training, supportive care, monitoring and investigations, and infection control
• abandonment of treatment
• palliative care
• essential drugs.

International Network for Cancer Treatment and Research (INCTR) (www.inctr.org): this organisation is dedicated to helping to build capacity for cancer research and treatment in developing countries, and it focuses on palliative care, cancer registration, research, training, nursing and pathology services.

Union for International Cancer Control (UICC) World Cancer Congress (www.uicc.org): this organisation focuses on raising awareness, education, and developing a global network of influence.

Franco-African Pediatric Oncology Group (GFAOP) (www.gifao.org): this runs projects for children with cancer in Africa, including a recent Wilms’ tumour protocol trial.

Further reading

5.15 Eye disorders

### BOX 5.15.1 Minimum standards
- Vitamin A.
- Ocular antibiotics.
- Fluorescein.
- Ocular steroids.
- Aciclovir.
- Occlusive pads.
- Glasses and other visual aids.

**Introduction**

Two of the most important eye disorders in children in resource-limited countries are vitamin A deficiency (xerophthalmia) and trachoma. Both of these can be prevented by appropriate action in the community, which is cheap and very effective for both disorders.

**Eye examination and diagnosis: basic equipment**

- Vision-testing chart. Show only one letter at a time and get the child to match the letter on a chart (see Figure 5.15.1).
- A bright torch light which can give a focused beam of light.
- An ophthalmoscope:
  - The ophthalmoscope is mainly used for examination of the ocular fundus (i.e. the retina, choroid and optic nerve).
  - It can also be used for examination of the ocular media (i.e. the cornea, lens, and aqueous and vitreous humour). Dial a small positive lens (about +2 or +3) in the ophthalmoscope, and hold it about 20 cm from the patient’s eye. In the healthy eye with a dilated pupil, there will be a clear red glow of light reflected from the retina, called the red reflex, and any opacity in the cornea, lens or aqueous or vitreous humour will appear as a black shadow against this red reflex.
  - The ophthalmoscope can also be used to act like a magnifying lens to examine in detail the conjunctiva, sclera, iris, etc. To do this a very strong positive lens (about +20) is dialled in the ophthalmoscope, which is then held very close to the patient’s eye. An ultra-low-cost ophthalmoscope, otoscope and loupe which is solar powered is now available (www.arclightscope.com).
- Mydriatic drops:
  - Cyclopentolate 1%, or cyclopentolate 0.5% in children less than 6 months old. Atropine 0.5%

![FIGURE 5.15.1 Eye testing.](image-url)
ointment is very long-acting. It can be given to parents to put into the eyes for 2 days prior to a clinic appointment, especially if an initial attempt at refraction and fundus examination has been unsuccessful because of the child becoming distressed when drops were used in the clinic.

- **Local anaesthetic drops:**
  - Proxymetacaine 0.5% is ideal for children because it stings less than other topical anaesthetic drops.
  - Tetracaine 0.5% or 1% is an alternative which is less quickly degraded when not stored in the refrigerator.
- **Sterile fluorescein paper strips.**
- **Binocular telescopic magnifying glasses (loupes) are very useful but not essential. Some magnification will be achieved by using a strong pair of reading glasses (+3.00–4.00 DS) perched as far down your nose as possible.**
- **More sophisticated equipment, such as a tonometer for measuring intra-ocular pressure, a slit lamp and a binocular indirect ophthalmoscope, may only be available in a specialist clinic. However, if available, they greatly add to the diagnosis and treatment that can be offered.**

Gaining the confidence and trust of the child is the most important step in a successful eye examination, which should not be painful or unpleasant, except possibly unavoidably when drops are put in the child’s eye. If the child finds it hard to cooperate, examine the parents’ or older siblings’ eyes first to gain the child’s confidence. A general anaesthetic may sometimes be required in small children where a serious eye problem (e.g. retinoblastoma) is suspected.

**Three ways of examining the eyes of young children**

Examining the eyes of babies and young children is often difficult. Patience and encouragement are required to gain the confidence of the child. If it is still difficult to get a good view, the following techniques may be helpful:

1. **Let the parent cuddle the child as he or she faces backwards over the parent’s shoulder (see Figure 5.15.2), especially if the parent’s anxiety and sense of obligation to restrain the child is adding to the child’s fears. You may then be able to attract the child’s interest in participating in the examination from this secure position.**

2. **In the case of infants, wrap the baby in a sheet or blanket, with their head on the examiner’s lap, and their body on their mother’s lap (see Figure 5.15.3). Gently hold open their lids with the fingers and thumb of one hand. The other hand is then free to instil any eye drops, or hold a torch or condensing lens. This is probably the best way to get a satisfactory view of the eye, but it also provokes the greatest resentment from the baby.**

3. **If it is difficult to get drops into the child’s eye, try lying the child flat on their back, create a puddle of drops at the inner canthus, and wait while the child is held facing upwards (see Figure 5.15.4). The child will eventually open their eye, and the medication in the puddle of drops at the inner canthus will then go into the eye.**

4. **In difficult cases, where a serious eye condition is suspected, it may be necessary to instil a drop of local anaesthetic, and use a speculum to hold open the eyelids. However, this should only be done by an experienced professional in controlled circumstances, and must not be attempted in the face of determined resistance from any but the smallest child.**

**Presenting symptoms of eye disease**

These include the following:

- red, sore, irritable or discharging eyes
- impairment or loss of vision
- squint.

**Red, sore, irritable or discharging eyes**

A sticky discharge with no redness, normal cornea and apparently normal vision in a child up to the age of 18 months (and occasionally older) is commonly caused by a blocked tear duct. Teach the mother to express the lacrimal sac with firm pressure to the side of the nose at the inner canthus.

- **Bilateral sore red irritable eyes are usually caused by conjunctivitis. If the symptom is unilateral the usual cause is an ulcer or injury to the cornea or iritis. Evert the upper eyelid to inspect the upper tarsal conjunctiva. Apply fluorescein stain to the cornea to diagnose an ulcer or identify a foreign body. The green fluorescein dye will stain the ulcer. A foreign body, especially if lodged under the upper lid, may be associated with staining of the cornea.**
Conjunctivitis

- **Acute bacterial conjunctivitis** causes a mucopurulent discharge from the conjunctiva and is usually self-limiting, resolving after a few days. Give topical antibiotics as drops or ointment to speed recovery.
- **Acute bacterial conjunctivitis** is **dangerous in neonates** when caused by sexually transmitted disease. The cornea in a neonate is at much greater risk, and neonates produce less tears to wash away bacteria. **Treatment is urgent.**
- The WHO-recommended treatment for severe neonatal conjunctivitis is a single IM injection of either ceftriaxone 50 mg/kg (maximum 125 mg) or kanamycin 25 mg/kg (maximum 75 mg) and hourly tetracycline ointment or chloramphenicol drops or ointment.

- In presumed gonococcal infection, empirical treatment for possible co-infection with chlamydia—that is, ceftriaxone and erythromycin to prevent chlamydial pneumonia in the baby—should be strongly considered.

In addition, we recommend diagnosis and treatment of the mother for uro-genital disease due to gonococcus and/or chlamydia in order to prevent salpingitis.
- **Acute viral conjunctivitis** is a self-limiting disease that usually lasts for a week or so. Tear secretions are watery rather than mucopurulent. There is no specific treatment, but it is customary to give antibiotic drops.
- **Vernal conjunctivitis** is a chronic allergic conjunctivitis which is very common and causes recurrent severe itching of the eyes. Affected children are usually atopic (i.e. suffer from asthma and eczema). In addition to itchy eyes, there may be redness, watering, lid swelling and a mucus discharge. Typically there are papillae of the conjunctiva under the upper lid. In some cases these can be massive in size and may be associated with corneal ulceration in the upper third of the cornea. There may be nodular swelling and opacity at the corneo-scleral junction (i.e. the limbus). Anti-inflammatory drops such as cromoglycate relieve the symptoms, but in severe cases use topical steroids (e.g. hydrocortisone 1%, betamethasone 0.1%, or dexamethasone 0.1% eye drops). However, prolonged use of topical steroids has a high risk of causing steroid-induced glaucoma.

**Trachoma**
See Section 6.1.M.

**Corneal ulcers**

- Corneal ulcers are usually **unilateral**. There is usually pain and photophobia. Staining the eye with fluorescein will show the outline of the ulcer.
- **Herpes simplex** ulcers are typically branched and irregular. Treat by applying **aciclovir ointment 3%** every 2 hours until the epithelium has healed.
- **Bacterial corneal ulcers** are more serious and can rapidly progress to destroy the cornea and the eye. They must be treated as an emergency. If possible, first perform a Gram stain and microscopy of tissue scraped with great care from the edge of the ulcer with a scalpel blade. This will often give helpful information about the cause of the ulcer and so make the treatment more specific. Antibiotic drops should be given hourly or 2-hourly for 48 hours and then four times a day. The choice of antibiotic depends on the availability and also the results of the Gram stain. Ofl oxacin (0.3%) or ciprofloxacin (0.3%) both have a good spectrum of activity against Gram-positive and Gram-negative bacteria. In most circumstances one of these is the first choice. Concentrated locally made antibiotic drops are very helpful if pre-prepared drops are not available. These can be made up by diluting antibiotic powder for injection in 5 mL of sterile water or 0.9% saline. These home-made eye drops should only be used for 48 hours, and should then be discarded. The following are the recommended strengths: gentamicin 15 mg/mL or amikacin 50 mg/mL for Gram-negative organisms; cefuroxime, ceftazidime or cefazolin 50 mg/mL for Gram-positive organisms. If a Gram stain is not possible, two types of drops can be given alternately every hour. Chloramphenicol (0.5%)
drops and 1% ointment) is a cheap and readily available alternative if none of the above are available.

- **Fungal corneal ulcers** are very common in hot humid climates. The branching filaments of the fungus can be identified on a Gram stain. The treatment is unfortunately very difficult because topical antifungal drugs are hard to obtain and the response to treatment is slow. Natamycin is sometimes available as an eye ointment. Econazole, clotrimazole and ketoconazole are all available as skin creams, and it may be necessary to use either these or systemic antifungal agents in difficult cases.

**Iritis**

Iritis is a less common cause of acute red eye. The pupil is constricted and irregular and there are often deposits known as keratic precipitates on the posterior surface of the cornea. Give intensive topical steroids hourly (prednisolone, betamethasone or dexamethasone drops) and keep the pupil dilated with mydriatics (atropine 0.5–1% twice daily).

**Vitamin A deficiency (xerophthalmia)**

Xerophthalmia usually only affects malnourished children (see Section 5.10.A on vitamin A deficiency).

- In the early stages, the conjunctiva appears dry and wrinkled, but this is not easy to detect.

- As the disease progresses, the cornea also appears dry and then shows signs of corneal ulceration. Ulcers may progress very rapidly to destroy the entire cornea. Eventually the whole eye shrinks or the child may be left with a dense corneal scar.

- In communities where vitamin A deficiency is common, older children are frequently found with corneal scars dating from early childhood. In most cases malnutrition is a chronic problem, and the disease is precipitated by an acute infective illness, which is nearly always measles. Xerophthalmia and measles are particularly important because these ulcers are very frequently bilateral, whereas most other causes of corneal ulceration and scarring usually only affect one eye.

There are three other factors which may precipitate corneal destruction in xerophthalmia:

- **Herpes simplex:** severe and often bilateral herpes simplex ulcers may develop.

- **Traditional eye medicines:** application of toxic substances may cause damage and chemical burns to the conjunctiva and cornea.

- **Exposure:** sick and malnourished children may lie with their eyes open and exposed, so the cornea is not protected by the eyelid.

**Management**

- Apply topical antibiotics and ensure adequate closure of the eyelids. Give *local aciclovir* if *herpes simplex* is suspected. Give *topical steroids* (hydrocortisone 1% or betamethasone 0.1% eye drops or ointment) if a clear history of toxic traditional eye medication is obtained.

- Give vitamin A capsules (200000 IU/day in children over 1 year of age, 100 000 IU/day for those aged 6–12 months, and 50 000 IU/day for those under 6 months, for 2 days, then another dose in 2 weeks). Systemic antibiotics and rehydration may also be indicated.

**The child who cannot see or who cannot see well**

If only one eye is affected, the child and their family may not be aware of the problem. However, a child with poor vision in one eye only will often develop a squint in that eye (see below).

**Cornea**

Bilateral corneal scarring that is severe enough to cause serious visual impairment is most commonly a consequence of xerophthalmia and measles (both of which are preventable, by giving vitamin A and immunisation). Careful refraction may improve the sight. *An optical iridectomy* or a *corneal graft* may also help.

**Cataract**

Cataract is the most common congenital ocular abnormality. It may be present at birth, or may develop in early childhood. It may be complete, presenting as a dense white opacity in the pupil, or be incomplete and less obvious. There will be a normal pupillary light reflex, so that the pupil constricts when a light is shone into the eye. In other cases of a white appearance of the pupil, including retinoblastoma, the reaction of the pupil to a light shone in the affected eye is usually lost.

Congenital cataracts require *early expert surgical treatment*, otherwise the child will develop nystagmus, which will prevent the development of good vision.

**Congenital glaucoma**

Congenital glaucoma usually presents with photophobia, a hazy cornea and often enlargement of the eye called *buphthalmos*. Urgent specialist surgery is required to control intra-ocular pressure and save what sight is available, otherwise the child will become irreversibly blind.

**Retinal diseases**

- **Retinopathy of prematurity** is the commonest cause of acquired retinal disease. It is associated with excessive oxygen given to premature babies (see Section 3.4). It is now particularly common in middle-income countries, such as Latin America, Eastern Europe, the Middle East and Asia. In countries with highly developed intensive neonatal care services it is uncommon, and in resource-limited countries most very premature babies do not survive.

- **Retinitis pigmentosa** is the most common congenital disorder of the retina. It affects the peripheral retina and causes night blindness.

- **Vitamin A deficiency** also causes night blindness by affecting rod photoreceptors in the peripheral retina.

- **Retinoblastoma** is important because it is one of the few eye diseases that can be fatal in a child if not properly treated. The tumour can present in one eye or in both eyes as a white mass in the pupil, a squint, a painful inflamed eye or a mass in the orbit. If the eye is removed before the tumour has spread, the child’s life may be saved.

**Optic nerve**

Optic nerve hypoplasia or optic atrophy may be congenital. It may also be acquired following meningitis, or rarely following an infection such as typhoid or measles. There is no effective treatment.
Cortical blindness
Cortical blindness occurs following severe brain insults such as meningitis or cerebral malaria. The pupillary light reflex is normal, but the child cannot see. In some cases the vision gradually improves with time.

Management of blindness
- In the majority of cases, management is with rehabilitation and education rather than medical treatment.
- Cataracts and glaucoma in particular must be recognised and diagnosed early to preserve and save as much sight as possible.
- Most blind children have some sight and should have an opportunity to use low-cost visual aids. Simple aids, manufactured locally, may enable children to read and so transform their opportunities for education. These aids may consist of a strongly positive lens worn as spectacles or used as a stand magnifier.

Squint
Squint, or misalignment of the eyes (also known as strabismus), is common in children. When assessing a child for squint, consider the following:
- Does the child really have a squint? Look at the corneal light reflexes. If the reflection of light is in the same position in each eye, there is no squint, but if one is asymmetrical then that eye is squinting.
- Does the squint alternate? Cover the non-squinting eye. If the squinting eye moves to look at the light or object being held, and if the child can use either eye to fixate, then the squint alternates. This means that the vision is fairly good in each eye, and the treatment of the squint is purely cosmetic.
- If the squint does not alternate, is there any disease in the squinting eye? Test the pupillary light reflex and then dilate the pupils with mydriatic eye drops. Look for diseases such as cataract, retinal scar and in particular retinoblastoma. Refer the child for treatment if you find cataract or an abnormality in the retina. Treatment for retinoblastoma is urgent enucleation.
- Is there a refractive error, such as hypermetropia (long sight) or myopia (short sight)? This requires refraction tests.
- Is the squinting eye amblyopic (i.e. is there poor vision in the squinting eye)? At first, squints cause double vision (diplopia), which the child finds confusing. As time passes, the visual acuity in the squinting eye becomes permanently suppressed. The treatment for amblyopia is to force the child to use the squinting eye by wearing an occlusive patch over the healthy eye for about 1 hour a day for several weeks.

Amblyopia only develops in young children, and it can only be treated in children under 5 years of age. Surgery may be required, but should not be considered until eye disease and refractive errors have been excluded and amblyopia has been treated.

5.16 Neurological disorders

5.16.A Coma

**BOX 5.16.1 Minimum standards**
- ABC and high-dependency care.
- Clinical chemistry.
- Haematology, including blood film for malaria.
- Toxicology, chest X-ray, cultures and lumbar puncture.
- Neuroimaging: CT and MRI (if available).

**Primary assessment and resuscitation**
Coma is a medical emergency that requires immediate assessment and detection of reversible causes. Initial quick resuscitative measures are paramount, before undertaking a full clinical assessment of the child.

**History**
A detailed history should be taken from the parent or carer, with a focus on the following:
- possible cause of coma
- onset and progression of unconsciousness
- extent of injury
- signs of deterioration or recovery
- past medical history.

**Examination**
Clinical examination is directed towards identifying signs suggesting the following: