THE NEW DRY EYE PLAYBOOK: APPLYING DEWS III IN CLINICAL PRACTICE

Kyle Sandberg, OD, FAAO, Dipl ABO
Associate Professor - UIWRSO
Asst. Dean for Professional Advancement
Chief, Refractive Surgery and Laser Services

Disclosures:

Dr. Sandberg

- AbbVie
- Tarsus
- World College of Refractive Surgery and Visual Sciences

Learning Objectives

- Review the history of dry eye diagnosis, treatment and how Evidence Based Medicine impacts today's approaches to dry eye management.
- Explain dry eye disease pathophysiology using current consensus definitions and classifications.
- Differentiate evaporative, aqueous-deficient, and mixed-mechanism dry eye using objective findings.
- Interpret results from modern dry eye diagnostic technologies to guide management decisions.
- Evaluate evidence supporting current pharmacologic and device-based dry eye therapies.
- Summarize clinically relevant updates from the DEWS III consensus report.
- Design individualized, stepwise dry eye management plans appropriate for optometric practice.
- Examine what the future of dry eye treatment and management holds

"Our eyes have been dry longer than we've had the words to complain about it"

-Kyle Sandberg, OD

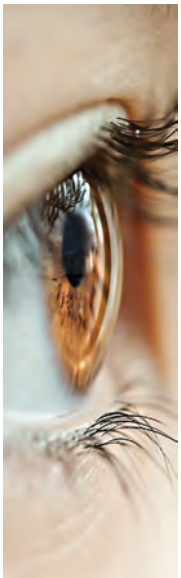


TEAR FILM AND OCULAR SURFACE SOCIETY (TFOS) DRY EYE WORKSHOP (DEWS) III MANAGEMENT AND THERAPY REPORT

3rd iteration of a comprehensive literature review that details the diagnosis, treatment, and management of dry eye disease based on over 1056 studies of peer-reviewed evidence. 600+ pages
"80 experts from 19 countries, who engaged in a transparent, evidence-based process to achieve global consensus on multiple aspects of DED."[1]
DEWS – 2007
DEWS II – 2017
...8,000+ peer reviewed articles published on DED
DEWS III – 2025

tfos DEWS III

[1]Perez, Victor L., et al. "TFOS DEWS III: Executive Summary." *American Journal of Ophthalmology*, 2026, https://doi.org/10.1016/j.ajo.2025.09.035. PubMed, https://pubmed.ncbi.nlm.nih.gov/41005521/.



DRY EYE DISEASE DEFINED

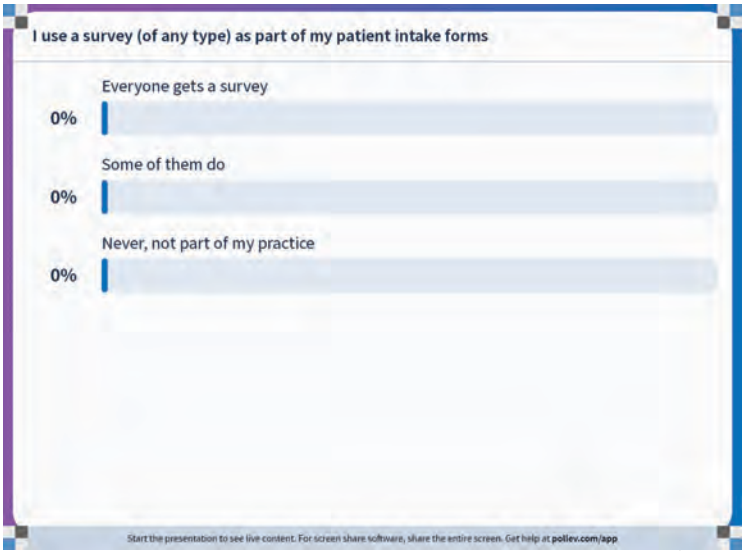
Dry eye is a multifactorial disease of the ocular surface characterized by a loss of homeostasis of the tear film, and accompanied by ocular symptoms, in which tear film instability and hyperosmolarity, ocular surface inflammation and damage, and neurosensory abnormalities play etiological roles.

- DEWS II

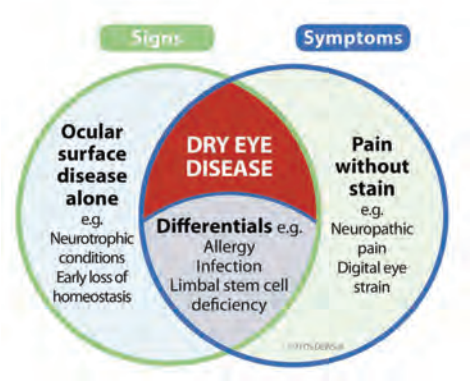
Dry eye is a multifactorial, symptomatic disease characterized by a loss of homeostasis of the tear film and/or ocular surface, in which tear film instability and hyperosmolarity, ocular surface inflammation and damage, and neurosensory abnormalities are etiological factors.

-DEWS III

EVALUATION AND DIAGNOSIS



The diagnosis of modern DED requires BOTH Signs and Symptoms



DEWS III - CASE HISTORY 6 QUESTIONS TO ASK

1. Do you feel eye pain rather than discomfort?
   - DED commonly presents with symptoms of discomfort, light sensitivity, or blurred vision, rather than pain, especially in mild-to-moderate dry eye. If pain is present, investigate for signs of trauma/erosion/infection/ulceration/acute glaucoma, and consider administering a pain questionnaire

2. Do you have any facial flushing/redness, mouth dryness, or enlarged salivary glands?
   - Trigger for rosacea, sarcoidosis, or Sjogren's disease investigation.

3. When did your symptoms start, and can you recall any triggering event?
   - DED is a chronic condition. If there is increased dryness when waking up or dryness symptoms at night, consider incomplete lid closure, for example.
   - If the onset was sudden or linked with an event, examine the eyes for trauma/infection/ulceration.
   - If the symptoms are linked with contact lens use, refer to the patient's contact lens practitioner to consider alternative approaches that might improve symptoms (such as changing lens material, fit, or modality)

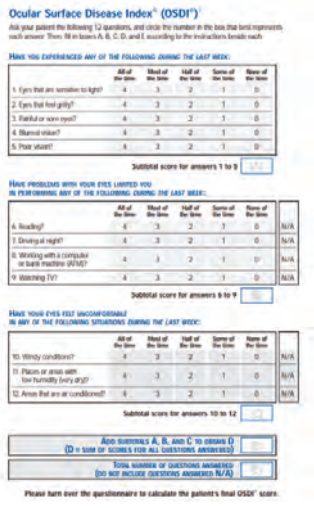
DEWS III - CASE HISTORY 6 QUESTIONS TO ASK

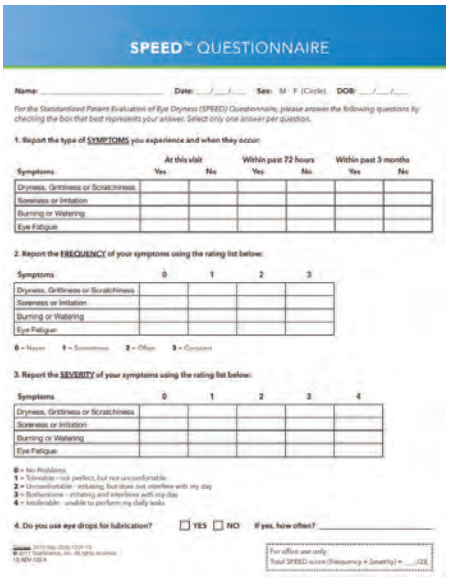
4. Is your vision affected, and if so, does it improve on blinking?
   - A reduction in vision that does not improve with blinking, especially with sudden onset, requires an urgent complete ophthalmic examination to rule out conditions such as vascular occlusions.

5. Are the symptoms or any redness much worse in one eye than the other?
   - DED is commonly bilateral. If signs and/or symptoms are significantly greater in one eye, investigate for signs of trauma/infection/ulceration.

6. Do the eyes itch, are they swollen or crusty, or is there any discharge?
   - Ocular itching is more likely associated with allergies/history of atopy, while a mucopurulent discharge is associated with ocular infection. Reported itching, specifically along the lash line, warrants assessment for demodex-related anterior blepharitis

SYMPTOM SURVEYS





SPEED™ QUESTIONNAIRE

Name: _____ Date: __/__/____ Sex: M F (Circle) DOB: __/__/____

For the Standardized Patient Evaluation of Eye Dryness (SPEED) Questionnaire, please answer the following questions by checking the box that best represents your answer. Select only one answer per question.

1. Report the type of SYMPTOMS you experience and when they occur:

Symptoms	At this visit Yes	At this visit No	Within past 72 hours Yes	Within past 72 hours No	Within past 3 months Yes	Within past 3 months No
Dryness, Grittiness or Scratchiness						
Soreness or Irritation						
Burning or Watering						
Eye Fatigue						

2. Report the FREQUENCY of your symptoms using the rating list below:

Symptoms	0	1	2	3
Dryness, Grittiness or Scratchiness				
Soreness or Irritation				
Burning or Watering				
Eye Fatigue				

0 = Never 1 = Sometimes 2 = Often 3 = Constant

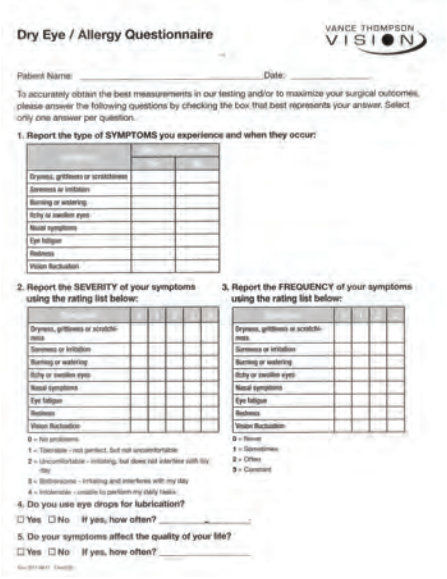
3. Report the SEVERITY of your symptoms using the rating list below:

Symptoms	0	1	2	3	4
Dryness, Grittiness or Scratchiness					
Soreness or Irritation					
Burning or Watering					
Eye Fatigue					

0 = No Problems
1 = Tolerable - not perfect, but not uncomfortable
2 = Uncomfortable - irritating, but does not interfere with my day
3 = Bothersome - irritating and interferes with my day
4 = Intolerable - unable to perform my daily tasks

4. Do you use eye drops for lubrication? ☐ YES ☐ NO If yes, how often? _____

For office use only:
Total SPEED score (frequency + severity) = ____/28



Dry Eye / Allergy Questionnaire

VANCE THOMPSON VISION

Patient Name: _____ Date: _____

To accurately obtain the best measurements in our testing and/or to maximize your surgical outcomes, please answer the following questions by checking the box that best represents your answer. Select only one answer per question.

1. Report the type of SYMPTOMS you experience and when they occur:

Dryness, grittiness or scratchiness		
Soreness or irritation		
Burning or watering		
Itchy or swollen eyes		
Nasal symptoms		
Eye fatigue		
Redness		
Vision fluctuation		

2. Report the SEVERITY of your symptoms using the rating list below:

Dryness, grittiness or scratchiness					
Soreness or irritation					
Burning or watering					
Itchy or swollen eyes					
Nasal symptoms					
Eye fatigue					
Redness					
Vision fluctuation					

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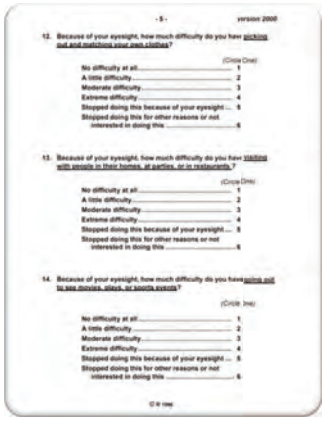
0 = Never
1 = Sometimes
2 = Often
3 = Constant

4. Do you use eye drops for lubrication?
☐ Yes ☐ No If yes, how often? _____

5. Do your symptoms affect the quality of your life?
☐ Yes ☐ No If yes, how often? _____

NEI-VFQ25 (**National Eye Institute Visual FUnction Questionnaire-25)**

- 25 question survey shortened from the 51 item version
- Less accessible than the OSDI and SPEED, but can be purchased



- 5 - version 2000

12. Because of your eyesight, how much difficulty do you have picking out and matching your own clothes?

(Circle One)
No difficulty at all 1
A little difficulty 2
Moderate difficulty 3
Extreme difficulty 4
Stopped doing this because of your eyesight 5
Stopped doing this for other reasons or not interested in doing this 6

13. Because of your eyesight, how much difficulty do you have visiting with people in their homes, at parties, or in restaurants?

(Circle One)
No difficulty at all 1
A little difficulty 2
Moderate difficulty 3
Extreme difficulty 4
Stopped doing this because of your eyesight 5
Stopped doing this for other reasons or not interested in doing this 6

14. Because of your eyesight, how much difficulty do you have going out to see movies, plays, or sports events?

(Circle One)
No difficulty at all 1
A little difficulty 2
Moderate difficulty 3
Extreme difficulty 4
Stopped doing this because of your eyesight 5
Stopped doing this for other reasons or not interested in doing this 6

© RAND 1996

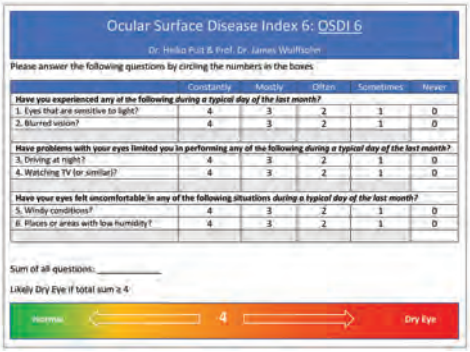
SYMPTOM SURVEYS

Others cost $$$

- **McCarty Symptom Questionnaire**
  - $29.90
- **McMonnies Questionnaire**
  - $374.73
- **Women's Health Study Questionnaire**
  - $600

SO... WHAT SHOULD I USE?

It's SIMPLE!!!
OSDI-6



Ocular Surface Disease Index 6: OSDI 6

Dr. Heiko Pult & Prof. Dr. James Wolffsohn

Please answer the following questions by circling the numbers in the boxes

	Constantly	Mostly	Often	Sometimes	Never
Have you experienced any of the following during a typical day of the last month?					
1. Eyes that are sensitive to light?	4	3	2	1	0
2. Blurred vision?	4	3	2	1	0
Have problems with your eyes limited you in performing any of the following during a typical day of the last month?					
3. Driving at night?	4	3	2	1	0
4. Watching TV (or similar)?	4	3	2	1	0
Have your eyes felt uncomfortable in any of the following situations during a typical day of the last month?					
5. Windy conditions?	4	3	2	1	0
6. Places or areas with low humidity?	4	3	2	1	0

Sum of all questions: _____

Likely Dry Eye if total sum ≥ 4

Normal ← 4 → Dry Eye

THAT WAS EASY! WHAT'S NEXT?

Establish loss of Homeostasis

This means that <u>one</u> of the following 3 signs should be present

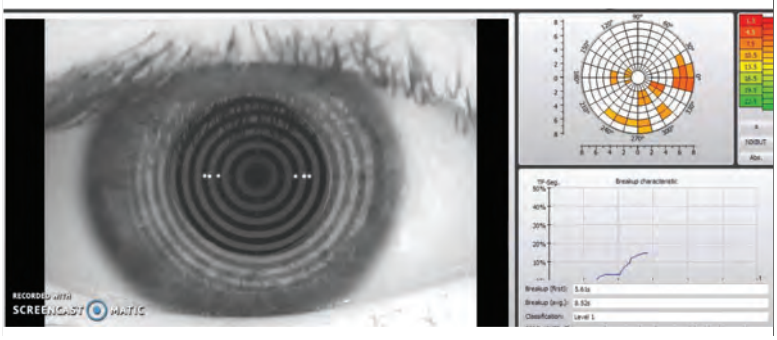
1. Reduced non invasive tear break up time
2. Increased osmolarity
3. Ocular surface or lid margin staining

NON-INVASIVE TEAR BREAK UP TIME

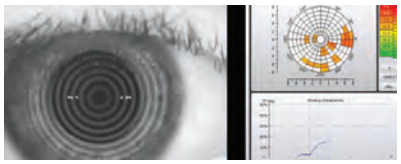
Oculus Keratograph 5M

- **Non-Invasive tear Break Up**
- Conjunctival Redness
- Meibography
- External Photography

- Topography
- Lipid layer assessment
- Tear meniscus



NITBUT



<10 seconds for non-invasive TBUT

If you don't have a device "...fluorescein can be applied, but the volume instilled should be minimized and a cut-off of <5 seconds applied as a positive sign of instability"

Wolffsohn, James S., et al. "TFOS DEWS III Diagnostic Methodology." *American Journal of Ophthalmology*, 2025, pp. 399–401, https://doi.org/10.1016/j.ajo.2025.05.033



≥ 308mOsm/L



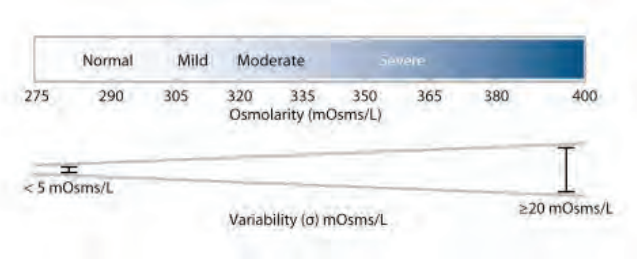
Osmolarity

- >308 mOsm/L or difference of 8 mOsm or more btwn eyes = Abnormal
- 308 – 320 mOsm/L = Mild
- 320 – 340 mOsm/L = Moderate
- >340 mOsm/L = Severe

Measurements should be repeated often

Inconsistency is an indicator of disease





SOURCE: https://www.tearlab.com/pdfs/TearLab%20Clinical%20Utility%20Guide.pdf



STAINING OF THE OCULAR SURFACE OR LID MARGIN

assess ocular surface staining

- cornea >5 punctate spots

and/or

- conjunctiva >9 punctate spots

and/or

- lid margin ≥2mm length and ≥25% width

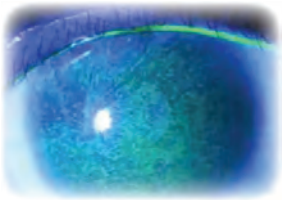


Image: https://www.sightspecialists.com.au/dry-eye-disease/

Wolffsohn, James S., et al. "TFOS DEWS III Diagnostic Methodology." *American Journal of Ophthalmology*, 2025, pp. 399–401, https://doi.org/10.1016/j.ajo.2025.05.033

SUMMARY

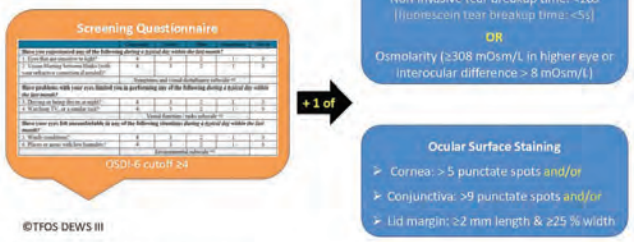
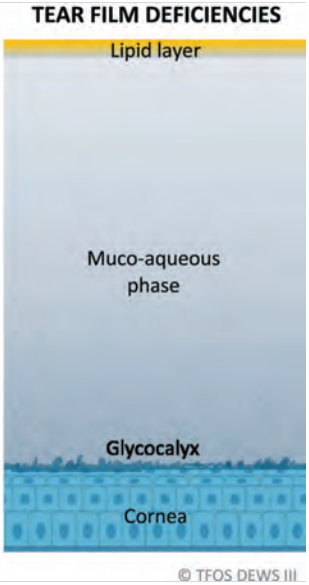


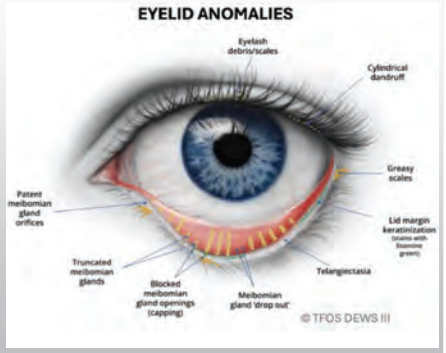
FIGURE 5. TFOS DEWS III diagnostic algorithm.

ASSESSING AND SUBTYPING

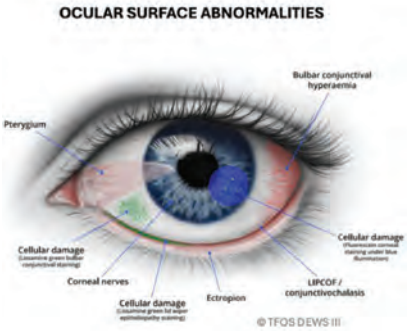
TEAR FILM DEFICIENCIES



EYE LID ANOMALIES



OCULAR SURFACE ABNORMALITIES



TOOLS IN ASSESSMENT OF TEAR FILM DEFICIENCIES

ETIOLOGIC DRIVER TESTS
Lipid
Tear film lipid layer thickness / interferometry
Meibomian gland expressibility
Meibum quality
Aqueous
Tear meniscus height
Meniscometry / Schirmer* / phenol red thread test*
Mucin / glycocalyx
Lissamine green / rose bengal staining
Conjunctival impression cytology

*invasive test

[VERSE]



[CHORUS]

[OUTRO]

TABLE 6. Subclassification of Dry Eye Disease Etiological Drivers: Recommended Tests and Cut-Offs (where available)

		Standard Testing		Advanced Testing
Tear Film Deficiencies	Lipid	Interferometry: grade ≤3 (non-amorphous or colored pattern) or <72 nm on LipiView[80,81,345] Meibum expressibility/quality: meibum not clear or limited expressibility[86,277,278]		
	Aqueous	Meniscometry: tear meniscus height ≤0.20 mm[34,126,280]		Strip meniscometry: ≤2.5mm wetting length[346,348] Tear proteins and other chemical components testing Immunohistochemistry and immunoelectron microscopy of tear fluid Impression cytology: goblet cell density and epithelial cell morphology
	Mucin/glycocalyx	Rose bengal or lissamine green staining: >9 punctate spots[281]		
Eyelid Anomalies	Blink/lid closure	Partial blinking observation: >40% occurrence[49]		
		Lagophthalmos/inadequate lid seal: observed		
	Lid margin	Anterior blepharitis observation		
		MGD	Meibography: gland length <75%[278,279,349]	
			Gland plugging: observed[73]	
			Telangiectasia: observed[279]	
			Gland expressibility	
		Keratinization	Slitlamp biomicroscopy	
		Ocular rosacea	Slitlamp biomicroscopy	
Ocular Surface Abnormalities	Anatomical misalignment	Slit-lamp biomicroscopy		Corneal topography
	Neural dysfunction	Sensation to puff or physical contact: corneal and lid margin sensitivity thresholds ≥0.8 mbar,[350] although instruments are not interchangeable[351]		*In vivo* confocal microscopy: normative values available for nerve length, branch, and density metrics[347]
	Ocular surface cellular damage/disruption	Corneal fluorescein staining: >5 punctate spots[281,351]		
		Conjunctival lissamine green staining: >9 punctate spots[350,351]		
		Lid wiper staining: ≥2 mm length and 25% width[352]		
	Primary inflammation/ oxidative stress	Bulbar conjunctival hyperemia: >1.5 Efron scale or >0.95 objective JENVIS[339]		*In vivo* confocal microscopy Tear fluid and ocular surface cell molecular testing
Systemic Drivers	Check for systemic conditions			

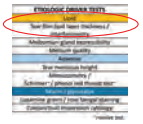


INTERFEROMETRY

A non-invasive way to estimate tear film lipid layer thickness



Rolando, Maurizio, Cristiana Valente, and Stefano Barabino. "New Test to Quantify Lipid Layer Behavior in Healthy Subjects and Patients with Keratoconjunctivitis Sicca." *Cornea*, vol. 27, no. 8, 2008, pp. 866–870. *Wolters Kluwer*, https://doi.org/10.1097/ICO.0b013e31816f630e



INTERFEROMETRY

A non-invasive way to estimate tear film lipid layer thickness



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INTERFEROMETRY

Stability in the pattern also indicates healthy tear film.
in patients with DED, the number of blinks required to change the lipid pattern by one grade (2.4 ± 3.1 blinks) was statistically lower than in healthy subjects (18.1 ± 5.9 blinks).

Rolando, Maurizio, Cristiana Valente, and Stefano Barabino. "New Test to Quantify Lipid Layer Behavior in Healthy Subjects and Patients with Keratoconjunctivitis Sicca." *Cornea*, vol. 27, no. 8, 2008, pp. 866–870. *Wolters Kluwer*, https://doi.org/10.1097/ICO.0b013e31816f630e



ASSESSING MEIBOMIAN GLANDS

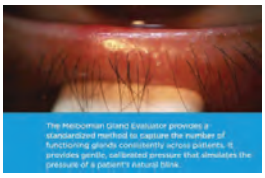
Look at what is produced...
Meibum quality is typically graded as

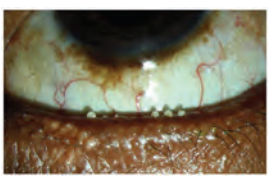
- 0 (clear fluid),
- 1 (cloudy fluid),
- 2 (cloudy particulate),
- 3 (toothpaste–like)

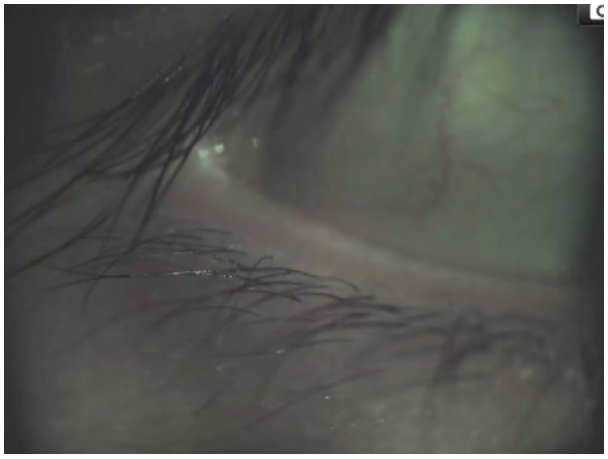


The expressibility of meibum from the meibomian glands of the upper and lower eyelids is graded after 10 to 15 seconds of applying pressure as:

- 0 (all glands expressible),
- 1 (3 or 4 glands expressible)
- 2 (1 or 2 glands expressible)
- 3 (no glands expressible)



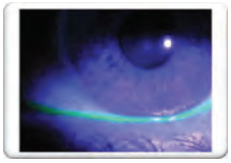


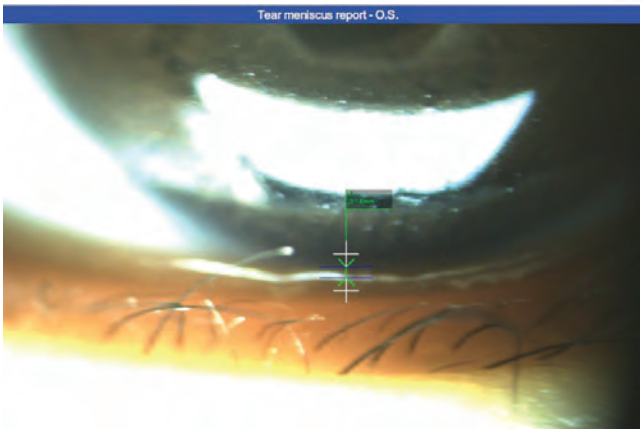


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TEAR FILM DEFICIENCIES ASSESSING AND SUBTYPING

Tear meniscus- lacrimal lake size & contents. Stringy mucus may indicate an abnormal tear film.
Meniscometry showing **0.20mm or lower** indicates ADDE
Importantly:
Should be measured directly below the pupil midline (+/- 1mm)
Should be assessed between 1 and 2.5 seconds after the second non-forced blink
Should be measured with infrared or white light but not both
- Stick with the same system





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ASSESSING AND SUBTYPING Classics that may be less repeatable

Schirmer 1(w/o A)- measures tear secretion but includes reflex tearing. Normal ~15mm. Hypersecretion is considered when the filter paper is rapidly inundated w/tears. False (+) may occur from the irritant. Serial testing to confirm.

Schirmer 2 (w/a)- eval.- Supposedly measures basal secretion, but there may be a reflex component.



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ASSESSING AND SUBTYPING Classics that may be less repeatable

PHENOL RED THREAD



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SM TUBE

Inserted into lower tear meniscus and absorbs tears by capillary action
Blue dye 1 reacts with tears and volume is measured on the scale
Each strip is 2 sided to measure OD, OS
5 seconds!
5mm or more is normal



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ASSESSING AND SUBTYPING



Tear Break Up Time

Non-invasive is preferred (<10 sec is diagnostic of EDE)

<5 seconds is diagnostic with NaFl

A 2019 study by Yokoi et al., suggested that a breakup pattern might help in subtyping, but there has not been sufficient literature to support these claims

Yokoi, Norihiko, and Georgi A. Georgiev. "Tear-Film-Oriented Diagnosis for Dry Eye." *Japanese Journal of Ophthalmology*, vol. 63, no. 2, 2019, pp. 127–136. https://doi.org/10.1007/s10384-018-00645-4.

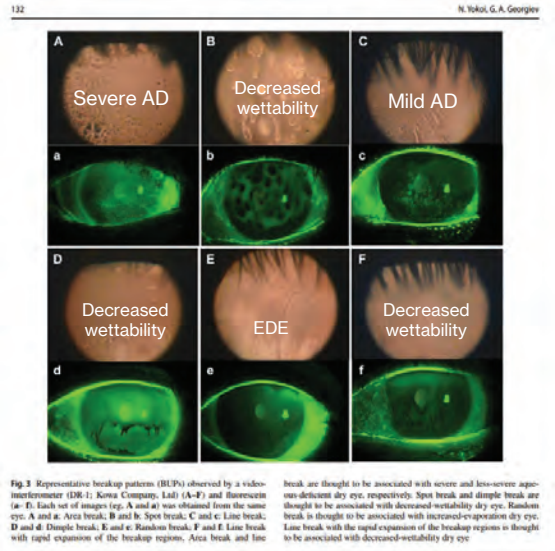


Fig. 3 Representative breakup patterns (BUPs) observed by a video-interferometer (DR-1; Kowa Company, Ltd) (A–F) and fluorescein (a–f). Each set of images (eg, A and a) was obtained from the same eye. A and a: Area break; B and b: Spot break; C and c: Line break; D and d: Dimple break; E and e: Random break; F and f: Line break with rapid expansion of the breakup regions. Area break and line break are thought to be associated with severe and less-severe aqueous-deficient dry eye, respectively. Spot break and dimple break are thought to be associated with decreased-wettability dry eye. Random break is thought to be associated with increased-evaporation dry eye. Line break with the rapid expansion of the breakup regions is thought to be associated with decreased-wettability dry eye



ASSESSING AND SUBTYPING

Lissamine green staining

DEWS 3 recommends:

- conjunctiva >9 punctate spots indicates dysfunction of the mucin/glycocalyx



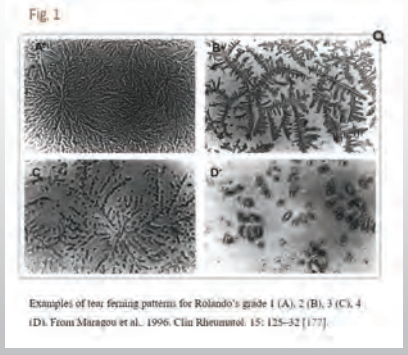
Photo: Michelle Hessen, OD

Uchiyama, E, Aronowicz JD, Butovich IA, McCulley JP. Pattern of vital staining and its correlation with aqueous tear deficiency an meibomian gland dropout. Eye Contact Lens 2007; 33:177-179

OTHER TEAR ASSESSMENT TECHNIQUES

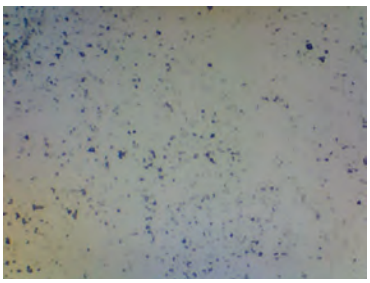
Tear Ferning

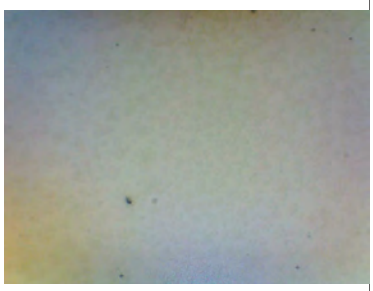
- White light microscopy of tears placed on a slide, collected by capillary tube. Studied after 10-15 minutes of drying.
- A is grade 1 (normal pattern with no gaps
- D is grade 4 (abnormal pattern showing no presence of ferning)

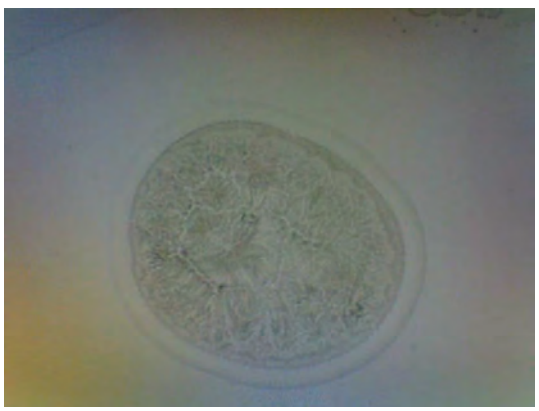


Examples of tear ferning patterns for Rolando's grade 1 (A), 2 (B), 3 (C), 4 (D). From Māragou et al., 1996. Clin Rheumatol. 15: 125–32 [177].

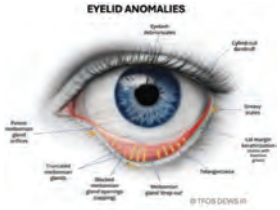
Source:
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6035753/#!po=11.9048





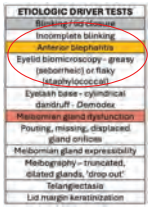


TOOLS IN THE ASSESSMENT OF EYE LID ANOMALIES

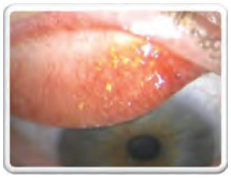


ETIOLOGIC DRIVER TESTS
Blinking / lid closure
Incomplete blinking
Anterior blepharitis
Eyelid biomicroscopy - greasy (seborrheic) or flaky (staphylococcal)
Eyelash base - cylindrical dandruff - *Demodex*
Meibomian gland dysfunction
Pouting, missing, displaced gland orifices
Meibomian gland expressibility
Meibography – truncated, dilated glands, 'drop out'
Telangiectasia
Lid margin keratinization

THE SLIT LAMP EXAM



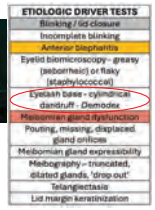
- Careful evaluation of the blink without instruction
  - Several studies demonstrate that incomplete blinking is common in DED. This leads to exposure keratopathy as well as poor meibomian gland expression.
- Eyelashes: blepharitis, trichiasis, distichiasis, madarosis, and/or poliosis
- Eyelids: including palpebral conjunctiva for irregularities or the presence of follicles, papillae or swelling, and eyelashes for crusting or cylindrical dandruff, and meibomian gland orifices for blockage, pouting, or presence of demodex tails





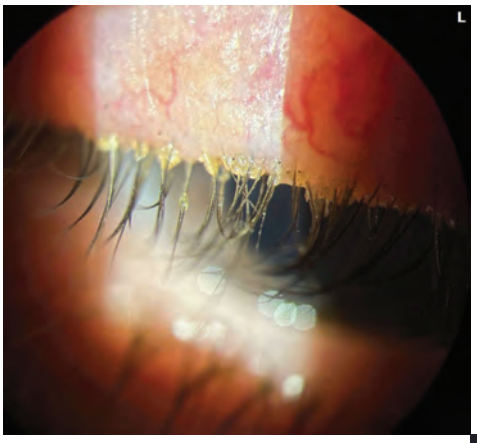
OCULAR DEMODICOSIS





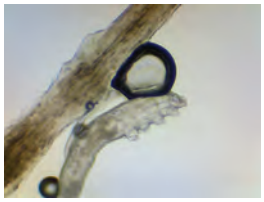
Anterior blepharitis caused by *Demodex* mites
Demodex are part of the normal flora of the human body
Mites live by eating dead skin cells and sebum, so the eyelids are a great environment
No agreement on how many mites are "normal", so symptoms drive treatment
Life cycle is ~ 2-3 weeks
2 types:

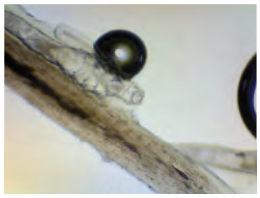
- *D. brevis* - smaller species (about 0.15 to 0.2 mm in length) live in the meibomian glands.
- *D. folliculorum* are twice as large (about 0.3 to 0.4 mm long) and live in the hair follicles.





DEMODEX BLEPHARITIS





Symptoms:

- Chronic red lids
- Itching
- Burning
- Sandy/gritty/FBS

Signs:

- Red, inflamed lid margin
- Collarettes – Clear cylinders at the root of the lashes
  - **THIS IS CONSIDERED by many to be PATHONAMOGNIC for *Demodex***
  - ***In some studies, 100% of patients with collarettes have Demodex blepharitis[1]***

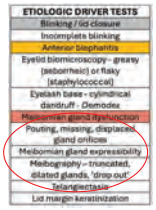


Lash rotation in a circular fashion can help to irritate the mite and cause them to leave the follicle. The lash is then epilated and viewed under high mag at the microscope. You may be able to see them at the slit lamp, but they are translucent, so it can be difficult.

[1]Gao YY, et al. High prevalence of Demodex in eyelashes with cylindrical dandruff. Invest Ophthalmol Vis Sci. 2005 Sep;46(9):3089-94. doi: 10.1167/iovs.05-0275. PMID: 16123406.

MGD ASSESSMENT





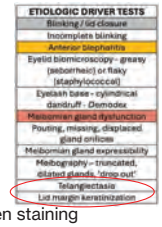
SLE is a very important component
Besides scoring secretions, and expressibility as described earlier, the international workshop on meibomian gland dysfunction: report of the diagnosis subcommittee described a MGYLS score

Meibomian Glands Yielding Liquid Secretions

- Using a Meibomian Gland Evaluator (8 glands at a time), count number of glands that produce anything, regardless of quality
- Avg for healthy, young patients was 10.6 +/- 2.6 out of 24 glands
- Found glands are much more active nasal than temporal
- 86% of pts scored 0 on the temporal glands
- 6% of pts scored 0 on the nasal glands.

THE LID MARGIN





SLE of the lid margin and careful attention to the Lissamine Green staining patterns are key here.

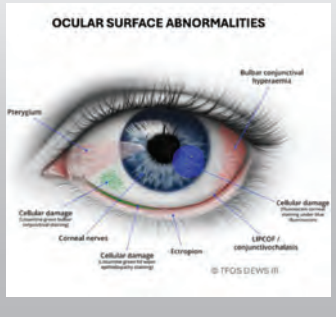
- Keratinization – whiteish plaque that signifies transformation into more skin-like texture from mucous membrane.
- Telangiecatsia – Abnormal blood supply at the lid margin

Both are indicative of chronic inflammation and may have systemic associations like SJS, OCP, SLK, Rosacea and allergy

Can contribute to the development of Lid Wiper Epitheliopathy, but LWE can come first in many cases.

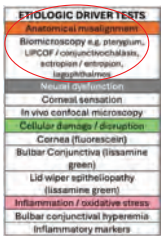
Image: https://www.optometricmanagement.com/issues/2009/may/rid4the-lid-of-blepharitis/

TOOLS IN ASSESSMENT OF OCULAR SURFACE ABNORMALITIES



ETIOLOGIC DRIVER TESTS
Anatomical misalignment
Biomicroscopy e.g. pterygium, LIPCOF / conjunctivochalasis, ectropion / entropion, lagophthalmos
Neural dysfunction
Corneal sensation
In vivo confocal microscopy
Cellular damage / disruption
Cornea (fluorescein)
Bulbar Conjunctiva (lissamine green)
Lid wiper epitheliopathy (lissamine green)
Inflammation / oxidative stress
Bulbar conjunctival hyperemia
Inflammatory markers

MISALIGNMENT



Again – SLE is King

Pterygium – Symptoms may warrant earlier removal

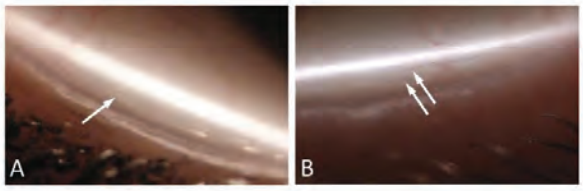
LIPCOF (Lid Parallel Conjunctival Folds) – Thought to be an early form of conjunctivochalasis - undulations in the inferior bulbar conjunctiva, parallel to the margin of the lower lid. They are:

- not age dependent like conjunctivochalasis.
- do not appear centrally
- commonly association with DED

Table 12.1
Grading schema for LIPCOF

Description	LIPCOF grade
No conjunctival folds	0
One permanent and clear lid-parallel fold	1
Two permanent and clear lid-parallel folds	2
Three or more permanent and clear lid-parallel folds	3

LIPCOF, Lid-parallel conjunctival folds.



Efron, Nathan. "Lid-Parallel Conjunctival Folds." *ClinicalPub*, 3 Jan. 2024, https://clinicalpub.com/lidparallel-conjunctival-folds/

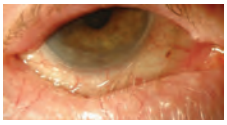
The Tropions

Involutional entropion usually **occurs in the lower eyelids**. Factors thought to play a role in development of involutional entropion are tissue atrophy w/horizontal laxity of the eyelid, attenuation or disinsertion of eyelid retractors, & overriding by the preseptal orbicularis.

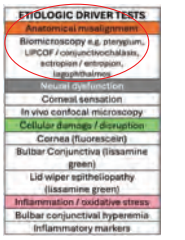
•Horizontal laxity can be detected by poor eyelid tone (***snapback test***) & the ability to pull the eyelid more than **6 mm from the globe** (***distraction test***).

•Such laxity is a result of involutional stretching of the eyelid & canthal tendons. Normally, **the lower eyelid retractors maintain the lower eyelid margin in proper orientation**.





Right eye lower lid senile involutional entropion

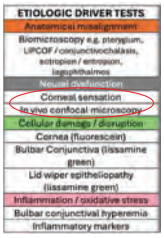






Eyelid distraction test to measure horizontal eyelid laxity. The eyelid should not pull away from the globe more than 6 mm.

CORNEAL SENSITIVITY



Why check??

- Stain, no pain
- Central staining only
- Case history (DM, recurrent erosions, recurrent herpetic infections)

Cotton wisp

Dental floss

Cochet-Bonnet esthesiometer





NEUROTROPHIC KERATOPATHY

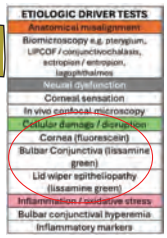
Often associated with Diabetes persistent/recurrent HSV or HZV infection, ocular surgery

Other causes:

- Trigeminal nerve palsy: (trigeminal neuralgia), tumor (acoustic neuroma compressing CN V), aneurysm, trauma
- Topical drugs (anesthetics, NSAIDs, preservatives)
- Chemical or thermal burns
- Multiple surgical procedures (cornea, refractive, glaucoma, conjunctiva, vitreo-retinal)
- Congenital (Riley-Day), Goldenhaar, Bassen-Kornzweig
- Corneal dystrophy (lattice, granular)
- Aging
- Contact lens wear
- Infection (leprosy, Lyme)



VITAL STAINS



NaFl – finds the disruption in the intracellular spaces. We're observing a pooling effect where the stain is filling a void.

Rose Bengal –

- first used by Sjögren in 1933
- Stains dead and devitalized cells. However, mucus, and some healthy cells may also pick up the stain

Lissamine Green – Synthetic dye developed in 1973. Has less stinging and ocular surface toxicity than Rose Bengal and does a better job of targeting only dead cells.







SODIUM FLUORESCEIN

Workhorse of ophthalmic stains

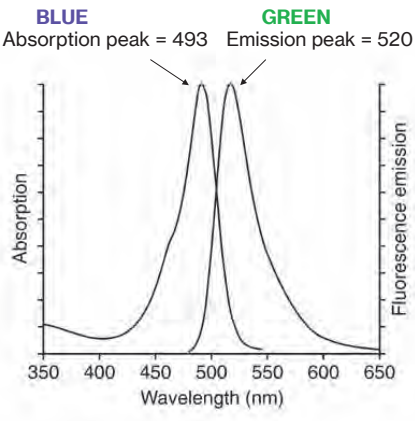
Pharmacology

- Fluorescent when exposed to light
- Absorbs **blue** (493 nm) and emits **green** (520 nm)

Clinical Uses

- **Topical**: Evaluation of ocular surface integrity, tear film visualization and analysis, CL fitting, lacrimal drainage evaluation, Goldmann tonometry
- **Oral & Intravenous**: Ocular blood flow analysis, retinal health assessment





Left: Sodium fluorescein impregnated strip
Right: Fluorescein absorbs at 493 nm (blue) and emits at 520 nm (green)

USE A FILTER IF YOU WANT TO SEE IT BETTER!



Typical cobalt blue emits at ~450nm

Best to use a cutoff filter at ~500nm

Peterson and collegues noted that most slit lamps are not optimized for viewing corneal staining with NaFl

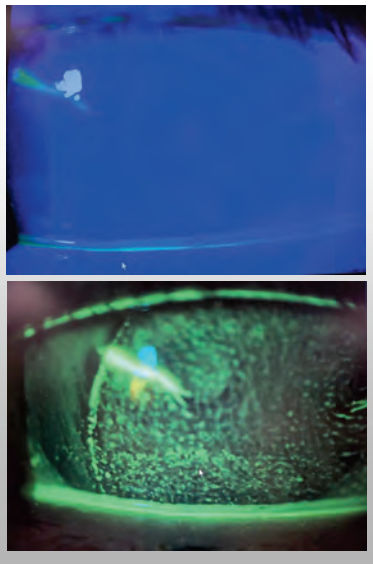
Quenching is also a problem

- Found that at higher concentrations, the maximum emission wavelength is shifted higher
- Recommended 1% minims or a moistened floret (a floret wet with saline and the excess shaken off) to achieve maximum fluorescence.



FLUORESCEIN SODIUM

Effect of yellow barrier filter on visualization of NaFl staining

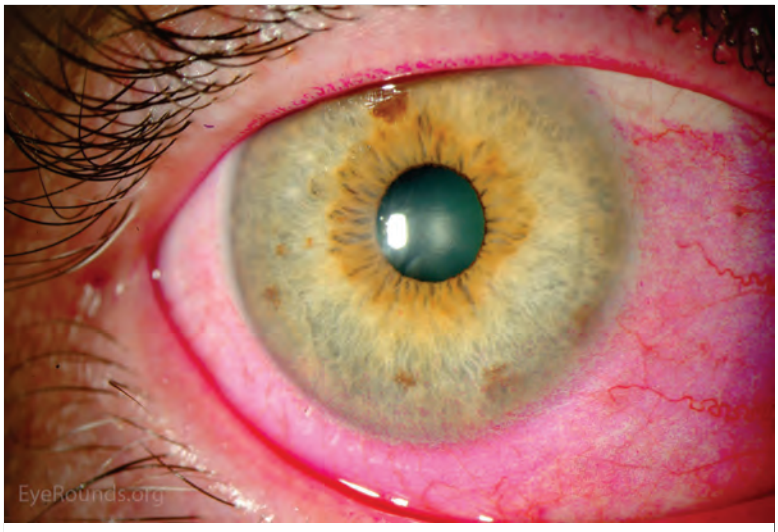


ROSE BENGAL

Pharmacology
–An iodine derivative of fluorescein; stains tissue pink or magenta

–It will bind to and stain:
- Mucus in the tear film
- Epithelium with disturbed glycocalyx
- Devitalized (dead) tissue (but is not a vital dye)

–Photoreactive: Generates singlet oxygen (**highly toxic to cells**) when exposed to light
- Rose Bengal will instantly kill (and then stain) unprotected cells that are exposed to it
- **Toxicity can be blocked by an intact glycocalyx**



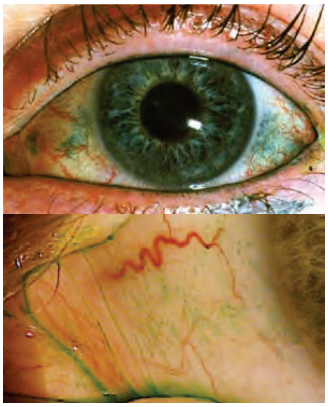
Rose Bengal staining of the conjunctiva in Sjogren's syndrome

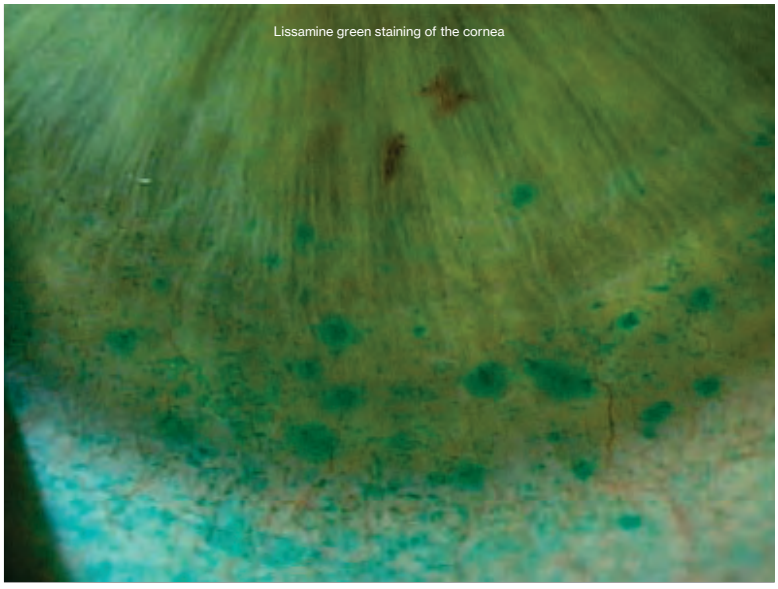
LISSAMINE GREEN

Stains in an **identical fashion to rose Bengal EXCEPT:**
- Stains membrane-damaged or devitalized cells (**it is a vital dye**)
- Nontoxic. Very safe
- Does not disturb or stain normal healthy cells
- Stains epithelial cells with a damaged membrane regardless of the presence of mucin

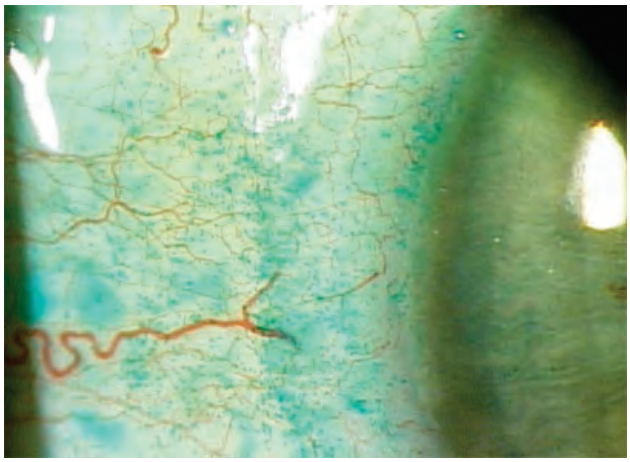
Widely used in cosmetics and as a food additive

May be used in place of rose bengal and is IMHO, a better option

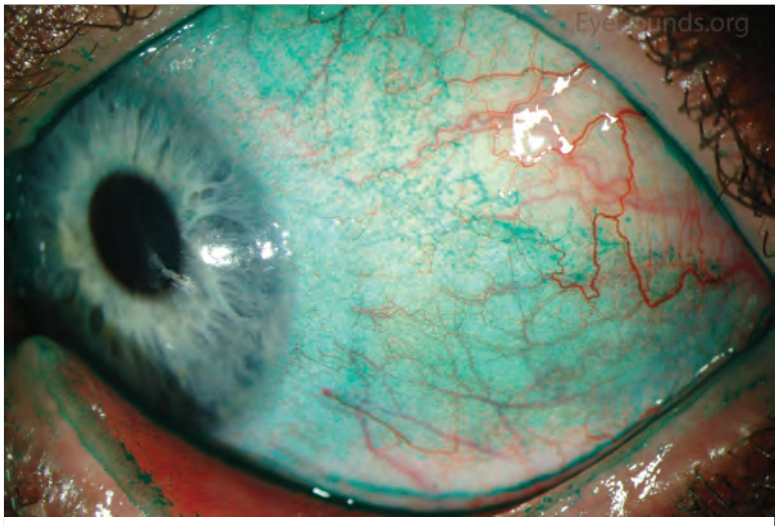




Lissamine green staining of the cornea

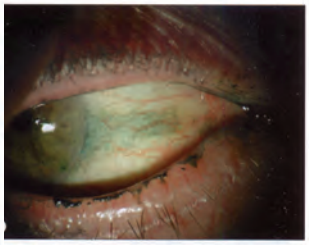


Lissamine green staining of the conjunctiva



Lissamine green staining in keratoconjunctivitis sicca





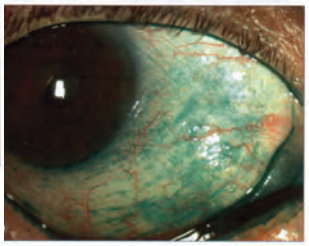
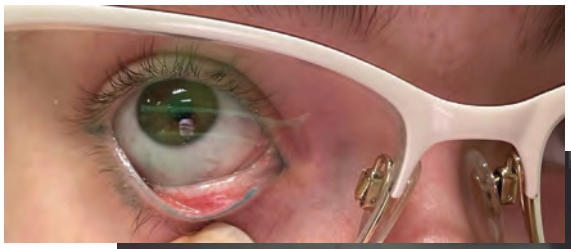


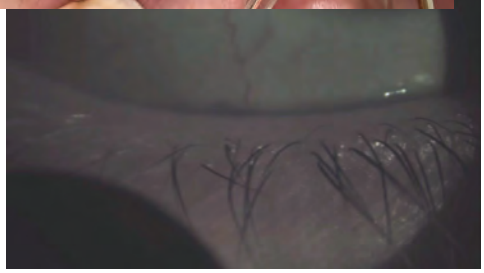
Fig. 10.4 Lissamine green staining in a 68-year-old female with Sjögren's syndrome and stem cell deficiency (secondary to long-term contact lens wear).

Fig. 36.4 Lissamine green staining in patients with moderate **(A)** and severe **(B)** dry eyes. Typically the conjunctiva stains to a greater extent than the cornea.

LID WIPER EPITHELIOPATHY

Damage to the lid wiper of the eyelid secondary to friction between the eyelid and ocular surface
Very common in DED
Associated with poor lipid spread, tear film instability, abnormal/altered lid anatomy, and decreased blink speed
Studies show the lid wiper portion will develop holes and fissures in severe dED



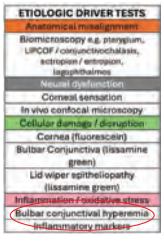


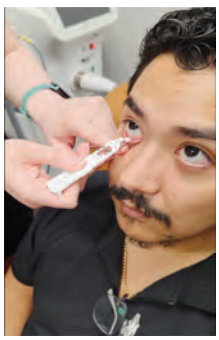
INFLAMMATION

Part of the **definition** of DED
Matrix metalloproteinases (MMP) are a family of enzymes that are consistently detected in the tears of patients with DED.

- Generated by pro-inflammatory cells and connective tissues
- Several MMP's are found on the corneal surface in DED (1, 3, 9, 10, 13)

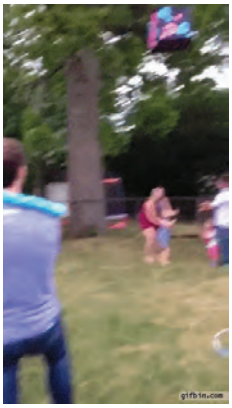
MMP-9 testing offers a POC tests for detecting these in pts, although tear volume may play a significant role in reliability
Pts with high MMP-9s tend to respond well to cyclosporine A









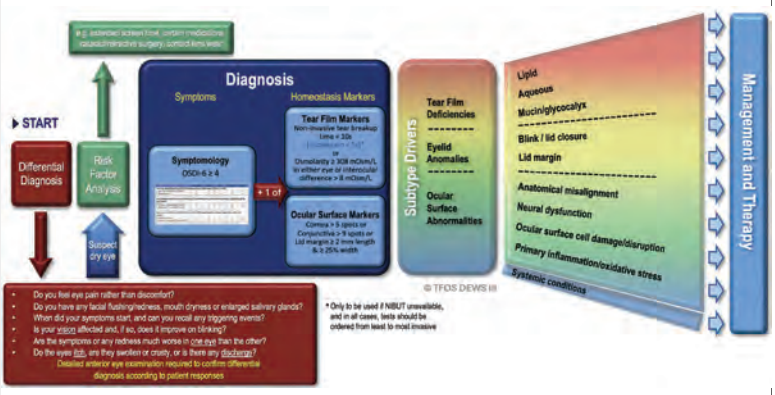


79



THAT WAS A LOT!!

80

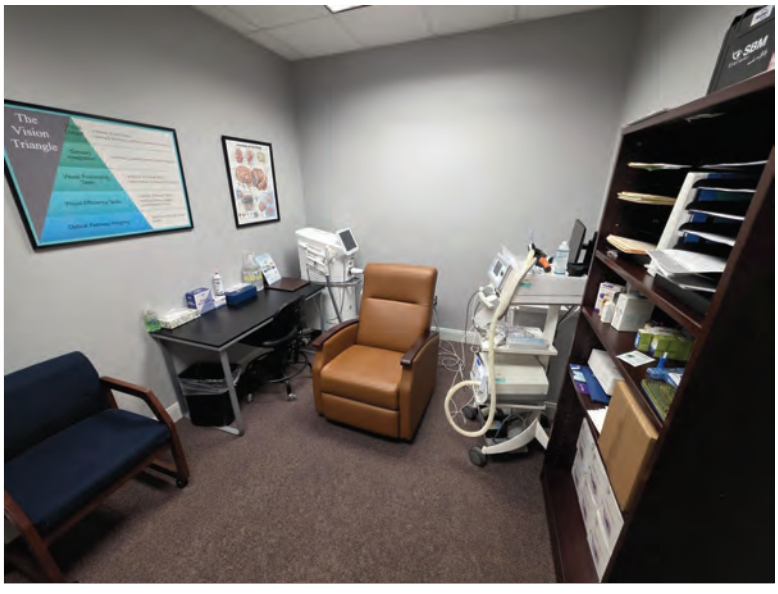


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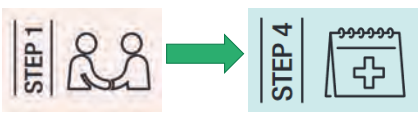
TREATMENT AND MANAGMENT

82



Treatments

- **Best practices for treatment**

DEWS II stages: 

STEP 1:

Patient education, lifestyle mods, lipid ATs, hygiene

STEP 2:

Meds, tea-tree, moisture chambers, occlusion, office Txs

STEP 3:

Advanced meds, *therapeutic CLs

STEP 4:

Long-term topical steroids, amnio grafts, surgery

Jones L, Downie LE, Korb D, et al. TFOS DEWS II management and therapy report. Ocul Surf. 2017;15(3):575-628.

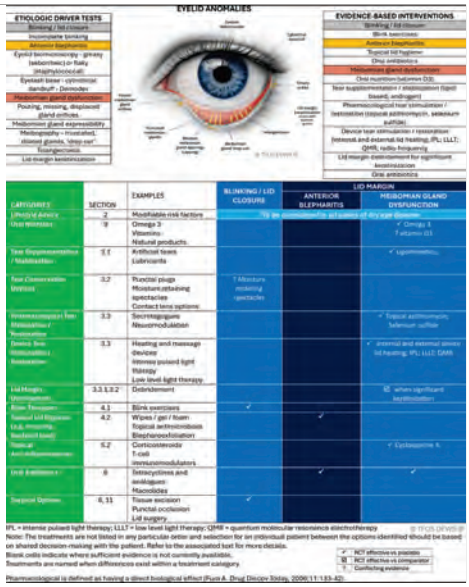
DEWS 3

These questions target treatment

- Is there a lid problem?
- Is there a tear film problem?
- Is there an ocular surface problem?

Or a combination of the above?

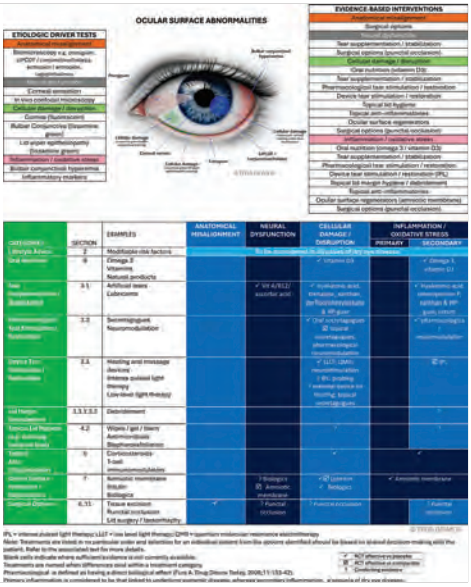
MANAGEMENT OF EYELID ANOMOLIES

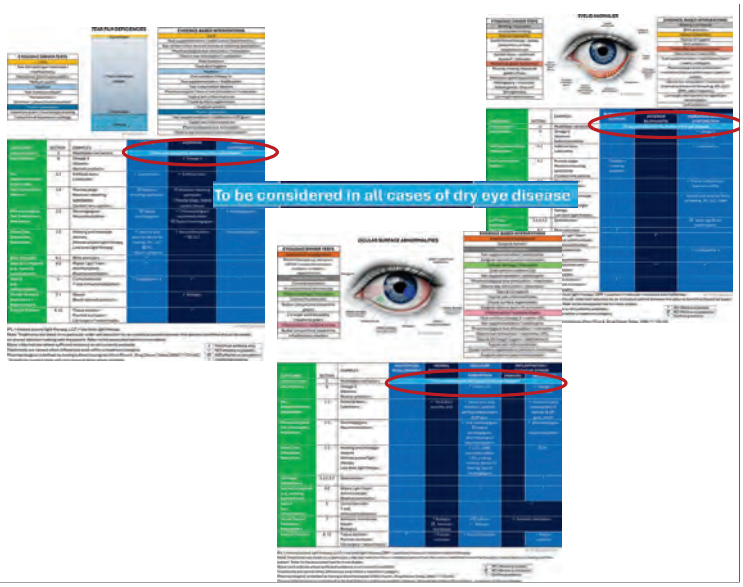


Management of Tear Film Deficiencies



MANAGEMENT OF OCULAR SURFACE ABNORMALITIES





THAT'S A LOT OF STUFF... WHAT DO THEY HAVE IN COMMON?

Lifestyle (3)
Omega-3 (3)
Topical secretagogues (3)
Blink Exercises (2)
Lipomimetics (2)
Lid heating (3)
IPL and LLLT (3)
Steroids (3)
Amniotic membranes (2)

LIFESTYLE ADVICE



Avoidance of factors that precipitate symptoms of DED:
- Avoid prolonged reading or device use
- avoid drafty environments

Control of the local environment:
- Humidifiers – usb powered, whole room, incorporated into eyewear

Physical protection:
- side panels on spectacles
- Moisture-retaining spectacles

TEAR EVAPORATION

Relative Humidity
Low humidity causes an increase In evaporation.
Over 40% increase in evaporation with a drop in humidity of 10%[1]



[1]McCulley JP, Aronowicz JD, Uchiyama E, Shine WE, Butovich IA. Correlations in a change in aqueous tear evaporation with a change in relative humidity and the impact. Am J Ophthalmol. 2006;141:758–60

MODIFICATIONS

Environment
- Pollution
- Air Quality

Diet
- Essential fatty acids
- Increase water intake

Medications
- Change meds or d/c meds that may be affecting ocular surface (both topical and oral)

Lid Hygiene – Heat, Massage and clean

BLINK EXERCISES

Kim, et al showed improvement in 54 DED patients by asking them to do 10-second blink cycle exercises q20 min while awake for 4 weeks
Step 1. Gently close the eyes for 2s;
Step 2. Open the eyes;
Step 3. Repeat step 1;
Step 4. While keeping the eyes closed, squeeze the eyes for 2s;
Step 5. Open the eyes. Instructions provided to repeat one cycle of the blinking exercise every 20 min during waking hours, for a period of four weeks.
Statistical improvement was seen in:
- DEQ-5 ($p<0.001$)
- OSDI ($p<0.001$)
- NITBUT ($p<0.04$)
- Proportion of incomplete blinks from 54 to 34% ($p<0.001$)

Kim, A. D., et al. "Therapeutic Benefits of Blinking Exercises in Dry Eye Disease." *Contact Lens and Anterior Eye*, vol. 44, no. 3, June 2021, article 101329. https://doi.org/10.1016/j.clae.2020.04.014.

THINGS TO COMPARE FROM DEWS 2 AND 3

Deemphasis of omega 3 supplementation in DEWS 3 since not all studies have shown the same effect (though some have)

Dr. Jones does concede: "broadly speaking, the omega-6 pathway results in the production of inflammatory mediators and in the omega-3 pathway, alpha-linolenic acid is converted to long-chain fatty acids that include eicosapentaenoic (EPA) and docosahexaenoic acid (DHA), subsequently leading to the generation of various anti-inflammatory mediators."
Diets with high ω6 to ω3 are pro-inflammatory which increases likelihood of DED

Omega-3 Sources

Food	Omega Type	Specific Fatty Acid	Notes
Salmon	Omega-3	EPA & DHA	One of the best sources; highly bioavailable
Sardines	Omega-3	EPA & DHA	Also high in calcium (if bones included)
Mackerel	Omega-3	EPA & DHA	Very high concentration
Tuna	Omega-3	EPA & DHA	Lower than salmon but still beneficial
Flaxseeds	Omega-3	ALA	Plant-based; conversion to EPA/DHA is limited
Chia seeds	Omega-3	ALA	Easy to add to yogurt/oatmeal
Walnuts	Omega-3	ALA	One of the few nuts high in omega-3
Hemp seeds	Omega-3	ALA	Good omega-3 to omega-6 balance
Canola oil	Omega-3	ALA	Moderate source; common cooking oil

Omega-6 Sources

Food	Omega Type	Specific Fatty Acid	Notes
Soybean oil	Omega-6	Linoleic acid (LA)	Very common in processed foods
Corn oil	Omega-6	Linoleic acid (LA)	High omega-6 content
Sunflower oil	Omega-6	Linoleic acid (LA)	Especially high unless labeled "high oleic"
Safflower oil	Omega-6	Linoleic acid (LA)	Similar to sunflower oil
Vegetable oil (generic)	Omega-6	Linoleic acid (LA)	Usually a blend of seed oils
Pumpkin seeds	Omega-6	Linoleic acid (LA)	Also high in magnesium
Peanuts	Omega-6	Linoleic acid (LA)	Includes peanut butter
Almonds	Omega-6	Linoleic acid (LA)	Healthy, but omega-6 dominant
Chicken (especially skin)	Omega-6	Linoleic acid (LA)	Depends on feed
Eggs	Omega-6	Linoleic acid (LA)	Can vary; omega-3 enriched eggs exist

https://ods.od.nih.gov/factsheets/Omega3FattyAcids-HealthProfessional/

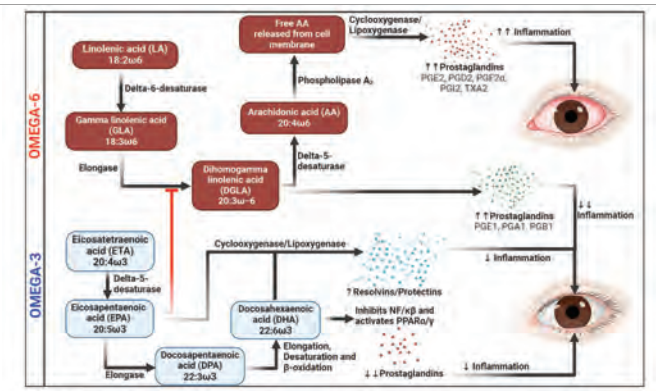


FIGURE 2. Key metabolic pathways for omega-6 and omega-3 fatty acids. The conversion of short-chain to long-chain omega-3 and omega-6 fatty acids occurs through 2 independent metabolic pathways that share, and compete for, the same series of enzymes. Broadly speaking, the omega-6 pathway results in the production of inflammatory mediators; through a series of steps, linolenic acid is converted to arachadonic acid, which is further metabolized to bioactive metabolites that include a range of prostaglandins. The omega-6 pathway also leads to generation of some anti-inflammatory mediators, in particular PGE1, although it predominantly generates proinflammatory mediators. In the omega-3 pathway, α-linolenic acid is converted to long-chain fatty acids that include eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), subsequently leading to the generation of various anti-inflammatory mediators, including families of resolvins and protectins; these are relevant in the context of dry eye, as they can modulate physiological processes that include epithelial cell survival, recovery from oxidative stress, and wound healing. Diets with a high omega-6 to omega-3 ratio are considered proinflammatory, which increase the likelihood of signs and symptoms of DED, due to a bias toward the production of proinflammatory mediators. The red line "inhibits" that pathway. Created in BioRender by Rohan Bir Singh, MD (2025) https://BioRender.com/ n49o832.

DRUG FREE MANAGEMENT

Tears

Heat

Mechanical



98

DEWS II - STEP 1



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what d… …mend

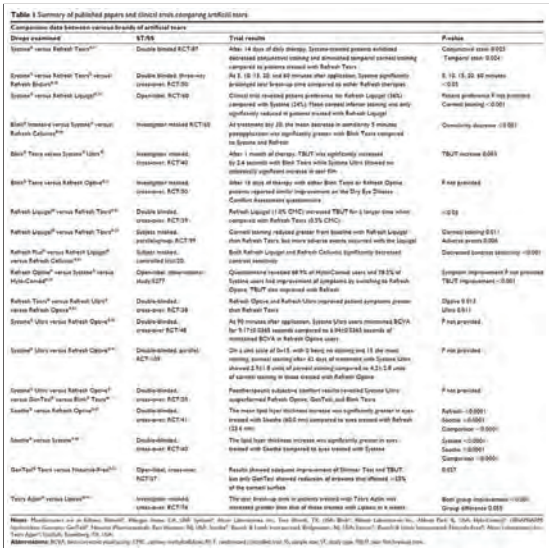


Table 1 Summary of published papers and clinical trials comparing artificial tears

Drugs examined	ST/SS	Trial results	P-value
Systane® versus Refresh Tears®[41]	Double blinded RCT:87	After 14 days of daily therapy, Systane-treated patients exhibited decreased conjunctival staining and stimulated tearpoint corneal staining compared to patients treated with Refresh Tears	Conjunctival stain: 0.015 Tearpoint stain: 0.024
Systane® versus Refresh Tears®, versus Refresh Endura®[42]	Double blinded, three-way crossover: RCT:50	At 5, 10, 15, 20, 30 minutes after application, Systane significantly prolonged tear break-up time compared to either Refresh therapies	5, 10, 15, 20, 30 minutes: <0.05
Systane® versus Refresh Liquigel®[43]	Open-label: RCT:60	Clinical trial revealed patient preference for Refresh Liquigel (36%) compared with Systane (24%). Those treated refresher staining was only significantly reduced in patients treated with Refresh Liquigel	Patient preference: P was promoted Corneal staining: <0.001
Blink® Intensive versus Systane®, versus Refresh Celluvisc®[44]	Investigator-masked RCT:50	At treatments day 28, the mean decrease in sensitivity 5 minutes preapplication was significantly greater with Blink Tears compared to Systane and Refresh	Osmolarity decrease: <0.001
Blink® Tears versus Systane®, Ultra®[45]	Investigator-masked, crossover: RCT:40	After 1 month of therapy, TBUT was significantly increased by 2.4 seconds with Blink Tears while Systane Ultra showed no statistically significant increase in tear film	TBUT increase: 0.045
Blink® Tears versus Refresh Optive®[46]	Investigator-masked, crossover: RCT:50	After 28 days of therapy with either Blink Tears or Refresh Optive, patients reported similar improvement on the Dry Eye Disease Comfort Assessment questionnaire	P was promoted
Refresh Liquigel® versus Refresh Tears®[47]	Double blinded, crossover: RCT:39	Refresh Liquigel (1.0% CMC) increased TBUT for a longer time when compared with Refresh Tears (0.5% CMC)	<0.05
Refresh Liquigel® versus Refresh Tears®[48]	Subjects masked, participating: RCT:99	Corneal staining reduced greater from baseline with Refresh Liquigel than Refresh Tears, but more adverse events reported with the Liquigel	Corneal staining: 0.01 Adverse events: 0.006
Refresh Plus® versus Refresh Liquigel® versus Refresh Celluvisc®[49]	Subject masked, controlled trial:20.	Both Refresh Liquigel and Refresh Celluvisc significantly increased corneal sensitivity	Decreased baseline sensitivity: <0.001
Refresh Optive® versus Systane® versus Hylo-Comod®[50]	Open-label, observational study:627	Questionnaire revealed 68.9% of HydroComod users and 78.5% of Systane users had improvement of symptoms by switching to Refresh Optive. TBUT also improved with Refresh	Symptom improvement P not provided TBUT improvement: <0.001
Refresh Tears® versus Refresh Ultra® versus Refresh Optive®[51]	Double-blinded, crossover: RCT:38	Refresh Optive and Refresh Ultra improved patient symptoms greater than Refresh Tears	Optive 0.013 Ultra 0.011
Systane® Ultra versus Refresh Optive®[52]	Double-blinded, crossover: RCT:48	At 90 minutes after application, Systane Ultra users minimized BCVA for 5 (1.7 ± 0.3265 seconds compared to a 2.9 ± 0.3265 seconds of	P was promoted
Systane® Ultra versus Refresh Optive®[53]	Double-blinded, crossover: RCT:39	On a unit scale of 0–10, with 0 being no staining and 10 the most staining, corneal staining after 42 days of treatment with Systane Ultra showed 2.9 ± 1.8 units of corneal staining compared to 4.2 ± 2.8 units of corneal staining in those treated with Refresh Optive	P was promoted
Systane® Ultra versus Refresh Optive®, versus GenTeal® versus Blink® Tears®[54]	Double-blinded, crossover: RCT:28	Fluorescein-punctate subjective comfort results revealed Systane Ultra outperformed Refresh Optive, GenTeal, and Blink Tears	P was promoted
Soothe® versus Systane®[55]	Double-blinded, crossover: RCT:41	The mean tear film thickness increase was significantly greater in eyes treated with Soothe (60.0 mm) compared to eyes treated with Refresh (22.6 mm)	Refresh: <0.0001 Soothe: <0.0001 Comparison: <0.0001
Systane® versus Systane®[56]	Double-blinded, cross-over: RCT:40	The tear film thickness increase was significantly greater in eyes treated with Soothe compared to eyes treated with Systane	Systane: <0.0001 Soothe: <0.0001 Comparison: <0.0001
GenTeal® Tears versus Naturale-Free®[57]	Open-label, cross-over: RCT:37	Results showed adequate improvement of Shirmer Tear and TBUT (on pre-GenTeal showed reduction of erosions that affected <33% of the corneal surface	0.037
Tears Again® versus Liposic®[58]	Investigator-masked, cross-over: RCT:74	The eyes treated with one in patients treated with Tears Again was associated greater than that of those treated with Liposic in 4 weeks	Best group improvement: <0.001 Group difference 0.005

Notes: Masked means not to Editors; Blinded: Allergan, Inc., Irvine, CA, USA; Bausch: Bausch & Lomb Incorporated, Rochester, NY, USA; Alcon: Alcon Laboratories Inc., Fort Worth, TX, USA; Abbreviations: BCVA, best-corrected visual acuity; CMC, carboxymethylcellulose; RCT, randomized controlled trial; SS, sample size; ST, study type; TBUT, tear film breakup time.

- Systane > Refresh
- Systane > Refresh
- Refresh >Systane
- Blink > Systane and Refr
- Blink > Systane
- Blink = Refresh
- Refresh Liquigel > Refres
- Refresh Liquigel > Refres
- (But more adverse FX with Liqui
- Refresh Liquigel = Celluvi
- Refresh > Systane/Hylo-Cor
- Optive/Ultra > Refresh
- Systane > Refresh
- Systane > Refresh
- Systane > Refresh, GenT And Blink
- Soothe > Refresh
- Soothe > Systane
- GenTeal > Naturale-Free
- Tears Again > Liposic

Moshirfar M, Pierson K, Hanamaikai K, et al. Artificial tears potpourri: a literature review. Clin Ophthalmol 2014;8:1419-33

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Cochrane Library

Cochrane Database of Systematic Reviews

Over the counter (OTC) artificial tear drops for dry eye syndrome (Review)

Pucker AD, Ng SM, Nichols JJ

Metanalysis that included 43 RCT (3487 participants).

The review found that, in general, there was uncertainty whether different OTC artificial tears provide similar relief of signs and symptoms when compared with each other or placebo.

The conclusion they could reach was that *"0.2% polyacrylic acid-based artificial tears were consistently more effective at treating dry eye symptoms than 1.4% polyvinyl alcohol-based artificial tears.*

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ARTIFICIAL TEARS

Little evidence to suggest that tears do *anything* at all to address underlying conditions.

- consider lipid-based tears for lipid deficiencies
- PF tears for frequent usage (s/p LASIK)
- Use in certain symptomatic environments and when the patient is relatively free from signs (Airplane, prolonged computer use)
- Cheapest way to offer something to the mildly symptomatic pt

Otherwise, we should be doing *Anything* else



Tear Stabilizer
100% perfluorohexyloctane
Water free (Non aqueous) liquid
- microbial growth is not possible, so no preservatives are needed

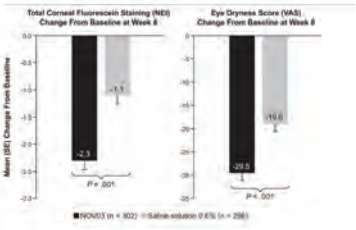
QID dosing
3mL bottle = ~280 drops
May work best to stabilize lipid layer so patients with severe MGD may not be great candidates

Miebo (perfluorohexyloctane ophthalmic solution)

A drop that treats dry eye in a new way

MIEBO is the first & only Rx eye drop that directly targets tear evaporation.

MOJAVE Study Data



John D. Sheppard, Fred Kurata, Alice T. Epitropoulos, Sonja Krösser, Jason L. Vittitow, NOV03 for Signs and Symptoms of Dry Eye Disease Associated With Meibomian Gland Dysfunction: The Randomized Phase 3 MOJAVE Study, American Journal of Ophthalmology, Volume 252, 2023, Pages 265-274, ISSN 0002-9394, https://doi.org/10.1016/j.ajo.2023.03.008.

HEAT

Application of heat has 2 main affects
- Increase temperature of meibum and decrease its viscosity
- It feels good



Warm compresses by Quantum Heat are applied with the lids closed for at least 15 minutes.
Image: Lee J

SUGGESTIONS FROM DEWS 3

Use a towel heated to 45ºC
Heat lids to 40ºC to 41.5ºC (104 to 107F)
At least once a day for 10 minutes or twice a day for 5 minutes
Cheapest is a damp washcloth in the microwave for 20-30 seconds (depending on wattage), but must be reheated every 2 minutes
Immediately follow with digital massage
- Studies have shown no significant change in K topography

Use a Bruder mask once a day!

BRIEF REPORT

Evidence-Based Strategies for Warm Compress Therapy in Meibomian Gland Dysfunction

Table 1 Temperature profile of warm compresses compiled from studies [16–20]

Type of WC	Temperature of WC				Temperature of eyelid			
	1 min	2 min	5 min	10 min	1 min	2 min	5 min	10 min
Hot towel								
Not reheated	≥ 40°	≥ 40°	< 40°	< 40°	< 40°/ ≥ 40°	< 40°	< 40°	< 40°
Reheated every 2 min	≥ 40°	≥ 40°	≥ 40°	≥ 40°	≥ 40°	≥ 40°	≥ 40°	≥ 40°
Microwavable								
Dry heat:								
EyeBag	≥ 40°	≥ 40°	< 40°/ ≥ 40°	< 40°/ ≥ 40°	< 40°	< 40°/ ≥ 40°	< 40°/ ≥ 40°	< 40°
Moist heat:								
Bruder	≥ 40°	≥ 40°	≥ 40°	≥ 40°	< 40°/ ≥ 40°	≥ 40°	≥ 40°	< 40°/ ≥ 40°
Thera° Pearl	< 40°	≥ 40°	≥ 40°	< 40°	< 40°/ ≥ 40°	≥ 40°	≥ 40°	< 40°/ ≥ 40°
Self-heating								
Dry heat: EyeGiene	≥ 40°	45° (peak)	< 40°	< 40°	< 40°	≥ 40°	< 40°	< 40°

Temperature in Celsius. < 40°/ ≥ 40° indicate differing results from different studies
WC Warm compress

HEAT



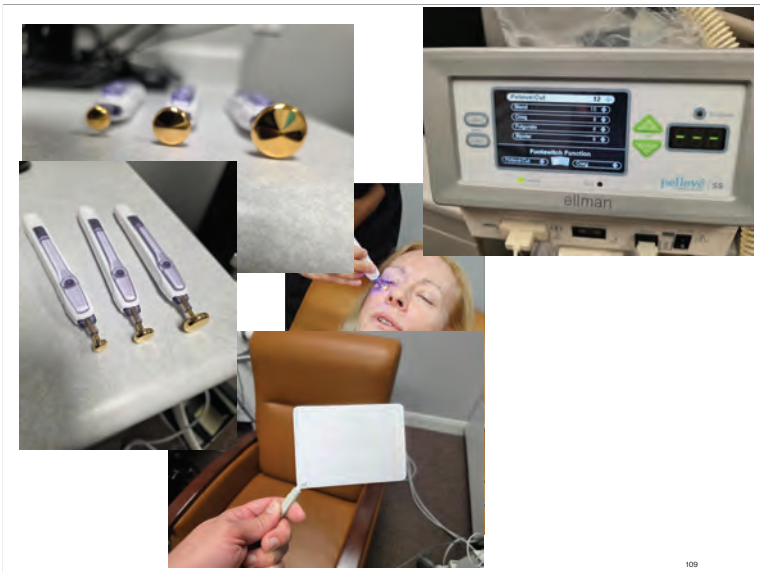
Bruder Moist Heat Eye Compress | Microwave Activated | Fast Acting and Effective Relief for Dry Eye and Other Eye Irritation

Visit the Bruder Store
4.5 ★★★★★ (32,488) | Search this page
#1 Best Seller in Microwavable Heat Pads
$22.95 ($22.95 / count) Price History
prime Today
FREE Returns
With Amazon Business, you would have saved $89.32 in the last year. Create a free account and save up to 20% today.
Bundles with this item
Top highlights

SOURCE: http://bt.e-

IN OFFICE MANAGEMENT RADIOFREQUENCY

RF uses an electromagnetic wave that generates heat in the tissue by causing the oscillation of cells
Can be used for surgical incisions and biopsies or wrinkle reduction
For MGD - RF lacks support of RCT in the literature, but we have found it to be useful in our clinics, especially when preceding mechanical expression
Benefit in darkly pigmented skin as an alternative to IPL



IPL

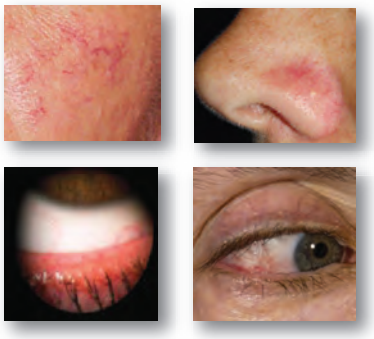
TFOS DEWS III: MANAGEMENT AND THERAPY: "IPL treatments have demonstrated reduced symptoms and signs of DED, improved optical quality, supporting an improved tear film lipid layer, and reduced dependence on the application of tear supplements."
Robust evidence to support its use.
Studies show improvement in

- lid margin abnormalities,
- Lipid Layer Thickness
- TBUT and NIBUT,
- meibomian gland score
- ocular surface staining
- Reduction in IL-6, IL-6R, IL-1b, IL-13
- Improvement in symptom surveys

-Arita R, Fukuoka S, Morishige N. Therapeutic efficacy of intense pulsed light in patients with refractory meibomian gland dysfunction. Ocul Surf. 2019;17(1):104–110.
-Yan S, Wu Y. Efficacy and safety of Intense pulsed light therapy for dry eye caused by meibomian gland dysfunction: a randomised trial. Ann Palliat Med. 2021;10(7):7857–7865.
-Yu H, Zeng W, Zhao G, Hong J, Feng Y. Response of tear cytokines following intense pulsed light combined with meibomian gland expression for treating meibomian gland dysfunction-related dry eye. Front Endocrinol (Lausanne). 2022;13:973902.

IPL

Rosacea is a chronic, inflammatory skin condition which affects the facial skin and eyelids. Rosacea worsens with time if left untreated.



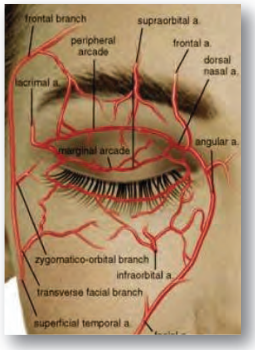


Image: Courtesy Lumenis

Intense Pulsed Light

TREATMENT INCLUDES IPL APPLICATION BELOW EYELIDS, AND THEN EXPRESSION OF THE MEIBOMIAN GLANDS

First, IPL
(from ear to ear,
including nose):





Then,
expression:



Image: Courtesy Lumenis

- IPL targets chromophores and destroys abnormal blood vessels, **removing a major source of the inflammation**
- Temporary increase of temperature at the eyelids and **liquefaction of the meibum**
- **Reduction of rosacea** and turnover of dead skin cells, therefore decreasing the risk of clogging the glands
- Eradication of Demodex mites (which carry B. Oleronius bacteria), therefore **reduces bacterial load**
- IPL increases the expression of **anti-inflammatory agents** (TGF-β)
- **Rejuvenation** of the Meibomian glands by photo modulation

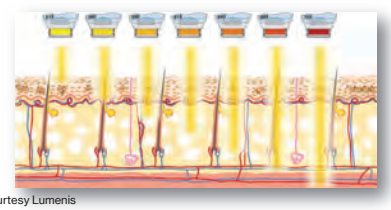




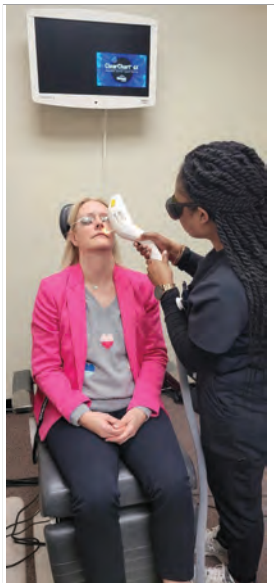
Image: Courtesy Lumenis

THE FITZPATRICK SKIN TYPE

Skin type	Skin color	Hair color	Eye Color	Tanning habits	Ethnicity
I	Very fair, pale white, freckles	Red	Blue	Always burns, never tans	Caucasian
II	Fair, white	Blonde	Hazel/ green	Always/usually burns, tans with difficulty, tan fades rapidly	Caucasian
III	Cream white /fair to olive	Any	Any	Sometimes middle burn, always or usually tans, tan stays for weeks.	Caucasian
IV	Medium Brown	Brown/Black	Brown	Rarely burns, tans with ease, tan stays for months	Mediterranean, Asian, Indian, Hispanic
V	Darker brown	Black	Brown/ Black	Very rarely burns, tans very easily	Non-Caucasian Mediterranean, Asian, Indian, Hispanic
VI	Darkest brown to black	Black	Black	Never burns, tans very easily	African



Image: Courtesy Lumenis



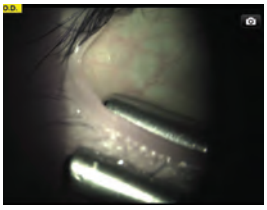


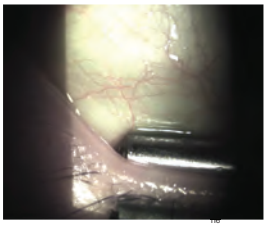
4 SESSIONS, 2 WEEKS APART



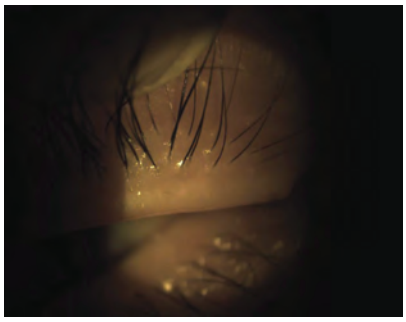
IN-OFFICE MECHANICAL EXPRESSION

May be done manually, in office at home (step 1) or with ancillary assistance from a number of instruments.
One thing is clear... Mechanical expression is aided by the application of heat
Open meibomian glands lead to less gland atrophy and better tear film stability.





IN-OFFICE CLEANING

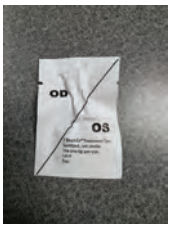






IN OFFICE CLEANING

IN OFFICE CLEANING





OTHER TREATMENTS

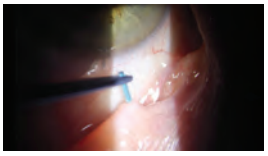




- Moisture Chamber Goggles
- TTO (other new applications to treat DB)
- Plugs - (have mixed evidence)
- Hypochlorous Acid – strong antimicrobial properties. 0.01% is well tolerated and can be useful in controlling ocular microflora, including demodex.







Treatments



- Meds
  - **Topicals**

Rx topicals:

- Cyclosporine (Restasis) & LFA-1 agonists (Xiidra)
  - Both AD & EDE
    - ✓ Rubin M, Rao SN. Efficacy of topical cyclosporine 0.05% in the treatment of post bleph. J Ocul Phar Ther. 2006.
- Azithromycin (Azasite 1%) → *every* aspect of DED
  - Equal to doxycycline but less side effects
    - ✓ Satitpitakul et al. *Graefe's Archive Clin & Exp Ophth.* 2019.

- Medications
  - **Topicals**

Rx Topicals (cont'd):

- Corticosteroids → anti-inflammatory Tx 20 yrs old
  - Mild (or "surface" steroids)/combinations drops







AUTOLOGOUS SERUM EYE DROPS (ASEDs)

First described in 1975 and used to treat Sjogren's pts by 1984.
3 steps

1. Pt donates blood
2. Blood is centrifuged and serum is extracted
3. Saline dilutes the serum (20% serum is most common, but some pts benefit from 100%)







BENEFITS OF ASEDs

ASEDs contain many compounds not found in tears including:

- Antibodies
- Growth factor
- Albumin
- Vitamin A

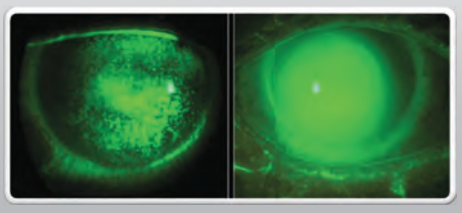
Excellent choice to promote epithelial healing for patients with

- Sjögren's
- OCP
- Stevens-Johnson
- Chemical burns
- Neurotrophic keratitis



SCLERAL LENSES

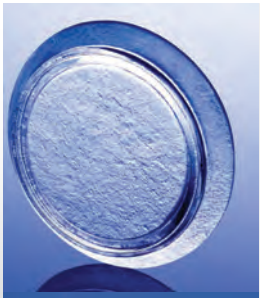
In the treatment hierarchy, Sclerals lie somewhere near the end of the path – right before surgery and systemic anti-inflammatories.
Bathing the eye in continuous moisture alleviates many symptoms of DES with the added benefit of enhancing vision.
Pt repeatedly demonstrated improved symptom scores as well as objective signs
Minimal complications, but rare reports of infectious keratitis



AMNIOTIC MEMBRANES

Innermost avascular layer of full term placental tissue
May be dehydrated, lyophilized, or cryopreserved

[1]SOURCE: https://www.aoa.org/news/clinical-eye-care/the-wonderful-healing-properties-of-amniotic-membranes







PT COUNSELING

"You have dry Eye"

Pts have a variety of reactions

1. Panic
2. Despair
3. Complete indifference
4. Relief?

As with any disease diagnosis, the communication of a clear plan with a step-wise approach to treatment offers the best chances of success

INCREASING COMPLIANCE

- Frequent follow ups help
- Make it part of the routine (brush your teeth and your lids)
- It didn't happen overnight, and we won't solve it over night — Steroids Help
- No cure, just treatments
- $ Discuss financial impact – it's a big deterrent
- Write out your instructions

THANK YOU!

Kyle A. Sandberg, O.D., F.A.A.O.

210-283-6876

ksandber@uiwtx.edu