A Tear Jerking Update on Dry Eye Disease

Jessica Tu, O.D.
Assistant Clinical Professor
UMSL Optometry
University of Missouri–St. Louis

DISCLOSURE

No financial disclosures

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DEFINITION

Tear Film & Ocular Surface Society (TFOS)

DEWS I (2007)

Dry eye is a multifactorial disease of the tears and ocular surface that results in symptoms of discomfort, visual disturbance, and tear film instability with potential damage to the ocular surface. It is accompanied by increase osmolarity of the tear film and inflammation of the ocular surface.

DEWS II (2017)

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.

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DEWS I versus DEWS II

- Emphasis that dry eye is indeed is a "disease"
- The addition of "loss of homeostasis"
- Symptoms become key element in the classification – more generic term
- Neurosensory abnormalities that contribute to common mismatch between signs and symptoms
- Main goal was resolving the confusion between **diagnostic versus pathophysiological** features, acknowledging **etiological triggers**, and recognizing **neurosensory abnormalities**

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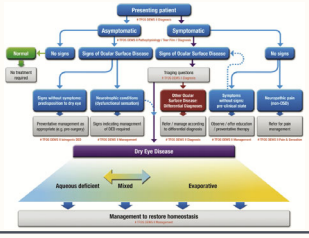
DEWS II



TFOS DEWS II Definition and Classification Report (2017)

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DRY EYE DISEASE

UNDERSTANDING THE TEAR FILM

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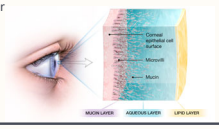
ANATOMY OF THE TEAR FILM

Traditionally

- Oily layer
- Aqueous layer
- Mucin layer

Current understanding

- Two-layered interactive structure composed of a mucoaqueous layer and an overlying lipid layer



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CLASSIFICATION OF DRY EYE

- Important to improve patient care through appropriate treatment

Tear deficient OR aqueous deficient

Evaporative

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CLASSIFICATION OF DRY EYE

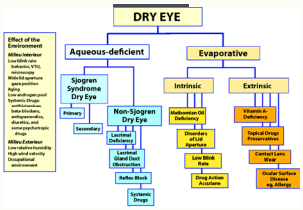
Traditionally

- Aqueous deficient and evaporative perceived as mutually exclusive
- Concurrent sub-classification
- General ambiguity

Current understanding

- Perception of exclusivity removed → shows as continuum
- Triaging elements provided

CLASSIFICATION OF DRY EYE



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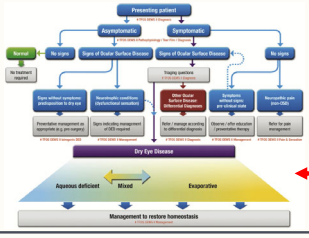
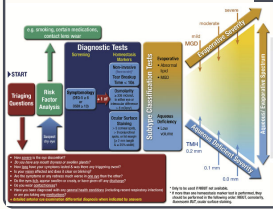


TRIAGE

CONTINUUM

TFOS DEWS II Definition and Classification Report (2017)

CLASSIFICATION OF DRY EYE



TFOS DEWS II TRIAGING QUESTIONS[3]

- How severe is the eye discomfort?
- Do you have any mouth dryness or swollen glands?
- How long have your symptoms lasted and was there any triggering event?
- Is your vision affected and does it clear on blinking?
- Are the symptoms or any redness much worse in one eye than the other?
- Do the eyes itch, appear swollen or crusty, or have they given off any discharge?
- Do you wear contact lenses?
- Have you been diagnosed with any general health conditions (including recent respiratory infections) or are you taking any medications?

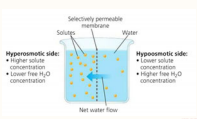
OSMOLARITY

"the concentration of an osmotic solution when measured in liters of the solution"

OR

"a measure of solid particles in a solution"

- Offers objective numerical output
- Tear osmolarity threshold of **308 mOsm/L** = discriminates between normal and DED
  - Hyperosmolarity = > 308 mOsm/L

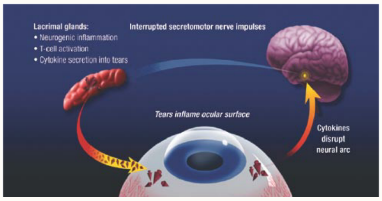


OSMOLARITY

INFLAMMATION

- Mediated by lymphocytes
  - Manifested and dependent on T-cell activation → autoimmune inflammation
  - Pro-inflammatory cytokines and matrix metalloproteinases
- Hyperosmolarity induces inflammation in human limbal epithelial cells by increasing expression and production of pro-inflammatory cytokines and chemokines

INFLAMMATION



The cycle of dry eye disease
Allergan, Inc (2005)

DRY EYE DISEASE

WHO IS AFFECTED, AND WHY?

EPIDEMIOLOGY

- Challenging due to lack of standardized definition and diagnostic criteria
- Few studies on younger populations (< 40 y/o)
- **Consistent findings**
  - Prevalence of signs/symptoms increase with age
  - Women > Men


American Journal of Ophthalmology

Prevalence of Diagnosed Dry Eye Disease in the United States Among Adults Aged 18 Years and Older

The Ocular Surface

TFOS DEWS II Epidemiology Report

EPIDEMIOLOGY ENVIRONMENTAL FACTORS

Asthma and Allergy Foundation of America

The Most Challenging Places to Live With Spring Allergies

2019 National Spring Rankings (1=Worst)	Overall	2018 Spring Rank (1=Worst)	Metropolitan Area	Total Score (max. 10.87)	Subtotal: Pollen Score	Subtotal: Medicine Utilization per Patient	Subtotal: Board-Certified Allergists per Patient
51	▲	47	St. Louis, MO	55.97	▲	▲	▲

EPIDEMIOLOGY TODAY'S DIGITAL WORLD

Blink Rate, Incomplete Blinks and Computer Vision Syndrome

Portello, Joan K.*; Rosenfield, Mark†; Chu, Christina A.‡

Computer Vision Syndrome (CVS)

- Reduced blink rate
- Reduced complete blinks ***MORE IMPORTANT**

EPIDEMIOLOGY
TODAY'S DIGITAL WORLD

THINK ABOUT THE BLINK!

EPIDEMIOLOGY
TODAY'S SURGICAL WORLD

Dry Eye after Lasik for Myopia: Incidence and Risk Factors

M.R. Shoja, M.R. Besharati

- 190 eyes
- Assessed: subjective complaint of dry eye, TBUT, corneal staining, corneal sensitivity, and Schirmer I test
- Compared at 1 week, 1, 3 and 6 months post-op

- **Conclusion**: compromised tear function at least 6 months post-op
  - Increased risk with women and patients requiring higher refractive correction

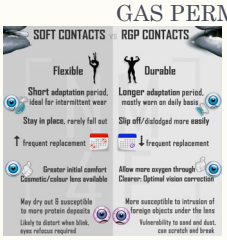
EPIDEMIOLOGY
TODAY'S SURGICAL WORLD

Evaluation of Dry Eye and Meibomian Gland Dysfunction After Cataract Surgery

- 58 eyes
- Assessed: ocular symptom scores, lid margin abnormalities, superficial punctate keratopathies, TBUT, Schirmer test, lower tear meniscus height, depth, and area, meibum expressibility and meibography
- Compared preoperatively, 1 month and 3 months post-op

- **Conclusion**: significant increase in lid margin abnormalities, decrease in TBUT, and decrease in meibum expressibility

SOFT VERSUS
GAS PERMEABLE LENSES



- Inconsistent results from research
- Consensus: always treat underlying dry eye before fitting or continuing with contact lens use

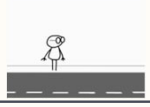
EPIDEMIOLOGY
♀ VERSUS ♂

DRY EYE DX AND TX

THE EFFECT OF HORMONES ON THE OCULAR SURFACE

Women > Men

androgens ↔ ♂ ↔ ♀ ↔ estrogens



EPIDEMIOLOGY
♀ VERSUS ♂

DRY EYE DX AND TX

THE EFFECT OF HORMONES ON THE OCULAR SURFACE

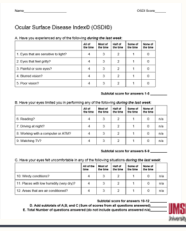
Sjögren's syndrome	Contraceptives
Androgen insensitivity syndrome	Hormone replacement therapy
Polycystic ovary syndrome	Ovariectomy

Implicate estrogens as a contributor to the development of DED in ♀

DRY EYE DISEASE

DIAGNOSTIC TESTING

QUESTIONNAIRES



QUESTIONNAIRES

Comparison of the OSDI and SPEED questionnaires for the evaluation of dry eye disease in clinical routine

- Both questionnaires are suitable for detecting symptoms of dry eye
- CANNOT be used interchangeably – consistency is key

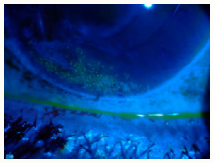
SPEED	OSDI
Correlated more with parameters of evaporative dry eye	Correlated more with parameters of aqueous-deficient dry eye

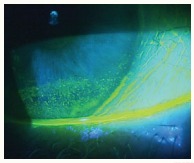
DRY EYE AND CL CORNEAL STAINING

Vital Stain Characteristics

Vital Stain	Color	Tissue	Slit Lamp Set-Up
Sodium Fluorescein	Yellow	Cornea	Wratten #12 filter Cobalt light High illumination
Rose Bengal	Red	Conjunctiva	White light High illumination
Lissamine Green	Green	Conjunctiva	White light Low illumination

DRY EYE AND CL CORNEAL STAINING





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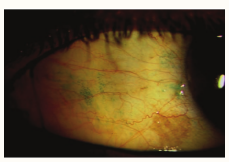
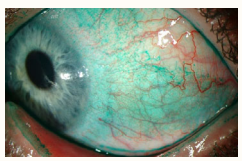
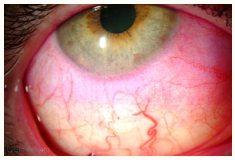


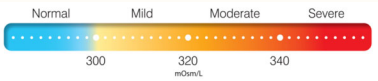


DRY EYE AND CL
CORNEAL STAINING



TEARLAB

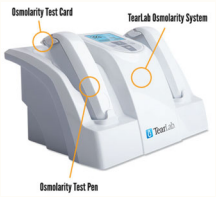
- Provides objective and quantitative information

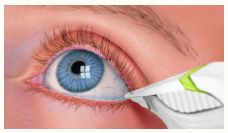


Abnormal Osmolarity:

- > 300 mOsm/L = loss of homeostasis
- Inter-eye difference > 8 mOsm/L = instability of tear film

TEARLAB

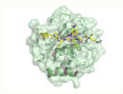




INFLAMMADRY

- Detects elevated levels of matrix metallopeptidase 9 (MMP-9)

MMP-9 = inflammatory protein



85% sensitivity

94% specificity

INFLAMMADRY

After 10 minutes, read the test results.
RED + BLUE = POSITIVE
BLUE = NEGATIVE

INFLAMMADRY

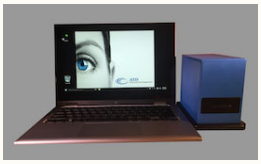
Making Matrix Metalloproteinase-9 Levels More Meaningful

Mile Brujic, OD, FAAO, David Kading, OD, FAAO

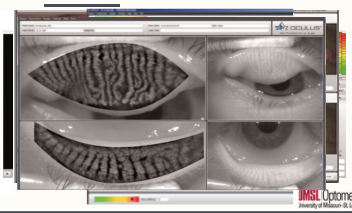
TEARSCAN MICRO-ASSAY

- **TearScan Lactoferrin Diagnostic Test Kit**
  - Assess lacrimal gland function
- **TearScan IgE Diagnostic Test Kit**
  - Quantitative assessment of allergies
- **Reduced concentrations of lactoferrin below 1.73 mg/ml = abnormal**

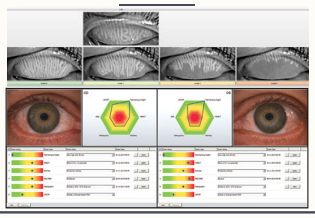
TEARSCAN MICRO-ASSAY



KERATOGRAPH



KERATOGRAPH
JENVIS DRY EYE REPORT



KERATOGRAPH
CRYSTAL TEAR REPORT

LIPIVIEW

Dynamic Meibomian Imaging

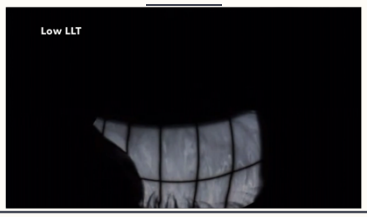
Lipid Layer Thickness (LLT)

Blink Dynamics

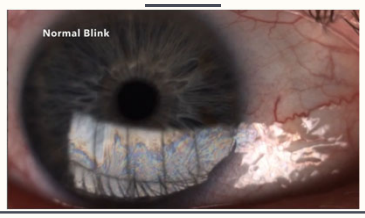
LIPIVIEW
MEIBOMIAN IMAGING

- Dynamic Illumination
- Adaptive transillumination
- Dual-Mode DMI

LIPIVIEW
LIPID LAYER THICKNESS



LIPIVIEW
AUTOMATED BLINK ANALYSIS



MEIBOMIAN GLAND EVALUATOR (MGE)

- Standardized, repeatable evaluation of meibomian gland function
- Pressure of deliberate blink

Grade	Secretion Quality
3	Clear Liquid Oil
2	Colored/Cloudy Liquid
1	Inspissated *(semi-solid, toothpaste-like consistency)*
0	No Secretion *(includes capped orifices)*

DRY EYE DISEASE

DRY EYE AND CONTACT LENS

DRY EYE AND CONTACT LENSES

DEWS guidelines

DEWS guidelines broke dry eye into 4 levels of severity and recommended treatment options for each:

Level I may present with mild to moderate symptoms, and there may be mild to moderate conjunctival signs, but it is also possible there may be no signs.

Level II patients may show moderate to severe symptoms, tear film signs, mild corneal punctate staining, and conjunctival staining.

Level III symptoms will be severe, including marked corneal punctate staining, central corneal staining, and filamentary keratitis.

Level IV patients experience extremely severe symptoms, possibly to the point of needing to alter their lifestyles. Look for severe corneal staining, erosions, and conjunctival scarring in this set of patients.

Level I — Level II — Level III — Level IV

Blinking exercises
20/20/20 rule
Lubricants
Lid hygiene
Nutrition

Awareness and compliance

Heavy digital use
Blocked glands
Poor fitting CL
Incompatible solutions/lubricants
Systemic disease
Medications

Poor awareness and compliance

DRY EYE AND CL
WHY DO WE CARE?

Contact lens wear and dry eyes: challenges and solutions

Maria Markoulli and Sailesh Kolanu

- Number of CL wearers remained stable in the past decade, despite investments into CL technology
  - 10-15% of wearers dropout of CL wear within 3 years of commencement
  - Most common reason: contact lens discomfort

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DRY EYE AND CL
WHY DO WE CARE?

"Contact lens discomfort is a condition characterized by episodic or persistent adverse ocular sensations related to lens wear, either with or without visual disturbance, resulting from reduced compatibility between the contact lens and the ocular environment, which can lead to decreased wear time and discontinuation of contact lens wear."

- TFOS International Workshop on Contact Lens Discomfort

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DRY EYE AND CL
WHY DO WE CARE?

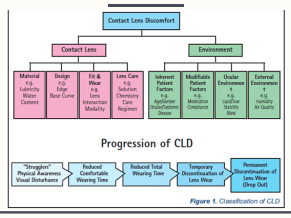

Figure 1. Classification of CLD

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DRY EYE AND CL
WHY DO WE CARE?

Dropout rate are as high as 16% to 30%!!!

Number One Reasons for Contact Lens Dropout

Number one reason for dropout	U.S.	Americas (Include U.S.)	Asia/Pacific	Europe/Middle East/Africa
Comfort/Itt	50.0%	52.9%	41.9%	45.6%
Vision not as good as with glasses	15.9%	14.2%	3.8%	17.5%
Expense	12.3%	11.6%	11.9%	17.5%
Difficult to put in and take out	7.2%	8.4%	7.5%	7.0%
Bifocal/trifocal lenses don't work as well as eyeglasses	5.1%	4.5%	0.6%	0.0%
Inconvenient to wear	5.1%	4.5%	10.0%	0.0%
Lens care/cleaning too time consuming	2.2%	1.9%	0.6%	0.0%
Fear of or history of eye infections	0.7%	0.6%	17.5%	3.5%
Lens care/cleaning too difficult	0.7%	0.6%	0.6%	0.0%
No selection	0.7%	0.6%	1.3%	1.8%
Need to clean frequently	0.0%	0.0%	3.1%	1.8%
Doesn't correct for astigmatism	0.0%	0.0%	0.6%	1.8%
Easy to lose	0.0%	0.0%	0.6%	1.8%
Need for regular eye exams	0.0%	0.0%	0.0%	1.8%

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DRY EYE AND CL
WHY DO WE CARE?

The median future value over the lifetime of a SINGLE contact lens dropout was calculated to be $19,497 to $24,556

Economic Survey Results

	U.S.	Americas (Includes U.S.)	Asia/Pacific	Europe/Middle East/Africa
Average rate of return on investment	5.0	5.0	11.7	7.4
Eye exam charge	$101	$97.96	$2	$28.84
Separate charge for CL services	$70	$68.14	$2.37	$40.15
CL patients average spending on glasses	$245	$246.65	$51.06	$201.52
Average number of new CL patients per month	22.2	22.0	22.2	11.7
Percentage of CL patients who buy spectacles	33.3%	33.4%	43.2%	36.9%
Number of CL patient visits per year	4.7	4.7	8.0	4.6
CL patients average payment for follow-up care	$157	$157.02	$41.11	$119.81
Average number of CL patients per month	83.4	82.7	148.9	176.9
GP CL patients per month	6.8	6.6	7.6	23.0
Soft CL patients per month	75.2	76.2	133.8	129.0
Patient annual revenue	$275	$271.7	$177	$325.8
Years in business	17.3	16.9	12.3	18.3
Annual patients	3,019.7	3,068.0	4,506.6	4,673.4
Percentage of CL patients	34%	33.4%	40.7%	45.7%
Percentage of new CL patients	31%	30.5%	25.6%	11.2%
Dropout	15.9%	17.0%	31.3%	30.4%
Median future value	$21,695	$19,625	$19,497	$24,556

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DRY EYE AND CL
MEIBOMIAN GLANDS

Clinical factors associated with contact lens dropout

Andrew D. Pucker[b,*], Lisa A. Jones-Jordan[b], Sebastian Marx[c], Daniel R. Powell[d], Justin T. Kwan[c], Sruthi Srinivasan[c], Wolfgang Sickenberger[c], Lyndon Jones[c], Contact Lens Assessment of Symptomatic Subjects (CLASS) Study Group

- Meibum expressibility, meibum quality and meibomian gland tortuosity may serve as warning signs for CL dropout

Conclusion: evidence suggests that practitioners should screen for and educate CL patients about the importance of maintaining healthy meibomian glands to increase comfort and CL longevity

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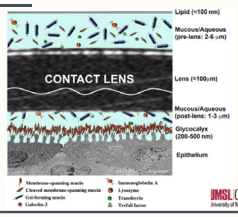
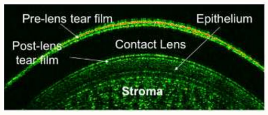
DRY EYE AND CL
OCULAR SURFACE

- Divides tear layer into pre-lens (anterior) and post-lens (posterior) films
- Codependence of tear film and ocular surface epithelium



DRY EYE AND CL
OCULAR SURFACE

- Research describes decreased tear film stability in the presence of a CL
- Prelens tear film thinning rate is higher compared to that of precorneal tear film → leads to shorter TBUT



DRY EYE AND CL

WHAT IS CAUSING ALL THE SYMPTOMS?

DRY EYE AND CL
LID WIPER EPITHELIOPATHY (LWE)

Lid-Wiper Epitheliopathy in Contact Lens Users and Patients With Dry Eye

Baris Yeniad;Muhittin Beginoglu;Lale Bilgin;

- 150 patients
- 3 groups: 69 CL users, 46 dry eye patients, 40 control
- CL group: 67% symptomatic; 32% asymptomatic

- **Conclusion**: LWE should be investigated in symptomatic CL users and symptomatic dry eye patients

DRY EYE AND CL
LID WIPER EPITHELIOPATHY

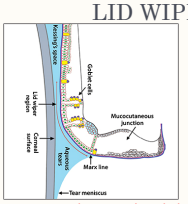
Lid Wiper Epitheliopathy in Soft Contact Lens Wearers

Marc-Matthias Schulze;Sruthi Srinivasan;Sheila Hickson-Curran;David Bernbsen;Gillian Howarth;Youssef Touboul;Philip Morgan;Jason Nichols;Lyndon Jones;

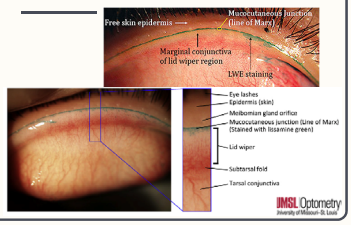
- 253 habitual SCL wearers
- Evaluated various SCL and solution combinations
- Assessed using lissamine green and sodium fluorescein dye, according to the Korb scale

- **Conclusion**: LWE was present in 85% of habitual wearers, independent of age, sex, race, comfort, and refractive error BUT dependent on habitual SCL type

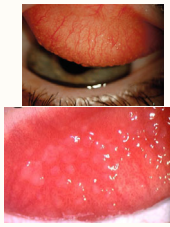
DRY EYE AND CL
LID WIPER EPITHELIOPATHY



May traumatize the corneal epithelium
↑ sensitivity of cornea



DRY EYE AND CL
FRICTION - GPC

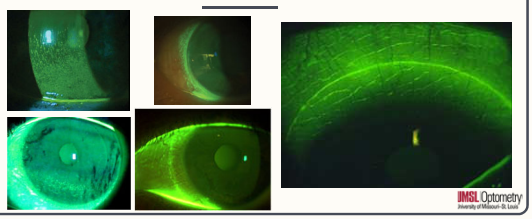


- Combination type I and type IV hypersensitivity
- Chronic trauma to the upper tarsal conjunctiva

Meibomian Gland Function and Giant Papillary Conjunctivitis

William D. Mathers M.D., Margarite Billborough M.D.

DRY EYE AND CL
CORNEAL STAINING



DRY EYE AND CL

WHAT CAN WE

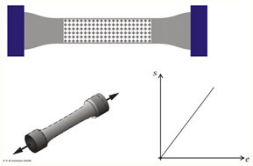
DRY EYE AND CL
MATERIALS

- **Tear volume and water content**
  - Higher water content → greater demand to keep lens moist → rapid pre-lens tear film thinning
  - Lower water content → lower demand to keep lens moist → decrease in pre-lens tear film thinning

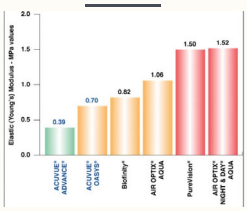
AOSA Allergan Competition

DRY EYE AND CL
MATERIALS

- **Modulus** = amount a material deforms when stress is applied
  - Higher modulus → higher amount of silicone content
  - Lower modulus → higher amount of water content



DRY EYE AND CL
MATERIALS



JNJ VisionCare

DRY EYE AND CL MATERIALS

- **Lubricity** (coefficient of friction) – how the lids blink over the surface
  - Higher lubricity = lower coefficient of friction = less friction
  - Lower lubricity = higher coefficient of friction = more friction
  - Has been stated that the coefficient of friction is the principal factor associated with end-of-day discomfort

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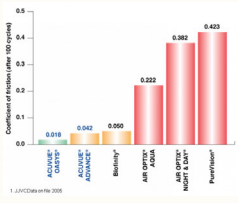
DRY EYE AND CL MATERIALS



JNJ VisionCare 1. JJVCData on File 2005

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DRY EYE AND CL SOLUTIONS

AOA Healthy Vision and Contact Lenses – Lens Care

– Generic (or store brand) contact lens solutions may have been formulated for older lens materials; new lens materials have different chemical compositions and may not be compatible with generic solutions

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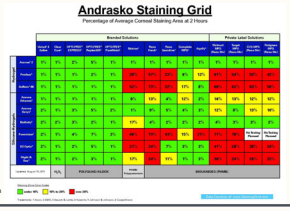
DRY EYE AND CL SOLUTIONS



www.StainingGrid.com

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DRY EYE AND CL SOLUTIONS

Hydroxyl free radicals attack lipid membranes

↓

Acts as an oxidizing agent

↓

Easily penetrates cell to cause destruction inside

↓

Destroys microorganism cell membranes and cell components

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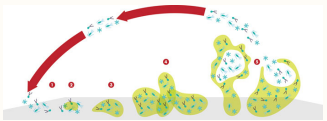
DRY EYE AND CL SOLUTIONS

– Biofilm = slimy, sticky film of bacteria that coats a surface
  – Incompatible solution
  – Old solution
  – Dirty contact lens case

↓

DRY EYE BLEPHARITIS SYNDROME (DEBS)!!!



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DRY EYE AND CONTACT LENSES

Blinking exercises
20/20/20 rule
Lubricants
Lid hygiene
Nutrition

Awareness and compliance

DEWS guidelines

DEWS guidelines broke dry eye into 4 levels of severity and recommended treatment options for each:

Level I may present with mild to moderate symptoms, and there may be mild to moderate conjunctival signs, but it is also possible there may be no signs.

Level II patients may show moderate to severe symptoms, tear film signs, mild corneal punctate staining, and conjunctival staining.

Level III symptoms will be severe, including marked corneal punctate staining, central corneal staining, and filamentary keratitis.

Level IV patients experience extremely severe symptoms, possibly to the point of needing to alter their lifestyles. Look for severe corneal staining, erosions, and conjunctival scarring in this set of patients.

Level I → Level II → Level III → Level IV

Heavy digital use
Blocked glands
Poor fitting CL
Incompatible solutions/lubricants
Systemic disease
Medications

Poor awareness and compliance

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DRY EYE DISEASE

TREATMENT AND MANAGEMENT

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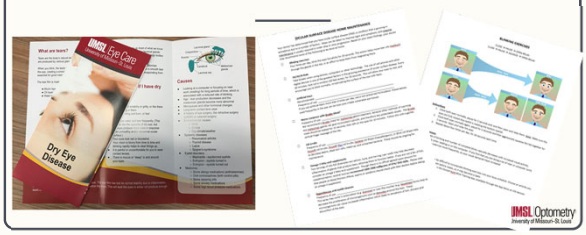
PATIENT EDUCATION



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DIETARY RECOMMENDATIONS

A randomized controlled trial of omega-3 fatty acids in dry eye syndrome

Rahul Bhargava,[1] Prachi Kumar,[2] Manjushrii Kumar,[3] Namrata Mehra,[1] and Anurag Mishra[1]

- 264 subjects
- 325mg EPA & 175mg DHA | 1C x 500mg BID vs. placebo
- Baseline, 1 month, 2 months, 3 months
- BCVA, SLE, questionnaire
- **Conclusion:** 65% omega-3 & 33% placebo had significant improvement in symptoms, especially patients with blepharitis and meibomian gland disease

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COMPLIANCE

Dry eye is a chronic, multifactorial disease that requires chronic and multifactorial management/treatment!!!

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ARTIFICIAL TEARS

CLINICAL SCIENCE

Long term treatment with sodium hyaluronate-containing artificial tears reduces ocular surface damage in patients with dry eye

Pasquale Aragona, Vincenzo Papa, Antonio Micali, Marcello Santocono, Giovanni Milazzo

- Sodium hyaluronate vs. saline
- **Conclusion:** sodium hyaluronate may effectively improve ocular surface damage associated with dry eye syndrome

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ARTIFICIAL TEARS FOR CONTACT LENSES

What Are Your Options?

	Manufacturer	Key Factor	Contact Lens Approval
Blink Contacts	Abbott Medical Optics	Mucin	Yes
Blink Tears		Sodium Hyaluronate	Off label
Oasis Tears	Oasis Medical	Sodium Hyaluronate	Off label
Optive	Allergan	Mucin, Osmoprotection	Yes
Systane Ultra	Alcon	Mucin	Off label
Systane Balance		Lipid and Mucin	

ANTI-INFLAMMATORY MEDICATION

Am J Ophthalmol. 2004 Feb;137(2):337-42.

Antiinflammatory therapy for dry eye.

Pflugfelder SC[1].

Conclusion: Ocular surface and lacrimal gland inflammation has been identified in dry eye that plays a role in the pathogenesis of KCS.

- Common to all ocular-surface disease is an underlying cytokine/receptor-mediated inflammatory process.
- Treat this process = normalize ocular surface and facilitate healing

RESTASIS

- Cyclosporin A – first FDA approved in December 2002
- 1 gtt BID OU
- 4 multicenter, randomized, clinical studies - ~ 1200 patients with moderate to severe keratoconjunctivitis sicca
- **MOA:** partial immunomodulator that lowers the activity of T-cells
  - Binds to lymphocytes → prevents activation of IL-2 → stops T-cell replication

XIIDRA

- Lifitegrast – FDA approved July 2016
- 1 gtt BID OU
- Multicenter, double-masked, vehicle-controlled studies - ~ 1181 patients
- **MOA:** inhibits leukocyte function-associated antigen-1 (LFA-1) and intracellular adhesion molecule-1 (ICAM-1) → decreases overexpression → stops T-cell activation and migration

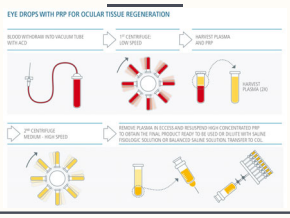
ANTI-HISTAMINE MEDICATION

Method of treating dry eye disease with non-drying antihistamines

Efficacy and Tolerability of Newer Antihistamines in the Treatment of Allergic Conjunctivitis

- Topical antihistamines have anti-inflammatory properties as well
- **Conclusion:** "Non-drying antihistamines" may increase tear production, in turn reducing corneal and conjunctival staining

AUTOLOGOUS SERUM EYEDROPS



AUTOLOGOUS SERUM EYEDROPS

Comparison of autologous serum eye drops with conventional therapy in a randomised controlled crossover trial for ocular surface disease

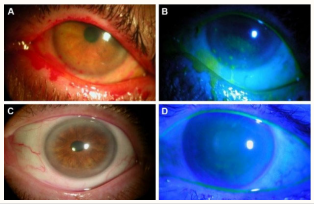
Neurotrophic eye pain

Neurotrophic keratitis

Severe dry eye

- **Conclusion:** superior to conventional treatment for improving ocular surface health and subjective comfort

AMNIOTIC MEMBRANE



PUNCTAL OCCLUSION PLUGS

Efficacy and Tolerability Outcomes After Punctal Occlusion With Silicone Plugs in Dry Eye Syndrome

- **Conclusion:** reduced dependency on artificial tears and relief of symptoms of dry eye

PUNCTAL OCCLUSION PLUGS

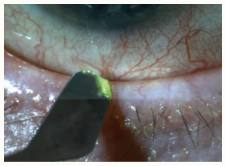
Comparison of Topical Cyclosporine, Punctal Occlusion, and a Combination for the Treatment of Dry Eye

Punctal plug - ↑ initial wetness

Cyclosporine - ↑ long-term ocular surface health

Effects may be additive

MEIBOMIAN GLAND TREATMENT



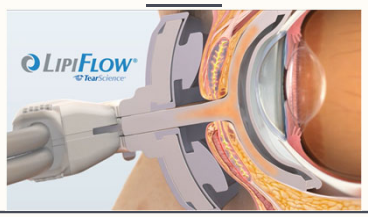
MEIBOMIAN GLAND TREATMENT MIBO THERMOFLO

- Therapeutic medical device
- 108°F continuous, controlled heat applied to outer eyelid and manual gentle massage
- Recommended 3 treatments, 2 weeks apart – reevaluate for necessity of 4th treatment
- Most patients go 12 months before requiring additional treatment

MEIBOMIAN GLAND TREATMENT LIPIFLOW

- Vectored Thermal Pulse Technology

MEIBOMIAN GLAND TREATMENT LIPIFLOW



MEIBOMIAN GLAND TREATMENT INTENSE PULSED LIGHT (IPL)

- Brief, powerful bursts of light at specific wavelengths cause changes in blood vessels near surface of the skin
- ↑ temperatures = ↓ problematic flora on the skin of the eyes

MEIBOMIAN GLAND TREATMENT INTENSE PULSED LIGHT (IPL)

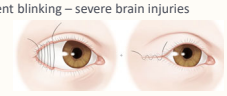
Intense Pulsed Light Treatment for Dry Eye Disease Due to Meibomian Gland Dysfunction; A 3-Year Retrospective Study

- 78 subjects
- Physician-judged improvement in TBUT in 87%
- 93% post-treatment satisfaction
- 13% adverse events: redness or swelling, but no serious events

- **Conclusion**: promising results – current multisite clinical trial underway

SURGICAL INTERVENTION TARSORRHAPHY

- To protect the cornea in the case of:
  - Inadequate eyelid closure – facial nerve palsy, cicatricial damage
  - Neuropathic cornea at risk of damage and infection
  - Proptosis causing risk of corneal exposure
  - Poor or infrequent blinking – severe brain injuries



SUMMARY

- TREAT THE UNDERLYING CULPRIT!
- Dry eye is a disease – understanding the mechanism is important
- Diagnostics will lead to the appropriate management/treatment
- Contact lens dropout can be largely impactful to your practice, without you even knowing it
- Dry eye is a chronic, multifactorial disease that requires chronic and multifactorial management/treatment

THANK YOU!!!

REFERENCES

Please contact me!

Too many to fit on one slide and do not want to cause dry eye…

tuje@umsl.edu