

Tear Film Dysfunction

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Financial disclosures

- I am not a paid consultant to any company.
- I am not on the speaker bureau of any company.
- I am not getting paid by any company to give this talk today.



52 year old woman

- cc: Eyes get more and more irritated over the course of the day.
- HPI: Eyes feel OK at beginning of day, but get irritated toward 3:00. Takes out contact lenses when she gets home from work. No longer wears contacts over weekends.



52 year old woman

Ocular history

- -4.00 Sph OU
- Wears daily disposable contact lenses
- Wears reading glasses over contact lenses
- Uses Systane® PRN



52 year old woman

Ocular history

- -4.00 Sph OU
- Wears daily disposable contact lenses
- Wears reading glasses over contact lenses
- Uses Systane® after eyes are irritated and she has removed her contact lenses
 - Up to 3-4 times a week



52 year old woman

- PMHx:
 - Diet-controlled diabetes mellitus
- ROS:
 - Normal
- Medications:
 - Claritin
 - Premarin



52 year old woman

- PMHx:
 - Diet-controlled diabetes mellitus
 - Seasonal allergies
- ROS:
 - Going through menopause
- Medications:
 - Claritin
 - Premarin



52 year old woman

- Family history: noncontributory
- Social history:
 - Married
 - Works as a bookkeeper
 - Hobbies: reading, crossword puzzles, cross-stitch
 - Smokes 1 pack of cigarettes per day
 - Alcohol: 2-3 drinks per week



52 year old woman

Physical exam

- V a c t x: 20/20 in each eye
 - Near vision J1+ OU at 14" with +2.25 add
- Slit lamp exam:
 - Mild conjunctival injection
 - Corneas normal
 - Contact lenses fits well
 - No blepharitis on lids
 - Moderate debris, soaps, oil in tear film



52 year old woman

Physical exam

- Motilities: Ortho at distance and near
- Pupils: Equal, responsive, no RAPD
- Amplitudes: Normal distance and near
- Schirmer with anesthesia: 5 mm OU



What's the problem?
How do we help?



Locating the problem

- Contact lenses
 - Fit
 - Material
 - Overwear
- Solutions
 - Multipurpose
 - Proper use of hydrogen peroxide systems
 - Hand soap
- Patient



Locating the problem

- I'm not going to address problems with contact lenses or solutions
- Let's look at the patient as the source of the problem
 - Figure out what the true problem is
 - Treat it appropriately
- The goal is to get this patient to comfortably wear her contact lenses as much as she wants



Dry eyes



Tear Film Dysfunction



Normal Tear Film

Why do we need it?

- The eye is the only part of the body that is not protected by skin
- Skin has two basic functions:
 - Prevent water from getting out
 - Prevent bacteria and fungus from getting in



Protecting the eye without skin

- Lashes protect the eyes from the big stuff
- Sleep with your eyes closed
 - 6-8 hours of regeneration
- Blink every three seconds
 - Cover entire surface with tears
 - Pump toxins and waste products into nose
- Constantly make tears to create a wet micro-environment



When does this system not work?

- Not getting 6-8 hours of sleep
- Not blinking every 3 seconds
 - Driving
 - Reading
 - Computer
 - TV, video games
- Dry environments
 - Air conditioning, dry heat, car defroster, MN
- Problems with the tears themselves

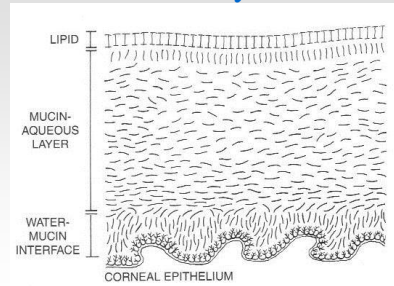


Makeup of tears

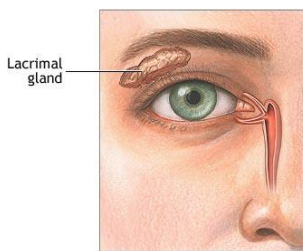
- **Water**
 - Makes up the majority of the tear volume
- **Oil**
 - Ensures a smooth surface
 - Prevents evaporation of the water part
- **Mucin**
 - Helps the water part coat the cornea evenly



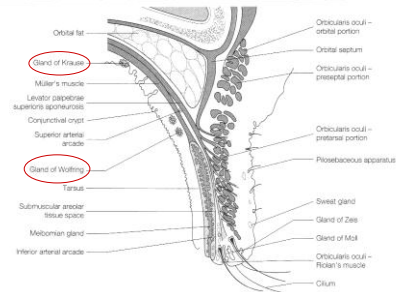
Healthy tear film



Lacrimal gland



Where are tears made?

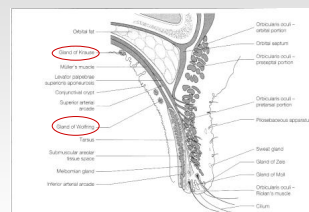


Water part of tears

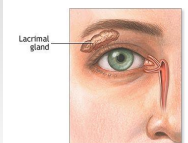
- **Baseline water production**
 - Always made at the same volume
 - No input from central nervous system
 - Tears made by small glands of Krause and Wolfring, found in the superior fornix
- **Reflex water production**
 - Created in response to irritation or emotion
 - Secreted by the lacrimal gland after signaled to do so by the brain.



Water part of tears



Baseline tears



Reflex tears



Water part of tears

- Responsible for tear film volume
- Deficiency in baseline formation of water part is true “dry eye”.
- Deficiency in reflex tearing is secondary to real pathology
 - Sjögren Syndrome
 - Sarcoid
- Testing and evaluation of reflex tearing only is not very relevant to day-to-day function

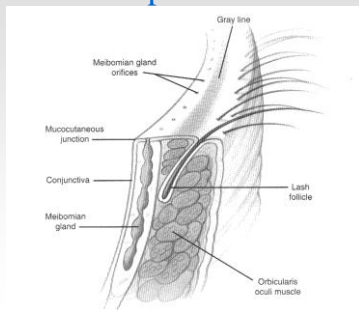


Oil part of tears

- Secreted by oil glands found in the eyelids
- It normally takes a few days for oils to be created, flow through gland, and be secreted onto surface of eye.
- Abnormalities of oil component of tears is from abnormal viscosity, not volume.



Oil part of tears



Oil part of tears

If oil is too thick (think lard instead of oil):

- Does not prevent evaporation (speeds it)
- Coats lashes and lid margins
- Does not go into puncta properly with blink
- Gets broken down abnormally
 - Gets made into toxic soapy esters which are easy to see in the tear film
- Concentration of toxins increases over the day



The Blepharitis Question

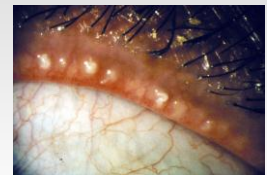
- Anterior blepharitis
 - Deposits/crud/oils/crystals/sleeves on lashes
 - These cause occasional irritation when deposits fall into the tear film
- Posterior blepharitis
 - Abnormal oils secreted by meibomian glands
 - These cause chronic irritation because the tears themselves are abnormal
 - May be difficult to see clinically – look at tears instead of glands.



The Blepharitis Question



Anterior blepharitis



Posterior blepharitis



Rosacea

- Meibomian gland dysfunction will often be seen in patients with Rosacea
- Rosacea may be untreated, or patients may only be treating skin rash with topical creams.



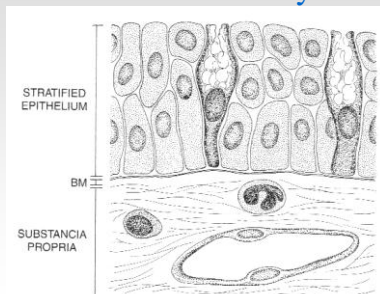
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The mucin layer

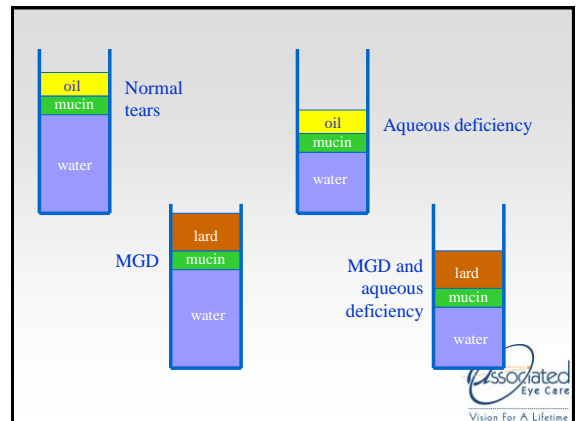
- Works as surfactant to help tears coat the corneal surface
 - Oil and vinegar = two layered salad dressing
 - Oil, egg yolk and vinegar = mayonnaise
- Mucin is secreted by goblet cells, which are found in the conjunctiva
- Mucin deficiency is seen in severe disease
 - Stevens-Johnson, severe alkali injuries, ocular cicatricial pemphigoid, ...

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The mucin layer



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Let's go back to our patient

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Things that are working against her

- Lives in Minnesota
 - Very dry for 4-6 months a year
- Works at a computer
 - Blinks every 10 seconds instead of every 3
- Menopause
 - Decreased volume of water
 - Increased viscosity of oil
- Cigarette smoker

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Things that are working against her

- Half hour drive to work every day
 - Blinks every 10 seconds instead of every 3
- Takes an oral antihistamine
 - Decreases water volume
- Wears contact lenses
 - Constant micro-trauma
 - Lens changes curvature and flexibility as tear volume decreases over the course of the day
 - Traps abnormal oils under the lens causing a micro-environment of soaps, debris, etc.



Treatment



Two pronged approach

- Treat her tear film dysfunction
- Treat her symptoms



Mismanaging these patients

- Eye doctors treat the dry eye and blepharitis
- C.L. fitters alter contacts and solutions
- No one is treating these patients' symptoms
 - Redness
 - Irritation
 - Tearing
 - Photophobia
 - Foreign body sensation
 - Contact lens intolerance



Other doctors know better

- Orthopedist
 - Will treat the broken leg, but will also give painkillers for the pain
- Gastroenterologist
 - Will treat the ulcer, but will also give antacids for the symptoms
- Obstetrician
 - Will deliver the baby, but will also give an epidural for the pain



Two pronged approach

- Treat her tear film dysfunction
- Treat her symptoms



Treating tear film dysfunction

Aqueous deficiency

- Artificial tears
 - Do not take them "PRN"
 - Analogy – don't wait until August to water your lawn.
 - Have to recommend a brand of tears that patient will want to take.
 - If you think all artificial tears are alike, try them.
- Punctal occlusion
- Restasis® - cyclosporine 0.05%



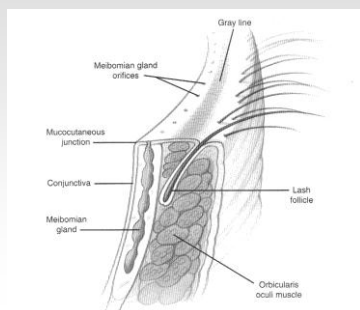
Treating tear film dysfunction

Meibomian gland dysfunction

- The problem is within the glands – need to treat the oils before they are secreted
- Produce thinner oils
 - Omega-3 supplements (Fish oil, flax seed oil)
 - Doxycycline (especially in rosacea patients)
- Express oils from lids
 - Hot compresses, massage, lid hygiene
- Artificial tears (Systane balance)



Meibomian glands



Treating tear film dysfunction

- Anterior blepharitis
 - Lid hygiene
 - Artificial tears
- Habits
 - Quit smoking
 - Don't have car defroster/heater aimed at face
 - Decrease contact lens wearing time
 - Decrease antihistamine use
 - Artificial tears



Treating tear film dysfunction

Artificial tears helped each time

- Aqueous deficiency – increased volume
- Abnormal oils – washed out toxins
- Anterior blepharitis – washed out debris
- Contact lens
 - Rehydrates lens
 - Washes out toxins and debris that is increasing in concentration under the lens



Treating symptoms

- Symptoms of dry eye
 - There are no symptoms
- Symptoms of inflammation
 - Redness
 - Irritation
 - Foreign body sensation
 - Photophobia
 - Contact lens intolerance



Treating symptoms

- When treating symptoms of dry eye, we are really treating inflammation
- Sprain your ankle:
 - Ice
 - Elevation
 - Rest
 - Anti-inflammatory medications (e.g. ibuprofen)



Treating symptoms

- Ice
- Elevation
- Rest
- Anti-inflammatory medications
- Chilled drops
- N/A
- Take breaks
- Anti-inflammatory medications
 - Steroid
 - NSAID's
 - Xibrom
 - Nevanac
 - Acular LS



Must change the way patients think

- They wait until eyes are irritated before they take artificial tears
- Eyes are inflamed, and artificial tears are not anti-inflammatory
- “Take tears to keep your eyes feeling good.”
- “Take NSAID if your eyes don’t feel good.”
- **Patients MUST understand and buy in to this**



Contact lens considerations

- Patients with tear film dysfunction almost always have problems with their contacts
- The contacts are not the primary problem
- Changing contacts lenses materials or fit will often improve symptoms, but will not address the underlying problem
- Patients with significant tear film dysfunction may never be able to wear contacts full time



Contact lens considerations

Be aware of patients' symptoms

- What time of day are they worse?
 - Worst in morning – solution
 - Worst in evening – tear film or fit
- What days of week are symptoms worse?
 - If worst on workdays, assume it is secondary to activities where blink rate is decreased
- Patients with oil-based problems will do better if they throw away their contacts more often



If a patient has untreated or under treated tear film dysfunction, you will never be able to make their symptoms go away completely



Summary

- Treat tear film dysfunction appropriately
 - Aqueous – tears, punctal occlusion
 - Oil – tears, omega-3, proper lid hygiene, doxycycline
 - Anterior blepharitis – tears, lid hygiene
- Use artificial tears to prevent symptoms
- Treat symptoms of inflammation separately
 - Anti-inflammatory eyedrops, chilled tears
- Think of other factors and treat them
 - Blink rate
 - Antihistamines



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Title

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