symptoms and environmental triggers) are broken out as follows:

Subscale	Questions
Vision-Related Function	4, 5, 6, 7, 8, 9
Ocular Symptoms	1, 2, 3
Environmental Triggers	10, 11, 12

Ocular Surface Disease Index©(OSDI©)²

Have you experienced any of the following during the last week?

1.Eyes that are sensitive to light?

All of the time | Most of the time | Half of the time | **Some of the time** | None of the time

2.Eyes that feel gritty?

All of the time | Most of the time | **Half of the time** | Some of the time | None of the time

3.Painful or sore eyes?

All of the time | Most of the time | Half of the time | **Some of the time** | None of the time

4. Blurred vision?

All of the time | Most of the time | Half of the time | Some of the time | **None of the time**

5.Poor vision?

All of the time | Most of the time | Half of the time | Some of the time | **None of the time**

Have problems with your eyes limited you in performing any of the following during the last week?

6.Reading?

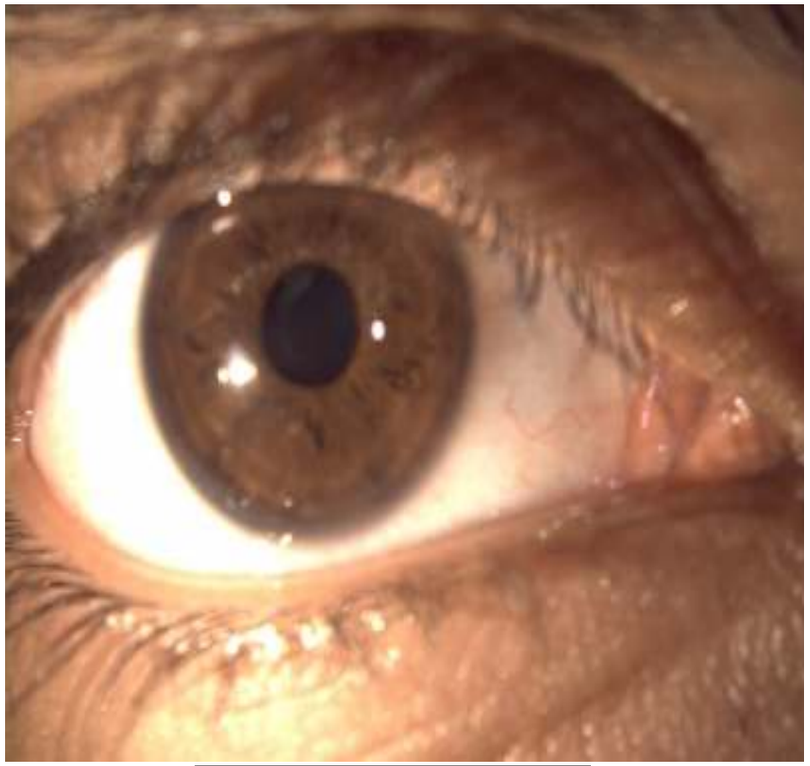
OSDI Questionnaire | Print to PDF | Print | Submit

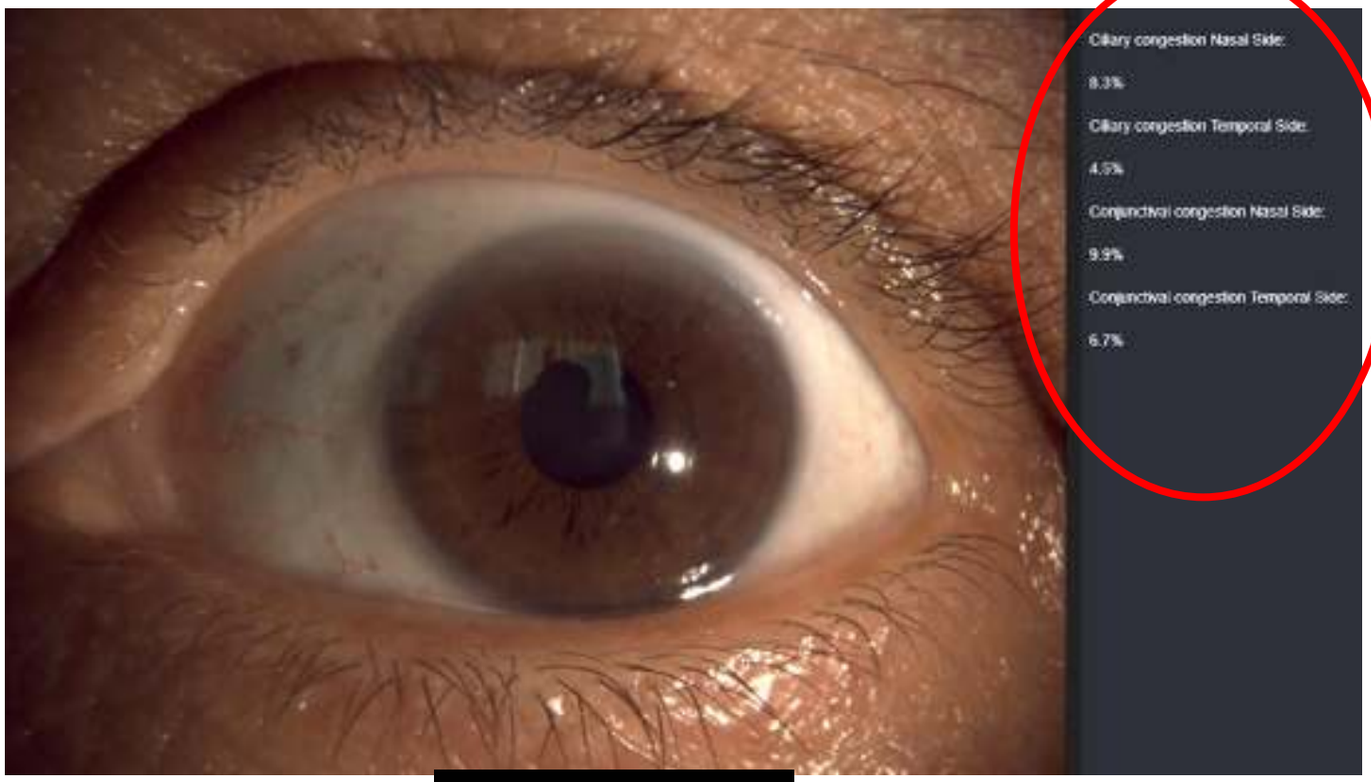
Total Score: 19

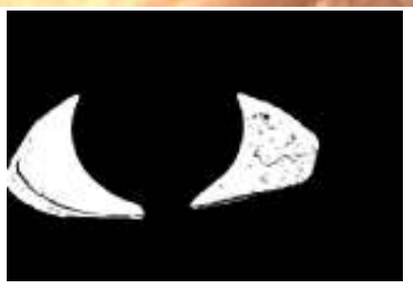
Grade Description: Mild dry eye

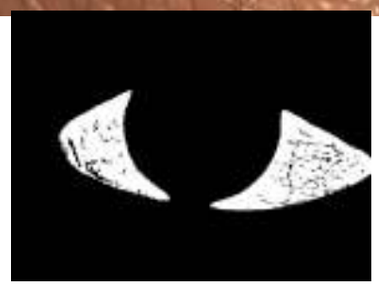
Clinical case

Mild ocular surface redness in the form of mild diffusely dilated conj. vessels







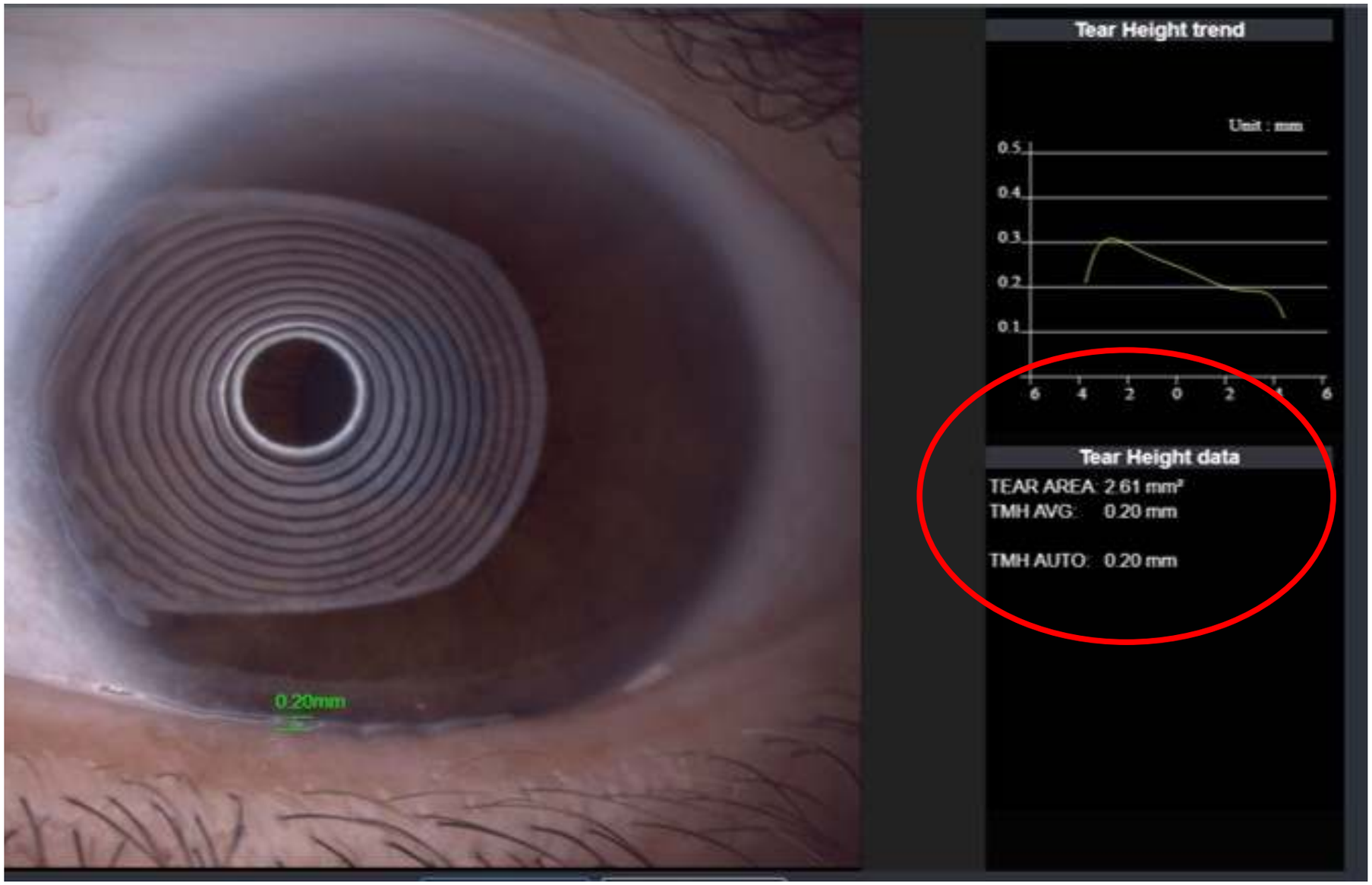


Clinical case

- Lid margin:
  - Slightly round posterior border
  - Some telangiectatic vessels.
  - MG orifices were obliterated with mild posterior migration.
- MGD Score:
  - Expresibility: 2/10 (grade 2).
  - Meibomian fluid slightly turbid (grade 1).

Clinical case

Lower tear meniscus height

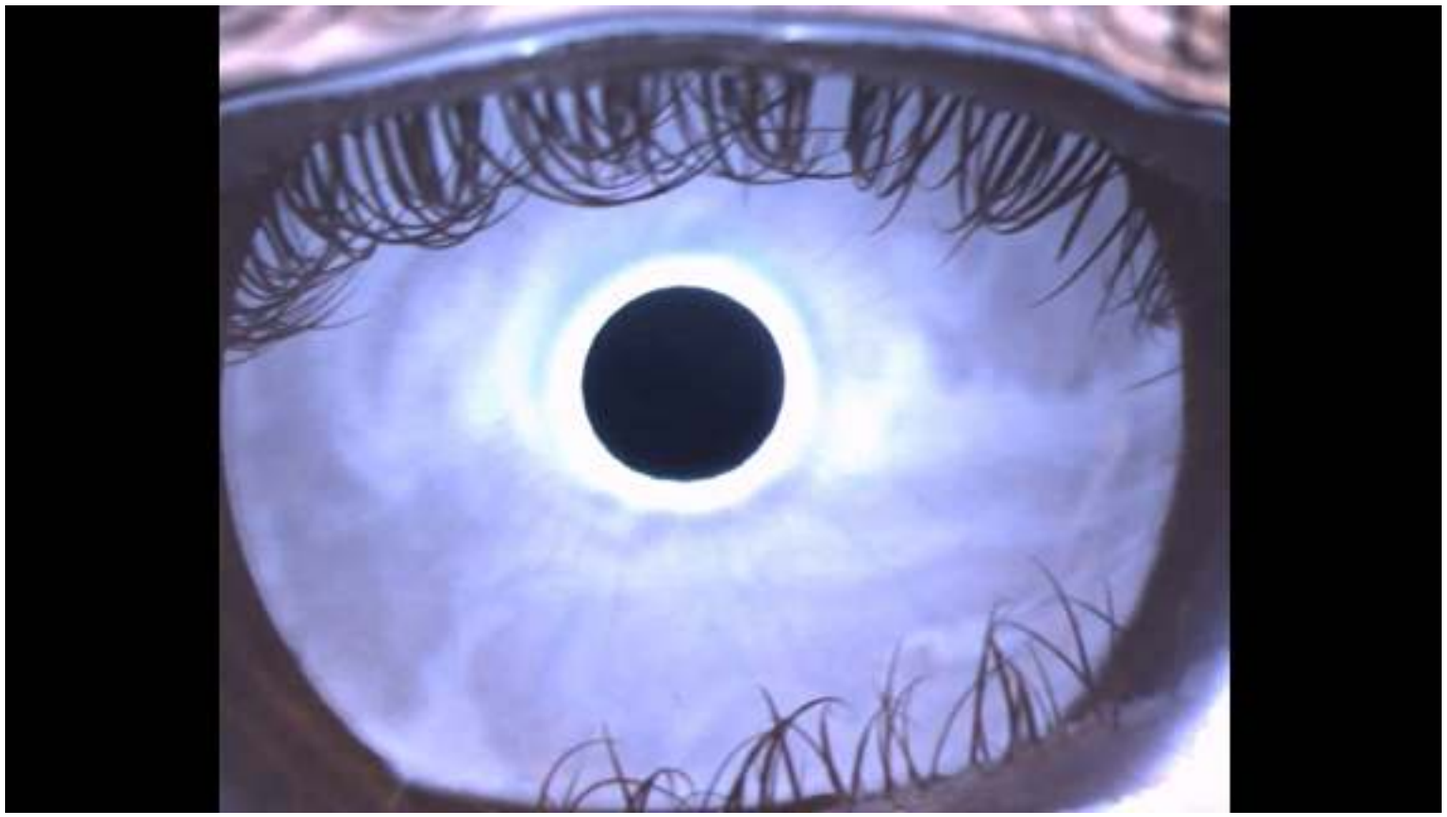


Clinical case

Reflection on tear film stability (NIBUT)

Clinical case

Tear lipid layer thickness: 30 60 nm.



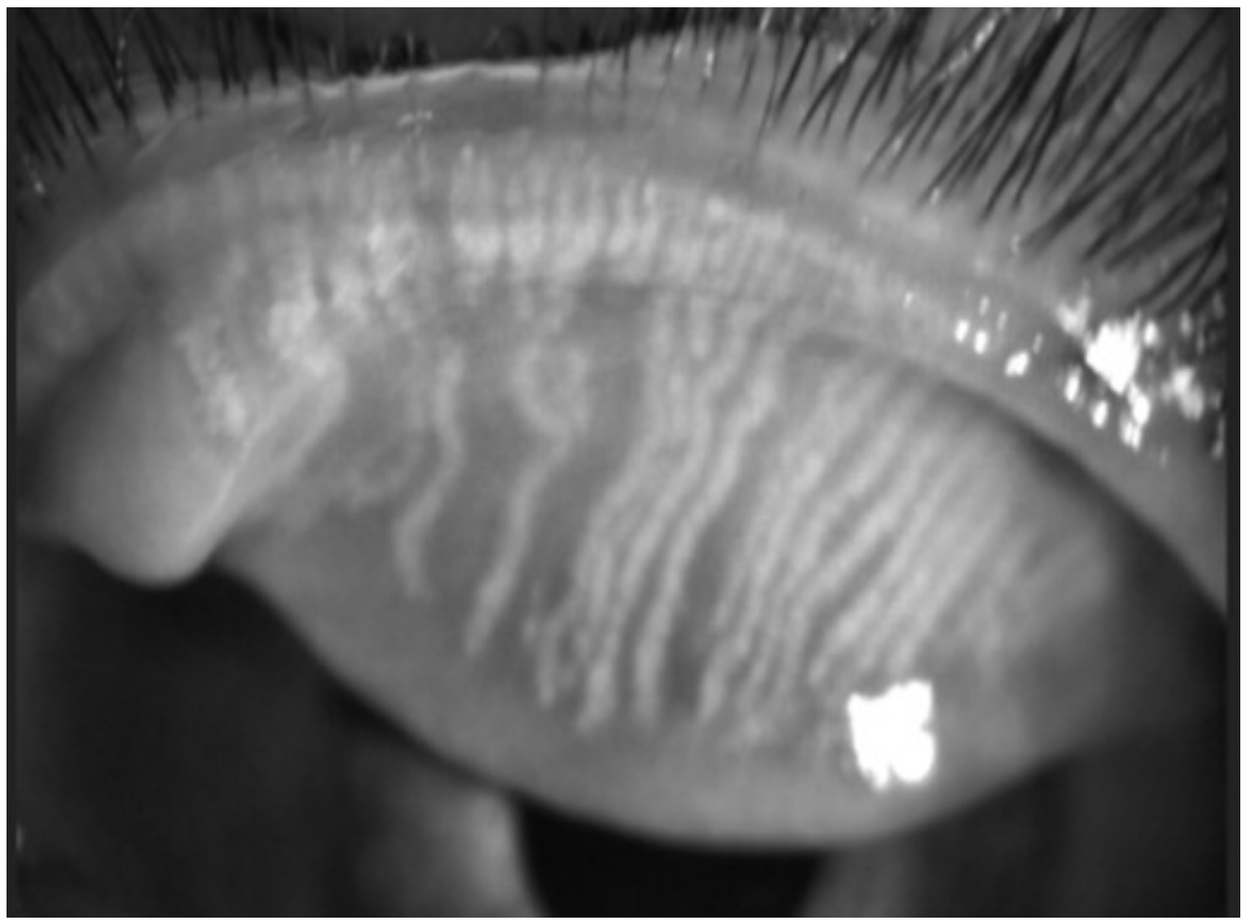
“Rippling” motion of the tear film over the corneal surface, like the flow of water in a shallow stream over a rocky streambed

Clinical case

Infra red Meibomiography

Detailed assessment of MG morphology

- Distorted: don’t follow the parallel course of normal glands.
- Tortuous configuration
- Bifurcation
- Kinking
- Looping
- Areas of gland loss (drop out)



Clinical case

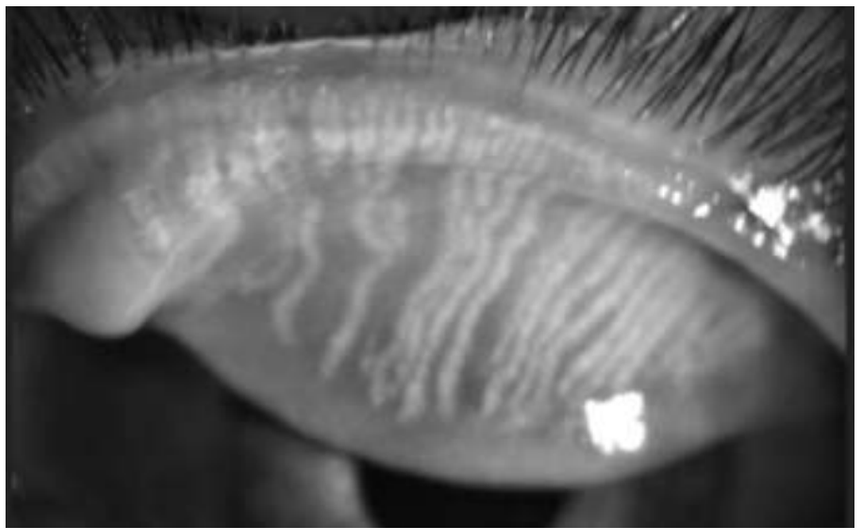
Infra red Meibomiography

Detailed assessment of MG morphology

- Fluffy appearance
- Shortened (not reach the full length)
- Thickened
- Areas of drop out

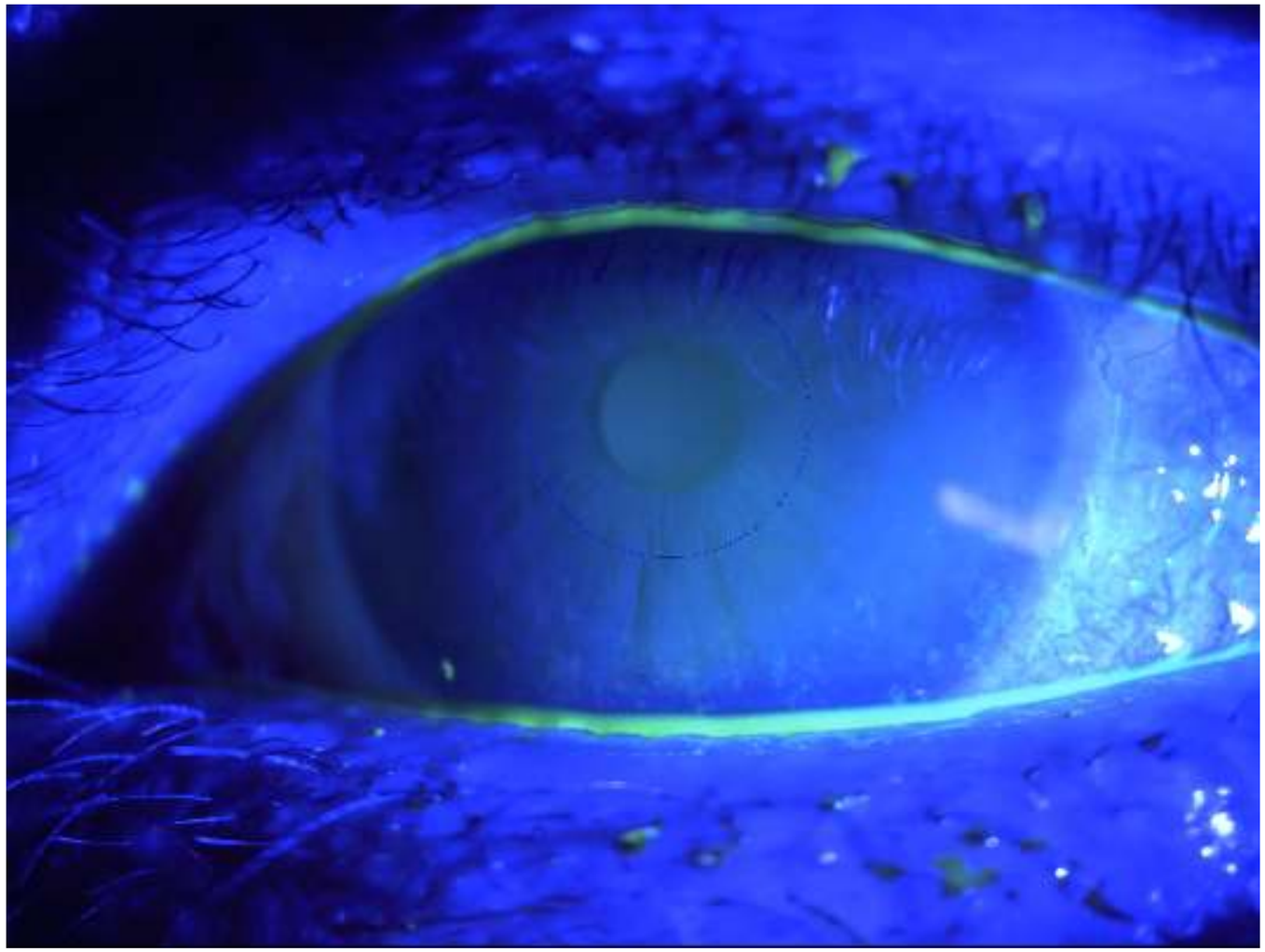
Clinical case

Comparing lid margin with infrared image



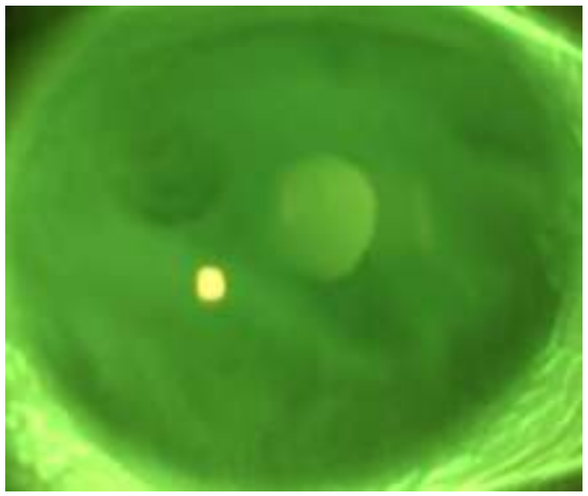
Clinical case

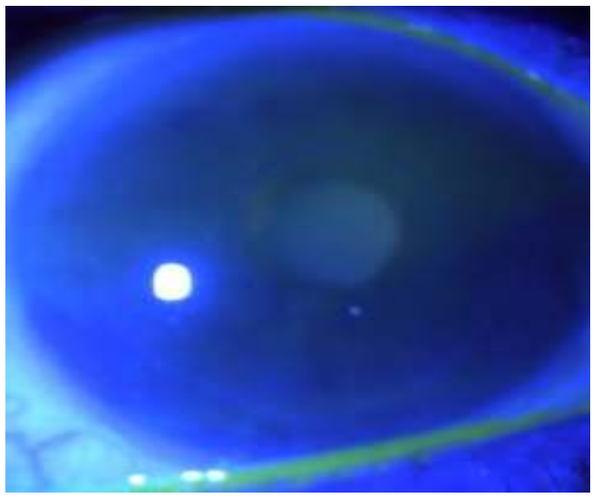
FIBUT

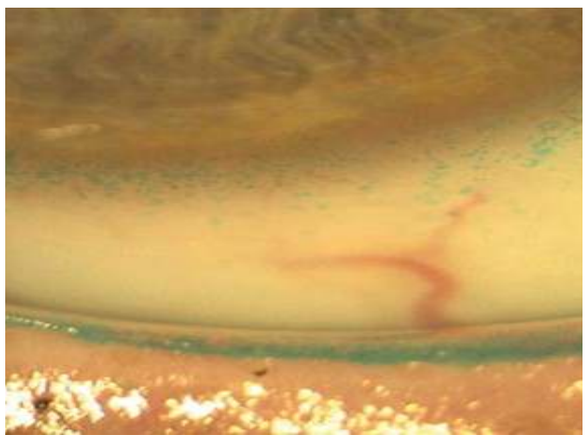


Clinical case

Ocular surface staining







Photos are from other patient of similar condition

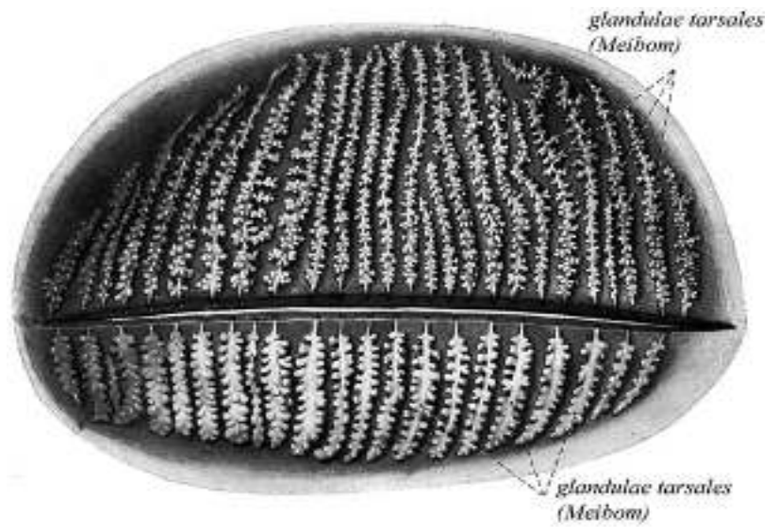
Clinical positive data

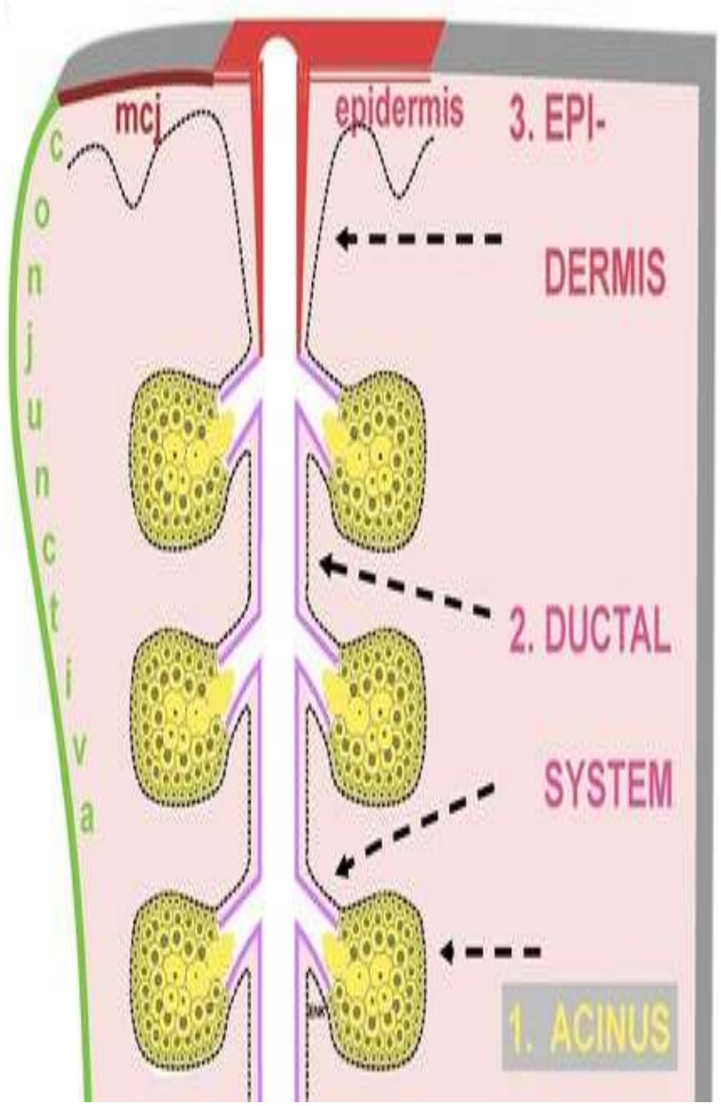
- Unstable tear film
- Lipid deficiency
- Low delivery (Obstructive) MGD
- Mild ocular surface inflammation
- expected:
  - Increase evaporation.
  - Hyperosmolarity.

Meibomian glands in Health & Disease

Normal Meibomian Glands

Anatomy



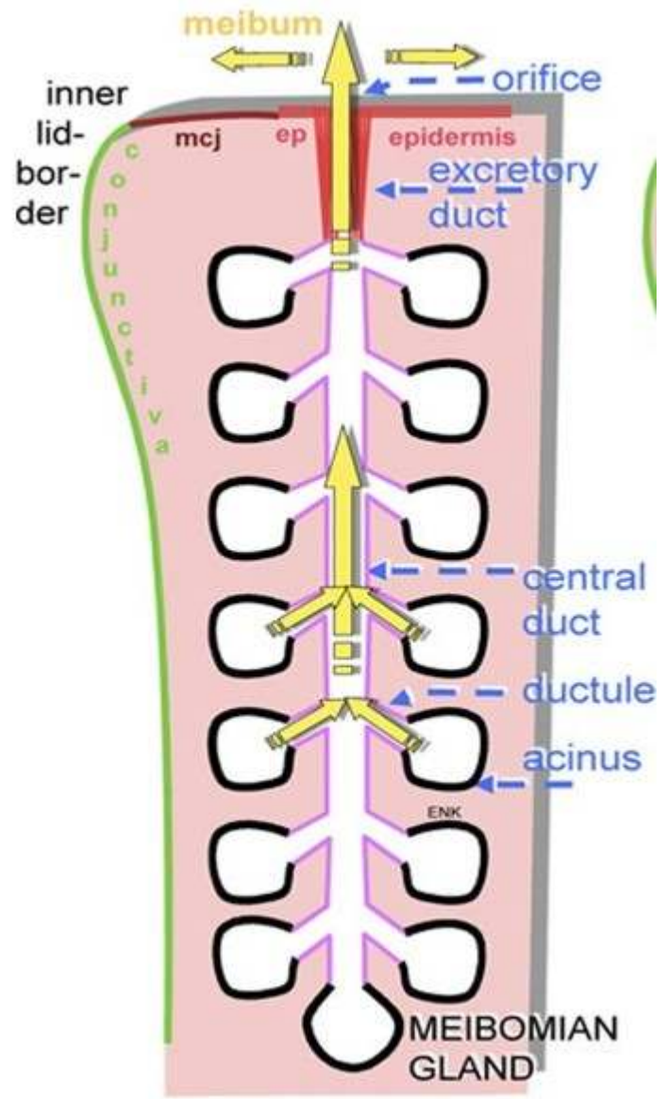


- Each meibomian gland consists of:
  - Multiple (10–15) circularly arranged acini containing meibocytes
  - Open into short connecting ductules.
  - Connected to a single central duct.
  - Terminal excretory duct opens at the posterior lid margin.

Normal Meibomian Glands

Anatomy

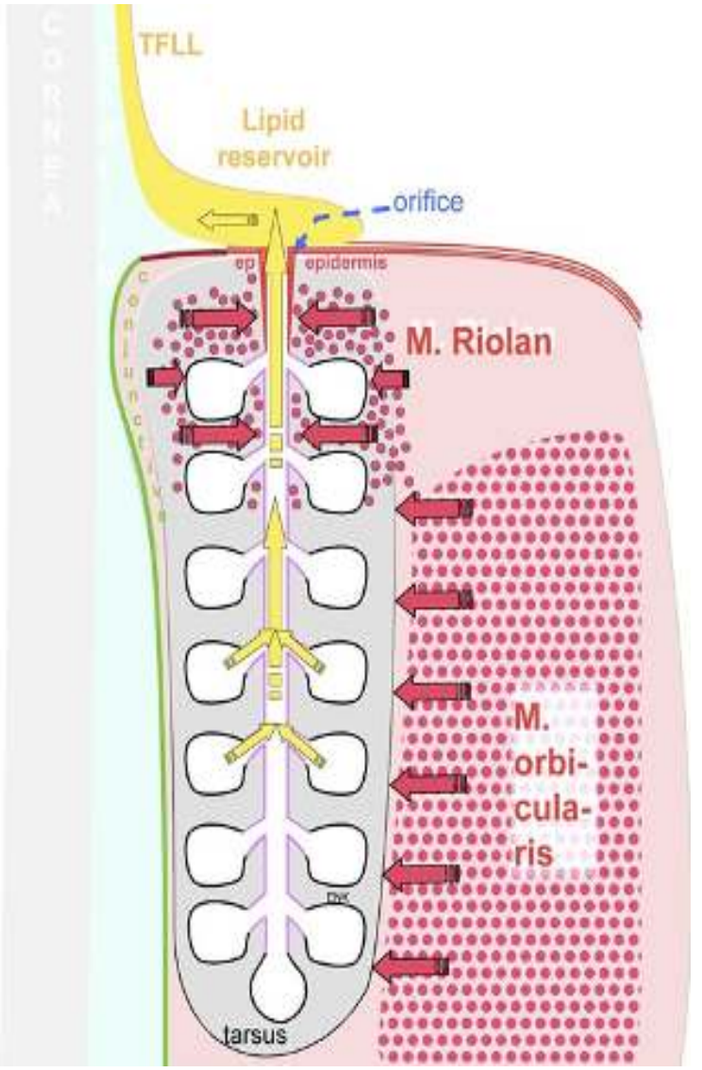
- The meibum is transported through the connecting ductules into the central duct and is finally delivered through the excretory duct and orifice that is located within the posterior lid border.



Normal Meibomian Glands

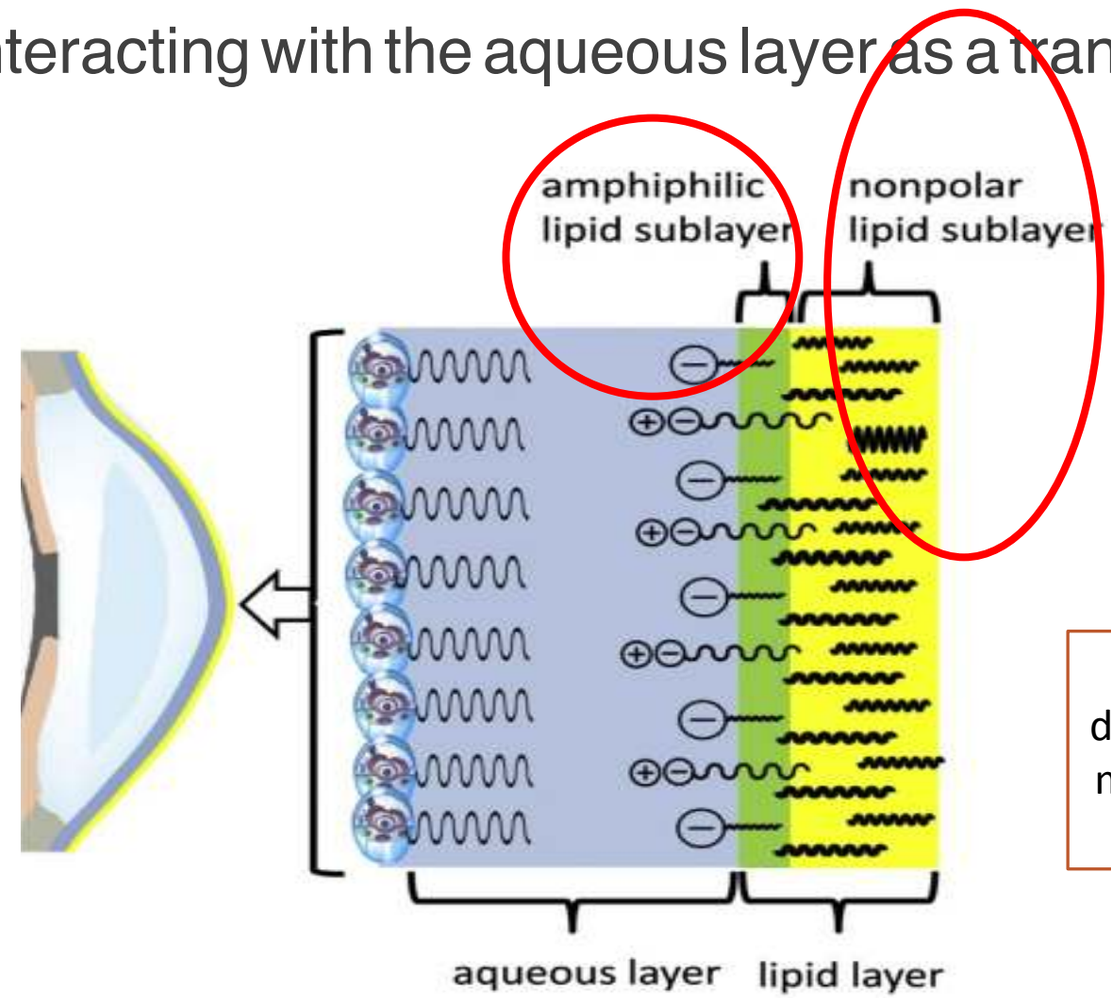
Driving force for meibum secretion

- Secretory pressure from continuous secretion.
- Mechanical muscular action by pretarsal orbicularis muscle and muscle of Riolan



Normal meibomian secretion

- Outer nonpolar phase：provides the air–tear film interface.
- Inner polar phase：interacting with the aqueous layer as a transition phase.



phosphatidyl ethanolamines, sphingomyelin, and phosphatidyl choline.

wax esters, cholesterol esters, diesters,triglycerides,diglycerides, monoglycerides, free sterols, and free fatty acids.

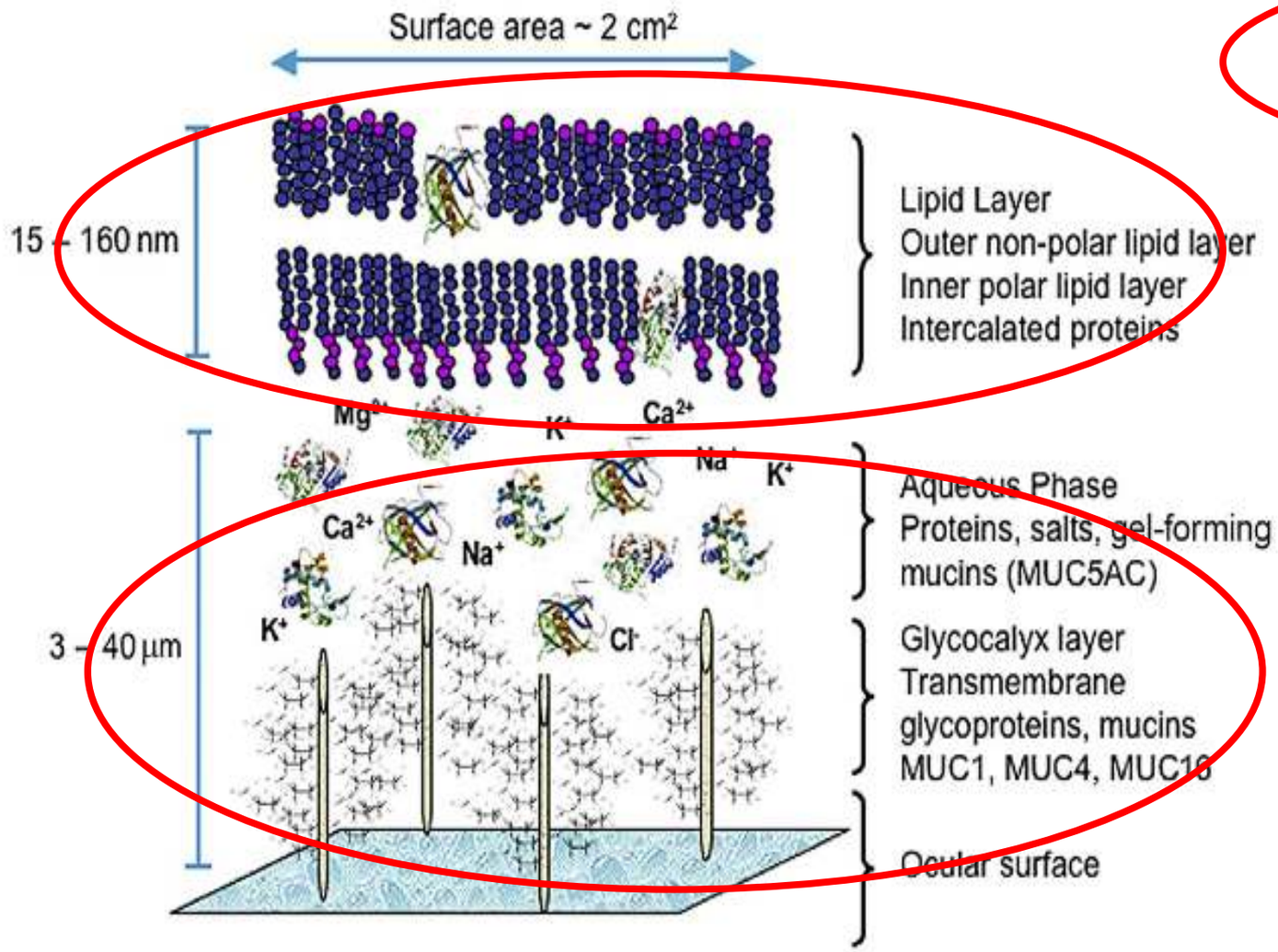
Butovich IA. Meibomian glands, meibum, and meibogenesis.xp Eye Res. 2017 Oct;163:2-16.
McCulley JP, Shine WE. Meibomian gland function and the tear lipid layer. Ocul Surf 2003;1(3):97–106

Tear Film Model

Lipid layer

Aqueous layer

Mucous layer



WE Non polar layer

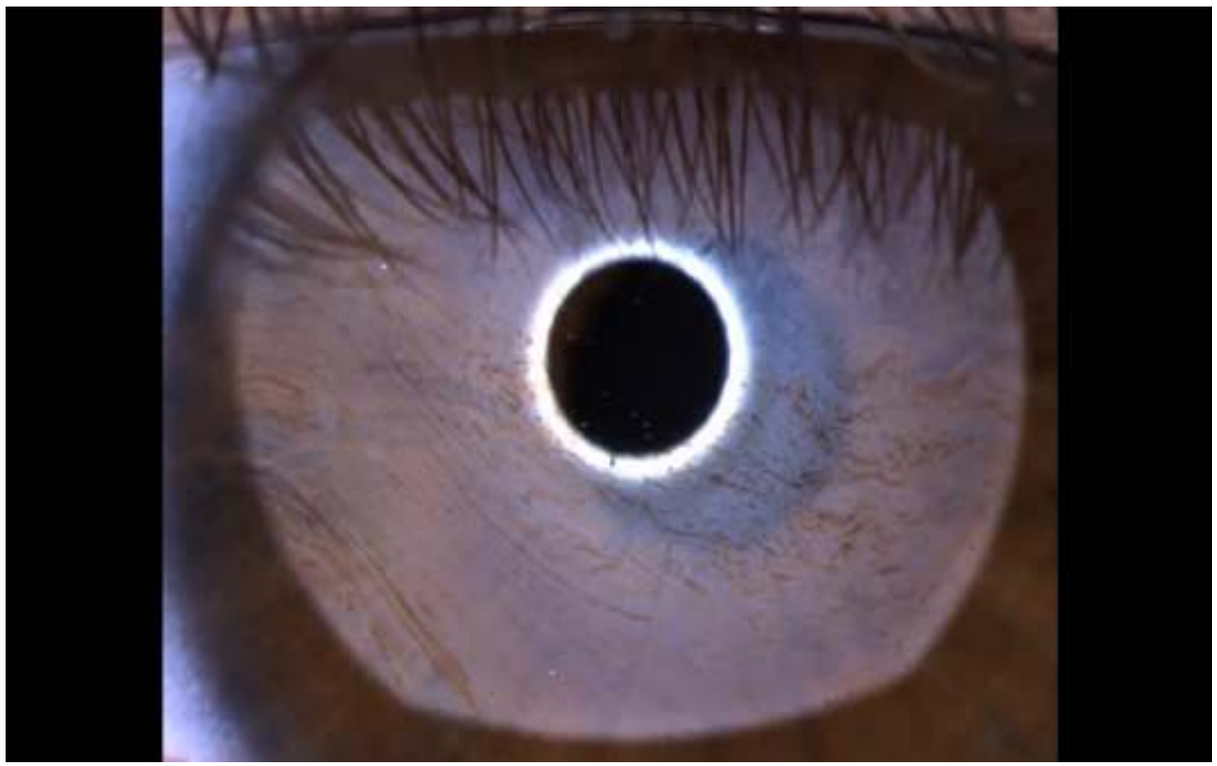
Lipo aqueous phase

Muco aqueous phase

Butovich IA. Meibomian glands, meibum, and meibogenesis.xp Eye Res. 2017 Oct;163:2-16.
McCulley JP, Shine WE. Meibomian gland function and the tear lipid layer. Ocul Surf 2003;1(3):97–106

Tear film Lipid layer

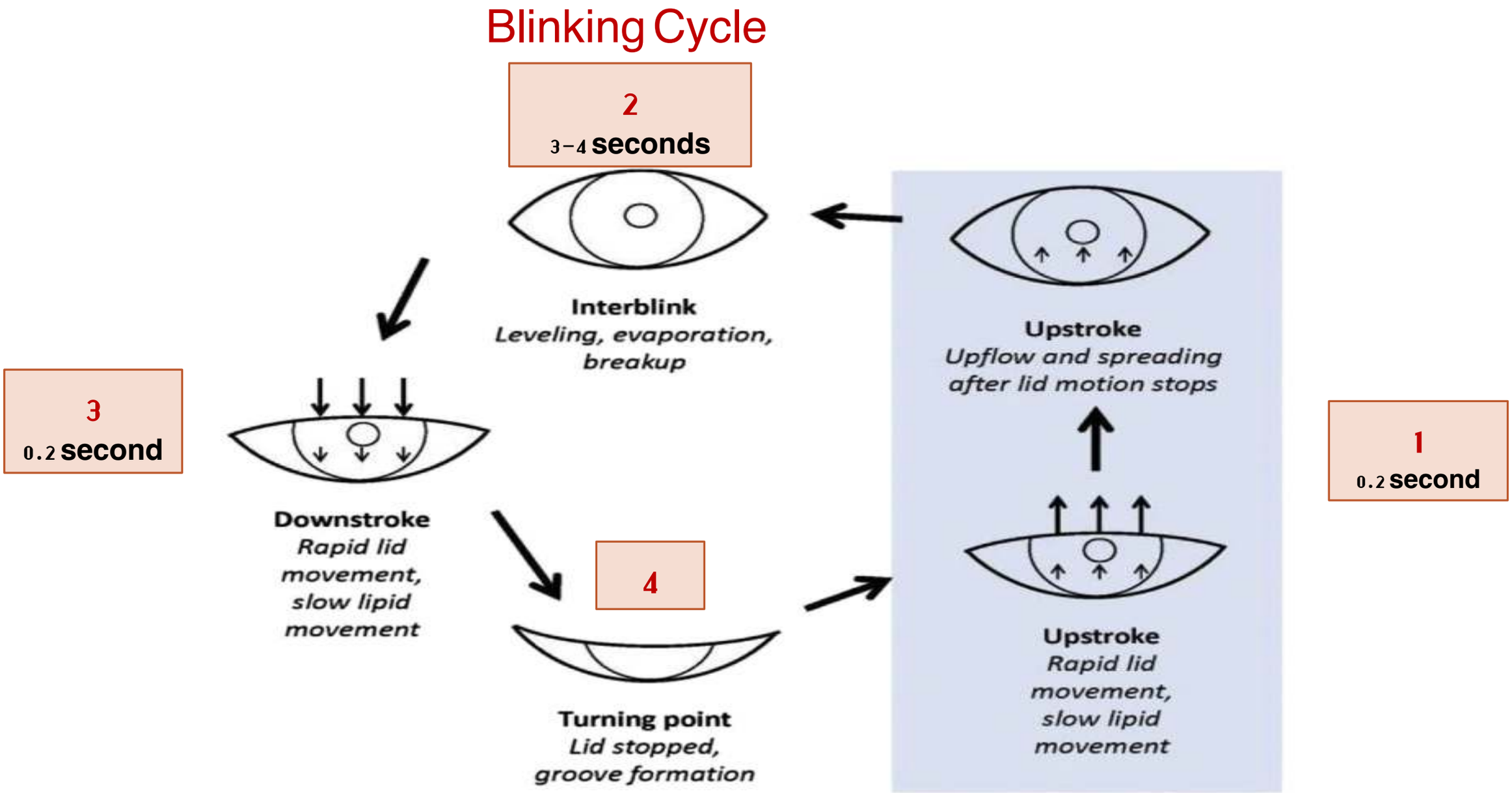
The thickness of the lipid layer does not accurately reflect their effectiveness to prevent evaporation.



A thin layer fails to form an efficient elastic bilayer

Thick particulated layer act as an iceberg, its movement cause discontinuity of protecting layer.

Meibomian dynamics in blinking



Braun et al. Dynamics and function of the tear film in relation to the blink cycle. *Prog Retin Eye Res*. 2015 March ; 0: 132–164.

Meibomian Secretion

Control of Secretion

- Meibomian glands are densely innervated by unmyelinated nerve fibers around the acini.
- Neurotransmitters are responsible for meibocyte stimulation.

Meibomian secretion is Influenced by:

Age, sex,

Hormonal disturbances: Androgens, Estrogens, Progestins

Retinoic acid

Growth factors

What is Meibomian Gland Dysfunction (MGD) ??

MGD is defined as

Diffuse abnormality of the meibomian glands,

Characterized by terminal duct obstruction

&/or

qualitative/quantitative changes

in the glandular secretion.

IOVS, Special Issue 2011, Vol. 52, No. 4

Risk factors for MGD

Ophthalmic

- Contact lens wear
- Demodex
- Floppy eye lid syndrome
- Poor blinking
- Eye lid tattooing
- Chronic anterior blepharitis

Systemic conditions

- Rosacea / Acne
- Metabolic syndrome
- Dyslipidemia
- Carbohydrate intolerance
- Psoriasis
- Polycystic ovary
- BPH
- Androgen deficiency
- Menopause

Medications

- Isotretinoin therapy
- Anti androgens
- Anti depressants
- Antihistaminic
- Medications for BPH
- Postmenopausal hormonal therapy

Interacting Pathways in the Pathogenesis of MGD

Core Mechanisms

Obstruction

Hyper keratinization

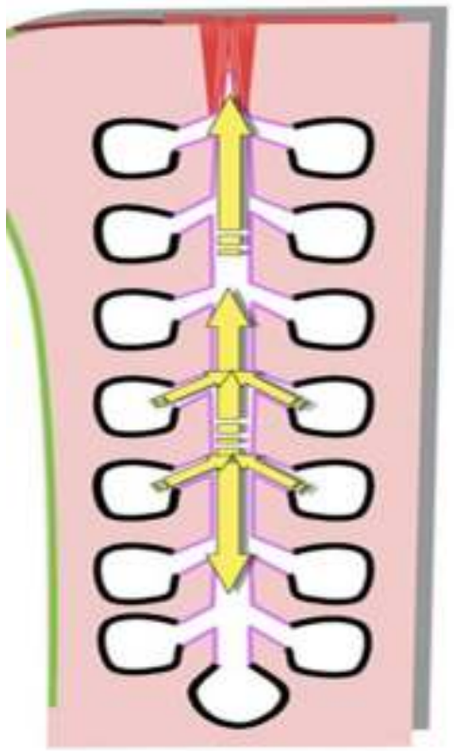
Increased Viscosity

Interacting Pathways in the Pathogenesis of MGD

Core Mechanisms

Obstruction

- Hyper keratinization of the epithelium at the lid margin



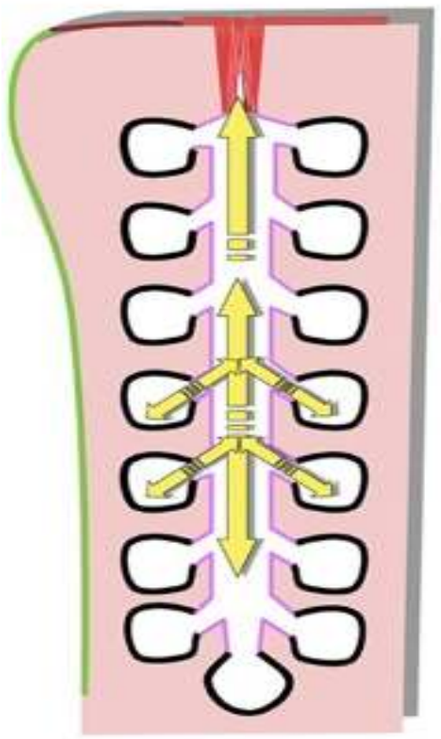
Interacting Pathways in the Pathogenesis of MGD

Core Mechanisms

Obstruction

- Stasis & additional dilatation

continuing secretion of meibum in the acini generates an increasing pressure inside the glands that leads to a gradual dilatation, first of the central duct.



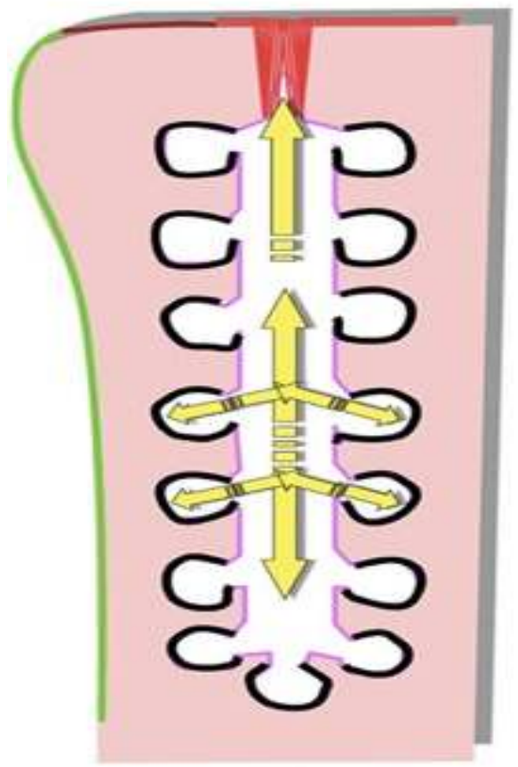
Interacting Pathways in the Pathogenesis of MGD

Core Mechanisms

Obstruction

- Additional atrophy

Prolonged increased dilatation leads to pressure atrophy of the acini with rarefaction of secretory meibocytes.



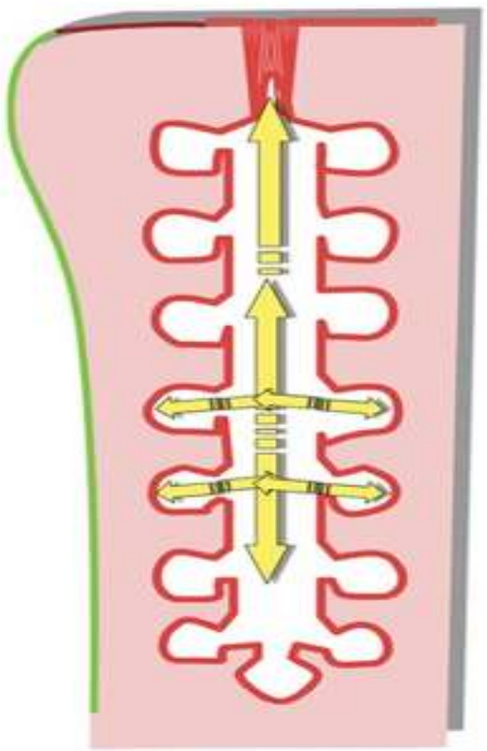
Interacting Pathways in the Pathogenesis of MGD

Core Mechanisms

Obstruction

- Additional keratinization of the glandular epithelium

The whole ductal epithelium can become cornified and the meibocytes replaced by a stratified squamous keratinized epithelium.



This effect causes shrinkage of the whole acini…..(gland dropout in meibography).

Interacting Pathways in the Pathogenesis of MGD

Core Mechanisms

Hyper keratinization

- One of the main Patho mechanisms of MGD.
- Lid margin epithelium changes to stratified squamous keratinized type.
- Increase at the posterior lid margin leads to orifice narrowing & subsequent occlusion.

Interacting Pathways in the Pathogenesis of MGD

Core Mechanisms

Increased Viscosity

- Stasis of meibum thus can, further aggravate the obstruction.
- Highly viscous meibum is mixed with hyperkeratotic cell material.
- Qualitative lipid changes: decrease in monounsaturated fatty acid, specifically oleic acid.

Interacting Pathways in the Pathogenesis of MGD

Added Mechanisms

Influence of Bacteria: Commensal Bacterial Growth

- It does not represent an infection, but rather an increased growth of preexisting commensal species *(staph aureus, coagulase negative Staphylococcus spp., lipophilic Corynebacterium spp., P. acnes)*

- This will degrade meibomian lipids by lipases and esterases, which lead to an altered lipid spectrum, meibomian foam formation.

Interacting Pathways in the Pathogenesis of MGD

Added Mechanisms

Inflammatory Mediators

- Activated epithelial cells then produce inflammatory cytokines such as
  - TNF
  - Interleukin
  - Promote a subclinical inflammatory microenvironment

Functional alterations in MGD

Tear Evaporation

- Studies provide evidence that tear evaporation rates correlate with meibum quality and quantity on the ocular surface.

- Evaporation seriously affects the homeostasis of the system, thereby becoming a critical trigger in the pathogenesis of the vicious cycle of DED.

Tear Evaporation

- Evaporative stress dysregulate para-inflammation adaptive response;

and leads to the subclinical inflammation that later on transform to frank inflammatory response.

- Tear evaporation is the starting component of pathogenic mechanisms behind OSD.

Tear Film Hyperosmolarity

- Tear hyperosmolarity occurs as a consequence of an increased rate of tear evaporation.

Normal osmolarity : 295 - 305 mosm/L

measured via the TearLab instrument, San Diego, CA

Tear Film Hyperosmolarity

Effects
Ocular surface insult:

- Decrease corneal epithelial glycogen levels & goblet cell density
- Induce ocular surface inflammation via production of inflammatory cytokines:
  - TNF-alpha, MMP9, IL-1β.
  - Recruitment of inflammatory cells

Tear Film Hyperosmolarity

Effects

Ocular surface insult:

- Unstable tear film.
- Stimulation of cold receptors

Reflections on patient's life

Ocular symptoms

- Patients with MGD do report dry eye symptoms and ocular pain
  - Foreign-body sensation, sore eyes.
  - Photophobia
  - Blurry vision
  - Problems with reading/driving/watching TV
  - Bulbar hyperemia

Reflections on patient's life

Ocular symptoms

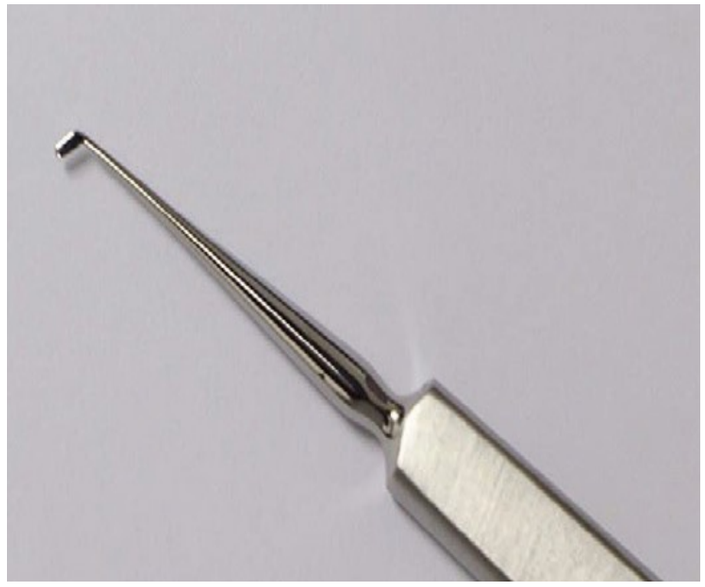
- No specific symptoms of dry eye & MGD
- Signs of MGD often do not correlate with symptoms
- Some patients with MGD are asymptomatic.
- Symptomatology usually doesn't correlate with the severity of MGD.

Back to our case

Management options employed

Management options employed

- **Lid margin vigorous scrapping** & exfoliation using golf club spud debrider.



- followed by gentle scraping by dry microsponge
  - Mechanically exfoliate the cells and debris & remove keratinized epithelium occluding the meibomian orifices.
  - Reduce the bacterial bioburden in the eyelid margin.

Management options employed

- **Topical azithromycin:**
  - Reduce the bacterial load
  - Immunomodulatory and anti-inflammatory properties
  - Anti lipase effect
- **Topical steroid:**
  - Manage acute flares of inflammation for 1 week.

Management options employed

- **Artificial tear eye drops:**
  - Hypo osmolar
  - low viscosity
- **Lid hygiene & lid margin & root of the lashes**
  - commercially available gels or swabs containing:
  - chamomile, tea tree oil, panthenol,..etc

Management options employed

- **Heat massage of the both eye lids:**
  - Ultrasonic vibrations

- **Manual gland expression (Purging):**
  - Forceful squeezing by applying force on the outer lid surface placing a rigid object on the inner lid surface such as a sterile cotton swab, or spatula.

Management options employed

- **Blephasteam lid worming device:**

  - Delivers moist heat
  - Constant temp at 42^{o}C for 15 minutes
  - Enough to melt meibum without harming the skin.
  - We did 3 sessions, 3 days a part.

Conclusion

- Meibomian glands are important contributors to the maintenance of a healthy ocular surface.

- Once gland disruption occurs (MGD), the quality and quantity of meibum is altered with a negative impact on the ocular surface.

Conclusion

- MGD is responsible for the most pathophysiological mechanisms of DED & Ocular Surface Disorders.
- It should be addressed in dealing with any symptom suggesting DED.
- Each pathologic mechanism should also be addressed in treatment planning.
- Dry Eye Treatment is not only artificial tears.

THANK YOU

EOS 2025

EGYPTIAN OPHTHALMOLOGICAL SOCIETY