



# An Overview of Red Eye diagnostic and Management Approach in Primary Health Care Center: Literature Review

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## ABSTRACT

**Background:** Red eye is a common complaint that a physician could face in the hospital setting. Many causes are identified to manifest as red-eye; some of them need only reassurance, others might need surgical intervention, and if not treated appropriately, it might lead to permanent loss of vision. **Objective:** This review aims to discuss the common causes of red eye that the physician can face in his/her career and how to approach it. **Method:** We searched the PubMed database looking for relevant articles to the topic using Mesh terms, "acute red eye" and "red-eye emergency." **Conclusion:** Proper history taking and examination will protect patients from possible vision loss. Hence, the diagnosis can range from self-remitting condition to sight-threatening diagnoses.

**Key Words:** Red eye, diagnosis, management approach

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## INTRODUCTION

Red-eye is a pretty common condition where ophthalmologists should know how to do its differential diagnosis and all other physicians, especially those at the emergency department [1, 2]. An acute red eye means a patient with redness of his conjunctiva and/or sclera [3]. Physicians generally need to survey a detailed history, basic ophthalmology tests, and consider other presentations at hand to narrow down their differential diagnosis [3]. Most importantly, to ask about the duration, laterality, and severity of pain. These will further help decide whether the case can be handled by a general practitioner, an ophthalmologist, or needs an urgent surgery [4].

## History

During taking a history, to notice whether there is pain or photophobia can help in distinguishing a minor (conjunctivitis, episcleritis) from a serious diagnosis (acute angle-closure glaucoma, bacterial keratitis, scleritis, anterior uveitis) [4-6]. However, it is also essential to know whether the patient's red-eye accompanies any other symptoms. Those associated symptoms can give hints of serious conditions such as headache or vomiting; hence, AACG or viral conjunctivitis is often presented primarily with infections in the upper respiratory tract [7, 8]. History of trauma, exposure, or surgery is equally important as this may suspect corneal abrasion or a superadded infectious keratitis resulting from minor trauma [9]. Also, major traumas may rise suspect rupture of the globe or iritis of trauma. Endophthalmitis should be strongly considered in a patient recently undergone surgery

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for his/her eye [10]. Risk factors can help guide a physician to suspect what particular red-eye is all about. For example, rheumatologic and autoimmune conditions can be linked with anterior uveitis, scleritis, and episcleritis [11, 12]. The risk of infectious keratitis comes with a history of contact lens use. Also, the history of medicines in use is essential. For instance, a subconjunctival hemorrhage is linked with anticoagulant use [13]. On the other hand, angle-closure is often linked with topiramate [4].

### Physical Examination

When performing a lid and skin examination of an acute red eye, slit-lamp examination, and fluorescein warrant additional evaluation for varicella or herpes keratitis of herpetic lesions on the skin [1]. Erythema or edema of the skin may increase the link with periorbital cellulitis, dacryocystitis, stye, or blepharitis [1]. To ensure the absence of a possible foreign object that may cause repetitive eye trauma, a physician must examine underneath the lid [4]. Any patient who presents with an ocular complaint should be assessed for visual acuity. An acutely reduced visual acuity should set a high connection for a sight-threatening diagnosis, such as AACG or endophthalmitis [3].

If pain is secondary to a lesion at the conjunctival or corneal surface, including a corneal abrasion, it should improve in response to topical anesthetic eye drops if installed [14, 15]. The phenylephrine response helps differentiate between episcleritis and scleritis; the redness of episcleritis can become better by putting phenylephrine, making the episcleral vessels constrict. In contrast, the redness of scleritis does not become better [12]. A slit-lamp examination is required to spot cells and flare in the anterior chamber, as this is a sign of an acute inflammatory process (anterior uveitis or bacterial keratitis) [11]. The slit lamp will also recognize a corneal infiltrate link with bacterial or fungal keratitis. Together with the slit lamp examination, fluorescein examination will show a corneal epithelial defect, such as a corneal abrasion or a corneal defect linked with microbial keratitis infiltrate [3].

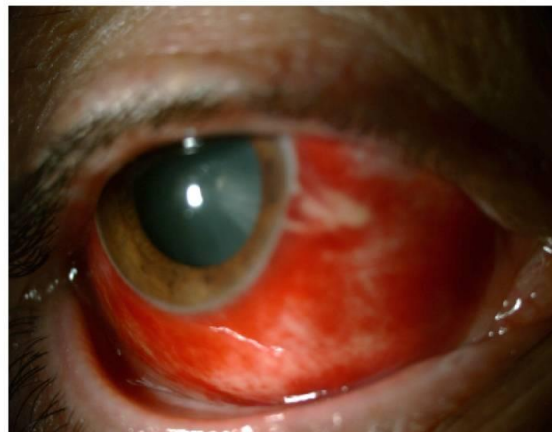
### DISCUSSION:

As mentioned previously, many diseases could present with red-eye, and it is important to differentiate them from each other to proceed with the management plan.

**Subconjunctival hemorrhage (SH)** is defined as the presence of blood beneath the conjunctiva, secondary to a ruptured conjunctival blood vessel [16]. Risk factors include trauma, straining, conjunctivitis, chronic health conditions, and coagulopathy [13].

Based on physical examination and history, there is no pain or photophobia; besides, you cannot instill a topical anesthetic [3]. No response to phenylephrine and the visual

acuity is normal, and pupils are normal, and the anterior chamber is clear, and no uptake of fluorescein will be noticed (figure 1) [4].



**Figure 1: Subconjunctival hemorrhage**

Management may be reassuring and advising the patient to use topical lubrication whenever needed. The patient could follow up with a primary healthcare physician to routine any chronic health conditions [13, 15].

**Conjunctivitis** is considered an umbrella term for a group of infectious or non-infectious eye disease that leads to inflammation of the bulbar and palpebral conjunctiva [16]. Conjunctivitis can be viral, bacterial, or allergic, and risk factors can include wearing contact lenses [16]. On physical examination and history, pain is minimal without photophobia, instillation of a topical anesthetic reduces the irritation and mild improvement in response to phenylephrine [4]. Visual acuity is normal, and the anterior chamber is clear [7].

Management of allergic conjunctivitis is to instill topical antihistamines [7]. Viral conjunctivitis can be treated with preservative-free artificial tears and supportive care up to 8 times/day [17]. Topical antibiotics for bacterial conjunctivitis reduces the period of the disease, but the disease itself is usually self-limited [17]. Then, patients can follow up with a primary care physician [7, 17].

**Episcleritis** is defined as an inflammation of the thin, highly vascular connective tissue layer between the sclera and conjunctiva [18]. Risk factors include female gender, age, and systemic autoimmune conditions. Redness is usually restricted in the inter-palpebral zone [18].

Based on physical examination and history, only mild irritation yet chronic or nodular episcleritis may have pain [3]. Installation of a topical anesthetic may improve the irritation [4]. Resolution of episcleral redness after 10 to 15 minutes in response to phenylephrine (Key Feature) [4]. Visual acuity and pupils are normal; also, the anterior chamber is clear, and there is no uptake of fluorescein [4]. Management of episcleritis includes the use of oral non-steroidal anti-inflammatory drugs and topical lubricants [12] and follow up with primary care for continued

management and workup of any underlying cause. Patients should be given return precautions for scleritis symptoms like in case there is any worsening pain [17-19].

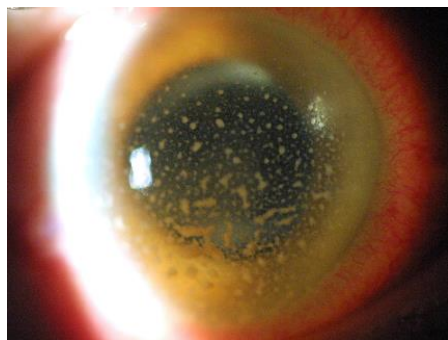
**Anterior scleritis** is defined as scleral inflammation that is associated with systemic autoimmune disease [20]. Risk factors in 50% of patients with anterior scleritis are associated with autoimmune, systemic diseases like rheumatoid arthritis, granulomatosis with polyangiitis, known as Wegener's granulomatosis [4]. Anterior scleritis has 3 forms of: nodular, diffuse, and necrotizing, the latter has the worst outcome and commonly leads to the most severe pain [21].

On physical examination and history, pain is gradual in onset, severe, dull, and piercing. Pain is worse at night with extraocular movements and may radiate to the face [12, 20]. Photophobia may be present. Installation of a topical anesthetic cannot improve the pain, and redness does not improve in response to phenylephrine [4]. Visual acuity is normal or decreased depending on the disease's extent. Pupils and anterior chamber are clear on examination [4]. It may show peripheral keratitis with fluorescein, which is common in the necrotizing form [21].

The management of such a condition is by referring the patient to an ophthalmologist to prevent permanent damage [12]. If there is uncontrolled scleral thinning, patients are at risk of perforation, and an eye shield should be applied [21, 22].

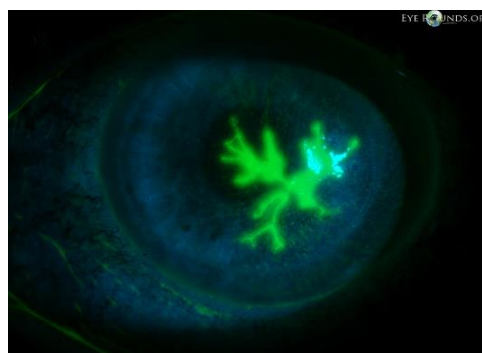
**Anterior uveitis** could be defined as idiopathic inflammation of the uvea, causing redness and pain. Multiple etiologies may participate in the development of anterior uveitis, which include systemic disease such (ankylosing spondylitis), infectious diseases like (syphilis, tuberculosis, Lyme disease), or iatrogenic such as (rifabutin, cidofovir, sulfa, moxifloxacin) [11, 23].

On history and physical examination, there is moderate to severe pain, and consensual photophobia. Installation of a topical anesthetic cannot improve the pain [4]. Redness does not improve in response to phenylephrine. Visual acuity is normal or decreased [4]. Pupils are constricted or irregular. Also, cells and debris are found in the anterior chamber (figure 2) [11].



**Figure 2: Anterior uveitis**

With fluorescein, dendrites may be revealed if the underlying cause is HSV (figure 3) [11].



**Figure 3: HSV on fluorescein**

Management for anterior uveitis is topical steroids [23]. Patients may also be treated with dilating drops to prevent scarring of the iris to the lens (synechiae) [11]. It is a must that patients follow up with an ophthalmologist within 24 hours to control symptoms, limit inflammatory consequences, and to consider lab work for an underlying cause [11, 23].

**Acute Angle Closure Glaucoma** is defined as closure or narrowing of the anterior chamber angle, causing elevated intraocular pressure and eventual optic nerve damage [8]. Risk factors include certain medications (sulfa or topiramate), hyperopia, chamber, shallow anterior Asian ethnicity, female gender, and increased age [24]. A typical presentation would be headaches, nausea, vomiting, halos around lights, photophobia, blurred vision, and pain. Eye redness is diffuse, with characteristic ciliary flush [8]. There is moderate to severe pain and photophobia in history and physical examination [24]. Installation of a topical anesthetic cannot improve the pain [4]. Instillation of phenylephrine may make things get worse and should not be given [4]. Visual acuity is decreased, and pupils are mid-sized or dilated, non-reactive [24]. Management involves topical para-sympathomimetic, topical beta-blocker, carbonic anhydrase inhibitors, and alpha agonists to relieve the pressure [8]. Physicians should avoid some medications that dilate the pupil, such as apraclonidine [4]. After that, an ophthalmologist consultation should be done to assess the need for surgical intervention [25].

#### **Corneal abrasion:**

When the corneal epithelium got damaged by a foreign body or abrasion, it leads to irritation, pain, and photophobia [26]. Precipitating factors for such a condition include trauma to the eye, contact lens use, and construction or manufacturing job without the use of eyeshield [26]. There is moderate to severe pain lasting <48h; photophobia is present [4]. Installation of a topical anesthetic can significantly improve the pain; besides, phenylephrine's installation improves redness [4]. Uptake of fluorescein at the site of the corneal abrasion [4].



Management of corneal abrasions is treated with lid eversion to exclude foreign bodies, lubricating ointment or drops, and topical antibiotics [26]. Patients with contact lenses should refer to an ophthalmology unit within 48 hours [4]. If there is a suspicion of corneal ulcer or if the pain is not getting better within 24 hours, patients should be referred to ophthalmology emergently [4].

#### **Bacterial or fungal keratitis/Corneal Ulcer:**

It is defined as a corneal epithelial defect with stromal haze due to microorganisms [9]. Risk factors include contact lens use, agricultural work, eye trauma, use of corticosteroids, systemic diseases, prior ocular surgery, and chronic ocular surface disease [9].

On history and physical examination, there is moderate to severe pain, photophobia is present, and the installation of a topical anesthetic may improve the pain; in addition, the installation of phenylephrine may improve redness. It is worth mentioning that fluorescein is instilled in corneal epithelial defects [4].

Management includes fortified topical antibiotics and follow up with ophthalmology within 24h [27]. The microbial keratitis complications include corneal perforation and extension into the visual axis [27].

#### **Endophthalmitis:**

It could be defined when a fungal or bacterial organism invades the vitreous with or without the aqueous humor [10]. This disease precipitating factors may include recent ophthalmic surgery, penetrating eye trauma, intravitreal injections, central venous access during hospitalization, and total parenteral nutrition in mal-nutrition patients [10]. Based on history and physical examination. There is moderate to severe pain. Photophobia is present. Topical anesthetic has no improvement. Instillation of phenylephrine minimal. Visual acuity decreased. Pupils may have an afferent pupillary defect. The anterior chamber is associated with hypopyon (figure 4) [28]. Fluorescein can be used in the corneal epithelial defect. Fluorescein can diagnose the traumatic causes of endophthalmitis [4]. The patient should be referred to an ophthalmologist as soon as possible [10].



**Figure 4: Endophthalmitis**

**Viral keratitis** is the corneal inflammation caused by varicella-zoster virus (VZV), herpes simplex, or adenovirus; risk Factors for VZV keratitis typically have a characteristic vesicular rash in the V1 (ophthalmic) branch of the trigeminal nerve [29]. On history and physical examination, pain and photophobia are present. Also, a topical anesthetic may improve pain; however, phenylephrine shows minimal improvement [4]. Visual acuity is normal or decreased, and pupils are normal. The anterior chamber may have cell and flare uptake of fluorescein at the associated corneal epithelial defect. Fluorescein depicts branching pattern with terminal bulbs (HSV), branching with thin ends (VSV), or fine diffuse keratitis [4]. Management includes topical and/or oral antiviral medications. Topical steroids may be added in severe cases [30].

#### **CONCLUSION**

Looking through history taking and physical examinations, a physician now can know how to notice the difference between mild and serious conditions. In a patient with a normal lid examination, the most considerate physical and historical findings in distinguishing between are the absence or presence of photophobia and/or pain, and visual acuity, slit-lamp examination (including fluorescein), intraocular pressure, response to phenylephrine and topical anesthetics.

Henceforth, this will help form the diagnosis. The differential diagnosis bounds from usual, subconjunctival hemorrhage, to the quick sight-threatening diagnoses, acute angle-closure glaucoma (AACG), or endophthalmitis. The essential thing in the diagnosis of red-eye is to do full history taking and performing a comprehensive physical examination to decide and distinguish the emergency cases from benign cases.

#### **REFERENCES**

- [1] Kilduff C, Lois C. Red eyes and red-flags: improving ophthalmic assessment and referral in primary care. *BMJ Qual Improv Rep.* 2016;5(1):u211608.w4680.
- [2] Alattas OA, Hamdi AA, Mudarba FM, Alshehri AM, Al-Yahya MS, Almotairi SA, Saeed RA, Buamer MM, Alsuwailem MS, Alamri IA. Red Eye Diagnosis and Management in Primary Health Care. *Arch. Pharma. Pract.* 2019;10(3):1-5.
- [3] Frings A, Geerling G, Schargus M. Red Eye: A Guide for Non-specialists. *Dtsch Arztebl Int.* 2017;114(17):302-12.
- [4] Gilani CJ, Yang A, Yonkers M, Boysen-Osborn M. Differentiating Urgent and Emergent Causes of Acute Red Eye for the Emergency Physician. *West J Emerg Med.* 2017;18(3):509-17.

- [5] Yaghoobi G, Heydari B, Heydari SR, Poorabdolahi F, Sharifzadeh G. Chronic Open-Angle Glaucoma and Its Association with The Cup Shape in Referral Ophthalmology Centre. *Pharmacophore*. 2018;9(6):65-70.
- [6] Alnujaim NH, Osman EA. Review of Current Literature on Congenital Glaucoma: A Focus on Surgical Management. *Int. j. pharm. res. Allied sci*. 2018;7(1):93-102.
- [7] Yeu E, Hauswirth S. A Review of the Differential Diagnosis of Acute Infectious Conjunctivitis: Implications for Treatment and Management. *Clin Ophthalmol*. 2020;14:805-13.
- [8] Wright C, Tawfik MA, Waisbourd M, Katz LJ. Primary angle-closure glaucoma: an update. *Acta ophthalmologica*. 2016;94(3):217-25.
- [9] Bourcier T, Thomas F, Borderie V, Chaumeil C, Laroche L. Bacterial keratitis: predisposing factors, clinical and microbiological review of 300 cases. *The British journal of ophthalmology*. 2003;87(7):834-8.
- [10] Durand ML. Endophthalmitis. *Clinical microbiology and infection : the official publication of the European Society of Clinical Microbiology and Infectious Diseases*. 2013;19(3):227-34.
- [11] Harthan JS, Opitz DL, Fromstein SR, Morettin CE. Diagnosis and treatment of anterior uveitis: optometric management. *Clin Optom (Auckl)*. 2016;8:23-35.
- [12] Daniel Diaz J, Sobol EK, Gritz DC. Treatment and management of scleral disorders. *Survey of ophthalmology*. 2016;61(6):702-17.
- [13] Mimura T, Usui T, Yamagami S, Funatsu H, Noma H, Honda N, Amano S. Recent causes of subconjunctival hemorrhage. *Ophthalmologica Journal international d'ophthalmologie International journal of ophthalmology Zeitschrift fur Augenheilkunde*. 2010;224(3):133-7.
- [14] Gudmundsson OG, Ormerod LD, Kenyon KR, Glynn RJ, Baker AS, Haaf J, Lubars S, Abelson MB, Boruchoff SA, Foster CS. Factors influencing predilection and outcome in bacterial keratitis. *Cornea*. 1989;8(2):115-21.
- [15] Ramadan M, Mohammad B, Karim Hussein AN, Ahmed A. The effect of long term treatment with betablockers in increasing the incidence of bradycardia in patients undergoing posterior segment eye surgeries. *J. Adv. Pharm. Educ. Res*. 2019;9(3):13-6.
- [16] Spitzer SG, Luorno J, Noël LP. Isolated subconjunctival hemorrhages in nonaccidental trauma. *Journal of AAPOS : the official publication of the American Association for Pediatric Ophthalmology and Strabismus*. 2005;9(1):53-6.
- [17] Azari AA, Barney NP. Conjunctivitis: a systematic review of diagnosis and treatment. *Jama*. 2013;310(16):1721-9.
- [18] Salama A, Elsheikh A, Alweis R. Is this a worrisome red eye? Episcleritis in the primary care setting. *J Community Hosp Intern Med Perspect*. 2018;8(1):46-8.
- [19] Williams CP, Browning AC, Sleep TJ, Webber SK, McGill JI. A randomised, double-blind trial of topical ketorolac vs artificial tears for the treatment of episcleritis. *Eye (London, England)*. 2005;19(7):739-42.
- [20] Okhravi N, Odufuwa B, McCluskey P, Lightman S. Scleritis. *Survey of ophthalmology*. 2005;50(4):351-63.
- [21] Galor A, Thorne JE. Scleritis and peripheral ulcerative keratitis. *Rheumatic diseases clinics of North America*. 2007;33(4):835-54, vii.
- [22] Dunlop AL, Wells JR. Approach to Red Eye for Primary Care Practitioners. *Primary care*. 2015;42(3):267-84.
- [23] Gutteridge IF, Hall AJ. Acute anterior uveitis in primary care. *Clinical & experimental optometry*. 2007;90(2):70-82.
- [24] Petsas A, Chapman G, Stewart R. Acute angle closure glaucoma - A potential blind spot in critical care. *J Intensive Care Soc*. 2017;18(3):244-6.
- [25] Shields SR. Managing eye disease in primary care. Part 3. When to refer for ophthalmologic care. *Postgraduate medicine*. 2000;108(5):99-106.
- [26] Fraser S. Corneal abrasion. *Clin Ophthalmol*. 2010;4:387-90.
- [27] Thomas PA, Geraldine P. Infectious keratitis. *Current opinion in infectious diseases*. 2007;20(2):129-41.
- [28] Kernt M, Kampik A. Endophthalmitis: Pathogenesis, clinical presentation, management, and perspectives. *Clin Ophthalmol*. 2010;4:121-35.
- [29] Sy A, McLeod SD, Cohen EJ, Margolis TP, Mannis MJ, Lietman TM, Acharya NR. Practice patterns and opinions in the management of recurrent or chronic herpes zoster ophthalmicus. *Cornea*. 2012;31(7):786-90.
- [30] Adam RS, Vale N, Bona MD, Hasanee K, Farrokhhyar F. Triaging herpes zoster ophthalmicus patients in the emergency department: do all patients require referral? *Academic emergency medicine : official journal of the Society for Academic Emergency Medicine*. 2010;17(11):1183-8.