Dry Eye Updates

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Disclosures

Financial Disclosures

Over the past three years, members of CORE have received research funding and/or honoraria from the following 15 companies & 3 funding agencies:

- Alcon
- Allergan
- Contamac
- CooperVision
- GL Chemtec
- Inflamax Research
- Johnson & Johnson Vision
- Menicon
- Nature’s Way
- Novartis
- PS Therapy
- Santen
- Shire
- SightGlass
- Visioneering
Objectives

By the end of this class you should be able to...

1) Know how dry eye is diagnosed
2) Recognize contemporary dry eye treatment therapies
3) Understand the role of optometric assistants in the diagnosis and management of dry eye disease
Anatomy

- Lacrimal gland
- Meibomian glands
- Ocular surface
Lacrimal Gland

- Aqueous portion of tear film
- Located in superior eyelid
- Consists of acini and ducts
- Manufactures proteins, mucins, water, electrolytes
- Ducts
  - Acini secretes into ducts, and onto the ocular surface
Meibomian Gland

- Lipid portion of tear film
- One gland unit consists of a long central tube surrounded by acini units
  - “String of beads”
- Acini manufactures lipids “meibum”
- Meibum travel out the ductules and through the central duct and into the tear film
Epithelium of Ocular Surface

- Epithelium and goblet cells produce mucins
- Mucins
  - Protects the ocular surface
  - Helps lubricates the blinking process
  - Forms crosslinks across the ocular surface
  - Has anti-bacterial/fungal properties


Tear Film

• Components
  • Mucins/Aqueous gel
  • Lipid

• Function
  • Provides smooth optical refractive surface
  • Nourishes corneal and conjunctival cells
  • Removes debris from ocular surface
  • Prevent colonization of bacteria and fungus
DEWS II Dry Eye Definition

2017 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.

Key Elements of the Definition

- No single factor behind dry eye
- Loss of functional harmony of the ocular tissues
- Discomfort, stinging, burning
- Loss of ability to maintain tear film structure
- Increased salt to water ratio
- Inflammation and damage
- Sensitivity of the eye is altered

Diagnosis
Presenting Patient

Symptomatic

Signs

No signs

Asymptomatic

Signs

No signs

Dry Eye Disease

Neuropathic Pain

Neurotrophic conditions

Normal

5 Steps to Diagnose Dry Eye

Step 1: Triage questions
Step 2: Risk factors
Step 3: Symptoms
Step 4: Homeostasis markers
Step 5: Dry eye subtype

Dry Eye Diagnosis

Step 1: Triage questions (rule out)

- Conjunctivitis (allergic, viral, bacterial)
  - Itchy, mucous discharge, after a cold
- Anterior blepharitis
  - Crusty and flaky eyelashes
- Demodex blepharitis
  - Mites inhabit eyelash follicles
- Uveitis
  - Anterior chamber reaction
Dry Eye Diagnosis

• **Step 2: Risk factors**
  - Aging
  - Female sex
  - Asian race
  - Connective tissue diseases (e.g., arthritis)
  - Sjögren syndrome
  - Computer use
  - Contact lens wear
  - Medications
    - Accutane
    - Antihistamines
    - Antidepressants
    - Contraceptives
  - Environment
    - Low humidity
    - Pollution

Dry Eye Diagnosis

Step 3: Symptoms

- Validated questionnaires
  - Ocular Surface Disease Index
  - Dry Eye Questionnaire (DEQ-5)
  - Standard Patient Evaluation of Eye Dryness (SPEED)
  - Symptom Assessment in Dry Eye (SANDE)

Symptomatic

- OSDI $\geq 13$
- DEQ-5 $\geq 6$

Ocular Surface Disease Index

Scoring
0-12 = normal
13-22 = mild
23-32 = moderate
33-100 = severe

Measures
Vision-related function
Ocular symptoms
Environmental triggers

**Dry Eye Questionnaire (DEQ-5)**

**Scoring**

≥ 6 is dry eye

**Measures**

Symptoms only

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Dry Eye Diagnosis

Step 4: Homeostasis markers

One of:

• Tear stability < 10s
• Osmolarity ≥ 308 in one eye or inter-eye difference of >8
• Corneal staining > 5 spots

Tear Stability

Non-invasive preferred

Fluorescein if non-invasive not possible

**Positive dry eye marker**

Stability <10s

Osmolarity

Small plastic end piece touches the inferior tear meniscus

Tear fluid enters the chip

Osmolarity is read and calculated

**Positive dry eye marker**
≥ 308 mOsm/L in either eye, or
>8 mOsm/L inter-eye difference

Corneal Staining

Instill fluorescein using wetted fluorescein strip

Fluorescein binds to cells that are damaged or dying

**Positive dry eye marker**

>5 spots on the cornea

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Dry Eye Diagnosis

Step 5: Assess subtypes

• Aqueous deficient dry eye
  • Tear meniscus height < 0.2mm
• Evaporative dry eye (meibomian gland dysfunction)
  • Meibomian gland dropout
  • Altered lipid quality
  • Altered meibum secretions

Tear Meniscus Height

• Tear meniscus height of <0.2mm considered aqueous deficient

Meibomian Gland Orifices

- Apply pressure to the eyelid margins
- Observe to see what comes out of the orifices

Grading:
- Grade 0: Clear fluid
- Grade 1: Cloudy fluid
- Grade 2: Cloudy particulate fluid
- Grade 3: Toothpaste-like

Meibography

- Imaged with infrared light
- Glands are the “grapevines” traveling vertically along the eyelid
- Examine for areas where glands have disappeared

Meibography

Single gland dropout
Meibography

Areas of missing glands
OCULUS Keratograph 5M

Multifunctional tool

- Tear meniscus
- Tear stability
- Meibography
- Imaging

Management
Update in management

Many therapies exist for dry eye management
- Artificial tears
- Warm compresses
- Immunomodulators
- Anti-inflammatory agents
- Secretagogues
- Autologous serum
- Punctal plugs
- Moisture goggle chambers
Artificial Tears

Outdated formulations

- Generic polymers for viscosity enhancement
- Contain preservatives
- Serves to supplement tear volume

Artificial Tears

“High tech” formulations

- Hyaluronic acid
- Lipids supplementation
- Osmoprotectants
- Preservative free

Hyaluronic Acid

Hyaluronic acid
• Large polymer binds water
• Can bind to the ocular surface
• Promotes healing

Example products
Refresh Optive Fusion
Labtician Hyabak
Systane Hydration
Lipid supplementation

Lipids
- Supplements the lipid layer
- Mineral oil
- Glycerin
- Phospholipids

Example products
- Refresh Optive Advanced
- Systane Balance
- OCuSOFT retaine MGD
Osmoprotectants

Trehalose

- Stabilizes membranes and proteins during drying
- Plants and bacteria use it for survival

Example products
Thealoz: 3% trehalose
Thealoz Duo: 3% trehalose, 0.15% HA

Osmoprotectants

Ectoine

- Allows cells to survive under extreme osmolarity stress
- Used by organisms living in extreme environmental conditions

Example products
CandorVision Hylo Dual: Hyaluronic acid + ectoine

Preservative-free

- Older drops preserved with BAK
  - Highly toxic to ocular surface cells
- Newer “soft preservatives” can still affect cells.
- Preservative free is preferred, however more expensive.
Warm Compresses

- Used to melt the meibum in the eyelids
- A temperature of at least 40°C is required
- Classic method
  1. Immerse face cloth in hot water
  2. Apply hot face cloth to closed eyes
- Problem: the face cloth cools down too quickly

Warm Compresses

- Variety of eye masks today that maintains therapeutic temperatures over a longer period of time

<table>
<thead>
<tr>
<th>Mask</th>
<th>Contents</th>
<th>Photo</th>
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<tbody>
<tr>
<td>MGDRx EyeBag® (The EyeBag Company)</td>
<td>Flax seeds</td>
<td></td>
</tr>
<tr>
<td>The Eye Doctor® (The Body Doctor)</td>
<td>Mixed natural grains</td>
<td></td>
</tr>
<tr>
<td>Bruder Eye Hydrating Compress (Bruder Healthcare)</td>
<td>Medifluids®</td>
<td></td>
</tr>
<tr>
<td>Tranquileyes™ goggles (eyeco)</td>
<td>Thermoeys beads</td>
<td></td>
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<tr>
<td>Therav Pearl Eye-ssential mask (Bausch &amp; Lomb)</td>
<td>Pearl Technology®</td>
<td></td>
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<tr>
<td>Warm facecloth</td>
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Warm Compresses

J&J LipiFlow

- 12 minute treatment, combination of heat and pressure
- Heat and pressure are delivered through “activators”
  - Eyelids heated to 42°C
  - Variable pressure for “squeezing” rhythm
- Activators are fitted over the eye similar to a big contact lens
- Improves symptoms, tear stability, and meibomian gland function up to 9 months

ALCON iLux

• Hand held device
• Warms the eyelids
• Compresses eyelids
• Visualize the treatment

http://www.tearfilm.com/ilux-device/
E-Eye Intense Pulsed Light (IPL)

- Adapted from dermatology
  - Used to treat skin lesions, stains, hemangiomas, excessive hair growth
- Emits high intensity light
  - 580nm - 1200nm pulse
- Light is absorbed by the meibomian glands and heats them

IPL

https://www.opticianonline.net/features/a-hot-new-treatment-for-mgd-1
Summary

Case history, ask about risk factors

- Elderly, female, Asian ethnicity
- Contact lens wear
- Computer and digital device use
- Medications
- Environmental conditions

Questionnaire administration

- Validated questionnaires
- Be familiar with the differences between each of them
- They are to be completed by the patient on their own
Summary

New generation of artificial tears
- BAK preserved drops no longer acceptable
- Inclusion of hyaluronic acid is common
- Contain agents that further protect ocular surface

Latest advances in warm compresses
- Face cloth warm compresses are obsolete
- Contemporary compresses maintain their heat
- In-office technological advances for warm compresses
Thank You