



A Modern Approach to Dry Eye

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Disclosures

- ◇ Allergan
- ◇ Alcon
- ◇ Tarsus
- ◇ Eyenovia
- ◇ Oyster Point
- ◇ Ocuphire
- ◇ Dompe
- ◇ Orasis

Dry Eye Overview

- 30 million Americans suffer from dry eye
- \$3.8 billion spent on dry eye symptom relief annually in USA
- most frequent encountered disease state by eye care providers
- 43% of asymptomatic patients have clinical dry eye
- Nomenclature

Dry Eye Definition

“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

Previous Dry Eye Treatments

“Treat the Symptoms”

- ◇ Artificial Tears
- ◇ Punctal Plugs
- ◇ Anti-inflammatory topicals
- ◇ Ignore

Modern Approach

1. Identify underlying cause
2. Address the underlying cause
3. Maintenance

ARTIFICIAL
TEARS
DO NOT
ADDRESS
UNDERLYING
CAUSE OF DRY
EYE

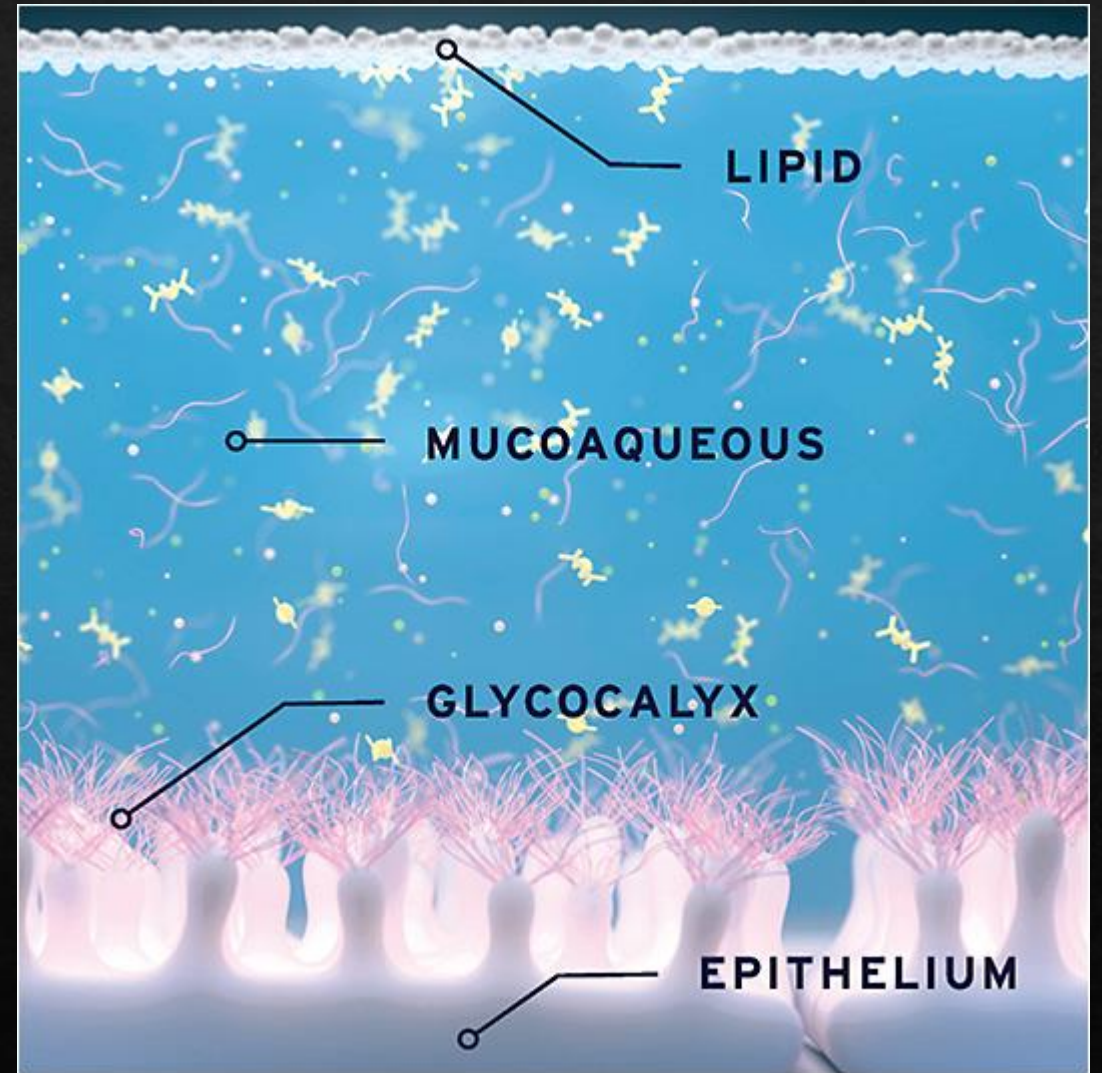


Tear Film Composition

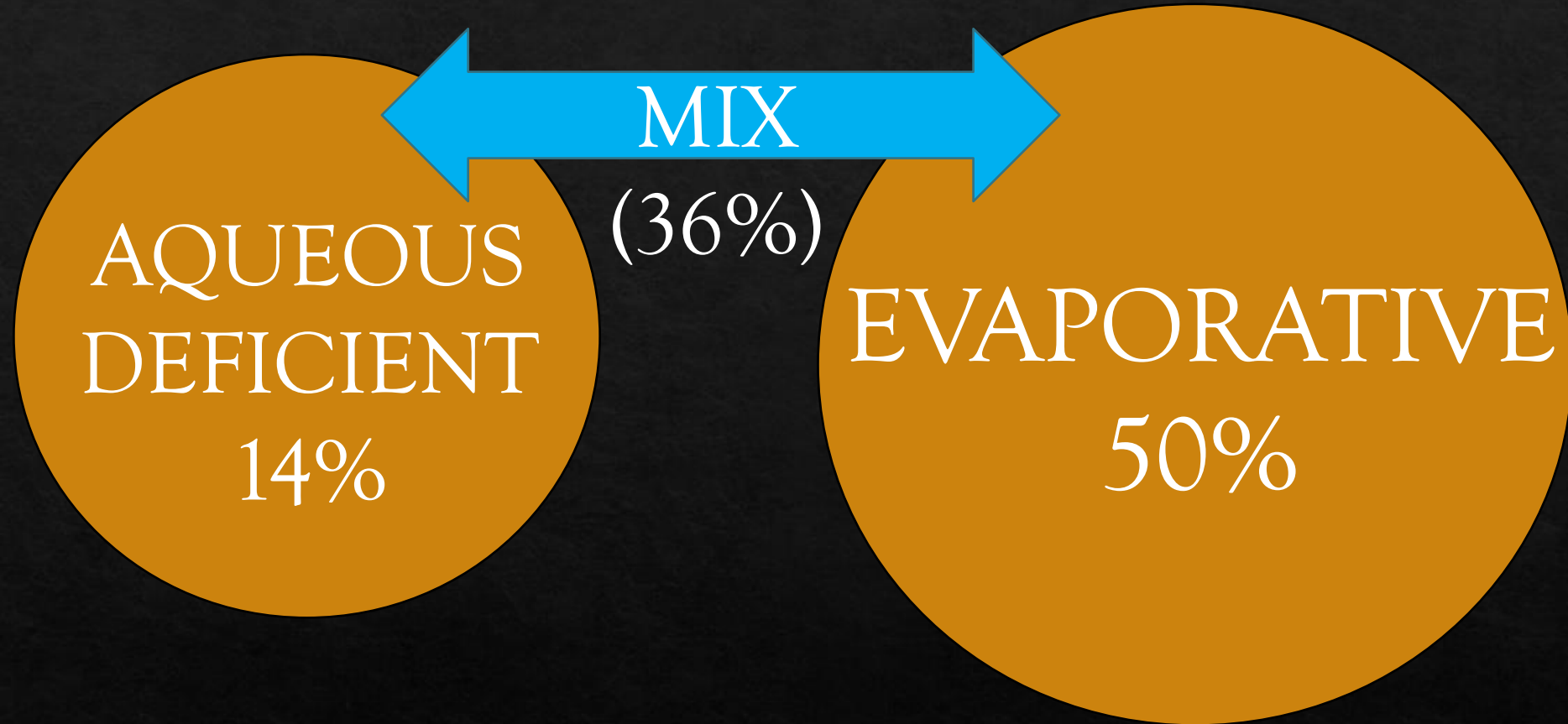
Lipid: prevents tears from evaporating between blinks

Aqueous: makes up bulk of tear film

Mucin: helps spread the tears across the surface of the eye



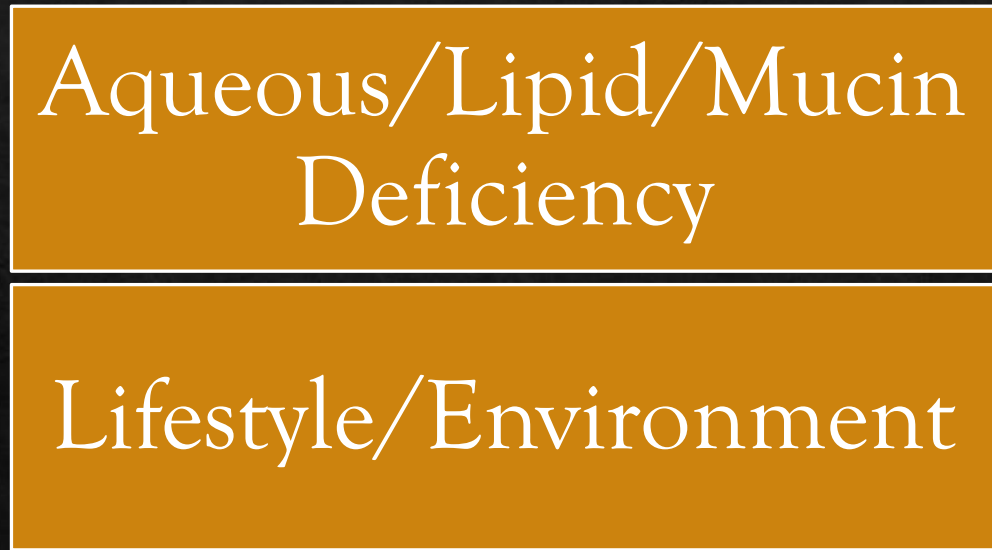
Categories of Dry Eye Disease



“DOES NOT MAKE ENOUGH TEARS”

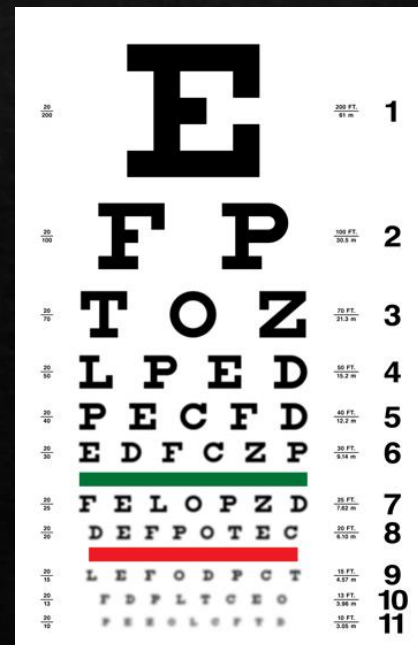
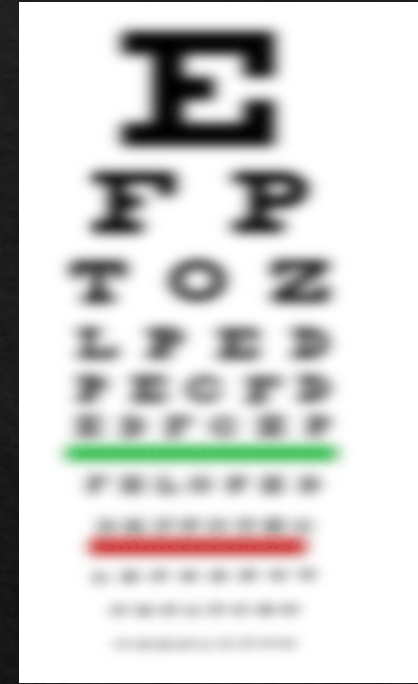
“MAKE ENOUGH TEARS, JUST NOT GREAT QUALITY”

Tear Evaporation



Symptoms of Dry Eye Disease

- 1) Blurry vision
- 2) Fluctuating Vision
- 3) Comfort
 - burning, watering, gritty, foreign body sensation, redness, itching
- 4) Asymptomatic



Risk Factors for Dry Eye Disease

Age (older)

Sex (females)

Medications

Diet

Environment

Ocular
Surgeries

Lifestyle
Factors

Contact Lens
Wear

Systemic
Conditions

SYSTEMIC CONDITIONS CAUSING DRY EYE DISEASE

HYPERTENSION

DIABETES

ROSACEA

ATOPY (allergic rhinitis, asthma, eczema)

ANDROGEN DEFICIENCY

SYSTEMIC LUPUS ERYTHEMATOSUS

SJOGREN'S SYNDROME

THYROID

GRAFT VS HOST DISEASE

FIBROMYALGIA

AUTOIMMUNE (RA, ARTHRITIS, AK,
PSORIASIS)

SLEEP APNEA

Class of drugs

Adjuncts to anesthesia	Antipyretic agents
Analgesics	Antirheumatic agents
Antiandrogens	Antispasmodics
Antiarrhythmics	Antivirals
Anticholinergics	Anxiolytics
Antidepressants	Bronchodilators
Antiemetics	Chelating agents
Antihistamines	Decongestants
Antihypertensives	Diuretics
Antileprosy agents	Neurotoxins
Antimalarial agents	Opioids
Antimuscarinics	Psychedelic agents
Antineoplastics	Retinoids
Antiparkinsonians	Sedatives and hypnotics
Antipsychotics	

CONTACT LENSES

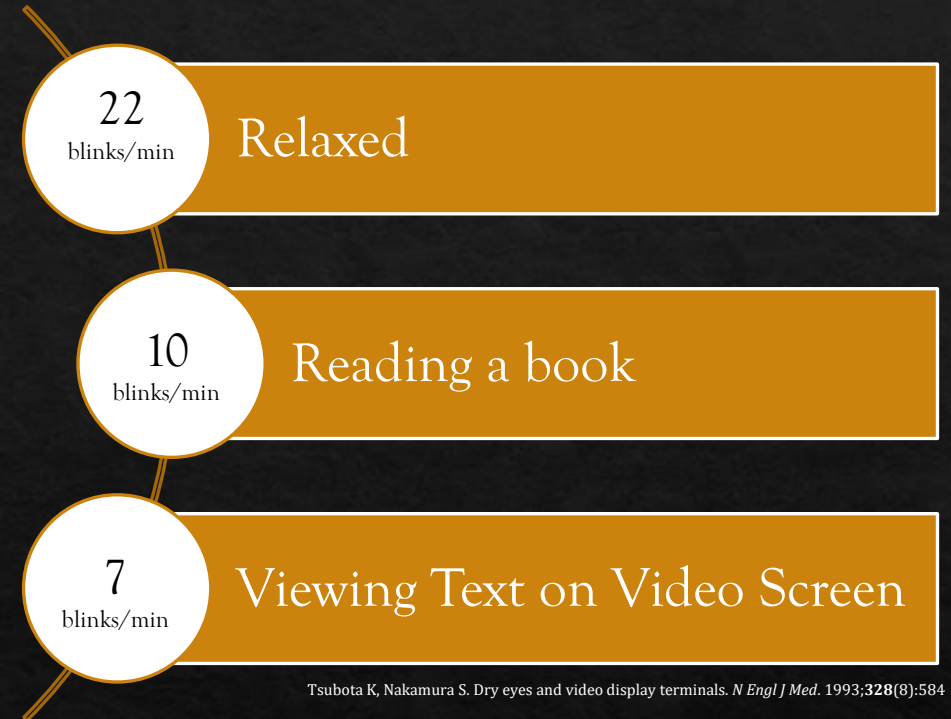
- CL wear ACCELERATES dry eye disease
- 60% OF CL WEARERS HAVE eye disease
- CLs can mask 'dry eye symptoms'
- contact lenses → cell damage → inflammation → goblet cell loss → tear film

OCULAR SURGERIES

Ocular Surgery	Prevalence of DED after
CATARACT	77%
PENETRATING KERATOPLASTY	60%
LASIK	27%
GLAUCOMA SUGERY	78%
BLEPHAROPLASTY	26%

Lifestyle Factors

- Increased Digital Device Use (Reduced or Incomplete Blinking)
- Poor Sleep Quality & Reduced sleep duration
- Psychological stress



Tsubota K, Nakamura S. Dry eyes and video display terminals. *N Engl J Med.* 1993;**328**(8):584

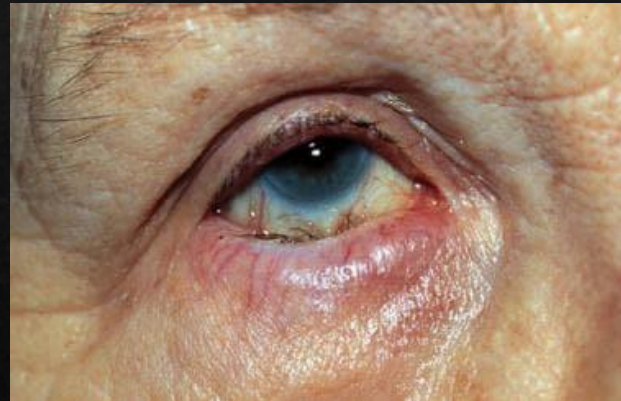
The Big Picture

- ◇ Eyelids
- ◇ Eyelashes
- ◇ Conjunctiva
- ◇ Cornea
- ◇ Face (V2 area)



Eyelid Exam Checklist

- ◇ Looking for
 - ◇ Lid architecture (entropion/extropian) & appearance (telangiectasia)
 - ◇ Biofilm
 - ◇ Eye lashes
 - ◇ Opening of the meibomian glands
 - ◇ Meibomian glands



Blepharitis

“Inflammation of the eyelid margin”

- ◇ Acute Anterior Blepharitis: caused by variety of bacteria, viruses, fungi, & parasites
- ◇ Chronic Anterior Blepharitis: overgrowth of normal skin flora (*Staphylococcus aureus*)

Deposition of biofilms that release inflammation induces exotoxins & lipases along lid margin



Leads to chronic inflammatory responses



Increases telangiectasia, lid hyper keratinization, folliculitis, MGD

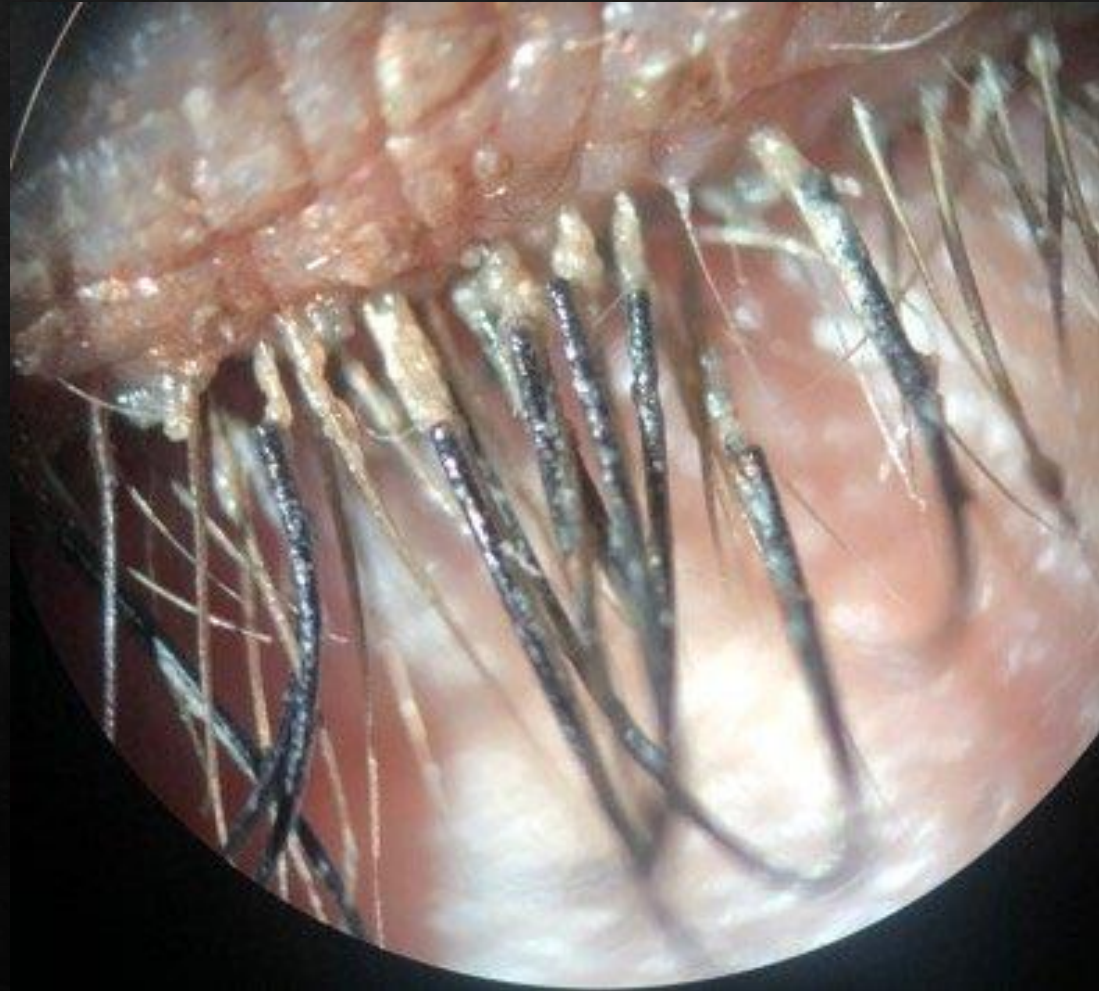
Blepharitis Biofilm Theory

- ◆ NOT eyelid dandruff
- ◆ A slimy, sticky film of bacteria that coats a surface
- ◆ Needs moisture, nutrients, & a surface



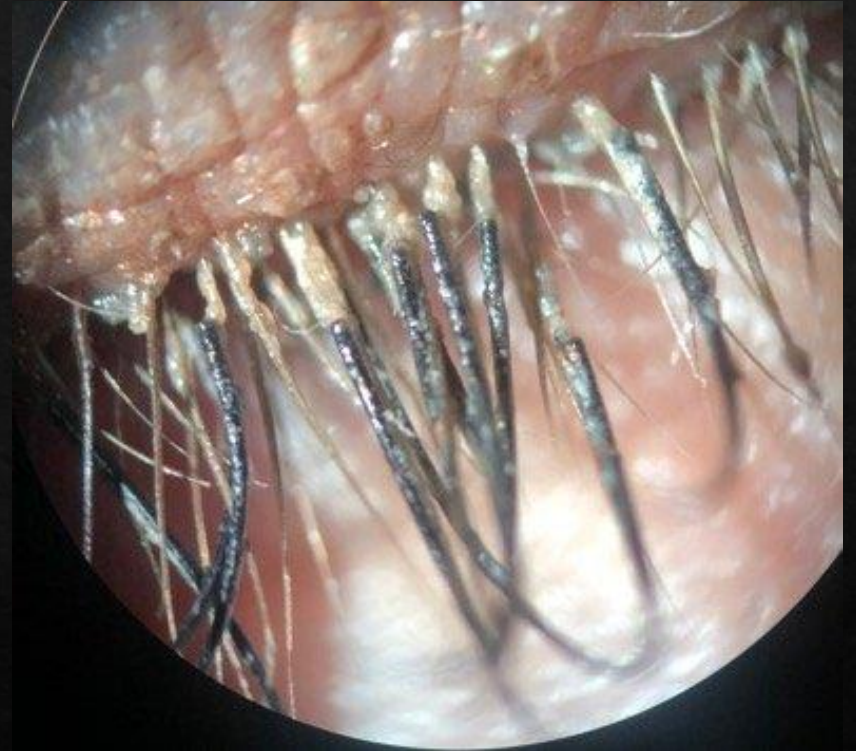


Collarettes?



Collarettes?

- ◇ Staphylococcal overgrowth
- ◇ Demodex
- ◇ “Demodex Blepharitis”
- ◇ Differentiated with microscopic examination
- ◇ Demodex found on 100% of lashes with collarettes



Demodex

- ◇ *Demodex folliculorum* & *Demodex brevis*: saprophytic mites
- ◇ Typically harmless but play pathogenic role in high densities (>5 mites per lash)
- ◇ 14 day life cycle → lay eggs inside hair follicle or sebaceous gland
- ◇ Nourishment comes from epidermis & sebum
- ◇ One opening



Demodex

- ◆ Incidence increase with age (73% in age 60+)
- ◆ Causes inflammation by:
 - ◆ destroying epithelial cells & exudation of digestive waste material when they die
 - ◆ 8 legs that scrape the lash/lid margin leads to mechanical damage that triggers inflammation
 - ◆ Carry bacteria that contributes to inflammation
- ◆ Symptoms: Itching
 - ◆ Types of itching



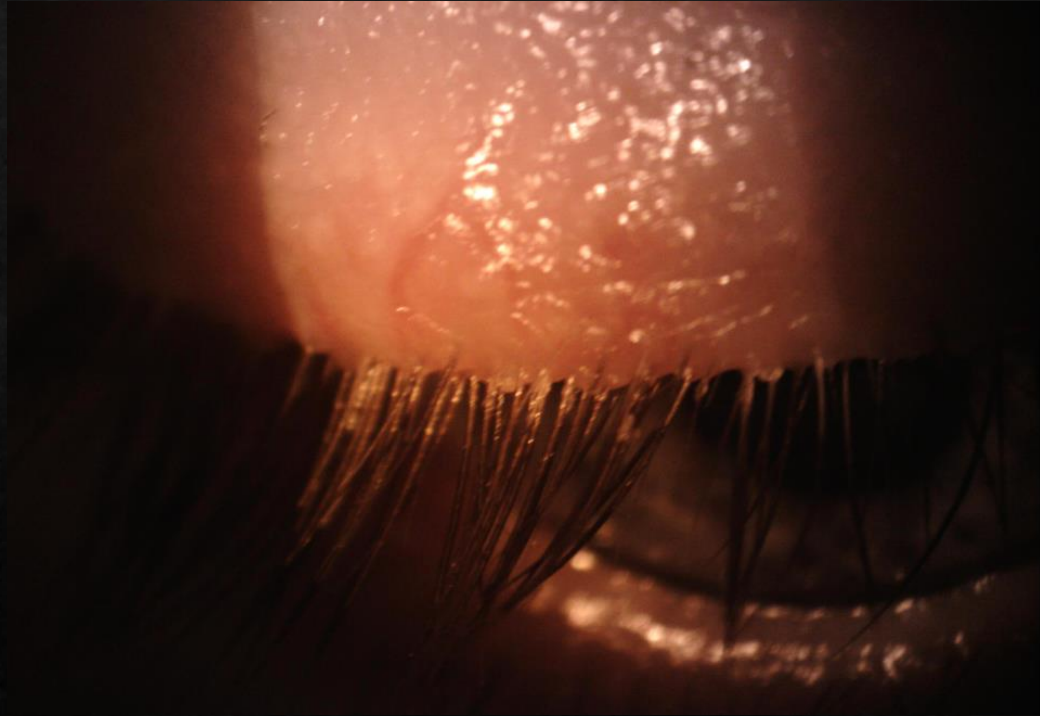
Clinical Pearl

◆ HAVE PATIENT LOOK DOWN



Clinical Pearl

◆ HAVE PATIENT LOOK DOWN



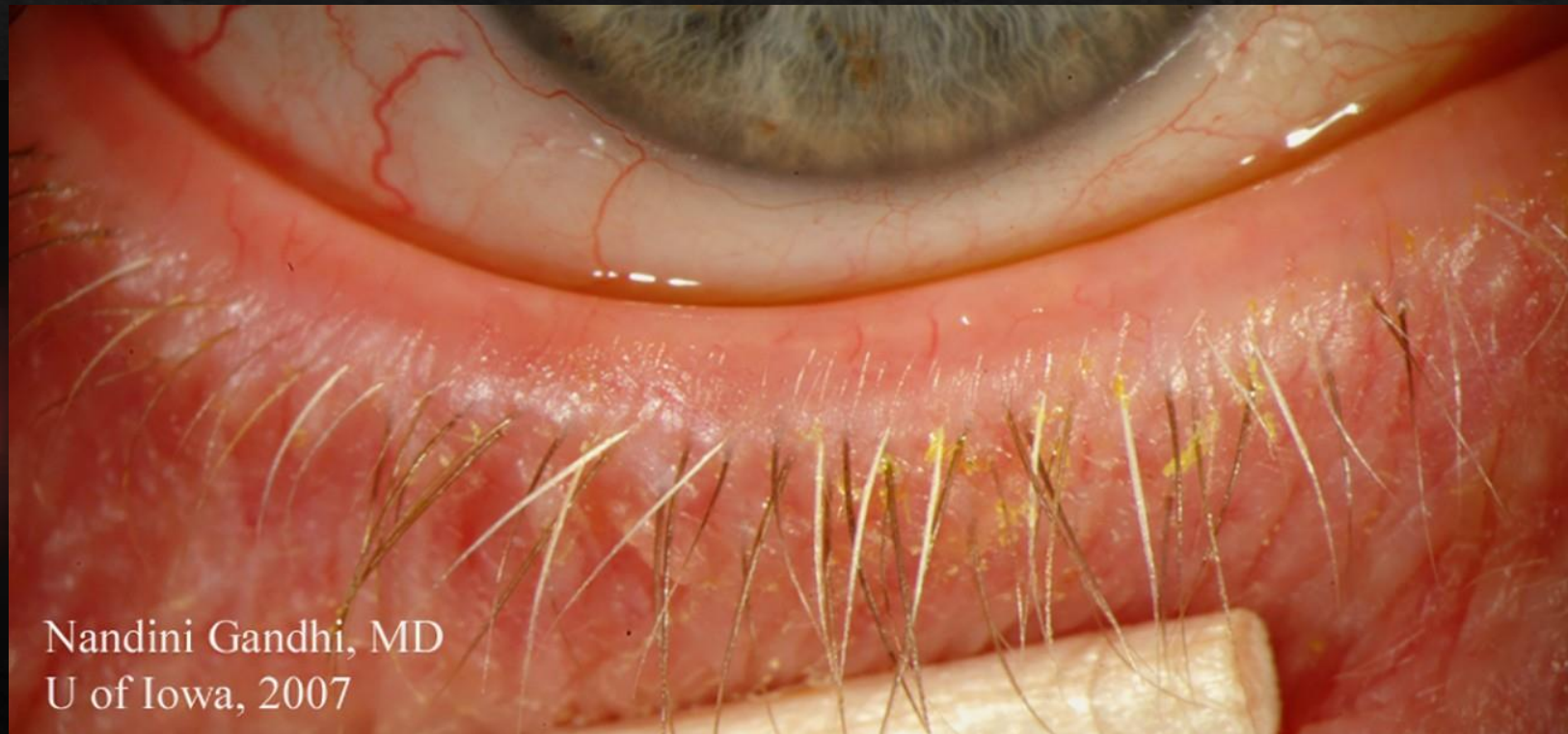
Eyelash Extensions

◆ Patient education



Ocular Rosacea

- ◇ 50% have ocular symptoms: tearing, FBS, itching, photophobia, blurry vision, dry eye



Rosacea

- ◇ Chronic Inflammatory Skin Disease
- ◇ 4 Historical Clinical Subtypes
 - ◇ Erythematotelangiectatic
 - ◇ Papulopustular
 - ◇ Phymatous
 - ◇ Ocular
- ◇ New Classification system phenotype approach



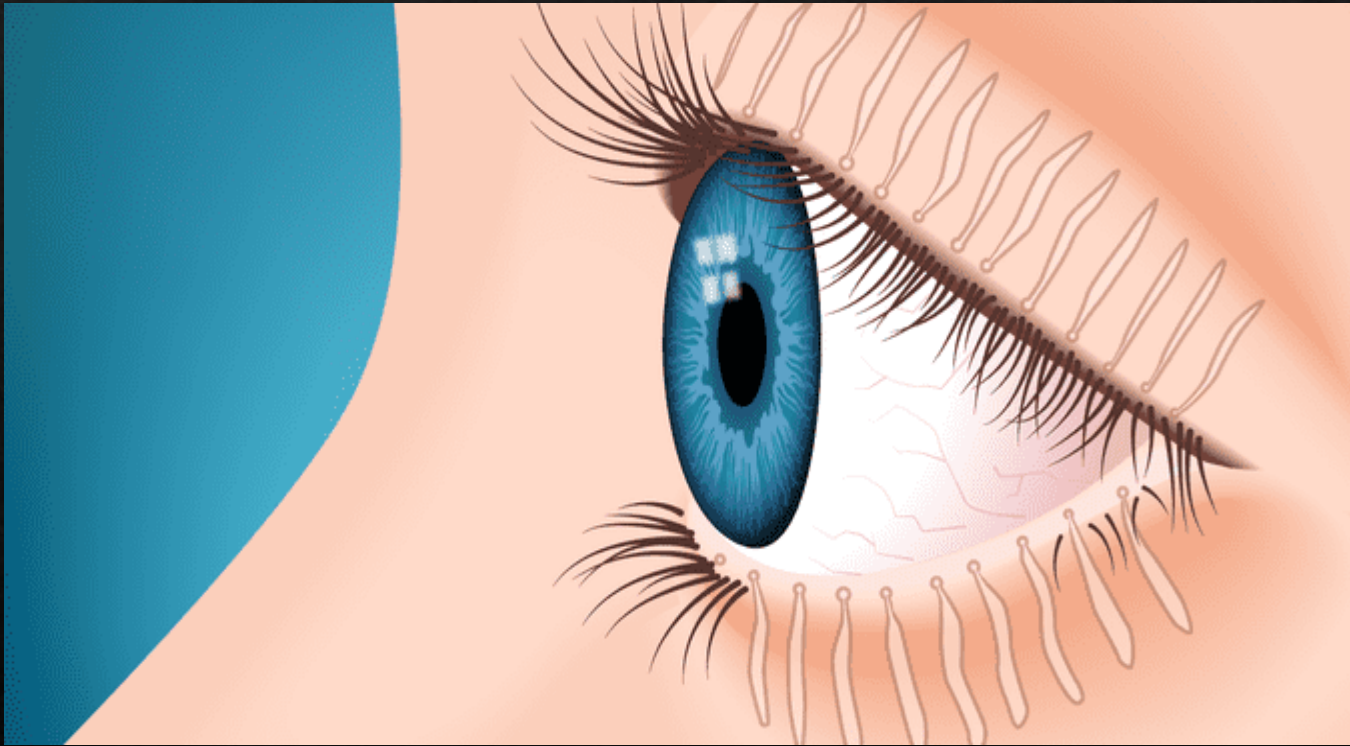
Rosacea

- ◇ Poorly understood etiology & pathophysiology
- ◇ 16 million Americans impacted
- ◇ “Celtic”/Northern European heritage most common
- ◇ Females = Males
- ◇ *Demodex* infestation increased in patients with rosacea
 - ◇ Eradication of demodex seems to alleviate rosacea symptoms

Rosacea Triggers

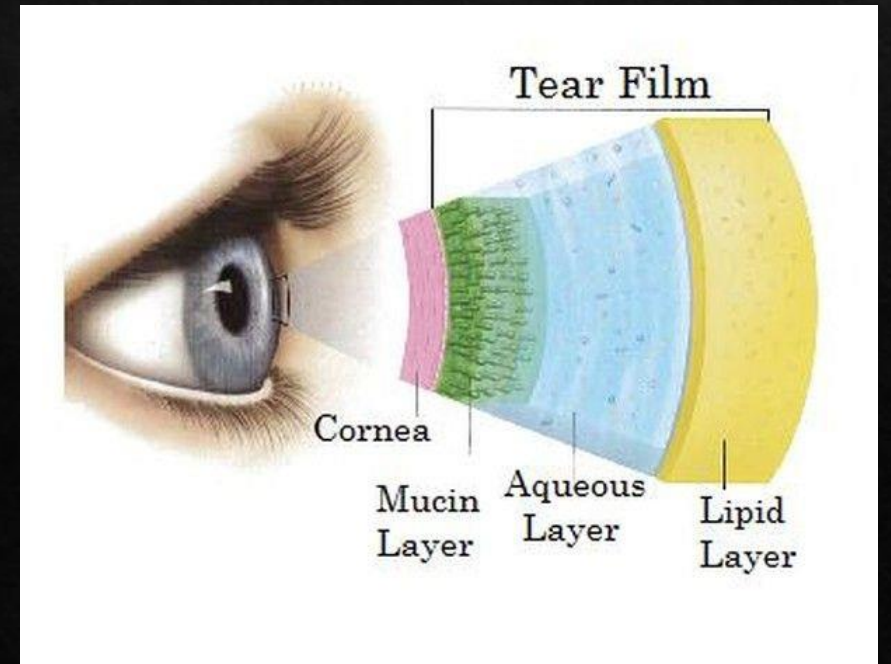
- ◇ Heat, noxious cold
- ◇ UV radiation
- ◇ Alcohol & coffee
- ◇ Spicy food
- ◇ Any event/ingredient that triggers inflammation
- ◇ Clinical Signs: flushing, erythema, telangiectasia, pustules

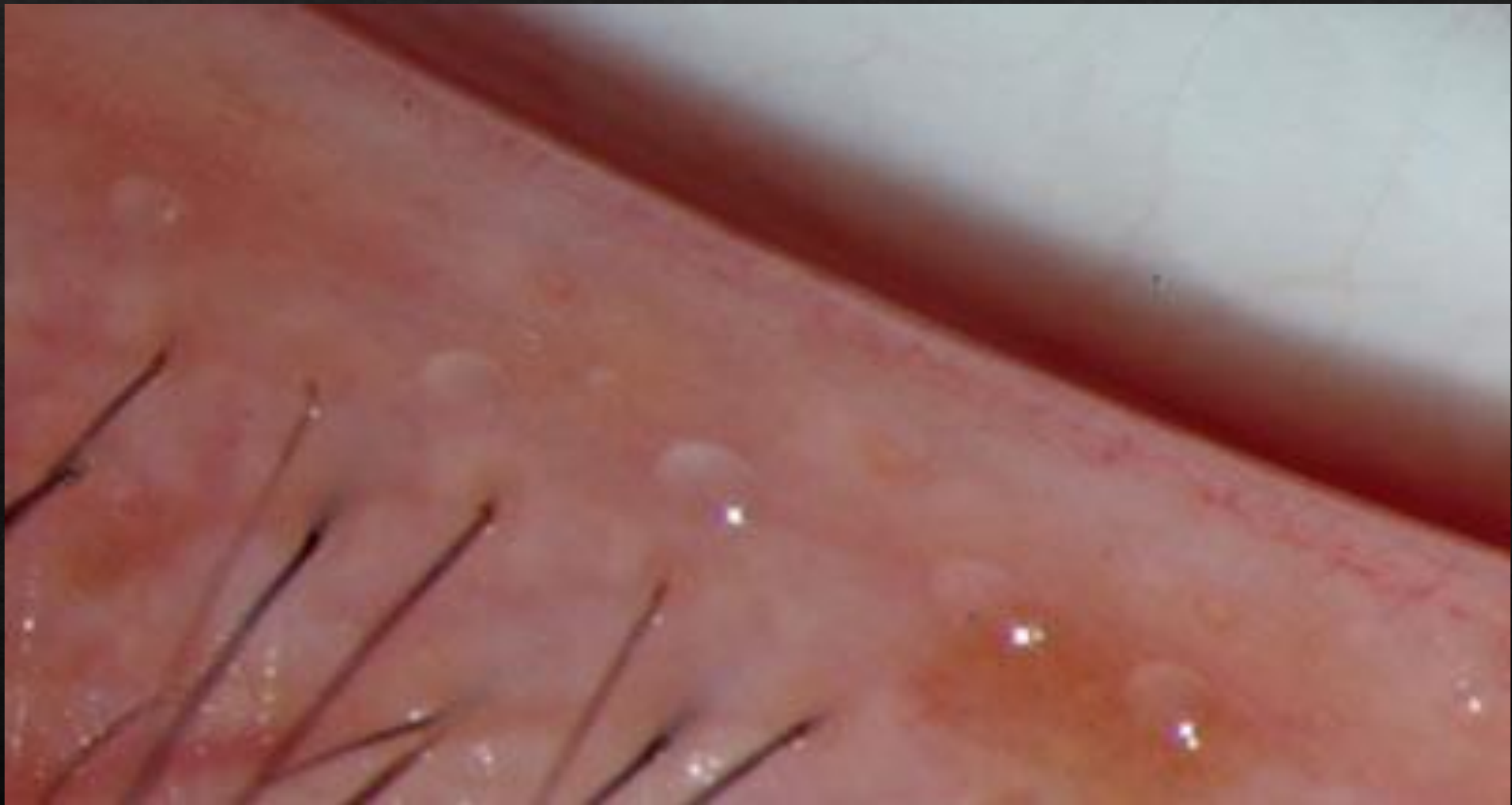
Meibomian Glands



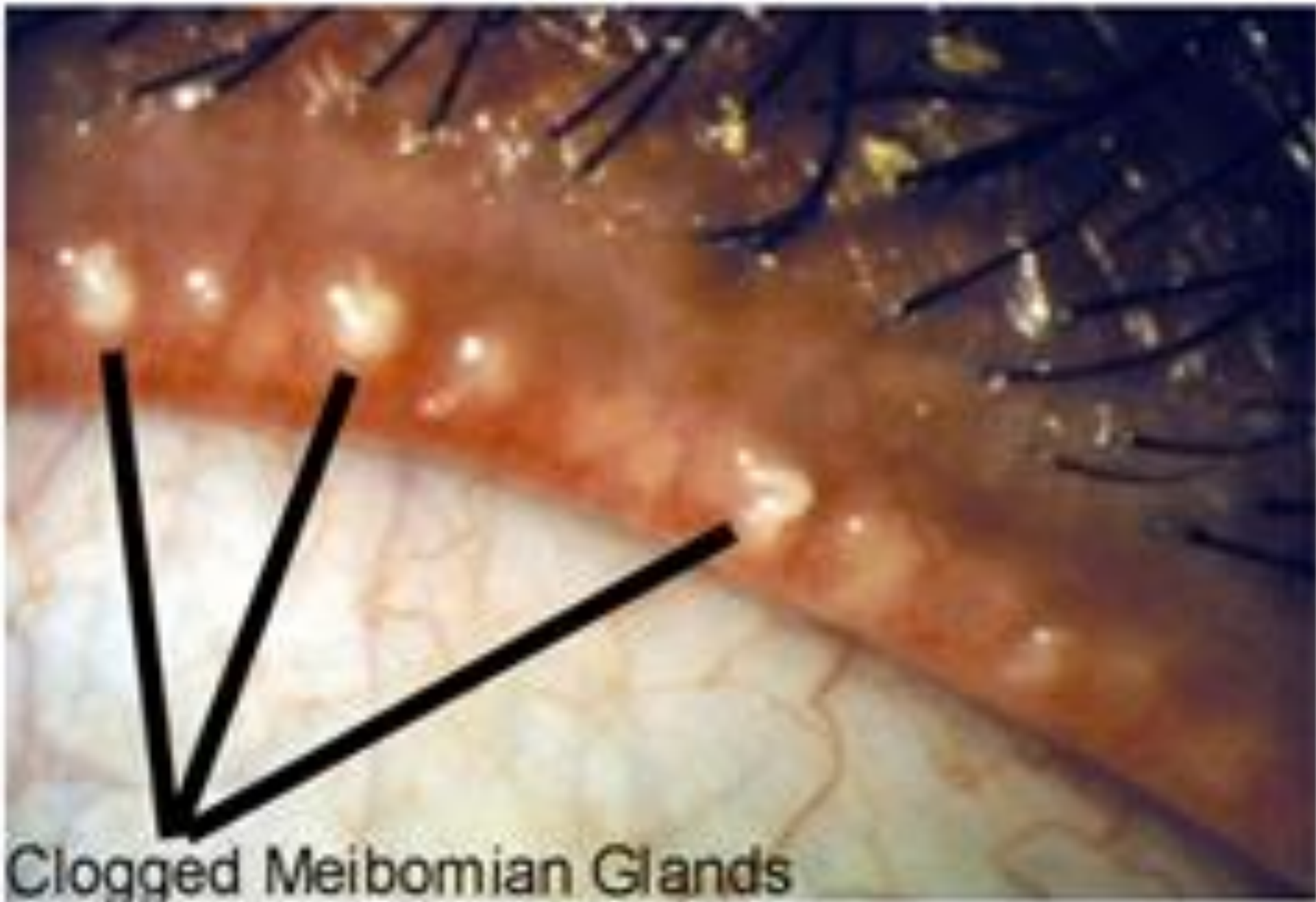
25-40 Upper lid
20-30 Lower lid

CREATE THE LIPID LAYER OF THE TEAR FILM





Healthy MG Sebum=olive oil consistency & easily expressed

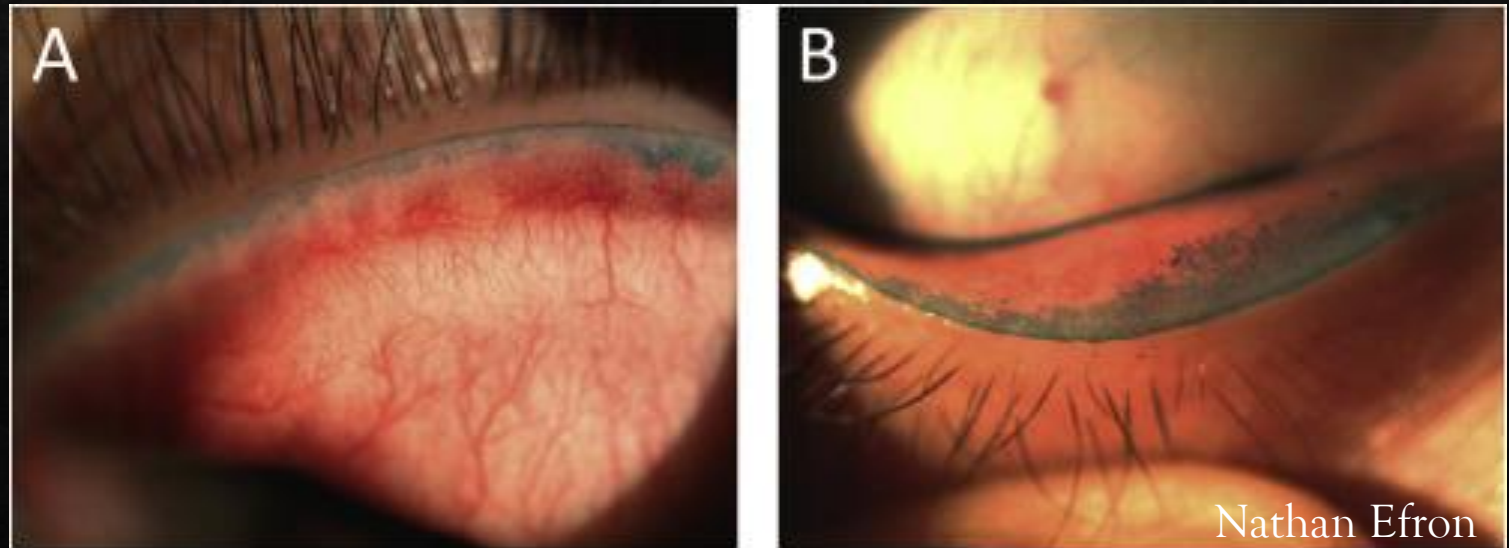


Clogged Meibomian Glands



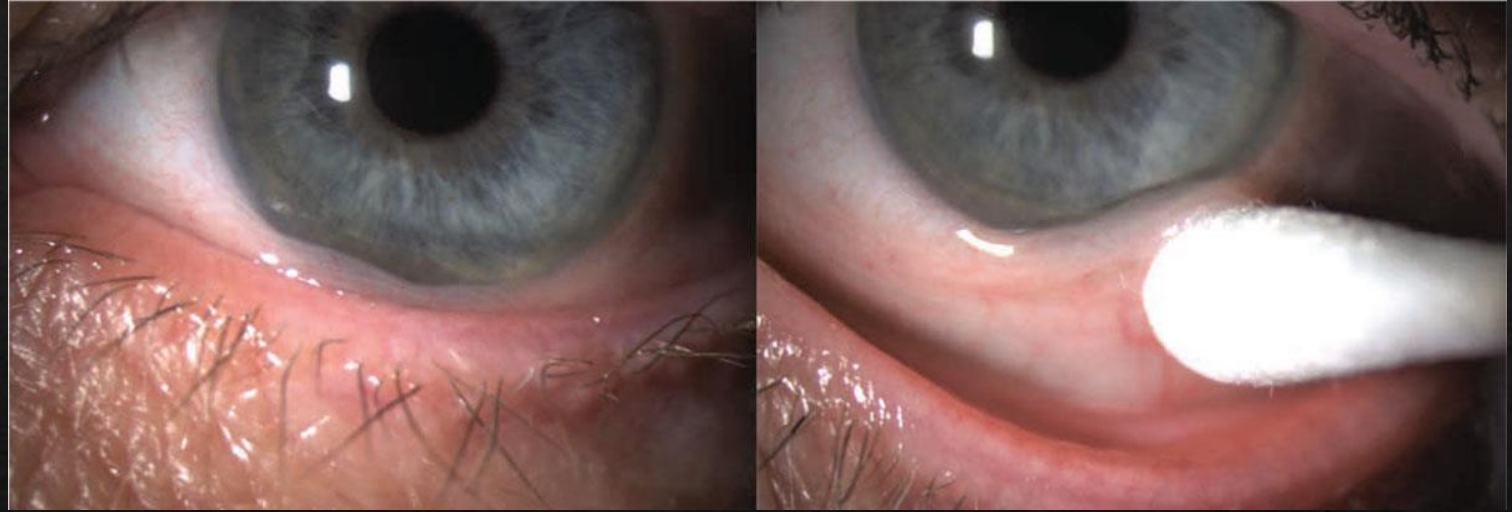
Lid Wiper Epitheliopathy

- ◆ Primary Cause: increased friction between the lid wiper & ocular/anterior contact lens surface due to inadequate lubrication
- ◆ -Dry Eye, abnormal blinking patterns, poor CL surface lubricity, environmental influences
- ◆ Linked with sub-clinical inflammation
- ◆ Treatment: steroid, lubricant



Conjunctiva Exam

- ◇ Conjunctivachalasis
- ◇ Lissamine Staining

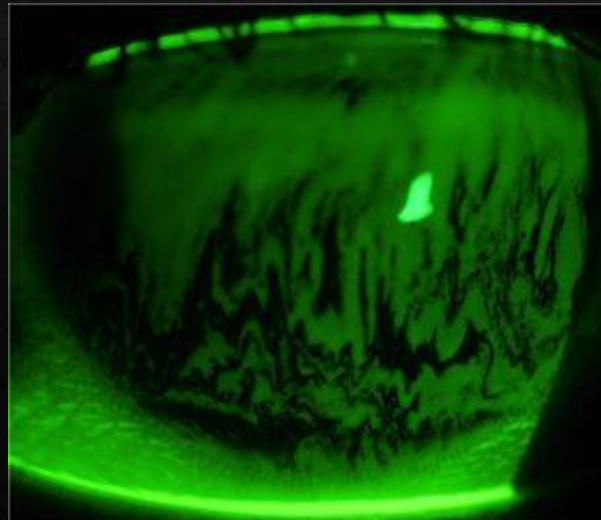


Mucin →



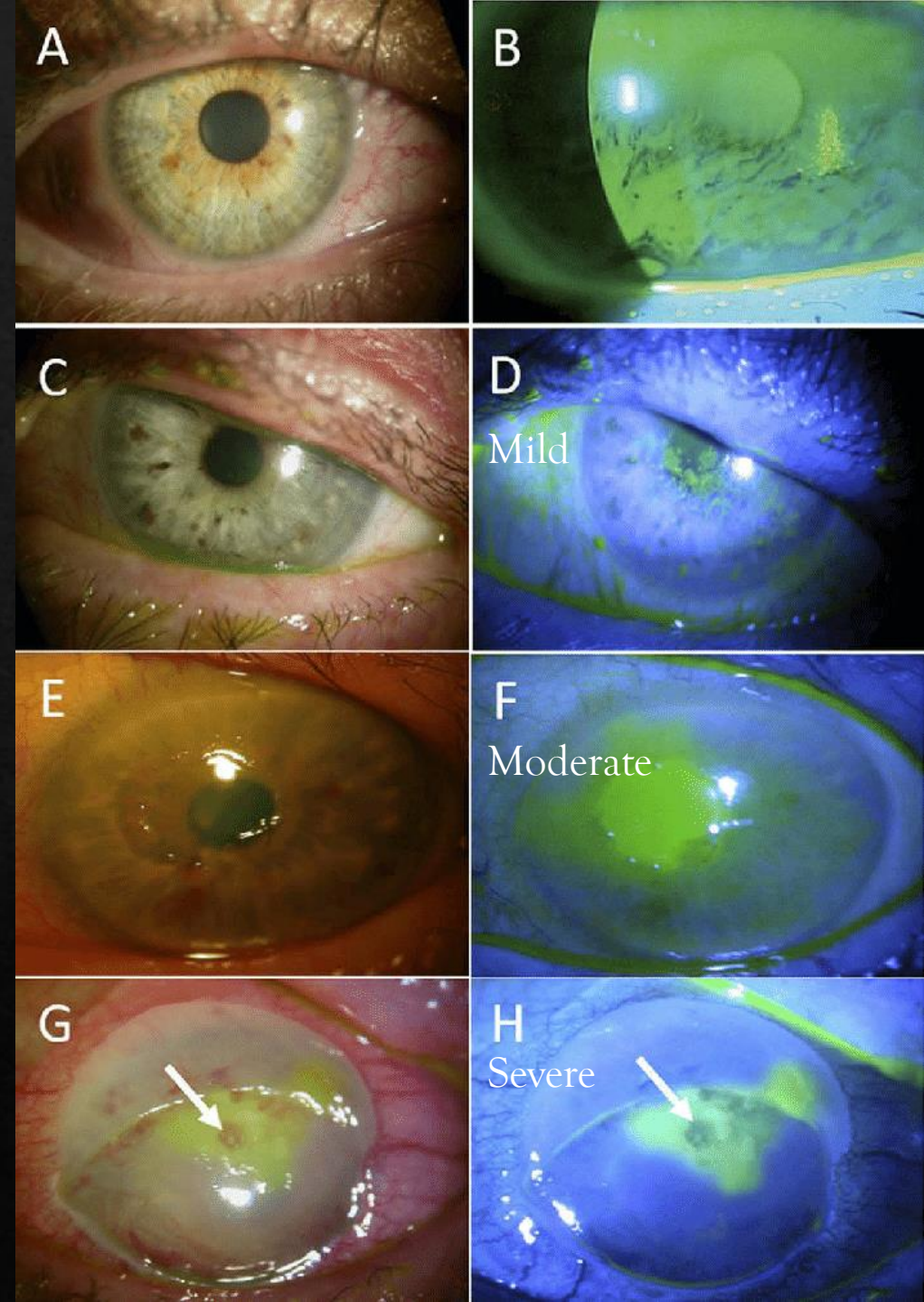
Cornea Exam

- ◇ NaFl & Lissamine
- ◇ Tear Meniscus (think aqueous)
- ◇ Tear Break Up Time (TBUT)
 - ◇ Goal: >10sec
- ◇ Corneal staining
 - ◇ Pattern
 - ◇ Stain Without Pain

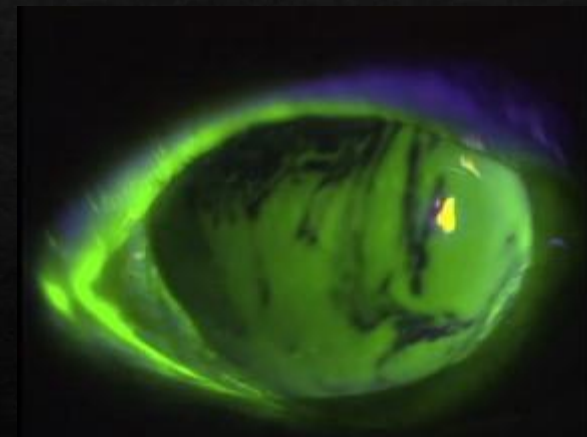
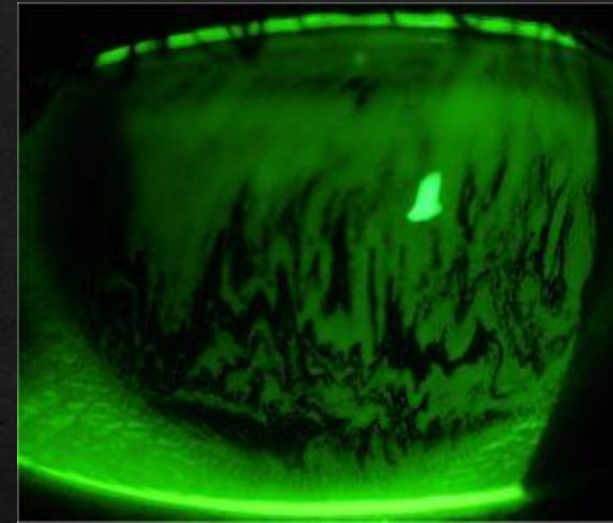
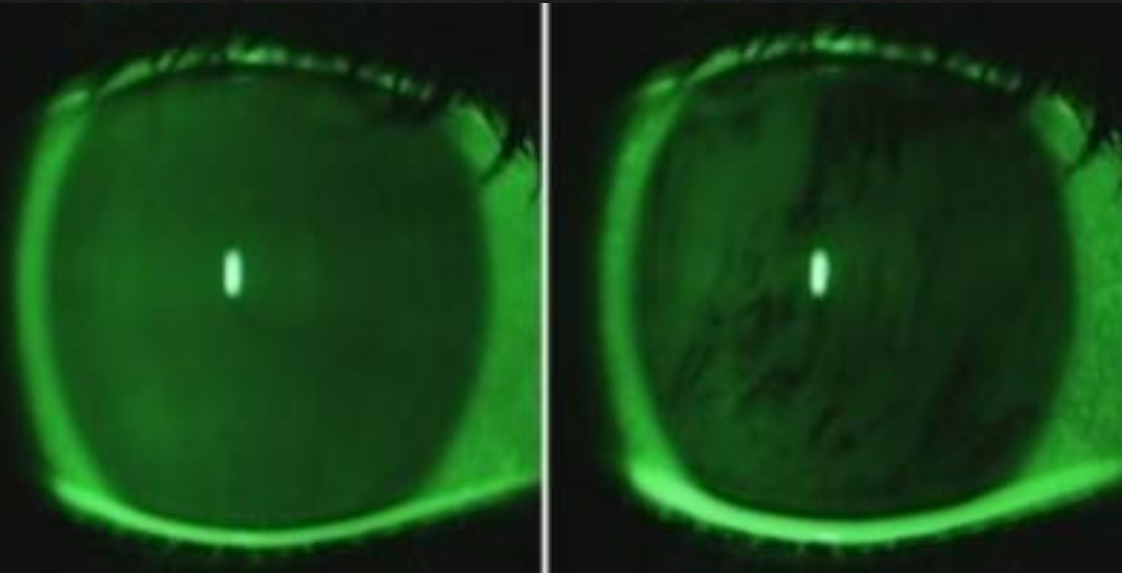


Neurotrophic Keratitis

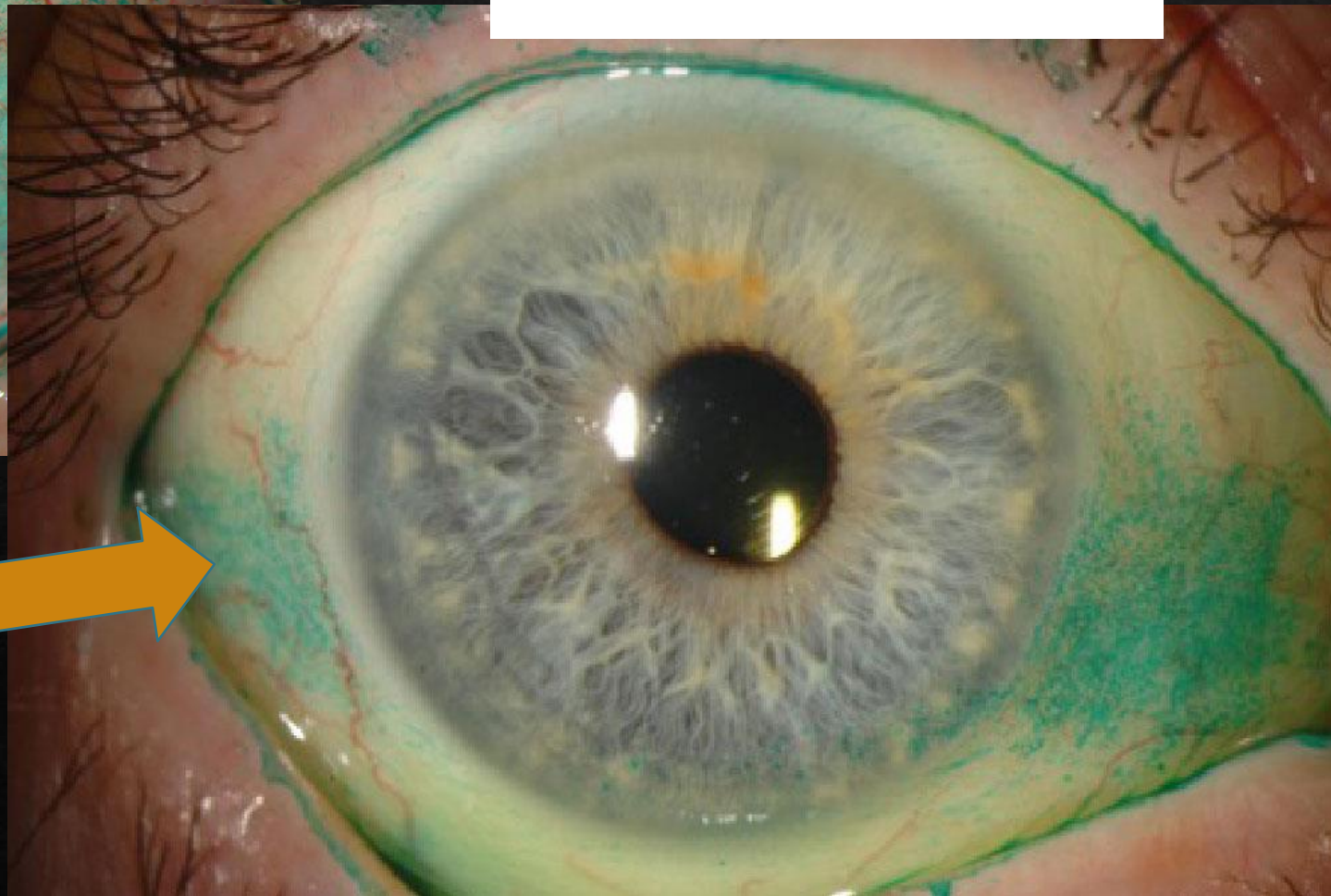
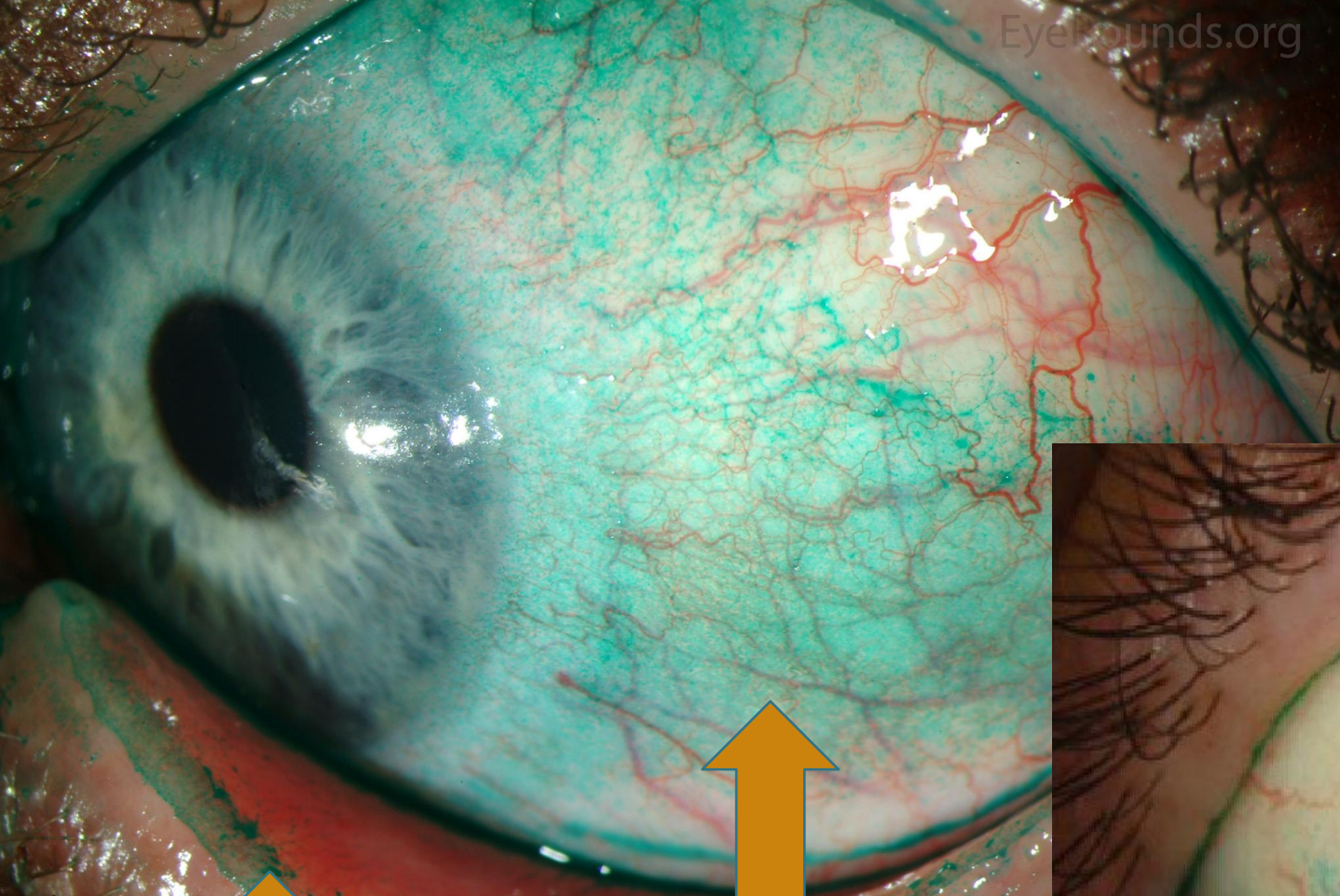
- ◆ “Stain without Pain”
- ◆ Corneal Sensitivity Test
 - ◆ Dental floss
 - ◆ Cotton from cotton tip applicator
- ◆ Stages: 1-3
- ◆ Treatment
 - ◆ Amniotic Membrane
 - ◆ **OXERVATE™** (cenegermin-bkbj)



DIAGNOSTICS

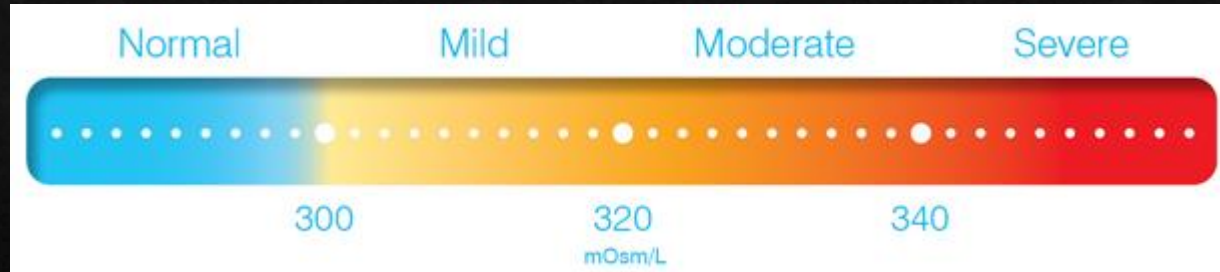


Wait several minutes



HYPEROSMOLARITY

- Osmolarity=measure of salt concentration of tears
 - Changes in osmolarity due to fluctuations in water content
- Hyperosmolarity from increased evaporation rate or reduction of tear secretion is indicated of reduced aqueous levels
 - Hyperosmolarity stimulates epithelial cell death → inflammatory cascade → proinflammatory cytokine production → cell death via apoptosis & loss of goblet cells
 - Variability (readings & between eyes)



INFLAMMATION DETECTION: INFLAMMADRY

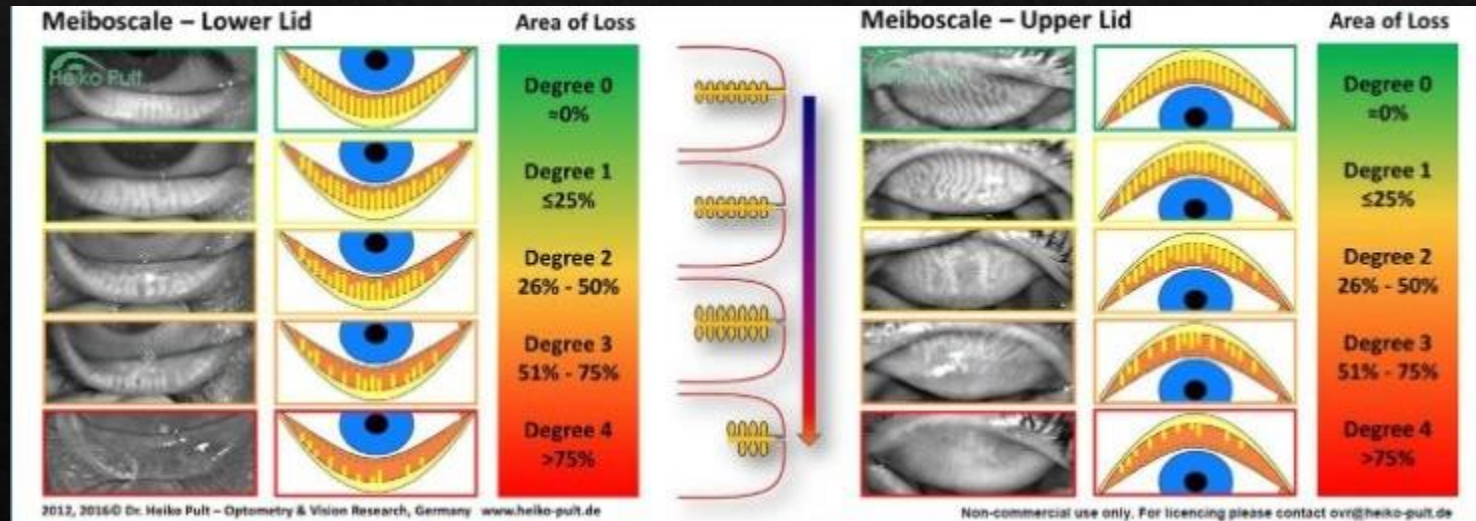
IDENTIFIES ELEVATED LEVELS OF MMP-9

85% SENSITIVITY

94% SPECIFICITY



MEIBOGRAPHY





No Structural Change
(could still have issues)



Duct dilation, truncation, & dropout



Severe Truncation & Dropout

Treatments

Treatment Goals

- ◇ Eradicate Demodex Inflammation
- ◇ Clean up the lid margin
- ◇ Improve meibomian obstruction
- ◇ Decrease Inflammation



In office treatments: Blephex ZEST



Sponsored

200 PCS Disposable Crystal Eyelash
Mascara Brushes Wands (Red)

200 Count (Pack of 1)

★★★★★ ~ 11,355

\$6⁵⁹ (\$0.03/Count)

Broad Band Light (BBL)/ Intense pulsed light (IPL)



Lumenis



- Rosacea
- Blepharitis
- Demodex
- Hordeolum
- MGD



Sciton

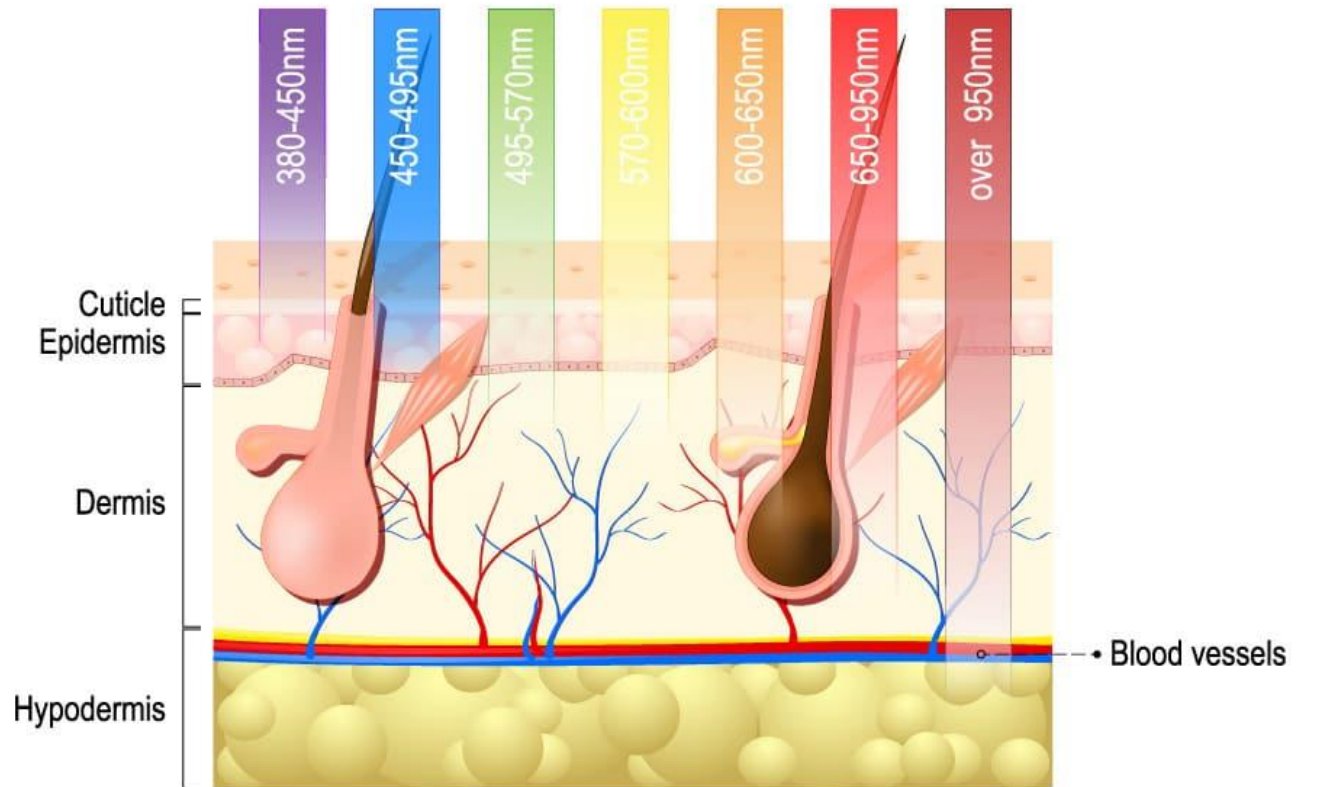


Cynosure (Icon)

IPL

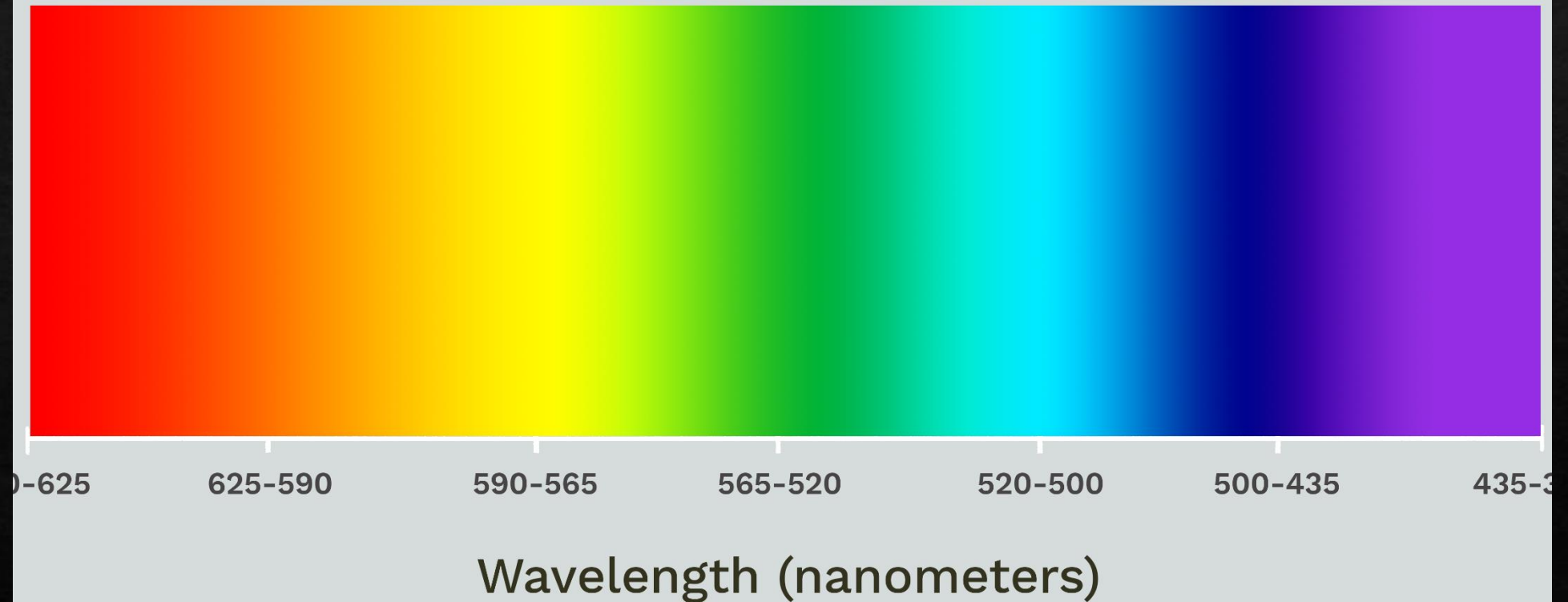
- Wavelength
- Different from 'laser light'
 - Non-Monochromatic
 - Non-coherent
 - Defocused

Light Therapy



The Visible Light Spectrum

The visible light spectrum is the section of the electromagnetic radiation spectrum that is visible to the human eye.



IPL

- Emits a broad, continuous spectrum of light (515-1200nm) with the ability to apply filters to target specific chromophores (ie melanin & hemoglobin)
 - Targets Reds & Browns
 - Melanin: absorption 400-700 nm range
 - Blood: absorption 900-1200nm range
 - The light that is emitted from the flashlamp is absorbed by the oxyhemoglobin in the blood vessels → generates heat that coagulates the cells

IPL Mechanism of Action

- ◇ Light is being absorbed by pigment & blood (chromophore) in skin
- ◇ Use different wavelengths to target skin depth, adjust power/fluence
 - ◇ Shorter wavelengths=superficial structures
 - ◇ Longer wavelengths=deeper into skin
 - ◇ 590→reaches dermis and nothing further
- ◇ Light emitted absorbed by the oxyhemoglobin → causes blood vessels to lyse—reduces release of proinflammatory mediators



BEFORE

AFTER 1 IPL

Jessilin Quint, OD



Death by IPL

- ◇ [\(90\) Death By IPL - Demodex Mite on Eyelash - YouTube](#)



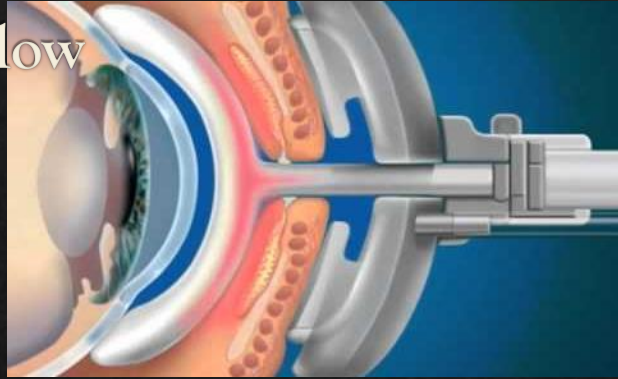
OptiLight IPL

- FDA approved (April 2021) for dry eye disease due to meibomian gland dysfunction (MGD)
- Intense Pulsed Light Technology (IPL)
- Skin Fitzpatrick I-V
- Non-ablative device that targets melanin reduction & oxy/deoxy hemoglobin





Lipiflow



Tear Care



iLux



Mibo Thermoflo



Radio Frequency

- Delivers radiofrequency to heat skin
- Dry Eye → unclogs MG
- Aesthetic Perks → “baggy” under eyes, wrinkle reduction, stimulation of collagen
- Treatments last 30-60 minutes



CVNDSURE
TempSure™ *Envi*

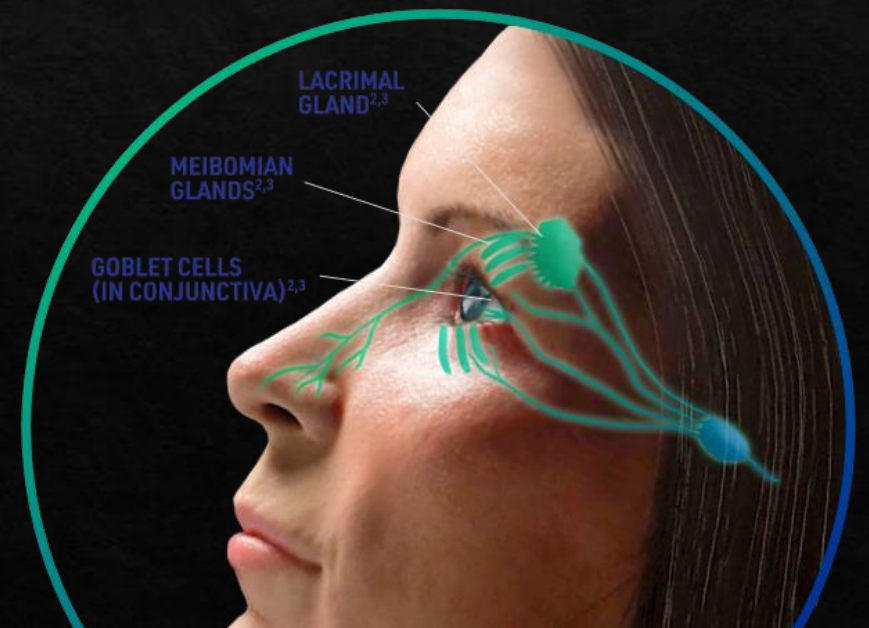
Before & after 3rd treatment
Courtesy of R. Saluja, MD



TempSure Envi

Neurostimulation

- How it works
- Increases production of basal tear components by stimulating the nerves responsible for producing various tear components
- Lacrimal Unit has several possible access points to stimulate tear production
 - Stimulation can be chemical or electrical energy
 - Research shows neurostimulation can achieve lacrimal, goblet cell, and meibomian gland stimulation
 - Symptoms Improve
 - Increase in basal tear production & volume



Tyrvaya (Oyster Point Pharma)

- FDA approved (October 2021) varenicline 0.03mg nasal spray
- Indicated for signs & symptoms of dry eye treatment
- Mechanism of Action: binds to cholinergic receptors to activate the trigeminal parasympathetic pathway resulting in increased production of basal tear film
- Bid dosing
- Educate patients on how to use



2nd Generation iTear 100

- FDA approved March 2022
- Prescription neuromodulation therapy designed to acutely increase production without contact in adults over a 30-day period
- iTear 100 is a non-chemical connected device that offers telehealth tools
- Only prescription medical device for home use that can increase natural tear production in all adult patients
- Olympic Ophthalmics



DRY EYE MASTER



Other therapeutics

1. Autologous Serum tears
2. Amniotic membranes
3. Topical & Oral Ab/Steroids
4. RegenerEyes
5. cyclosporine
6. lifitegrast



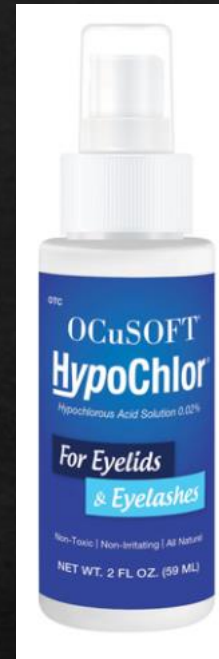
Moist hot compress



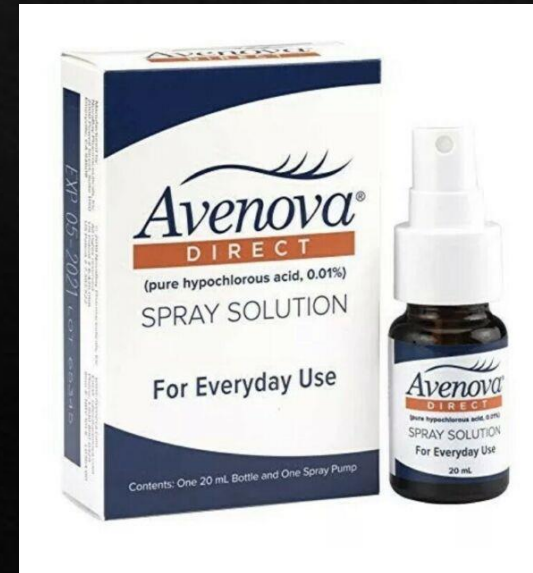
- MORE EFFECTIVE THAN WASH CLOTH
- CLEANER/MORE HYGENIC
- BETTER COMPLIANCE
- LESS MESSY



baby shampoo for lid scrubs one of the
worst things to recommend for
blepharitis OR demodex



0.02% hydrochlorus acid



0.01% hydrochlorus acid