Late 19th Century Sir William Osler at the Johns Hopkins Medical School

- Introduced bedside teaching as a new approach to clinical education
- Residents learned as faculty passed from patient to patient, explaining their methods of diagnosis and treatment
- As this method grew in popularity, the rounds moved from bedside to the auditorium, and the traditional approach to grand rounds was created

Senior physicians questioned the patient and observed any physical findings demonstrated by the resident

- After the patient exited, his or her problems were discussed in what was described as a “free discussion between thinking men of widely different interests and experience”, that instilled character and inspired future physicians
- The patient, the “theoretic focus of all clinical activity” remained the principal topic

In the mid to late 20th century, patients were no longer present, nor were they the focus, as the diseases had taken precedence in the discussions
Effective Grand Rounds

- Should be Patient Focused
- Should disseminate knowledge
- Change physician behavior
- Improve patient outcomes
- Should interact with physicians

Case Report

55 yo WF Jody M
CC: red eyes OU. Burning, tender, with associated yellowish discharge, itching and tearing
- Approx 6 weeks duration (last visit 4 mo ago)
Oc Hx
- POAG – Pre Tx IOP OD 30, OS 43, (Dx approx. 1½ year prior)
- C/D OD .4, OS .75
Med Hx
- Brain Aneurysm R side 2003
- HTN
- Meds
  - HCTZ
  - Wellbutrin SR
  - Latanoprost Qhs OU
  - Timoptic XE Qam OU

Classify Conjunctivitis into 4 Categories

1. Time course
2. Morphology
3. Localization of disease process
4. Type of discharge or exudate
_____ weeks is the dividing point as it is the upper limit for cases of viral infection and most bacterial infections to resolve without treatment.

- Acute Conjunctivitis
  - Conjunctivitis that has been present for less than 3 weeks
  - Adenoviral
  - Herpes Simplex
  - Inclusion (chlamydial) – if caught early
  - Newcastle disease (poultry handlers or veterinarians)
  - Enterovirus
  - Cat Scratch Fever

- Chronic Conjunctivitis
  - Conjunctivitis that has been present for greater than 3 weeks

**Classification: Time Course**

**Classification: Morphology**

Morphologic classification can be broken down into five categories:

1. Papillary
2. Giant papillary
3. Follicular
4. Membranous/pseudomembranous
5. Cicatrizing

**Papillary**

- All forms of conjunctivitis will have some form of papillary hypertrophy.
- Papillae are described as elevations of the conjunctiva with a central core blood vessel.
- As the conjunctiva becomes thickened by infiltration with inflammatory cells, the individual papillae are created by septae that are fibrous connections of the epithelium to the underlying substantia propria.
- Each papilla is then seen as a red dot, which represents the core blood vessel viewed on end.
- Normally, visualization of individual papillae is difficult.
  - In papillary hypertrophy, the normal vascular pattern becomes obscured, and in extreme cases obliterated, by the inflammatory process.

**Giant Papillary**

- When the individual septae separating papillae break down, multiple individual papillae merge to form a giant papilla.
- Giant papillae are conjunctival elevations that are greater than 1 mm in size.
- Most commonly occur on the upper tarsal conjunctiva, but in some cases can be seen on the lower tarsal conjunctiva.
- They usually have flat tops and seem to fit together like cobblestones, hence the descriptive term “cobblestone papillae.”
**Follicular**
- Dome-shaped conjunctival elevations with a circumferential blood vessel and clear center
- Histopathologically, follicles are aggregations of mononuclear inflammatory cells that are organized similarly to follicles within lymph nodes
- In children, follicles are sometimes seen in the absence of other disease, a condition sometimes termed folliculosis
- When follicles are present in conjunction with papillary hypertrophy, there is a follicular conjunctivitis

**Membranous/Pseudomembranous**
- Membranes and pseudomembranes are sheets composed of a network of fibrin and inflammatory cells that form a layer over the surface of the conjunctiva
- True membranes have a growth of capillaries from the conjunctiva into the membrane, while pseudomembranes are avascular
- Either type of membrane is a sign of severe inflammation where the conjunctiva is very friable, and stripping either type of membrane causes bleeding

**Cicatrizizing**
- Some forms of conjunctivitis lead to progressive conjunctival scarring, or cicatrization
- Findings associated with cicatrization include:
  - stellate or linear subconjunctival scars
  - shortening of the conjunctival fornices
  - formation of symblepharon
  - eventual ankyloblepharon
  - cicatricial entropion
  - loss of conjunctival goblet cells leading to conjunctival and corneal keratinization
- Patients with pre-existent scarring are not immune to the causes of acute conjunctivitis
- Concurrency of scarring and inflammation is not enough to confirm a diagnosis of cicatrizing conjunctivitis; this diagnosis is made when chronic conjunctival inflammation is associated with progressive cicatrization
Different forms of conjunctivitis tend to affect different areas of the external eye. Determining the predominant area of inflammation can contribute to making an accurate diagnosis. Some conditions have significant involvement of the eyelids as well as the conjunctiva.

- Chronic blepharitis
- Molluscum contagiosum
- Atopic keratoconjunctivitis

Some primarily affect the upper palpebral conjunctiva.

- Vernal keratoconjunctivitis (VKC)
- Trachoma
- Superior limbic keratoconjunctivitis (SLK)

Some primarily affect the lower palpebral conjunctiva.

- Inclusion conjunctivitis
- Toxic conjunctivitis

Other entities involve the bulbar conjunctiva.

- Keratoconjunctivitis sicca

Many forms of chronic conjunctivitis have significant corneal involvement, termed Keratoconjunctivitis sicca.

Most forms of chronic conjunctivitis are bilateral, although often asymmetric.

- Some are unilateral
  - Lacrimal drainage infections
  - Ocular surface tumors

As part of the inflammatory process, blood vessels have increased permeability, leading to leakage of serum, proteins, and inflammatory cells, creating an exudate. Exudates can take different forms:

- Grossly purulent exudates are seen in hyperacute conjunctivitis. These are always acute diseases.
- Watery exudates are seen in viral infections. These are always acute diseases.

The most common type of exudate is mucopurulent (or catarrhal), representing a mixture of mucus and pus.

In some allergic conditions such as VKC, there can be a mucoid exudate, a thick, tenacious discharge that can be peeled intact off the conjunctival surface, often revealing a cast of the morphology of the conjunctival surface.

Case Example:

1. Time course
   - > 3 weeks, Yes, was 6 weeks maybe longer... Chronic
2. Morphology
   - Mostly Follicular.....Follicular
3. Localization of disease process
   - Mainly lower lid
4. Type of discharge or exudate
   - Mucopurulent
**Case Report**

**DDx** –
- **Viral Conjunctivitis**
  - Time course doesn't fit. No PA node or Hx of exposure – Fits a Chronic Follicular Conjunctivitis
- **Chlamydial / Trachoma vs Inclusion Conjunctivitis**
  - Maybe? Did cultures in office
- **Molluscum Contagiosum**
  - Lash line was clear and no signs of Molluscum anywhere on face or body
- **Drug Toxicity / Toxic conjunctivitis**
  - Was recently switched to different generic of latanoprost / ? tolerability of new med vs Preservative reaction from preservatives in glc meds

**Case Report**

**Treatment**
- Stop Latanoprost (continued TXE), Add lotemax BID
- RT 2 weeks
- Pt reports minimal improvement noted
  - Still 1-2+ inj with follicles
  - IOP 14, 15
  - Plan
  - Stop TXE and increase Lotemax Q2h
  - RT 1 week, write Rx for Zioptan, but hold on starting
- Reports eyes finally feeling much better, and not as bothersome
  - Less injection and less papillary reation
  - IOP 22,26 (off all glc meds)
  - Start Zioptan, RT 2 weeks
- Feeling best yet, back to normal
  - Conj quiet
  - IOP 17, 18
  - Cont Zioptan QHS OU , eventually started Timoptic in Ocudose

**Case Presentation**

- **RM, 81 year old Caucasian male**
- Presents with c/o blurred vision OS x 1 month
- **Medical History**
  - Type II Diabetes
  - Hyperlipidemia, hypertension
  - Chronic kidney failure
- **Ocular history**
  - Cataract surgery 10+ years ago
- **Surgical history**
  - Tonsillectomy
  - Trigeminal nerve surgery for cluster headaches
Uncorrected VA (12/2014) 20/30 OD, OS
- Best corrected to 20/20 OD, 20/25 OS
Uncorrected VA (9/2015) 20/30 OD, 20/80 OS

Slit lamp exam

"NK is a disease related to alteration in corneal nerves leading to impairment in sensory and trophic function with consequent breakdown of the corneal epithelium, affecting health and integrity of the tear film, epithelium and stroma" 

This implies that NK is the likely diagnosis in the presence of an epithelial defect that does not heal, or heals and breaks down repeatedly in the presence of reduced or altered corneal trophic function and sensitivity.

Additional ocular causes:
- Other infections e.g. acanthamoeba with nerve damage related to keratoneuritis
- Abuse of topical anesthetics
- Drug toxicity (timolol, betaxolol, diclofenac sodium, sulfacetamide 30%)
- Chronic ocular surface injury or inflammation
- Corneal dystrophies (lattice, granular)
- Ocular surgery
  - Alterations of corneal sensitivity have been observed after cataract surgery even if no frank NK has been reported.
  - Penetrating keratoplasty (PK) and deep anterior lamellar keratoplasty (DALK) can cause some degree of corneal denervation, up to 12 months after surgery, but NK is not very frequent after this kind of surgery. (Lin et al., 2014)
  - Collagen crosslinking for keratoconus. Treated corneas frequently show a transient reduction of corneal sensitivity (Wakahara et al., 2013)
- Development or worsening of NK has been frequently associated with vitrectomy for retinal detachment and photocoagulation to treat diabetic retinopathy (Daverey et al., 2014)
- Postoperative or late treatment (trauma of ciliary nerves). Rosacea, single sessions, indirect laser for proliferation diabetic retinopathy has also been reported as a possible cause of NK. (Titey and Gray, 2000)

Symptoms in early stage of NK:
- Dryness
- Photophobia
- Foreign body sensation
- Inability to read for prolonged periods
- Impaired quality of vision and reduced blink

Symptoms in moderate to late stage of NK:
- Visual impairment appear when central cornea involved
- Pain and discomfort are less

Neurotrophic Keratopathy

Affects fewer than 65,000 people in US
Causes
- Most common
  - Herpes Simplex (6%) or Herpes Zoster (12.8%)
  - Trigeminal Nerve Surgery (2.8%)
- Less common
  - Chemical burns
  - Diabetes
  - Contact lenses
  - Space occupying lesions
  - Multiple sclerosis
  - Leprosy

Although dry eyes are a feature of NK, DED and NK are different clinical entities
However some convergence is seen in LVC
Likely will have depletion of Substance P
**Neurotrophic Keratopathy**

- **Staging of NK**

  - **Mild**
    - Epithelial changes only without epithelial defect
    - Epithelial irregularity without frank epithelial defect; tear film instability and symptoms (hyper-aesthesia) with reduced or absent sensations in one or more quadrants of the cornea

- **Moderate**
  - Epithelial defect without stromal defect
  - Frank persistent epithelial defect and corneal hypo-aesthesia/anesthesia

- **Severe**
  - Stromal involvement
  - Stromal involvement from corneal ulcer to lysis to perforation, with corneal hypo-aesthesia/anesthesia

- **Treatments** limited to addressing symptoms
- Epithelial healing
- Prevent progression of corneal damage
- Caution with topical medications

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**Treatment**

- **Mild NK**
  - Evaluation of side effects of systemic therapies such as neuroleptic, antipsychotic, and antihistamine drugs
  - Treat concurrent ocular surface problems, especially infection of ocular surface/lacrimal passage
  - Anti-inflammatory therapy if inflammation present (non-steroidal anti-inflammatory drugs can be toxic)
  - Tear substitution/Administration of topical preservative-free lubricants
  - Punctal occlusion
  - Correction of lid abnormalities
  - Debridement of sick epithelium

- **Moderate NK**
  - Prophylactic topical preservative-free antibiotics
  - Prevention of melting with Citrate/tetracycline/macrolides (if stromal involvement is threatened)
  - Recombinant Human (rh)NGF (Cenergemin/Oxervate)
  - Q10 co-enzyme
  - Calcium 20/RGTA
  - Serum eye drops, platelet-rich plasma
  - Corneal or scleral therapeutic contact lenses
  - Non-surgical eyelid closure
  - Debridement of ‘rolled’ edges of epithelial defect
  - Tarsorrhaphy
  - Amniotic membrane transplantation usually single layer as patch
  - Conjunctival flaps
Neurotrophic Keratopathy

- Treatment
  - Severe NK
    - rhNGF and RGTA are likely to be of particular help
    - Amniotic membrane, multilayer, usually as graft
      - Can be combined with tarsorrhaphy
    - Corneal grafts (tectonic, lamellar or full thickness)
    - In the event of perforation
      - Cyanoacrylate tissue adhesive with therapeutic contact lens
      - Fibrin glue
      - Amniotic membrane graft or corneal grafts

Case Presentation

- Plan
  - Sutureless amniotic membrane (AmbioDisk)
  - Besivance QID OS
  - Oasys 8.4 BCL
  - RTO x 1 day

- Patient returns in 2 days
  - Vision seems slightly clearer
  - Clinical appearance improved
  - Plan
    - Continue Besivance QID OS
    - RTO 3-4 days

Case Presentation

- Patient returns in 4 days
  - Membrane dissolved
  - BCL gone???
  - Still using Besivance
  - RTO in 3 days

Case Presentation

- Post Day 9
  - BCVA ~20/25
  - Defect healed
  - Minimal haze
  - RTO x 1 week
  - Continue Besivance BID OS, add Pred Forte BID OS

Case Presentation

- Post Day 16
  - Patient feels vision back to normal
  - BCVA 20/25
  - Discontinue all drops
  - Continue use of artificial tears

Oxervate (cenegermin)

- Dompé Pharmaceutical
- First treatment specifically indicated for neurotrophic keratitis
- First ever topical biological medication in the ophthalmic space
- First ever application of a human nerve growth factor as a drug or treatment
- Was authorized in Europe in 2017
- Received Orphan Drug Designation, Fast Track Status, Breakthrough Therapy Designation
  - Ultimately Priority Review
Oxervate

- 151 patients in 2 studies
  - 8 week, randomized controlled
  - Multi-center, double masked

- Drops used 6x/day (Q2H) in affected eye(s) for 8 weeks
  - Compared drops to placebo or different concentration (Study 1)
  - Compared drops to placebo (Study 2)

- Results: Complete corneal healing in 8 weeks in 70% of patients (Oxervate) vs. 28% (without Oxervate)

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Oxervate (cenegermin)

- Approved August 2018
- Expected rollout 1st Quarter 2019

- The regenerative potential of NGF was discovered by Nobel-prize winning scientists, but its therapeutic potential was not realized in eyecare until Dompé’s research and development center in L’Aquila, Italy, created cenegermin-bkbj
  - a recombinant version of human NGF, through a unique development process

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Oxervate

- Oxervate is supplied in a weekly carton containing 7 multiple-dose (glass) vials in an insulated pack in a “Delivery System Kit”
  - Contains 8 vial adapters, 45 pipettes, 45 sterile disinfectant wipes and a dose card

- Within 5 hours of leaving the pharmacy the weekly carton should be refrigerated between 36-46F (up to 14 days)
  - No Contact lenses (including BSCL), limits med distribution
  - Do not freeze (re-freeze)
  - Do not shake
  - Discard any unused portion after 12 hours

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Oxervate

- Instructions for use:
  1. “Follow Steps 1 to 19 each day you use Oxervate”

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Oxervate

- Side Effects
  - Eye pain (most common - 16%)
  - Less than 10%
    - Corneal deposits
    - Foreign body sensation
    - Ocular hyperemia
    - Ocular inflammation
    - Tearing

- Cost
  - $$$

- In addition to neurotrophic keratitis, cenegermin is also under development (Phase II) for the treatment of dry eyes, retinitis pigmentosa, and glaucoma

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Case Report
A 55 year old female with history of mascara brush trauma several years prior.

She reports complaining of difficulty upon wakening with redness, tearing, photophobia, pain and blurred vision OD.

BVA 20/70 OD, 20/20 OS

Slit lamp examination:
- Irregular epithelium with a large epithelial defect OD.
- Dx with a recurrent corneal erosion

**Management**

- Bandage CL
  - Designed to relieve pain
  - Protect epithelium from eyelids
  - Options
    - Acuvue Oasys (Vistakon)
    - Air Optix Night and Day (Ciba Vision)
    - Purevision (Bausch and Lomb)

- CPT Code 92071 (99070) — Fitting of a contact lens for treatment of ocular surface disease
  - Old Code 92070 used to include materials (CL)
  - Now it’s just fitting of lens and need to bill for CL separately
  - Other lens choices: scleral CL, collagen shield

**Stepwise Approach**

- Medical Management
- Bandage CL
- Epithelial debridement
- Autologous Serum
- Surgical Intervention

**Fraunfelder F. Cabezas M. Treatment of Recurrent Corneal Erosion by Extended-wear Bandage Contact Lens. Cornea. Feb 2011**

- 12 patients fit with EW BSCL x _ months
  - Replaced q2weeks
  - Prophylactic ofloxacin BID
  - All pts felt immediate relief after BSCL insertion and during 3 month period
  - 75% asymptomatic after 1 year

**Management**

- Bandage CL
  - Lens should be fitted fairly tightly
  - Minimum of _ weeks is needed to allow BM remodeling to return to normal
  - On a continuous wear basis
  - Concerns?

**Stepwise Approach**

- Medical Management
- Bandage CL
- Epithelial debridement
- Autologous Serum
- Surgical Intervention

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  - 75% asymptomatic after 1 year
**Controlled Studies on RCE**


**Anatomy**

- Epithelial cells rest on the basement membrane - 128nm
  - Lamina Lucida – made of glycoprotein laminin
    - secreted by overlying epithelium
  - Lamina Densa – Made of Type IV collagen
    - secreted by overlying epithelium
  - Lamina Reticularis – Made of fibronectin
    - secreted by underlying stroma
- Normal adherence to BM is maintained by “adhesion complexes”:
  - Hemidesmosomes (arrowhead)
  - Lamina lucida and densa
  - Anchoring fibrils (arrows)
  - Laminin
  - Fibronectin
  - Type IV and VII Collagen

**Pathological Anatomy**

- Matrix metalloproteinase (MMP)
  - Name for group of enzymes that break down the structure of the extracellular matrix (collagenase)
  - Gelatinase
    - Composed of MMP-9 and MMP-2
    - Degradates collagen type IV and VII and laminin
  - all major components of BM
- Elevated levels of MMP-9 and MMP-2 have been observed in tears of patients with RCE
- Increased MMP-9 and MMP-2 expression have been implicated in the pathogenesis of RCE's upregulation may lead to BM degradation and poor epithelial basement membrane adhesion.
- Higher than required levels of MMP may dissolve old and newly forming BM

**Stepwise Approach**

- **Medical Management**
  - Bandage CL
  - Epithelial debridement
  - Autologous Serum
- **Surgical Intervention**
  - Muro ung qhs >>> FreshKote gtts TID >>> Lotemax qid x 2 weeks then bid x 6 weeks >>> AzaSite
  - Muro ung qhs >>> FreshKote gtts TID >>> Lotemax qid x 2 weeks then bid x 6 weeks >>> DCN
  - Muro ung hs >>> FreshKote gtts TID >>> Autologous Serum >>> DCN
  - Lotemax >>>DCN

**Medical Combination Tx**

- Epi debridement >>> Amniotic Membrane >>> BSCL 12 weeks >>> DCN
- Epi Debridement >>> BSCL 12 weeks >>> DCN
- ASP >>> BSCL 12 weeks >>> DCN
**Case Study**

- Combined four treatment modalities together
  - Corneal debridement
    - Removal of loose epithelium by mechanical debridement
      - Strengthens the adhesion of the basal epithelial cells to the basement membrane (Main 2002; Ohman 1998).
  - AmbioDisk dehydrated amniotic membrane
    - Amniotic membrane therapy decreases inflammation and replaces key components of the basement membrane to facilitate proper adhesion of anchoring connections
  - Extended wear BSCL (12 weeks)
    - A therapeutic contact lens protects the epithelium from the shearing force of the lids (Lu 1996; Williams 1985, Fraunfelder 2011).
  - Oral doxycycline
    - Oral tetr / doxycycline inhibit matrix metalloproteinases and hence reduce protein breakdown to preserve the bond between the epithelium and basement membrane. (Durson 2001, Hope-Ross 1994)

**Case Report**

Ruth, 90 year old Caucasian female
Initial visit June 2016
Chief complaint
- Irritation, dryness, burning, and blur
  - X 15 years
  - “Tired of the Bull $*^* of OTC artificial tears”

**Best corrected visual acuity**
- 20/70 OD, 20/50 OS

**Slit lamp exam**
- Diffuse SPK OU, decreased TBUT OU, (+) filaments OU

**Filamentary Keratitis**

- Filaments
  - Complexes of mucus and corneal epithelium
  - Firmly attached to corneal surface at one end
  - Differ in size
    - 0.5 mm to 10 mm
  - Differ in shape, composition, distribution
    - Broad and short
    - Long and stringy
Pathophysiology

- Associated with a variety of diseases
  - Keratoconjunctivitis Sicca
  - Recurrent corneal erosions
  - Keratitis

- Change in ratio of mucus to aqueous may increase formation of filaments
  - Lack of tear production may increase mucus production

Treatments

- Debridement
- Bandage CL
- Mucomyst (N-acetylcysteine 10%)
  - Mucolytic agent
  - Decreases viscosity of mucus
- 0.1% diclofenac sodium
  - Grinbaum et al
  - Sole treatment or conjunction with other modalities
- Amniotic membrane?

Mechanisms of Action

- Promotes Epithelialization
- Suppresses Inflammation
- Inhibits Scarring
- Inhibits Angiogenesis
- Neurotrophic Factors
- Anti-Microbial Agent

All without the harmful side effects found in topical and oral medications

Case Study

- Decided on amniotic membrane (AmbioDisk) OS first
- Applied in office, followed by bandage CL
- Zylet QID OS
- RTO x 4-5 days

- Significant improvement in comfort and vision
- BCL removed
- Applied amniotic membrane (AmbioDisk) OD
- Same instructions

Case Study

- Patient returned 4-5 days later
- BCL removed
- Patient states “best I have felt or seen in 10 years”

- Continued treatment
  - Add Restasis Q12H OU

- But…… Restasis caused significant blurring, irritation, and discomfort
- Patient stopped drops on her own and returned to office

- Wait…… we’ve got a new drop we can try
  - Add Xiidra Q12H OU

- But…… Was more uncomfortable than Restasis
Case Study

- Options
  - 0.1% diclofenac
  - Muro 5%
  - Tears
  - BCL
  - Autologous serum
  - Steroids
  - New options?
  - Repeated treatments

Defining Dry Eye

- Dry eye is a disorder of the tear film due to tear deficiency or excessive evaporation, which causes damage to the inter-palpebral ocular surface and is associated with symptoms of ocular discomfort.
  - NEI, 1995

Defining Dry Eye

- Dry eye is a multi-factorial 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 increased osmolarity of the tear film and inflammation of the ocular surface.
  - Tear Film and Ocular Surface Society, 2007

Defining Dry Eye

- 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.
  - Tear Film and Ocular Surface Society, 2017
DEWS II

DEWS I 2007
- 58 members from 11 countries, 7 subcommittees, 140 pages long

DEWS II 2017
- 2-year effort, 150 experts from 23 countries led by 25 doctors, 12 subcommittees, 400 pages
- Committed to an evidence-based approach

Goals:
1. Update definition
2. Assess Etiology, mechanism, distribution and impact of DED
3. Address Management and therapy

Diagnostic Methodology Subcommittee examined the research evidence for tests to quantify patient symptoms, visual disturbance, tear film stability, osmolarity, tear volume, ocular surface damage, inflammation of the ocular surface and eyelid signs (such as MGD), and recommended the key diagnostic tests and techniques

1. Prior to diagnosis, it is important to exclude conditions that can mimic DED with a number of triaging questions:
   - 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 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?

2. Perform either the Dry Eye Questionnaire-5 (DEQ-5) or Ocular Surface Disease Index (OSDI) to indicate whether a patient might have DED
   - A positive symptom score on either of these questionnaires should then trigger a more detailed examination for clinical signs of DED

3. The presence of any one of these three specified signs is considered representative of disrupted homeostasis, confirming the diagnosis of DED:
   - Reduced non-invasive break-up time (or FL TBUT)
   - Elevated or a large interocular disparity in Osmolarity
   - Ocular surface staining (of the cornea, conjunctiva or lid margin) in either eye
   - Severe amounts of staining correlate best to severe DED and can be used alone to Dx, in mild to modest DED, it may not correlate as well, so other methods are necessary

4. Determine the subtype classification (ADDE / EDE) tests using
   - via meibography, lipid interferometry and tear volume measurement
   - Decide:
     1) where the DED falls on the spectrum between ADDE and EDE
     2) the severity of DED, in order to guide treatment

Masqueraders of DED:
- Allergic Conjunctivitis (24%)
- Anterior Blepharitis (24%)
- EBMD (12%)
- Keratoneuralgia / Neuropathic -Pain w/o stain (12%)
- Contact lens intolerance (8%)
- Conjunctivochalasis (8%)
- Entropion / Ectropion
- Foreign Body
- Floppy Eyelid Syndrome
- Superior Limbic Keratoconjunctivitis
- Mucus Fishing Syndrome
- Nocturnal Lagophthalmos
- Lib imbrication Syndrome
The ultimate aim of DED management is to restore the homeostasis of the ocular surface and tear film, by breaking the vicious cycle of the disease. While certain treatments may be specifically indicated for one particular aspect of an individual patient's condition, a number of therapies might be appropriately recommended in order to treat the multiple aspects of a patient's presentation with DED.

While aiming to identify and treat the primary source of the disease, the management of DED typically involves ongoing management to address chronic sequelae, rather than short-term treatment.

The management algorithm is not proposed as a rigid sequential approach to be followed linearly. It should be viewed as an organizational tool to help guide initiation of treatment with those interventions most likely to benefit most patients with DED, and progressing to more advanced and specific treatments aimed at particular aspects of the DED pathophysiology.

Ongoing evidence-based therapies, as well as risk versus benefit and cost considerations, will also contribute to decisions made in choosing between multiple treatment options.

Step 1: Identification regarding the condition, its management, treatment and prognosis
Step 2: Education regarding potential etiologies (including use of essential fatty acid supplements)
Step 3: Identification and potential modification/elimination of offending systemic and topical medications
Step 4: Ocular lubricants of various types (if MG D is present, then consider lipid-containing supplements)

Similar to treatment strategies currently employed for RA around Biologics.

Step 2: If Step 1 options are inadequate consider:
- Non-preserved ocular lubricants to minimize preservative-induced toxicity
- Topical antibiotic or antibiotic/steroid combination applied to the lid margins for anterior blepharitis (if present)
- Topical corticosteroid (limited duration)
- Topical LFA-1 antagonist drugs (such as lifitegrast)
- Oral macrolide or tetracycline antibiotics
- Rigid scleral lenses

Step 3: If above options are inadequate consider:
- Oral secretagogues
- Autologous/allogeneic serum eye drops
- Therapeutic contact lens options
- Soft bandage lenses
- Rigid scleral lenses

Step 4: If above options are inadequate consider:
- Amniotic membrane grafts
- Surgical punctal occlusion
- Other surgical approaches: transconjunctival, subcaruncular, or blepharoplasty

Management options reviewed in detail covered over 90 different treatments for DED.

Keys to discussion:
- Pictures worth 1000 words. Educate w photos
- Discuss that you see something that is of concern to you
- Discuss the consequences of doing nothing

Key words to use when discussing DED with patients:
- This is a multifactorial disease
- Identification and early management is important
- No single treatment works for everyone
- Need to break the cycle of inflammation and restore tear homeostasis
- Case to case customization of treatment is required
Managing and Treating Dry Eye Disease

5 ways to apply DEWS II to your practice tomorrow:

1. Ask the right questions
   a) DEQ 5 vs OSDI
   b) Be consistent in system assessment at all visits (allows the tracking for symptom improvement, even if mild)
2. Use Screening tests
   a) 1 of the 3 recommended tests
   b) TBUT (invasive vs non-invasive), osmolarity, corneal and conjunctival staining
3. Determine Subtype
   a) Aqueous deficient, Evaporative, Mixed
4. Develop a management plan
5. Manage expectations
   a) Schedule follow up’s and treat it like the Disease it is

Conclusion

- All eye care providers who treat patients with Ant Segment Disease must exercise their clinical skills and judgement to screen for and identify patients with Anterior Segment Disease
- The treatment of the Ocular Surface remains something of an art form, not easily lending itself to a rigid, evidence-based algorithms that accommodates all patients with symptoms or signs
- Don’t wait to treat. Early diagnosis and treatment is critical to prevent long term complications and decreased Quality of Life scores

Conclusion

- Whenever attending a lecture, go with the goal of learning new thoughts and techniques
  - Acquire NEW knowledge
- Be ready to change or at least question your previous behavior / routine
  - With the overall objective of improving patient outcomes

Thank you

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