

**Dry eye:** multifactorial disease of the tears and ocular surface → discomfort, visual disturbance and tear film instability, potential damage to ocular surface → accompanied by increased osmolarity of tear film & ocular surface inflammation

### Core mechanisms of dry eye

- Hyperosmolarity of tear film → inflammation (↓ tear production (aqueous deficient) and/or ↑ evaporation from eye)
- Instability/dysfunction of tear film (maybe secondary to hyperosmolarity → ↓ goblet cells → ↓ mucin)

### Etiologies of dry eye disease:

#### Aqueous deficient

- Sjogren: primary/secondary
- Non-Sjogren
  - Lacrimal gland insufficiency
  - Lacrimal duct obstruction
  - Reflex hyposecretion

#### Evaporative

- Meibomian gland disease
- Topical drugs/preservatives
  - Benzalkonium chloride
- Ocular surface disorders

#### Drugs

- Antihistamines
- Tricyclic antidepressants
- SSRIs
- Diuretics
- B-blockers
- Isotretinoin
- Anticholinergics
- Antilytics
- Antipsychotics
- Oral contraceptives

### Symptoms

- Dry, scratchy, gritty, sandy feeling
- Foreign body sensation
- Pain or soreness
- Stinging or burning
- Itching
- Blurred vision
- Increased blinking
- Eye fatigue
- Photosensitivity or photophobia
- Redness
- Mucus discharge
- Contact lens intolerance
- Excessive tearing (paradox)
- Generally worsen as day progresses
- Acute exacerbations due to environment

Severe dry eye: scarring, ulceration, secondary infection, photophobia

### Referral

- Visual loss
- Moderate-severe pain
- Corneal infiltration or ulceration
- If you suspect dry eye secondary to an undiagnosed condition
- Symptoms persist >3 days (w/ txt) or become worse

### Goals of therapy

- Provide symptomatic relief (cure unlikely)
- Correct:
  - Underlying medical condition
  - Prevent underlying abnormalities of ocular surface and/or tear film
- Educate about the condition
- Improve quality of life

### Diagnostic Tests

- Tear osmolarity
- Aqueous tear flow via Schirmer test: measure distance wetted in specific time – normal > 15 mm in 5 minutes
- Tear breakup time (TBUT): evaluates tear film instability with fluorescein (dye) – normal > 10 seconds for first dry spot to appear after blink

### Monitoring

- Dry eye Sx: improvement in 3-5 days → if no improvement, switch product → if worsening, refer to MD
- SEs: change brand (pH), different preservative or preservative-free, lanolin-free product

**Level 1 Treatment Measures**

- Education
- Elimination of offending meds
- Environmental management
  - Optimize room temp & humidity
  - Position computer below eye level
  - Reminder to blink
  - Smoking cessation
- Dietary management: ↑ omega-3
- Eyelid therapy
  - Cool, moist compress over closed lids for short-term relief
  - Warm compress on lids x 5 mins upon awakening & mid-afternoon (Meibomian gland dysfunction)
  - Treatment of contributory ocular factors
- Artificial tears (1-2 drops qid), gels/ointments (0.5 cm strip inside lower lid qhs)

**Level 2 Treatment: ADD**

- Anti-inflammatories
  - Ophthalmic corticosteroids (up to 1 month)
    - >3 mo associated with ↑ IOP, cataracts
  - Cyclosporine 0.05% 1 gtt ou q12h
    - initial benefits in 4-8 weeks, improvement for 3-6 months
    - remove lenses & wait 15 mins after before instilling artificial tears or other drops
- Tetracyclines (rosacea)
- Punctal plugs
- Secretagogues
- Moisture chamber spectacles

**Level 3 Treatment: ADD**

- Serum
- Contact lenses
- Permanent punctal occlusion

**Level 4 Treatment: ADD**

- Systemic anti-inflammatory agents
- Surgery

**Artificial tears:** used to protect ocular surface & lubricate eye NOTE: limit OTC to <72 h

**Viscosity:** demucant effect

→ increase viscosity = increase adhesion to mucus layer of tears = increase retention time

- Cellulose derivatives: high viscosity
  - dry crusts on lids
  - temporary blurred vision
- Dextran polymers: mimic mucin
  - used in combo w/ hypromellose
- Polyols (polyhydric alcohols): PEGs, glycerin
  - less effective at viscosity than cellulose
  - better lubricity
  - often combo w/ gelling agent (HP-guar)
- Polyvinyls: water-soluble
  - lower viscosity than cellulose
  - less lubricity than polyols
  - viscosity increases with increasing conc.

**Eye ointments and gels**

- Ointment = mineral oil & petrolatum
  - more viscous
  - don't require preservatives
  - some contain lanolin (irritating, wool allergy)
- Carbomer resin gel: less blurred vision than ointments

**Preservatives:** limit to 4 x/day (sensitivity)

- Detergent: *most irritating*
  - Benzalkonium chloride & chlorobutanol
    - concentration-dependent toxicity
    - damaging to soft contact lenses
  - Polyquad
    - safe for contact lenses
    - may cause superficial damage
- Oxidative (sodium chlorite/perborate): vanishing preservatives
  - may not fully degrade in severe dry eye
- Chelating: edetate disodium

**Preservative-free:** single-use vials

- With moderate to severe dry eye
- Mild dry eye using drops > 4x/day or long-term
- Using multiple preserved topical eye products
- With punctal occlusion

**Osmolarity:** dry eye = hyperosmolarity, so treat with hypo-osmolar eye drops  
→ starting place if no other reason for choosing another med

**pH:** natural tear pH 6.9 - 7.5  
→ stinging due to mismatch of drop with tear, so change products (most comfortable)