

Dry Eyes in an Hour What Really Works

Peter J. Cass, OD

1

Peter J. Cass, OD - Disclosures

- Vice President, **Practice Compliance Solutions**
- Past President, **Texas Optometric Association**
 - Chair HIT Committee, member AOA HIE Workgroup
 - L&L Committee, Third party Committee
- Adjunct Faculty, **University of Houston College of Optometry**
- Board Member, **Elevate Digital Optics Lab**
- Associate, **MyEyeDr Beaumont**
- Consultant/Speaker for ophthalmic companies:
 - Alcon, Bausch & Lomb, BioD, Crystal Practice Management, Diopsys, Solution Reach, Katena, Tear Science, Shire, Weave
- Lecturer for
 - Professional groups: Vision Source, Vision West, ECPN, PERC, Vision Trends, Vision West, TSO, etc.
 - Universities: RSO, UHCO, UAB, etc.
 - State associations: TOA, and over 20 others
- Working relationships with: CodeSafePlus, Clenman, Power Practice
- Shareholder Essentia, EDO labs, PCS, CVS



2

DEWS and TFOS

- “Dry eye disease is a **common** yet **frequently under-recognized** clinical condition whose etiology and management **challenge clinicians** and researchers alike” – Introduction to Report of the DEWS (2007)
- International Dry Eye WorkShop (DEWS)
 - an international panel of experts in DED who sought to clarify the definition & characteristics of DED
 - Took several years, final report over **130 pages long**
- Supported by the **Tear Film & Ocular Surface Society** (TFOS), a non-profit organization

3

DEWS II

- Designed to achieve a **global consensus** concerning multiple aspects of dry eye disease
 - included more than **150** clinical and basic **research experts** from **23 countries** and
 - required **more than 2 years** to complete
 - Released after **July 2017**
- **New 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,”

4

MGD Workshop

- TFOS tried to help improve our knowledge of MGD through the **International Workshop on Meibomian Gland Dysfunction**.
 - Took more than 2 years to complete
 - Finalized in **2010**
 - Involved more than 50 leading clinical and basic research experts from around the world

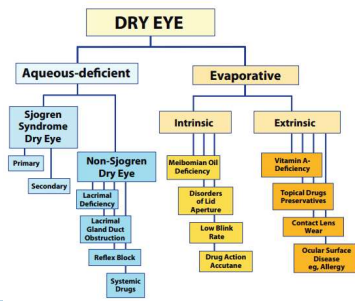
5

Current Approach

- Many of the algorithms to treat DED use a severity-based approach
- Typically divide dry eye into 2 types
 - **Aqueous Deficient**
 - **Evaporative**

6

DEWS Classification of Dry Eye

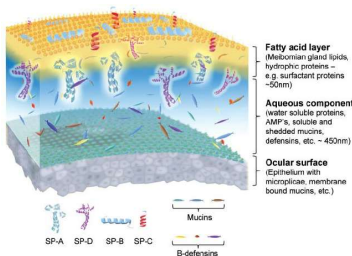


The Ocular Surface / April 2007, Vol. 5, No. 2 / www.theocularsurface.com

7

An Anatomical Based Approach

- I prefer an **anatomical approach**
- **3 Layers** of the tear film
 - lipid,
 - aqueous, and
 - mucous
- Can also consider other issues:
 - Lagophthalmos, etc.



8

Surface Inflammation

- Symptoms
 - Dryness / grittiness
 - Burning / stinging
 - Epiphoria
- Signs
 - Conjunctival edema / hyperemia
 - Conjunctival staining
 - Corneal staining

9

Surface Inflammation

- Causes
 - ocular surface stress
 - changes in the composition of tear film
 - Hyper-osmolarity
 - ultraviolet light exposure
 - Systemic disease

10

Aqueous Deficient Dry Eye

- Symptoms
 - Foreign-body sensation
 - Excessive lacrimation
- Signs
 - Reduced tear meniscus
 - Debris and strands of mucous in the tear film
 - Corneal filaments (filamentary keratitis)

11

Aqueous Deficient Dry Eye

- Causes
 - Reduced aqueous production
 - May be secondary to lacrimal-gland output deficiency

12

Evaporative Dry Eye

- The most common form of dry eye.
 - Accounting for **up to 86% of all dry eye** cases
- TFOS MGD Definition
 - “a chronic, diffuse abnormality of the Meibomian glands, commonly characterized by **terminal duct obstruction** and/or qualitative/quantitative changes in the glandular secretion. This may result in alteration of the tear film, symptoms of eye irritation, clinically apparent inflammation, and ocular surface disease.”

13

Meibomian Glands

- **31 glands in the superior lid and**
- **26 glands in the lower lid**
- They release meibum, a clear oily substance into the tear film
- protect the ocular surface from evaporation of the aqueous layer and
- provide stabilization of the tear film by lowering surface tension



Normal Eyelid (meibomian) Glands:



Gland (oil) Dropout:

14

Evaporative Dry Eye Symptoms

- Prevalent symptoms may include
 - **blurry vision**
 - **discomfort**
 - **excess tearing**
 - **lid irritation**
 - **burning sensations**



Normal Eyelid (meibomian) Glands:



Gland (oil) Dropout:

15

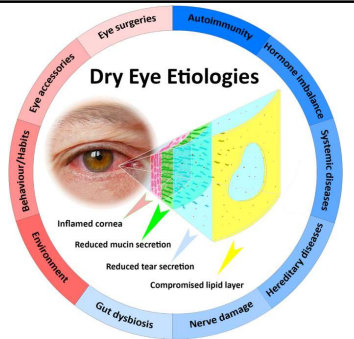
Causes

Intrinsic factors

- Auto-immunity
- Hormonal Imbalance
- Systemic Disease
- Hereditary Disease
- Nerve Damage
- Gut Dysbiosis

Extrinsic Factors

- Environmental influences
- Behaviour and/or habits
- Contact lens wear
- Prior Ocular Surgery



16

Systemic Causes of MGD

- Many Systemic factors that may contribute to MGD
 - androgen deficiency, menopause, aging,
 - Sjögren's syndrome,
 - cholesterol levels,
 - psoriasis, atopy, rosacea,
 - hypertension, and
 - benign prostatic hyperplasia (BPH).

17

Ophthalmic Causes of MGD

- Ophthalmic factors may include
 - anterior blepharitis
 - contact lens wear
 - Demodex folliculorum

18

Medications and MGD

- Medications associated with MGD include
 - antiandrogens
 - medications used to treat BPH,
 - postmenopausal hormone therapy (e.g., estrogens and progestins),
 - antihistamines,
 - antidepressants,
 - retinoids.
- Omega-3 fatty acids may be protective.

19

Risk Factors

- Advancing age,
- Rheumatoid arthritis,
- Graves' disease,
- Drugs that decrease aqueous or mucous membrane secretions,
- eyelid or blinking abnormalities,
- a history of trauma to the lids
- Environmental
- Refractive surgery

20

Dry Eye Diagnosis & Testing

- Prevalence varies, but **around 15%**
 - **About 48 million in the U.S.** - compared to:
 - ARMD 7.0 M
 - Diabetic ret 4.2 M
 - Glaucoma 2.9 M
- DEWS compared studies and found a range of about **5% to over 35%** at various ages.
 - But...different definitions of dry eye were employed in these studies
- MGD has been estimated to account for 86% of dry eye

21

Two tiered approach

- **Step 1:** normal subjects are distinguished from patients with dry eye
- **Step 2:** differential diagnosis of type of dry eye.
- In my office this involves
 - Initial exam
 - Dry eye exam
- Great for time management and for emphasis of medical nature of disease as well

22

SPEED

Report the **FREQUENCY** of dry eye symptoms you are experiencing by checking Never, Sometimes, Often or Constant using the numbering system below:

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

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

23

SPEED

Report the **SEVERITY** of your symptoms using the ratings list below:

- 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

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

24

Importance of order of testing

- Tests should be performed in an order that minimizes the extent to which one test influences the results of the tests that follow.

25

My preferred order

1. Lipid Layer Thickness (LipiView)
 2. Blink Rate and blink interval (LipiView)
 3. Meibomian gland dropout (LipiView)
 4. Meibomian gland duct dilation (LipiView)
 5. Meibomian gland duct expression (Korb expressor)
 6. Tear Breakup Time (after instilling NaFl)
 7. Tear osmolarity (Tear Labs);
 8. Tear Meniscus height
 9. Inflammadry
 10. Grading of conjunctival fluorescein staining
 11. Grading of corneal fluorescein staining
- Surface Layer
- Middle Layer
- Bottom Layer

26

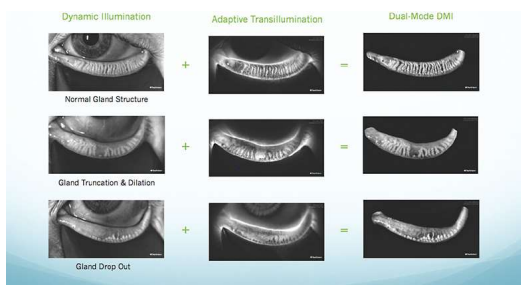
Meibomian Gland Imaging

- LipiView
 - Small footprint
 - works with normal lighting
- OCULUS Keratograph® 5M
 - Can also do Keratography
- Box Medical
 - Least Expensive



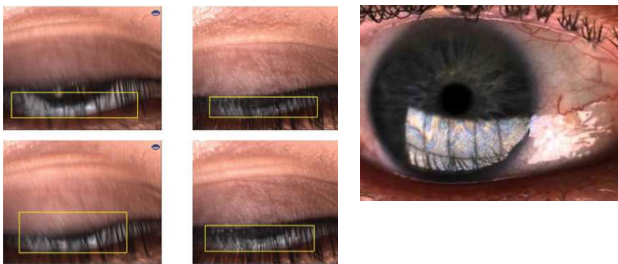
27

Meibomian Gland Imaging



28

Blink Rate and Lipid Layer Thickness

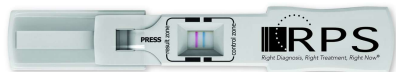


29

MMP-9 Detection

• Matrix Metalloproteinase-9 (MMP-9) Detection

- InflammaDry (Rapid Pathogen Screening, Inc.)
- similar to an at-home pregnancy test



• MMP-9

- A proteolytic enzyme **secreted from stressed epithelial cells** on the ocular surface (a non-specific marker of inflammation)
- Correlate with dry eye, OSD, and some clinical findings
- Associated in both Sjögren's and MGD

30

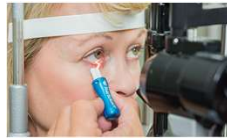
Tear Osmolarity

- Important for many aspects of epithelial and nerve cell function.
 - In healthy tears, the electrolyte concentrations are maintained to ensure correct osmolarity.
 - **unhealthy tears, proteases are activated**, degrade the extracellular matrix and the tight junctions between adjacent cells of the corneal epithelium.
- Very **high predictive value** for the detection of DED

31

Meibomian Gland Expression

- **Diagnostic expression** (as opposed to therapeutic expression)
 - Can be done with a finger or cotton-tip applicator pressed against the inferior eyelid for 5 to 15 seconds.
 - The central to nasal inferior lids that are the most important to assess severity
 - KORB expressor



32

Meibomian Gland Expression

- Classification
 - Normal
 - Slight
 - Moderate
 - Severe
 - Hard
 - Absent



33

Tear Break Up Time

- **Tear film stability**
- **Observing dry spot formation on the cornea following instillation of sodium fluorescein**
- Can also be done with
 - Keratograph® 5M or
 - LipiView



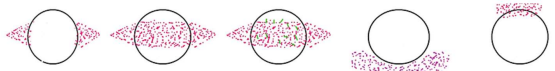
34

Staining

- **Fluorescein**
 - stains defects in the corneal and conjunctival epithelium,.
- **Rose bengal**
 - stains dead conjunctival cells or cells unprotected by the normal mucin layer.
 - stains the conjunctiva more than the cornea
 - correlates with the degree of aqueous tear deficiency, TBUT, and reduced mucus production by conjunctival goblet cell and non-goblet epithelial cells.
 - **may irritate, and be toxic to, the ocular surface**
- **Lissamine green**
 - **similar mechanism to rose bengal**; but less irritating

35

Staining



Mild presentation of:

- Keratoconjunctivitis sicca (classic pattern)
- Blepharitis
- Chemical injury (hair spray keratopathy)
- Ultraviolet exposure keratitis/arc welding keratitis
- Medication toxicity

Moderate presentation of:

- Keratoconjunctivitis sicca (classic pattern)
- Blepharitis
- Chemical injury (hair spray keratopathy)
- Ultraviolet exposure keratitis/arc welding keratitis
- Medication toxicity

Severe presentation with filaments (noted in green):

- Keratoconjunctivitis sicca (classic pattern)
- Blepharitis
- Chemical injury (hair spray keratopathy)
- Ultraviolet exposure keratitis/arc welding keratitis
- Medication toxicity

Mucus fishing syndrome

- Chemical injury
- Medication toxicity
- Inferior ectropion
- Entropion
- Trichiasis
- Conjunctivochelasis

Superior limbic keratoconjunctivitis

- Foreign body under lid
- Atopic keratoconjunctivitis
- Floppy lid syndrome
- Conjunctival concretions
- Vernal keratoconjunctivitis
- Infectious keratitis
- Superior entropion

Milner MS, Beckman KA, Luchs JL, et al. Dysfunctional tear syndrome: dry eye disease and associated tear film disorders- new strategies for diagnosis and treatment. Curr Opin Ophthalmol. 2017 Jan;27 Suppl 1:3-47.

36

Treatment

- Treatment of DED varies greatly among ECPS.
- Most practitioners agree that underdiagnoses is common and clinical follow-up irregular.
- DEWS found that without generally accepted definitions for a staging system, it is problematic to propose a treatment plan based on disease stage.

37

Treatment based on anatomy

- Lipid Layer Issues
 - LipiFlow
 - Hot Compresses
 - Lid Massage
 - Lid Scrubs
 - Fish Oils
 - Blink training
 - Retaine MGD drops
- Aqueous deficiency
 - Artificial tears
 - Punctal plugs
- Goblet cell deficient/mucin deficient
 - Restasis or Xiidra
 - Lotemax, Alrex, or Durezol
 - Amniotic Membranes
 - Retaine MGD drops
 - Treatment of concurrent allergies

Surface Layer

Middle Layer

Bottom Layer

38

Micro exfoliation

- **BlephEx**, a handheld device similar to an Alger brush that rotates a PVA sponge tip along the eyelid margins at approximately 2,000RPM
- **Tip is pre-soaked in a lid cleanser**
- Removes fibrinous debris at the base of the lashes, oily scales due to seborrheic blepharitis, cylindrical dandruff associated with Demodex species, and the meibomian plugs which are often inherent in MGD.



39

LipiFlow

- **Automated therapeutic energies** to each meibomian gland
- **Protective shell** vaults the cornea and protects the eye allowing a maximum therapeutic temperature of 109F to reach glands
- **Pulsed sequences** to expel blockages



40

IPL

- Non-laser, broad wavelength, high intensity flash of light
 - applied using a handpiece that contacts the skin through a sapphire or quartz block
- Reduces Inflammatory Mediators
- Improves meibomian gland morphology and functionality
- Can cause permanent skin depigmentation
 - Not a serious medical problem
 - can be a permanent aesthetic issue



41

Dry Eye Medications & Follow up

- Patients are symptomatic and looking for someone to help
- Huge potential for your practice
- Medication options
 - Nutraceticals
 - Immunosuppressants
 - Steroids
- Give them an OTC recommendation and you might as well give them a referral to your colleague down the road
- Actual treatment requires follow up (and you can bill for it!)
- Patients will appreciate it and refer others



42

Anti-inflammatories

- Disease or **dysfunction** of the tear secretory glands can change tear composition (osmolarity)
 - **stimulates the production of inflammatory mediators** on the ocular surface
- **Inflammation may then cause dysfunction** or disappearance of cells responsible for tear secretion or retention.
 - can also be initiated by chronic irritative stress (eg, contact lenses) and systemic inflammatory/autoimmune disease (eg, RA)
- Starts a **cycle of inflammation**

43

Anti-inflammatories

- Different mechanism but
- Increases tear production in patients where it's presumed to be suppressed due T-cell activation and inflammatory cytokine production
 - **Restasis**
 - **Xiidra**
 - **Cequa (cyclosporine 0.09%, Sun Ophthalmics)**

44

Anti-inflammatories

- **Cequa (cyclosporine 0.09%, Sun Ophthalmics)**
 - use of nanomicelles—small, highly soluble colloids with a hydrophilic surface
 - Increase cyclosporine bioavailability while reducing adverse reactions
 - Higher concentration and improved drug delivery method may be more effective and better tolerated than older forms of cyclosporine

45

Anti-inflammatories

- **Eysuvis (loteprednol etabonate ophthalmic suspension 0.25%, Alcon)**
- An ophthalmic nanosuspension that delivers corticosteroid to the anterior eye using mucus-penetrating particles (MPPs).
 - Facilitates drug penetration through the mucus barrier and enables the drug to spread more quickly and uniformly across the ocular surface
- Side effects are minimal compared to traditional corticosteroids

46

Tetracyclines

- Tetracyclines have **anti-inflammatory** effect, useful
 - These agents decrease the activity of collagenase, phospholipase A2, and several matrix metalloproteinases, and
 - they decrease the production of interleukin (IL)-1 and tumor necrosis factor (TNF)-alpha in a wide range of tissues, including the corneal epithelium.¹⁴⁹⁻¹⁵¹
- At high concentrations, tetracyclines **inhibit staphylococcal exotoxin-induced cytokines and chemokines**
- The anti-angiogenic effect of tetracycline may help as well

47

Corticosteroids

- **methylprednisolone** has been shown to **preserve corneal epithelial smoothness** and barrier function
- Also **prevents an increase in MMP-9** protein in the corneal epithelium
- The risks of prolonged topical corticosteroid therapy are well known.
 - should be reserved for acute exacerbations
 - not recommended for long-term therapy
- Topically applied androgen and estrogen steroid hormones are currently being evaluated

48

Nasal Sprays

- Tyrvaya (varenicline tartrate solution 0.03mg, Oyster Point Pharma)
- The first nasal spray to treat the signs and symptoms of DED.
- It is applied to the inside of the lower nasal area twice a day.
- Thought to stimulate the lacrimal glands and increase basal tear film production
- Can spare the ocular surface from drug exposure.
- Well-tolerated and fast onset, In clinical trials, Schirmer score after just four weeks.



49

Autologous Serum

- More effective than conventional tears for improving tear film stability and subjective comfort
- Provide statistically significant improvements in Schirmer's scores, tear film debris and goblet and epithelial cell density
- Improve signs and symptoms of ocular surface disorders associated with systemic autoimmune diseases
- Can also accelerate corneal epithelial healing



50

Bandage Contact lenses

- The role of BCLs in dry eye is **controversial**
- Work well for:
 - For patients who need to continually instill lubricating drops into their eyes
 - Patients with significant epithelial defects
 - Patients with significant lagophthalmos
 - Patients with exposure keratopathy
- However, contact lenses are generally contraindicated for dry eye

51

Types of Disks Available

- Wet
 - Prokera®
 - **Prokera® Slim (ring half as thick)**
 - Prokera® Plus (membrane twice as thick)
- Dry
 - 9mm, 12mm, 15 mm

AMBIODisk

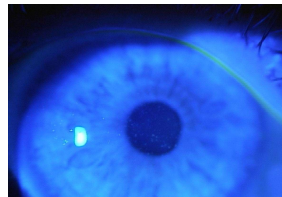
BioB



52

Indications: Diseases without Epithelial Defects

- To prevent further damage and promote regeneration (no debridement/PTK)
- **Dry Eye Syndrome**
- **Superficial (Punctate) Keratitis**
- **Filamentary Keratitis**
- Radiation Keratitis; whorl pattern indicative of limbal stem cell injury
- Exposure (Graves) Keratopathy



53

Scleral contact lens fits

- 2012 study used mini-scleral showed
 - reduced discomfort and symptoms,
 - decreased use of artificial tears and
 - improved visual acuity.
- Several other studies have shown benefits as well
- It's **important that the scleral lens completely vaults the cornea to avoid mechanical injury**
 - complete lens clearance of the cornea,
 - evenly distributed haptic bearing that doesn't excessively compress the bulbar conjunctiva and a semi-seal fit.

54

Blink Training



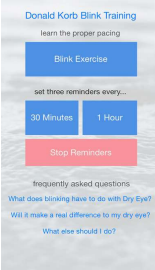
Good Blinking: A Key to Healthy Vision.

Proper blinking keeps your tear's healthy by releasing and spreading oil from eyelid glands into the tear. When your tears are healthy, they stabilize your vision and protect you from eye infections and eye discomfort.

Like breathing, your blinking is automatic but there are many things like working on a computer and reading, that create poor blinking habits. These habits will make your blinking much less effective. Poor blinking can easily lead to an unhealthy tear film but blinking exercises are practical and effective.

- the blinking exercise that follows is an improvement and simplification of those recommended by eye doctors for 30 years.

TearScience, Inc.



55

Sunglasses



56

Water Intake

- Interesting article by Kelly Nichols
 “We've all heard of the recommended water intake, eight 8-ounce glasses per day. However, **reviews of the scientific literature on the topic performed in 2002 and 2008 did not reveal *any* solid scientific evidence that supported this recommended intake**”
- Thus, water intake data is probably confounded by other patient characteristics and habits
 “Having said that, **what if it did help?**”

57

Hot Compress & Lid Massage

- Warm compress is a **necessity for nearly every patient** that suffers from both MGD/OSD.
 - increased compliance when purchased from the practice



58

Lid Hygiene

- Lid hygiene is an important part of treatment
 - increased compliance when purchased from the practice
 - Foam lid hygiene product in the shower
 - Lid scrubs
 - Hypochlorous acid for stubborn blepharitis
 - Demodex take-home product



59

Eye seals/sleep masks

- Options include Eye Eco and Sleep Tite



60

Nutrition

- A 30% reduction in dry eye risk was observed with each gram of omega-3 consumed each day
 - Anti-inflammatory properties.
- Macronutrients most important in maintaining ocular surface health include:
 - Vitamins A2, A3, B12, C and D.
 - Vitamin C may play a role as well

61

Exercise

- In a recent study, researchers found that high-intensity interval aerobic exercise (HIIAE) and a Mediterranean diet resulted in:
 - Decrease in weight
 - Decreased BMI
 - Decreases in systolic and diastolic blood pressure
 - Improvements in dry eye scoring system and
 - Improvements in OSDI
 - Improvements in tear breakup time and Schirmer's test

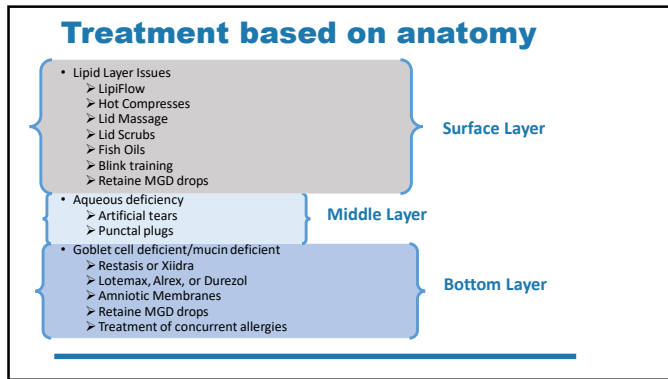
62

Economics

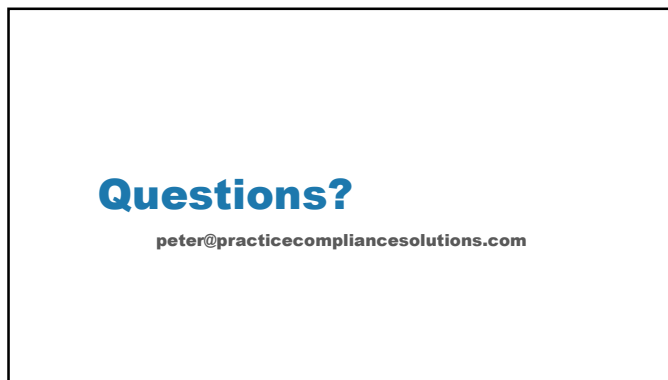
- | | |
|---------------------|-----------------|
| • Initial Exam | \$149 |
| • Dry Eye Workup | \$83 + \$50 +25 |
| • LipiFlow | \$980 |
| • 1 month follow up | \$83 |
| • 3 month follow up | \$83 |
| • 6 month follow up | \$83 |

\$1,536

63



64



65
