Acute red eye in children

A practical approach

Siyuan Jabelle Lu, Graham A Lee, Glen A Gole

Background
Acute red eye in a child is a common ocular presentation in general practice. It can arise from a wide spectrum of pathologies and involve various ocular structures.

Objective
The aim of this article is to provide a framework for the general practitioner to assess and manage a child presenting with a red eye, with a focus on cases that require immediate referral.

Discussion
Most paediatric red eyes are benign and can be safely managed in general practice. However, this requires thorough history-taking and examination together with the ruling out of red flags. Assessment of a child with a red eye may pose specific challenges that can usually be overcome by focused history-taking and opportunistic examination. Urgent referral for examination under sedation or anaesthesia is indicated when there is suspicion of a vision-threatening cause and/or assessment in the clinic is unsuccessful.

ACUTE RED EYE in a child is a common presentation in general practice.[1] It can arise from inflammatory, infective or traumatic processes involving the globe itself or the structures around it.[1] The differential diagnosis list is therefore extensive; however, with careful history-taking and clinical examination techniques, a diagnosis can usually be made. This article outlines the diagnosis and management of acute red eye conditions, highlighting those that require immediate referral to ophthalmic care (Table 1).

History

In children with shorter attention spans, it is best to obtain a brief history first, then examine the patient and obtain a more detailed history later. The history-taking should begin with determining the duration of redness and involvement of one or both eyes, inquiring about any possible causes and seeking information regarding associated symptoms and signs such as blurring, photophobia, loss of vision, discharge and ocular pain, discomfort or itch.[2] For a young child (aged ≤6 years), the history is often taken from the accompanying family member, who may not necessarily know the full story. Further history may need to be obtained from other family members or witnesses.

It is important to elicit a history of recent trauma. This could be a physical impact, a foreign body or chemical exposure. Taking an accurate history of trauma can pose a challenge, such as in the case of a pre-verbal child or a teenager who might be reluctant to communicate, especially in the presence of a parent.[2] In such cases, where trauma is suspected but the mechanism of injury cannot be clearly determined, talking to the child alone in a friendly and non-accusatory manner may be beneficial. If the history is inconsistent with the signs, consider non-accidental injury. If this becomes more obvious during the consultation, a report will need to made to the relevant state child protection agency.

Previous ocular history is particularly important, as 'acute-onset vision loss' may arise from amblyopia or more chronic eye issues. The medical history should include recent illness, systemic abnormalities, medications, allergies and prenatal and birth history. A family history of eye and any relevant medical conditions can also be helpful.

Examination

The examination begins as soon as the general practitioner (GP) calls the child into the room. Are they rubbing their eyes while remaining active and engaging with others, or do they appear miserable with photophobia? Depending on the age, temperament and discomfort of the child, an eye examination may present an enormous challenge. Putting the child at ease and gaining their trust is critical. It is important to ensure the child is at the same eye level, use age-appropriate vocabulary (with toys

if appropriate) and give plenty of praise and opportunities for them to vocalise.[3]

An opportunistic approach is recommended, first carrying out the most relevant examination pertaining to the patient's history and chief complaint, with later systemic examination as required.[3] On occasion, if the child is very young and/or unable to hold still, a photograph of the affected eye or eyes is very useful to instantly capture any pathology for detailed examination. For infants, the ideal time for an examination of the eye is during sleep. If it is impossible to perform the examination in the clinic, GPs should consider referral to hospital for examination under sedation or anaesthesia.

Examination steps

1. Assessment of vision should always be attempted. For infants and toddlers, this involves testing their ability to fix and follow. For children over the age of three years, the use of an eye chart is recommended, and the exact chart (eg Lea, HOTV symbol matching, Snellen) depends on their level of literacy. Test each eye independently, with the opposite eye properly occluded as children often peek. Children develop 6/7.5 vision around the age of six years.[4] (A two-line difference in visual acuity between the eyes in a child always requires further investigation.)
2. The patient's lids and ocular surface need to be examined with magnification (eg head loupes) and good illumination from a direct ophthalmoscope, pen torch and/or a slit lamp if available. Look for signs of swelling, redness, discharge, trauma or lid malposition such as entropion.
3. Inspect the conjunctiva for swelling and/or intense injection, particularly if diffuse rather than sectorial.
4. In the cornea, inspect for any foreign bodies, haze, infiltrates or ulceration. An epithelial defect is better visualised after the instillation of fluorescein dye and the use of a cobalt blue light. It is important to note the size and location of any corneal ulcers. Any epithelial defect with an infiltrate is suspicious of microbial keratitis.
5. Check for protrusion and/or peaking of the iris that indicates perforation of the cornea, requiring urgent emergency referral.[5]
6. The fornix under the upper lid can be further examined by lid eversion, specifically looking for foreign bodies. The ability to evert the lid is dependent on the cooperation of the child and is not possible if the eyelid is very swollen.
7. The anterior chamber of the eye can be inspected for a hypopyon (pus in the anterior chamber). This may be sterile because of an inflammatory reaction or may indicate intraocular spread of severe microbial keratitis into the eye causing endophthalmitis.
8. Irregularity of the pupils may indicate posterior synechiae (adhesion of the iris to the anterior capsule of the lens) due to anterior uveitis.
9. The intraocular pressure may be elevated. However, measurement of intraocular pressure requires the use of a tonometer.[6]
10. The red reflex can be simultaneously compared between the eyes with the child looking into the light of a direct ophthalmoscope (Brückner test).[7] Asymmetry of the reflexes can indicate media opacities, retinal abnormalities, significant refractive errors and deviations of the eye.

Box 1 outlines features in the history and examination that indicate a potentially more serious disease and lower the threshold for referral to ophthalmic care.

Summary

Assessment of acute red eye in children is challenging and heavily dependent on the cooperation of the patient. The history tends to indicate the diagnosis, so eliciting key symptoms is important for successful management. Examination may not be possible; hence sedation and examination under anaesthesia are important considerations. If the child is distressed and uncooperative because of a painful eye, instillation of a drop of local anaesthetic into the eye may make examination possible. Urgent referral to ophthalmology of potentially eye-threatening conditions may save a child's vision.

Box 1. 'Red flags' for referral to ophthalmic care

- High-velocity injury
- Contact lens use
- Reduced vision
- Photophobia
- Significant pain
- Loss of red reflex
- Lid swelling
- Corneal defect/haze
- Abnormal pupil reaction
- Failure to resolve

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Table 1. Differential diagnosis list of acute red eye in children, with key features and management. Rows with red shading denote sight-threatening conditions that require urgent referral to ophthalmology for confirmation of diagnosis and management.

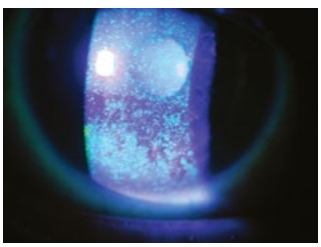
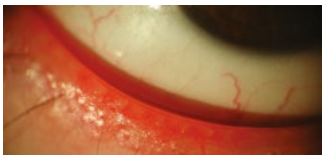
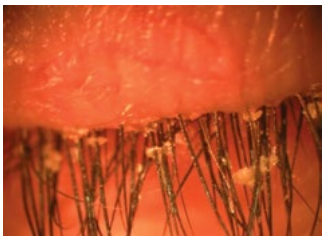
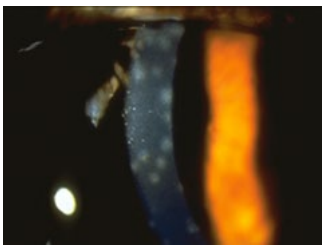
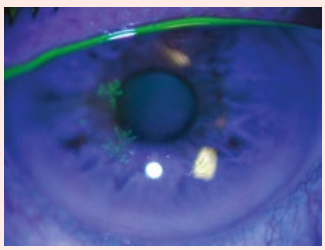
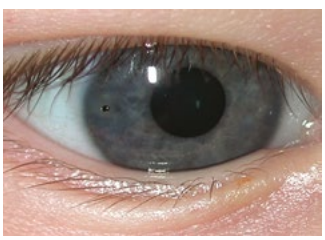
Key symptom	Discharge	Key features	Diagnosis	Management	
Painless	Nil	Blood under bulbar conjunctiva; spontaneous or traumatic	Subconjunctival haemorrhage	Observation – should clear in 1–3 weeks; if recurrent, investigate cause (eg bleeding disorder). Consider non-accidental injury.	
	Watery	First year of life; elevated area over lacrimal sac	Nasolacrimal duct obstruction	Instruct the parent to perform lacrimal sac massage twice a week by pressing his or her index finger on the child's inner corner of eye in an inward and downward fashion. The majority of cases resolve within first year of life. Refer to ophthalmology for probe and syringing if persistent or there are signs of inflammation/infection.	
Irritation	Nil	Gritty sensation; mild redness; mild vision reduction	Dry eye	Regular lubricants including drops and ointment at night depending on the severity. If dosing of drops is frequent (more than six times per day), preservative-free artificial tears should be used. Check for the presence of contributing disorders such as blepharitis and treat accordingly.	
	Nil	Sectoral congestion of episcleral vessels; unilateral; mild ocular tenderness	Episcleritis	Observation. Lubricants if there is irritation. If it persists for more than one week, use a mild topical steroid four times per day or oral nonsteroidal anti-inflammatory drugs.	
	Nil	Eyelid nodule; mild discomfort; single or multiple in upper or lower lids	Chalazion	Conservative management with warm compresses and gentle massage for five minutes, twice a day. Refer to ophthalmology for incision and curettage, if not resolving after three months or showing signs of cellulitis.	

Table 1. Differential diagnosis list of acute red eye in children, with key features and management (cont'd). Rows with red shading denote sight-threatening conditions that require urgent referral to ophthalmology for confirmation of diagnosis and management.

Key symptom	Discharge	Key features	Diagnosis	Management	
Irritation (cont'd)	Watery	Inflammation of lid margins; crusting on lashes; conjunctival inflammation; blepharo-conjunctivitis	Blepharitis	Conservative management with warm compresses, gentle massage and careful eyelid cleaning with proprietary eyelid wipes.	 
	Watery	Bilateral conjunctival inflammation ± chemosis ± eyelid swelling; periauricular lymphadenopathy; small corneal sterile infiltrates	Viral conjunctivitis	Self-resolving over 1–3 weeks. Saline washes, lubricants and cool compresses as necessary. Advise patient and/or parents of infection control measures (eg washing hands before and after touching eyes, avoiding sharing towels). Contagious until eye stops tearing.	
	Watery	Reduced vision; photophobia; dendritic pattern on cornea with fluorescein stain	Herpes simplex keratitis	Acyclovir ointment five times per day for 7–10 days; infection control measures. Refer to ophthalmology for further investigation if worsening.	
	Watery	History of inciting event; foreign body sensation; ± visible foreign body (<1 mm) on cornea/conjunctiva	Corneal/ conjunctival foreign body (small)	Patient needs to be able to hold eye still. May require a general anaesthetic for younger patients. Instil topical anaesthetic such as oxybuprocaine 0.4% into the eye; foreign body may be removed with an anaesthetic-soaked cotton bud, short 25G hypodermic needle or a 15 blade; if rust ring, remove if safely possible; apply antibiotic ointment such as chloramphenicol 0.5% to the eye and then double pad. Follow-up next day.	 

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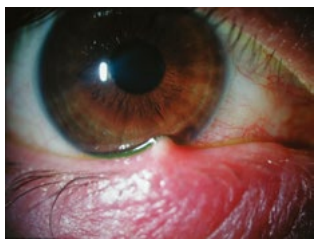
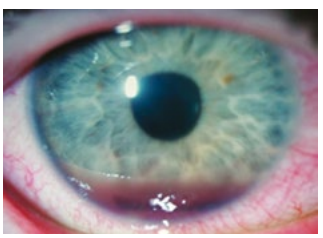
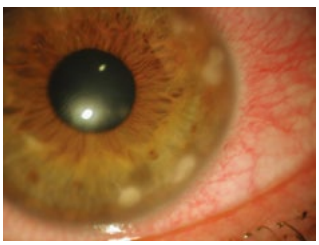
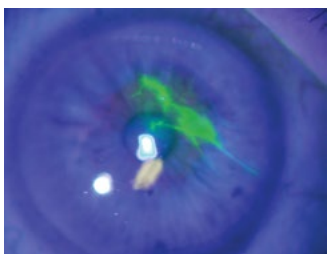
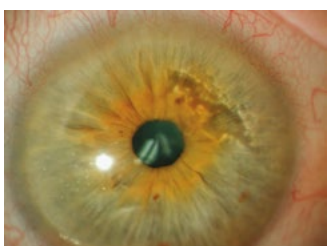
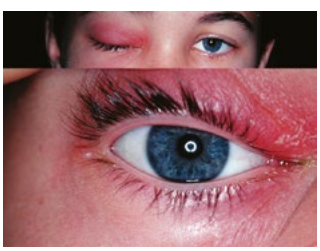
Key symptom	Discharge	Key features	Diagnosis	Management	
Irritation (cont'd)	Purulent	Conjunctival inflammation; sticky discharge on eyelids; cornea clear with no infiltrates	Bacterial conjunctivitis	Topical broad-spectrum antibiotic such as chloramphenicol 0.5% eye drops 4–6 times per day for 5–7 days; infection control measures.	
	Purulent	Localised tender swelling on eyelid	Stye	Topical broad-spectrum antibiotic such as chloramphenicol 0.5% eye drops four times per day for seven days. Epilate infected follicle if possible. Conservative management with warm compresses, gentle massage and careful eyelid cleaning with proprietary eyelid wipes. Refer to ophthalmology if signs of cellulitis.	
Itching	Watery	Seasonal pattern; history of atopy; papillary inflammation of tarsal conjunctiva	Allergic conjunctivitis	Topical antihistamine/mast cell stabiliser such as ketotifen 0.1% twice per day; cooled topical lubricants. Avoid rubbing eyes and identify and limit allergen exposure.	
Pain	Nil	Conjunctival inflammation; ± subconjunctival haemorrhage; ± epithelial defect; ± hyphaema; ± eyelid bruising	Blunt trauma	Management depends on the severity of the injury. Refer to ophthalmology if reduced vision, loss of red reflex, pupil irregularity, hyphaema or reduced extraocular movement.	
	Nil	Photophobia; ± reduced vision; conjunctival and ciliary inflammation; white cells in anterior chamber ± hypopyon; irregular pupil from posterior synechiae; history of autoimmune disease	Uveitis	Urgent referral to ophthalmology to confirm diagnosis, exclude endophthalmitis and check intraocular pressure. If sterile inflammatory cause, intensive topical steroids and pupil dilation to break posterior synechiae ± management of systemic disease in conjunction with rheumatologist.	

Table 1. Differential diagnosis list of acute red eye in children, with key features and management (cont'd). Rows with red shading denote sight-threatening conditions that require urgent referral to ophthalmology for confirmation of diagnosis and management.

Key symptom	Discharge	Key features	Diagnosis	Management	
Pain (cont'd)	Watery	Localised conjunctival inflammation; superficial corneal infiltrate/s with minimal staining	Marginal keratitis	Topical steroids such as fluorometholone 0.1% four times per day for 5–7 days. Conservative management of blepharoconjunctivitis with warm compresses, gentle massage and careful eyelid cleaning with proprietary eyelid wipes. Refer to ophthalmology if suspected infection or contact lens use.	
	Watery	History of inciting event; foreign body sensation; visible foreign body (>1 mm) on cornea/conjunctiva	Corneal/ conjunctival foreign body (large)	Removal technique as for smaller foreign body. Refer to ophthalmology if child is uncooperative, uncertainty with removal, signs of aqueous leak on fluorescein staining or red flags.	
	Watery	History of inciting event; epithelial defect with fluorescein stain	Corneal abrasion	For larger defects (>2 mm), topical antibiotic ointment and double eye-pad overnight. For smaller defects (<2 mm), topical antibiotic drops such as chloramphenicol 0.5% four times per day for 5–7 days. Need to exclude foreign body. Refer to ophthalmology if suspected infection or red flags.	 
	Watery	Red, swollen, tender eyelid; white eye; no proptosis; full eye movement with no pain; mild fever; irritability	Preseptal (periorbital) cellulitis	Oral antibiotics such as flucloxacillin for 10 days. Review within 48 hours. Refer to emergency department if not settling or worsening as may require intravenous (IV) antibiotics.	

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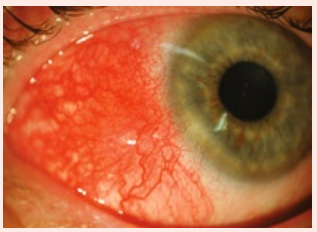
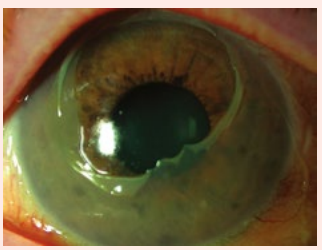
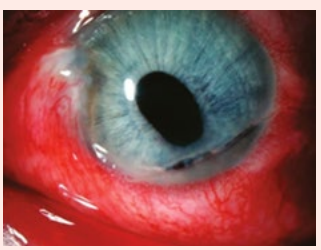
Key symptom	Discharge	Key features	Diagnosis	Management	
Pain (cont'd)	Watery	Severe pain; vision loss; intense inflammation of sclera, episclera and conjunctiva; ± bluish scleral hue if thinning; ± history of autoimmune disease	Scleritis	Urgent referral to ophthalmology for confirmation of diagnosis, ocular and systemic workup, systemic immunosuppression or antibiotics depending on the aetiology.	
	Watery	Severe pain; vison loss; nausea and vomiting; headache; cloudy cornea; fixed pupil; high eye pressure	Acute glaucoma	Urgent referral to ophthalmology for confirmation of diagnosis, medical ± laser treatment.	
	Watery	History of inciting event such as chemical/ heat exposure; conjunctival inflammation or pallor in more severe burns; ± corneal epithelial defect; ± corneal opacity	Chemical/ thermal injury	Chemical injury: Immediate irrigation of eye, fornices and eyelids with water, saline or Ringer's lactate solution for at least 30 minutes. Can place topical anaesthetic such as oxybuprocaine 0.4% and an eyelid speculum if available prior to irrigation. Remove any particulate matter; check pH in the inferior fornix 5–10 minutes after irrigation; continue irrigation until pH becomes neutral. Refer urgently to ophthalmology for further management, particularly if red flags are present.	
	Watery	History of inciting event with sharp object or strong blunt force; vision loss; loss of fluid from eye; ± irregular iris; ± hyphaema; ± externalisation of ocular contents	Penetrating eye injury	Protect eye with shield and avoid patching or any pressure on the eye. Administer tetanus toxoid if indicated. Administer analgesia and anti-emetic to prevent Valsalva manoevre and possible expulsion of intraocular contents. Keep nil by mouth but may need IV fluids. IV antibiotics such as cephazolin and gentamicin should be given within six hours of injury. Refer urgently to ophthalmology for further assessment and surgical management.	

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Key symptom	Discharge	Key features	Diagnosis	Management	
Pain (cont'd)	Purulent	Severe pain; vision loss; intense inflammation of conjunctiva; corneal infiltrate with overlying epithelial defect; ± contact lens use	Microbial keratitis	Urgent referral to ophthalmology for confirmation of diagnosis, corneal scraping for microscopy/culture and sensitivity, and intensive antibiotic treatment with close follow-up. Do not commence antibiotics before the corneal scraping. Keep contact lens if possible, for culture.	
	Purulent	History of intraocular surgery or penetrating trauma; severe pain; vision loss; intense inflammation of conjunctiva; hypopyon	Endophthalmitis	Urgent referral to ophthalmology for confirmation of diagnosis. Most common aetiology is acute postoperative endophthalmitis, requiring vitrectomy and intraocular/topical ± systemic antibiotics.	
	Purulent	Diffusely red and swollen eyelid; diffusely red eye, reduced vision; painful eye movements; proptosis; fever; headache	Orbital cellulitis	Urgent referral to emergency department for confirmation of diagnosis and initiation of broad-spectrum IV antibiotics. Computed tomography scan of orbits and sinuses with contrast to confirm diagnosis, identify extent of infection and exclude other causes (eg retained foreign body, cavernous sinus thrombosis). Managed in conjunction with ophthalmology, otorhinolaryngology and infectious diseases ± neurosurgery.	
	Purulent	Inflammation and pain over lacrimal sac area; epiphora; fever	Dacryocystitis	Urgent referral to ophthalmology for confirmation of diagnosis, medical treatment with systemic antibiotics ± surgical drainage. Dacryocystorhinostomy may be required upon resolution of acute infection.