Frequently Seen Conditions
The purpose these notes are to ensure that you make the most of your introduction to
ophthalmology. Here is a selection of the most frequently seen conditions and we have
included brief notes which we hope will help you study. Inevitably, many topics have been
omitted and it is important that this is not used as a textbook, but more of a guide and adjunct
to wider reading.

Phil Murray
(P.I.Murray@bham.ac.uk) Si Rauz
(S.Rauz@bham.ac.uk)

Common Symptomatology ......................................................... 2
Entropion................................................................. 3
Ectropion............................................................. 4
Ptosis ............................................................................. 5
Blepharitis ................................................................. 7
Chalazion (Meibomian Cyst) ............................................. 8
Bacterial Conjunctivitis .................................................... 9
Viral Conjunctivitis ........................................................ 10
Bacterial Keratitis .......................................................... 11
Viral Keratitis ............................................................... 12
Corneal Foreign Body................................................... 13
Corneal Abrasion ........................................................... 14
Iritis (Uveitis) ................................................................. 15
Glaucoma ..................................................................... 16
Acute Angle Closure Glaucoma....................................... 17
Cataract ........................................................................ 18
Retinal Vein Occlusion .................................................... 20
Retinal Artery Occlusion .................................................. 21
Anterior Ischaemic Optic Neuropathy .............................. 22
Diabetic Retinopathy ....................................................... 23
Retinal Detachment ........................................................ 25
Age Related Macular Degeneration (ARMD/AMD) .......... 26
Strabismus .................................................................... 29
Visual Fields ................................................................. 31
Eye Movements ............................................................. 32
Nystagmus .................................................................... 34
Pupil Responses .............................................................. 35
Optic Atrophy ................................................................ 36
Papilloedema ................................................................. 37
Trauma............................................................................ 38
Differential Diagnosis of the Red Eye .............................. 40
Painless Loss of Vision .................................................... 43
Painful loss of vision ....................................................... 44
Common Symptomatology

Disorders of the visual system manifest in a number of recognised ways, yet patients often have difficulty in explaining visual symptoms

Pain/redness/photophobia/discharge = Front of Eye
Painless loss of vision = Back of Eye
Misty vision/glare = Cataract
Distortion of vision/central scotoma = Macula
Flashes and floaters = Vitreous/Retina

NB:
Primary open angle glaucoma = Asymptomatic

Flashes and floaters
- posterior vitreous detachment
- retinal tear
- retinal detachment
- vitreous haemorrhage

Transient loss of vision
- unilateral
  - amaurosis fugax
  - giant cell arteritis
- bilateral
  - cerebrovascular insufficiency
  - migraine

Double vision
- binocular (commonest)
  - strabismus
    - concomitant
    - paralytic e.g. III, IV, VI N palsy
- monocular
  - cataract
Entropion

An in-turning of the lid, usually the lower

Causes
- Ageing (commonest)
- Cicatricial e.g. following trachoma infection in the tropics

Symptoms
- Irritation, foreign body feeling

Examination
- In-turning of the lid or lashes
- If not present, ask patient to close eyes tightly - then open slowly
- May be associated corneal exposure or epithelial damage/disruption

Complications
- Eyelashes rubbing on the cornea leading to keratitis permanent corneal scarring and reduced vision

Treatment
- Topical antibiotic to prevent infection
- Taping down the lower lid (temporary measure)
- Long-term correction with surgical procedure under LA
Ectropion

Eversion of the lower lid

Causes
- Ageing (commonest)
- VII cranial nerve palsy
- Cicatricial

Symptoms
- Watery eye
- Foreign body sensation

Examination
- Everted lower lid and red palpebral conjunctiva easily seen with naked eye
- May be small medial ectropion only

Complications
- Exposed eye leading to drying of the conjunctiva
- Watering of the eye due to poor apposition of tear drainage apparatus (puncta)

Treatment
- Lubrication to prevent drying due to exposure
- Long-term correction with surgical procedure under LA
Ptosis

Drooping of the upper eyelid, may be unilateral or bilateral. The upper lid normally covers the superior corneal limbus by 1-2 mm.

Causes
- Neurogenic III N palsy
  Horner’s syndrome
- Myogenic
  Congenital - dystrophic levator palpebrae superioris (LPS), may be associated superior rectus weakness, old photos may be of value for comparison
  Myasthenia gravis - variable, fatiguable
  Myotonic dystrophy
- Aponeurotic
  Dehiscence of LPS aponeurosis due to ageing, trauma
- Mechanic Lid lumps
  Inflammation
  Oedema

Symptoms
- Nil
- Reduced vision if lid covers visual axis, in children may cause amblyopia (see under STRABISMUS) leading to permanent visual loss
- Cosmetic

Examination
- Exclude pseudoptosis i.e. microphthalmic (small) eye, or upper lid retraction/prominent other eye
- Using clear plastic ruler measure: degree of ptosis (palpebral aperture)
  LPS function (immobilize frontalis) - normal 15 mm or greater
  height of upper lid skin crease - a higher crease = aponeurotic defect
- Check movements of extraocular muscles
- Assess corneal sensation (V1) - use end of a tissue
- Check Bell's phenomenon - ask patient to squeeze eye very tightly and you forcibly try to open it, as you prise the lids apart the eye should roll upwards and not be exposed = good Bell's
- Tensilon test, anti-acetylcholine receptor antibodies (if indicated)
Treatment

- Nil
- Treat underlying cause e.g. myasthenia gravis, lubricants may be required
- Surgery - type of operation depends on LPS function and degree of ptosis

NOTES:
Blepharitis

Common chronic inflammation of the eyelid margins

Causes
- Usually Staphylococcus aureus or epidermidis
- Associated with skin disease e.g. acne rosacea, seborrhoeic dermatitis

Symptoms
- Sore, gritty, occasionally red eyes especially in the morning

Examination
- Hyperaemic lid margins
- Crusts on lashes
- Blocked meibomian gland orifices
- Chalazia

Complications
- Conjunctivitis
- Marginal keratitis
- Chalazia

Treatment
- Lid hygiene with sodium bicarbonate
- Warm compresses over eyelids
- Lubricants
- Antibiotic ointment
- Low-dose systemic (oxy)tetracycline

NOTES:
Chalazion (Meibomian Cyst)

Granuloma of the lipid secreting meibomian glands in the lid

Causes
- Local dysfunction of meibomian gland lipid
- Associated with blepharitis

Symptoms
- Lump on upper/lower lid (commonest lid lump)

Differential diagnosis
- Stye (infection of eyelash root)
- Lid tumours e.g. basal cell carcinoma (rodent ulcer)

Examination
- Initially presents as an erythematous oedematous lid with discrete tender area
- Resolves into hard lump as surrounding oedema disappears

Complications
- Unsightly if large
- Occasionally causes astigmatism by pressing on globe

Treatment
- Hot compresses
- Antibiotic drops/ointment
- Most resolve (40% by 4 months). Otherwise may require incision and curettage under LA

NOTES:
Bacterial Conjunctivitis

Bacterial infection of the conjunctiva

Causes
- Usually staph, strep or haemophilus

Symptoms
- Slight discomfort
- Red, sticky eye(s)

Examination
- Generalised conjunctival injection with purulent discharge
- Lashes may stick together
- Both eyes may be involved

Complications
- Slightly blurred vision due to purulent exudation, but vision clears when material is blinked away

Treatment
- Frequent antibiotic drops or ointment (chloramphenicol) instil hourly for 24 hours then qds for a week
- General hygiene by not sharing towels etc.

NOTES:
Viral Conjunctivitis

Viral infection of the conjunctiva

Causes
Usually adenovirus (self-limiting, but can also affect cornea - keratoconjunctivitis)

Symptoms
• Red, watery eye(s)
• Gritty, uncomfortable feeling

Examination
• Generalised conjunctival injection with watery discharge
• Follicles (lymphoid aggregates) in the tarsal conjunctiva
• Enlarged pre-auricular lymph nodes
• Petechial conjunctival haemorrhages
• Both eyes are usually involved
• Associated URTI

Complications
• Highly contagious
• May last several weeks
• Small corneal opacities may cause photophobia and reduced vision

Treatment
• Reassure that no other signs of serious disease and will resolve spontaneously
• No treatment may be required, but topical lubricants may help relieve symptoms
• Antibiotic drops (chloramphenicol) qds may be used to prevent secondary bacterial infection
• General hygiene by not sharing towels etc.
• Needs assessment by ophthalmologist if vision reduced

NOTES:
Bacterial Keratitis

Bacterial infection of the cornea - an ophthalmic emergency

Causes
- Large range of gram positive or negative species e.g. pseudomonas aeruginosa
- Predisposing factors include: corneal abrasion, contact lenses (usually soft or ‘extended wear’), topical steroids, corneal anaesthesia (e.g. previous herpes zoster ophthalmicus)

Symptoms
- Red, sticky eye
- Pain
- Reduced vision
- Photophobia

Examination
- Conjunctival injection with purulent discharge
- White fluffy corneal abscess (may be cells in anterior chamber or hypopyon)

Complications
- Severe sight-threatening intraocular infection (endophthalmitis)
- Corneal perforation
- Permanent corneal scarring and visual loss

Treatment
- Admit to specialist eye unit - scrape cornea, with urgent gram stain and culture, also consider sending contact lens and case to lab
- Antibiotics: intensive drops e.g. hourly day and night, initially broad spectrum until sensitivities are known
- Isolate in cubicle on ward

NOTES:
Viral Keratitis

Viral infection of the cornea

Causes
• Herpes simplex type I (commonest)

Symptoms
• Unilateral red eye
• Pain
• Photophobia
• Reduced vision

Examination
• Conjunctival injection
• Branching dendritic (epithelial) ulcer staining with fluorescein
• Reduced corneal sensation

Complications
• Corneal scarring and vascularisation
• May affect deeper corneal layers e.g. stroma (disciform keratitis)
• Corneal perforation
• Secondary bacterial infection
• Topical steroids will worsen dendritic disease and so are contraindicated
• Ulcer will often recur, so they need to be assessed by an ophthalmologist for any subsequent red eye

Treatment
• Antiviral ointment e.g. acyclovir 5x/day initially then gradually taper over 3-4/52
• Dilate pupil to relieve pain

NOTES:
Corneal Foreign Body

Foreign material embedded in corneal epithelium/stroma.

Causes
- Metal or vegetable
- Industrial environment (failure to wear goggles if grinding)
- Domestic (gardening, farming)
- Chance e.g. windy day

Symptoms
- Red, watery eye
- Foreign body (FB) feeling

Examination
- Conjunctival injection
- Small FB on cornea (if metal, may have surrounding rust ring)

Complications
- Very occasionally leads to bacterial keratitis
- Suspect penetration of the globe if no FB is seen especially after hammering, grinding or drilling with power tools, even if minor/no symptoms and normal vision
- Radiology (CT scan), B-scan ultrasound of orbit to exclude a radio-opaque intraocular FB

Treatment
- Instill topical local anaesthetic and remove FB (+/- rust ring) with cotton wool bud, needle tip
- Instill topical antibiotic and pad eye overnight
- Subsequently rust ring may develop and require removal the following day as it may prevent healing
- Topical antibiotic qds for 1/52 to prevent secondary bacterial infection

NOTES:
Corneal Abrasion

Loss of corneal epithelium

Causes
- Trauma e.g. foreign object, child's fingernail

Symptoms
- Red, watery eye
- Moderate to severe pain
- Blurred vision if abrasion crosses visual axis
- Photophobia

Examination
- Conjunctival injection
- Loss of epithelium stains green with fluorescein drops using a 'blue' torch
- Linear scratches are usually secondary to a sub-tarsal FB
- Miosis if there is marked photophobia

Complications
- Occasionally leads to bacterial keratitis
- Recurrent abrasion (erosion) occurs when there is incomplete epithelial healing causing the epithelium to repeatedly break down in an area where there has been a previous abrasion

Treatment
- Dilate pupil to prevent ciliary spasm, antibiotic drop/ointment, the eye may need to be padded
- Antibiotic drops/ointment for 1/52 to prevent secondary bacterial infection and to keep the cornea lubricated

NOTES:
Iritis (Acute Anterior Uveitis)

Inflammation of the iris (acute iridocyclitis, acute anterior uveitis)

**Causes**
- > 70% unknown, usually in 20-50 yr. age group
- Associated with ankylosing spondylitis as 50% with acute anterior uveitis may be HLA B27 +ve

**Symptoms**
- Red eye (usually unilateral)
- Pain
- Blurred vision
- Photophobia
- (may be history of previous attacks)

**Examination**
- Conjunctival injection (circumcorneal injection, ciliary flush)
- Keratic precipitates (inflammatory cells) on corneal endothelium
- Flare (albumin leakage from iris vessels) and (inflammatory) cells in the anterior chamber, hypopyon if severe
- Miosis and posterior synechiae (adhesions between iris and lens, PS)

**Complications**
- May be associated with raised intraocular pressure (IOP)
- 360° PS formation leads to blockage of aqueous humour circulation causing iris bombé and high IOP
- May become chronic and develop secondary cataract +/- macular oedema leading to reduced vision
- The condition is likely to recur and in either eye

**Treatment**
- Dilate pupil to prevent ciliary spasm and break PS
- Intensive topical steroids (drops), initially 1-2 hourly then gradually reduce over next 4-6/52
- In severe cases a subconjunctival injection of steroid +/- mydricaine (dilating agent) is necessary

**NOTES:**
Glaucoma

A group of eye conditions characterised by optic disc cupping and visual field loss, in which the intraocular pressure is sufficiently raised to impair normal optic nerve function.

Primary Open Angle Glaucoma – commonest type

Causes
- Ageing
- Steroids (both topical and systemic)
- Inherited

Associations
- Family history
- Ocular (high myopia, retinal vein occlusion)
- Systemic (diabetes mellitus)

Symptoms
- Usually none
- Visual loss noticed by patient only when condition is advanced

Examination/Diagnosis
- Reduced visual acuity (advanced disease)
- Pathologically cupped optic discs (cup:disc (C:D) ratio > 0.5, pallor, nasal shift of vessels, haemorrhages, asymmetry of C:D ratio)
- Glaucomatous visual field loss - initially nasal step progressing to arcuate scotoma and later progressing to ‘tunnel vision’
- Raised intraocular pressure (>21 mmHg)
- Open drainage angle (gonioscopy)

Complications
- Blind eye(s)
- Central retinal vein occlusion

Treatment
- Topical ocular hypotensives
  - prostaglandin analogue (e.g. atanoprost)
  - beta blockers (e.g. timolol)
  - sympathomimetic – alpha2 agonist e.g. brimonidine)
  - carbonic anhydrase inhibitor (e.g. dorzolamide)
- Systemic hypotensives
  - oral carbonic anhydrase inhibitor (acetazolamide), not for long term therapy
- Drainage surgery
  - Trabeculectomy +/- antimetabolite
  - Surgical insertion of drainage device (‘valve/tube’)
Acute Angle Closure Glaucoma

(part of the differential diagnosis of the red eye – an ophthalmic emergency)

Causes
- Primary: hypermetropia - smaller eye with narrower drainage angle (commonest)
- Secondary: cataract

Symptoms
- Haloes around lights (when intraocular pressure raised)
- Reduction in vision
- Severe eye pain
- Headache
- Nausea and vomiting
- Abdominal pain

Examination
- Reduced vision
- Red eye(s)
- Corneal oedema and haziness
- Mid-dilated, oval pupil
- Closed drainage angle (gonioscopy)

Complications
- Blind eye(s)

Treatment
- Urgent admission
- Systemic ocular hypotensives
  acetazolamide oral/iv
  glycerol oral
  mannitol iv
- Topical pilocarpine drops to constrict pupil, plus standard IOP lowering drops used for POAG
- Laser iridotomy (or surgical peripheral iridotomy), due to predilection of eventual involvement, it is usual to perform laser/surgery on the unaffected eye, due to predilection of eventual involvement

NOTES:
Cataract

Any opacity in the normally transparent lens of the eye

Causes
- Ageing (COMMONEST CAUSE, almost everybody >65 years has a degree of cataract)
- Secondary to ocular disease (e.g. intraocular inflammation)
- Secondary to systemic disease (e.g. diabetes mellitus)
- Secondary to drugs (e.g. systemic steroids)
- Congenital

Symptoms
- Gradual blurred/cloudy/misty vision
- Glare

Examination
- Grey/white pupil using a pen torch
- Reduced red reflex
- Three main types (although there may be a mixture in some patients): nuclear sclerosis (commonest), cortical, posterior subcapsular

Cataract Surgery
Indicated when the level of vision restricts normal activity and is the commonest operation performed in the NHS

Phakoemulsification and posterior chamber intraocular lens (IOL) implant
- Usually results in an excellent return of vision in over 90% of patients if no other ocular pathology present

Procedure
- Usually under LA (day case)
- Incision in the cornea or at the corneoscleral junction (approx 4 mm)
- Removal of anterior lens capsule (capsulorhexis)
- High speed ultrasonic vibrating tip cuts nucleus into smaller fragments and aspirates them (phakoemulsification)
- Aspiration of soft lens matter
- Insertion of posterior chamber IOL (soft foldable, acrylic) into capsular bag
- No sutures required

Advantages
- Small incision
- Fast healing
- Minimal astigmatism
- Rapid visual rehabilitation

Complications
• Per-operative - rupture of the posterior lens capsule causing vitreous loss (if this occurs before the lens nucleus is removed and the nucleus then falls back into the vitreous cavity ‘dropped nucleus’ and the patient will require an additional operation to remove it).
• Post-operative – the most feared complication is infection – endophthalmitis that could lead to blindness. Patients are warned the risk is about 0.1% and the commonest organism is staph. epidermis. Other complications include uveitis, glaucoma and retinal detachment.

Postoperative treatment
• Topical steroids
• Topical antibiotics

NOTES:
Retinal Vein Occlusion

Occlusion of central (CRVO – ischaemic or non-ischaemic) or branch retinal vein (BRVO)

Causes
- Atherosclerosis (commonest for CRVO)
- Hypertension (commonest for BRVO)
- Diabetes mellitus
- Hyperlipidaemia
- Raised intraocular pressure (CRVO)
- Hyperviscosity syndromes
- Retinal vasculitis

Symptoms
- Painless, sudden decrease or distortion in visual acuity in one eye, usually as a result of macular oedema/haemorrhage - can remain undetected for weeks or months (some BRVO are asymptomatic)

Examination
- CRVO
  - swollen disc and retina especially macular area
  - marked venous engorgement
  - haemorrhages and cotton wool spots
  - Afferent Pupillary Defect if extensive retinal ischaemia
- BRVO
  - the above signs are confined to one sector of retina e.g. superotemporal, inferotemporal, superonasal, inferonasal.

Complications
- Macular oedema, ocular neovascularisation, vitreous haemorrhage, neovascular glaucoma (CRVO)

Treatment
- Systemic evaluation to determine cause - treat accordingly
- Panretinal photocoagulation for ischaemic CRVO
- Intravitreal anti-VEGF injections (intravitreal steroid implant can also be used) for macular oedema

NOTES:
Retinal Artery Occlusion

Occlusion of central (CRAO – an ophthalmology emergency) or branch retinal artery (BRAO)

Cause
- Atheroma
- Embolus (usually from carotid bifurcation)
- Arteritis (especially giant cell arteritis)
- Raised intraocular pressure

Symptoms
- Painless, sudden loss of vision in one eye (more severe visual loss cf CRVO)
- Visual field defect (BRAO)
- May have preceding history of amaurosis fugax

Examination
- Afferent pupillary defect (CRAO)
- Pale retina with a cherry red spot at the macula (CRAO)
- Segmentation of blood in the vessels
- Embolus
- May have carotid bruit

Treatment
- If within 8-12 hours lower the intraocular pressure (drain aqueous surgically - a specialist procedure, re-breathe into a bag (to increase pCO₂ to dilate the vessel for the embolus to pass through), massage the eye, intravenous acetazolamide) to aid perfusion – often ineffective
- After 12 hours no immediate eye treatment
- Systemic evaluation, including an urgent ESR (for GCA)
- (aspirin for amaurosis fugax)

Complications
- High incidence of other embolic phenomena e.g.TIA, CVA
- Optic atrophy (CRAO)
- Ocular neovascularisation and neovascular glaucoma

NOTES:
Anterior Ischaemic Optic Neuropathy

Occlusion of the short posterior ciliary arteries that supply the optic nerve head. Usually in middle aged/elderly patients – an ophthalmic emergency

Cause
- Arteritic (giant cell arteritis)
- Non-arteritic (arteriosclerosis/atherosclerosis/hypertension etc.)

Symptoms
- Painless, sudden loss of vision

Examination
- Gross reduction in visual acuity e.g. PL if arteritic
- Relative afferent papillary defect
- Pale, swollen optic disc with surrounding nerve fibre haemorrhages if arteritic
- Disc swelling may be segmental, often affecting superior part of disc with corresponding inferior altitudinal field defect if non-arteritic

Complications
If arteritic, fellow eye involved in up to 95% without treatment. Treatment reduces the risk to 5-20%. 2nd eye involved in 10-20% of cases of non-arteritic AION over 5 years. Systemic complications of undetected GCA include CVA or involvement of major vessels.
- Optic atrophy
- Blindness

Management
EXCLUDE giant cell arteritis: history e.g. temporal pain, jaw claudication, transient visual obscurations, night sweats, weight loss, examination, ESR, CRP, superficial temporal artery biopsy
- If arteritic, immediate high dose systemic (intravenous) corticosteroids (if in doubt treat arteritic)
- If non-arteritic, treat underlying medical condition e.g. hypertension, consider aspirin

NOTES:
Diabetic Retinopathy

Microvascular disease of the retinal microcirculation
- Commonest cause of blindness in young people (<65 years)
- Vital to have excellent glycaemic control
- Important to control any associated hypertension

**Symptoms**
- Usually none until:
  - gradual loss of vision - central (macular area) retina is involved by oedema, exudation or haemorrhage
  - sudden loss of vision - most commonly vitreous haemorrhage

**Revised English Diabetic Eye Screening Programme Grading Classification**

Each eye graded in three categories

<table>
<thead>
<tr>
<th>Retinopathy</th>
<th>Examination</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>R0 No</td>
<td>Microaneurysms, haemorrhages, exudates</td>
<td>Observe (focal laser if threatening fovea)</td>
</tr>
<tr>
<td>R1 Pre-proliferative Background</td>
<td>Venous beading looping of vessels</td>
<td>Careful observation by ophthalmologist</td>
</tr>
<tr>
<td>R3 Proliferative a – active s - stable</td>
<td>Fine new vessels on disc or elsewhere ± vitreous haemorrhage</td>
<td>Urgent panretinal laser photocoagulation (long standing haemorrhage will require vitreoretinal surgery)</td>
</tr>
<tr>
<td>M0 Absent or M1 Present</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Photocoagulation**
P1 added if present, omitted if absent

**Retinopathy**

**Maculopathy (more common in Type 2 diabetes)**
- Involves predominantly the central retinal region
• Exudative
• Ischaemic

**Symptoms**
• Distortion of central vision with difficulty reading

**Examination**
• Oedema, exudates, microaneurysms and haemorrhages at macula

**Treatment**
• Intravitreal anti-VEGF injections for macular oedema. Intravitreal injection of steroid implant also used.

**NOTES:**
Retinal Detachment

Separation of the sensory retina from the retinal pigment epithelium

Causes
- Retinal tear with influx of fluid between the two layers
- Associated with posterior vitreous detachment
- Associated with trauma
- Commoner in myopes

Symptoms
- Flashes
- Floaters (tadpoles, cobwebs)
- Field loss, opposite direction to detachment
- Reduced vision, profound if a "macular off" detachment

Examination
- Grey, corrugated appearance of retina ballooning forward into the vitreous

Complications
- Poor recovery of vision due to photoreceptor damage, especially if macula
- Detached prior to surgery
- Redetachment
- Glaucoma
- Blindness if surgery unsuccessful

Treatment
- Surgical
  (Commonest surgery is a vitrectomy)

NOTES:
Age Related Macular Degeneration (ARMD/AMD)

Age related disease involving the macula, usually bilateral. Can cause a devastating loss of central vision in the ageing population. Commonest cause of severely sight impaired (blind) and sight impaired (partial sight registration) in people over the age of 60 years in the UK. Patients do not go completely ‘blind’ as many keep their independence as peripheral vision is maintained. If there is AMD in one eye, then the risk of the fellow eye developing AMD is 39-55%.

Cause
• Unknown

Symptoms
• Gradual loss of central vision (central scotoma)
• May be very slowly progressive (years) – dry type (see below)
• If associated with haemorrhage may have sudden deterioration – wet type (see below)
• Distortion usually first symptom
• Eventually severe loss of central field but maintain peripheral navigational vision
• Difficulty with reading, recognising faces

Examination
There are two forms:

Dry (atrophic) – the more common form of the disease and accounts for 90% of all AMD.
• The classic lesion in dry AMD is geographic atrophy causing severe central vision loss.
• The precursor lesion that leads to the development of geographic atrophy is a small yellowish macular lesion called ‘drusen’ – the soft type (not the hard type).

Wet (neovascular/exudative) – accounts for approximately 10% of all AMD but 90% of all blindness from the disease.
• This form is characterized by choroidal neovascularization (CNV), the development of abnormal blood vessels beneath the retinal pigment epithelium (RPE) layer of the retina.
• CNV identified on fundus fluorescein angiography.
• These new blood vessels penetrate into the retina in the macular region and bleed.
• This eventually causes macular scarring which can result in profound loss of central vision (disciform scar).

Evaluation
• Fundus fluorescein angiography Optical Coherence Tomography (OCT)

Treatment - general
• Usually nil as majority are the dry form of AMD (there is no treatment, laser, or other that can halt or reverse the relentless progression of dry AMD related vision loss), stop smoking.
• Low vision aids (LVA) i.e. magnifiers to help reading.
• Vitamins - a beneficial effect of very high doses of antioxidants (daily dose vitamin C 500mg, vitamin 400 IU, Beta-carotene 15mg (25,000 IU)) and zinc 80mg (along with 2mg
copper to prevent anaemia) in reducing patient’s relative risk of progression to advanced AMD by 25%. These supplements may be indicated in patients with advanced AMD in the fellow eye.

- Registration as Sight Impaired or Severely Sight Impaired.
- Social support

**Treatment – wet**

**Anti-Vascular Endothelial Growth Factor (VEGF)**

- VEGF-A has been implicated as a key mediator in the pathogenesis of blood vessel growth and leakage – both hallmarks of wet AMD.

**Intravitreal anti-VEGF therapies**

These are given as a course and monitored by visual acuity, OCT and/or fluorescein angiography. The 3 main drugs are:

- Ranibizumab
- Bevacizumab
- Aflibercept

As these injections are given into the eye it must be undertaken in a clean (sterile) room. Complications of the injection include: endophthalmitis (potentially devastating infection inside the eye), retinal detachment, and severe uncontrolled uveitis.

**NOTES:**
**LASERs**

Light Amplification by Stimulated Emission of Radiation.

**Photocoagulation**
- By Argon, Krypton or Diode laser

**Aim**
- To create a burn
- Absorption of light energy by ocular pigments
- Light energy converted into heat

**Some Indications** - Laser treatment can also be used for the management of some glaucomas
- Focal
  - create adhesion around retinal holes and tears
- Diabetic retinopathy
- Panretinal
  - Proliferative retinopathies: retinal new vessels due to diabetes or retinal vein occlusion

**Photodisruption**
- By Neodymium-YAG laser

**Aim**
- To disrupt tissues, cells actually explode/implode

**Indications**
- Posterior capsulotomy: to place a hole in the residual lens capsule after cataract surgery
- Peripheral iridectomy: to place a hole in the iris after angle closure glaucoma to prevent further attacks

**Photoablation**
- By Excimer laser

**Aim**
- To alter corneal curvature

**Indications**
- Excision of superficial corneal scars
- Refractive surgery: to help people see better without spectacles e.g. LASIK

**NOTES:**
Strabismus

Misalignment of the eyes (visual axes). Also commonly known as squint, but by patients also as a 'turn' or 'cast'.

Strabismus may be the first sign of a serious neurological or ocular disorder - in other words its significance, as in so many eye conditions, may extend beyond the visual system.

Terminology
2 broad categories:
1. Paralytic = incomitant
2. Non-paralytic = concomitant = comitant
For each of the above, the eyes may be convergent (esotropia) or divergent (exotropia). Vertical deviations can also occur.

Consequence of strabismus - Amblyopia
Amblyopia is caused by strabismus, refractive errors and any obstacle to the DEVELOPING visual system, such as cataract, ptosis etc. Amblyopia does not occur after about 6-8 years of age
AMBLYOPIA - reduced vision which persists after the removal of any obstacle to clear vision.

Amblyopia treatment
Can only be treated in childhood, therefore it is important to diagnose early
- Treatment of the underlying cause
  remove any obstacle to clear vision - cataract, ptosis etc.
  refractive correction by spectacles or even contact lenses
- Occlusion therapy - patch the good eye
  note this is undertaken after management of the underlying cause
  note the squint does NOT have to be corrected first

Paralytic strabismus (incomitant)
Strabismus due to a cranial nerve palsy (III, IV, or VI). The usual type of deviation in adults, because of the serious associations, consider a paresis first.

Causes
- Compression, by tumour, aneurysm etc.
- Infection
- Muscle disease e.g. myasthenia gravis
- Congenital - a diagnosis of exclusion

Symptoms
- Diplopia when the eyes attempt to move into the direction of the palsied muscle
- Diplopia which clears when the eyes look away from the palsied muscle, or one eye is covered – binocular
- The young child is able to suppress diplopia very quickly and therefore this symptom is not common in childhood
- Other symptoms dictated by the underlying cause of the strabismus

Examination
Examine the eye movements in ALL directions - there will be limitation of movement towards the direction of the palsied muscle, sometimes quite subtle
Consider neurological examination if indicated

**Treatment**
- Management of the diplopia - (see under EYE MOVEMENTS)
- Management of the visual consequence of diplopia - AMBLYOPIA, in children only

**Non-paralytic strabismus (comitant)**
The commonest strabismus type in children. Infrequent in adults, but may result from a childhood tendency for a squint which somehow does not become manifest until adult life. Unlike paralytic strabismus the ocular movements are full

**Causes**
- High refractive errors
- Poor vision of one or both eyes
- Squint may be the presenting sign of an intraocular tumour such as retinoblastoma
- Familial
- Premature birth - the incidence of squint in ex-prematures is much higher than normal
- Neurodevelopmental delay - very high incidence
- Unknown - exclude other causes first
- Remember a longstanding squint may be become comitant with time

**Examination**
- Examine ocular movements in ALL positions
- Perform a cover test, with an interesting target (not a light) at near (33cm) and distance (6m)

**Treatment**
- Child
correct any amblyopia first
refractive correction -this is the first part of amblyopia correction, and may also correct the squint itself
surgery

- Adult
refractive correction
botulinum toxin
surgery

**NOTES:**
Visual Fields

Representation in space of the extremes of visual sensation.

**Visual Field Defects**
- Scotoma (isolated, central, centrocaecal): positive - patient sees a grey/black area, negative - patient sees a gap in visual field
- Hemianopia (homonymous, heteronymous; congruous, incongruous)
- Nature of defect depends on cause and part of visual pathway involved

Important rule: the more posterior the more congruous, i.e. uniocular defect must arise from one eye, and a congruous hemianopia must involve the optic radiation or visual cortex.

**Causes**
- Multiple and varied
- Central scotoma: optic nerve lesion (ischaemic, compressive, demyelination), macular lesion
- Centrocaecal scotoma: toxic optic neuropathy
- Bitemporal hemianopia e.g. pituitary space occupying lesion
- Homonymous hemianopia: retrochiasmal pathways (vascular, compressive)

**Symptoms**
- Often asymptomatic or clumsy behaviour noted by relatives
- Loss of vision progressive in SOL, sudden in vascular causes

**Examination**
- Perimetry
  - Confrontation to white and red targets (easy, quick and accurate)
  - Manual perimetry: Goldmann perimetry
  - Automated perimetry: e.g. Humphrey visual field

**Treatment**
- Investigate as indicated by type of defect found - treat the cause
- Some defects may be reversible e.g. those due to compressive lesions

**NOTES:**
Eye Movements

Eye movement disorders are very difficult to classify, being relatively infrequent only certain aspects are included here.

**Nuclear and infranuclear disorders**
- Affect the movement of ONE eye only, unless the lesion is bilateral.
- The site of the lesion can be in the cranial nerve nucleus or anywhere along the peripheral nerve: in the brainstem, cavernous sinus, orbit, or muscle

**Causes**
- Cranial nerve lesions of III, IV or VI vascular occlusive disease as a mini-stroke compressive by tumour or aneurysm etc. inflammatory, e.g. in orbit or cavernous sinus following neurosurgery
- Muscle disease myasthenia gravis there are others but very rare

**Symptoms**
- Diplopia - binocular diplopia, due to misalignment of the eyes, must be differentiated from monocular, due to cataract etc., the former disappears when one eye is closed, the latter persists when using each eye individually
- Other symptoms depend on cause of nerve palsy or muscle disease

**Examination**
- Ocular movements
- Full neurological examination

The aim of assessment is to distinguish between a serious, neurological disorder requiring very urgent action, from an ophthalmic disorder, which although important is not in itself life-threatening.

**Treatment**
- The underlying cause
- Amblyopia - (see under STRABISMUS)
- Diplopia patch eye - temporary only prisms botulinum toxin strabismus surgery

Supranuclear disorders affect the movements of BOTH eyes as the lesion is central to the cranial nerve nucleus. Internuclear ophthalmoplegia (INO) is the most important and occurs because of a lesion in the medial longitudinal fasciculus (MLF) - commonly in MS. The MLF links the 6th nerve nucleus to the contralateral medial rectus - meaning that when one eye abducts, the other adducts to follow. A lesion here therefore prevents the eye adducting when the contralateral eye
abducts and the abducting eye develops nystagmus.

NOTES:
Nystagmus

Rhythmic oscillation of the eye(s). Almost always affects both eyes, but can be asymmetrical, and occasionally is voluntary

Causes
- Physiological e.g. calorics, optokinetic
- Sensory deprivation - reduced vision in early life (before 6 years)
- CNS causes
  - vestibular - often with a rotatory element
  - cerebellar disease
- brainstem disorders - many including demyelination
- vascular lesions and tumours
- drugs - almost any acting on the CNS - alcohol is the most frequently seen
- Specific types - there are a number of types such as see-saw, up-beat which provide important clues to the basic pathology.
- Congenital nystagmus - this diagnosis can only be made after all other possibilities have been considered, can be familial.

Symptoms
- Acquired - causes oscillopsia and reduced vision - quite disabling
- Congenital - reduced vision but no oscillopsia

Examination
- Examine for a neurological abnormality
- Examine for an ocular abnormality - which may be subtle and in childhood require electrophysiological testing

Treatment
- Treat the underlying cause

NOTES:
Pupil Responses

Normal
• Light reflex: direct and consensual
• Near reflex

Examination
• Pupil size, up to 20% of the population have a physiological anisocoria of 1mm or less
• Asymmetry (which is the abnormal pupil?)
• Irregularity (previous uveitis (iritis)
• Direct and consensual light reflex
• Near reflex
• For relative afferent pupillary defect (RAPD)

Abnormal
• RAPD +ve (also known a Marcus Gunn, swinging flashlight test): reduced optic nerve function, (or gross retinal disease e.g. extensive detachment)
• Holmes-Adie (tonic pupil, large pupil initially, smaller years later): cause obscure, associated with reduced tendon reflexes
• Horner’s syndrome (oculosympathetic palsy, small pupil more obvious in dim illumination): due to interruption of sympathetic chain
• Argyll-Robertson (small pupils, light-near dissociation): syphilis, diabetes
• III nerve palsy (dilated pupil, eye abducted, ptosis): posterior communicating artery aneurysm (pupil may be spared if a medical cause e.g. diabetes)
• Drug induced: pilocarpine, cyclopentolate, atropine

Symptoms
• Usually nil
• Difficulty in focusing if pupil large

NOTES:
Optic Atrophy

Atrophy of the optic nerve head (or a part thereof) resulting from damage to nerve fibres at the level of the retina, optic disc or pre-geniculate visual pathways.

Causes
- Retinal
  retinal artery occlusion
  retinitis pigmentosa
- Optic disc
  vascular: ischaemic optic neuropathy (arteritic and non-arteritic)
  glaucoma
- Demyelinating disease
  inflammatory: vasculitis, papillitis, pre-geniculate visual pathways (i.e. optic nerve, chiasm, tract)
  vascular: ischaemia
demyelinating disease
  compressive (tumour, aneurysm)
toxic (drugs) and metabolic e.g. B12 deficiency, tobacco/alcohol amblyopia, methanol poisoning
- Congenital/hereditary

Symptoms
- Those of original cause
- Loss of vision

Examination
- Optic disc pallor: whole of disc in optic nerve lesions, may be segmental in vascular disease
- Characteristic visual field defects depending on site of lesion
- Afferent pupillary defect may be present

Treatment
- Treat the original cause
- Atrophy usually represents irreversible loss of optic nerve fibres so poor prognosis for vision

NOTES:
Papilloedema

Bilateral swelling of the optic nerve head resulting from raised intracranial pressure (ICP).

Causes
- Obstruction of CSF flow in ventricular system by congenital or acquired lesions such as tumours
- Obstruction of CSF absorption by arachnoid villi (e.g. blood, protein, inflammatory debris)
- Obstruction of cerebral venous drainage system
- Idiopathic intracranial hypertension (IIH)

Symptoms
- Headache with diurnal variation and postural features, pulsatile tinnitus
- Transient visual obscurations
- Normal vision unless optic atrophy

Examination
- Blurring of both optic disc margins
- Loss of spontaneous venous pulsations
- Elevation of optic disc with obscuration of vessels
- Hyperaemia and venous engorgement
- Haemorrhages and cotton-wool spots
- Visual fields full although blind spot enlarged in more advanced cases

Complications
- Optic atrophy with visual loss

Treatment
- Treat the cause
- In IIH, weight loss, carbonic anhydrase inhibitors, lumboperitoneal shunt or optic nerve sheath fenestration may prevent loss of vision

Differential diagnosis
- Swollen disc due to causes other than raised ICP e.g. papillitis, vasculitis, optic neuritis, CRVO, ischaemic optic neuropathy, malignant hypertension (these causes usually associated with significant visual loss) and optic nerve head drusen

NOTES:
A systematic approach is essential - always work from front to back. **Beware - some of the most serious injuries exhibit little in the way of symptoms or signs.** The purpose of this section is to alert you to the variety of ophthalmic injuries, and treatment will not be considered.

**Surface injuries**

**Conjunctiva**
- Only rarely the sole site of injury, however the presence of a subconjunctival haemorrhage (insignificant in itself) can be a clue to a serious underlying problem such as intraocular haemorrhages in non-accidental injury of childhood
- Foreign bodies - may lodge on the tarsal surface of the upper lid - examine this area

**Cornea**
- Abrasions - due to blunt injury
- Foreign bodies - history is often uninformative: always consider this if there is a red eye, if there is a possibility of an intraocular foreign body X-ray

**Chemical injuries**
- Whatever the chemical - wash out copiously with saline until pH is neutral, alkalis are particularly damaging

**Blunt injuries**
- Caused by squash ball, assault etc.

**Signs**
- **Hyphaema** - blood in the anterior chamber
- **Vitreous haemorrhage** - both of these will cause a black ophthalmoscopic view
- **Traumatic mydriasis** - irregular, poorly reacting pupil due to blunt trauma
- **Iridodialysis** - peripheral tear of a section of the iris root
- **Lens** - dislocation or cataract formation
- **Retinal detachment** - particularly likely if there has been a vitreous haemorrhage
- **Orbital damage** - blow-out fracture

**Penetrating injuries**
A high index of suspicion is essential, for the patient is often unaware of the nature and severity of the injury (also the site of penetration may seal) - external signs can be minimal.

If the object penetrating the eye is large, the symptoms and signs are obvious
- Small FBs which can be metallic and of high velocity, typically hammer and chisel injuries (DIY, home mechanics etc.) may pass into the eye with virtually no tissue destruction, thus there are often no, or minimal signs in the eye, however iron or copper are chemically toxic to the retina so a CT scan is essential to exclude a FB
- Vegetable material (due to gardening or farming injuries) often lead to serious intraocular infection
Examination of all injuries
- Take a careful history, ask about hammering and chiseling etc.
- Measure the visual acuity of each eye unaided with a pin-hole
- Examine the eyelids for subtle signs of penetration

Do not press on the eye which may be perforated, you may cause the intraocular contents to be extruded!
- Examine the anterior surface of the eye - conjunctiva, cornea and do not forget to evert the upper eyelid to look for foreign bodies etc.
- Examine the anterior chamber, iris and lens - (measure the intraocular pressure - specialist procedure)
- Ophthalmoscopy - black view could be due to a hyphaema or vitreous haemorrhage
- Always perform a CT scan of the orbit if there is a possibility of an intraocular foreign body or fracture - it is important to have a high index of suspicion in these cases

NOTES:
Differential Diagnosis of the Red Eye

Blepharitis

- Minimal red eye(s)
- Foreign body feeling
- No pain
- No photophobia
- Normal visual acuity
- Crusts on lashes
- Meibomian cysts
- Acne rosacea

Bacterial Conjunctivitis

- Red eye(s)
- Minimal discomfort
- No pain
- No photophobia
- Normal vision
- Pus

Viral Conjunctivitis

- Red eye(s)
- Minimal discomfort
- No pain
- No photophobia
- Normal vision
- Watery discharge
- Associated URTI
- Pre-auricular lymphadenopathy

Bacterial Keratitis

- Red eye
- Pain
- Photophobia
- Reduced vision
- Pus
- White spot (abscess) on cornea
- Predisposing trauma, anaesthetic cornea, contact lens wear

Viral Keratitis

- Red eye
- Pain
- Photophobia
- Reduced vision
- No discharge
- Classical dendritic staining pattern of HSV with fluorescein
- Reduced corneal sensation
- Recurrent

**Marginal Keratitis**

- Red eye
- Discomfort
- Photophobia
- No discharge
- Normal vision
- White spots on peripheral cornea which stain with fluorescein
- Blepharitis
- Meibomian cysts
- Acne rosacea

**Acute Anterior Uveitis (iritis)**

- Red eye(s)
- Pain
- Photophobia
- Blurred vision
- No discharge
- Small pupil
- Irregular pupil
- Recurrent
- Associated HLA-B27 disease

**Episcleritis**

- Red eye(s)
- Mild discomfort/ache
- No discharge
- Normal vision
- Recurrent

**Scleritis**

- Red eye(s)
- Severe pain
- No discharge
- Normal vision
- Associated auto-immune disease
- Recurrent
Angle Closure Glaucoma

- Red eye(s)
- Severe pain
- Nausea/vomiting
- No discharge
- Haloes around lights
- Reduced vision
- Hazy cornea
- Semi-dilated pupil
- Hypermetropia
Painless Loss of Vision

**Sudden**
- vascular occlusion
  - retina
    - venous
    - arterial
  - optic nerve head
    - anterior ischaemic optic neuropathy
- vitreous haemorrhage
- retinal detachment
- wet age related macular degeneration

**Recent**
- cataract
- wet/dry age related macular degeneration

**Gradual**
- cataract
- dry age related macular degeneration
- primary open angle glaucoma
- diabetic maculopathy
- papilloedema
Painful loss of vision

- keratitis
- uveitis
- angle closure glaucoma
- scleritis
- optic neuritis