

RED EYE
Dr. Mohan Merchea, MD FRCSC

As a primary care physician, you will frequently see patients who complain of a red eye. As a primary care physician, you should be able to differentiate whether the condition causing the red eye is a simple disorder such as a sub-conjunctival hemorrhage or an infectious conjunctivitis, or it is a more serious disorder such as intraocular inflammation, corneal inflammation or acute glaucoma. Such a patient may need an immediate referral to an Ophthalmologist for proper diagnosis and treatment because of specialized skills, knowledge, and examining instruments which are required to make correct diagnosis and correct therapeutic decisions. Quite often a red eye is a simple disorder such as a sub-conjunctival hemorrhage or infectious conjunctivitis, which can usually be treated by a primary care physician.

The **objectives** of this lecture will be:

1. To be able to perform the nine basic diagnostic steps.
2. To recognize the danger signs of a red eye.
3. To describe the treatment of those cases that you can manage.
4. To recognize more serious problems that should be referred.
5. To describe serious complications of prolonged use of cortico-steroids.
6. To describe serious complications of prolonged use of topical local anaesthetics.

Here is a diagram of the eye where I will show you the various structures, which can be involved in a simple red eye.

The red eye refers to hyperemia of the superficial visible vessels of the conjunctiva, episclera or sclera. Hyperemia or engorgement of conjunctival vessels can also be caused by adjoining structures, including the cornea, iris, ciliary body, and the ocular adnexa.

The **basic diagnostic tests** are as follows:

1. **Visual acuity** – the visual acuity must be recorded with every patient with an eye involvement. You should be able to use various kinds of tests available for infants, children, and adults. In infants, we can only assess the visual acuity and the visual function, whereas in children, one could record the visual acuity using a picture card or a tumbling E chart. In an adult, one could use a Snellen's chart.
2. By **inspection of the conjunctiva**, and the redness present, you should be able to make out whether it is due to a sub-conjunctival hemorrhage, conjunctival hyperemia, ciliary flush, or a combination of these.
3. Detect the presence of **conjunctival discharge** and categorize it as to its character, whether it is serous, muco-purulent or purulent. Also categorize as to its amount, whether is profuse or scant.
4. You should be able to detect any **abnormalities on the cornea**, as a large keratic precipitates, corneal edema, or a corneal opacity caused by scar tissue. Cornea can be examined by using a pen light or a transilluminator.

5. Look for any **disruption of the corneal epithelium** like a corneal abrasion or a corneal ulcer by staining the cornea with fluorescein.
6. Estimate the **depth of the anterior chamber** as normal or shallow. Detect any blood or pus in the anterior chamber. The blood in the anterior chamber is termed as hyphema and pus in the anterior chamber is termed as hypopyon.
7. **Examine the pupil** as to reaction and any irregularities of the size. You may be able to detect whether the pupil is very small, which can occur in iritis or it is mid-dilated which could occur in acute glaucoma. Also, observe the reaction of the pupil to the light, both direct and consensual.
8. Determine the **intraocular pressure**, whether it is high, normal, or low by performing tonometry. You will be able to exclude whether the person has acute angle closure glaucoma if the pressure is too high. Obviously, you should omit tonometry if you suspect obvious external infection.
9. Look at the **eyelid function and limitation** of extra ocular movements or presence of any proptosis.

Although many conditions can cause a red eye, and the associated signs and symptoms of the various disorders overlap to some extent, several signs and symptoms signal danger and you should be careful if one of these signs are present. These signs could indicate to you that a prompt referral to an Ophthalmologist is required.

Signs of a Red Eye:

1. Reduced **visual acuity** with a red eye usually suggests a serious ocular disorder such as an inflamed cornea, iridocyclitis, or glaucoma. It never occurs in simple conjunctivitis unless there is the involvement of the cornea.
2. **Ciliary flush** – is an injection of deep conjunctival and episcleral vessels surrounding the cornea. This is seen easily in the daylight. It is a danger sign often seen in the eye with corneal inflammation, iridocyclitis, or acute glaucoma. You will not find ciliary flush in simple conjunctivitis.
3. **Conjunctival hyperemia** is an engorgement of the large vessels and more superficial bulbar and conjunctival vessels. It is a non-specific sign and may be seen in almost any of the conditions causing a red eye.
4. **Corneal opacification**. You may be able to detect a corneal opacity by direct illumination with a penlight or they may be seen with a direct ophthalmoscope when they may appear black against the red fundus reflex. The frequently encountered opacities are as follows:
 - a) Keratic precipitates or cellular deposits on the corneal endothelium, usually too small to be visible but occasionally forming large clumps. These indicate iritis or chronic iridocyclitis.

- b) A diffuse haze obscuring the pupil and iris markings, characteristic of corneal edema and acute glaucoma.
 - c) Localized opacities due to keratitis or an ulcer.
5. **Corneal epithelial disruption**. The corneal epithelium disruption occurs in ocular inflammations and trauma. It can be detected in two ways.
- a) By direct observation of reflection from the cornea with a pen light and epithelial disruption can cause distortion and irregularities of the reflection.
 - b) Fluorescein stains the diseased epithelium or areas of denuded epithelium as bright green. By a simple device - a cobalt blue tip, which goes over a transilluminator and it will highlight the fluorescein staining area on the cornea as bright green.
6. **Pupillary abnormalities** – the pupil in an eye with iridocyclitis is typically somewhat smaller than that of the other eye, due to direct spasm of the iris sphincter muscle. Sometimes the pupil is distorted by posterior synechia, which is an inflammatory adhesion between the lens and the iris and occurs in iridocyclitis. In acute glaucoma, the pupil is usually mid-dilated, usually fixed and usually slightly vertically oval. Conjunctivitis does not affect the pupil.
7. **Anterior chamber depth** –In a red eye, if the anterior chamber is shallow, it will suggest the possibility of acute angle closure glaucoma. You can estimate the depth of the anterior chamber through side elimination with a penlight.
8. **Intraocular pressure** – intraocular pressure is unaffected by common causes of a red eye like conjunctivitis or corneal ulcer. It may be elevated in iridocyclitis and glaucoma. Any red eye without obvious infection or a corneal ulcer, the intraocular pressure should be measured with a tonometer to rule out glaucoma.
9. **Proptosis** – Proptosis is a forward displacement of the globe. Sudden proptosis suggests a serious orbital or cavernous sinus disease. It is particularly important in children when orbital infection or orbital tumor like rhabdo-myosarcoma should be suspected. The most common cause of chronic proptosis is thyroid disease; however, orbital mass lesions also result in proptosis and should be ruled out. Proptosis may be accompanied by conjunctival hyperemia or limitation of eye movements and the patients may complain of diplopia. Small amounts of proptosis are detected most easily by standing behind the patient and looking down the position of the two corneas. You could also compare the two eyes and see if excess amount of sclera is visible, particularly the superior sclera.
10. **Discharge** – the type of discharge may be an important clue to the cause of the patient's red eye, purulent or mucopurulent. Purulent is creamy white or mucopurulent is yellowish, which generally suggests a bacterial cause. Serous which is watery, clear or yellow discharge usually suggests a viral cause. Scant white, stringy discharge sometimes occurs in allergic conjunctivitis and in keratoconjunctivitis sicca, more commonly known as Dry Eye.

11. **Pre-auricular lymph node enlargement** – the enlargement of the lymph nodes just in front of the auricle of the ear is a frequent sign of viral conjunctivitis. Usually you will not find pre-auricular node enlargement in a bacterial conjunctivitis.

Symptoms of the Red Eye:

1. **Blurred vision** – as I have already mentioned blurred vision often indicates serious ocular disease. Blurred vision that improves with blinking suggests a discharge or mucous on the ocular surface.
2. **Severe pain** – it may indicate keratitis, corneal ulcer, iridocyclitis, or acute glaucoma. Patients with conjunctivitis may complain of a mild irritation or scratchiness but not of severe pain.
3. **Photophobia** – photophobia is an abnormal sensitivity to light that accompanies iritis, either alone or secondary to corneal inflammation. A patient with conjunctivitis has normal light sensitivity.
4. **Coloured halos** – rainbow as fringes or coloured halos seen around the point of light are usually as symptom of corneal edema, often resulting from a rise in intraocular pressure. The coloured halos are a danger symptom suggesting acute glaucoma as a cause of the red eye.
5. **Exudation** – is a typical result of conjunctival or eyelid inflammation and does not occur in iridocyclitis or glaucoma. Patient will often complain that their lids are stuck together in the morning when they wake up. The corneal ulcer is a serious condition that may or may not be accompanied by exudation.
6. **Itching** – this is a non-specific symptom but usually indicates an allergic conjunctivitis. Many people say that no itching, no allergy.

Associated Systemic Problems:

1. **Upper respiratory tract infection and fever** – upper respiratory infection and fever and may be associated with conjunctivitis, particularly when these symptoms are due to adenovirus type 3 or type 7. Allergic conjunctivitis may be associated with seasonal rhinitis or hay fever.
2. **Herpes Zoster Ophthalmicus** . Often there may be a history of chicken pox in childhood and the person may complain of severe headache and burning sensation in scalp prior to any lesions being seen around the eye.
3. **Herpes Simplex Keratitis** may often be associated in people who frequently have cold sores on the lips.

4. **Erythema multiforme** - is a serious systemic disorder, possibly an allergic response to medication, which can result in serious conjunctivitis, irreversible conjunctival scarring, and blindness. Bulls eye or target-shaped red lesions are found on the skin. Steven's Johnson's Syndrome is a name given to the form of Erythema multiforme associated with ocular involvement.

5. **Laboratory Diagnosis** – in practice, most mild cases of conjunctivitis are managed without laboratory diagnosis. This represents a compromise with ideal management, but is justified by the economic waste of obtaining routine smears and cultures in such a common and benign disease. Most clinicians are able to make a presumptive clinical diagnosis of bacterial conjunctivitis, proceed directly to broad-spectrum topical ophthalmic antibiotic treatment. Patients with presumed bacterial conjunctivitis who do not improve after two days of antibiotic treatment should be referred to an Ophthalmologist for diagnosis and appropriate treatment. In cases of hyper acute purulent conjunctivitis, when copious purulent discharge is produced, conjunctival cultures and Ophthalmological referral are indicated because of possible gonococcal etiology. Gonococcal hyperpurulent conjunctivitis is a serious and potentially blinding disease. The smears of exudate or conjunctival scrapings can confirm the clinical impression regarding the type of conjunctivitis. With bacterial conjunctivitis, you will typically find polymorph nuclear cells and bacteria, in viral conjunctivitis lymphocytes and in allergic conjunctivitis eosinophils.

Cultures for bacteria and determination of antibiotic sensitivity are also useful in cases that are resistant to therapy. Many times, we will discontinue all antibiotic treatment for three days, then culture the eye, and start on the appropriate antibiotic treatment.

Disorders Associated with a Red Eye

Any patient that complains of a red or painful eye should be examined to diagnose the condition as one of the following:

1. Acute angle closure glaucoma.
2. Iritis or iridocyclitis
3. Herpes Simplex Keratitis
4. Conjunctivitis
5. Episcleritis
6. Scleritis
7. Adenexal disease
8. Sub-conjunctival hemorrhage
9. Pterygium
10. Keratoconjunctivitis sicca
11. Abrasions or foreign bodies
12. Secondary to abnormal lid function

I will now show you common conditions, which either require no treatment or maybe appropriate treatment by a primary care physician. Patient's requiring prolonged treatment

or those in which expected response to treatment does not occur, should be referred to an Ophthalmologist promptly.

1. **Blepharitis** – this is inflammation of the lid margin, usually staphylococcal in origin and following chronic staphylococcal lid infection that produces inflamed swollen lids that may ulcerate. The oily discharge binds the lashes and sometimes condenses to form a colarette around an eyelash. Where as in seborrheic blepharitis there is dry flaking lashes and red lid margins. The main stays of treatment are:
 - a. Treat staphylococcal infection with frequent application of appropriate antibiotic eye drops or ointment.
 - b. Treatment of scalp seborrhea with anti-dandruff shampoos to prevent the spread of seborrhea to the eyes.
 - c. Cleansing of the lids to alleviate seborrheic blepharitis. I usually advise them Lid Care, which can be performed with half strength Johnson’s baby shampoo used as scrubs with Q-Tip twice a day or using commercially made lid care products.

2. **Stye and chalazion** – a stye or hordeolum is an acute inflammation of the gland of zeiss and of the hair follicle. There is usually an external swelling, whereas a chalazion involves the meibomian gland and shows an internal swelling. An external hordeolum occurs on the surface of the skin at the edge of the eyelid, whereas an internal hordeolum presents on the conjunctival surface of the lid. A chalazion is a chronic granulomatous inflammation of the meibomian gland and may develop spontaneously or may follow an internal hordeolum.

Styes are initially treated with hot compresses and topical antibiotics. Most of the chalazia are sterile, and antibiotic therapy is of no value, but hot compresses may be useful for early lesions. If the eyelid is very acutely swollen and there is associated infection, one could prescribe oral antibiotics. Oral antibiotics are usually not indicated in a chalazion. Incision and drainage is indicated when the lesion does not resolve spontaneously or with medical therapy. A persistent or recurrent chalazion should undergo biopsy because it may be a rare meibomian gland carcinoma or squamous cell carcinoma of the conjunctiva rather than a benign chalazion.

3. **Subconjunctival Hemorrhage** – in the absence of blunt trauma, hemorrhage into sub-conjunctiva, the potential space between the conjunctiva and sclera, requires no treatment and unless recurrent, no evaluation. You will see quite often this in elderly people who are on chronic aspirin therapy. Other causes include a sudden increase in ocular venous pressure, such as occurs with coughing, sneezing, vomiting, or vigorous rubbing of the eye. Many subconjunctival hemorrhages occur during sleep. If recurrent, an underlying bleeding disorder should be considered.

4. **Conjunctivitis** – Bacterial conjunctivitis is treated with frequent antibiotic drops as well as an antibiotic ointment applied at bedtime. Cold compresses may give some relief. There is no specific medicinal treatment for viral conjunctivitis. These patient’s should be instructed with proper instructions as to a contagion.

5. **Herpes Simplex Keratitis and Herpes Zoster Ophthalmic** - will need appropriate anti-viral treatment. I cannot emphasize too strongly that corticosteroids have no place in the treatment of infectious conjunctivitis and that eye drops containing a combination of antibiotics and corticosteroids, for example Garasone and Tobradex are seldom indicated for treatment of ocular inflammation. The corticosteroids are particularly dangerous to use in presence of Herpes simplex keratitis.

Special therapeutic warnings:

- a. **Topical Anaesthetics** – should never be prescribed for a prolonged analgesia in ocular inflammation and injuries for three reasons:
- 1) Topical anaesthetics inhibit growth and healing of the corneal epithelium.
 - 2) They may cause severe allergic reactions.
 - 3) Cornea anesthesia eliminates the protective blink reflex, exposing the cornea to dehydration, injury and infection.
- b. **Topical Corticosteroids** – have the following potentially serious ocular side effects:
- 1) Keratitis – both herpes simplex keratitis and fungal keratitis and are markedly potentiated by use of corticosteroids. They may cause corneal melting or even perforation of the cornea.
 - 2) Cataract – prolonged use of corticosteroids either locally or systematically will often lead to cataract formation. These cataracts are usually posterior subcapsular in location and interfere with the visual acuity much earlier and quickly as compared to a cataract in an elderly individual.
 - 3) Elevated intraocular pressure – local application of corticosteroids for two to six weeks may cause an elevation of intraocular pressure in approx. 1/3 of the population. This can cause optic nerve damage and permanent loss of vision, very quickly.

As I have already mentioned, a combination of corticosteroids and antibiotic drops carries the same risk. Topical corticosteroids alone or in combination with antibiotics should not be administered to the eye by a primary care physician. Topical corticosteroids should only be used under close supervision of an Ophthalmologist.

Now I will try to show you some slides with common conditions of patient's presenting with acute red eye.