

Management of Dry Eye Syndrome



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Description

Dry eye is a common condition that occurs when your tears are not able to produce adequate lubrication for your eyes. This can be for a number of reasons such as an individual might simply not produce enough tears, or the tears produced are of poor quality.

Individuals with dry eyes describe feeling uncomfortable and eyes may sting or burn, in extreme circumstances significant inflammation and even scarring of the front of the eye can occur. Some individuals only experience dry eyes in certain situations such as in an air-conditioned room, on a plane, or following several hours of looking at a screen.

Symptoms

The symptoms of dry eyes can vary from person to person but are usually found to affect both eyes. These may include;

- A burning, stinging or scratching sensation in your eyes.
- Presence of string-like mucous in or around the eye
- Sensitivity to light
- Eye redness
- A sensation of having something in your eye

- Difficulty wearing contact lenses
- Difficulty with driving at night
- Blurred vision or eye fatigue

As the body's way to compensate for dry eyes, some people may also experience watery eyes. It is recommended that you see your eye doctor if symptoms of dry eye such as prolonged irritation, redness or painful eyes persist.

Causes

Dry eyes are caused by a lack of adequate tears (poor quality/quantity), or increased tear evaporation.

Tears are a mixture of water, oils and mucous that are required to lubricate and protect the eye. A problem with any of the sources for each component can result in tear instability and dry eyes.

The medical terms for dry eye are keratitis sicca, keratoconjunctivitis sicca, and dysfunctional tear syndrome. **Common causes of decreased tear production are;**

- Ageing
- Certain medical conditions including diabetes, rheumatoid arthritis, lupus, Sjogren's syndrome, thyroid disorders and vitamin A deficiency.
- Certain medications can also cause decreased tear production such as antihistamines, decongestants, hormone replacement therapies, antidepressants, and drugs required for high blood pressure or acne.
- Laser eye surgery, however dry eyes related to this procedure are usually temporary

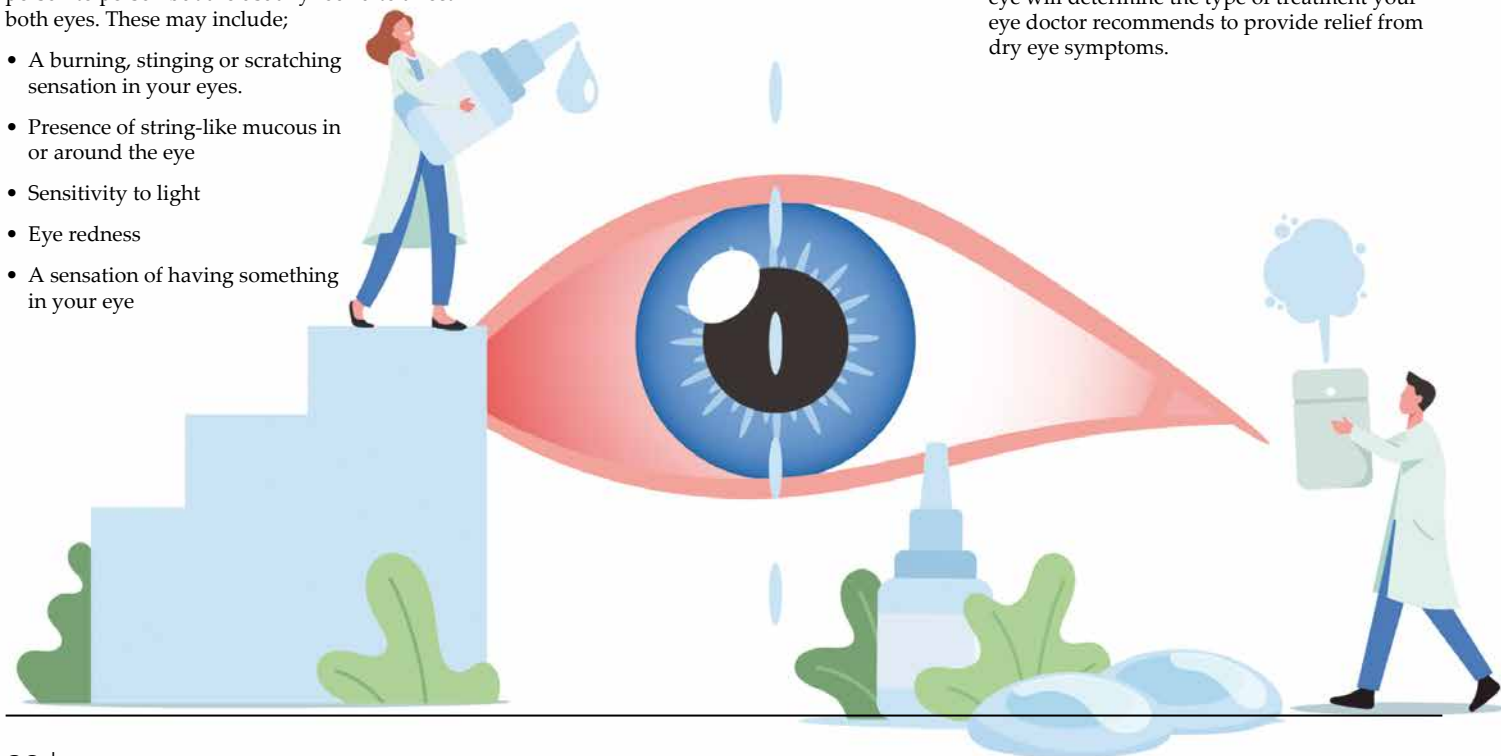
- Tear gland damage caused by inflammation or radiation
- Corneal nerve desensitization caused by contact lens use, nerve damage or that caused by laser eye surgery, though symptoms of dry eyes related to this procedure are usually temporary

There are different categories of dry eyes, depending on which component is affected. For example, meibomian glands, small glands on the edge of the eyelid, are responsible for tear oil production. If these glands don't produce or release enough oil, the tear film can evaporate too quickly- a condition called "evaporative dry eye". The condition, meibomian gland dysfunction, is currently recognised as a significant factor in many cases of dry eye.

Common causes of increased tear evaporation include:

- Posterior blepharitis
- Blinking less often, due to certain conditions, such as Parkinson's disease; or certain activities, such as while reading, driving or working at a computer
- Eyelid problems, such as the lids turning outward (ectropion) and the lids turning inward (entropion)
- Eye allergies
- Preservatives in topical eyedrops
- Wind, smoke or dry air
- Vitamin A deficiency

In other instances, the primary cause of dry eye is a failure of the lacrimal glands (tear glands) to produce enough water-like fluid to keep eyes moisturised. This condition is called "aqueous deficiency dry eye". The specific cause of dry eye will determine the type of treatment your eye doctor recommends to provide relief from dry eye symptoms.



There are a number of risk factors associated with development of dry eyes which are outlined below;

- Being older than 50. Tear production naturally decreases as you get older
- Females are more likely to develop dry eyes than males. This is especially true if they experience hormonal changes due to pregnancy, use of birth control pills or menopause.
- Eating a diet that is low in vitamin A or low in omega-3 fatty acids increases individuals chances of developing dry eyes
- Contact lens wearers are also at a higher risk of developing dry eye following long periods of wearing lenses.
- According to a recent study, decreased sleep quality can aggravate dry eye symptoms by increasing tear osmolarity and decreasing tear production. Osmolarity, or saltiness of the tears, needs to be low and stable across both eyes so that they remain healthy and moist.

Diagnosis

Chronic dry eye syndrome is best diagnosed by having your doctor perform more than one dry eye examination during an eye test. Symptoms can vary from person to person in number and severity. Tests you may have include;

- **The Schirmer test:** This involves your eye doctor assessing tear production through measuring absorbance of tears on to filter paper. If the paper takes longer than average to soak up tears it might be due to reduced tear production.
- **Epithelial staining:** This process involves the use of special eye drops that contain a dye which enables your eye doctor to observe the rate of tear film evaporation as well as assess whether there is any damage on the surface of the eye. The dye binds to damaged cells on the eye and it can also be useful in identifying areas of the eye that do not have a protective oil layer.
- **Meibomian gland evaluation:** Doctors can evaluate oil production by pressing on the meibomian glands, located on around the edge of the eyelid, and assessing whether oil is produced.
- **TearLab:** TearLab is used to assess the osmolarity of the tears, or the saltiness of the tears. An osmolarity that is low and stable across both eyes will ensure that the eyes remain healthy and moist. During this test, the eye doctor collects a small sample of the tears. The TearLab device will then assess the osmolarity and make-up of the tears to provide quantitative diagnostic information.
- **LipiScan:** Since meibomian gland dysfunction (MGD) is a common cause of chronic dry eyes, it's important to assess the health of your meibomian glands. LipiScan is a diagnostic imaging device that provides high-resolution digital images of the lower and upper meibomian glands.
- **Phenol red thread test:** During this test, the optometrist drapes a thin red thread string over the eyes to observe the amount of tears the eyes produce in just a few seconds. The doctor will then compare the results of each eye.
- **InflammaDry:** InflammaDry is a specialized diagnostic tool used to identify elevated levels of MMP-9 in the tears. MMP-9 is a

protein found in the inner lining of your lower eyelid. High levels of MMP-9 can indicate eyelid inflammation, a common symptom of dry eye syndrome. In March 2022, a new study got published on the diagnostic test for MMP-9.

(<https://www.globenewswire.com/en/news-release/2022/03/08/2399020/33692/en/AXIM-Biotech-Develops-Rapid-Quantitative-Tear-Test-for-MMP-9-An-Inflammatory-Biomarker-of-Dry-Eye-Disease.html>)

The eye doctor will ask about a person's medical history, including any family history of eye conditions. Individuals will receive a clinical eye examination where they may be asked to read letters off a chart (Snellen chart). They may also check intraocular pressure and examine visual field and visual acuity.

Treatment

Unfortunately, there is no cure for this condition however there are a number of treatments available for chronic dry eye syndrome.

In the majority of cases, routine use of artificial tears and changes in behaviour (for example, taking breaks during long periods of computer use), can significantly reduce dry eye symptoms. The eye drops can be sold Over-the-counter (OTC) and are called artificial tears. However, the doctor may prescribe a medication to treat chronic dry eye. These medications may be given orally or as eye drops too.

If symptoms are persistent and more serious other avenues might be explored. The type of treatment you receive will be subject to specific dry eye diagnoses, i.e, what it is exactly that is causing your dry eyes.

Underlying conditions might be responsible for some cases of dry eye. In this instance, treatment of the underlying condition such as cessation or changing of medications that may be causing dry eye.

Examples of treatment options for meibomian gland dysfunction include administration of antibiotics to reduce eyelid inflammation, or manual unblocking or the glands using a warm compress.

The RF (Radiofrequency) also is a treatment option when there is meibomian gland dysfunction (MGD) which is a common type of dry eye causing evaporative dry eye disease. RF is applied to the skin adjacent the eyes and the heat from the treatment melts the thick oil secretions blocking the meibomian glands, facilitating easier gland expression and improved oil flow treatment. It also stimulates collagen production in the deeper layers of the skin around the eye, helping to reduce inflammation that may be contributing to MGD.

In addition to prescription and OTC medications, certain procedures may be used to treat chronic dry eye.

General eye check-ups are important for people living with dry eyes, as these individuals may still be at risk of developing other kinds of eye problems that affect the general population, some of which may be treatable.

No matter what level of vision a person may have, it is important to look after the eyes. To find out more about what can be done to take care of the eyes on a daily basis, please visit our Tips for Good Eye Health (<https://www.fightingblindness.ie/living-with-sight-loss/caring-for-your-sight/looking-after-your-eyes/>).

Research

Researchers continue to actively search for novel ways to treat chronic dry eye syndrome.

A clinical trial is underway from the Researchers at the University of Illinois at Chicago, which investigate a new type of eye drop containing antibodies. These antibodies aim to target foreign items on the eye surface and aid their destruction. More details: <https://www.newswise.com/articles/uic-researcher-awarded-10-15m-to-develop-antibody-based-dry-eye-treatment>

Another clinical trial that ran from 2016 till 2020, examined the benefits of hyaluronic acid (salt-like solution) in the form of an eye drop for the treatment of the condition. It showed that "High molecular weight hyaluronic eye drops 0.15 per cent, provided superior improvement of symptoms in patients with severe dry eye disease, when compared to other lubricant eye drops." It was published in the Journal of Clinical Medicine. (<https://doi.org/10.3390/jcm9113536>). However, an even more recent study/review published in 2021, says that hyaluronic eye drops may be superior to non-hyaluronic eye drops, but further research is needed to assess the efficacies stratified by age, treatment duration, the severity of dry eye, and optimal dosages. (<https://dx.doi.org/10.3390%2Fijerph18052383>).

There are multiple new treatment approaches being investigated in clinical trials for dry eye syndrome also. One approach involves the use of a laser acupuncture treatment used frequently over a 12-week treatment period for the relief of dry eye. Another option under investigation involves the use of a device to apply a small electrical current through the nasal cavity to stimulate the natural development of tears. Last, a light-based procedure has been approved by the FDA (U.S. Federal Drug Administration) for the management and treatment of Dry Eye. It uses a non-invasive, light-based procedure that is performed on the regions above and below your eyes. (<https://pubmed.ncbi.nlm.nih.gov/31916061/>)

The University of Manchester, Seoul National University College of Medicine and Link Biologics Limited announced promising preclinical data on the treatment of dry eye disease using a novel protein biological drug, Link_TSG6. (<https://doi.org/10.1016/j.jtos.2021.12.012>). They hope to further progress this to human clinical trials.

Another study (<https://www.mdpi.com/1999-4923/13/6/905/htm>) about alternative drug delivery systems investigates the pilot scale development of a material that can act like a vehicle, in the form of eye drops. The study aims to use this vehicle to transport therapies for Dry Eye Syndrome into the eye.

It is being conducted by The ORBITAL(Ocular Research By Integrated Training And Learning) network which is an EU-funded Marie Skłodowska-Curie Innovation Training Network (MSCA-ITN). More research by ORBITAL can be found here: <https://www.orbital-itn.eu/publicationsandresearch/>

Information about clinical trials that are on-going and completed can be found on the clinical trials website (<https://clinicaltrials.gov/>) and can be searched by both condition and location.

For further information, please contact the Research Department on 01 6789004 or email research@fightingblindness.ie.