

Ophthalmology – Red Eye

SOAP Note

with Stephanie Baxter, MD

INTRODUCTION

A red eye is a common presentation to primary care physicians, in their offices, walk-in clinics, and the emergency department. **A red eye is defined as loss of the normal white coloration of the eye.** It may be caused by hemorrhage under the conjunctiva – the superficial covering of the eye or vascular engorgement of one of the following three layers: the conjunctiva, the episclera or the sclera.

BASIC SCIENCE PEARLS FROM A CLINICIAN

- It is very important to differentiate a benign from a serious red eye. While the vast majority of red eyes are related to an infection of the conjunctiva, a red eye may also signify a serious intraocular process, including angle closure glaucoma and iritis or a serious ocular surface problem, such as keratitis (inflammation, most often infectious, of the cornea).
 - A sign that is quite specific for a serious ocular problem – as opposed to a conjunctivitis – is a ciliary flush. A ciliary flush refers to engorgement of the peri-limbal vessels, or a red-violaceous hue at the corneal/scleral junction.
 - The ocular vessels that are visible to the naked eye are located in the conjunctiva and the episclera (layer between the sclera and conjunctiva).
 - These vessels when dilated, as in the case of a viral or bacterial conjunctivitis, do not typically affect the peri-limbal area as their terminals ends attenuate in this area.
 - However, intraocular processes, can cause vascular dilatation of the sclera and uvea – the vascular layer that is deep to the sclera, and which consists of the iris, ciliary body and choroid.
 - This deeper vascular engorgement can become visible at the level of the limbus, often taking on a violaceous hue.
 - If a ciliary flush is seen, careful examination of the cornea and anterior segment is necessary to rule out serious corneal or intraocular pathology.
- A condition that presents with a red eye that can quickly cause a painful, blind eye, if not diagnosed and treated in a timely fashion, is acute angle closure glaucoma.
 - The eye's "angle," or anterior chamber, is defined anteriorly by the underside of the cornea (corneal endothelium), its apex by the trabecular meshwork and its posterior line by the iris.
 - Aqueous humour, the fluid created by the ciliary body, moves as a current towards the base or root of the iris, flows through the pupil, into the anterior chamber and leaves the eye through the trabecular meshwork – which can be thought of as the eye's drainage system.
 - The pathogenesis of acute angle closure glaucoma is related to pupillary block.

- With pupillary block, the posterior tip of the iris comes in contact with the lens, causing the aqueous humour to become trapped in the posterior chamber (a pocket defined by the iris, lens zonules and lens).
- As the pressure rises in the posterior chamber, the iris bows forward eventually covering the trabecular meshwork. With this, the eye pressure rapidly becomes dangerously high and vision can quickly be lost (the high pressure in the front is transmitted to the back as the eye is a closed system and the optic nerve becomes damaged both mechanically and its perfusion compromised).
- To treat this problem a small hole must emergently be made at the base of the iris so that aqueous humour can escape from the posterior chamber, move into the anterior chamber and leave the eye (this hole is usually made with a laser in a procedure called a laser iridotomy).

SUBJECTIVE

When presented with a patient with a red eye, there are some key questions you must ask¹. These are the 'S' in SOAP. Here is my list of key questions that I ask patients presenting with a red eye, and why I ask them:

- **When did the red eye start and how has the redness progressed?** The rapidity of onset and its severity usually imply that something more worrisome is causing the red eye.
- **Is the red eye monocular or binocular?** A red eye that started in one eye and progressed to the other eye, usually suggests conjunctivitis and is usually (not always) less worrisome than monocular redness.
- **Is it just the eyeball that is red – or are the tissues surrounding the eye affected?** Lid swelling alone is usually not too worrisome, but when associated with bulging forward of the eyeball (proptosis) it usually means an intraorbital process^{1,2}.
- **Are itching, discharge, recent cold, flu or infectious contacts present?** These symptoms allow you to differentiate allergic, bacterial and viral conjunctivitis from one another – which account for the majority of cases of red eye^{3,4}.
- **Are either pain or significant photophobia (light sensitivity) present?** Significant pain and photophobia usually herald more worrisome conditions – most worrisome being iritis and angle closure glaucoma^{5,6}. If present, it requires more urgent referral
- **Is vision loss present?** Benign causes of a red eye usually have no associated vision loss¹. Patients may complain of some blurring, but vision loss is usually not significant. If visual loss is present think of corneal infections, iritis or angle closure glaucoma.
- **Are nausea, vomiting, or brow ache present?** These associated symptoms are usually associated with very high intraocular pressure due to either angle closure glaucoma or iritis. Urgent referral is critical to prevent optic nerve damage from high eye pressure⁶.
- **Is there a recent history of facial rash or oral cold sores?** If present think of herpes zoster or simplex^{7,8}.

- **Does the patient wear contact lenses?** The red eye in contact lens wearers should be considered to be related to contact lens use until proven otherwise. Bacterial corneal infection and overuse must be ruled out⁹.
- **Is there any past ocular history, surgeries, previous similar episodes, or recent trauma?** This is an extremely important question, as some causes of a red eye can recur or be associated with recent surgery (like post-op inflammation or endophthalmitis – a severe infection of the inside of the eye)¹⁰. In the setting of trauma, getting the full details surrounding the trauma – including involvement of a foreign body, and an understanding if enough pressure was applied to cause the eye to rupture – is important.
- **What are the patient's other medical conditions and medications?** Autoimmune conditions can be associated with ocular inflammation; patients with diabetes can develop neovascular glaucoma – a condition in which the eye pressure can rise dramatically because of new vessels growing in the eye's angle¹¹.

OBJECTIVE

On examination, an almost complete ocular examination is necessary to help one determine the benign or potential vision threatening nature of the condition causing the red eye. These are the 'O' in SOAP, and include:

- **Measuring visual acuity.** This should be measured formally with a vision chart whenever possible, using the patient's glasses. Visual acuity is an important gauge of the severity of the condition.
- **Check pupils.** Examine their size and reactivity to light. Any abnormality not previously documented should be of concern. Patients with angle closure glaucoma may have a mid-dilated and fixed pupil. Others with orbital causes may have a relative afferent pupillary defect, indicating involvement of the optic nerve. In the setting of trauma, a "peaked" pupil suggests an open or ruptured eye is present – if present place a shield over the eye (without making contact with the eye) and immediately refer.
- **Check extraocular motility.** Reduced motility on the affected side can be an indicator of an orbital process. Significant pain with motility can also herald a more serious problem.
- **Try to determine the eye pressure.** If you don't have a tonometer (and there has been no trauma), palpating the eye through the eyelid to determine how firm it is relative to the other eye can help determine if the eye pressure is very high, as is seen in angle closure glaucoma. Do not do this if you suspect an open eye in the setting of trauma.
- **Examine the external appearance of the eyes.** Are the lids red and swollen? Is the eye proptotic (bulging forward)? What is the severity of the redness? Determine laterality.
- Get a closer look at the **anterior structures** of the eye with a penlight or a slit lamp (provides magnification and a view of the anterior chamber). Determine the pattern of the redness – is it diffuse or is it worse around the outside of the cornea (perilimbal flush)? If a perilimbal flush is present this is a worrisome sign as it is commonly caused by angle closure glaucoma, corneal infection, and iritis. Is the cornea clear or is there any white opacification of its surface? Are there any layered white (hypopyon) or red (hyphema)

blood cells in the inferior anterior chamber? If you have a slit lamp, can any microscopic white or red blood cells be visualized floating in the aqueous in the anterior chamber?

- **Fluorescein staining** of the cornea. This will highlight any defects of the ocular surface including a corneal abrasion or a herpetic dendrite.

ASSESSMENT AND PLAN

There are a variety of causes for a red eye, some are benign and self-limiting while others can be quickly vision threatening needing emergent treatment. Here are some key things to remember about the assessment and plan (the 'AP' of SOAP) to help you sort out the underlying cause of the patient's red eye. It is helpful to think about these various causes using a broad anatomic classification listed below.

The most common and most worrisome are listed below; referral should be made nonurgently (N), urgently (U), or emergently (E) for each of these diagnoses:

- **Extraocular causes** – Eyelid malpositions (N), blepharitis (N), styes (N), eyelid skin cellulitis (preseptal cellulitis)(U), and orbital cellulitis (E)^{12,13}.
- **Conjunctival, episcleral, scleral causes** – Conjunctivitis (allergic, bacterial, viral) (No referral, unless not resolving/responding as expected), pinguecula (N), pterygium (N), episcleritis (N), scleritis (U)
- **Corneal causes** – Dry eye (N), corneal abrasion (U), infectious keratitis (bacterial, viral (HSV, VZV), fungal) (E)
- **Intraocular causes** – Iritis (U), angle closure glaucoma (E), hyphema (E), endophthalmitis (E)

The majority of vision threatening causes of the red eye will have rapid onset, significant associated symptoms, and abnormalities on examination other than just a red eye. Having a consistent approach with a good history and complete eye examination will allow you to make good clinical decisions when dealing with these patients.

References

1. Leibowitz H. The Red Eye. *New England Journal of Medicine*. 2000;343(5):345-351.
2. Schotthoefer E, Wallace D. Strabismus associated with thyroid eye disease. *Current Opinion in Ophthalmology*. 2007;18(5):361-365.
3. Weber C, Eichenbaum J. Acute red eye. *Postgraduate Medicine*. 1997;101(5):185-196.
4. Rietveld R. Predicting bacterial cause in infectious conjunctivitis: cohort study on informativeness of combinations of signs and symptoms. *BMJ*. 2004;329(7459):206-210.
5. Au YK. Recognition of iritis. *Journal of Family Practice*. 1996 Mar 1;42(3):314-5.
6. Ritch R. Argon laser treatment for medically unresponsive attacks of angle-closure glaucoma. *American Journal of Ophthalmology*. 1982 Aug 31;94(2):197-204.
7. Barron BA, Gee L, Hauck WW, Kurinij N, Dawson CR, Jones DB, Wilhelmus KR, Kaufman HE, Sugar J, Hyndiuk RA, Laibson PR. Herpetic Eye Disease Study: a controlled trial of Endophthalmitis Vitrectomy Study Group. Results of the Endophthalmitis Vitrectomy Study: a randomized trial of immediate vitrectomy and of intravenous antibiotics for the treatment of postoperative bacterial endophthalmitis. *Archives of Ophthalmology*. 1995 Dec 1;113(12):1479.
8. Karbassi M, Raizman MB, Schuman JS. Herpes zoster ophthalmicus. *Survey of Ophthalmology*. 1992 May 1;36(6):395-410.
9. Schein OD, Glynn RJ, Poggio EC, Seddon JM, Kenyon KR. The relative risk of ulcerative keratitis among users of daily-wear and extended-wear soft contact lenses. *New England Journal of Medicine*. 1989 Sep 21;321(12):773-8.
10. Ahmed Y, Schimel AM, Pathengay A, Colyer MH, Flynn HW. Endophthalmitis following open-globe injuries. *Eye*. 2012 Feb 1;26(2):212-7.
11. Gross JG, Glassman AR, Jampol LM, Inusah S, Aiello LP, Antoszyk AN, Baker CW, Berger BB, Bressler NM, Browning D, Elman MJ. Panretinal photocoagulation vs intravitreal ranibizumab for proliferative diabetic retinopathy: a randomized clinical trial. *JAMA*. 2015 Nov 24;314(20):2137-46.
12. Moloney JR, Badham NJ, McRae A. The acute orbit. Preseptal (periorbital) cellulitis, subperiosteal abscess and orbital cellulitis due to sinusitis. *The Journal of Laryngology and Otology. Supplement*. 1986 Dec;12:1-8.
13. Barrow DL, Spector RH, Braun IF, Landman JA, Tindall SC, Tindall GT. Classification and treatment of spontaneous carotid-cavernous sinus fistulas. *Journal of Neurosurgery*. 1985 Feb;62(2):248-56.