Diagnosis and Treatment of Dry Eye Syndrome

Ophthalmologists at the Penn Dry Eye & Ocular Surface Center are applying recent advances in diagnostic technology to diagnose the primary causes of keratoconjunctivitis sicca (or dry eye syndrome) in order to optimize treatment for the condition.

The symptoms of dry eye syndrome (DES) include blurred vision, scratching, irritation, redness and tiredness of the eyes. Traditionally, the condition has been thought of as a deficiency of tears at the ocular surface. Recent investigations have shown, however, that DES is much more complex than previously thought and that it might more accurately be described as "tear film dysfunction syndrome."1

Tear film dysfunction can be broken down into two basic etiologic classifications: insufficient tear production or increased evaporation of tears from the eye surface. The tear film is made up of lipid, mucin and aqueous components. Individuals with dry eye syndrome can be deficient in any of these basic factors.

- Lipid tear deficiency is most commonly caused by blepharitis or meibomian (oil producing) gland dysfunction. This leads to abnormally increased evaporation of the tears from the surface of the eye.
- Mucin deficiency can be caused by conditions such as vitamin A deficiency, chemical injury, and Stevens-Johnson syndrome. Mucin is produced by goblet cells, and promotes even distribution of the aqueous tears over the surface of the eye.
- Aqueous tear deficiency is associated with insufficient tear production. Congenital causes include conditions such as Riley-Day syndrome or familial dysautonomia. Acquired causes of aqueous tear deficiency include contact lens wear, increasing age, hormonal changes, medications, and Sjogren’s Syndrome and other autoimmune diseases.

DES is often misdiagnosed, and accurate assessment of the underlying causes of a patient’s ocular surface disease is critical. Misdiagnosis and the resulting delay in appropriate treatment can permit the continuation of destructive disease processes and may lead to eventual permanent scarring of the ocular surface.

Diagnosis

The Penn Dry Eye & Ocular Surface Center has developed a multidisciplinary approach to identify the cause of a patient’s tear film dysfunction or ocular surface disease. Ophthalmologists collaborate with specialists in other departments to provide care for any medical problems or conditions that may be contributing to the patient’s eye problems. In the office, specially-trained ophthalmologists perform thorough evaluations of the ocular surface. These assessments may include analysis of the tear film for specific proteins, cytokines and osmolarity. Schirmer testing is used to measure tear production, while optical coherence tomography (OCT) allows quantification of tear meniscus height. Special stains and impression cytology are used to evaluate the cornea and conjunctiva. Keratographs utilizing trans-illumination and infrared light capture detailed images of the meibomian glands in the upper and lower eyelid and lid margin. The oil or lipid layer is also measured with sophisticated surface interferometers.

Treatment Options

Management of tear film dysfunction and ocular surface disease at the Penn Dry Eye & Ocular Surface Center is tailored to the individual patient and has the objective of promoting the health of the ocular surface. Lifestyle changes, artificial tears and topical eye ointments may help patients with mild DES. Patients with moderate to severe DES may benefit from medical treatment with immunomodulators, anti-inflammatory agents, omega-3 fatty acid supplements, autologous serum, mucolytic agents or surgical interventions such as punctal occlusion, cautery or various lid surgeries.

The specialists at the Penn Dry Eye & Ocular Surface Center also perform amniotic membrane transplantation, artificial cornea transplants (keratoprosthesis surgery) and other advanced ocular reconstructive surgeries. Therapeutic options for eyelid diseases include intense pulsed light (IPL) therapy (Fig. 2), Lipiflow, Blephex, lid debridement and meibomian gland probing (Fig. 3, back page).

Patients may also be fitted for specialized contact lenses including various types of scleral lenses. In addition, supplemental treatments including drops, gels, ointments, vitamins, lid scrubs, warming and cooling gel packs, goggles, specialized sunglasses, etc. are offered on site for patients to purchase.

Reference

PennMedicine.org/clinical-briefings

Faculty Team

Tear film dysfunction and other ocular surface diseases are treated at the Penn Dry Eye & Ocular Surface Center by specially trained ophthalmologists who have a particular interest in caring for patients with dry eye and other types of ocular surface disease. The Center involves collaboration with specialists in cornea and external disease, oculoplastics, contact lens, rheumatology, dermatology and endocrinology.

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Figure 3: An intraductal probe is used to open occluded meibomian glands, which contribute lipid-rich meibum to the ocular tear film. Image: Steven L. Maskin, MD. 2014.

RESEARCH AT THE DRY EYE & OCULAR SURFACE CENTER

TrueTear in Sjögren’s Disease Patients
The purpose of this study is to evaluate acute tear production produced by the intranasal tear neurostimulator in participants with Sjögren’s syndrome and aqueous tear deficiency. Our primary goal is to evaluate whether Sjögren’s patients respond to this intervention and whether there is a baseline tear production level below which these patients do not respond. Information about this enrolling trial is available here.

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