

49 The eye and orbit

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Acute angle closure

Acute angle closure

This usually occurs in older, often hypermetropic, patients. The prevalence is much higher in some Asian populations. The cornea becomes hazy, the pupil oval, dilated and non-reacting, the vision poor and the eye feels hard. In severe cases pain may be accompanied by vomiting and the condition can be mistaken for an acute abdominal problem. Tonometry (intraocular measurement) and examination of the iridocorneal angle by gonioscopy (using a prism placed on the cornea) is diagnostic. Urgent treatment to reduce the pressure with pilocarpine eyedrops, oral acetazolamide and, if refractory, mannitol should be started, followed by yttrium aluminium garnet (YAG) laser iridotomy, laser iridoplasty, anterior chamber paracentesis or surgical iridectomy. The condition is usually bilateral and the second eye usually needs a prophylactic iridotomy at the same time. Except for a simple conjunctivitis and subconjunctival haemorrhage, which are self-limiting, the management of an acute red eye requires expert treatment and a specialist opinion should be sought. A painful eye with a cranial nerve III palsy (ptosis, dilated pupil, globe down and out) often signifies an intracranial aneurysm and should be investigated immediately. This may occur in one or both eyes, and the visual loss may be transient or permanent. Possible causes are: /uni25CF obstruction of the central retinal artery (Figure 49.32); /uni25CF obstruction of the central retinal vein (Figure 49.33); - /uni25CF ischaemic optic neuropathy; /uni25CF migraine and other vascular causes; - /uni25CF vitreous and retinal haemorrhages; /uni25CF retinal detachment (Figure 49.34); - /uni25CF macular hole, cyst or haemorrhage; /uni25CF cystoid macular oedema, often after surgery; /uni25CF hysterical blindness. /uni25CF Chronic : /uni25CF cataract; /uni25CF glaucoma; /uni25CF macular degeneration. /uni25CF diabetic retinopathy .

Figure 49.31 Episcleritis. Figure 49.32 Retinal artery occlusion. Figure 49.33 Central retinal vein occlusion.

Specialist help should be sought in any case of loss of vision. The possibility of temporal arteritis should always be considered in the differential diagnosis of sudden visual loss, as prompt treatment of this condition is extremely important. Elderly patients with sudden visual loss should be specifically asked for symptoms of scalp tenderness and jaw claudication and temporal arteries should be palpated for pulsation and tenderness. The erythrocyte sedimentation rate and C-reactive protein should be measured immediately if temporal arteritis is suspected, and the carotid system should be examined for bruits and other signs of arteriosclerosis in cases of ischaemic optic neuropathy and central retinal artery occlusion. Glaucoma, hypertension, hyperviscosity syndromes and diabetes should be looked for in cases of central vein thrombosis.

Figure 49.34 B-scan of a retinal detachment.

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Adults

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Malignant melanoma is the most common primary malignant tumour of the eye and originates in the pigmented cells of the choroid (Figure 49.14), ciliary body or iris. It can present with a reduction in vision, a vitreous haemorrhage or by the chance finding of an elevated pigmented lesion in the eye. Tumour growth is variable but, as a general rule, the more posterior the lesion, the more rapidly progressive it is likely to be. Spread may be delayed for many years; however, the liver is frequently involved, hence the advice 'beware of the patient with a glass eye and an enlarged liver'. Treatment options vary by size and location of the tumour but include laser photocoagulation, radioactive plaque, radiotherapy/proton beam therapy, enucleation and, in selected cases, local excision. Diagnosis is made by direct observation and/or ultrasonography, which shows a solid tumour, often with low internal reflectivity on ultrasound (Figure 49.15).

- Figure 49.14 Choroidal melanoma. Figure 49.15 B-scan showing choroidal melanoma (courtesy of Dr Marie Reston).

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Blunt injuries to the eye and orbit

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The floor of the orbit is its weakest wall and in blunt trauma, such as a blow from a fist, it is often fractured without fractures of the other walls. This is called a blow-out fracture. Clinical - signs are enophthalmos, bruising around the orbit, maxillary hypoaesthesia and limitation of upward gaze owing to entrap - ment of the inferior rectus muscle leading to vertical diplopia. This occurs when the extraocular muscles or orbital septa become trapped in the fracture and can be identified as a soft-tissue mass in the antrum on a radiograph (Figure 49.17 although CT scans or tomograms may be necessary). Surgical repair of the orbital floor with freeing of the trapped contents may be necessary if troublesome diplopia persists or enophthalmos is marked. A child with an orbital floor fracture requires urgent assessment, particularly if upgaze is restricted, as trapping of the inferior rectus muscle may cause ischaemia and require urgent surgery . If an orbital haemorrhage is too extensive to examine the eye, it may be necessary to examine the eye under anaesthesia because there may be a hidden perforation of the globe. Injuries to the lids and lid margins must be repaired; if the lacrimal canaliculi are damaged, they should be repaired if possible, especially the lower canaliculus, as 75% of tear drainage goes through it. Blunt injuries can also cause damage to the optic nerve, which can result in blindness and a total a ff erent nerve defect (Figures 49.18 and 49.19).

Figure 49.17 Radiograph showing a blow-out fracture of the orbit (left) with soft tissue in the antrum (arrow) (courtesy of Dr Glyn Lloyd). Figure 49.18 Injury from a ski pole into the right brow. Vision reduced to 'no perception of light' (courtesy of J Beare, FRCS).

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Blunt ocular injuries

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Blunt injuries to the eye can give rise to several problems, which include the following:

- /uni25CF Iritis . Inflammation; treated with topical steroids.
- /uni25CF Hyphaema (blood in the anterior chamber) (Figure 49.20). Rest and sedation, particularly in children, are advised because the main danger in this condition is secondary bleeding, resulting in an acute rise in intraocular pressure and blood staining of the cornea. The use of antifibrinolytic agents (ϵ -aminocaproic acid) has been advocated; if the pressure rises, surgery to wash out the blood may be necessary .
- /uni25CF Subluxation of the lens . This is suspected if the iris, or part of the iris, 'wobbles' on movement (iridodonesis).
- /uni25CF Secondary glaucoma . This is often associated with recession of the iridocorneal drainage angle.
- /uni25CF Retinal and macular haemorrhages and choroidal tears (Figure 49.21).
- /uni25CF Retinal dialysis . This may lead to a retinal detachment and permanent damage to vision (Figure 49.22).

Figure 49.19 Scan of orbit from Figure 49.18 showing a massive swelling of the medial rectus (courtesy of J Beare, FRCS). Figure 49.20 Hyphaema. Blood in the vitreous chamber after a con

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Burns

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Radiation burns Corneal injury may occur after exposure to ultraviolet radiation, for example after arc welding or excessive sunlight (snow blindness) and sun lamps. Such burns cause intense gritty burning pain and photophobia as a result of keratitis (corneal inflammation), which starts some hours after exposure. Mydriatic and local steroids with antibiotic drops ease the condition, and healing usually occurs after 24 hours. **Thermal burns** If these involve the full thickness of the lids, corneal scarring may occur from exposure and immediate corneal protection is necessary. A splash of molten metal may cause marked local necrosis and may lead to permanent corneal scarring. Treatment is to remove any debris by irrigation and to instil local atropine, antibiotics and steroids to prevent superadded infection and scarring. Lid reconstruction may be necessary. **Chemical burns** Chemical burns, and especially alkali burns, can be serious because ocular penetration occurs quickly and ischaemic necrosis can result (Figure 49.24). Immediate copious irrigation until the pH is neutral will ensure that the chemical is diluted as much as possible, and all particles should be removed from the fornices. Treatment can then be continued as with thermal burns. Well-fitting goggles should prevent such injuries.

Figure 49.24 Chemical burn showing conjunctival necrosis.

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Conjunctivitis

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Symptoms are grittiness, redness and discharge. Causes are infective, chemical, allergic or traumatic. In the newborn it can be serious; gonococcal and chlamydial infection must be excluded. Bacterial conjunctivitis is purulent, usually self-limiting and treated with topical broad-spectrum antibiotics. Chlamydial and adenovirus infections must be considered. Adenoviral infections are common and usually affect one eye much more in severity and onset, tending to be more watery than sticky, and are often associated with a palpable preauricular gland. Vernal conjunctivitis (Figure 49.25) is a form of allergic conjunctivitis that is characterised by itchy eyes, usually worse in the summer. Moritz Kaposi, 1837–1902, Professor of Dermatology, Vienna, Austria, described pigmented sarcoma of the skin in 1872. Allergic problems such as hay fever. Clinically, most signs are under the upper lid, which may have a cobblestone appearance instead of a smooth surface. Giant papillary conjunctivitis with large papillae under the upper lid may be seen in soft contact lens wearers. This is usually caused by an allergy to the sterilising solutions and lens protein and may be helped by either using a preservative-free solution or using daily-wear disposable lenses. Kaposi's sarcoma, often associated with human immunodeficiency virus (HIV) infection, can rarely present like a subconjunctival haemorrhage (Figure 49.26). Considerable conjunctival and corneal irritation can be caused by the lids turning in (entropion) (Figure 49.27) or turning out (ectropion) (Figures 49.28 and 49.29), and by ingrowing lashes. The lids should be repaired surgically to their normal position.

Figure 49.25 Vernal conjunctivitis (spring catarrh) showing cobblestone appearance under the upper lid.

Figure 49.26 Kaposi's sarcoma of conjunctiva.

Vision is not commonly affected in conjunctivitis but, with some viral infections, a keratitis may be present and result in visual impairment and pain. All of the other conditions below are painful and usually affect vision. Rose Bengal (or Bengal Rose) is dichlorotetraiodofluorescein. Hulusi Behçet, 1889–1948, Professor of Dermatology, Istanbul, Turkey, described this disease in 1937. Hans Conrad Julius Reiter, 1881–1968, President of the Health Service and Honorary Professor of Hygiene at the University of Berlin, Germany, described this disease in 1916. Herpes simplex infection presents as a dendritic (branching) ulcer, shown easily by staining with fluorescein or Rose Bengal. It is treated with aciclovir ointment five times per day. The use of steroid drops must be avoided as this can make the condition much worse (Figure 49.30). Corneal ulceration may occur as a result of ingrowing lashes or corneal foreign bodies, marginal ulceration and infected

abrasions. Infected ulcers can occur in patients wearing soft contact lenses or elderly immunocompromised individuals. Herpes zoster (shingles) may affect the ophthalmic division of cranial nerve V and can give rise to a keratitis and uveitis. It is important to avoid the use of steroid drops until a diagnosis has been made. Local anaesthetic drops should also not be given on a regular basis.

Figure 49.27 Entropion (courtesy of J Beare, FRCS). Figure 49.28 Ectropion, lower lid (courtesy of J Beare, FRCS). Figure 49.29 Ectropion, upper lid – chronic staphylococcal infection (courtesy of J Beare, FRCS).

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Conjunctivitis

Symptoms are grittiness, redness and discharge. Causes are infective, chemical, allergic or traumatic. In the newborn it can be serious; gonococcal and chlamydial infection must be excluded. Bacterial conjunctivitis is purulent, usually self-limiting and treated with topical broad-spectrum antibiotics. Chlamydial and adenovirus infections must be considered. Adenoviral infections are common and usually affect one eye much more in severity and onset, tending to be more watery than sticky, and are often associated with a palpable preauricular gland. Vernal conjunctivitis (Figure 49.25) is a form of allergic conjunctivitis that is characterised by itchy eyes, usually worse in the summer. Moritz Kaposi, 1837–1902, Professor of Dermatology, Vienna, Austria, described pigmented sarcoma of the skin in 1872. Allergic problems such as hay fever. Clinically, most signs are under the upper lid, which may have a cobblestone appearance instead of a smooth surface. Giant papillary conjunctivitis with large papillae under the upper lid may be seen in soft contact lens wearers. This is usually caused by an allergy to the sterilising solutions and lens protein and may be helped by either using a preservative-free solution or using daily-wear disposable lenses. Kaposi's sarcoma, often associated with human immunodeficiency virus (HIV) infection, can rarely present like a subconjunctival haemorrhage (Figure 49.26). Considerable conjunctival and corneal irritation can be caused by the lids turning in (entropion) (Figure 49.27) or turning out (ectropion) (Figures 49.28 and 49.29), and by ingrowing lashes. The lids should be repaired surgically to their normal position.

Figure 49.25 Vernal conjunctivitis (spring catarrh) showing cobble

stone appearance under the upper lid. Figure 49.26 Kaposi's sarcoma of conjunctiva.

Vision is not commonly affected in conjunctivitis but, with some viral infections, a keratitis may be present and result in visual impairment and pain. All of the other conditions below are painful and

usually affect vision. Rose Bengal (or Bengal Rose) is dichlorotetraiodofluorescein. Hulusi Behçet , 1889–1948, Professor of Dermatology , Istanbul, Turkey , described this disease in 1937. Hans Conrad Julius Reiter , 1881–1968, President of the Health Service and Honorary Professor of Hygiene at the University of Berlin, Germany , described this disease in 1916. Herpes simplex infection presents as a dendritic (branching) ulcer, shown easily by staining with fluorescein or Rose Bengal. It is treated with aciclovir ointment five times per day . The use of steroid drops must be avoided as this can make the condition much worse (Figure 49.30). Corneal ulceration may occur as a result of ingrowing lashes or corneal foreign bodies, marginal ulceration and infected abrasions. Infected ulcers can occur in patients wear - ing soft contact lenses or elderly immunocompromised individuals. Herpes zoster (shingles) may affect the ophthalmic division of cranial nerve V and can give rise to a keratitis and uveitis. It is important to avoid the use of steroid drops until a diagnosis has been made. Local anaesthetic drops should also not be given on a regular basis.

Figure 49.27 Entropion (courtesy of J Beare, FRCS). Figure 49.28 Ectropion, lower lid (courtesy of J Beare, FRCS). Figure 49.29 Ectropion, upper lid – chronic staphylococcal infection (courtesy of J Beare, FRCS).

DIFFERENTIAL DIAGNOSIS OF THE ACUTE RED EYE

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This is important in the management of minor ocular complaints and the recognition of conditions that require expert attention. Possible causes of the acute red eye include: /uni25CF subconjunctival haemorrhage; /uni25CF conjunctivitis; /uni25CF keratitis; /uni25CF uveitis; /uni25CF episcleritis and scleritis; /uni25CF acute glaucoma. Any condition with pain, visual impairment or a pupil abnormality suggests a more serious diagnosis. DIFFERENTIAL DIAGNOSIS OF THE ACUTE RED EYE

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INJURIES INVOLVING THE EYE AND ADJACENT STRUCTURE

INJURIES INVOLVING THE EYE AND ADJACENT STRUCTURES Corneal abrasions and ulceration

The cornea is frequently damaged by direct trauma or by foreign bodies (Figure 49.16). Ulceration can occur with infection, exposure (for example in severely ill patients with incomplete eye closure) or after damage to the facial nerve. Postherpetic ulceration is common and serious if not treated. Fluorescein instillation illuminated by blue light shows up corneal ulceration at an early stage, with areas of epithelial loss fluorescing green. Treatment of sterile corneal abrasions or exposure is by topical lubrication or padding of the eye. If bacterial infection is suspected, a swab or scrape may be performed for microbiological diagnosis and topical antibiotics such as 0.5% chloramphenicol or ofloxacin eye drops are commonly used. Jean Descemet , 1732–1810, French physician and botanist. The eye is made more comfortable by the use of mydriatics such as cyclopentolate to reduce photophobia. Herpes simplex dendritic ulcers are treated with aciclovir ointment. In countries in the Far and Middle East, chronic infection with trachoma can cause corneal opacification and blindness, although the worldwide incidence of this condition is falling. Corneal grafting is the only cure for an opaque cornea. Until recently , full-thickness penetrating keratoplasty was the only corneal graft technique. For some conditions this has largely been replaced by lamellar or partial-thickness graft surgery , in a technique termed DSEK or ‘Descemet’s stripping endothelial keratoplasty’. However, penetrating keratoplasty remains the treatment of choice for severe corneal damage due to infection or injury . Rarely , osteo-odonto-keratoprosthesis can be attempted in very severe cases of opaque corneas that are not suitable for grafting. Artificial corneal prostheses have also been developed. Acanthamoeba is a rare serious cause of corneal infection. This infection usually follows the use of contact lenses. Specialist management and treatment is recommended. Summary box 49.3 Corneal abrasions

Figure 49.16 Corneal foreign body. A drop of fluorescein dye illuminated by a blue light reveals even the smallest corneal abrasion. Corneal ulcers are often more serious in contact lens wearers and require prompt assessment and treatment. Development of white infiltrate in/around a corneal abrasion is a sign of infection.

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INTRAOCULAR TUMOURS

Children

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Retinoblastoma, the most common ocular malignancy of childhood, is a malignant tumour of the retina that can be bilateral in around one-third of cases. Half of cases are hereditary (autosomal dominant) and are due to mutation of the gene on chromosome 13; children with a family history should be carefully monitored from birth. Remaining cases occur sporadically. Inherited retinoblastoma is more likely to be bilateral. Retinoblastoma is often not spotted until the tumour fills the globe and presents as a white reflex in the pupil or as a squint (Figure 49.13). The differential diagnosis includes retinopathy of prematurity, persistent fetal vasculature (PFV) and intraocular infections. If the tumour is large, enucleation may be required, but radiotherapy, cryotherapy, chemotherapy or laser treatment can cure small lesions. Liaison with a paediatric oncologist is essential. Summary box 49.2 Intraocular tumours /uni25CF /uni25CF - RB1

Figure 49.12 Capillary haemangioma in a child. An orbital venogram demonstrates displacement of the second part of the superior ophthalmic vein (arrow) (courtesy of Dr Glyn Lloyd). Figure 49.13 Retinoblastoma giving rise to a white pupillary reflex. This child was first seen with a convergent squint and discharged without a fundus examination. He was next seen many years later with a 'white reflex' and died soon after diagnosis (courtesy of MA Bedford, FRCS). Any child with a white pupil (leukokoria) should be referred to an ophthalmologist to exclude retinoblastoma, although congenital cataracts may also cause this sign. A blind painful eye may hide a melanoma or other ocular tumour.

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The lid margin is everted to allow the application of a meibomian clamp. The ring of the clamp is placed on the incision is made with a small blade in the axis of the gland. The herniating granulomatous tissue is removed with a curette and the cavity is scraped clean. Recurrent cysts may have to have the cyst wall dissected away with scissors. A biopsy may be necessary in atypical or recurrent cysts to exclude malignant change. Incision and curettage of chalazion (meibomian cyst)

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Intraocular foreign bodies

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Intraocular foreign bodies must always be excluded when patients attend the accident and emergency department with an eye injury and a history of working with a hammer and chisel or a history of a potentially high-velocity injury . Radio - graphy of the orbits must be performed. Ferrous and copper foreign bodies should always be removed, sometimes requiring the use of a magnet. B-scan ultrasonography can also assist in localising foreign bodies when a vitreous haemorrhage or cata - ract is present. CT can be used, but MRI is contraindicated if a ferrous intraocular foreign body is suspected. Summary box 49.4 Penetrating eye injuries /uni25CF /uni25CF

A distorted and irregular pupil warrants the careful exclusion of a penetrating eye injury Avoid extensive eye examination if globe rupture is suspected to avoid worsening the injury prior to surgical repair

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Introduction

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LASERS IN OPHTHALMOLOGY

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Blue-green lasers (argon or frequency-doubled YAG) or diode lasers are used to treat the retina in diabetic retinopathy (pan-retinal photocoagulation for proliferative disease or focal treatment for leaky microaneurysms) and may also be used to close retinal tears or breaks that might lead to retinal detachment. Argon laser or selective laser trabeculoplasty can be used to open the drainage angle to control elevated intraocular pressure in open angle glaucoma. Trans-scleral diode photocoagulation of the ciliary body is used to treat refractory secondary glaucoma with uncontrolled ocular pressure. Laser iridotomy with the neodymium-doped YAG (Nd:YAG) laser is used to treat both the affected and fellow eye in acute angle closure glaucoma. The Nd:YAG laser is also used to photodisrupt and clean an opaque posterior capsule, which occurs in 5–10% of cases following cataract surgery . LASERS IN OPHTHALMOLOGY

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Lacrimal system

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The almond-shaped lacrimal gland lies under the upper outer orbital rim and opens into the upper conjunctival fornix through 10–15 ducts. Tears are swept across the globe by the lids and evaporate or pass into the upper and lower lid puncta, and then into the canaliculi to join the common canaliculus, which passes into the lacrimal sac under the medial canthal tendon. The sac is drained by the nasolacrimal duct into the nose, opening in the inferior meatus under the inferior turbinate. Lacrimal system

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Learning objectives

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To understand and appreciate: The anatomy of the eye and orbit • The common ocular disorders and their symptoms and • specific signs Learning objectives

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Neurofibromatosis

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Neurofibromatosis may also produce swellings above the eye. The diagnosis can usually be confirmed by an examination of the whole body , as there are often multiple lesions. Proptosis can also result (Figure 49.3). Other ophthalmic features may be present.),

Figure 49.3 Neuro /f_i broma in the orbit with proptosis, and also similar lesions in the forehead.

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OCULAR ANATOMY Adnexae

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The lids comprise skin, connective tissue, the orbicularis oculi (cranial nerve VII) and the tarsal plate, with multiple meibomian glands opening posterior to the lashes and lined with conjunctiva, which is reflected onto the sclera. The upper lid is elevated by the levator muscle (cranial nerve III) and has a horizontal strip of sympathetically innervated Müller's muscle, giving rise to 2 /uni00A0 mm of ptosis in Horner's syndrome. The frontalis muscle may also contribute to eyelid elevation, particularly when the levator muscle is weak. Both lids are attached to the orbital rim by the medial and lateral canthal tendons. Both have a rich vascular supply and are innervated by the V1 division of the trigeminal nerve (cranial nerve V) above and the V2 division below . OCULAR ANATOMY Adnexae

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Orbit

Orbit

The orbit is four-sided and pyramidal in structure, housing the globe, optic nerve, the four rectus and two oblique muscles, the lacrimal gland, orbital fat, the cranial nerves III-VI, the ophthalmic artery with its tributaries and the ophthalmic veins, which anastomose anteriorly with the face and posteriorly with the cranial cavity . Above is the frontal lobe of the brain, temporally the temporal fossa, inferiorly the maxillary sinus and nasally the lacrimal sac and ethmoidal and sphenoidal air sinuses. The optic nerve passes through the optic canal to the chiasm, with other nerves and vessels passing through the superior orbital fissure. Orbit

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Orbital swellings

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Orbital swellings result in displacement of the globe and limitation of movement. A full description of orbital swellings is outside the realm of this text, but some of the most common causes include the following. Pseudoproptosis. This results from a large eyeball, as seen in congenital glaucoma or high myopia. Orbital inflammatory conditions that result in orbital cellulitis (Figure 49.7). Haemorrhage after trauma or retrobulbar injection. Neoplasia affecting the lacrimal gland, the optic nerve, the orbital walls or the nasal sinuses (e.g. glioma [neuro fibromatosis, Figure 49.3], meningioma and osteoma [Figure 49.8]). Thyroid eye disease (Figures 49.9–49.11). This is the most common cause of unilateral and bilateral proptosis in adults and may occur in the absence of active thyroid disease or after thyroidectomy. Management of severe thyroid eye disease may require large doses of systemic steroids, radiotherapy or even orbital lateral wall decompression if the eyeball is threatened by exposure or optic nerve compression. The disease is often more severe in smokers and those with poorly controlled thyroid function. CT and - - - -

Figure 49.7 Orbital cellulitis. Figure 49.8 Radiograph showing an osteoma on the nasal side of the orbit giving rise to proptosis.

Figure 49.9 Computed tomogram of the orbit in dysthyroid exoph

thalmos, showing swollen muscles (courtesy of Dr Glyn Lloyd). Figure 49.10 Magnetic resonance imaging scan of a coronal view of the orbit, showing enlarged muscles in thyroid disease (courtesy of Dr Juliette Britton).

magnetic resonance imaging (MRI) scans are useful in diagnosis. MRI with short tau inversion recovery (STIR) sequences is particularly useful for identification of active inflammation within the

orbital tissues. /uni25CF Pseudotumour , or malignant lymphoma. /uni25CF Haemangiomas of the orbit (Figure 49.12). /uni25CF Tumour metastases . These are rare. In children they usually arise from neuroblastomas of the adrenal gland, whereas in adults the oesophagus, stomach, breast and prostate can be sites of primary lesions.

Figure 49.11 Exophthalmos in dysthyroid eye disease.

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Other lid swellings

Other lid swellings

Other types of lid swelling are less common. They include squamous cell carcinoma and malignant melanoma, sebaceous cyst, papilloma, keratoacanthoma, cyst of Moll (sweat glands) (Figure 49.6) or Zeis (sebaceous glands) and molluscum contagiosum. When molluscum contagiosum occurs on the lid margin, it can give rise to a mild viral chronic keratoconjunctivitis and should be curetted or excised. Carcinoma of the meibomian glands and rhabdomyosarcomas are rare lesions; they need to be treated by radical excision. Atypical or meibomian cysts that recur should be biopsied to exclude sebaceous gland carcinoma.

Figure 49.6 Cyst of Moll.

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PERIORBITAL AND ORBITAL SWELLINGS

Swellings relate

PERIORBITAL AND ORBITAL SWELLINGS Swellings related to the supraorbital margin

Dermoid cysts Dermoid cysts are benign congenital choristomas of the orbit that originate from fetal bone suture lines during development, most commonly the frontozygomatic suture (Figure 49.2 although they may also occur more medially . Dermoid cysts account for about half of childhood orbital neoplasms and consist of keratinised epithelium and adnexal structures such as sweat glands and hair follicles. They often cause a bony depression and they may have a dumbbell extension into the orbit, which is of particular importance should they need to be excised. Dermoid cysts can also erode the orbital plate of the frontal bone to become attached to dura; for this reason it is important to image the area by computed tomography (CT) before excision. Friedrich Schlemm , 1795–1858, Professor of Anatomy , Berlin, Germany .

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Penetrating eye injuries

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These occur when the globe is penetrated, often in road traffic and other major accidents (Figure 49.23) and also in injuries from sharp instruments. The compulsory wearing of seat belts in motor vehicles has substantially reduced the incidence of this type of eye injury , by up to 73% in the UK. The presence of an irregular pupil suggests prolapse of the iris and should arouse suspicion of a penetrating injury . Treatment is prompt primary repair to restore the integrity of the globe. not be attempted before anaesthesia because this may lead to further extrusion of the intraocular contents. If the fundal view is poor, ultrasonography and orbital imaging are indicated. Secondary corneal grafting, lensectomy and vitrectomy have considerably improved the visual prognosis; these must be done by an experienced eye surgeon. Injuries to the optic nerves must also be excluded in severe accidents.

Figure 49.21 Retinal haemorrhage from a cricket bat injury (courtesy of J Beare, FRCS). Figure 49.22 Retinal dialysis after blunt ocular injury. Figure 49.23 Facial lacerations from a windscreen injury. Beware of a perforating eye injury.

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RECENT DEVELOPMENTS IN EYE SURGERY

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In the last three decades, eye surgery has become a micro surgical specialty . Cataract surgery has been transformed by changes in local anaesthesia, implants, phacoemulsification and small-incision surgery , which allows compressible/foldable silicone or acrylic implants to be inserted through a 2-mm incision. The implant power can be more accurately measured by new formulae and the use of A-scan ultrasonography or laser wavefront biometry , and multifocal and accommodative lenses are now available. An even more recent advance in cataract surgery is the development of femtosecond laser technology , which allows extremely controlled corneal incisions, lens capsule opening and lens fragmentation to be achieved automatically together with the facility to adjust the shape of the cornea at the time of surgery to improve visual outcome for some patients. The extent to which this technology improves long-term visual outcomes remains to be seen. There are new treatments for eye disorders that involve abnormal growth of blood vessels in the back of the eye, such as the wet form of age-related macular degeneration. Anti-vascular endothelial growth factor (VEGF) antibodies, such as the drug ranibizumab, may be injected directly into the vitreous cavity to reduce new vessel proliferation. Intravitreal steroid injections or anti-VEGF agents are now also being used in diabetic retinopathy or retinal vein occlusion. Developments in vitreous surgery have enabled membranes to be peeled off the retina and macular holes to be repaired, and have also increased success rates in retinal detachment surgery with the additional use of gases and silicone oil or heavy liquid inserted into the vitreous cavity to tamponade the retina. Advances in technology have also led to the development of photosensitive chips and camera systems that can be implanted into the eye to restore some vision in patients with severe and otherwise untreatable macular diseases. Some paralytic squints can be helped by the use of adjustable sutures or injections of botulinum toxin into the overacting muscles. Refractive errors can be treated by the excimer laser. These laser in situ keratomileusis (LASIK) surgery can be combined with phakic surgery , which involves cutting a corneal flap (by femtosecond laser or surgery) and performing the laser surgery at a deeper level. There have been some concerns about defective contrast sensitivity and problems with night vision after laser correction of myopia. Phakic implants have also been used to correct high refractive errors. Corneal topography aids the accuracy of corneal and refractive surgery and the increased use and quality of CT and MRI scans has revolutionised the diagnosis of orbital and intracranial lesions involving the optic pathways (Figures 49.35–49.37). Fluorescein angiography and ocular coherence tomography (OCT) are invaluable in the diagnosis and treatment of macular conditions. OCT angiography has recently been developed; this allows assessment of the retinal microvasculature without the need for systemically administered agents. This technology may reduce the need for fluorescein angiography in the future. OCT as well as scanning laser polarimetry of the retinal nerve fibre

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Figure 49.35 Magnetic resonance imaging scan, sagittal view. Craniopharyngioma.

The mass in the suprasellar cistern is of high signal intensity because of the proteinaceous fluid that the cyst contains (courtesy of Dr Juliette Britton).

George G Baerveldt, 1945–2021, ophthalmologist, Emeritus Professor of Ophthalmology, UC Irvine, CA, USA. A Mateen Ahmed, contemporary, Nigerian ophthalmologist, based in California, USA, developed the shunt that was approved by the US Food and Drug Administration in 1993. Jacques Rene Tenon, 1724–1816, surgeon, La Salpêtrière, Paris, France. become more refined in recent years, with better control of wound healing using topical application of antiscarring drugs such as mitomycin C. Alternatives to trabeculectomy have been developed using devices such as Baerveldt and Ahmed shunts that drain aqueous from the eye to lower the pressure. A new revolution is also under way using minimally invasive glaucoma surgical techniques, with a variety of tiny devices now available to shunt aqueous and reduce eye pressure.

Figure 49.36 High-resolution computed tomography through the orbits showing dense calcification of the optic nerve sheaths typical of optic nerve meningioma (courtesy of Dr Juliette Britton). Figure 49.37 Axial enhanced magnetic resonance imaging scan showing a mass involving the optic chiasma and extending down the optic nerves and tracts.

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SURGICAL PROCEDURES

Excision of an eyeball enuclea

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Indications include a blind, painful eye, a blind, cosmetically poor eye/intraocular neoplasm and, in cadavers, for use in corneal grafting. The operation The speculum is introduced between the lids and opened. The conjunctiva is picked up with toothed forceps and divided completely all round as near as possible to the cornea. Tenon's capsule is entered and each of the four rectus and two oblique muscle tendons is hooked up on a strabismus hook and divided close to the sclera. The speculum is now pressed backwards and the eyeball projects forwards. Blunt scissors, curved on the flat, are insinuated on the inner side of the globe, and these are used to sever the optic nerve. The eyeball can now be drawn forwards with the forceps, and the oblique muscles, together with any other strands of tissue that are still attaching the globe to the orbit, are divided. A swab, moistened with hot water and pressed into the orbit, will control the haemorrhage. If an orbital implant is inserted to give better eye movement, the muscles are sutured to the implant at the appropriate sites. The subconjunctival tissues and conjunctiva are closed in layers. Evisceration is preferred to excision in endo-ophthalmitis, minimising the risk of orbital and intracranial spread with meningitis. The sclera is transfixated with a pointed knife a little behind the corneosclerotic junction, and the cornea is removed entirely by completing the encircling incision in the sclera. The contents of the globe are then removed with a curette, care being exercised to remove all of the uveal tract. At the end of the operation the interior must appear perfectly white. A ball orbital implant made of acrylic or hydroxyapatite may be placed within the orbit behind the sclera to improve the appearance when the artificial eye is fitted. SURGICAL PROCEDURES Excision of an eyeball/enucleation

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Swellings of the lacrimal system

Lacrimal sac mucocele

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This occurs from obstruction of the lacrimal duct beyond the sac and results in a fluctuant swelling that bulges out just below the medial canthus. It can become infected to give rise to a painful tense swelling (acute dacryocystitis). If untreated, it may give rise to a fistula. Treatment is by performing a bypass operation between the lacrimal sac and the nose (a dacryo - cystorhinostomy). Watering of the eye can also occur as a result of eversion of the lower lid (ectropion), which causes loss of contact between the lower punctum and the tear film, or from inturning lashes in entropion, and these must be distinguished from a mucocele. Lacrimal gland tumours These are swellings of the lacrimal glands, which lie in the upper lateral aspect of the orbit. Eventually they lead to impairment of ocular movements and displacement of the globe forwards, downwards and inwards. Pathologically the tumours resemble parotid tumours and they can be pleomorphic adenomas with or without malignant change, carcinomas or mucoepidermoid tumours.

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Swellings of the lids

Meibomian cysts (chalazion)

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These are the most common lid swellings (Figure 49.4). A meibomian cyst is a chronic granulomatous inflammation of a meibomian gland. It may occur on either upper or lower lids and presents as a smooth, painless swelling. It can be felt by rolling the cyst on the tarsal plate. It can be distinguished from a sty (hordeolum), which is an infection of a hair follicle and is usually painful. Persistent meibomian cysts that do not resolve with conservative treatment (hot compresses) are treated by incision and curettage from the conjunctival surface. Styes are treated by antibiotics and local heat. Basal cell carcinoma (rodent ulcer) This is the most common malignant tumour of the eyelids (Figure 49.5). Basal cell carcinomas may be locally invasive but do not tend to metastasise. They are more common on the lower lids, often start as a small pimple that ulcerates and has raised edges ('rodent ulcer') and are usually easily excised in the early stages. Histological confirmation that the excision is complete is required. More extensive lesions may require specialist techniques such as Mohs' micrographic surgical excision controlled by frozen section. Local radiotherapy or cryotherapy can be carried out; however, recurrence is more common, more aggressive and more difficult to detect. Frederic E Mohs , 1910–2002, developed the technique of micrographic surgical excision while a medical student at University of Wisconsin, USA. Jacob Antonius Moll , 1832–1913, ophthalmologist of The Hague, The Netherlands. Eduard Zeis , 1807–1868, Professor of Surgery , Marburg (1844–1850), who later worked at Dresden, Germany , described these glands in 1835. Basal cell carcinomas /uni25CF /uni25CF /uni25CF

Figure 49.4 Meibomian cyst (courtesy of Mr D Spalton, FRCS). Figure 49.5 Rodent ulcers (courtesy of Mr J Beare, FRCS). Basal cell carcinomas are the most common malignant eyelid tumour Treatment is by wide local excision with careful histopathological margin control All unusual eyelid lesions (especially in the elderly) should be biopsied

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The globe

The globe

The cornea is the 12-mm-diameter window of the eye, 550 μm thick centrally on average; its clarity is due to the regular arrangement of collagen bundles and relative dehydration. It merges into the sclera at the corneoscleral junction (the limbus), the insertion of the bulbar conjunctiva. The sclera, which is 1 mm thick, constitutes four-fifths of the wall of the eye and gives attachment to the extraocular muscles (Figure 49.1). It is perforated by the long and short posterior ciliary arteries and the vortex veins and is contiguous with the optic nerve sheath. -

The value of special investigations • When specialist referral is appropriate • Recent advances in ocular surgery • Choroid Sclera Superior Lens Retina re ctus Conjunctiva Canal of Schlem m Central re tinal Cornea artery Optic nerve Iris Macula Vascular choroid Ciliary body Inferior Vitreous re ctus Uvea humour Figure 49.1 Anatomy of the eye.

Photoreceptor cells in the outer retina sense light and send impulses to retinal ganglion cells in the inner retina via bipolar cells. The retinal pigment epithelium underlies the photo- receptors and is responsible for reprocessing of photopigments. The optic nerve conveys the axons of retinal ganglion cells from the eye to the brain. The most high-resolution part of the retina – the macula – lies at the posterior pole within the vascular arcade. The biconvex lens and capsule are suspended by the lens zonules, over 300 tiny fibres attached to the ciliary muscle. Aqueous humour arises from the ciliary processes, hydrates the vitreous gel, passes through the pupil into the anterior chamber between the iris and the cornea and then drains out through the trabecular meshwork into Schlemm's canal in the drainage angle and from there to the episcleral venous circulation. The balance between production and drainage of aqueous humour determines the intraocular pressure, which in most normal eyes is regulated at a level of 10–21 mmHg. The inner retina is supplied by the central retinal artery and drained by the central retinal vein. The globe

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Treatment

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Uveitis

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This can be anterior (iritis) or, more rarely, posterior. In anterior uveitis, the pupil is sometimes small and/or irregular owing to formation of posterior synechiae (adhesions between the iris and the lens). There is often circumcorneal injection and there may be keratic precipitates present on the posterior surface of the cornea. Pain, photophobia and some visual loss are usually present. Posterior uveitis can present with a white eye and blurred vision. It usually takes a chronic course. Granulomatous diseases, Behçet's disease, Reiter's syndrome, toxoplasmosis and cytomegalovirus infection should be excluded. Topical systemic steroids and, sometimes, immuno-suppressive drugs are useful in treating these conditions; management should be under the care of an ophthalmologist.

Figure 49.30 Dendritic staining caused by herpes keratitis.

Episcleritis or inflammation of the episcleral tissue often occurs as an idiopathic condition (Figure 49.31). Scleritis is a less common, more serious, condition in which the deeper sclera is involved. There is often an associated uveitis and severe pain. Thinning of the sclera may result. Systemic non-steroidal anti-inflammatory drugs or steroids/other immunomodulatory agents may be required to treat the condition adequately. Approximately half of patients with scleritis have an underlying systemic disorder. Scleritis is often associated with severe rheumatoid conditions. The presence of scleritis suggests that there is active systemic disease and this requires systemic work-up, including renal function tests. Uveitis

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