



Recent aspect of dry eye syndromes pathophysiology and management of the disease

Debjit Bhowmik¹, Chiranjib. B¹, Gyan Prakash Yadav¹, Navinkanth Singh¹,
K. P. Sampath Kumar^{*2}

¹Rajiv Gandhi College of Pharmacy, Nautanwa, Maharajganj, Uttar Pradesh

²Coimbatore Medical College, Coimbatore

Abstract

Dry eye syndrome is one of the most common problems treated by eye physicians. Over ten million Americans suffer from dry eyes. It is usually caused by a problem with the quality of the tear film that lubricates the eyes. Tears are comprised of three layers. The mucus layer coats the cornea, the eye's clear outer window, forming a foundation so the tear film can adhere to the eye. The middle aqueous layer provides moisture and supplies oxygen and other important nutrients to the cornea. This layer is made of 98 percent water along with small amounts of salt, proteins and other compounds. The outer lipid layer is an oily film that seals the tear film on the eye and helps to prevent evaporation. Tears are formed in several glands around the eye. The water layer is produced in the lacrimal gland, located under the upper eyelid. The oil deficiency also affects the tear film. Without as much oil to seal the watery layer, the tear film evaporates much faster, leaving dry areas on the cornea. Many other factors, such as hot, dry or windy climates, high altitudes, air-conditioning and cigarette smoke also cause dry eyes. Many people also find their eyes become irritated when reading or working on a computer. Stopping periodically to rest and blink keeps the eyes more comfortable. Although no cure exists for Dry eye syndrome, many treatments are available. Treatment is dependent on the severity of Dry eye syndrome. Over-the-counter lubricating eye drops, commonly referred to as artificial tears, may help relieve your dry eyes.

Keywords: Dry eye syndrome, Infection Medication, treatment.

Introduction

Dry Eye is a collection of symptoms that make up an eye condition that stems from an imbalance in the quantity or quality of tears bathing the eye. These symptoms include dry, red, gritty, and even watery eyes. Often, Dry Eye sufferers report the feeling of something foreign within the eye

or eyestrain. Some people do not produce enough tears to keep the eye comfortable. The eye depends on the flow of tears to provide constant moisture and lubrication to maintain vision and comfort. Tears are a combination of water, for moisture; oils, for lubrication; mucus, for even spreading; and antibodies and special proteins, for resistance to infection. These components are secreted by special glands located around the eye. When there is an imbalance in this tear system, a person may experience dry eyes. Sometimes, a person with a dry eye will have excess tears running down the cheeks, which may seem confusing. This happens when the eye isn't getting enough lubrication. The eye sends a distress signal through the nervous system for more lubrication. In response, the eye is flooded with tears to try to compensate for the underlying dryness. However, these tears are mostly water and do not have the lubricating qualities or the rich composition of normal tears.

Individuals with severe tear deficiency will benefit from using long-lasting, high viscosity tear substitutes. Recent data indicate that tear deficiency leads to inflammation of the ocular surface, so low potency corticosteroids, such as loteprednol eye drops four times a day, or topical cyclosporine drops can be prescribed to enhance the efficacy of tear replacement. Whereas topical steroids should be used sparingly because of potential complications such as cataract formation or secondary glaucoma, cyclosporine seems both safe and effective for long-term use. Medications by mouth are also available to treat severe dry eyes, especially in people with combined dry eye and dry mouth, such as Sjögren Syndrome. Pilocarpine and cevimeline stimulate saliva production in people with dry mouth, but have a more limited effect on increasing tear production. However, these medications must be used carefully as they can produce side effects, such as excessive sweating and trouble focusing the eyes during reading. Surgical treatment for people with tear deficiency includes closing the holes (puncta) that allow what few tears are made to drain away from the eye and into the back of the nose. The puncta may be closed using a variety of hard silicone or foam-like plugs. These plugs are semi-permanent in that they may be retained for one year or more, but are also reversible since they can be removed if the dry eye condition improves. The plugs, however, are not without complications, so permanent surgical occlusion may be an important option for some. Conditions such as eyelid malposition, poor eyelid closure, and incomplete eyelid blink are most often managed with eyelid surgery. In cases of severe dry eyes, tarsorrhaphy or partial closure of the eyelids to reduce tear evaporation from the ocular surface can be performed. In general, significant dry eye is a chronic condition that may gradually worsen with time and requires careful monitoring and treatment by an ophthalmologist.

Pathophysiology

Having dry eyes for a while can lead to tiny abrasions on the surface of the eyes. In advanced cases, the epithelium undergoes pathologic changes, namely squamous metaplasia and loss of goblet cells. Some severe cases result in thickening of the corneal surface, corneal erosion, punctate keratopathy, epithelial defects, corneal ulceration (sterile and infected), corneal neovascularization, corneal scarring, corneal thinning, and even corneal perforation.

Risk Factors

Dry eye can be a temporary or chronic condition. Dry eye can be a side effect of some medications, including antihistamines, nasal decongestants, tranquilizers, certain blood pressure medicines, Parkinson's medications, birth control pills and anti-depressants. Skin disease on or

around the eyelids can result in dry eye. Diseases of the glands in the eyelids, such as meibomian gland dysfunction, can cause dry eye. Dry eye can occur in women who are pregnant. Women who are on hormone replacement therapy may experience dry eye symptoms. Women taking only estrogen are 70 percent more likely to experience dry eye, whereas those taking estrogen and progesterone have a 30 percent increased risk of developing dry eye. Dry eye can also develop after the refractive surgery known as LASIK. These symptoms generally last three to six months, but may last longer in some cases. Dry eye can result from chemical and thermal burns that scar the membrane lining the eyelids and covering the eye. Allergies can be associated with dry eye. Infrequent blinking, associated with staring at computer or video screens, may also lead to dry eye symptoms. Both excessive and insufficient dosages of vitamins can contribute to dry eye. Homeopathic remedies may have an adverse impact on a dry eye condition. Loss of sensation in the cornea from long-term contact lens wear can lead to dry eye. Dry eye can be associated with immune system disorders such as Sjögren's syndrome, lupus, and rheumatoid arthritis. Sjögren's leads to inflammation and dryness of the mouth, eyes, and other mucous membranes. It can also affect other organs, including the kidneys, lungs and blood vessels. Dry eye can be a symptom of chronic inflammation of the conjunctiva, the membrane lining the eyelid and covering the front part of the eye, or the lacrimal gland. Chronic conjunctivitis can be caused by certain eye diseases, infection, exposure to irritants such as chemical fumes and tobacco smoke, or drafts from air conditioning or heating. If the surface area of the eye is increased, as in thyroid disease when the eye protrudes forward or after cosmetic surgery if the eyelids are opened too widely, dry eye can result. Dry eye may occur from exposure keratitis, in which the eyelids do not close completely during sleep.

Signs and symptoms

A patient with dry eye syndrome may have the following signs and symptoms:

- 1) A stinging sensation in the eyes
- 2) A burning sensation in the eyes
- 3) Feeling of dryness in the eyes
- 4) Feeling of grittiness and soreness in the eyes
- 5) Stringy mucus in or around the eyes
- 6) Eye sensitivity to smoke
- 7) Eye sensitivity to wind (eyes water more in the wind)
- 8) Redness of the eyes
- 9) Eye fatigue, even after reading for a relatively short period
- 10) Photophobia - sensitivity to light
- 11) Discomfort when wearing contact lenses
- 12) Tearing
- 13) Blurred vision - usually worse towards the end of the day
- 14) Double vision
- 15) Eyelids stick together when waking up

Complications of dry eye syndrome may have the following signs and symptoms:

- 1) Eye redness worsens

- 2) Photophobia (light sensitivity) worsens
- 3) Eyes become more painful
- 4) Eyesight deteriorates

Causes

There are more to our tears than simply water. Tears are made of water, fatty oils, protein, electrolytes, substances to fight off bacteria, and growth factors. Tears are made of a mixture that helps keep the surface of our eyes smooth and clear. Without tears we cannot see properly.

In some cases dry eyes are the result of an imbalance in the tear mixture, while in others not enough tears are produced for the requirements of good eye health. Other causes of dry eye syndrome include eyelid problems, some drugs, and environmental factors.

Tear quality - the tear film has three layers - oil, water and mucus. If any of these layers are not right, the patient may develop dry eye symptoms.

Oil (the top layer) - this oil is produced by the meibomian glands, located on the edge of the eyelids. They produce lipids (fatty oils). The oil smoothes the tear surface as well as slowing down the rate of evaporation. When oil levels are not right the tears may evaporate too rapidly. If a patient's meibomian glands are blocked (clogged) the likelihood of developing dry eyes is much greater. Patients with blepharitis (inflammation along the edge of the eyelids), rosacea and some other skin disorders have a greater risk of having clogged meibomian glands.

Water (the middle layer) - this is the thickest layer, which consists of water and some salt. This layer is produced by the lacrimal glands (tear glands). They cleanse the eyes and wash away particles and irritants. If this layer is not right the patient is susceptible to film instability. If the water layer is too thin the oil and mucus layers may touch each other, resulting in a stringy discharge - a hallmark sign of dry eyes.

Mucus (the inner layer) - this layer makes it possible for the tears to spread evenly over the surfaces of the eyes. If the mucus layer is not right, dry patches may develop on the cornea (the front surface of the eye).

Reduced tear production - we tend to produce fewer tears after the age of 40 years. When tear production lowers to a certain point, the eyes can become dry and easily irritated and inflamed.

Causes

Aging: Aging is one of the most common causes of dry eyes because tear production decreases as we get older.

Hormonal Changes: Dry eye affects more women than men because hormonal changes, such as those that occur in pregnancy, menstruation, and menopause, can decrease tear production.

Environmental Factors: Environmental conditions also can play a role in making the eyes dry, these include: wind, heat, dust, air conditioning, cigarette smoke etc.

Treatment

When it comes to treating dry eyes, everyone's needs are a little different. Many find relief simply from using artificial tears on a regular basis. Some of these products are watery and alleviate the symptoms temporarily; others are thicker and adhere to the eye longer. Preservative-free tears are recommended because they are the most soothing and have fewer additives that could potentially irritate. Avoid products that whiten the eyes – they don't have adequate lubricating qualities and often make the problem worse. Closing the opening of the tear drain in the eyelid with special inserts called punctal plugs is another option. This works like closing a sink drain with a stopper. These special plugs trap the tears on the eye, keeping it moist. This may be done on a temporary basis with a dissolvable collagen plug, or permanently with a silicone plug. There are also simple lifestyle changes that can significantly improve irritation from dry eyes. For example, drinking eight to ten glasses of water each day keeps the body hydrated and flushes impurities. Make a conscious effort to blink frequently – especially when reading or watching television. Avoid rubbing the eyes. This only worsens the irritation. Treating dry eye problems is important not only for comfort, but also for the health of the cornea.

Artificial tear drops and ointments.

The use of artificial teardrops is the primary treatment for dry eye. Artificial teardrops are available over the counter. No one drop works for everyone, so you might have to experiment to find the drop that works for you. If you have chronic dry eye, it is important to use the drops even when your eyes feel fine, to keep them lubricated. If your eyes dry out while you sleep, you can use a thicker lubricant, such as an ointment, at night.

Temporary punctal occlusion

Sometimes it is necessary to close the ducts that drain tears out of the eye. This is done via a painless procedure where a plug that will dissolve quickly is inserted into the tear drain of the lower eyelid. This is a temporary procedure, done to determine whether permanent plugs can provide an adequate supply of tears.

Permanent punctal occlusion

If temporary plugging of the tear drains works well, then silicone plugs (punctal occlusion) may be used. The plugs will hold tears around the eyes as long as they are in place. They can be removed. Rarely, the plugs may come out spontaneously or migrate down the tear drain. Many patients find that the plugs improve comfort and reduce the need for artificial tears.

Surgery

If needed, the ducts that drain tears into the nose can be permanently closed to allow more tears to remain around the eye. This is done with local anesthetic on an outpatient basis. There are no limitations in activity after having this surgery.

Conclusion

These come as eye drops and gels, and are usually good at relieving symptoms. You can buy them at pharmacies or get them on prescription. At first, you may need to use them every hour or more to improve symptoms. Once symptoms improve, you may then only need to use them three or four times a day. You may need to use them regularly to keep symptoms away. There are several types of artificial tear drops and gels with different ingredients. Occasionally, some people find one type may irritate. A change to a different preparation may help if the first does not suit. Some types of artificial tears contain preservatives such as benzalkonium hexachloride. If you use drops that contain benzalkonium hexachloride for long periods, they may damage the front of the eye (the cornea). Therefore, if you use artificial tears more than four times per day long-term, it is best to use a 'preservative-free' brand which does not contain benzalkonium chloride. It may also help to use a soothing and lubricating ointment at bedtime for overnight. Consumption of dark fleshed fish containing dietary omega-3 fatty acids is associated with a decreased incidence of dry eye syndrome in women. This finding is consistent with postulated biological mechanisms. Early experimental work on omega-3 has shown promising results when used in a topical application or given orally. Inflammation occurring in response to tears film hypertonicity can be suppressed by mild topical steroids or with topical immunosuppressant such as ciclosporin. Elevated levels of tear NGF can be decreased with 0.1% prednisolone. Some people who have had laser-assisted in-situ keratomileusis (LASIK) surgery find that they experience dry eye syndrome in the weeks after surgery. However, the symptoms will usually clear up after a few months. Anti-inflammatory medicines can be used to help reduce the inflammation associated with more severe cases of dry eye syndrome. They work by blocking the functions of your immune system that are involved in triggering inflammation. Anti-inflammatory medicines are normally prescribed in the form of a cream or ointment. Once dry eye syndrome develops, some people have recurring episodes for the rest of their lives. Although no cure exists for dry eye syndrome, there are a range of treatments, such as eye drops, that can control your symptoms. Rarely, more severe cases of dry eye syndrome may require surgery.

References

- [1] Peral, G. Carracedo, M.C. Acosta, J. Gallar, J. Pintor. (2006) *Invest. Ophthalmol. Vis. Sci.* 47 (9):4053–4058
- [2] Lemp MA. (2008). *American Journal of Managed Care* 14 (4): S88–S101.
- [3] Tatlipinar S, Akpek E (2005). *Br J Ophthalmol* 89 (10): 1363–7.
- [4] Barber L, Pflugfelder S, Tauber J, Foulks G (2005). *Ophthalmology* 112 (10): 1790–4.
- [5] Miljanović B, Trivedi K, Dana M, Gilbard J, Buring J, Schaumberg D (2005). *Am J Clin Nutr* 82 (4): 887–93.
- [6] Rashid S, Jin Y, Ecoiffier T, Barabino S, Schaumberg M, Dana R D (2008). *Arch Ophthalmol* 126 (2): 219–225.
- [7] Creuzot C, Passemard M, Viau S, Joffre C, Pouliquen P, Elena PP, Bron A, Brignole F (2008). *J Fr Ophtalmol* 29 (8): 868–73.
- [8] Barber LD, Pflugfelder SC, Tauber J, Foulks GN. *Ophthalmology*. 2005 Oct;112(10):1790-4.