

RECENT CHALLENGES IN DRY EYE

Swati Kumari, Arti Vaish

E-Mail ID: baliyan.sd777@gmail.com, vaisharti@gmail.com

Sushant University, Gurugram, Haryana, India

Abstract- 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. Dry eye is commonly caused by abnormalities in production of tear film. There is so many test to evaluate the dry eye like TBUT (tear break-up time), Epithelial staining, Scheirmer test, Tear function index, Cotton thread test, Tear osmolarity, Impression cytology, Fluorophotometry, Tear fluid protein immunoassays, Tear ferning test. This article will provide an overview of the dry eye and its evaluation and management or the recent challenges in dry eye.

Keywords: Dry eye, Tear film, ocular surface.

1. INTRODUCTION

Tear film is a thin liquid layer that covers the ocular surface of eye. It provides comfort, mechanical, environmental and immune protection to the ocular surface. [4]Blinking action helps in spreading tears and maintaining a moist surface. Tears are chiefly secreted by the lacrimal glands, along with the contributions from the conjunctiva, including goblet cells and Meibomian glands.[2] Tear production, absorption, evaporation, and drainage, these are the factors responsible for dynamic balance of preocular tear film. The stability of tear film can be disturbed by deficiencies, imperfect distribution of tear film, during application of some systematic/topical medication and dry eye occurs as a consequence's of it.[4]

1.1 Functions of tear film

- It helps in formation of smooth optical surface for vision.
- Tear film mainly helps in providing moisture to the cornea and conjunctiva.
- It works as a lubricant for the ocular surface and lid also decrease the frictional forces that are generated during blinking and the rotation of eyeball.
- It also transfers the oxygen to cornea, and washes away debris and irritants.
- Tear film provides pathway during injury for white blood cells.

1.2 Structure of tear film

Tear film is a three layered structure-lipid layer, aqueous layer, mucin layer. A recent study proposed model consist of two layers: superficial-lipid and mucin/aqueous glyocalyx gel with decreasing mucin concentration from epithelium to lipid layer.[4]

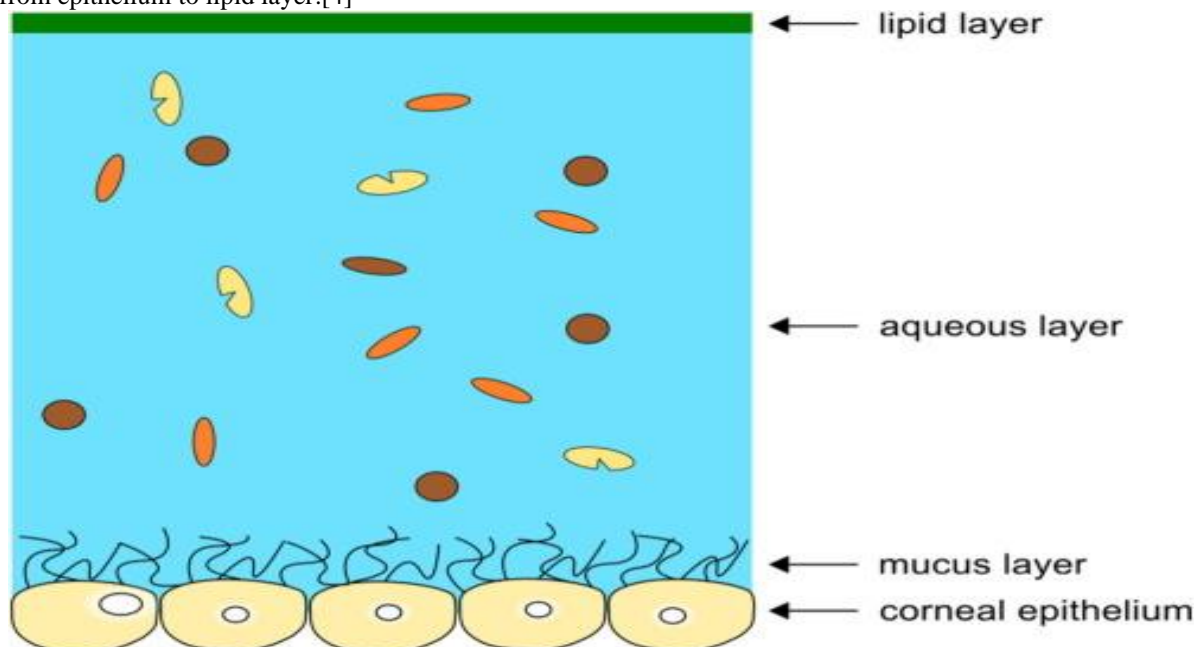


Fig. 1.1 Structure of Tear Film

1.2.1 Lipid Layer

It is the outermost layer of tear film. It is secreted by Meibomian gland along with small contribution with moll and zeiss gland located within upper and lower eyelid. It reduces the evaporation of tear and improves the stability of tear film also provide the smooth optical surface and prevent the contamination of tear film form dust and microorganism. [1]

1.2.2 Aqueous Layer

It is the middle layer of the tear film. It is secreted by Krauze and Wolfring glands. It constitutes approx. 90% of tear film volume. It lubricates the ocular surface of the eye, prevent the foreign body contamination. It includes proteins that are responsible for anti-microbial activity (lysozyme, lactoferrin, lipocain, immunoglobulin and glycoproteins).[4]

1.2.3 Mucous Layer

This layer of tear film is produced by both corneal and conjunctival epithelium and the lacrimal gland and conjunctival goblet cells. It forms glycocalyx layer over the ocular epithelium. Mucous layer bind water to hydrate and lubricate the ocular surface.[9] It helps in reduce the friction during blinking and clear the surface of pathogens and debris also it contributes to maintain the tear stability.[4]

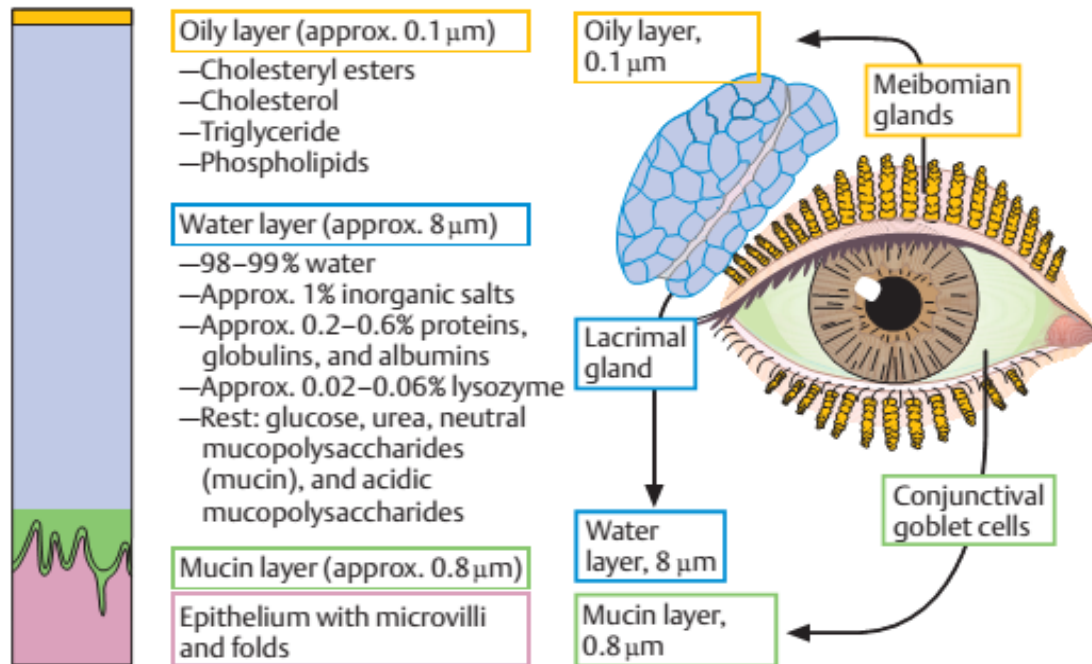


Fig 2. Layers of tear film

2. COMPOSITION OF TEAR FILM

- Water: - major component (90-95%) with dissolving salts Na^+ , K^+ , Cl^- , HCO_3^- , Ca^{3+} .
- Proteins: - stimulated tears – 0.3-0.7gm/100ml
- Un-stimulated tears – 2gm/100ml
- Immunoglobulin: - IgA is most prominent, produced by plasma cells in conjunctiva, defends against viral and bacterial antigens.
- Lysozymes.
- Glycolytic enzymes
- Betalysin
- Mucopoly saccharides
- Glycoproteins
- Amino acids
- Lipids
- Metabolites

3. DRY EYE

3.1 Introduction

It is a multifactorial disease accompanied by many symptoms; it is mainly caused by instability of tear film. It is a disease with symptoms of ocular discomfort, ocular surface damage, tear film instability, loss of homeostasis and neurosensory abnormalities. [7]

3.2 Definition

According to TFOS DEWSII “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.” [6]

3.3 Classification of dry eye

Dry eye mainly divided into two groups:

- aqueous production deficient dry eye disease
- Evaporative dry eye disease.

In dry eye, reduce ability to perform activities like reading, driving, writing, computer work.[3]

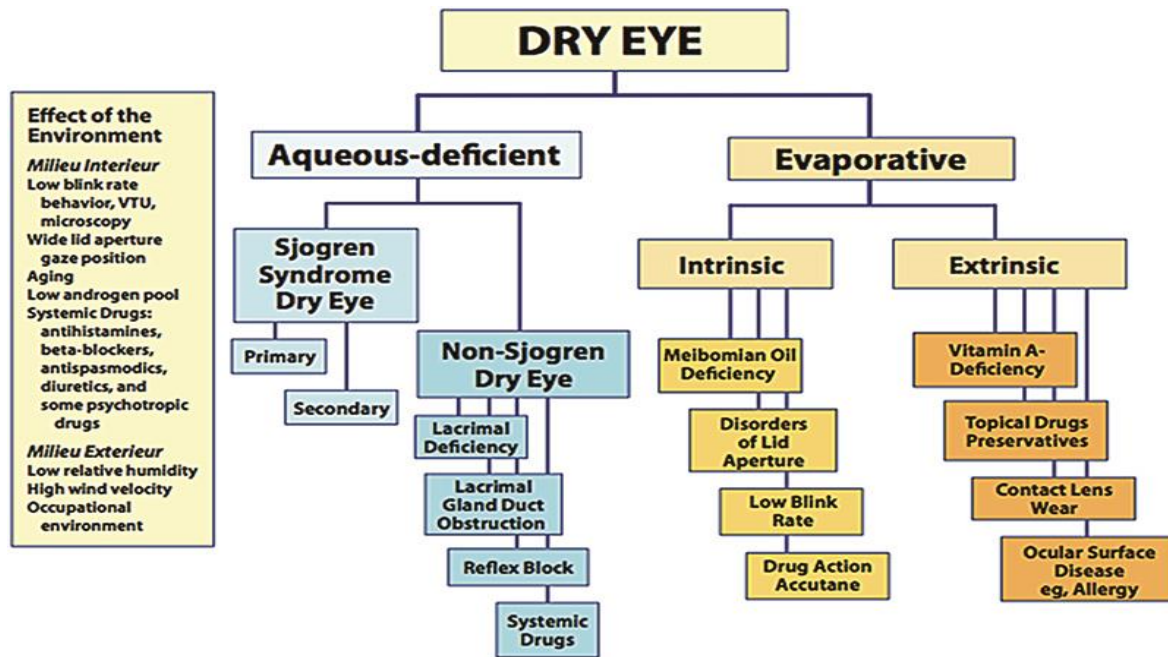


Fig. 3.1 Classification of tear film

3.4 Causes of dry eye

- Decreased tear production.
- Excessive tear evaporation.
- Abnormality in production of mucus or lipid layers.
- Post-menopausal women’s
- Dysfunctions of lacrimal glands cause tear film instability leading to inflammation of ocular surface.
- Vitamin A deficiency
- Trachoma
- Sarcoidosis
- Lymphoma

3.5 Symptoms of dry eye

- Dryness in eyes
- Gritty feeling
- Burning sensation
- Itching of eyes
- Foreign body sensation
- Excess tearing
- Pain
- Redness of eye
- Photophobia in some cases
- Sometimes stringy discharge and blurred vision.

3.6 Diagnostic test for dry eye syndrome

- TBUT (tear break-up time)
- Epithelial staining
- Scheirmer test
- Tear function index
- Cotton thread test
- Tear osmolarity
- Impression cytology

- Fluorophotometry
- Tear fluid protein immunoassays
- Tear ferning test
- Meibometry, Meibography, Meiboscopy for Meibomian gland dysfunction
- Meniscometry for aqueous rear deficient dry eyes.
- Phenol red impregnated test
- Fluorescein clearance test (FCT)
- Tear film stability test (TFS)
- Topographical analysis
- Interferometry
- Aberrometry
- AS-OCT
- Corneal In vivo confocal microscopy (IVCM)
- Ocular protection index (OPI)
- Ocular surface analyser (OCA)
- Tearscope
- Rose Bengal staining
- Practical double vital staining
- Lissamine green dye
- Tear osmolarity
- Lipiflow
- Lipcof
- Nasolacrimal reflex
- Conjunctival and corneal sensation
- Tear protein height
- Tear meniscus height

3.7 Management for dry eye

Management of dry eye helps to reduce the symptoms of dry eye and improve the patient's comfort, return the ocular surface and tear film to the normal state, and whenever possible, prevent corneal damage.

- Artificial tears
- Autologous serum eye drop
- Non-steroidal anti-inflammatory drugs and antibiotics
- Punctal plugs
- Corticosteroids
- Cyclosporine
- Vitamin A
- Omega 3 fatty acid

CONCLUSION

Dry eye is the most common syndrome among population, which can lead to corneal ulcer, ocular infection, and blindness. Most of the new drugs center their action towards controlling inflammation and restoring normal amount of tears, but none of them attend the main cause of disease.

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