

3.4 Dry eye

Plan

Basic concept of dry eye

General features / Epidemiology

Definitions

Tear film layers with functions

Types of dry eye causes or predisposing factors

Detailed workup for dry eye disease

- Symptoms & signs

- Investigations

Treatment / Strategy

- Level 1

- Level 2

Basic concept of dry eye is that tear film consist of superficial oil layer, middle aqueous layer and deep mucin layer attached to eye. Deficiency of one or more layers results in dry eye.

- No water causes deficient aqueous layer so dry eye
- No lipid layer causes more evaporation so dry eye
- No mucin layer causes poor sticking of other two layers so dry eye



General / Epidemiology of dry eye

- Nearly 6% of world population has dry eye
- One in three eye patients attend outpatients with dry eye
- Three common groups are prolonged screen user, postmenopausal women and elderly

Definitions

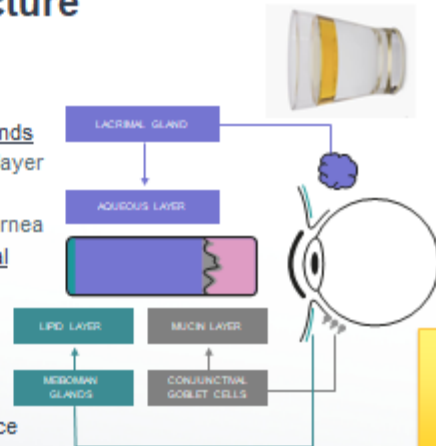
- Dry eye: Unstable tear film because of less tear volume or component
- Keratoconjunctivitis sicca (KCS): Dry eye disease is also called KCS
- Dry eye disease: Dry eye syndrome refers to a group of disorders of the tear film that are due to reduced tear production or excessive tear evaporation that is associated with ocular discomfort and/or visual symptoms and may cause disease of the ocular surface
- Xerosis: Extreme dry eye with conjunctival keratinization
- Xerophthalmia: Dry eye associated with vitamin A deficiency
- Sjogren syndrome: It is an autoimmune disease including dry eye, dry mouth

Tear film layers with function

Tear film – origins & structure

3 layers of tear film:

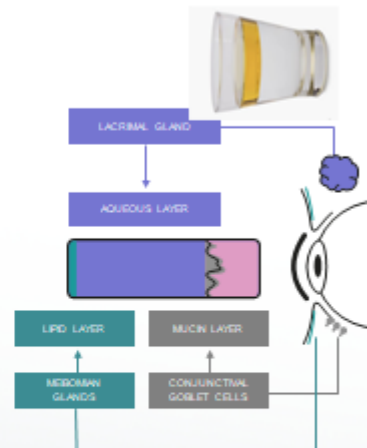
- **Outer lipid layer:** Produced by meibomian glands
 - Prevents rapid evaporation of the aqueous layer
 - Stabilizes the tear film
 - Creates a smooth optical surface for the cornea
- **Central aqueous layer:** Produced by Lacrimal gland & Accessory glands in the conjunctiva
 - Stores moisture to hydrate the cornea
- **Inner mucin (glycosylated protein) layer:** Produced by goblet cells in the conjunctiva of the eye itself
 - Causes adherence of tear film to eye surface



Types of dry eye with causes or predisposing factors

Dry Eye – Ocular Surface Issues

- **Lipid Deficiency – Evaporative dry eye**
 - Meibomian Gland Dysfunction
 - Blepharitis
- **Aqueous Insufficiency dry eye**
 - Sjogren's
 - Trauma, neurological
- **Mucin Abnormalities**
 - pemphigoid, radiation, vitamin A deficiency
- **Mixed dry eye (mixture of 3 causes)**
 - Ageing
 - Hormonal changes like menopause, pregnancy, lactation
 - Environmental like, screen use wind, smoke, air travel, heat/AC
 - Laser eye surgery
 - Medications like antidepressants, antihypertensives, antihistamines
 - Systemic diseases like diabetes and hyperthyroid



Detailed workup for dry eye disease

Symptoms & signs

Detailed history of symptoms particularly age, working conditions, medication, systemic diseases is taken. Then detailed examination to look for signs

Dry eye disease (DED) – symptoms & signs

DED is a complex disease where signs and symptoms do not always correlate

Main symptoms	Main signs
Burning	Corneal erosions
Dryness	Conjunctival hyperaemia
Eyes stuck shut in morning	Ocular surface damage
Foreign body/sandy sensation	Redness and loss of brightness
Itching	Secretion with filaments
Pain, discomfort	Tear film instability
Photophobia	
Watering (Reflex to dry eye)	

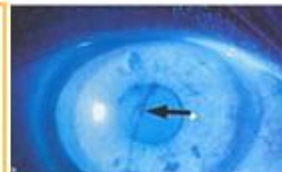
A combination of tests are required to diagnose dry eye disease and guide appropriate treatment

Investigations

Tear film break-up time (TFBUT)

Measuring the time until the tear film breaks

Fluorescein is instilled in the eye, without anaesthesia. While the patient suppresses blinking, the time between the last complete blink and the first break in the tear film is measured.



TFBUT

Schirmer test

Detection of aqueous-deficient dry eye by measuring reflex tear secretion volume

After precisely 5 minutes, the path wetted by the tear fluid is measured.

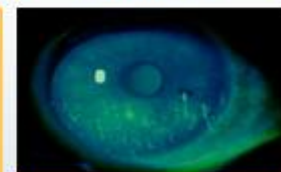


Schirmer test

Staining tests

Examination of the integrity of the ocular surface

Fluorescein is used to detect corneal and conjunctival defects.



Staining tests

Treatment of dry eye

Strategy / Principles:

1. Awareness:

- Life style modifications like avoiding prolonged screen time
- Avoid drying situations and drugs
- Treat the cause like meibomian glands

2. Basic tear replacement eye drops:

- Replace aqueous/lipid/mucin part of tear film with following drugs

	COMPOSITION	ACTION FIELD
PHYSIOLOGICAL SALINE Frequent installation	H ₂ O + NaCl	Aqueous layer
NATURAL POLYMERS Prolonged retention time	Methylcellulose derivatives	Aqueous layer
SYNTHETIC POLYMERS Prolonged retention time	PVA (Polyvinyl alcohol) , povidone, carbomers, hydroxypropyl guar	Aqueous layer
HYALURONIC ACIDS Prolonged retention time & mucoadhesive	Mucopolysaccharides	Aqueous and mucinic layers
LIPID ANIONIC EMULSIONS Irritative	Phospholipid + triglyceride	Lipid and aqueous layers
CATIONIC EMULSION All 3 layers	Mineral oil	All 3 layers of the tear film

3. Advanced treatment:

- Preservative free eye drops
- Anti-inflammatory drugs
- Punctal plugs or punctal occlusion
- Spectacle shields and moisture chambers
- Serum eye drops