PART 3:
Lecture notes on common eye diseases for ophthalmic assistants

Contents

Introduction to Part Three

This part of the book is an outline of lecture notes for the theoretical part of teaching ophthalmic assistants and ophthalmic nurses about common eye diseases.

The lecture notes are set out in a problem orientated fashion, based upon common presenting symptoms. For ease of memory the lecture notes use a system of **fours** which is intended to help both the teacher and the student. Needless to say, at times this is rather artificial but, we believe, useful in helping students to examine, diagnose and manage patients in a systematised way.

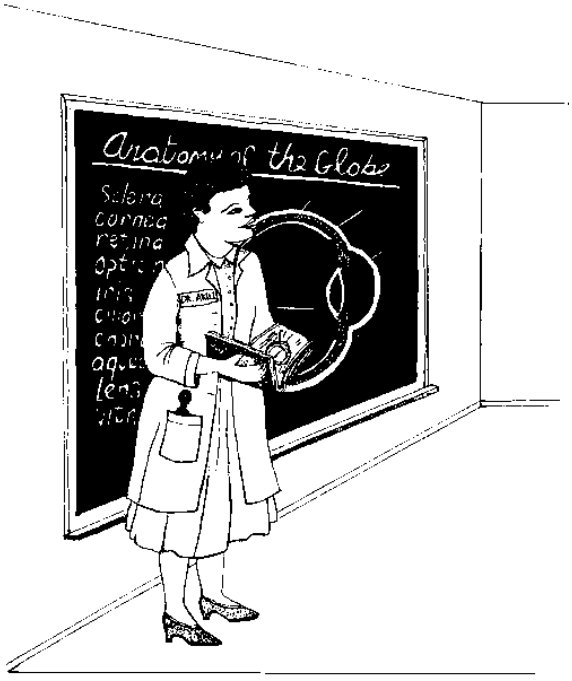
There are four sections:

A - Examination of the eye

B - Basic sciences of the eye

C - Diagnosis of common eye diseases

D - Management of common eye diseases



In no way are these notes meant to be comprehensive. They are only intended as a teaching aid for use in the classroom. There is no substitute for clinical teaching with patients, which should form the bulk of any course training ophthalmic assistants.

Outline

SECTION A Eye Examination	SECTION B Basic Sciences	SECTION C Diagnosis	SECTION 4 Management
1 HISTORY	**ANATOMY**	**ACUTE RED EYE**	**REMEDY**
Acute red eye Loss of vision Cannot read Other specific symptoms	Globe Orbit	In babies In children At any age Trauma	Use medicines to REMEDY acute red eye(s)
2 VISUAL ACUITY	**PHYSIOLOGY**	**LOSS OF VISION**	**REFER/ REHABILITATION**
Good 6/6-6/18 Poor 6/24-3/60 Blind 2/60-PL Blind to light NPL	Aqueous Vision Tears Optics	Corneal scar Cataract Glaucoma Others	REFER treatable blindness and REHABILITATE non-treatable blindness
3 BASIC EXAMINATION	**PHARMACOLOGY**	**REFRACTIVE ERRORS**	**REFRACT**
Eyelids Conjunctiva Cornea Pupil	Anti-infectives Anti-inflammatory Mydriatics Others	Presbyopia Myopia Hypermetropia Astigmatism	REFRACTIVE ERRORS are treated with spectacles
4 SPECIAL EXAMINATION	**PATHOLOGY**	**OTHER EYE DISEASES**	**REFER/ REASSURE**
Pin hole Tonometry Ophthalmoscopy Slit-lamp etc.	Congenital Inflammations Tumours Degenerations	Orbit Muscles/nerves Eyelids Naso-lacrimal	REFER other serious eye diseases and REASSURE people with normal eyes

SECTION A:
Examination of the eye

History and examination

The examination of a patient with eye problems can be simply divided into four stages:

1. Taking the history.
2. Measurement of visual acuity.
3. Basic examination of the external eye with a torch.
4. Special examinations of the inner parts of the eye.

1 Taking a history

Patients attending an eye clinic can be divided into four main groups according to the symptom they complain of.

1.1 Red painful eye(s).

1.2 Cannot see - an inability to see in the distance with one or both eyes.

1.3 Cannot read - an inability to read small print, or see near objects.

1.4 Other specific symptoms - for example diplopia, epiphora, proptosis.

2 Taking the visual acuity

The visual acuity should be assessed in each eye of all eye patients. The acuity can be measured using the Snellen test chart or the E test type for people who cannot read.

The visual acuity can be usefully divided into four main groups.

2.1 Good vision = 6/6 to 6/18.

2.2 Poor vision = 6/24 to 3/60 (CF3m).

2.3 Blind = 2/60 (CF2m) to PL (perception of light).

2.4 Blind to light - NPL (no perception of light).

3 Basic eye examination

The basic eye examination can be carried out with a simple hand torch. There are four important parts of the front of the eye that should be examined:

3.1 The eyelids - do they look and function normally?

3.2 The conjunctiva - is the white of the eye white?

3.3 The cornea - is the cornea clear?

3.4 The pupil - is the pupil black and does it react to light?

4 Special eye examinations

Besides these four basic examinations with a torch there are four special examinations which may also be required in examining a patient. The special examinations are:

4.1 Visual acuity with a pin hole (to check for refractive errors).

4.2 Schiotz tonometry (to measure intra-ocular pressure).

4.3 Ophthalmoscopy (preferably after dilation of the pupil).

4.4 Other special examinations - for example slit-lamp microscopy, examination of ocular movements, visual fields. (Any of these special examinations may be required for certain patients.)

Having taken the history, measured the visual acuity and examined the patient one is now in a position to try and make a diagnosis and decide upon the management of the patient.

SECTION B:
Basic sciences

In order to better understand how the eye works and how diseases can affect the eye a knowledge of the basic sciences in regard to the eye is required. This is discussed in four sections:

1. Anatomy
2. Physiology and optics
3. Pharmacology
4. Pathology.

1 Anatomy

The anatomy of the eye can be considered under two main headings, the anatomy of the globe and the anatomy of the orbit.

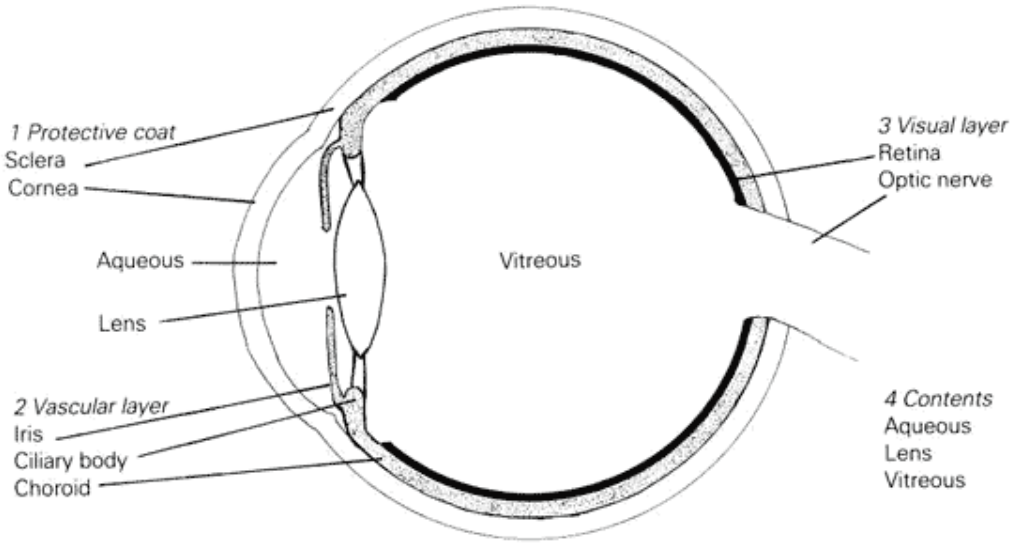


Figure 28 Anatomy of the globe

1.1 Anatomy of the globe (Figure 28)

The eye globe can be considered under **four** headings:

- The protective coat - cornea and sclera.
- The vascular layer - iris, ciliary body, and choroid - together called the uvea.
- The visual layer - retina and optic nerve.
- The contents of the eye - aqueous, lens and vitreous.

1.2 Anatomy of the orbit

The structures of the orbit can be considered under four headings:

1.2.1 The bones of the orbit

- Roof - frontal bone
- Outside wall - temporal bone
- Floor - maxilla
- Inside wall - ethmoid plate
- Back wall - sphenoid bone

All of these bones (except the temporal) contain an air space known as a SINUS.

1.2.2 The muscles and nerves

Muscles

Muscle	Action	Nerve supply
Orbicularis oculi	Closes the eye	Facial (7)
Levator palpebrae superioris	Opens the eye	Oculomotor (3)
Superior rectus	Looks up	Oculomotor (3)
Medial rectus	Looks in	Oculomotor (3)
Inferior rectus	Looks down	Oculomotor (3)
Lateral rectus	Looks out	Abducens (6)
Superior oblique	Looks down and in	Trochlear (4)
Inferior oblique	Looks up and in	Oculomotor (3)
Ciliary muscle	Accommodates	Oculomotor (3)
Pupil constrictor	Constricts pupil	Oculomotor (3)
Pupil dilator	Dilates pupil	Sympathetic

Nerves

Nerve	Action	Paralysis causes
Optic (2)	Vision	Loss of vision
Oculomotor (3)	Motor to ocular muscles	Ptosis, eye down and out, mydriasis
Trochlear (4)	Superior oblique m.	Diplopia
Trigeminal (5)	Sensation to the eye and face	Corneal anaesthesia
Abducens (6)	Lateral rectus m.	Diplopia with inability to abduct the eye
Facial (7)	Orbicularis oculi m. and facial muscles	Lagophthalmos

1.2.3 The eyelids (Figure 29)

ANATOMY OF THE EYELID

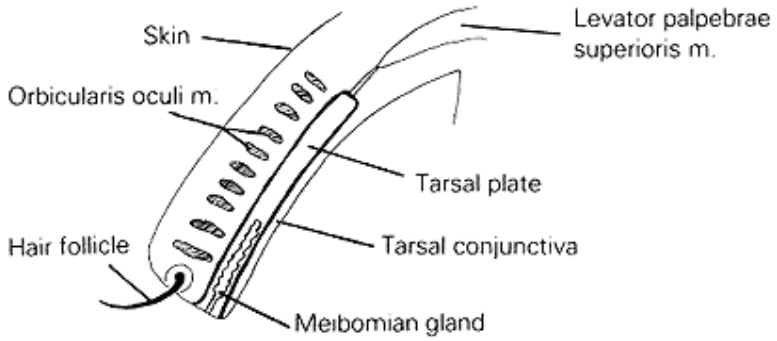


Figure 29 The eyelid

1.2.4 The nasolacrimal apparatus (Figure 30)

ANATOMY OF THE NASOLACRIMAL APPARATUS

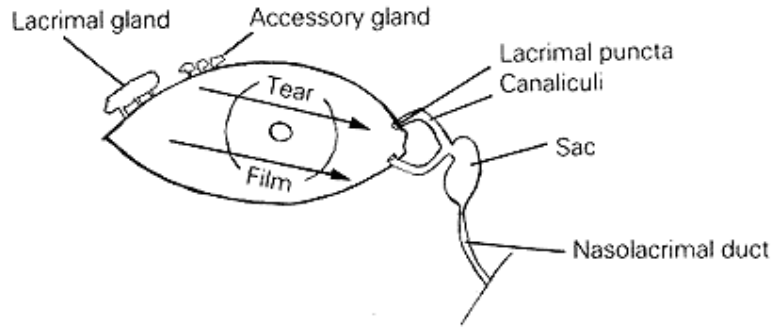


Figure 30 The nasolacrimal apparatus

Diseases of the orbital structures include protrusion of the eye (proptosis), causes of double vision (diplopia), diseases of the eyelids, and causes of a watering eye (epiphora). These diseases are discussed under the section on OTHER DISEASES (page 216).

2 Physiology

There are four important parts of eye physiology:

2.1 AQUEOUS production and drainage

2.2 Physiology of VISION

2.3 TEAR production and drainage

2.4 OPTICS of the eye.

2.1 Aqueous (Figure 31)

2.1.1 The aqueous is produced from blood by the ciliary body.

2.1.2 The aqueous flows through the pupil into the anterior chamber.

2.1.3 The aqueous flows from the anterior chamber through the filtration angle of the eye.

2.1.4 The aqueous leaves the eye through the trabeculum to enter the canal of Schlemm and drains to the episcleral veins.

AQUEOUS FLOW

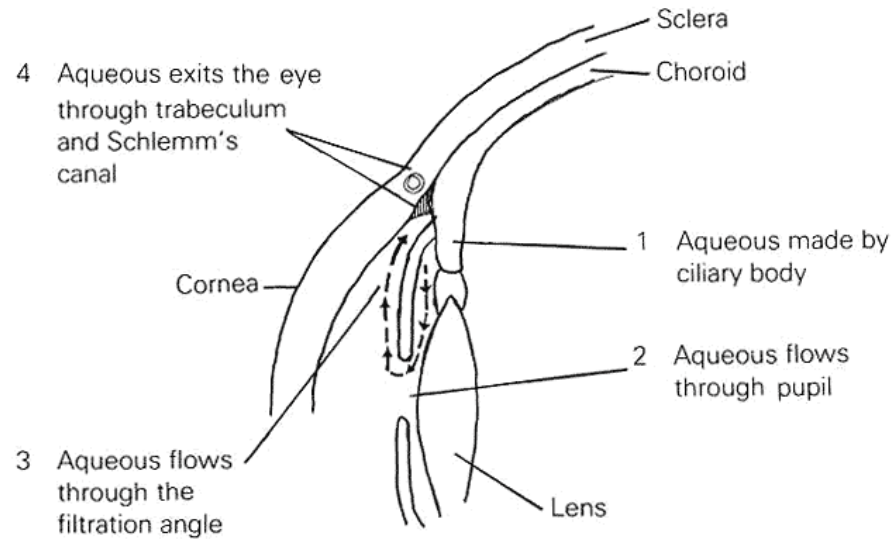


Figure 31 Aqueous flow

An increase in aqueous production or a blockage in aqueous drainage, either at the pupil (PUPIL BLOCK), the filtration angle (ANGLE BLOCK), or the trabeculum (TRABECULAR BLOCK), may produce an increase in INTRA-OCULAR PRESSURE which can result in GLAUCOMA.

2.2 Vision

The eye is the organ of vision and we are able to perceive different forms of vision.

2.2.1 Visual acuity - is the ability to see fine detail. (This is a function of the macula.)

2.2.2 Visual field - is the ability to see to either side in a wide direction. (This is a function of the periphery of the retina.)

2.2.3 Colour vision - is the ability to see different colours. (This again occurs mainly in the macula area.)

2.2.4 Binocular vision - is the ability to see with both eyes at once which gives us a perception of depth.

Each of the different types of vision can be assessed in different ways. However it is the measurement of visual acuity which must always be measured on every patient.

2.3 Tears

2.3.1 Tears are produced by the lacrimal gland (and accessory glands).

2.3.2 Tears flow across the cornea producing the tear film. The tear film is essential for the normal functioning of the cornea.

2.3.3 The tear film consists of a sandwich of three layers. The mucin layer is produced by goblet cells in the conjunctiva, then the aqueous tears and, on the outside, a fatty (lipid) layer produced by the Meibomian glands.

2.3.4 Tears drain from the eye at the lacrimal puncta into the lacrimal sac and on into the nose via the nasolacrimal duct.

2.4 Optics

2.4.1 Refraction in a block of glass and prism

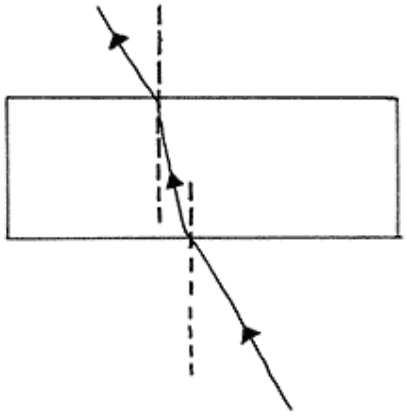


Figure 32 Refraction in a block of glass

As light enters the *glass* from the air, it is displaced towards the vertical. As it leaves the glass it is displaced away from the vertical (Figure 32).

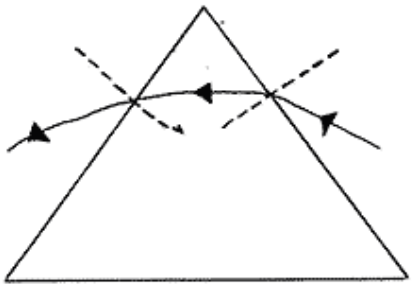


Figure 33 Refraction in a prism

As light passes through a glass prism it is displaced towards the base of the prism (Figure 33).

2.4.2 Refraction in convex and concave spheres

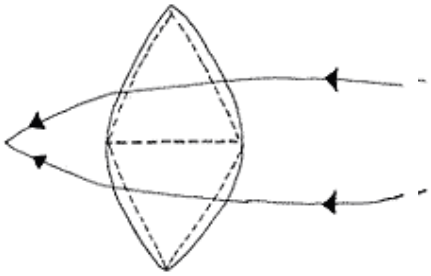


Figure 34 Refraction in a convex lens

A *convex lens* (plus lens) is like two prisms placed base to base. Light passing through a convex lens is converged. Convex lenses are used to treat presbyopia, hypermetropia and aphakia. If parallel light is brought to a focus at 1 metre the lens is said to have 1 DIOPTRE of power. If the focus is at 1/2 metre, 2 DIOPTRES, and a 1/3 metre, 3 DIOPTRES (Figure 34).

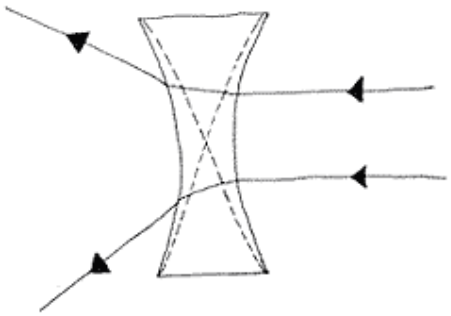


Figure 35 Refraction in a concave lens

A *concave lens* (minus lens) is like two prisms placed apex to apex. Light passing through a concave lens is diverged. Concave lenses are used to treat myopia (Figure 35).

2.4.3 Refraction in cylinders

A cylindrical lens has different powers in the vertical and horizontal axis. Thus, light passing through a cylindrical lens does not focus at one point, but forms two foci, one for the horizontal and the other for the vertical.

Cylindrical lenses may be convex, concave or mixed. They are used to treat astigmatism.

2.4.4 Refraction of the eye

Light entering the eye is converged at the cornea and then the lens acts as a focusing mechanism to converge the light to a point on the retina, so that the object is seen clearly (Figure 36).

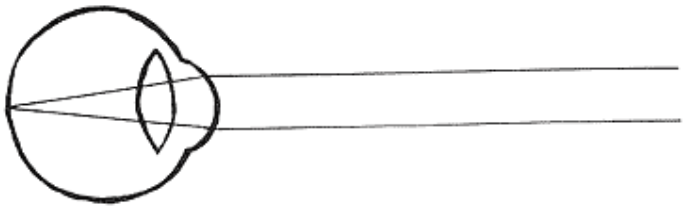


Figure 36 Refraction of the eye

If the object is close to the eye then the lens changes shape so that the light rays can still be focused on the retina. This is called ACCOMMODATION. (The ability to accommodate begins to fail after the age of 40, so that spectacles are needed for close work.) (Figure 37)

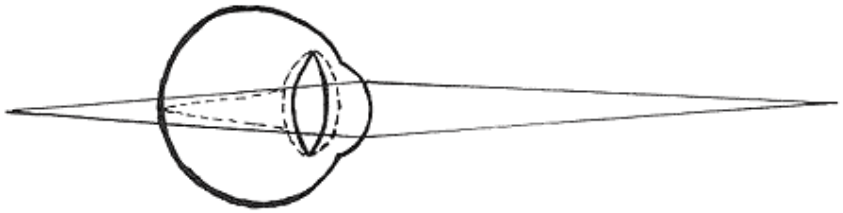


Figure 37 Refraction of the eye when the object is close: accommodation

In myopia light rays are focused in front of the retina, so that a *minus* concave lens is needed to diverge the rays (Figure 38). In hypermetropia, it is the opposite, the rays are focused behind the retina so that a *plus* convex lens is needed (Figure 39).

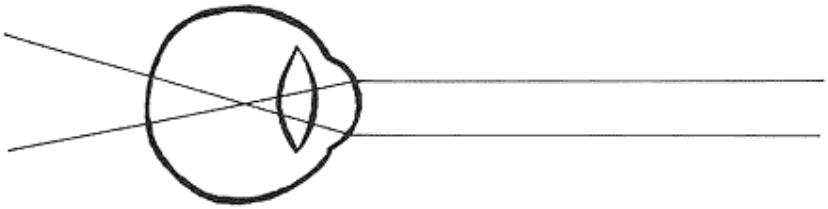


Figure 38 Refraction of the eye: myopia

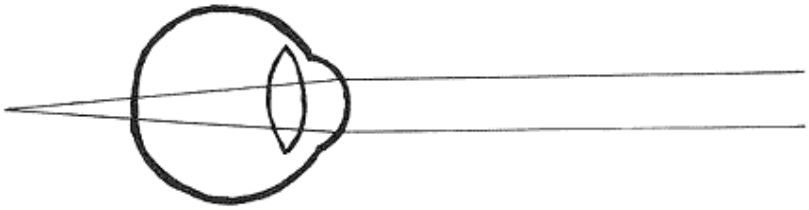


Figure 39 Refraction of the eye: hypermetropia

3 Pharmacology

The common *methods* of applying medications to the eye are as follows:

a) **Drops** - these are particularly useful in in-patients and also may be used to help in the diagnosis of certain diseases.

b) **Ointments** - these tend to be used by patients at home who are being treated as out-patients.

c) **Periocular injections** - these may be subconjunctival or retro-bulbar injections around the eye.

d) **Systemic** - sometimes oral therapy, intravenous, or intramuscular injections are required to treat ocular disease.

There are many different *types* of drugs used in eye disease.

a) **Anti-infective drugs** e.g. antibiotics, antivirals, and occasionally antifungals.

b) **Anti-inflammatory drugs**, e.g. prednisolone - these are used to suppress inflammation when there is no infecting organism.

c) **Mydriatics** e.g. atropine, cyclopentolate - these are drugs which dilate the pupil.

d) **Other eye drugs** - this is a miscellaneous group of drugs which includes local anaesthetic drops, drugs which lower the intraocular pressure (Diamox), as well as special forms of therapy such as Vitamin A.

Drugs and their uses

Type	Name	Uses
Anti-infective	Tetracycline 1%	Trachoma Bacterial infections
	Chloramphenicol 0.5%	Conjunctivitis Corneal ulcer
	Gentamicin inj. 20mg.	Bacterial corneal ulcer
	Idoxuridine, Acyclovir	Herpes simplex ulcer
	Econazole 1%, Pimaracin 5%	Fungal ulcer
Anti-inflammatory	Hydrocortisone 1%	Vernal catarrh
	Prednisolone 0.5%	After eye surgery
	Dexamethasone 0.1%	Iritis
Pupil dilators	Cyclopentolate 1%	Fundoscopy, retinoscopy
	Phenylephrine 10%	Fundoscopy
	Atropine 1%	Iritis; post-operative
Other	Amethocaine 0.5%	Local anaesthetic
	Acetazolamide 250mg	Reduce intra-ocular pressure
	Vitamin A 200,000 IU	Xerophthalmia treatment

4 Pathology

Pathology is the study of diseases in man. There are four common types of disease processes:

4.1 Congenital abnormalities

These are diseases due to abnormalities in the development of the foetus, which include genetically determined diseases, e.g. congenital cataract or albinism.

4.2 Inflammations

Inflammatory diseases may be due either to infections (bacteria, viruses, fungi, parasites) e.g. trachoma; or inflammation which may be non-infective or may follow injury to the eye, e.g. iritis.

4.3 Tumours

Tumours may be benign (slowly growing and not spreading elsewhere in the body) e.g. lacrimal adenoma; or malignant (usually rapidly growing and tending to spread to other parts of the body), e.g. retinoblastoma.

4.4 Metabolic and degenerative diseases

Many diseases are due to degeneration of the body's tissues with age (and this group includes diseases of blood vessels) e.g. senile macula degeneration and cataract.

SECTION C:
Diagnosis

The majority of people with eye complaints have common diseases which are usually straightforward to diagnose and treat. In this section notes are given in a systematic form on how to make a diagnosis and treat the common eye conditions, based upon the initial complaint or symptom. The major symptom groups are:

1. Acute red eye
2. Cannot see/loss of vision - for the distance
3. Cannot see near, e.g. reading, sewing
4. Other specific eye symptoms, e.g. diplopia.

1 Acute red eye

Patients presenting with acute red eye may initially be divided into one of **four** groups:

1.1 Acute red eye *in babies* (0-28 days) - ophthalmia neonatorum

1.2 Acute red eye *in children* (6 months-6 years) - this may be due to vitamin A deficiency or measles leading to a corneal ulcer.

1.3 Acute red eye *at any age:*

- 1.3.1 Conjunctivitis and trachoma
- 1.3.2 Corneal ulcer
- 1.3.3 Iritis
- 1.3.4 Acute glaucoma.

1.4 Acute red eye due to *injuries:*

- 1.4.1 Blunt injuries
- 1.4.2 Perforating injuries
- 1.4.3 Foreign bodies
- 1.4.4 Burns and chemicals.

1.1 Acute red eye in babies - ophthalmia neonatorum

Definition

A sticky eye in any baby-during the first twenty eight days of life.

Causes

Neisseria Gonococcus or *Chlamydia Trachomatis*

Diagnosis

a) Eyelids - swollen

b) Conjunctiva - red, swollen and a pussy discharge

c) Cornea - usually clear, but may show a corneal ulcer

d) Pupil - normal

Treatment

a) Clean the eyes with a clean cloth/swab and water.

b) Apply tetracycline eye ointment hourly for four days and then three times a day for ten days.

c) If the ophthalmia neonatorum is very severe, particularly if there is a corneal ulcer, give also antibiotic (e.g. penicillin or chloramphenicol) eye drops every minute for one hour, then every hour for one day then three hourly until there is improvement.

d) Give systemic antibiotics. Example: procaine penicillin 60 mg by IM injection, or other suitable systemic antibiotic.

Prevention

a) Using a clean cloth/swab and water, clean the eyes of each newborn baby immediately at birth even before the baby has opened his eyes.

b) If available, apply tetracycline eye ointment once to a new born baby's eyes (or 1 drop of 1% silver nitrate solution).

1.2 Acute red eye in children - corneal ulcer due to xerophthalmia/measles

As well as the causes of acute red eye which may occur at any age (see page 193), a specific and important cause of red eyes in children is corneal ulcer due to vitamin A deficiency and/or measles.

Definition

Xerophthalmia is dry eyes due to vitamin A deficiency which may lead to corneal ulceration and blindness, particularly during the presence of measles infection.

Causes

Malnutrition - insufficient intake of foods rich in vitamin A

Malabsorption - chronic diarrhoea causing malabsorption of vitamin A

Measles - an increased demand for vitamin A during and after measles infection.

Diagnosis of xerophthalmia

a) Night blindness (XN) - inability to see in dim light e.g. in the evening.

b) Bitot spots (XIB) - white foamy spots on the lateral conjunctiva.

c) Xerosis - dryness of the conjunctiva (XIA) or cornea (X2).

d) Corneal ulcer (keratomalacia) (X3) - ulceration of the cornea.

Treatment of an infant with corned ulcer

a) Vitamin A 200,000 IU by mouth on the first day, on the second day and after one week.

b) Tetracycline eye ointment three times a day.

c) Atropine eye ointment once a day.

d) An eye pad to stop the child rubbing his eyes and causing perforation.

Prevention of xerophthalmia:

Malnutrition can be prevented by nutrition education. Encourage the use of:

Mother's milk

Mangoes, papaya

More dark green leafy vegetables.

Malabsorption control - oral rehydration solution for diarrhoea.

Measles - immunisation against measles.

Mass Vitamin A supplementation - give Vitamin A capsule (200,000 IU) to children with:

Measles,

Malnutrition,

Malabsorption, or

Any sign of vitamin A deficiency e.g. night blindness or Bitot spots.

1.3 Acute red eye at any age

There are **four** major causes of acute red eye at any age:

1.3.1 Conjunctivitis (this may be acute bacterial infection or chronic chlamydial infection - trachoma)

1.3.2 Corneal ulceration

1.3.3 Iritis

1.3.4 Acute glaucoma.

The differential diagnosis between these common causes of acute red eye can be made by:

a) Assessing the degree of pain and loss of vision
b) Examination of the cornea
c) Examination of the pupil
d) Special diagnostic tests.

1.3.1 Acute conjunctivitis

Definition

Inflammation of the conjunctiva.

Causes

a) Bacterial - Haemophilus, Streptococcus, Staphylococcus
b) Viral - Adenovirus, Herpes simplex, Enterovirus 70
c) Allergic - Vernal disease
d) Chemical - Cosmetics, smoke, harmful eye practices

Symptoms

a) Little pain
b) Good vision

c) Pus or mucus discharge.

Signs

a) Eyelids - swollen
b) Conjunctiva - redness is maximal in the fornices, often with a discharge
c) Cornea - clear
d) Pupil - normal.

Treatment

a) Bacterial conjunctivitis - tetracycline eye ointment three times a day for one week.
b) Viral conjunctivitis - usually recovers in 7-21 days; tetracycline may be used to stop secondary infection.
c) Severe allergic conjunctivitis (vernal disease) - requires specialist treatment with the minimal and weakest steroid drops needed to relieve symptoms.
d) Chemical conjunctivitis - usually improves once the irritant is removed.

Chronic chlamydial conjunctivitis - Trachoma

Definition

Chronic conjunctivitis due to repeated re-infection with *Chlamydia Trachomatis*.

Causes

There are various environmental factors which favour trachoma and various factors which are important in the repeated transmission of trachoma.

a) Environment - features of the environment favouring trachoma:

Dry (lack of water)

Dusty (lack of water)

Dirty (animal/human faeces)

Discharge (on children's faces).

b) Transmission - factors favouring repeated infection with *Chlamydia:*

Fingers: eye-finger-eye

Flies: eye-fly-eye

Fomites: eye-cloth/sheet-eye

Family: between mothers, brothers and sisters.

Signs

The signs of trachoma are seen best in the everted upper eyelid and on the cornea. The severity of trachoma depends on the amount of upper eyelid inflammation due to repeated re-infection mainly in childhood.

a) **Active trachoma**
TF - Trachoma follicles (five or more follicles on the upper tarsal conjunctiva)
TI - Trachoma intense inflammation (50% or more of the deep tarsal vessels are obscured by papillary hypertrophy)

b) **Inactive**
TS - Trachoma scars (conjunctival scars)

c) **Trichiasis - entropion**
TT - Trachoma trichiasis (at least one lash turns in and touches the globe)

d) **Corneal scar**
CO - Corneal opacity (an opacity which obscures at least part of the pupil margin)

TF and TI is found mainly in pre-school children, the first few years of schooling and in mothers.

TS, TT and CO occur more commonly in women than men, starting around the age of 15 and gradually increasing in prevalence.

Treatment

a) Instruct the patient and family in daily face washing.

b) Tetracycline eye ointment two to three times a day for six weeks, for TF and/or TI. Ideally treat the whole family.

c) Systemic treatment with tablets of sulpha or tetracycline for 14 days (this is only required in cases of severe trachoma e.g. severe TI).

d) Epilate for trichiasis, and entropion surgery for entropion.

Prevention

a) Education in the importance of daily face washing, especially for pre-school and school children.

b) Administration of tetracycline eye ointment to any cases of acute red sticky eye, particularly during epidemics of conjunctivitis.

Complications

Severe conjunctivitis from any cause may lead to corneal ulceration, subsequent scarring and blindness.

Inflammation from trachoma leads to conjunctival and tarsal plate scarring which causes the eyelashes to turn in. The lashes rub on the cornea, producing ulceration, scarring and blindness.

1.3.2 Corneal ulceration

Definition

Loss of the corneal epithelium. (Corneal ulceration usually involves the epithelium and stroma of the cornea. Keratitis is an inflammation of the cornea, usually with no loss of corneal epithelium. Corneal abscess is suppuration within the corneal stroma. The term corneal abrasion or corneal erosion is sometimes used for just epithelial loss of the cornea, with or without minor trauma.)

Causes

a) Bacterial - Staphylococcus, Streptococcus, Gonococcus, Pseudomonas

b) Viral - Herpes simplex, measles

c) Nutritional - Vitamin A deficiency/measles

d) Others - e.g. Harmful eye practices (HEP), trauma

Symptoms

a) Severe pain + + +
b) Loss of vision + + +

Signs

a) Eyelids - swollen
b) Conjunctiva - redness maximal around the cornea
c) Cornea - there is a grey spot on the cornea
d) Pupil - the pupil is usually normal

Special test

Fluorescein drops or paper applied to the conjunctiva will show green staining of a corneal ulcer when the epithelium is deficient.

Different types of corneal ulceration

a) **Viral** - this is due to *Herpes simplex* virus. The ulcer may be branch-like (DENDRITIC) or may take the appearance of the outline of a country (GEOGRAPHIC, MAP, AMOEBOID) type of ulcer. The treatment of herpetic ulceration is with anti-virals. e.g. idoxuridine ointment × 5/day, trifluorothymidine drops hourly, or acyclovir ointment × 5/day.
b) **Bacterial** - bacterial corneal ulcers may be due to *Staphylococcus, Streptococcus, Pseudomonas,* or *Gonococcus*. They usually present as a stromal ulcer and often produce early **hypopyon** formation. The treatment is with antibiotics. Sub-conjunctival injections of gentamicin 20 mg or chloramphenicol 100 mg are recommended for large corneal ulcers or corneal ulcers with a hypopyon. Combined with this one may give hourly drops of chloramphenicol or tetracycline eye ointment. Smaller ulcers without hypopyon may be treated just with topical antibiotics, example chloramphenicol or gentamicin drops or tetracycline eye ointment hourly until improvement begins and then slowly reduce the dosage.
c) **Nutritional** - this is due to vitamin A deficiency and is discussed separately (see Section 1.2). The treatment is with Vitamin A.
d) **Fungi** - may also cause a hypopyon ulcer which can be treated with antifungal agents.
e) **Others** - other causes of corneal ulceration include **trauma**, which may cause an abrasion or lead to secondary bacterial infection. The treatment is with antibiotics as for a bacterial ulcer. Another cause of ulceration is the use of **harmful eye practices**, which may cause severe bilateral corneal ulceration with chemical conjunctivitis. The treatment is initially with antibiotics. **Leprosy** may also cause corneal ulceration from exposure of the cornea due to inability to close the eyelids (LAGOPHTHALMOS). This is discussed in the section on leprosy (see Section 2.4.3).

Treatment

The treatment of corneal ulcer is that of the cause - page 195. Atropine ointment 1%, three times/day and an eye pad are usually recommended as well.

Complications

Corneal ulceration may lead to:

a) Diffuse scarring of the cornea
b) Leucoma formation - a dense white scar
c) Perforation of the cornea with adherent iris and possibly staphyloma formation
d) Loss of intra-ocular contents with or without infection (endophthalmitis) leading to phthisis bulbi.

N.B. Staphyloma and endophthalmitis are two of the commonest causes of a blind to light (NPL) painful eye for which the patient may require REMOVAL OF THE EYE. If the patient consents to this procedure, it can be performed in one of two ways:

- Evisceration - the cornea and contents of the eye are removed but the scleral shell and optic nerve are left. This is an easy operation and usually produces an acceptable socket which can be fitted with an artificial eye.
- Enucleation - the extra-ocular muscles and optic nerve are divided and the whole eye is removed. This is the operation of choice for intra-ocular tumours, e.g. retinoblastoma.

1.3.3 Iritis

Definition

Inflammation of the iris

Causes

a) Trauma/surgery
b) Leprosy
c) Onchocerciasis
d) Others (idiopathic)

Symptoms

a) Pain + +
b) Loss of vision + +
c) Maybe photophobia and lacrimation

Signs

a) Eyelids - normal
b) Conjunctiva - red, with **ciliary injection** around the cornea
c) Cornea - there may be **keratic precipitates** on the inside of the corne
d) Pupil - the pupil is initially small but on dilation may be irregular due to **posterior synechiae**

Special test

Dilate the pupil in the clinic with cyclopentolate or phenylephrine and look for posterior synechiae which will confirm the diagnosis.

Treatment

a) Dilate the pupil immediately with cyclopentolate and/or phenylephrine.
b) Give atropine ointment three times a day.

c) Give topical steroids as required to reduce the redness and inflammation. (Usually for 1-4 weeks.)

d) Subconjunctival injection of mydriatics or steroids may be required for very severe cases of iritis where drops alone are insufficient to break the posterior synechiae.

Complications

If posterior synechiae develop, the posterior synechiae may cause secondary opacification of the lens leading to cataract formation. The posterior synechiae may also occlude the pupil, resulting in a pupil block glaucoma with rise in intra-ocular pressure.

1.3.4 Acute glaucoma

Definition

Acute rise in intra-ocular pressure

Causes

a) Primary angle closure

b) Swollen cataract

c) Blunt trauma

d) Iritis

Symptoms

a) Severe pain + + + +

b) Vision is markedly reduced + + + +

c) Maybe headache and vomiting

Signs

a) Eyelids - often swollen

b) Conjunctiva – red

c) Cornea - hazy due to oedema fluid in the cornea

d) Pupil - the pupil is dilated and does not react to light

Special test

Measurement of intra-ocular pressure with Schiotz tonometer (or digital tonometry)

Treatment

Diamox tablets 500 mg immediately followed by 250 mg four times a day. The patient should be referred for treatment of the cause of the glaucoma, e.g. a swollen cataract will require removal. Primary angle closure can also be treated with pilocarpine drops, but pilocarpine should not be used in acute glaucoma due to swollen cataract, trauma or iritis.

Complications

Persistent elevation in intra-ocular pressure, even for one or two days, will damage the optic nerve causing blindness from optic atrophy.

Summary of acute red eye at any age

	Conjunctivitis	Corneal ulcer	Iritis	Acute glaucoma
Pain and vision loss	+	+ + +	+ +	+ + + +
Cornea	Normal	Grey spot	Keratic precipitates	Hazy
Pupil	Normal	Normal	Small and irregular	Dilated and inactive
Special sign	Pus	Fluorescein stain	Irregular pupil after dilation	Raised eye pressure

1.4 Acute red eye due to trauma

There are **four** main types of ocular injury:

1.4.1 Blunt injuries

1.4.2 Perforating injuries

1.4.3 Foreign bodies

1.4.4 Burns or chemicals in the eye.

The type of injury can usually be ascertained from taking the history. The visual acuity in each eye should be measured in all patients with ocular injury.

1.4.1 Blunt injuries to the eye

After taking the history and visual acuity the eye should now be examined.

Examination

a) **Eyelids** - there may be bruising in the eyelids. There is no specific treatment for this and it will gradually resolve over 7-10 days.
There may be a *fracture* of one of the orbital bones. This most commonly affects the medial bone (ethmoid), or the inferior orbital bone (maxilla). The clinical signs of an orbital fracture are:

i. Bleeding from the nose - epistaxis

ii. Proptosis of the eye - this may be due to air in the orbit

iii. Anaesthesia of the lower eyelid - due to damage of the infra-orbital nerve

iv. Double vision - on looking up due to entrapment of the inferior rectus muscle in an inferior wall fracture; or on looking out - due to entrapment of the medial rectus in a medial wall fracture.

The *management* of a fracture of the orbit depends on the signs. If there is air in the orbit then the patient should be given systemic antibiotics for seven days. If there is double vision, then the patient should be referred to a specialist for possible surgical exploration of the trapped muscle with a view to releasing the muscle from the fracture.

b) **Conjunctiva** - there may be a **sub-conjunctival haemorrhage** due to bleeding under the conjunctiva. There is no specific treatment for this and it will resolve over 7-10 days.

c) **Cornea** - there may be an *abrasion* of the cornea, which will present as an acutely painful eye. This pain will be relieved by local anaesthetic drops and the diagnosis can be confirmed by fluorescein staining of the cornea. The treatment is with antibiotic eye ointment and an eye pad for 24 hours.

d) **Pupil** - the pupil may be *distorted,* or not visible, due to blood in the anterior chamber (**hyphaema**). It is useful to think of hyphaema in two forms. The non-painful variety will usually settle with conservative treatment i.e. bedrest, antibiotic eye ointment and an eye pad for five days. A painful hyphaema may be due to a rise in intra-ocular pressure due to the hyphaema. The eye will be very painful and the pressure will be raised. In this situation, the patient should be given Diamox 250 mg four times a day, and if the hyphaema and glaucoma do not resolve in 48 hours, then surgery may be required to remove the blood from the anterior chamber by paracentesis.

After blunt injury the pupil may be distorted due to *tears in the iris*. This may result in a dilated pupil or an irregular pupil. Occasionally the lens may be damaged by a blunt injury, and there may be **cataract** formation or *dislocation of the lens*. Dislocation of the lens may also cause a rise in intra-ocular pressure, and if this occurs the patient should be referred for possible lens extraction.

The above conditions are the common and more treatable problems arising from blunt injury to the eye. Blunt injury may also damage the posterior segment of the eye and cause vitreous haemorrhage, retinal oedema and haemorrhage, retinal tears and even optic nerve damage. These conditions are less common and usually not easily remediable.

1.4.2 Perforating injury

Having taken a history and visual acuity, which will suggest that the injury is due to a sharp object and may result in perforation of the eye, it is now important to very *gently examine the eye.*

Examination

a) **Eyelids** - there may be lacerations of the eyelids. If these do not involve the lower canaliculus or the lid margin, they can be sutured simply. If the lid margin is involved, then very careful suturing with close apposition of the two edges of the lid margin is required to avoid notching of the margin. If the lower canaliculus has been torn, then the patient will require specialist management to avoid a permanently watering eye from canalicular stenosis.

b) **Conjunctiva** - there may be lacerations of the conjunctiva, but these usually do not require any suturing.

c) **Cornea** - a perforating injury of the eye will usually involve the cornea, and prolapsed uveal tissue will be seen on the surface of the eye.

d) **Pupil** - this will be distorted by the prolapse of iris and the anterior chamber is likely to be shallow. There may also be hyphaema and damage to the lens with cataract formation. This

basic examination of the eye must be undertaken very carefully, making sure that no pressure is placed on the globe as this may result in further prolapse of intra-ocular contents.

Treatment

The first aid management of a perforating injury includes:

a) Administration of tetanus toxoid
b) Antibiotic to the eye (preferably drops)
c) Atropine to the eye (preferably drops)
d) Eye pad.

The patient should then be referred urgently to an eye specialist for admission and treatment. Fresh perforations may be treated surgically by cleaning the wound, excising prolapsed and dead tissue, and resuturing the wound edges with fine sutures followed by reformation of the anterior chamber. With older perforations (after five days) it may be best to treat conservatively with topical antibiotics and atropine.

1.4.3 Foreign bodies

Having taken the history and visual acuity a foreign body may be looked for by performing the following examination.

Examination and treatment

a) Eyelids - evert the eyelid and look for a sub-tarsal foreign body on the tarsal conjunctiva. This can be simply removed with cotton wool or a piece of paper.

b) Conjunctiva - examine the conjunctiva to see if a foreign body is in the conjunctival sac. This again can simply be removed with cotton wool or a piece of paper.

c) Cornea - examine the cornea to see if a foreign body is embedded on the cornea. If the foreign body is superficial, then follow the **four L** practice as follows:

1. **L**ie the patient flat
2. **L**ocal anaesthetic drops are applied
3. **L**ight, to give good illumination of the eye
4. **L**ift off the foreign body with the corner of a piece of paper, a matchstick or suitable instrument.

The patient should then be given tetracycline eye ointment and an eye pad for 24 hours and seen the next day.

Sometimes the corneal foreign body will be deep, for example a thorn in the cornea. If this is the case it may still be possible to remove the foreign body as above, using a pair of forceps and withdrawing the foreign body in the direction in which it entered the cornea. It is then usually advisable to give a subconjunctival antibiotic injection. If the foreign body is too deeply embedded then it will be necessary to take the patient to the operating theatre and, under full local anaesthesia, perform an operation to remove the foreign body.

d) Pupil - occasionally following explosive injuries or an injury where a hammer strikes another piece of metal and a foreign body enters the eye, the foreign body may penetrate the protective layer of the eye and enter right inside. Such an **intraocular foreign body** (IOFB) is of great

danger to the eye, but fortunately this is a relatively rare injury. The IOFB may be visible in the anterior chamber; otherwise after dilating the pupil the IOFB may be seen in the lens, vitreous or on the retina. If an intra-ocular foreign body is suspected, the patient should be referred immediately to a specialist after giving topical antibiotics and atropine. If the IOFB can *be* located it may be possible to remove the IOFB by surgery. However the prognosis for an eye with an **intra-ocular foreign body** is usually poor.

1.4.4 Burns and chemicals

a) **Burns**

Burns of the eye may affect the eyelids, conjunctiva or cornea. It is most important to keep the cornea moist and free from exposure. The first aid management is to apply ointment generously all over the conjunctiva, cornea and burned eyelids. An eye pad should *not* be placed over the eye as this may ulcerate the cornea; instead, ointment should be applied every hour to the exposed cornea. The patient should be referred to a specialist who may perform plastic surgery (either a skin graft or tarsorrhaphy) to protect the cornea,

b) **Chemicals**

The first aid management of chemicals in the eye is immediate and profuse irrigation with water. The patient should lie flat while water is poured into the eye generously for 10-15 minutes. After this time the eye can be examined to see if there is any evidence of corneal ulceration, which can be looked for with fluroescein staining. If there is ulceration, the patient should be given antibiotics, atropine and an eye pad and seen daily.

If concentrated sulphuric acid (car battery acid) or caustic soda (lime) have entered the eye, then this is a much more serious situation. Again the eye should be irrigated profusely for 15 minutes, and then the patient should be immediately referred to hospital for continuous irrigation with a normal saline drip into the eye for 48 hours. Sulphuric acid and lime burns of the eye may lead to severe corneal ulceration, permanent corneal scarring and blindness if they are not vigorously treated.

In summary therefore, **burns** of the eye must be kept *lubricated* and **chemicals** in the eye must be thoroughly *irrigated.*

2 Inability to see - blindness

The symptom of 'cannot see' is a common presenting symptom of eye patients. The causes of loss of vision are many but can, for simplicity, be divided into four main groups of diseases.

2.1 Diseases of the cornea - corneal scar.

2.2 Diseases of the lens - cataract.

2.3 Diseases of optic nerve - glaucoma, optic atrophy.

2.4 Other causes of loss of vision:

- 2.4.1 Bilateral loss of vision
- 2.4.2 Acute unilateral loss of vision
- 2.4.3 Leprosy
- 2.4.4 Onchocerciasis.

The term 'blindness' refers to a loss of vision which results in the patient being unable to continue with a normal lifestyle. Various definitions for blindness are used of which the most common is:

'Inability to walk by oneself because of loss of vision, usually equivalent to a binocular vision of less than 3/60, less than CF3m.'

The prevalence of blindness varies greatly from country to country and region to region within countries. However, on average it can be said that in industrialised countries 2 people per 1000 are blind compared with 5-20 per 1000 in developing countries. Areas which have blindness from trachoma and onchocerciasis usually have even higher rates of blindness than this, ranging from 10-50 per 1000 total population.

Overall it is estimated that there are as many as 30 million blind people in the world. Nearly half of all the blindness is due to cataract and a quarter of the world's blindness is due to trachoma. Other major causes of blindness are glaucoma, onchocerciasis and xerophthalmia.

The major causes of blindness in both eyes are:

2.1 Corneal scar - trachoma, xerophthalmia, ophthalmia neonatorum, bacterial corneal ulceration, and harmful eye practices

2.2 Cataract

2.3 Optic nerve disease - glaucoma and onchocerciasis

2.4 Other diseases - these include macula degeneration, retinitis pigmentosa, diabetic retinopathy and myopia with its complications.

2.1 Corneal scar

Corneal scarring may account for up to a quarter of all patients with blindness.

The types of scarring can be considered under four main groups:

a) Diffuse scar - scar all over the cornea

b) Leucomas - dense white scar in part of the cornea

c) Staphyloma - bulging forward of the cornea

d) Phthisis bulbi - small shrunken eye.

Aetiology

The common causes of *bilateral* corneal scarring are:

a) Ophthalmia neonatorum
b) Vitamin A deficiency
c) Harmful eye practices (HEP)
d) Trachoma.

Common causes of *unilateral* corneal scarring include:

a) Bacterial ulceration
b) Herpetic ulceration
c) Trauma
d) Other rarer causes of corneal ulcer, e.g. fungal infection, leprosy.

Treatment

The management of corneal scar in developing countries is difficult. The majority of patients cannot be helped by medical or surgical treatment. The possibilities for treatment are:

a) **Optical iridectomy** - create an artificial pupil. Optical iridectomy can be performed on *one* eye of a **blind** patient who has a central leucoma. It is a relatively simple operation but the visual results are limited.
b) **Corneal grafting** - replaces a corneal scar with a new clear cornea from a donor eye. Corneal grafting can be performed on *one* eye of a **blind** patient with **diffuse scarring** containing only a few or no vessels. It is very difficult to get donor material for corneal grafting and the rejection rate is high, unless there is careful follow-up and the use of long-term topical steroids. For these reasons it is not practical in most situations to undertake corneal grafting in developing countries.
c) **Removal of the eye** - is indicated in patients with a **blind to light painful eye**.
d) The **remainder** of patients with either unilateral corneal scars, phthisis, or scars which do not cause blindness, require no treatment.

Corneal scarring is a major cause of blindness which is difficult to treat. However, the causes of corneal ulcer which lead to scarring are relatively easy to prevent. Corneal scarring accounts on average for 70% of blindness in children in Africa, and 25% of blindness in adults.

2.2 Cataract

Cataract is the single most important cause of blindness in the world. There are an estimated 15 million people blind from cataract in the world of which 3 million live in Africa. On average one in every 200 people is blind from cataract in Africa.

Causes

a) **Congenital** - rubella infection and familial
b) **Traumatic** - perforating and blunt injuries
c) **Secondary** - eye disease (iritis) and systemic diseases (diabetes)
d) **Senile** - no definite cause known.

The most common cause of cataract is the senile variety which represents about 85% of all cataracts. There is no proven way of preventing senile cataract, although it is a very treatable disease.

Types of cataract

Cataracts can be classified into different types according to their appearance:

a) **Immature** - this is a partial cataract in which some of the lens has become opaque. It can be further sub-divided into:
    i. Anterior cortical
    ii. Nuclear sclerosis
    iii. Posterior cortical.

a) **Mature** - the total lens has now become opaque.
b) **Intumescent** - all the lens is opaque and the lens is swollen due to absorption of water. The intumescent (swollen) cataract may push the iris forward and occlude the angle of the eye causing a secondary glaucoma. This will present as an acute red painful eye with a hazy cornea, shallow anterior chamber and fixed dilated white pupil with high intra-ocular pressure.
c) **Hypermature** - the lens is completely opaque but is now small and wrinkled due to loss of water.
   Occasionally the hypermature type of cataract may cause a **secondary iritis** due to leakage of lens protein from the lens into the anterior chamber. This may also lead to a secondary glaucoma due to blockage of the trabecular meshwork with cells and lens protein.
d) **Clinical signs and symptoms**

Cataract usually presents as gradual loss of vision in one or both eyes. On examination the visual acuity is reduced, the conjunctiva is white, the cornea is clear, and there is an opacity in the pupil. Immature cataracts cause a grey opacity in the pupil, while mature, intumescent and hypermature cataracts give a white pupil.

Assessment of cataract for surgery

In deciding whether to refer a patient for cataract surgery, the following four examinations must be performed:

a) **Visual acuity** - the visual acuity must be accurately measured in each eye.

b) **Pupil reaction** - in cataract there is a normal brisk reaction of the pupil. If the pupil does not react briskly to light, other diseases, for example optic nerve disease, should be suspected as the cause of the loss of vision.

c) **Tonometry** - measurement of the intra-ocular pressure is important to see if the cause of loss of vision may be due to glaucoma.

d) **Ophthalmoscopy** - after dilating the pupil the fundus should be examined with an ophthalmoscope for the red reflex to assess how dense the lens opacity is. This is particularly important in immature cataracts. If it is still easily possible to visualise the optic disc and fundus then the lens opacity is not yet dense enough to warrant cataract extraction.

Treatment of cataract

There are **four** possible treatments:

a) **Cataract extraction** - is indicated in the following circumstances:

   i. To improve the patient's required vision

   ii. To treat a complication of cataract e.g. secondary glaucoma.

b) **Atropine** ointment weekly - this may be indicated in an immature nuclear or posterior cortical cataract which is not yet ready for surgery. The atropine will dilate the pupil and may therefore improve the vision. (There is the possible danger of causing acute glaucoma with atropine, if the anterior chamber is shallow.)

c) **Spectacles** - occasionally the visual loss due to nuclear cataracts is associated with myopia which can be improved by minus (concave) spectacles.

d) **Nil** - in cases of unilateral cataract or bilateral small immature cataracts, no treatment may be indicated at the time but the patient should be reviewed after three to six months.

Management of patients with cataract

Patients presenting with cataract can be considered under fourgroups:

a) **Bilateral cataract** - patients with cataract in both eyes.

b) **Unilateral cataract** - patients with a cataract in one eye and normal lens and vision in the other eye.

c) **Only eye cataract** - patients with a cataract in one eye whose other eye is totally and irremediably blind.

d) **Second eye cataract** - patients who have already had successful cataract surgery in one eye and now have a cataract in the second eye.

Indications for cataract surgery

These correspond to the group the patient is in (opposite). The following are indications for the elderly from rural areas in Africa:

a) **Bilateral cataract** - patients with bilateral cataract should be operated on when the visual acuity is reduced below 6/60 in both eyes i.e. the vision in both eyes is count fingers or less.

b) **Unilateral cataract** - the indication for surgery in unilateral cataract is to treat, or prevent, possible complications of cataract, as the patient's vision in the other eye is good. The patient's vision will not be improved by operating on a unilateral cataract and prescribing aphakic

spectacles. Therefore the indication to operate is to prevent or treat secondary glaucoma or secondary uveitis.

c) **Only eye cataract** - surgery should be delayed on patients with only eye cataract until their vision is so poor that they have difficulty in getting about by themselves. This is because of the possible complications that may follow any cataract operation occurring in a patient who is already totally blind in one eye. It is therefore recommended that cataract on an only eye be delayed until the person's vision is severely restricted i.e. less than count fingers at three metres.

d) **Second eye cataract** - if the patient is already happy with aphakic spectacles provided after the first cataract operation, then cataract surgery can be considered on the second eyeat any time convenient to the surgeon and patient . Because the patient can already see with one eye, priority should be given to patients with bilateral cataracts and only-eye cataract, over those requesting surgery on their second eye.

Nursing care of a cataract patient

Pre-operative

a) Explain the operation and ensure patient's consent.

b) Wash the patient's face and cut the eyelashes.

c) Give treatment as ordered:

i. antibiotics (for 24 hours pre-op)

ii. dilating drops (1 hour pre-op)

iii. local anaesthetic drops (1/2 hour pre-op).

d) Label the eye which is to be operated on.

Operative

a) The operation is usually performed under local anaesthetic.

b) A nurse should stay with the patient throughout the operation.

c) The operation is performed under full sterile conditions.

d) An eye pad is placed over the eye at the end of the operation.

Post-operative

a) The patient should remain in bed until next morning when a *first dressing* is performed by the surgeon.

b) After the first dressing, drugs and dressings should be given as ordered by the doctor.

c) The patient is usually discharged between 1 and 10 days after the operation.

d) The patient will require APHAKIC glasses.

Cataract operation

a) The operation is usually performed under local anaesthetic. This consists of giving a facial nerve block to prevent the patient from closing the eye and a retrobulbar nerve block to anaesthetise the eye and also prevent movement of the eye.

b) The cataract can be removed in two ways:

i. **Intracapsular cataract extraction** in which the whole lens is removed within the capsule of the cataract.

ii. **Extracapsular cataract extraction** in which the anterior capsule is broken and the nucleus and cortex of the lens removed in pieces leaving the posterior capsule in place. Intracapsular cataract extraction is, at present, the preferred method of extraction in developing countries, although extracapsular cataract extraction is safer in younger people, (0-30 years old).
There are various ways in which the cataract may be removed by intracapsular extraction and these include:

i. Cryoextraction
ii. Forceps
iii. Erisophake
iv. Expression.

c) After removal of the cataract the corneal section is sutured, usually with nylon or virgin silk sutures. The number of sutures may vary on the size of the incision, but is usually three to seven.
The patient should rest in bed until the next day when a first dressing is performed.

d) Complications at the time of surgery include:

i. Accidental rupture of the lens capsule when trying to do an intracapsular extraction resulting in accidential extracapsular extraction.
ii. Loss of vitreous after removing the cataract.
iii. Occasionally, bleeding in the eye may be severe and a problem.

Post-operative management

Each day the post-operative cataract patient should be examined and the dressing changed. Early *post-operative complications* include:

a) Infection - **endophthalmitis**. The patient complains of pain in the eye and loss of vision. The eye is red, the cornea hazy and there may be a hypopyon. Treatment is with sub-conjunctival and systemic antibiotics. The prognosis is usually poor.

b) Bleeding - **hyphaema**. There is blood in the anterior chamber. This will usually resolve itself with bed-rest over a few days.

c) Wound leakage - **shallow anterior chamberand iris prolapse**. If there is obvious iris prolapse the patient must have another operation, at which the prolapsed iris is excised and the wound resutured. If the anterior chamber is flat, but without iris prolapse, then a firm pad and bandage for 24-48 hours is advised. If this fails and the wound is still leaking aqueous then it will require resuturing.

d) Rise in intra-ocular pressure - **secondary glaucoma**. There are various reasons for the pressure going up after cataract surgery. One of the more common is pupil block with vitreous. The anterior chamber is flat and the pressure high. Full dilation of the pupil will usually break the pupil block glaucoma, and if there is no patent peripheral iridectomy, then it will be necessary to perform this operation as a secondary procedure.

e) Inflammation - **iritis**. Some degree of iritis is common after cataract surgery, which usually resolves itself spontaneously over a few days. The iritis is more severe after extra-capsular cataract surgery or if vitreous has been lost. In these situations it is advisable to give topical steroids for 1-2 weeks after surgery to suppress the iritis.

f) Damage to the corneal endothelium - **striate keratitis**. If the corneal endothelium has been traumatised then there may be visible corneal oedema known as striate keratitis. This does not require treatment and usually settles in 1-5 days.

The post-operative cataract patient should be examined each day with *particular attention* being paid to:

a) **The wound** - to see that it is tight and there is no evidence of iris prolapse.

b) **The cornea** - to see that it is clear.

c) **The anterior chamber** - to examine the depth and also the contents.

d) **The pupil** - to see if it is circular and also whether there is a red reflex.

Cataract patients are usually kept in hospital for 1-10 days and then given a pair of aphakic spectacles (+10). The actual number of glasses required varies from individual to individual, but on average it is around +10.00 for distance and +14.00 for reading. Aphakic spectacles cause some distortions in vision. Objects appear larger and straight edges may appear curved. The field of vision is also limited with aphakic spectacles.

2.3 Glaucoma

There are many causes of optic nerve disease (optic atrophy), but glaucoma is the most important in Africa.

Other causes of optic atrophy include onchocerciasis (see Section 2.4.4), trauma, fevers in childhood, meningitis and occasionally tumours of the orbit or optic chiasma.

Definition

Raised intra-ocular pressure which damages the optic nerve leading to loss of vision. (The pressure may sometimes be recorded as normal.)

Causes

a) Congenital

b) Secondary

c) Primary angle closure

d) Chronic open angle glaucoma

Mechanism

The intra-ocular pressure may rise because of:

a) Increased secretion of aqueous by the ciliary body

b) Decreased drainage of aqueous due to PUPIL BLOCK

c) Decreased drainage of aqueous due to ANGLE BLOCK

d) Decreased drainage of aqueous due to TRABECULAR BLOCK (see Section B 2.1).

Clinical presentation

Glaucoma may present in two clinical forms:

a) **Acute** - an acute rise in intra-ocular pressure leading to a red painful eye with sudden loss of vision, a hazy cornea, shallow anterior chamber, and fixed dilated pupil. This type of glaucoma may be primary or may be secondary to other diseases such as intumescent cataract, trauma, iritis, and other rarer causes.

b) **Chronic** - chronic rise in intra-ocular pressure over a long period of time causes gradual loss of vision in white eyes. This may be due to chronic open angle glaucoma, or secondary to other diseases e.g. blunt injury, or iritis.
The commonest type of glaucoma leading to loss of vision in Africa is chronic glaucoma which is usually open angle. This disease is usually bilateral, but may be asymmetrical. It may occur at any age but is more common after the age of 30. The cause is unknown, but it is believed that the obstruction to drainage is at the level of the trabeculum (trabecular block).

Clinical manifestations

There are four important clinical manifestations of chronic glaucoma:

a) **Loss of vision** - this starts as a loss of visual field, followed by a loss of visual acuity, and finally complete loss of light perception.

b) **Abnormal pupil responses** - this begins as a *relative* pupil defect in which one pupil does not react as well as the other to the swinging torch test. Further damage of the optic nerve leads to a *partial* pupil defect in which there is a sluggish response of the pupil, and finally there is a *total* pupil defect in which there is no response at all to light.

c) **Raised intra-ocular pressure** - this can be demonstrated either by digital tonometry which is easy but unreliable, Schiotz tonometry which is relatively easy and fairly reliable, or applanation tonometry, which is more difficult to perform, but which is very accurate. Using a Schiotz tonometer with a 5.5 gm weight, a reading of 2 or less is indicative of high pressure (more than 28 mms Hg), and a reading of 4 or above is indicative of normal pressure (less than 21 mms Hg).

d) **Cupping of the disc** - optic nerve damage can be demonstrated by looking at the optic disc with an ophthalmoscope. In chronic glaucoma the **C**onfiguration of the disc is abnormal, with a cup:disc ratio of more than 0.5, the **C**olour of the disc is pale -not pink, and **C**omparison of the two eyes of the patient may reveal asymmetry in size and colour between the discs. All these findings suggest glaucoma.

In summary, therefore, chronic glaucoma can be suspected in a patient with loss of vision as demonstrated by the **T**est **T**ype, an abnormal pupil response demonstrated with a **T**orch, and raised intra-ocular pressure demonstrated with the **T**onometer. Definite cupping of the disc on ophthalmoscopy will confirm the diagnosis and in late cases there may also be a hazy cornea due to corneal oedema.

Management of chronic glaucoma

There are **four** possible managements:

a) **Topical medical therapy** - pilocarpine or timolol. These drugs must be taken regularly for the rest of the patient's life. Their disadvantages are poor patient acceptance and the expense of buying the drugs.

b) **Systemic treatment with Diamox** - this also must be taken four times a day for the rest of the patient's life. It has the disadvantage of causing lethargy and other more serious side effects.

c) **Trabeculectomy** - this relatively simple operation has a reasonable success rate and is the recommended treatment of choice in patients with glaucoma who still have useful vision to save. The operation does not improve the vision but only preserves what remaining vision there is.

d) **Nil** - in patients who are already blind (that is they cannot see to walk by themselves) no therapy will restore the eyesight and no treatment can be recommended.

2.4 Other causes of loss of vision

Discussed under this heading are:

2.4.1 Other causes of *bilateral* visual loss

2.4.2 Causes of *acute* loss of vision in *one* eye

2.4.3 Leprosy

2.4.4 Onchocerciasis.

2.4.1 Other causes of bilateral visual loss

Other causes of loss of vision in both eyes besides corneal scar, cataract and glaucoma include:

a) Refractive errors

b) Uveitis

c) Diseases of the macula of the retina

d) Diseases of the periphery of the retina.

a) **Refractive errors** - can usually be diagnosed from the fact that the visual acuity improves with pin-hole examination. The common refractive errors are:

i. Myopia

ii. Hypermetropia

iii. Astigmatism

iv. Presbyopia.

These are discussed in more detail later, under 'Refractive errors' (see Section 3, page 215).

b) **Uveitis** - may be unilateral or bilateral and presents as fairly sudden loss of vision over several days in a white eye or, sometimes, a red eye associated with an anterior uveitis. The causes of posterior uveitis are often unknown but may be due to toxoplasmosis or toxocariasis infection. If there is a specific cause, e.g. toxoplasmosis, then treatment with Daraprim and sulphonamides is

recommended, otherwise a trial of systemic steroids may be given to see if there is any improvement.

c) **Diseases of the macula** include - senile macular degeneration, chloroquine maculopathy and other less common forms of macular disease. Occasionally infections with toxocara or toxoplasma may affect the macular area.

d) **Diseases of the periphery of the retina** - may cause gradual loss of vision in both eyes. Retinitis pigmentosa is a familial disease which presents as gradual loss of vision in both eyes over several years, often starting in adolescence. The ophthalmoscopic findings are typical, with black pigmentation starting in the periphery and gradually approaching the optic nerve. The pigmentation often follows the distribution of the blood vessels.

In general, diseases of the retina are less common than corneal scar, cataract and chronic glaucoma. Diseases of the retina are usually not treatable.

2.4.2 Acute unilateral loss of vision in a white eye

Occasionally patients may present with sudden loss of vision in one eye. The common causes of this presentation are:

a) Posterior uveitis
b) Retinal detachment
c) Optic neuritis
d) Retinal vessel occlusion.

a) **Posterior uveitis** - this may present as loss of vision over one or two days in a red or a white eye. There may be signs of an anterior uveitis. After dilation of the pupil the vitreous will appear hazy and the view of the fundus is indistinct. Causes of posterior uveitis include toxoplasmosis and toxocariasis. If no specific cause can be identified, a trial of systemic steroids may be used.

b) **Retinal detachment** - the patient may complain of a flash of light, followed by a black floating 'cobweb' in the vision which gradually gives way to a shadow or curtain moving across the vision, eventually causing complete loss of vision in the eye.
After dilation of the pupil, examination with an ophthalmoscope will reveal an abnormal red reflex in one area of the retina, with elevation and abnormal tortuosity of the vessels and retina. Patients diagnosed as having a retinal detachment should be referred urgently to an eye specialist. Retinal detachment is more common in people with high myopia, aphakia or injury to the eye.

c) **Optic neuritis** - this presents as sudden loss of vision in one or both eyes. It sometimes follows the use of drugs or methyl alcohol. Occasionally it occurs without any known cause. Examination reveals severe loss of vision with an absent pupil light reflex. Ophthalmoscopy may show an absolutely normal optic nerve (retrobulbar neuritis) or a swollen optic disc (papillitis). A trial of systemic steroids is justified in severe bilateral cases.

d) **Retinal vessel occlusion** - occlusion of the central retinal artery or central retinal vein may cause sudden loss of vision to the patient. Central retinal artery occlusion reveals a pale oedematous retina on ophthalmoscopy, with a cherry red spot at the macula. Central retinal vein thrombosis on the other hand shows a swollen disc with multiple haemorrhages all over the retina. There is no specific treatment for these conditions, although an underlying cause in the cardiovascular system or blood

may be looked for. Central retinal vein thrombosis occasionally causes a secondary glaucoma three months after the thrombosis, which is known as neovascular glaucoma.

2.4.3 Leprosy

Leprosy is a chronic infection of skin and nerves caused by the bacteria *Mycobacterium leprae.*

Leprosy can affect the eyes by damaging the nerves to the eye, or by causing an inflammation in the iris - iritis.

Clinical signs of ocular leprosy

a) **Eyelids** - the most important effect of leprosy on the eyelids is to cause paralysis of the muscle which closes the eye: orbicularis oculi. This muscle is supplied by the facial nerve (seventh cranial nerve) which may be paralysed in leprosy. The inability to close the eye is called lagophthalmos. Inability to close the eye leads to exposure of the cornea and resultant corneal ulceration, scarring and blindness.

b) **Conjunctiva** - this is not specifically affected by leprosy.

c) **Cornea** - leprosy may affect the ophthalmic nerve which is a branch of the trigeminal (fifth cranial nerve). This results in anaesthesia of the cornea. The patient does not blink as much as usual and may also be unaware of minor trauma to the cornea. This can cause corneal ulceration , scarring and blindness. The cornea may also be ulcerated from exposure due to lagophthalmos.

d) **Pupil** - in leprosy there may be acute iritis with a red painful eye, and small irregular pupil. This may occur as part of the ENL (Erythema Nodosum Leprosum) reaction when a leprosy patient is treated with anti-leprosy drugs. Leprosy may also cause a chronic silent or quiet iritis in which the pupil is very small and irregular, and will not dilate. The eye is usually white in chronic iritis.

Ocular examination of a leprosy patient

a) Visual acuity - it is always very important to measure the visual acuity in each eye of a leprosy patient.

b) Eyelid closure - ask the patient to gently close his eyes and observe whether there is any lagophthalmos with corneal exposure.

c) Fluorescein staining - using fluorescein, examine the cornea for evidence of exposure keratopathy or corneal ulcer.

d) Dilate the pupil - give short-acting pupil dilators (e.g. cyclopenolate 1%) to examine the pupil for evidence of posterior synechiae due to iritis.

Treatment

a) **Lagophthalmos** - if there is evidence of lagophthalmos it may be necessary to protect the cornea at night when the patient is asleep by applying ointment, and possibly strapping the upper eyelid to the cheek. If the lagophthalmos is severe and permanent, or if there is any evidence of corneal ulceration, then a lateral tarsorrhaphy will be required to protect the cornea. A lateral tarsorrhaphy consists of sewing the upper and lower eyelids together over the lateral third of the eyelid margins.

b) **Corneal anaesthesia** - if there is evidence of corneal anaesthesia without ulceration then the patient should be taught *think-blink*. This requires the patient to consciously think about blinking and so protect the cornea by regularly blinking.

c) **Corneal ulcer** - in the presence of frank corneal ulceration the patient should be treated with topical antibiotics and atropine. If there is lagophthalmos or corneal anaesthesia a lateral tarsorrhaphy should be performed.

d) **Iritis** - in acute iritis the pupil should be dilated immediately and the patient kept on atropine and topical steroids. In chronic iritis it is important to keep the pupil dilated and to maintain the patient on mydriatics for life.

Many leprosy patients become blind from corneal scarring due to exposure of the cornea from lagophthalmos and corneal anaesthesia. This can be prevented by early recognition of the problem, and educating the patient to protect his cornea during the day by blinking, and at night with ointment and strapping of the eyelid to the cheek. If these measures fail to protect the cornea, then a permanent lateral tarsorrhaphy is required. Leprosy patients also become blind because of secondary cataract and secondary glaucoma as a consequence of iritis. If there is any evidence of iritis in a patient with leprosy it is very important to dilate immediately the pupil and keep the patient on atropine for as long as there is any evidence of iritis.

2.4.4 Onchocerciasis

An infection of the skin and eye of man due to *Onchocerca volvulus.*

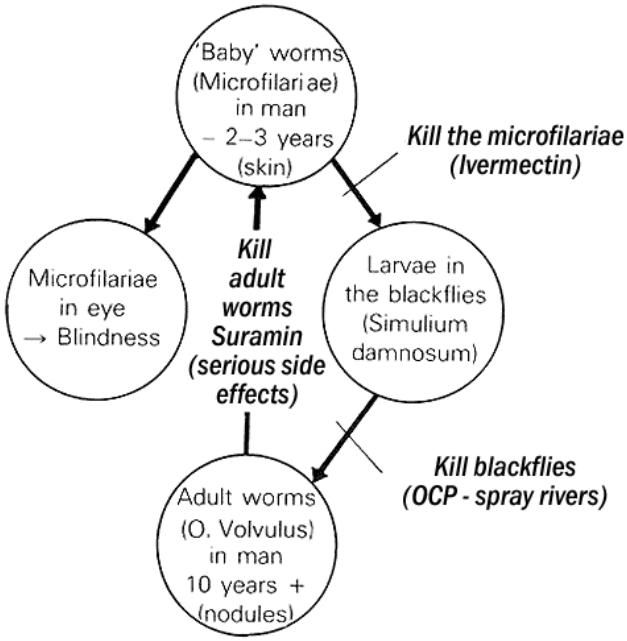


Figure 40 Natural life cycle of onchocerciasis

Skin signs of disease

a) Dermatitis causing roughened skin
b) Dermatitis causing atrophic depigmented skin
c) Dermatitis causing itching
d) Nodules, usually over bony prominences

Eye signs of onchocerciasis

a) Inflammation of the cornea - acute punctate **keratitis**, which may lead on to **sclerosing keratitis** and corneal scar.
b) Inflammation of the iris - iritis, which causes posterior synechiae and peripheral anterior synechiae, leading to **secondary glaucoma**.
c) Inflammation of the choroid and retina - **chorioretinitis,** which causes night blindness, with **chorioretinal atrophymost** marked temporal to the macula.
d) Inflammation of the optic nerve - **optic neuritis** leading to secondary **optic atrophy** which is the major cause of visual loss in onchocerciasis.

Control of onchocerciasis infection

There are various forms of possible control of onchocerciasis:

a) **Control of the adult worms:**
   i. Suramin - this drug is given as a weekly intravenous injection over six weeks to kill the adult worms. It is effective but has serious side effects and should only be given to hospitalised patients. It is therefore not a very practical drug for the majority of patients with onchocerciasis.
   ii. Nodulectomy - surgical removal of the nodules (adult worms) is often performed in an effort to reduce the amount of infection. It is unlikely to be of benefit to elderly patients, and possibly should be reserved for patients under the age of 30 with head nodules or nodules on the upper body.

b. **Control of the microfilaria:**
   i. Diethylcarbamazine (DEC) - this drug kills the microfilaria, but in so doing often causes severe pruritus and other reactions in the body including inflammation in the eye. It is now not recommended to use this drug for treating onchocerciasis. DEC has no effect on the adult worm.
   ii. Ivermectin - is a new drug which kills the microfilaria. It is given as a once oral dose and is probably effective for 6-12 months. It has the advantage of being relatively free of the reactions which are caused by DEC. This drug can now be used to treat patients and communities with proven onchocerciasis. The experience so far gained with ivermectin has shown it to be a safe, easily administered, highly effective drug against onchocerciasis.

c. **Suppression of inflammation** - topical steroids may be used to suppress the inflammatory aspects of keratitis and iritis. Systemic steroids are also used in cases of papillitis associated with onchocerciasis.

b) **Vector control** - community programmes for the prevention of blindness from onchocerciasis have mainly focused on reducing the number of Simulium flies by spraying the rivers where the

vector breeds. This has been done since 1976 in seven of the West African countries. This programme, the Onchocerciasis Control Programme, was extended to four other West African countries in 1986.

Management of patients with ocular onchocerciasis

Important aspects in the management of patients with onchocerciasis in order to prevent blindness are:

a) Treatment of patients with Ivermectin 150 ug/kg once/year.
b) Early treatment of iritis and keratitis with topical steroids and atropine.
c) The early diagnosis and management of secondary glaucoma. This may include topical steroids, atropine, Diamox, and possibly trabeculectomy if required.
d) The treatment of active acute papillitis with systemic steroids.

As already mentioned, the value of nodulectomy is questionable, although it is probably reasonable to remove nodules from the head and upper body of younger patients.

3 Refractive errors

Many patients over the age of 40 have difficulty in reading. This condition is called presbyopia. Other refractive errors are more difficult to diagnose and treat. The refractive errors are:

3.1 Myopia
3.2 Hypermetropia
3.3 Astigmatism
3.4 Presbyopia.

3.1 Myopia

The person has difficulty seeing in the distance (reduced visual acuity) but usually no difficulty in seeing near objects. The condition usually starts between ages 5 and 20, and may gradually get worse up to the age of 25. It is corrected by *minus spherical lenses,* which may be different in the two eyes. The spectacles are usually worn for distance and reading. (See Section B 2.4)

3.2 Hypermetropia

This occurs usually in young people who may present in childhood with a **squint**, or in adolescence with headaches and **eyestrain**when reading. The visual acuity is usually normal, although this will begin to fall around the age of 40 if the hypermetropia is not corrected. The treatment is with *plus spherical lenses,* usually worn for distance and reading. (See Section B 2.4)

3.3 Astigmatism

The refractive error of the eye is different in different axis of direction (e.g. maybe +1.00 vertical and +2.00 horizontal, or -2.50 vertical and +1.00 horizontal). Astigmatism causes a reduction in visual acuity for distance as well as headaches and blurring of vision when doing a lot of close work. It is treated with *cylindrical lenses* of the appropriate power.

3.4 Presbyopia

This is caused by failure of the lens of the eye to change shape (ACCOMMODATION) when focusing from distant objects to near ones. This difficulty usually begins around the age of 40.

Features of Presbyopia

a) The patient complains of difficulty in seeing near objects (e.g. reading, sewing), which is getting worse with increasing age.

b) The patient is usually aged 40 or over.

c) The corrected visual acuity for distance is normal (the patient may or may not have a refractive error for distance - see above).

d) The difficulty in reading is treated by giving plus spherical lenses (of equal power to both eyes) usually following these guidelines:

   i. age 45 approximately +1.0

   ii. age 55 approximately +2.0

   iii. age 65 approximately +3.0

Presbyopic glasses are only worn for close work.

4 Other eye diseases

There are a great many eye diseases which 'have not been mentioned so far in the text. In this section, a few of the more important eye diseases which affect the ocular adnexae are discussed. Following the system used to describe the anatomy of the orbit, we will discuss these other eye diseases under four sections:

4.1 Diseases of the orbital bones and sinuses (Section B 1.2.1).

4.2 Diseases of the muscles and nerves (Section B 1.2.2).

4.3 Diseases of the eyelid (Section B 1.2.3).

4.4 Diseases of the nasolacrimal apparatus (Section B 1.2.4).

4.1 Diseases of the orbital bones and sinuses

4.1.1 Proptosis

Definition

Protrusion of the eye out of the orbit due to a space occupying lesion in the orbit.

Causes:

	Children	Adults
ACUTE (history of less than 3 months)	Retinoblastoma (0-5 yrs) Orbital cellulitis Burkitt's lymphoma (5-15 yrs) Metastases	Orbital cellulitis Pseudotumour Dysthyroid eye disease Lacrimal carcinoma
CHRONIC (history of 3 months or more)	Vascular abnormalities in the orbit Optic glioma	Lacrimal adenoma Frontal mucocoele Meningioma Hydatid cyst

Diagnosis and management

a) **Retinoblastoma** - a malignant tumour of the retina which may be familial and may be bilateral. The first sign can be a squint, followed by a white/yellow reflex in the pupil known as leucocoria. Enucleation of the eye or radiotherapy at this stage may save the child's life. If left untreated, the tumour spreads along the optic nerve causing proptosis. The prognosis for life at this stage, even with exenteration of the orbit, is poor.

b) **Orbital cellulitis** - infection may enter the orbit from the sinuses or from trauma. There is a sudden onset of fever with swollen eyelids and proptosis. Treatment is with intensive systemic antibiotics. Orbital cellulitis may lead to cavernous sinus thrombosis with uni- and then bilateral proptosis, venous engorgement and total paralysis of ocular movements. Treatment is with systemic antibiotics.

c) **Burkitt's lymphoma** - this unusual tumour typically occurs between the ages of 5 and 15. The orbit is one of the common sites. There is a rapid onset of usually painless proptosis in which the eye appears relatively normal. Treatment is with cytotoxics, e.g. cyclophosphamide 40 mg/kg IV one dose. This can be repeated after two weeks but only if the blood picture is reasonably normal.

d) **Metastases** - in children the orbit may be the site of secondary deposits from neuroblastoma or acute leukaemia. In adults breast or lung carcinoma may give secondary deposits in the orbit.

e) **Pseudotumour** - this is a condition of unknown cause which typically affects people aged 15-35. Over the course of 1-2 weeks there is uni- or bilateral proptosis with or without paralysis of the extra-ocular muscles. All investigations are normal. The condition responds to high dose systemic steroids which can be tailed off over 4 weeks, although a maintenance dose of prednisolone 5 mg/day may be required for 3-6 months.

f) **Dysthyroid eye disease** - Bilateral or unilateral proptosis may be associated with abnormalities of the thyroid gland. It is more common in middle-aged women. Besides signs of thyroid dysfunction there may be lid retraction and limitation of ocular movements. If the patient is thyrotoxic, this should be treated. If the proptosis threatens vision then systemic steroids may be used and, if this fails, an operation to decompress the orbit can be performed.

g) **Lacrimal carcinoma** - this is a rare malignant tumour of the lacrimal gland usually occuring in elderly people. If diagnosed early surgical removal may be attempted, but the prognosis is poor.

h) **Vascular abnormalities of the orbit** - these may be present at birth, develop during childhood or appear for the first time in adults. They include cavernous and capillary haemangiomas, arterio-venous fistulae and venous varices. Treatment is usually not necessary.

i) **Optic glioma** - this is a slow growing benign tumour of the optic nerve. There is loss of vision with optic atrophy and then unilateral proptosis. Treatment is usually not indicated.

j) **Lacrimal adenoma** - a benign but locally invasive tumour of the lacrimal gland. There is gradual proptosis over months or years with a palpable tumour in the superior-temporal quadrant of the orbit. Treatment is total excision of the tumour with the lacrimal gland.

k) **Frontal mucocoele** - this is a cystic swelling originating from the frontal sinus. There is slowly progressive proptosis with a palpable tumour in the superior-nasal quadrant of the orbit. Treatment is by surgical drainage.

l) **Meningioma** - a benign, slowly growing tumour which may affect the sphenoid bone or the optic nerve. There is gradual proptosis, paralysis of eye movements and loss of vision. There is no satisfactory treatment. Diagnosis can usually be made on the x-ray showing sclerotic appearances.

m) **Hydatid cyst** - in parts of Africa, particularly northern Kenya, hydatid disease is common, and it may cause proptosis. Very careful surgical excision can be performed, but it is important not to rupture the cyst.

In summary, **proptosis** is a fairly uncommon but important and usually serious condition. The age of the patient and rapidity of onset should give an idea as to the diagnosis. Examination of the eye, ocular movements and palpation of the orbital rim for tumours will usually enable a provisional diagnosis to be made. In most situations, further investigations are not possible and the patient should be referred to a specialist if possible, or a trial of therapy may be tried if indicated and if referral is not possible.

4.2 Diseases of the muscles and nerves

Diseases of the muscles and nerves include four relatively common conditions:

4.2.1 Strabismus (squint)
4.2.2 Diplopia (double vision)
4.2.3 Ptosis
4.2.4 Lagophthalmos.

4.2.1 Strabismus

Strabismus is when the eyes are not straight. It usually starts in early childhood. The squint may be in-turning (**esotropia**) or out-turning (**exotropia**). If left untreated a squint in childhood can lead to disuse of the eye, with suppression of the visual stimuli leading to loss of vision known as **amblyopia**.

Treatment

It is possible to treat amblyopia and recover vision up to about the age of 8. However, once the child is aged 8 or older the amblyopia will usually remain for life.

If a child is diagnosed as having a squint before the age of 8 he should be referred to a specialist for treatment. Treatment may include:

a) Correction of any refractive error with spectacles.
b) Treatment of any amblyopia with intermittent occlusion of the good eye.
c) Surgery, if required, to straighten the eyes.

If a child, aged 8 or more, or an adult is diagnosed as having a squint and/or amblyopia, then there is no specific treatment. The only reason then for surgery would be to correct the squint to improve the cosmetic appearance.

4.2.2 Diplopia

Diplopia means double vision.

Causes and Treatment

There are many causes, of which some are serious in nature:

a) **A sixth nerve (abducens) palsy** - will cause diplopia with a convergent squint and inability to look out with the affected eye due to paralysis of the lateral rectus muscle. Causes of sixth nerve palsy are hypertension, diabetes mellitus and raised intra-cranial pressure. Treatment is that of the cause.
b) **A third nerve (oculomotor) palsy** - causes ptosis, the eye is displaced down and out and cannot look up or in. The pupil may be dilated. Causes of a third nerve palsy are hypertension, diabetes and brain aneurysms. Treatment is that of the cause.

   Patients with definite diplopia should be referred to a specialist quickly.
c) **Myasthenia gravis** - a disease causing weakness of muscles.
d) **Any cause of proptosis**, e.g. thyroid eye disease.

4.2.3 Ptosis

Ptosis is an inability to open the eye normally.

Causes

a) Congenital
b) Traumatic
c) Oculomotor palsy
d) Muscular diseases, e.g. myasthenia gravis

Patients with ptosis should be referred to a specialist to confirm the cause and decide whether ptosis surgery will be of benefit or not.

4.2.4 Lagophthalmos

Lagophthalmos is an inability to close the eye. It is usually due to paralysis of the orbicularis oculi muscle following facial nerve paresis. It is an important sign and complication of leprosy. The management of lagophthalmos is discussed under Section 2.4.3.

4.3 Disease of the eyelids

These are discussed under four headings:

4.3.1 Skin tumours
4.3.2 Meibomian cysts/hordeolum
4.3.3 Trichiasis/entropion
4.3.4 Ectropion.

4.3.1 Skin tumours

There are two important skin tumours which can affect the eyelids:

a) The **squamous cell carcinoma** - is a slowly growing malignant tumour which spreads to regional lymph nodes. It is more common in albinos. Squamous cell carcinoma may also arise from the conjunctiva spreading locally to invade the fornices and eyelids.
b) **Basal cell carcinoma** - occurs in elderly people and is more common in light skinned races. It is locally invasive, but rarely metastasises. Treatment is by surgical removal or radiotherapy.

4.3.2 Meibomian cyst and hordeolum

a) Meibomian cyst (**chalazion**) - is a cystic swelling of a Meibomian gland. Multiple cysts often occur and appear as round discrete swellings within the substance of the eyelid. Treatment is required for larger cysts and involves incision and curettage of the cyst from the conjunctival surface under local anaesthetic.
b) **Hordeolum** (stye) - is an infection of a hair follicle on the eyelid. It appears as a tender red swelling on the eyelid margin. Treatment requires removal of the hair follicle and hot bathing to encourage discharge of the pus. If this fails, antibiotics may be given.

4.3.3 Trichiasis/entropion

Trichiasis is when one or more eyelashes turn in to touch the globe. Entropion is when the eyelid margin turns in so that most or all of the eyelashes turn in on the eye. (The commonest cause in Africa is trachoma.)

Treatment

a) Treatment of **mild trichiasis** is removal of the in-turning eyelashes by epilation. This may have to be repeated every six weeks. Alternatively, the hair follicles may be completely removed by electrolysis.

b) **Entropion** requires corrective lid surgery to return the eyelashes to their normal position. There are many different types of operation including mucous membrane grafting and tarsal plate rotation. Entropion is a major cause of blindness in areas with hyperendemic trachoma. In these situations entropion surgery campaigns are an important way of preventing corneal blindness.

4.3.4 Ectropion

When the eyelid margin is not apposed to the globe the condition is called ectropion. It may follow trauma, burns or deep infections of the eyelids which can also result in scarring and ectropion. In this situation skin grafting after scar excision is required to correct the ectropion.

Ectropion may also be due to lack of tone in the orbicularis oculi muscle and this occurs particularly after facial nerve paresis. If severe, corrective lid surgery can be performed of which the Kuhnt-Zymanowsky operation is the most popular.

4.4 Diseases of the nasolacrimal apparatus

These conditions are discussed under the following **four** headings:

4.4.1 Congenital atresia of the nasolacrimal duct
4.4.2 Dacrocystitis
4.4.3 'The watering eye'
4.4.4 'The dry eye'.

4.4.1 Congenital atresia of the nasolacrimal duct

In some babies, the nasolacrimal duct fails to become patent at birth. Over the first few months the mother notices that the baby's eye waters. A secondary infection may develop with a little discharge of pus at the medial canthus.

In the majority of children, the nasolacrimal duct will open spontaneously by the age of 18 months, so that reassurance and topical antibiotics for any infection is all that is required. If the child still has a watering eye by the age of 2, then probing to open the nasolacrimal duct under general anaesthetic can be performed.

4.4.2 Dacrocystitis

This is inflammation of the lacrimal sac usually due to obstruction of tear drainage through the nasolacrimal duct. It may present as an acute bacterial infection (**acute dacrocystitis**) with a tender red swelling over the lacrimal sac. Treatment is with systemic antibiotics, but if an abscess forms surgical incision and drainage of the abscess will also be necessary.

Chronic dacrocystitis presents as a chronic watering of the eye (**epiphora)**. The obstruction is usually in the nasolacrimal duct. Sometimes a lacrimal wash-out can clear a partial obstruction, but if this fails and the patient is greatly troubled by the epiphora, then surgery can be performed. This consists of making an opening between the lacrimal sac and the nose - dacrocystorhinostomy (DCR).

4.4.3 The watering eye

The complaint of watering or tearing is a very common one and, in many cases, there is no serious abnormality. Watering of the eye can be due to:

a) Increased production of tears - lacrimation
b) Obstruction to drainage of tears - epiphora.

a) **Lacrimation** may be due to anything which irritates the eye, so that all the causes of acute red eye also produce lacrimation.
   These have been discussed in Section 1. Other common causes of lacrimation are pinguecula and pterygium.
   i. **Pinguecula** - a degeneration found in the conjunctiva at either the 3 or 9 o'clock positions. They are slightly raised and often yellow. They may become inflamed. They are of no significance and do not require treatment.
   ii. **Pterygium** - is a wedge of conjunctival tissue usually situated medially which grows onto the cornea. The conjunctiva is raised and may become inflamed causing lacrimation and redness. Most pterygia can be left alone or treated symptomatically with vasoconstrictor drops (e.g. zinc and adrenaline). The only real indication for surgical excision is if the pterygium grows so far across the cornea that it begins to reach the pupil margin and threaten vision. Excision of pterygium can be performed under local anaesthetic, but there is a very high recurrence rate. The simplest operation is to excise the pterygium and to leave an area of bare sclera.
b) **Epiphora** - may be due to any blockage in the lacrimal puncta, canaliculus, sac or nasolacrimal duct. Blockage to the drainage apparatus can usually be confirmed by failure to irrigate saline into the throat of the patient with a lacrimal sac wash-out. If the epiphora causes a great deal of trouble then surgical bypass of the obstruction may be considered.

4.4.4 The dry eye

There are many conditions which result in a reduction in tears or a poor tear film. Disease of the lacrimal glands may reduce the amount of tears. This occurs more commonly in elderly people and is known as **keratoconjunctivitis sicca.** The patient complains of burning eyes and there is reduced tear production. Treatment is with artificial tears or methylcellulose drops.

Trachomatous conjunctival scarring may also cause lack of tears, and in vitamin A deficiency the goblet cells of the conjunctiva fail to produce mucin resulting in conjunctival and corneal xerosis.

SECTION D:
Management of common eye diseases

The management of common eye diseases has already been covered in Section C. In this section a brief review of the common methods of management available to ophthalmic assistants is made:

1. Diseases causing acute red eye **REMEDY**
2. Diseases causing loss of vision **REFER or REHABILITATION**
3. Diseases causing difficulty in reading **REFRACT**
4. Other eye diseases **REFER or REASSURE**

1 Remedy

Medications are particularly used in ophthalmology for treating acute red eyes. They have a small role in the treatment of loss of vision, cannot read or other eye diseases. The medical treatment of glaucoma has very limited value in Africa because of poor patient compliance and the expense of lifelong therapy.

The treatment of conditions causing acute red eye is summarised below. The reader is referred to the text for dosages.

1.1	**Acute red eye in babies:**	Ophthalmia neonatorum	oc tetracycline 1% penicillin inj. IM
1.2	**Acute red eye in children:**	Vitamin A deficiency	Vitamin A capsules (200,000 I.U.) oc tetracycline 1%
1.3	**Acute red eye at any age:**	1.3.1 Conjunctivitis	
		- bacterial	oc tetracycline 1%
		- viral	oc tetracycline 1%
		- Chlamydial (trachoma)	oc tetracycline 1%
		- allergic (mild)	g zinc and adrenaline
		- allergic (vernal)	g prednisolone 0.5%
		- chemical	oc tetracycline 1%
		1.3.2 Corneal ulceration	
		- viral	oc IDU 0.5%
		- bacterial	oc tetracycline 1% g chloramphenicol gentamicin inj. oc atropine 1%
		1.3.3 Iritis	oc atropine 1% g prednisolone 0.5%
		1.3.4 Acute glaucoma	Acetazolamide tabs
1.4	Acute red eye from trauma:	1.4.1 Blunt injuries (with glaucoma)	oc tetracycline 1% ± Acetazolamide tabs
		1.4.2 Perforating injuries	g chloramphenicol g atropine
		1.4.3 Foreign bodies	g amethocaine oc tetracycline 1%
		1.4.4 Burns and chemicals	oc tetracycline 1%

2 Refer

Certain common eye conditions, particularly those which cause **treatable loss of vision**, need to be referred to an eye specialist for intra-ocular surgery.

In addition, some of the other eye diseases are not only sight threatening but may also endanger life and should be referred.

Following the order used in Section C, a list of conditions requiring specialist attention is given:

1.3.2 Corneal ulcer - if severe and failing to respond to treatment

1.3.3 Iritis - if severe and failing to respond to treatment

1.3.4 Acute glaucoma

1.4.2 Perforating eye injury

2.1 Corneal scar with bilateral vision less than 3/60

2.2 Cataract
- a) bilateral - with vision less than 6/60
- b) unilateral - if there is a complication
- c) only eye - with vision less than 3/60
- d) second eye - at anytime

2.3 Chronic glaucoma - if travel vision is still present

2.4.1 Sudden bilateral loss of vision - any cause

2.4.2 Sudden unilateral loss of vision due to retinal detachment

4.1.1 Proptosis

4.2.1 Strabismus - age 8 or under

4.2.2 Diplopia

4.2.3 Ptosis

4.3.1 Skin tumours.

The common surgical procedures which are performed for eye conditions can be divided into extra-ocular and intra-ocular operations.

Extra-ocular operations	**Intra-ocular operations**
Incision of chalazion	Cataract extraction
Excision of pterygium	- intracapsular
Evisceration	- extracapsular
Enucleation	Filtration surgery
Entropion repair	- trabeculectomy
Ectropion repair	- Scheie procedure
Lateral tarsorrhaphy	Iridectomy
Strabismus correction	- peripheral, sector, optical
	Repair of perforating injury

Other less common procedures include:

- Keratoplasty
- Retinal detachment repair/vitrectomy
- Oculo-plastic surgery
- Orbital exenteration surgery.

Surgical procedures should be learned by watching specialists do the operation, then assisting the surgeon and then being assisted, as one gradually learns the operation technique.

3 Refract

Presbyopia presenting as inability to see dose things and other refractive errors causing loss of vision (which can be improved by a pinhole) require spectacles.

Refractive error	**Age of presentation**	**Spectacles**
Presbyopia	40 yrs +	plus spheres
Hypermetropia	1-8 yrs or +40 yrs	plus spheres
Myopia	5-20 yrs	minus spheres
Astigmatism	any age	cylinders
Aphakia	post-cataract op	+10 distance

4 Rehabilitation/Reassurance

Patients who are blind in both eyes, for which there is no treatment, should be considered for appropriate education (if children) or rehabilitation (if adults). Children can be taught mobility, basic living skills, agriculture and a handicraft or technical skill. Adults may receive instruction in mobility and basic living skills including cooking for a woman and agriculture for a man.

Untreatable blindness includes:

Bilateral phthisis

Bilateral staphyloma

Bilateral NPL glaucoma

Blinding onchocerciasis

Optic atrophy

Retinitis pigmentosa.

Other patients who, after a careful history and examination, are found not to have a serious eye condition can be **reassured**. If both eyes have good vision, are white, the patient is under 40 and there is no specific symptom then it is likely that there is nothing seriously wrong.