The ocular surface is critical to the health of the eye and essential for good visual functioning. It is a complex, integrated system involving the cornea, conjunctiva, tear film, lacrimal gland, nasolacrimal system and the eyelids (incorporating the meibomian glands and lashes). The normal physiological function of the ocular surface depends on the interaction of these different components. Working together, they maintain a clear optical surface, keep the eye from drying out, and protect it from trauma and infection. Changes in the structure and function of any of the ocular surface components can disrupt its delicate balance and lead to pathology.

Ocular surface diseases have a relatively limited set of symptoms and signs, and a systematic approach to assessing and diagnosing these conditions is therefore necessary.

**History**

Because patients with ocular surface problems present with a limited range of symptoms and signs, taking a detailed history is very important. Ask patients whether they have experienced, or are experiencing, any of the following:

- **Reduced vision** (mild blurring can occur if the tear film is disturbed; a more severe visual disturbance suggests corneal or other disease)
- **Redness**
- **Irritation or gritty sensation** (suggests epithelial disturbance)
- **Itching** (suggests allergy)
- **Pain** (sharp pain suggests a corneal problem or foreign body; a duller ache may suggest uveal or scleral inflammation)
- **Purulent discharge**
- **Watering**, whether from lacrimation (increased tear production) or epiphora (decreased tear drainage)

It is important to take a careful note of when and how the problem developed. You need to ask if there has been a history of trauma or a foreign body. In some settings, contact lens use is common and you need to ask about this. If patients do use contact lenses, ask how they clean and use them.

**Examination**

Your examination of the ocular surface needs to be systematic. A stepwise approach helps to ensure that important things are not missed.

- **Vision**. Start by assessing the uncorrected, pinhole and best corrected visual acuity.
- **Eyelids**. Examine the lid position and closure and check for entropion (when the eyelid turns in on itself), trichiasis (lashes touching the eye) and lagophthalmos (a gap between...
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Table 1: Symptom and signs of common conditions

<table>
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<tr>
<th>Condition</th>
<th>Symptoms/signs</th>
<th>Bacterial conjunctivitis</th>
<th>Viral conjunctivitis</th>
<th>Allergic conjunctivitis</th>
<th>Microbial keratitis</th>
<th>Dry eye</th>
<th>Blepharitis</th>
<th>Rosacea</th>
<th>Mucous membrane pemphigoid</th>
<th>Stephens-Johnson Syndrome</th>
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<td>Visual impairment</td>
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Understanding the ocular surface

The ocular surface consists of the cornea, conjunctiva, tear film, lacrimal gland, nasolacrimal system and the eyelids (incorporating the meibomian glands and lashes), each of which is described in detail below. Figure 1 shows the anatomy of the upper eyelid and anterior segment of the eye in cross-section.

Cornea

The cornea is the most powerful refracting component of the eye. Together with the lens, it focuses light on the retina. The central 4 mm zone is critical for good vision. The cornea is made up of five layers: epithelium, Bowman’s layer, stroma, Descemet’s membrane and endothelium. The normal cornea does not have blood vessels; it gains oxygen and nutrients through diffusion from the aqueous, from limbal blood vessels and from the atmosphere. The cornea is very sensitive; there is dense innervation by fine nerve fibres from the trigeminal nerve. Normal corneal sensation is essential for a healthy intact epithelial surface, tear function and protection through the blink reflex.

If damaged, the corneal epithelium can regenerate, so simple abrasion injuries can heal without scarring. However, if the stem cells that repopulate the corneal epithelial surface are damaged, for example by a chemical injury, the resulting epithelium is abnormal and clarity is lost. Corneal clarity also depends on there being a highly ordered arrangement of collagen fibres within the stroma. These deeper layers are unable to regenerate well and often heal with scarring. In addition, the cornea needs to be maintained in a relatively dehydrated state by the action of the endothelial cell layer. If this is not functioning well, the cornea becomes oedematous and opaque.

Conjunctiva

The conjunctiva is composed of an epithelial layer overlaying a loose connective tissue (stroma). It covers the eye from the edge of the cornea (limbus) to the fornices and the inside surface of the eyelids. It contains specialised goblet cells that produce the mucus layer of the tear film. In the stromal layer of the conjunctiva, there are immune system cells that defend against infection. Sometimes lymphoid cells are recruited and gather together to form visible follicles, particularly on the tarsal conjunctival surface. Papillae, which form in the tarsal conjunctiva, are dome-like swellings with inflammatory cells, oedema and a dilated blood vessel. Conjunctival scarring develops in some chronic inflammatory ocular surface conditions, with shortened fornices, symblepharon (adhesions between the eye lid and globe) and distortion of the eyelids.

Tear film

The tear film is made up of three layers. The outer lipid layer (produced by the meibomian glands) reduces evaporation of the middle aqueous layer (produced by the lacrimal gland), with the inner mucin layer (produced by goblet cells) helping to stabilise the aqueous layer on the corneal epithelium. A good tear film helps to maintain a well-hydrated, healthy corneal epithelium and a clear optical surface, and it protects against infection.

Lacrimal gland

The lacrimal gland sits in the superolateral region of the orbit. Fine ducts open into the upper fornix, delivering lacrimal fluid to the ocular surface. Secretion of tear fluid is controlled by the parasympathetic nervous system. Problems with the gland itself, obstruction of the ducts (by scarring) and neurological problems can all result in reduced aqueous tear production.

Nasolacrimal system

The nasolacrimal system drains tear fluid from the surface of the eye. Fluid is collected through the punctae and passes along the canaliculi into the lacrimal sac. From the sac, the fluid passes down the nasolacrimal duct and drains into the nasal cavity. Obstruction at any point along the system can result in a watery eye (epiphora) and predispose the eye to infection.

Eyelids

Eyelids protect the eyes by covering them. They are formed of several layers: skin, the orbicularis muscle, the tarsal plate (including the meibomian glands), and the conjunctiva.