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APPROACH TO RED EYE

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Introduction:

Hello, and welcome to this PedsCases podcast episode on an Approach to Red Eye in Children. My name is Karanvir Gill, and I am a fourth-year medical student at the University of British Columbia. This podcast was developed in collaboration with second-year ophthalmology resident Dr. Kim Papp and pediatric ophthalmologist Dr. Jane Gardiner, both from the UBC Department of Ophthalmology and Visual Sciences.

Red eye is one of the most common pediatric eye complaints encountered in emergency departments, primary care clinics, and pediatric offices. While many causes are benign and self-limited, others represent true ophthalmologic emergencies that can threaten vision if not recognized quickly.

In today's episode, we will use symptom-based and anatomical approaches together to develop a practical framework for pediatric red eye.

Learning Objectives

By the end of this podcast, listeners should be able to:

1. Develop a systematic approach to pediatric red eye, guided by key details in the history and physical exam findings.
2. Differentiate common causes of pediatric red eye based on symptom pattern and anatomy.
3. List red flag features requiring urgent ophthalmology referral.
4. Discuss initial management principles for common pediatric red eye conditions.
5. Identify important pediatric infectious causes of red eye, including HSV keratitis and neonatal conjunctivitis.

Case

As always, let's start with a case.

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You are a third-year medical student working in the pediatric emergency department. Your next patient is Emma, a 9-year-old girl brought in by her mother for a painful red right eye.

Yesterday, Emma developed tearing and mild irritation in the eye. Overnight, the pain worsened significantly, and this morning she refused to open the eye due to light sensitivity. Her mother denies trauma but mentions Emma had a cold sore, near her mouth, last week.

On examination, visual acuity is 20/40 in the right eye and 20/20 in the left. The right eye is diffusely red and tearing excessively.

Your preceptor asks:

"What diagnoses are you worried about? And how do you systematically approach red eye in children?"

The rest of today's episode will help answer those questions.

A Symptom-Based Framework

A very useful way to organize pediatric red eye is by the dominant symptom.

Ask yourself:

- Is the eye painless?
- Is it mainly itchy or irritated?
- Or is it truly painful?

This framework helps rapidly narrow the differential.

Painless Red Eye

Let's start with painless causes.

A **subconjunctival hemorrhage** appears as a sharply demarcated bright red patch beneath the conjunctiva. Children are otherwise well and typically have no pain, no discharge, and normal vision. Subconjunctival hemorrhages can look quite scary, but they are usually benign. They can cover a large area and spread out to involve an even larger area, in the first day or two. Causes include minor trauma, coughing, vomiting, and Valsalva maneuvers. Management is reassurance, as most resolve spontaneously within one to three weeks. Be sure to ask about significant bruising, recurrent bleeding, or other features suggestive of an underlying bleeding disorder, particularly if there is no clear inciting event. Always consider non-accidental trauma if the history is suspicious in an infant or young toddler.^{1,2}

Another common pediatric presentation that may initially be mistaken for "red eye" is **nasolacrimal duct obstruction**, particularly in infants with chronic tearing.

Nasolacrimal duct obstruction is very common during the first year of life and typically presents with chronically watery eyes, sometimes accompanied by intermittent mucous discharge and mild periocular redness. Importantly, the globe itself is usually white rather than truly injected. Gentle pressure over the lacrimal sac, located at the inner corner of the eye adjacent to the nose, may produce reflux of tears or mucous through the puncta. Management includes lacrimal sac massage and observation, with treatment of episodes of secondary conjunctivitis if they occur. Most cases resolve spontaneously within the first year of life. Persistent obstruction beyond one year of age, or signs of dacryocystitis such as a painful, swollen lacrimal sac, warrant ophthalmology referral.³

Irritation and Itching Predominant Red Eye

Next, let's discuss patients whose main symptoms are irritation, itching, or mild discomfort rather than true pain. These are among the most common pediatric red eye presentations.

Viral conjunctivitis is extremely common in children, especially if they attend daycare or school. Patients typically present with watery discharge, diffuse conjunctival injection, which refers to the dilation of the conjunctival blood vessels giving the red eye appearance, gritty sensation, upper respiratory infection symptoms, and a history of contact with similarly affected individuals. The infection often starts in one eye before spreading bilaterally. Pre-auricular lymphadenopathy is a classic exam finding. Management is generally supportive, including artificial tears, cool compresses, and hand hygiene. Families should be reminded that viral conjunctivitis is extremely contagious.^{1,2,4}

Bacterial conjunctivitis classically presents with purulent discharge, eyelids stuck shut in the morning, mild irritation, and conjunctival injection. Many uncomplicated cases are self-limited, but topical antibiotics are commonly prescribed. Options include: Erythromycin ointment or Polysporin ophthalmic drops or ointment. In contact lens wearers, however, clinicians should have a high index of suspicion for microbial keratitis. These patients require careful corneal examination, including fluorescein staining, to exclude a corneal infection before being treated as simple conjunctivitis.^{1,2,4}

Allergic conjunctivitis presents with bilateral itchy eyes, watery discharge, seasonal symptoms, and associated eczema or allergic rhinitis. Itching is the hallmark symptom. On exam, you may see chemosis, which is swelling of the conjunctiva, bumps called papillae on the tarsus, which is the inside of the eyelids, or allergic shiners, which are dark rings around the eyes from venous congestion. Treatment includes avoidance of allergens, artificial tears, topical and oral antihistamines, and mast cell stabilizers.^{1,2,4}

For a more detailed discussion on differentiating and managing viral, bacterial, and allergic conjunctivitis in children, be sure to check out the dedicated PedsCases podcast episode on conjunctivitis.

Blepharitis is a common chronic inflammation of the eyelid margins that can cause irritated, mildly red eyes. Children may present with crusting around the eyelashes, burning or foreign body sensation, excessive tearing, and a history of recurrent styes or chalazia. Symptoms are often worse on waking. On examination, you may notice redness of the eyelid margins with dandruff-like scales or debris at the base of the eyelashes. Management focuses on warm compresses, gentle eyelid hygiene using diluted baby shampoo or commercial lid wipes, and artificial tears for symptomatic relief. Persistent or severe cases may require topical antibiotics, systemic antibiotics, and ophthalmology referral.⁵

Painful Red Eye

Now let's move to truly painful red eye. Pain generally suggests corneal, intraocular, orbital, or traumatic pathology. These diagnoses are more likely to threaten vision.

Corneal abrasions are a scrape of the top layers of the cornea, just like you can get a scrape of your skin. Children typically present with a history of trauma, pain, tearing, photophobia, redness, and foreign body sensation. On examination, the cornea usually remains clear and transparent under normal white light. However, fluorescein staining under blue light demonstrates a bright green epithelial defect on the corneal surface. This is an important distinction from a corneal ulcer or infectious keratitis, where a white corneal opacity or infiltrate may be visible even under normal lighting. It is important to carefully examine for any retained foreign body, including underneath the eyelids, as foreign material trapped beneath the lid can repeatedly scrape the cornea with blinking. Superficial foreign bodies, which are easily removed with topical anesthetic and cotton bud, may be managed in the emergency department or clinic, whereas deeply embedded or adherent foreign bodies require ophthalmology referral. Management of corneal abrasions includes frequent bland antibiotic ointment such as erythromycin, pain control and close follow-up to be sure the abrasion heals without becoming infected. Fortunately, most uncomplicated corneal abrasions heal rapidly over a few days, much like a scrape on your skin. Persistent symptoms, reduced vision, or large abrasions require referral for ophthalmology follow-up.^{1,2}

Another serious cause of painful red eye is a **corneal ulcer**, which is an emergency. Patients typically present with severe eye pain, diffuse conjunctival redness, photophobia, tearing, reduced vision, and sometimes purulent discharge. On examination, you may see a white or gray spot on the normally clear cornea, even under regular room lighting without any special stains. This is an important finding that should never be dismissed. In more severe cases, there may also be hypopyon, which is a layer of white blood cells sitting at the bottom of the anterior chamber. The classic risk factor is contact lens use, although corneal ulcers can also occur following trauma or in immunocompromised patients. Because corneal ulcers may rapidly progress to corneal scarring and permanent vision loss, urgent ophthalmology consultation is required for corneal scraping, culture, and intensive topical antibiotic treatment.^{1,2}

Herpes simplex virus, most commonly HSV-1, which is the virus responsible for cold sores, is an important vision-threatening cause of pediatric red eye, which clinicians must not miss. Patients typically present with unilateral painful red eye, photophobia and reduced vision. There may be a history of cold sores, vesicular lesions around the eye, and prior HSV infection. When you use the orange fluorescein dye and look with a blue light, HSV may show a classic branching pattern on the cornea called dendrites. Management includes urgent ophthalmology referral and topical or oral antivirals such as acyclovir. Importantly: DO NOT start topical steroids unless directed by ophthalmology, as steroids may worsen HSV keratitis. Returning to our case, Emma's painful unilateral red eye with photophobia and recent cold sore history should strongly raise suspicion for HSV keratitis.⁶

Anterior uveitis often occurs in children with juvenile idiopathic arthritis (JIA). It presents with photophobia, eye pain, blurred vision, and ciliary flush, which is redness which seems to be coming out of the edges of the cornea like sun rays. When looking closely with the slit lamp, you may see cells and flare. Cells appear as tiny white dots floating in the anterior chamber, which are white blood cells. Children with JIA, require regular screening to look for uveitis. Surprisingly, it is usually asymptomatic, but it can be vision threatening and requires aggressive treatment. Any untreated uveitis can lead to complications such as glaucoma, cataracts, and permanent vision loss.⁷

Acute glaucoma is rare in children but is an important vision-threatening diagnosis not to miss. Congenital glaucoma typically presents during infancy with excessive tearing, photophobia, corneal clouding, and enlarged eyes due to chronically elevated intraocular pressure. Parents may notice that their infant keeps their affected eye or eyes, as it can be unilateral, tightly shut or seems unusually sensitive to light. Older children present more similarly to adults with severe eye pain, headache, nausea, vomiting, blurred vision, and halos around lights. On examination, the eye may appear diffusely red with a cloudy cornea and a fixed mid-dilated pupil. The intraocular pressure will be high, if you have the ability to check it. Be sure to obtain a medication history, as certain medications, including seizure medication topiramate, can precipitate acute angle-closure glaucoma. Acute glaucoma requires immediate ophthalmology referral to prevent permanent optic nerve damage and irreversible vision loss.⁸

Trauma and chemical injury should always be taken seriously in pediatric red eye. Signs concerning for globe rupture include irregular pupil, hyphema, which is a layer of red blood cells sitting in the anterior chamber, vision loss, or even seeing pigment from the inside of the eye that has been squeezed through a globe rupture to the outside. Avoid applying pressure to the eye and urgently consult ophthalmology. Chemical injuries are true ocular emergencies. Before doing anything, immediately flush the eye for a long time, even 15-30 minutes. Do NOT delay irrigation while waiting for assessment. While you're flushing the eye, call ophthalmology. After irrigation check ocular pH and continue irrigation until neutral.⁹

Children can also get cellulitis around the eye, which can be preseptal, meaning in the front with the orbital septum, or orbital, meaning behind orbital septum, which is more dangerous.

Preseptal cellulitis is inflammation of the eyelids, where the eyelids become hot, red, painful, and swollen. It is critical to differentiate preseptal cellulitis from orbital cellulitis. In preseptal cellulitis vision is normal, extraocular movements are normal, and there is no proptosis or bulging of the eyeball. It commonly arises from local skin trauma or insect bites. We usually treat preseptal cellulitis with oral antibiotics as an outpatient. More severe cases or in very young patients, hospitalization and IV antibiotics are needed.¹⁰

Orbital cellulitis, in contrast, is a much more dangerous infection behind the orbital septum, involving the eye socket or orbit and is a true ophthalmologic emergency. There are red flags including fever, painful or limited eye movements, proptosis, reduced vision, and double vision. The eye itself may appear chemotic and injected. Orbital cellulitis most commonly results from extension of bacterial sinusitis, particularly from the ethmoid sinuses. We take orbital cellulitis seriously, because the infection from the orbit can spread to the brain. If you suspect orbital cellulitis, or if you can't tell if it is preseptal versus orbital, consult ophthalmology and consider imaging with a CT scan.¹⁰

Neonatal Conjunctivitis

Before concluding, let's briefly discuss neonatal conjunctivitis. Any conjunctivitis occurring in an infant less than 30 days old deserves special consideration. Neonatal conjunctivitis is receiving renewed attention due to rising rates of sexually transmitted infections and decreasing use of neonatal ocular prophylaxis in some jurisdictions.¹¹

Chemical conjunctivitis is the most common cause of neonatal conjunctivitis. It happens in the first 24h of life and is from exposure to prophylactic eye medications given after delivery. The child may have a red eye, but they are overall well, and this should self-resolve.¹¹

Gonococcal conjunctivitis, caused by *Neisseria gonorrhoeae*, is one of the most serious causes of neonatal conjunctivitis and should be considered an ophthalmologic emergency. It classically presents within the first 3 to 5 days of life with hyperacute onset of copious thick purulent discharge, marked eyelid swelling, conjunctival injection, and chemosis. The discharge is often so profuse that it rapidly reaccumulates after wiping the eye. Because *N. gonorrhoeae* can invade the intact corneal epithelium, these infants are at high risk for rapidly progressive corneal ulceration, perforation, and permanent vision loss. Management requires immediate ophthalmology involvement, conjunctival cultures, systemic antibiotics such as IV or IM ceftriaxone, and evaluation for disseminated gonococcal infection.¹¹

Chlamydial conjunctivitis, caused by *Chlamydia trachomatis*, is another important cause of ophthalmia neonatorum and typically presents between 5 and 14 days of life.

Infants usually develop mucopurulent discharge, eyelid swelling, conjunctival injection, and excessive tearing. Symptoms may initially begin in one eye before becoming bilateral. Unlike gonococcal disease, the presentation is often more subacute. Clinicians should also remember that neonatal chlamydial infection may be associated with chlamydial pneumonia, so it is important to ask about cough, tachypnea, or respiratory symptoms. Diagnosis is confirmed with conjunctival testing, and treatment requires systemic antibiotics, typically oral macrolides, because topical therapy alone is insufficient for the systemic involvement.¹¹

Neonatal herpes simplex virus infection is an important but less common cause of neonatal conjunctivitis which can have devastating consequences if missed. Signs and symptoms are noted around 14 days of life. Infants may present with vesicular skin lesions around the eyes or mouth, keratitis, conjunctival injection, excessive tearing, or corneal ulceration. Some infants may also appear systemically unwell with lethargy, fever, seizures, or signs of disseminated infection involving the central nervous system or liver. Ocular HSV infection may produce characteristic dendritic lesions on fluorescein staining similar to older children and adults. Neonatal HSV requires urgent ophthalmology and pediatric involvement, systemic IV antiviral therapy, and careful evaluation for disseminated disease.¹¹

Return to Case

Returning to Emma's case, her unilateral painful red eye, photophobia, decreased vision, and recent HSV exposure strongly suggest HSV keratitis.

You explain to your preceptor that this is NOT simple conjunctivitis and warrants urgent ophthalmology involvement.

Fluorescein staining later demonstrates a classic dendritic lesion, confirming the diagnosis.

Emma is urgently referred to ophthalmology and started on antiviral therapy. With prompt treatment, her symptoms gradually improve over the following weeks and she recovers without permanent vision loss.

Because this virus can stay dormant in the body, there is a chance it could return in the future. You explain to her family that they will need to be vigilant; if she ever develops a similar red, painful eye, they should see an eye specialist immediately to protect her vision.

Summary and Take-Home Messages

1. Pediatric red eye should first be categorized by the presence or absence of pain and red flag symptoms.
2. Simple conjunctivitis should not cause severe pain, photophobia, or vision loss.

3. Viral, bacterial, and allergic conjunctivitis are the most common pediatric causes of red eye.
4. HSV keratitis is a potentially vision-threatening cause of unilateral painful photophobic red eye.
5. Corneal pathology, uveitis, orbital cellulitis, trauma and chemical injury, and glaucoma require urgent ophthalmology assessment.
6. Contact lens use should always raise concern for an infectious corneal ulcer and requires ophthalmology referral.
7. Neonatal conjunctivitis requires special consideration due to congenital gonococcal, chlamydial, and HSV infections.

Conclusion

Thank you for listening to this PedsCases podcast episode on an Approach to Red Eye in Children. We hope this episode has helped you develop a more systematic and practical framework for approaching pediatric red eye presentations.

Thank you to resident doctor, Kim Papp, and Dr. Jane Gardiner for their expert review of this content.

Take care!

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