

INFECTIONS IN & AROUND THE EYE

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Examining the eyes

Always assess visual acuity in each eye separately

- > 6 weeks fixing & following or reaching for objects of interest.
- >12 months – see and pick up small objects such as hundred-and-thousands
- > 3 to 4 years – letter or shape matching is usually possible
- > 5-6 year olds - Snellen chart usually possible

(NB: 6/9 means the child can read line 9 at 6 metres)

Check pupil responses and for a red reflex, examine the conjunctiva, stain with fluorescein and examine with the BLUE light on the ophthalmoscope (not the green light), check for a foreign body including beneath the upper eyelid by everting the lid over a cotton bud.

Preseptal versus Orbital cellulitis

It is essential to distinguish between these conditions as they differ considerably in terms of severity of complications, urgency of investigations & management.

The orbital septum is a thin membrane that extends from the orbital periosteum & inserts into the tarsal plates of both eyelids. It acts as a physical barrier to infection.

Preseptal (periorbital) Cellulitis

- Infection of the superficial eyelid & periorbital structures anterior to the orbital septum.
- Usually caused by local spread of bacterial infection from the adjacent upper respiratory tract (especially paranasal sinuses) or extra-ocular structures or from local trauma including insect bites.
- It is more common in younger children – average age 2 years.
- The causative pathogens are *Staph aureus*, *Strep pyogenes* & *Strep pneumoniae*. In partially immunised or unimmunised children consider *H. influenzae* type B



Clinical features of preseptal cellulitis:

Redness & swelling of the eyelid and adjacent soft tissues including onto the forehead – the eyelid may be swollen closed.

Associated with pain & tenderness (itchiness and absence of pain suggests local reaction to an insect bite)

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95% cases are unilateral (bilateral involvement may suggest other aetiology: viral, allergic or generalised oedema)

Conjunctivitis with a thin or purulent discharge may be present

Systemic upset is unusual

Pupils are equal & reactive

Full range of pain free eye movement

No proptosis

Normal visual acuity

If in doubt or unable to examine the eye adequately – consult with ED senior and ophthalmology. A CT scan may be required.

Investigations:

FBC & Blood cultures are indicated in the systemically unwell child.

A swab for bacterial culture should be taken if there is pus or an open wound.

Imaging is not required unless the diagnosis is in doubt – see above.

Management:

Most children require admission under general paediatrics for IV antibiotics for 24-48 hours. The antibiotics of choice are

1. Cefuroxime 30 mg/kg/dose Q8hrly
2. Amoxicillin & clavulanic acid 30mg/kg/dose (amoxicillin component) Q8hrly
3. If penicillin &/or cephalosporin allergy use:
Clindamycin 10mg /kg/dose (max 600mg/dose) Q6hrly - requires discussion with Infectious Diseases team

Failure to respond in 24-48 hours may indicate orbital cellulitis or underlying sinus disease. Treat as for orbital cellulitis. When improving change to oral antibiotics to complete a total of 7 days of antibiotics. The oral antibiotic choices are

1. Cephalexin 20mg/kg/dose bd (max 500mg / dose)
2. Amoxicillin & clavulanic acid 25mg/kg/dose tds (max 500mg / dose)
3. If penicillin &/or cephalosporin allergy use
Erythromycin 10 mg/kg/dose qds or 20mg/kg/dose bd (max 500mg / dose) or
Roxithromycin 4mg/kg/dose bd (max 150mg /dose) if able to swallow tablets

Mild, early preseptal cellulitis may be considered for outpatient treatment with oral antibiotics (as above) with review the following day by the GP - providing the diagnosis is not in doubt and there is no concern about compliance.

Orbital cellulitis

Is a bacterial infection of the soft tissues of the orbit posterior to the orbital septum, which may involve the extra-ocular muscles, sensory & motor nerves as well as the optic nerve. Increased intraocular pressure may lead to blindness. Intracranial extension of infection may be life threatening.

It is usually due to preceding or concurrent infection of the paranasal sinuses, most commonly the ethmoid, then maxillary then frontal sinuses. It may also be due to spread from dental infections, penetrating eye trauma or haematogenous spread from bacteraemia.



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Orbital cellulitis is more common in older children – mean age 12 years.

Causative organisms include *Saureus*, *S pneumoniae*, *S pyogenes*, non-typable *H influenzae*, *M catarrhalis* and anaerobes. Infection may be polymicrobial.

Clinical Features of orbital cellulitis:

Tender, swollen, red eyelid

Almost always unilateral

Chemosis – the conjunctiva is red & swollen

Pain in and behind the eye

Decreased visual acuity

Papilloedema

Double vision

Systemic signs such as fever, tachycardia more common

Vomiting, severe headache & neck stiffness, photophobia may indicate spread to meninges or cavernous sinus thrombosis

The key features distinguishing it from preseptal cellulitis are one or more of the following:

Proptosis – bulging out of the eyeball

Limitation of spontaneous eye movement or painful eye movements

A dilated pupil or afferent pupil defect

Investigations:

FBC & blood cultures are required.

CT scan of the orbits, brain & sinuse.

This is the investigation of choice to confirm intra-orbital involvement, identify subperiosteal or retrobulbar abscesses and other complications and may show the underlying cause e.g. sinusitis.

The timing of the CT scan should be dictated by the severity of the clinical presentation and the speed of progression of the illness. If urgent surgical intervention is NOT being considered then CT scanning is less urgent. CT is the method of choice, with IV contrast if there is no contraindication. Therefore, parental consent is needed for IV contrast and the child has to have a good IV running before going to radiology. MRI is only a consideration if there is concern re intracranial pathology

Swab skin for MC&S if any pus present.

LP is needed if meningitis is suspected. Only perform after CT scan.

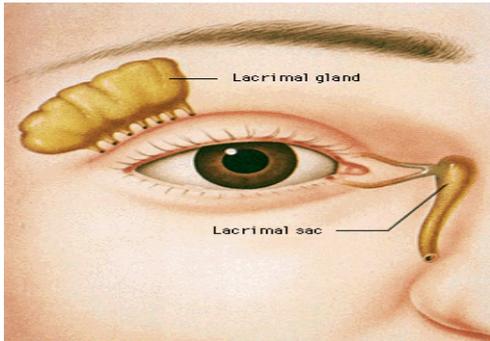
Management:

- Arrange urgent review by ophthalmology and ORL surgeons – urgent orbital decompression and or drainage of abscess may be required
- Most patients are admitted under General Paediatrics with daily ophthalmology review and further review by ORL as required .
- IV antibiotics: cefotaxime 50mg/kg Q6hrly (max 2g/dose) AND flucloxacillin 50mg/kg Q6hrly (max 2g/dose)
- Discuss with the infectious diseases team if
 - True penicillin allergy
 - Confirmed or suspected MRSA
 - Anaerobic infection suspected
 - Evidence of intracranial extension
- Closely monitor visual acuity, pupil reaction and eye movements and obtain urgent review if any deterioration.

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Dacryocystitis

This is infection of the lacrimal sac. Peak paediatric incidence is in infants, often due to incomplete canalisation of the tears ducts (lacrimal canaliculi) or due to obstruction of the terminal portion in the nose e.g. by adenoids, swelling due to sinusitis or allergic rhinitis. Infections are typically caused by *S aureus* or Streptococci.



Clinical Features of Dacryocystitis:

- Rapid onset pain, redness, swelling and tenderness overlying the lacrimal sac region, just medial to & below the eye - may extend to the nose & face
- May be purulent discharge from the puncta
- Distended lacrimal sac may be palpable as a mass medial to the medial canthus
- Maybe rupture of the lacrimal sac with formation of a fistula from which pus drains, usually resolves within a few days
- The eye invariably waters – the tear ducts are blocked
- Often associated with conjunctivitis and preseptal cellulitis
- Usually children are systemically well but untreated may progress to orbital cellulitis with its attendant complications (see above)

Investigations: usually none but if pus present swab for M,C&S

Management: Admit on IV flucloxacillin 25mg/kg/dose Q6hrly with review by ophthalmology – may require incision & drainage.

Stye / Hordeolum

This is an acute bacterial infection of the glands of Zeis (external hordeolum) or less commonly, the Meibomian glands (internal hordeolum) resulting in a small, well localised abscess. *S aureus* is the usual cause.

Clinical Features of a Stye or Hordeolum

- Rapid onset of a small, red, painful lump on or near the eyelid margin
- Pus may be visible
- Localised swelling or erythema
- May rupture and the contents drain spontaneously
- May be associated with conjunctivitis or blepharitis
- May progress to preseptal cellulitis
- May result in chalazion formation (see below)



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Investigations: none required

Management:

- Usually self-limiting, resolving within 1-2 weeks.
- Resolution can be enhanced by warm compresses (hot, wet facecloth twice daily) and lid massages - gently rubbing the eyelid vertically towards the lid margin (downward for the upper lid and upward for the lower lid) to try to express the material in the blocked gland. This should be done for a few minutes 4 times a day).
- If there is skin erythema, the lesion is draining or conjunctivitis or blepharitis is present - give topical antibiotics – chloramphenicol ointment 4 times a day to the skin surface rather than into the eye for 5 days.
- Give systemic antibiotics if there is progression to preseptal cellulitis (see above).
- Hordeola rarely require incision & drainage.

Neonatal Conjunctivitis

This is an acute bacterial infection due to *Neisseria gonorrhoea* or *Chlamydia trachomatis* acquired from the mother during delivery. The two infections may co-exist so if there is any doubt admission and treatment for both Gonorrhoea and Chlamydia is warranted.

Viral neonatal conjunctivitis is rare although perinatally acquired Herpes simplex virus may also occur in the first few weeks of life.

The mother and her partner will also need investigation & treatment via referral to sexual health. See also

<http://www.adhb.govt.nz/newborn/Guidelines/Infection/NeonatalConjunctivitis.htm>

Gonococcal conjunctivitis usually presents within the first 5 days of life and causes severe and rapidly progressive conjunctivitis. It is usually bilateral, with marked redness, swelling of the lids and conjunctiva associated with purulent discharge. Systemic involvement may be present e.g. meningitis, septicaemia, septic arthritis.

Untreated gonococcal conjunctivitis causes corneal ulceration and perforation, leading to blindness.

Investigations:

Swab for M,C&S (standard blue swab) – ask lab to process urgent gram stain for gonococcus. In working hours a special swab can be used to test for both *N.gonorrhoeae* & Chlamydia PCR (BD ProbeTec swabs) - use the small blue one (designed for male urethral swabs). If febrile perform full sepsis screen including CXR.

Management:

Admit all neonates under general paediatrics.

At least one dose of IM/IV ceftriaxone 50mg/kg is required, longer courses are used in severe or disseminated gonococcal infection. Ceftriaxone remains first line and is one of the few explicit indications for neonatal ceftriaxone

Cefotaxime is only used for infants with hyperbilirubinaemia.

Good eye hygiene is important – saline washes hourly until exudate clears.

Chlamydial conjunctivitis tends to present later than gonococcal –usually between days 5-14 of life. It ranges in severity from mild redness of the conjunctiva with minimal watery discharge to severe redness and swelling of the lids & conjunctiva with purulent discharge. It may be unilateral or bilateral. It may be associated with extra-ocular infections such as pneumonia in 10-20%.

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Investigations: as above with CXR if pneumonia or pneumonitis suspected

Management:

Admit if suspected lung involvement, severe disease or compliance concerns.

Treat with 14 days oral erythromycin 50mg/kg/day qid

An alternative is 5 days azithromycin syrup (10mg/kg/dose OD). Requires ID approval

Discuss with ophthalmology about the timing of review. Follow up is required and includes repeat testing to ensure negative for Chlamydia as second courses of macrolides are sometimes required.

Conjunctivitis outside of the neonatal age group

The most common causes are bacteria, viruses and allergies but the differential also includes foreign body or corneal laceration or chemical irritant, particularly if symptoms are unilateral. There may be no history of this in younger children.

Viral Conjunctivitis

Usually acute or subacute onset of sore, red eyes with clear watery discharge. Usually bilateral.

Pain is not severe but may be itchy.

May be a concurrent viral illness or history of contact with someone with same symptoms.

Highly contagious.

Difficult to differentiate clinically from bacterial conjunctivitis.

Epidemic keratoconjunctivitis (EKC) (adenovirus)

- Causes rapid onset of sore red eyes with a foreign body sensation, burning, itch & photophobia.
- Conjunctival injection & oedema with large oval follicles within the conjunctiva. Preauricular lymph nodes and pseudomembrane formation on the conjunctiva are common.
- There may be an associated URTI or pharyngitis.
- Infectious for at least 10 days after onset of symptoms.

Acute Haemorrhagic Conjunctivitis (enterovirus 70 and coxsackievirus A24).

- Can cause epidemics in school age children and young adults.
- Rapid onset severe eye pain, photophobia, blurred vision, lid swelling, tearing, conjunctival redness and oedema, preauricular lymph nodes and in some cases subconjunctival haemorrhages and punctate keratitis.
- Eye discharge is usually watery at first but becomes purulent if secondary bacterial infection develops.
- Systemic symptoms such as fever are rare though there may be associated URTI/pharyngitis symptoms. It resolves within 1-2 weeks.

Investigations: usually none required

Management:

- Eye & hand hygiene to prevent secretion build up and spread of infection
- Cool compresses may provide symptomatic relief
- Topical chloramphenicol if suspected bacterial involvement
- Artificial tears such as Optive or Sustane Ultra Q2 hourly to help lubricate the eye.

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When to refer: if vision is affected, if cornea involved, if no improvement or worse after 2 days, if symptoms persist after 5 days of treatment; consider chlamydia in disease lasting more than 3 weeks

Bacterial conjunctivitis

Most common causes are Staphylococcus, Streptococcus, Haemophilus and Moraxella spp. Usually acute onset of moderate to marked conjunctival injection with copious purulent discharge. Pain and itch are minimal.

Visual acuity is normal. The cornea and anterior chamber are not involved.

Pre-auricular lymph nodes may be present. May begin in one eye and spread to the other.

Investigation: A standard bacterial swab can be sent for M,C&S if diagnostic doubt.

Management: Good eye hygiene with saline or water to prevent build up of secretions. Ensure hand washing after touching eyes & separate tissues/towels/pillow cases etc. to prevent spread.

Chloramphenicol eye drops 0.5% qds for 5 days.

When to refer: if vision or cornea is affected, if no improvement or worse after 2 days, if symptoms persist after 5 days of treatment

Herpes Simplex Keratitis

This is caused by active replication of Herpes simplex virus in the cornea. Vesicles rapidly coalesce to form classic dendritic ulcers with branching terminal bulbs.

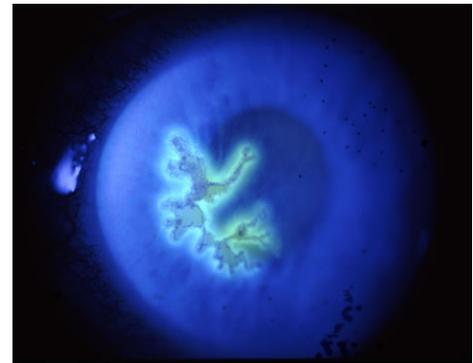
Corneal defect stains with fluorescein eg dendritic ulcer →

Visual acuity may be affected.

Patients present with pain, photophobia, blurred vision, tearing and redness of the eye.

Investigations: viral swab of tears for HSV PCR & culture.

Management: ophthalmology review within 24 hours, topical 3% Acyclovir (Zovirax) 5 times daily. Never give topical or oral steroids.



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Herpes Zoster Ophthalmicus

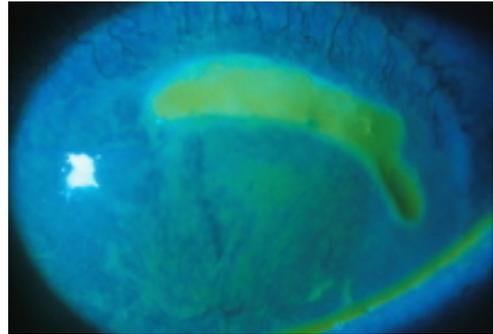
This is due to reactivation of the Varicella zoster virus in the distribution of the ophthalmic division of the trigeminal nerve.

Clinical Features:

May have a prodrome of a flu-like illness with malaise, low grade fever and pain in the region of the ophthalmic division of the trigeminal nerve for a week prior to onset of rash.

Zoster rash is similar to that of chicken pox (primary Varicella) with progression of red macules to papules to vesicles & pustules followed by crusting & scabbing. Dermatomal distribution - ophthalmic division of the trigeminal nerve – the forehead, the upper eyelid and the side and tip of the nose (Hutchinson's sign - implies involvement of the nasociliary branch and therefore a higher likelihood of ocular involvement.).

May be complicated by corneal ulceration, scleritis and uveitis.



Examine acuity and stain with fluorescein.

Management:

Oral acyclovir: 20mg/kg/dose qds (available as dispersible tablets, as effective and easier than 5 x daily dosing) – decreases the duration & severity of symptoms and decreases the incidence of complications.

Most effective if started within 72 hours of onset of rash but may be of benefit while active lesions are present.

Ensure adequate analgesia.

Treat any secondary bacterial infection with oral or IV antibiotics as indicated clinically.

Refer to ophthalmology for review within 24 hours.

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Non-infectious conditions that may cause diagnostic confusion

Watery & Sticky eyes in the Newborn

Congenital nasolacrimal duct obstruction occurs in 10% of newborn infants but resolves spontaneously in 95% by the age of one year.

It causes watery or sticky eyes that is first noticed in the first 1-2 weeks of life. The eye itself is neither red nor inflamed.

Management: bathe with warm water or breast milk to remove sticky discharge. Massage of the lacrimal sac is not recommended. If not resolved by 12 months of age refer to ophthalmology for probing of the nasolacrimal duct under GA.

Allergic Conjunctivitis

Can be misdiagnosed as infectious conjunctivitis.

Typically causes bilateral intense itching and profuse watery discharge, pain is unusual.

Moderate conjunctival injection and oedema may be present with prominent follicles on the conjunctiva overlying the eyelids.

Not associated with preauricular lymph nodes.

There may be a history of atopy.

Vernal keratoconjunctivitis is a more aggressive form that most commonly occurs in young boys in warmer months.

Investigations: usually none

Management:

Avoid allergen if known or possible

Cool compresses for symptomatic relief. Oral antihistamines are NOT helpful.

Topical mast cell stabilizers (Patanol or Lomide bd) on an on-going basis to help control the disease and topical antihistamines (Livostin) tds PRN for flare-ups.

Refer those whose symptoms fail to settle with the above management or those who have corneal involvement.

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Chalazion

If the outlet of a Meibomian gland is blocked then sebaceous material from the gland can leak into tissues in the tarsal plate, causing a granulomatous reaction and chronic inflammation. This is a non-infectious process though chalazia can become infected – or may result from infection (internal hordeola)

Clinical Features:

May be present for weeks to months
May develop from a hordeolum
A non-tender, firm nodule
Located in the eyelid margin or deep within the tarsal plate
Not red or painful
More common in the upper eyelids
May rupture through the eyelid skin or conjunctiva and discharge contents
May lead to the formation of a pyogenic granuloma



Investigations: none required

Management: usually resolve spontaneously but may take months.

Resolution may be hastened by warm compresses and eyelid massage as for styes / hordeola (see above).

Antibiotics are not indicated unless there are signs of infection.

If fails to resolve and/or are multiple or become complicated by infection they may be incised and removed by curettage by the ophthalmology team.

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