Differential Diagnosis of Red Eye

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Differential diagnosis of red eye

Abstract

Patients frequently present to primary eye care providers with red eyes. The pathological processes of red eyes may involve the eyelid, conjunctiva, cornea, sclera, lens, uvea or the structures behind the eye. An accurate diagnosis of any type of red eye requires a thorough case history, knowledge of presenting signs and symptoms and the use of diagnostic tests. In this article, red eye conditions and many of its important clinical or diagnostic criteria are discussed. Primary eye care providers will find the content of this article to be potentially useful addition to their collection of learning resources.

Key words: hyperemia, discharge, ocular pain, vision, pupil, cornea

Introduction

A red eye is a cardinal sign of ocular inflammation and occurs when blood vessels of the eye become enlarged and dilated. It can be caused by several conditions; the most common anterior segment causes being blepharitis, conjunctivitis, corneal ulcer, contact lens wear, dry eye, acute angle closure glaucoma, injury, subconjunctival hemorrhages, scleritis and uveitis. Clinical findings of concern are reduction in visual acuity (VA), ocular pain, blepharospasm and photophobia. Further findings may include ocular discharge, corneal edema or opacity, abnormal pupil size and abnormal intraocular pressure (IOP). The differential diagnosis of red eye ranges from self-limiting conditions to sight threatening ones. A close look at the different external structures of the eye individually provides information essential for differential diagnosis of various etiologies of red eye. A single penlight examination with a magnifying loupé can be used to examine a red eye in a primary eye care setting. However, a slit-lamp biomicroscope is required to make an accurate diagnosis. Treatment, which depends on a sound differential diagnosis, should be targeted according to the cause of the problem.

Symptoms

Certain specific symptoms may assist in determining the etiology of the red eye.

Blurred vision

Some patients with red eyes may report blurred vision. Blurred vision is not diagnostic of a red eye and may indicate the presence of other serious ocular diseases. If patients with red eyes report that the blurred vision gets better when they blink, it may suggest that there may be some ocular surface discharge of some variety. Blurred vision can occur in conditions such as acute angle closure glaucoma due to disruption of the corneal endothelial pump action thereby resulting in corneal edema. Blurrosi vision in a condition such as uveitis is generally attributed to the severity of the cells and flare in response to inflammation.

Ocular pain

Pain is often associated with an inflammation or infection and therefore, those suffering from conjunctivitis/inflammation may report mild irritation or scratching, but never extreme pain. Severe pain is an indicator of more serious ocular conditions such as keratitis, corneal ulceration, toxocariasis, scleritis or acute glaucoma. Photophobia

The development of photophobia is prevalent in individuals who have inflammation of the uvea (iris, ciliary body and choroid) and has also been reported in acute angle closure glaucoma.

Coloured halos

Symptoms of coloured halos may occur in varying degrees depending on the nature of the cause and are usually an indication of corneal edema and acute angle closure glaucoma.

Signs

Visual acuity (VA)

Visual acuity is the aspect that best predicts visual function and is important in monitoring disease progression. Acute inflammation such as simple conjunctivitis (without corneal involvement) never presents with reduced vision but reduced VA is indicative of serious ocular disease, such as corneal inflammation, uveitis and glaucoma. It is also important to exert the eyelid to check for papillae, follicles or presence of foreign bodies in patients who present with a red eye. Sectoral redness usually associated with episcleritis.

Discharge

Patients with red eyes usually present with three main types of discharges. The type of discharge can help to distinguish the cause and type of the red eye. The most common types of discharge in a red eye are watery,ropy or mucous/secretion, depending on the type and cause of the red eye. A watery discharge is usually associated with a viral etiology and aropy, mucoid discharge with allergic etiologies while mucopurulent discharge is associated with a bacterial etiology. While various discharges have a tendency to be associated with certain etiologies, differential diagnosis can become complicated because they are not always exclusive to specific etiologies. However, to facilitate a more precise differential diagnosis, the discharge must be considered in conjunction with other signs and symptoms.

Corneal disruption

The depth of corneal disruption indicates the extent of corneal damage. Superficial epithelial disruptions heal within 24-48 hours and can be detected with fluorescein staining of the eye. Corneal opacification, either in keratic, haze-like or localized forms always indicate that a serious disease process is in progress. Patients with corneal disruption must be handled with care and consistent follow-up examinations to ensure that the etiology is not sight-threatening.

Pupillary abnormalities

Conjunctivitis generally does not affect the pupils and serious conditions such as uveitis would have one pupil that is smaller than the other, which is caused by a reflex spasm of the iris sphincter muscle. For example, with acute angle closure glaucoma, the pupil would be partially dilated and the pupillary response sluggish due to the waterlogged inflamed iris.

Abnormal intraocular pressure

Intraocular pressure is affected by conditions such as uveitis, penetrating injury, and acute angle closure glaucoma, but not by relatively benign conditions. Uveitis causes increases and decreases in IOP while penetrating ocular injury causes increases in IOP while acute angle closure glaucoma causes significant increases in IOP.

Anterior chamber depth

Cells and flare in the anterior chamber is a sign of ocular inflammation such as uveitis and a shallow anterior chamber depth may indicate acute glaucoma and penetrating ocular injury, which requires immediate attention.

Proptosis

Proptosis is a forward displacement of the globe and is usually associated with thyroid disease and infections of the orbit.
Causes

Clinically, there are two simple and conventional ways of categorizing causes of red eye. These include painless red eye and painful red eye. Causes of painless red eye are mostly self-limiting and those causes of painful red eye are usually severe and sight-threatening conditions. Prompt diagnosis and management of the causes of painful red eye is important to prevent visual loss. Examples of causes of painless red eye include blepharitis, conjunctivitis, pingueculum, pterygium, and others, while those causes of painful red eye include keratitis and corneal ulcer, acute angle closure glaucoma, episcleritis, scleritis, and uveitis.

Blepharitis

Blepharitis is a chronic inflammation of the eyelid and eyelashes that is often associated with conjunctivitis and keratitis. Changes in meibomian gland lipid secretions and poor eyelid hygiene can also result in blepharitis. Other causes include bacterial infections such as staphylococcus, allergic reactions, or lice on the eyelids. Patients usually complain of eye irritation and itching, burning, gritty sensation and tearing. Complications include a hordeolum, chalazion and dry eyes. Treatment includes warm compresses followed by light scrubbing of the eyelid with a cotton swab dipped in a mixture of baby shampoo and water.

Conjunctivitis

Conjunctivitis is a general term for any inflammation of the conjunctiva and is arguably the most common cause of red eye. It is generally not associated with vision loss or ocular pain. Conjunctivitis can be caused by allergies, bacteria, viruses or toxic substances. As mentioned earlier, one of the diagnostic procedures required to help decide amongst them is the type of redness and discharge. Allergic conjunctivitis often has papillary projections and a watery to stringy mucoid discharge and causes persistent itching and tearing of both eyes. Treatment includes cold compresses and artificial tears. Allergic conjunctivitis also responds well to vasoconstrictor-antihistamine medication such as cromolyn sodium. Viral infections, commonly referred to as a “pink eye”, tend to have lymphoid follicles on the palpebral conjunctiva and enlarged tender preauricular lymph nodes. It is highly contagious and usually present with watery discharge, photophobia and irritation. Viral conjunctivitis is self-limiting but topical antibiotics can be used prophylactically.

Bacterial conjunctivitis is also highly contagious and presents with eye irritation, mucopurulent discharge, edema of the conjunctiva (chemosis), eyelid swelling and papillae. Treatment includes warm or cold compresses, artificial tears and broad spectrum antibiotics. Definite treatment of bacterial conjunctivitis is guided by interpretation of a Grams stain and subsequent culture of any exudates present. The use of steroid or steroid containing antibiotics is discouraged as they reduce local immunity and encourage micro organism to multiply. Complications of bacterial conjunctivitis include more invasive disease such as keratitis or abscess formation, with potential corneal perforation and destruction.

Subconjunctival hemorrhage

A subconjunctival hemorrhage is caused by a burst blood vessel resulting in vessel bleeding. It may also occur spontaneously or with trauma and can also be caused by hard sneezing, coughing, intense straining, vomiting associated with endoscopy, hypertension, diabes, gout, HIV/AIDS, cardiovascular disease, leukemia and hemalogical dyscrasia. Subconjunctival hemorrhage can be treated in the early stages by alternating hot and cold compresses as well as vasoconstrictors. Although the problem of subconjunctival hemorrhage usually resolves without complication within 7-10 days, in patients where subconjunctival hemorrhage is recurrent or suspicious, referral for thorough medical assessment and possible treatment is important. A subconjunctival hemorrhage that shows no resolution could be a diagnostic feature of a Kaposi sarcoma and therefore it is pertinent to follow up on a patient with a subconjunctival hemorrhage. The resolution progression of a subconjunctival hemorrhage can be monitored by the various color changes that accompany the hemorrhage due to the degradation of hemoglobin.

Hyphema

This is an accumulation of layered blood in the anterior chamber caused by blunt trauma. Hyphema increases the risk of retinal detachment and patients present with nausea, photophobia and pain. A referral to an ophthalmologist is required and treatment is usually strict bed rest, cycloplegia and steroids. Hyphema due to blunt trauma must be examined thoroughly for other complications of trauma such as traumatic uveitis and retinal detachment.

Keratitis

Keratitis (any type of corneal inflammation), corneal ulcer (loss of some of corneal epithelium and inflammation in surrounding cornea) and corneal scar (white and opaque cornea, which is the final result of any serious inflammation) are all common terms used to describe corneal diseases. They can be caused by infections, toxic, degenerative, traumatic and allergic conditions. Generally, in corneal disease, patients have decreased VA and photophobia and often complain of severe and sharp eye pain. On examination, the hyperemia is circumcorneal and may be accompanied by an anterior chamber reaction. Treatment should be directed to the underlying cause and usually includes gentamycin or ciprofloxacillin eye drops. Any opacification of the cornea in a red eye is an ophthalmic emergency and should be regarded as an infection of the cornea until proven otherwise. In some individuals, wearing contact lenses every day or for extended periods of time can cause the eye to appear red. Some people develop contact lens-induced dry eyes, which makes it difficult to wear contact lenses comfortably. In others, merely having a foreign body, such as a contact lens, in the eye causes redness. Also, frequent use of certain vasoconstrictor eye drops can cause rebound dilation of the eyes’ blood vessels.

Episcleritis

Episcleritis is an inflammation of the superficial scleral vessels and is usually associated with inflammatory systemic conditions such as rheumatoid arthritis, Sjogren syndrome, syphilis, zoster and tuberculosis. Unlike conjunctivitis, the inflammation tends to be limited to an isolated patch, not involving the eye diffusely. Vision is normal and there is no discharge or corneal involvement. There may be mild-to-moderate tenderness over the area of injection. Episcleritis is a self-limiting condition and not sight threatening and topical vasoconstricting agent may reduce the redness.

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**Acute angle closure glaucoma**

Unlike most types of glaucomas, acute angle closure glaucoma causes painful red eyes, photophobia and sudden reduction of vision with markedly elevated IOP.⁷,¹² It is a serious medical emergency and must be referred immediately for treatment. Haloes around light are common and the pupil may be mid-dilated and non-reactive to light.⁴,¹² Nausea and vomiting are common while silt lamp examination reveals corneal edema with mild cells and flare in the anterior chamber.⁴,¹¹ The traditional treatment is usually timolol (a beta-blocker) eye drops and acetazolamide (diamox) to lower the IOP.

### Table 1: Summary of differential diagnosis of the main causes of red eye

<table>
<thead>
<tr>
<th>Condition</th>
<th>Symptoms</th>
<th>Discharge</th>
<th>Vision</th>
<th>Hyperemia</th>
<th>Cornea</th>
<th>Pupil</th>
<th>IOP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conjunctivitis</td>
<td>No pain</td>
<td>Yes</td>
<td>Generally not affected</td>
<td>Diffuse</td>
<td>Moderate to severely reduced</td>
<td>Clear</td>
<td>Not affected</td>
</tr>
<tr>
<td>Superficial Keratitis</td>
<td>Moderate to severe pain, Photophobia</td>
<td>Watery</td>
<td>Moderate to severely reduced</td>
<td>Diffuse</td>
<td>Hazy</td>
<td>May be irregular or motic</td>
<td>Not affected</td>
</tr>
<tr>
<td>Episcleritis</td>
<td>Mild to moderate pain</td>
<td>No</td>
<td>Not affected</td>
<td>Focal</td>
<td>Clear</td>
<td>Not affected</td>
<td>Not affected</td>
</tr>
<tr>
<td>Scleritis</td>
<td>Severe aching, boring pain, Localized tenderness</td>
<td>No</td>
<td>May be reduced</td>
<td>Focal or diffuse</td>
<td>Clear</td>
<td>Not affected</td>
<td>Not affected</td>
</tr>
<tr>
<td>Anterior Uveitis</td>
<td>Pain, Photophobia</td>
<td>Non-specific, but usually watery</td>
<td>Mildly to moderately reduced</td>
<td>Diffuse, more prominent adjacent to limbus</td>
<td>May be hazy</td>
<td>Small and/or irregular</td>
<td>May be raised</td>
</tr>
<tr>
<td>Acute Angle Closure Glaucoma</td>
<td>Severe pain, Headaches</td>
<td>No</td>
<td>Severely reduced</td>
<td>Diffuse, more prominent adjacent to limbus</td>
<td>Hazy</td>
<td>Dilated and non reactive</td>
<td>Raised</td>
</tr>
</tbody>
</table>

**References**

References available online at www.visionmag.co.za
1. Which of the following conditions is least likely to be a differential diagnosis for a “painful red eye”?
   a. Acute angle closure glaucoma
   b. Allergic conjunctivitis
   c. Herpes simplex keratitis
   d. Uveitis
   e. Scleritis

2. Findings that distinguish uveitis from conjunctivitis include all of the following except:
   a. Absence of foreign body sensation
   b. Formation of anterior synchiae between the iris and the cornea
   c. No pain in uveitis
   d. Decreased visual acuity in uveitis
   e. A watery discharge in uveitis

3. Complications of uveitis include:
   a. Development of synchiae
   b. Glaucoma
   c. Band keratopathy
   d. Cataract
   e. All of the above

4. Treatment of noninfectious allergic conjunctivitis include all of the following except:
   a. Antihistamine/mast cell stabilizer
   b. Artificial tears
   c. Cold compresses
   d. Oral acetylsalicylic acid
   e. All of the above

5. Clinical features of keratitis include all of the following except:
   a. The cornea is not clear and will stain with fluorescein in the case of corneal ulcer
   b. Visual acuity is usually normal
   c. The condition is often unilateral
   d. The eye is painful
   e. Excessive production of tears (lacrimation)

6. Clinical features of uveitis include all of the following except:
   a. The pupil is irregular and has a different size from that in the healthy eye
   b. Dull, deep-seated pain
   c. Circumcorneal redness (mostly around the cornea)
   d. Reduced vision (sometimes severely reduced)
   e. None of the above

7. A 55 year old patient presents with unilateral blurred vision, halos around lights, intense pain and photophobia. On examination, you noticed a fixed, mid-dilated pupil, corneal edema with blurring of light reflex. What is the MOST likely condition that this patient has?
   a. Scleritis
   b. Preseptal cellulitis
   c. Acute angle closure glaucoma
   d. Corneal ulcer
   e. Dacryocystitis

8. The most significant diagnostic sign for viral conjunctivitis is:
   a. Redness
   b. Tearing
   c. Mucopurulent discharge
   d. Palpable pannus and lymph nodes
   e. All of the above

9. Which of the following statements is incorrect?
   a. A history of recurrent itching, asthma may be suggestive of ocular allergy
   b. Mild itching can be a feature of blepharitis and dry eyes
   c. Compared to conjunctivitis, in which the intensity of the vascular engorgement decreases toward the limbus, uveitis shows more vascular engorgement towards the limbus
   d. Bacterial conjunctivitis is most commonly caused by Staphylococcus species
   e. In iritis and traumatic perforating ocular injuries, pressure is usually high.

10. Which of the following structures provides the protection to the orbit in preventing a preseptal cellulitis from becoming an orbital cellulitis?
    a. Muller muscle
    b. Meibomian glands
    c. Grey line
    d. Orbital septum
    e. None of the above

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