



# Dry Eye Disease: A Comprehensive Overview

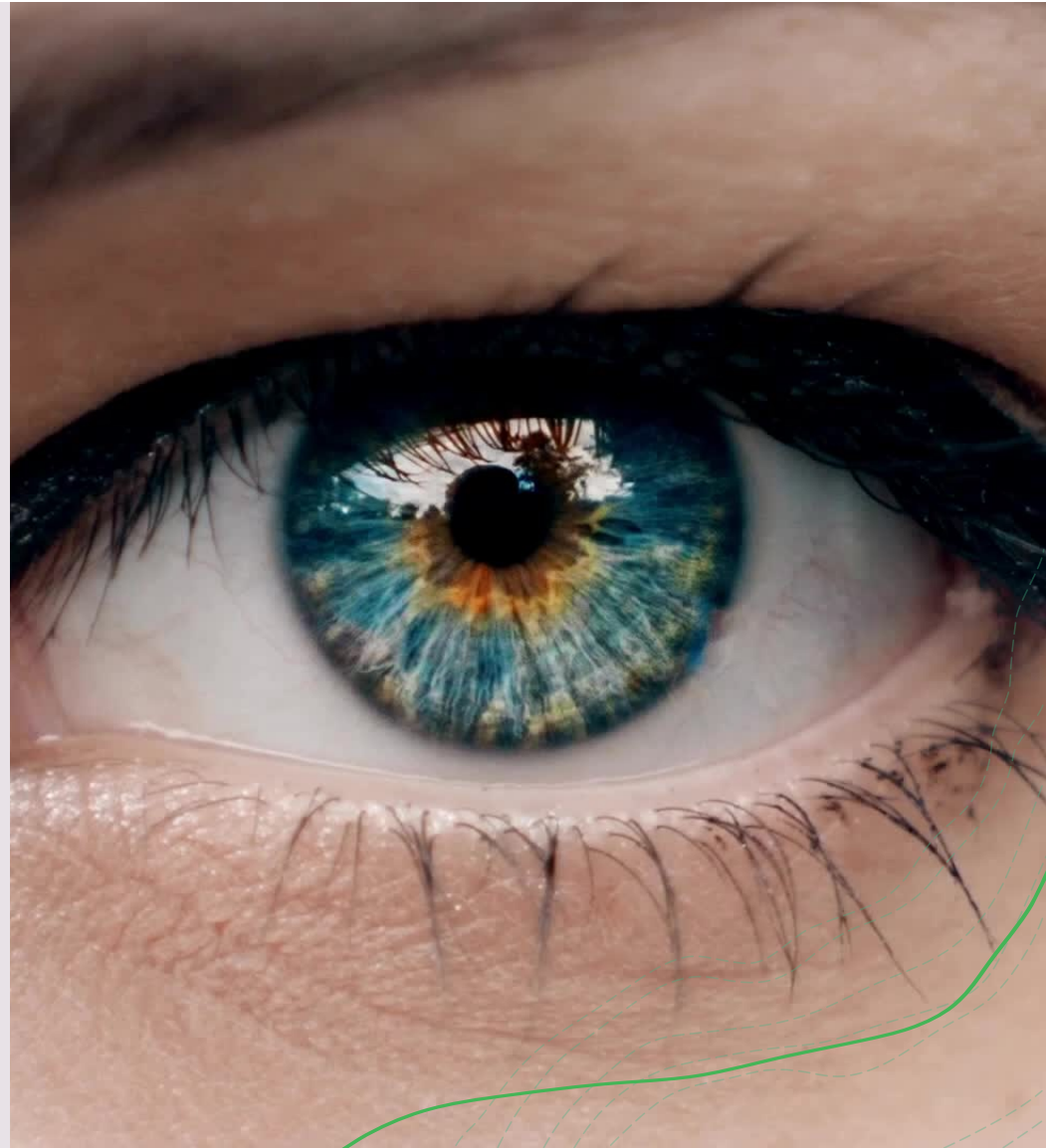
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# Introduction

- + Dry Eye Disease (DED) affects millions worldwide, with a prevalence ranging from 5% to 50%, varying by population and criteria used for diagnosis.
- + It's a chronic, multifactorial condition disrupting the tear film and causing ocular surface damage.
- + Understanding and managing DED is crucial as it significantly impacts patients' quality of life and visual function.





# Definition of Dry Eye Disease

- + According to the TFOS DEWS II report, DED is defined as "a multifactorial disease of the ocular surface characterized by a loss of homeostasis of the tear film, and accompanied by ocular symptoms, in which inflammation and damage of the ocular surface play central roles."



# Types of Dry Eye Disease

**Aqueous Deficient Dry Eye (ADDE):** Results from decreased tear production, commonly due to lacrimal gland dysfunction or autoimmune disorders like Sjögren's syndrome.

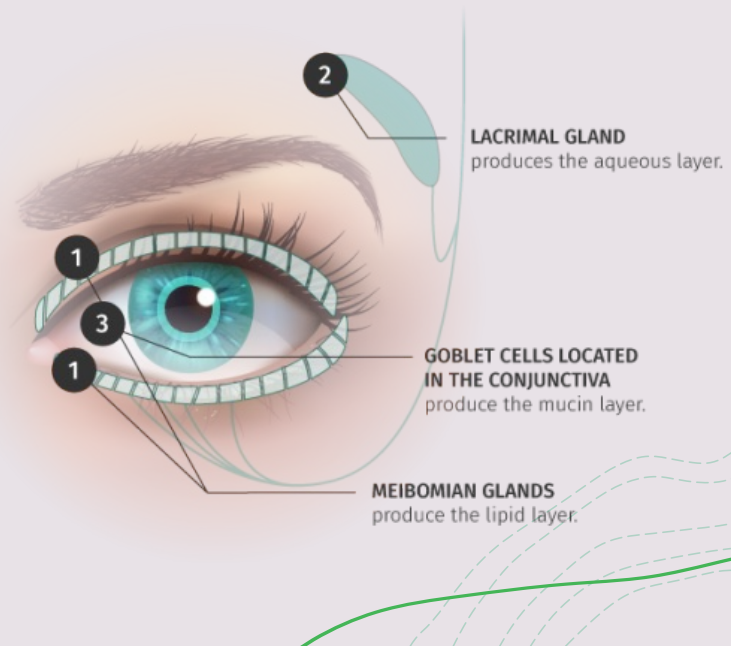
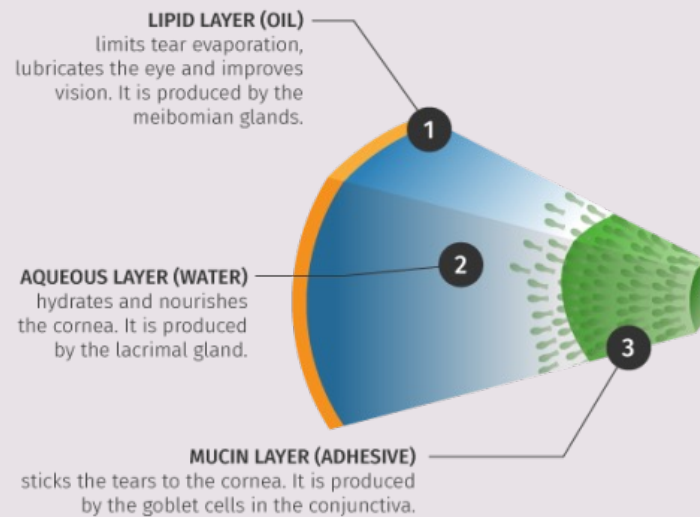
**Evaporative Dry Eye (EDE):** Involves increased tear evaporation rates, often associated with Meibomian gland dysfunction (MGD), lid abnormalities, environmental factors.

**Mixed Type:** Features elements of both ADDE and EDE, making diagnosis and treatment more complex.



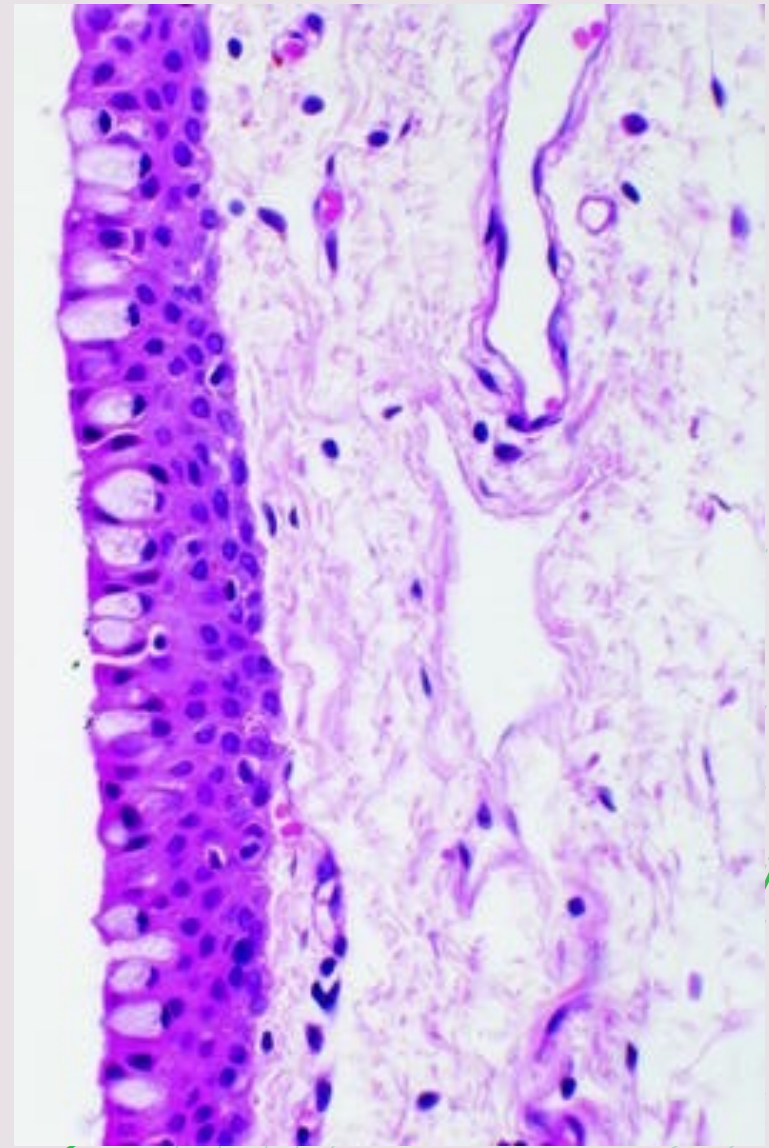
# Pathophysiology

- + The pathogenesis involves inflammation, tear hyperosmolarity, and unstable tear film.
- + Disrupted production or clearance leads to tear film instability, promoting open-eye contact with air and increased evaporation.
- + Inflammatory mediators further worsen tear film instability and ocular surface damage.

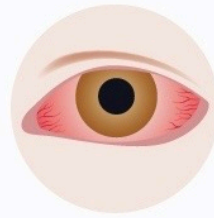


# Pathophysiology

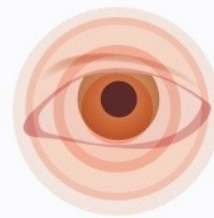
- + Inflammatory mediators play a significant role in the pathogenesis of Dry Eye Disease (DED).
  - + Cytokines such as interleukin-1 (IL-1), interleukin-6 (IL-6), and tumor necrosis factor-alpha (TNF- $\alpha$ ).
  - + Matrix metalloproteinases (MMPs), particularly MMP-9
  - + These mediators contribute to the disruption of the tear film and damage to the ocular surface, exacerbating the symptoms of dry eye



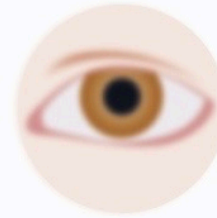
# Diagnosis: Symptoms



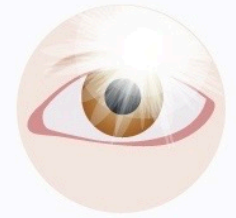
Redness



Stinging or  
Burning



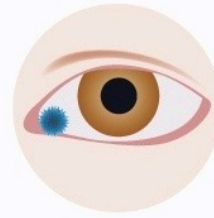
Blurred  
Vision



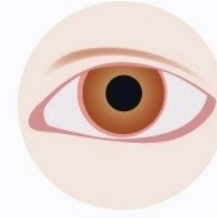
Sensitivity to  
Light



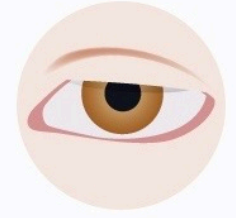
Excessive  
Tearing



Foreign Body  
Sensation



Itchiness



Eyelid  
Asymmetry



# Diagnosis: Dry Eye Syndrome Questionnaires

- + National Eye Institute Visual Function Questionnaire - 25
- + Ocular Surface Disease Index (OSDI)
- + Standard Patient Evaluation of Eye Dryness Questionnaire (SPEED)
- + Canadian Dry Eye Epidemiology Study (CANDEES)
- + Dry Eye Screening for Dry Eye Epidemiology Projects (DEEP)
- + Dry Eye Questionnaire (DEQ)
- + Contact Lens Dry Eye Questionnaire (CLDEQ)
- + Impact of Dry Eye in Everyday Life (IDEEL)
- + Ocular Comfort Index (OCI)



# Ocular Surface Disease Index

## Ocular Surface Disease Index® (OSDI®)<sup>2</sup>

Ask your patients the following 12 questions, and circle the number in the box that best represents each answer. Then, fill in boxes A, B, C, D, and E according to the instructions beside each.

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? ...	4	3	2	1	0
2. Eyes that feel gritty? .....	4	3	2	1	0
3. Painful or sore eyes? .....	4	3	2	1	0
4. Blurred vision? .....	4	3	2	1	0
5. Poor vision? .....	4	3	2	1	0

Subtotal score for answers 1 to 5 (A)

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? .....	4	3	2	1	0	N/A
7. Driving at night? .....	4	3	2	1	0	N/A
8. Working with a computer or bank machine (ATM)? .....	4	3	2	1	0	N/A
9. Watching TV? .....	4	3	2	1	0	N/A

Subtotal score for answers 6 to 9 (B)

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? .....	4	3	2	1	0	N/A
11. Places or areas with low humidity (very dry)? .....	4	3	2	1	0	N/A
12. Areas that are air conditioned? ...	4	3	2	1	0	N/A

Subtotal score for answers 10 to 12 (C)

Add subtotals A, B, and C to obtain D  
(D = sum of scores for all questions answered) (D)

Total number of questions answered  
(do not include questions answered N/A) (E)

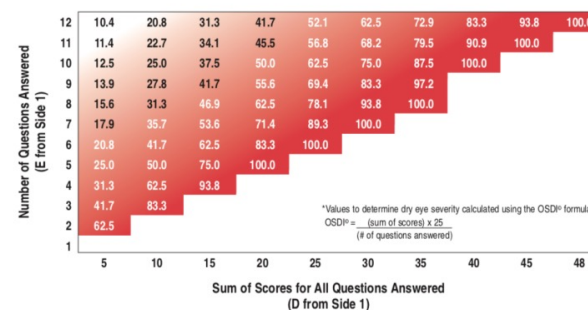
Please turn over the questionnaire to calculate the patient's final OSDI® score.

## Evaluating the OSDI® Score<sup>1</sup>

The OSDI® is assessed on a scale of 0 to 100, with higher scores representing greater disability. The index demonstrates sensitivity and specificity in distinguishing between normal subjects and patients with dry eye disease. The OSDI® is a valid and reliable instrument for measuring dry eye disease (normal, mild to moderate, and severe) and effect on vision-related function.

## Assessing Your Patient's Dry Eye Disease<sup>1, 2</sup>

Use your answers D and E from side 1 to compare the sum of scores for all questions answered (D) and the number of questions answered (E) with the chart below.\* Find where your patient's score would fall. Match the corresponding shade of red to the key below to determine whether your patient's score indicates normal, mild, moderate, or severe dry eye disease.



Normal Mild Moderate Severe

Patient's Name: \_\_\_\_\_ Date: \_\_\_\_\_

How long has the patient experienced dry eye disease? \_\_\_\_\_

Eye Care Professional's Comments: \_\_\_\_\_

1. Data on file, Allergan, Inc.
2. Schiffman RM, Christianson MD, Jacobsen G, Hirsch JD, Reis BL. Reliability and validity of the Ocular Surface Disease Index. *Arch Ophthalmol.* 2000;118:615-621

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# Diagnosis: Medical History & Medications

## + Medical History:

- + Autoimmune disorders
  - + Sjogren's Syndrome
  - + Rheumatoid Arthritis
  - + Lupus
  - + Thyroid Disease
  - + Multiple Sclerosis
  - + Inflammatory Bowel Disease
  - + Psoriasis
- + Contact Lens use
- + History of LASIK

## + Medications:

- + Antihistamines
- + Antidepressants
- + Birth control pills
- + Hormone replacement therapy
- + Diuretics
- + Acne medications
- + Pain medications
- + Eye drops



# Diagnosis: Environmental Factors



## **low humidity**

Dry climates  
Heated environments



## **wind exposure**



## **Smoke exposure**

Cigarette smoke  
Smoke from fires



## **Air Pollution**



## **Prolonged digital screen usage**

# Diagnostic Tests



## Tear Break-Up Time (TBUT):

Measures the stability of the tear film; a shorter TBUT indicates instability.



## Schirmer's Test:

Assesses tear production with filter paper strips placed under the lower eyelid.



## Osmolarity Measurement:

High tear osmolarity reflects osmotic stress instability.

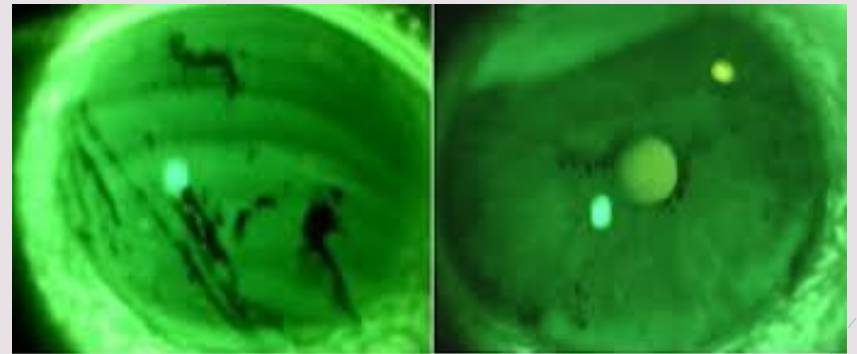


## Meibography:

Evaluates Meibomian gland structure using specialized imaging to detect gland dropout or dysfunction.

# TBUT

- + Performed by instilling a small amount of dye into the eye and then observing.
- + The patient is asked to blink normally
- + The time it takes for the tear film to break up is measured
- + Normal TBUT is 10 seconds or longer
- + Dry Eye is anything less than 10 seconds





# Schirmer's Test

- + Sterile filter paper strip placed in lower eyelid
  - + With or without anesthesia
  - + \*after lower eyelid is dried with cotton swab
- + Patient closes eyes or blinks normally
- + After 5 minutes, strip removed
- + Results:
  - + Normal: >15 mm
  - + Mild: 10-15 mm
  - + Moderate: 5-10 mm
  - + Severe: 0-5 mm



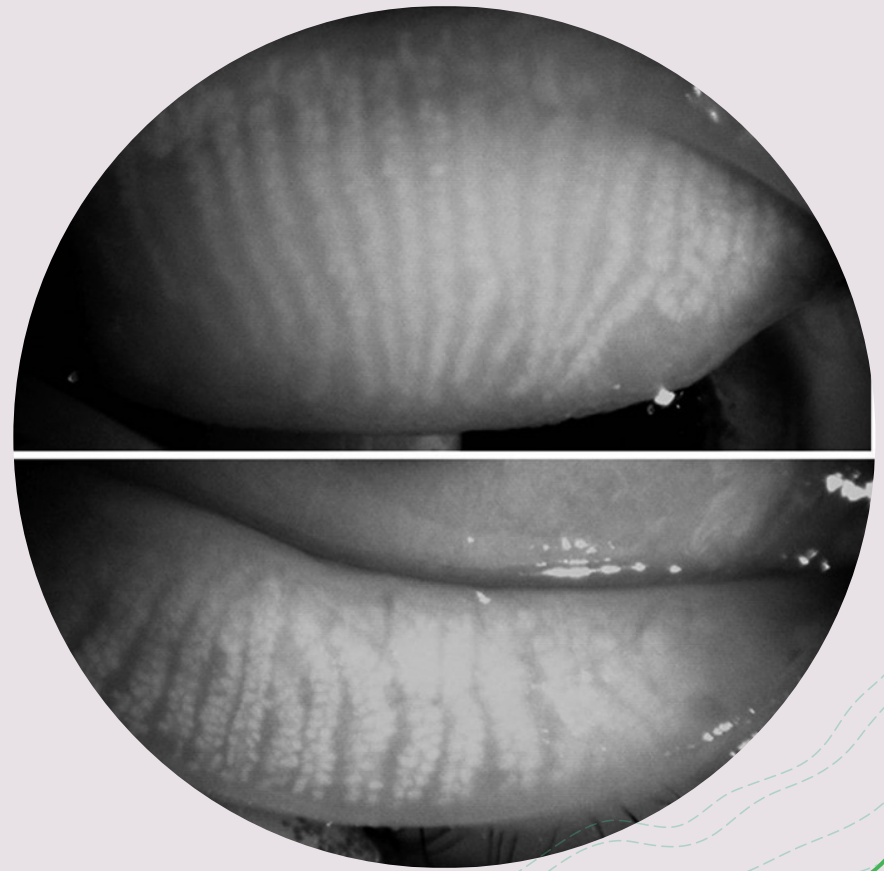
# Osmolarity Tests

- + Patient instructed not to use eye drops 2 hours before test
- + Contact lenses can be worn
- + Small collection device is placed on the edge of the lower eyelid
  - + Tiny amount of tears is absorbed
- + Device is then placed in an osmolarity analyzer to measure salt concentration in tears
- + Results:
  - + Dry Eye:
    - + 308 mOsm/L or greater
    - + Greater than 8 mOsm/L difference between eyes



# Meibography

- + Patient is asked to look up as the technician uses a special camera to take pictures of the eyelids
- + Pictures are then processed by a computer to create an image of the meibomian glands





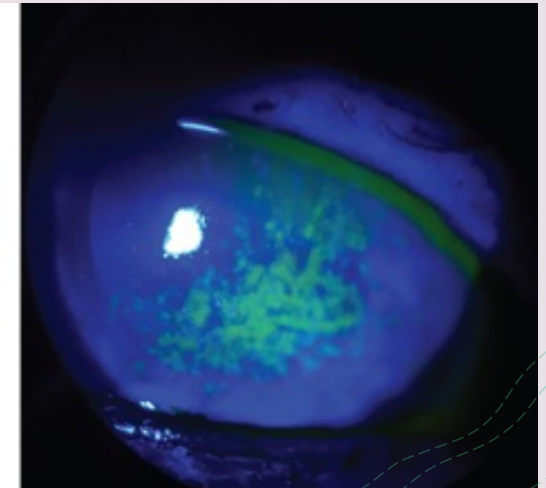
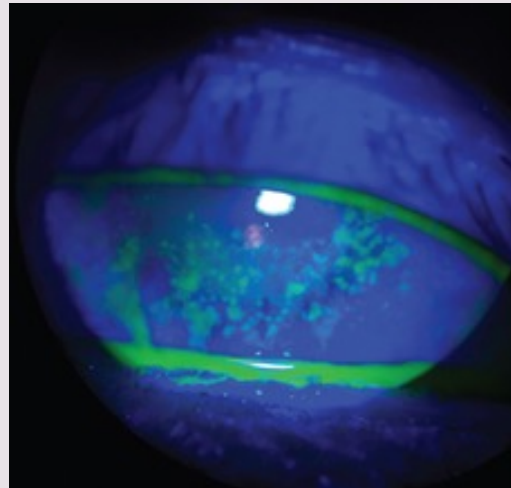
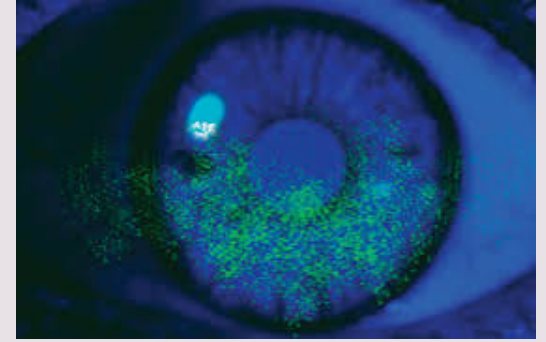
# Diagnosis: Slit Lamp Examination

- + Staining of conj or cornea with fluorescein
- + Reduced tear meniscus
- + Rapid TBUT
- + Conjunctival hyperemia
- + Meibomian gland abnormalities
- + Lid malpositioning
- + Decreased blink rate



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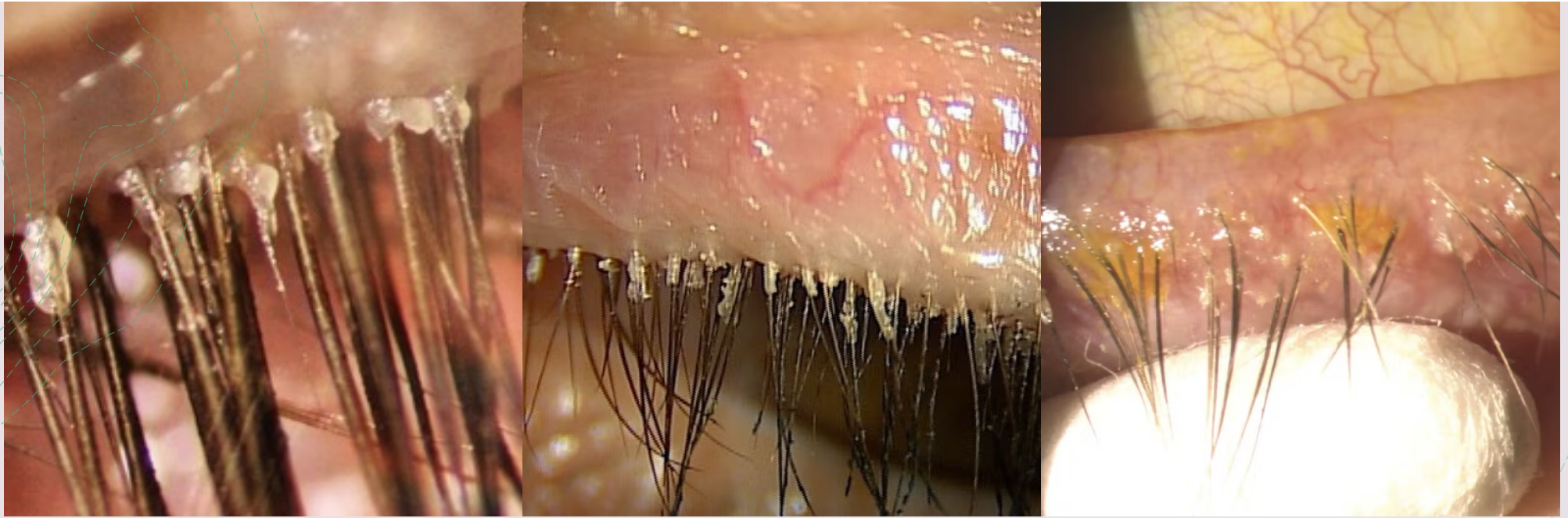
# Diagnosis: Slit Lamp Examination



# Diagnosis: Slit Lamp Examination







**Diagnosis:  
Slit Lamp  
Examination**



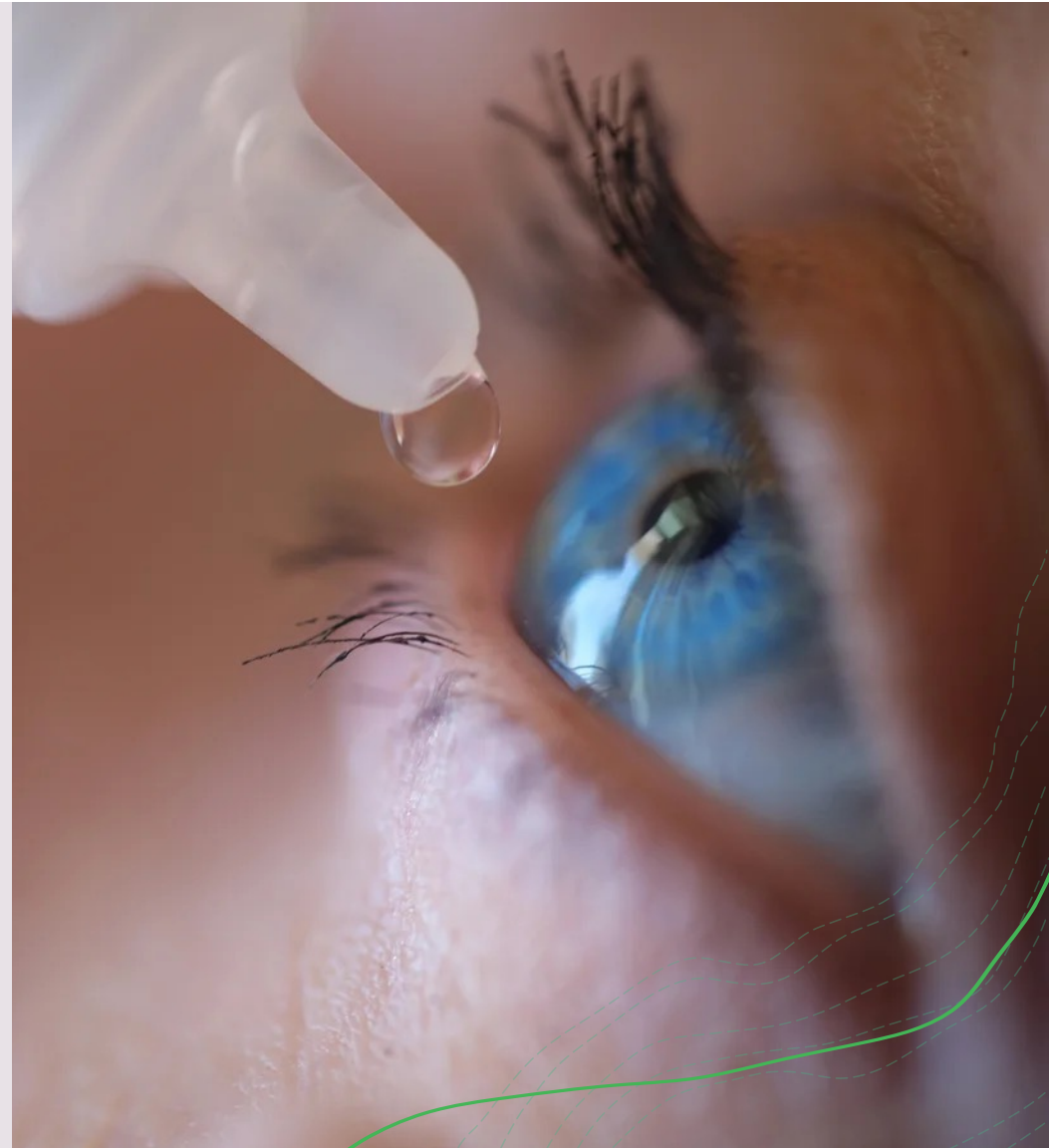
# Treatment Overview


- + Treatment goals are aimed at mechanical protection and supporting the health of the ocular surface, reducing inflammation, and encouraging patient adherence.
- + Tailoring treatment plans to individuals based on their specific etiologies of DED is critical for effective management.



# Pharmacological Treatments

- + Tear Substitutes:
  - + Topical artificial tears lubricate and protect the ocular surface.
- + Anti-inflammatory Medications:
  - + Include cyclosporin A and lifitegrast, both of which reduce inflammation on the ocular surface and improve symptoms.
- + Steroids:
  - + Used for short-term management of severe inflammation.
- + Autologous Serum Tears / Albumin Tears:
  - + Offer biologically active tear components for moderate-to-severe DED not fully responsive to standard therapies.





# Newer Pharmacological Treatments:

- + Varenicline (Tyrvaya) nasal spray for addressing tear production deficiencies.
- + Perfluorohexyloctane solution (MIEBO) forms a thin, protective layer on surface of eye to prevent tear evaporation
- + Lotilaner (XDEMZY) used for killing demodex mite irritating and clogging meibomian
- + Oral omega-3 fatty acid supplementation as an adjunct therapy offers potential benefits, though evidence is mixed.



*Demodex  
folliculorum*

XDEM VY





# Perfluorohexyloctane

- + Considered a “forever chemical” because it belongs to the group of chemicals known as PFAS
  - + Highly persistent in the environment and do not easily break down
- + Health effects
  - + Animal Studies have shown potential for reproductive toxicity
  - + In rabbits: **oral** administration at **high** doses led to maternal toxicity, miscarriages, etc
- + Globally regulated pollutant
- + Well absorbed but not metabolized
- + Passes through the placental barrier and can be partially detected in the fetus

# Other Treatments

- + Punctal Plugs:

- + Block tear drainage to increase tear volume

- + Warm Compresses & Lid Scrubs

- + Intense Pulsed Light (IPL) Therapy:

- + Targets periocular inflammation and improves Meibomian gland function.

- + MGD Therapies:

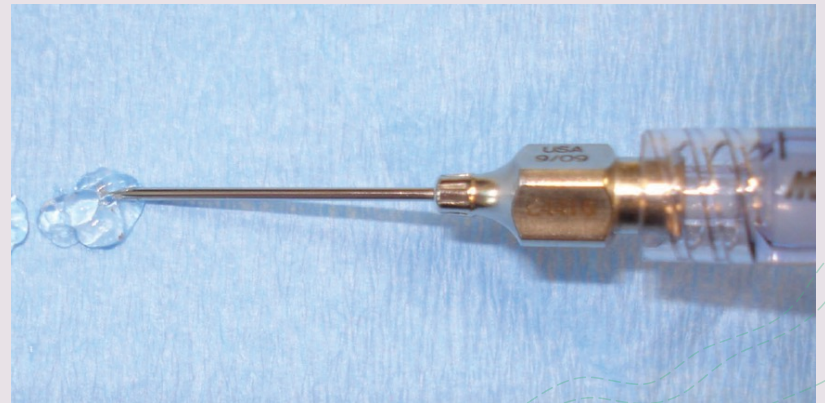
- + Devices like LipiFlow deliver controlled heat and pressure to improve gland function and secretion.



# Other Treatments

- + Lacrifill

- + Cross-linked hyaluronic acid derivative
- + Fills the lacrimal canaliculi, blocking draining of tears
- + Effective for 6 months



# MGD Therapies

- + Mechanical Blepharoexfoliation (BlephEx)
  - + Rapidly reduces infectious loads
  - + Reduces bacterial and biofilm resistance
  - + Reduces risk of postop infections

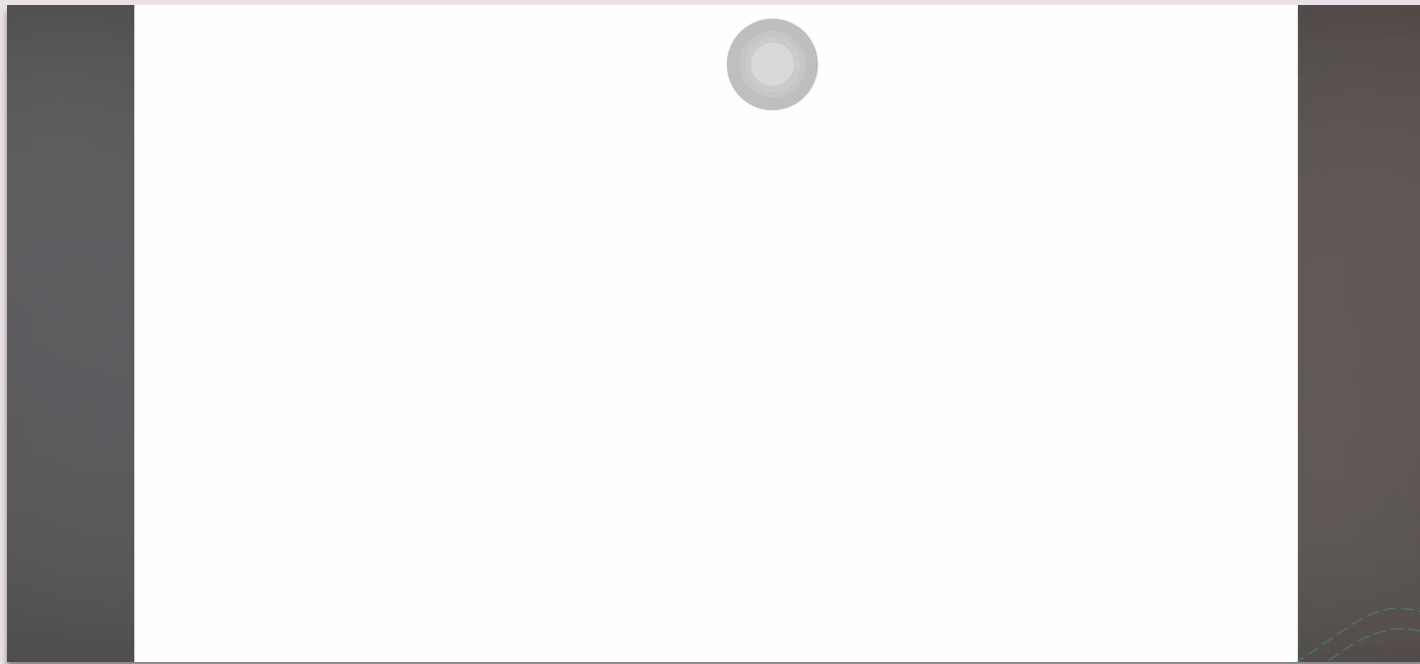


# MGD Therapies:

## +Lipiflow

- + 12 min automated procedure for heating, massaging, and expressing meibomian glands
- + Thermal pulsation applies constant heat and sequence of pressure pulsations
  - + Evacuate the glands of static oils, improving glandular flow.
  - + Avoids skin irritation and vascular inflammation (warm compresses) by avoiding going through the anterior skin of eyelid

# Lipiflow



# MGD Therapies:

In-office thermal pulsation treatments

+ iLux

- + Handheld device
- + Lightbased heat and compression under direct visualization by the physician via magnifying lens





# MGD Therapies

In-office thermal pulsation treatments

- + TearCare
  - + Wearable eyelid device
  - + Provides targeted and adjustable thermal energy to meibomian glands
  - + Followed by manual expression



# Challenges and Considerations in DED Management

- + Emphasize compliance challenges due to chronic nature and treatment complexity.
- + Considerations on access to innovative treatments and demographic-specific variations in presentations and outcomes.
- + Encouragement of regular follow-ups and comprehensive patient education for effective management.





# Conclusion

- + Dry Eye Disease (DED) affects millions worldwide
- + It's a chronic, multifactorial condition disrupting the tear film and causing ocular surface damage.
- + Understanding and managing DED is crucial as it significantly impacts patients' quality of life and visual function.



# Thank You

