# Ophthalmology
# High-Yield Exam Notes

All 12 lectures + past papers
(161 final-exam MCQs · 176 mini-OSCE stations · 2016–2025)

| Symbol | Meaning |
|---|---|
| ★★★ | Must-know: appeared repeatedly in past papers or is a slide-highlighted fact |
| **[PP]** | Tested as an MCQ in the final-exam collection (018 / 019 / 020 finals) |
| **[OSCE]** | Tested as a mini-OSCE station (images, spot diagnoses, short answers) |
| **[+]** | Added standard knowledge, **not** on your slides or in the papers: verify with your lecturer |
| **VERY HIGH** / **HIGH** / **MEDIUM** | Priority, calculated from the number of past MCQs + mini-OSCE stations on that topic |

**How to use this PDF**

- Chapters are ordered by **exam frequency** (study from Chapter 1 down if you are short of time).
- Where a slide and a past paper disagree, the **past paper wins** and the conflict is flagged in a yellow box.
- Pictures from the mini-OSCEs are not reproduced: their **answers** are in the "OSCE spot-diagnosis" table of each chapter.
- Past-paper answer keys sometimes contain errors or blanks; those are marked "key unclear".
- Counts: 161 MCQs from the final-exam collection; 176 stations from the "Ophtha Mini-OSCEs" file. The second mini-OSCE file (2016–2024, 151 items with answers) overlaps heavily and was used for answers.

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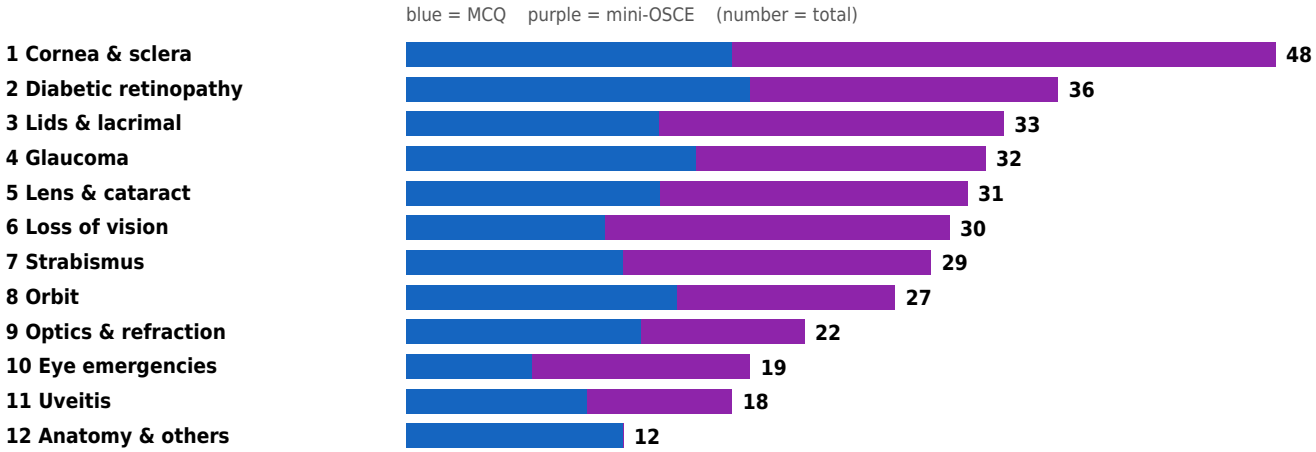
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Also inside: exam-intelligence page (after the contents) · ophthalmic drug cheat-sheet · OSCE instrument & image atlas · last-night rapid-fire sheet

# Exam intelligence: what was actually tested

Counts come from the files you uploaded: 161 final-exam MCQs (018/019/020 collections) and the 176 numbered stations of the "Ophtha Mini-OSCEs" file. Many stations repeat between years, which itself shows how predictable they are.




## Priority ranking of the learning objectives

| # | Topic | MCQ + OSCE | Priority | Comment (slides vs exams) |
|---|---|---|---|---|
| 1 | Cornea & sclera (+ LASIK, graft, keratoconus) | 48 | VERY HIGH | Most questions of any lecture: keratoconus, HSV, graft, LASIK contraindications, Acanthamoeba |
| 2 | Diabetic retinopathy | 36 | VERY HIGH | Fundus-photo station almost every year ("PDR: neovascularisation + laser marks") |
| 3 | Lids & lacrimal | 33 | VERY HIGH | **Upgraded:** brief on the slides but very frequent (ectropion, ptosis, BCC, DCR, chalazion) |
| 4 | Glaucoma | 32 | VERY HIGH | Drugs, acute angle closure, congenital glaucoma, tonometry |
| 5 | Lens & cataract | 31 | VERY HIGH | Phaco vs ECCE, PCO + YAG, endophthalmitis, leukocoria |
| 6 | Loss of vision | 30 | VERY HIGH | Painful vs painless, RD, CRAO/CRVO, optic neuritis, visual-field lesions |
| 7 | Strabismus | 29 | VERY HIGH | Esotropia types, yoke muscles, 6th/3rd palsy, amblyopia |
| 8 | Orbit (TED, cellulitis, tumours) | 27 | HIGH | Graves spot-diagnosis is a station every year |
| 9 | Optics & refraction | 22 | HIGH | LASIK + hypermetropia questions repeat |
| 10 | Eye emergencies | 19 | MEDIUM | Chemical burn, hyphema, acute angle closure photo stations |
| 11 | Uveitis | 18 | MEDIUM | **Fewer questions than the slides suggest**, but each is predictable (HLA-B27, sarcoid KP, Fuchs, Behçet) |
| 12 | Anatomy & others | 12 | MEDIUM | Small recurring facts: ora serrata, accommodation, Argyll-Robertson, leukocoria |

### Frequency insights

- **Rarely/never tested although in the slides:** corneal dystrophies, scleral anatomy, orbital tumour details (lymphoma, optic glioma), Chandler classification, tear-film layers, Crouzon syndrome, pterygium.
- **Frequently tested although only brief on the slides:** keratoconus signs (Munson), hyphema management, congenital glaucoma, corneal-graft facts, PRP complications, ptosis causes, ice-pack test, ectropion, leukocoria causes, visual-field localisation.
- **Most repeated image stations:** PDR fundus · Graves proptosis/lid retraction · hyphema · chemical burn · keratoconus (Munson/CXL/ring) · RD · hypopyon/keratitis · ectropion/entropion · BCC · mature cataract · acute angle closure.

## Slide vs past-paper discrepancies (past paper wins)

| Topic | Slide says | Past paper says → use this |
|---|---|---|
| Flame-shaped haemorrhage | Microaneurysm rupture produces dot, blot AND flame haemorrhages | MCQ key: flame = superficial capillary rupture, **not** microaneurysm rupture; dot/blot = deep layers |
| Cotton-wool spots | Slide text next to IRMA reads "a sign of severe NPDR"; classification slide puts soft exudates in **moderate** NPDR | MCQ: "cotton-wool + dot-blot = severe NPDR" is the **wrong** association → cotton-wool = moderate |
| Cataract in diabetic eye disease | Listed under "diabetic eye disease" | MCQ: cataract is **not** a manifestation of diabetic *retinopathy* (retinopathy, maculopathy, PDR are) |

| Topic | Slide says | Past paper says → use this |
|---|---|---|
| Pseudo-strabismus | Take-home: "there is nothing called pseudo-strabismus" | MCQ/OSCE: wide nasal bridge = **pseudo-esotropia** (not a true cause of esotropia) |
| Patching | Take-home: "never patch the eye of a child" | Exams: patching the **good eye** treats amblyopia; **total / prolonged** occlusion is the wrong answer |
| Aqueous-deficient dry eye | Symptoms worse in the evening; VA affected by corneal damage | MCQ key: "decreased visual acuity" is the non-symptom (answer E) |
| Infantile esotropia | Not associated with hypermetropia; large angle; surgery | Q16 key "B or E?" unclear. Learn: **not** hyperopia-related; amblyopia can occur; onset first 6 months |
| Sudden vision loss in the elderly | Cataract = commonest cause of reversible vision loss | OSCE key: for **sudden** loss in an elderly patient the answer is **wet AMD** (not CRAO/CRVO) |
| Keratoconus class | Disorder of shape (ectasia) | Final 020 key: "KC is a corneal degeneration" counted as the true statement |
| Tarsal plate (Q114) | Meibomian glands lie in the tarsus | Key says "A or D?" unclear. By anatomy lash follicles are NOT in the tarsal plate; the cyst of Zeis arises from lash glands |

# Chapter 1 — Cornea, Sclera & Refractive Surgery

| VERY HIGH | **18** past MCQs | **30** mini-OSCE stations | Exam rank **#1** of 12 |
|---|---|---|---|

## Why is this topic important?

- Most-tested lecture: **48 questions** across the papers (18 MCQ + 30 OSCE stations).
- The same questions come back every year: **keratoconus** (Munson sign, topography, cross-linking, ring), **HSV dendritic ulcer**, **corneal graft** facts, **LASIK contraindications**, **Acanthamoeba**, **episcleritis vs scleritis**.
- Easy marks: most answers are one-liners you can memorise from the tables below.

## High-Yield Facts: anatomy & physiology

| Fact | Detail |
|---|---|
| **Size** | ★★★ Diameter **11–12 mm** (key answer 11.5), thickness **0.5 mm** [PP][OSCE] |
| **5 layers** | **Epithelium** (stratified squamous, **regenerates** from limbal stem cells) → **Bowman** (acellular, not a true basement membrane) → **Stroma 90 %** (parallel collagen) → **Descemet** (tough; the MCQ key treats "Descemet cannot regenerate" as false) → **Endothelium** (single layer, **does NOT regenerate**, pumps water) |
| **Endothelial failure** | Loss of pump → oedema → clouding → **bullous keratopathy** (pseudophakic/aphakic) = commonest graft indication worldwide |
| **Nutrition** | Aqueous humour ($O_2$ to endothelium + posterior stroma); tear film/air (epithelium + anterior stroma). **Avascular** |
| **Nerve supply** | Nasociliary branch of V1 (rich sensory endings, very painful when abraded) |
| **Refractive power** | ★★★ **2/3 cornea** (fixed) vs 1/3 lens (accommodates) [PP] |
| **Defences** | Blinking, tear flow, mucus entrapment, antimicrobial tears, intact epithelium. *Neisseria gonorrhoeae* is the only organism that can penetrate an **intact** epithelium |
| **Fluorescein** | Epithelial defect stains **green** under cobalt-blue light |

## Infective keratitis: comparison table

| | HSV (type 1) / HZV | Bacterial | Acanthamoeba | Fungal |
|---|---|---|---|---|
| **Clue** | Reactivation from trigeminal ganglion; **dendritic ulcer** (pathognomonic), painful, photophobia, watery | Staph/strep (>90 % of infections); pain, purulent discharge, ciliary flush, **hypopyon**, white stromal infiltrate | **Contact-lens wearer**, plant injury; severe pain; **ring-shaped** infiltrate (abscess, not an ulcer) [PP] | Warm areas, plant trauma, long steroid use; **fluffy** opacity |
| **Risk factors** | Stress, illness, debilitated patients | Dry eye (KCS), epithelial breach, contact lens, prolonged topical steroids | Contact lenses; non-response to antibacterials; steroid use | Plant trauma, steroids |
| **Treatment** | **Topical aciclovir** [OSCE]; HZO with skin involvement: **oral antiviral** + derma (↓ post-herpetic neuralgia); **steroids make a dendritic ulcer WORSE** | Combined topical antibiotics for G+ and G−; **fluoroquinolone monotherapy** possible | **Chlorhexidine + propamidine** for months; may end in graft. **Pyrimethamine is wrong** (that is toxoplasma) | Topical + systemic antifungals |
| **Complication** | Disciform keratitis (stroma, immune reaction) → oedema → scar → graft | Perforation, endophthalmitis | Graft | |

**KEY POINT**

- ★★★ **Hutchinson sign** = vesicle on the **tip of the nose** (nasociliary branch) → HZO **not simple HSV** [PP][OSCE]: ocular involvement is more likely. HZO also: V1 pain, headache, fever, keratitis, iritis, scleritis, lid swelling.
- Stain: fluorescein. Cause of dendritic ulcer: **HSV-1** (acquired in early life; what we see is reactivation); layer involved: **epithelium**.
- Commonest organism in bacterial keratitis (OSCE key): **Staph. aureus**. Contact-lens-associated (Final 020): **Acanthamoeba**.

## Keratoconus (KC): the star of the cornea exam

| Item | High-yield |
|---|---|
| **What** | Sporadic, progressive **central/paracentral thinning + conical ectasia**; painless; protrusion causes myopia and astigmatism; sometimes sub-clinical |
| **Why vision falls** | ★★★ **Progressive irregular myopic astigmatism** (NOT oedema/scar) [PP][OSCE] |
| **Signs** | **Munson sign** (V-shaped indentation of lower lid on down-gaze) [PP]; scissoring reflex [+]; red reflex is **preserved** (does not cause an absent red reflex) [PP]; hydrops = Descemet rupture → sudden painful oedema [+] |
| **Diagnosis** | **Corneal topography/tomography** (also detects sub-clinical KC) [OSCE] |

| Item | High-yield |
|---|---|
| **Treatment ladder** | 1 Spectacles → 2 Contact lenses → 3 **Corneal cross-linking** (riboflavin vit $B_2$ + **UV-A**, targets **stroma**, **stops progression**; "thiamine" is the wrong answer **[PP]**) → 4 **Intrastromal corneal ring segments** **[OSCE]** → 5 **Corneal graft** |
| **Refractive surgery** | KC is a **contraindication** to LASIK/PRK |

## Corneal graft (keratoplasty)

| Fact | Answer |
|---|---|
| **Why it works** | **Avascular, immune-privileged** host bed → success rate ≈ **80 %** (the "50 %" option is the wrong one) **[OSCE]** |
| **Matching** | **No HLA or ABO matching** needed **[PP][OSCE]** |
| **Donor** | Extracted within **24 h of death**; can be grafted within **2 weeks** of extraction; in Jordan 50 % of need is met by local donation (eye bank at JUH since 1979) |
| **Sutures** | Non-absorbable (10-0), left ~1 year; tight/asymmetric sutures → **astigmatism** |
| **Failure / complication** | ★★★ **Rejection is the commonest cause of failure** **[OSCE]**; risk ↑ with **vessels at the donor–recipient junction**. Rejection is a delayed (**type IV**) reaction, **not type II** **[PP]**. Early recognition → **topical steroids**; patient stays on steroid drops long-term **[OSCE]** |
| **Indications** | Severe keratoconus, bullous keratopathy (pseudophakic = most common worldwide), dystrophies, scars, persistent keratitis. **NOT high myopia** **[PP]** |
| **Other complications** | Endophthalmitis, glaucoma, astigmatism, PAS |

## Refractive surgery & LASIK

| Procedure | Key points |
|---|---|
| **Excimer laser** | UV, photo-**ablation** of stroma. **Myopia → flattens** the cornea; hyperopia → steepens; astigmatism → flattens the steepest meridian. 90–95 % of corneal refractive surgery is laser |
| **PRK / LASEK / Trans-PRK** | Laser on the corneal surface after removing the epithelium (resurfaced later) |
| **LASIK** | **Flap** (in situ) + reshaping (keratomileusis). **Topical anaesthesia** |
| **Contraindications** | ★★★ **Pregnancy & lactation**, **keratoconus**, **severe dryness / inflammation**, active corneal disease/keratitis, unstable refraction, age <19, collagen disease. **Make-up is NOT** a contraindication **[PP][OSCE]** |
| **Complications** | Commonest = **dryness** **[PP]**; incomplete/free flap, flap subluxation, corneal opacification, under/over-correction, **ectasia** (thin cornea) |
| **Before laser** | Corneal **thickness + topography** are a must. Success approaches 99 % with proper selection |

## Corneal dystrophies (rarely tested, brief on the slides)

| Type | Presentation |
|---|---|
| **Anterior** | **Recurrent corneal erosion** |
| **Stromal** | **Visual loss**; commonest cause of loss = **corneal opacity** **[PP]** |
| **Posterior (endothelial)** | Gradual visual loss (oedema). Relatively common in Jordan because of consanguinity |

## Sclera

| | Episcleritis | Scleritis |
|---|---|---|
| **Layer** | Superficial | Deep: swelling of sclera |
| **Symptoms** | Mild discomfort, **segmental** redness; commonest cause of **localised red eye** **[PP]** | **Severe ocular pain**, generalised redness |
| **Associations** | Rarely systemic | **Collagen vascular disease, commonest RA**, SLE; confirm with RF, ACPA, anti-dsDNA, anti-Smith **[OSCE]** |
| **Treatment** | Self-limiting; topical anti-inflammatory if persistent | Mild: topical steroid + oral NSAID; moderate/severe: **systemic steroids / cytotoxics** + investigate the cause |
| **Complications** | — | Scleromalacia (thinning ± perforation), keratitis, uveitis, cataract, glaucoma |

**ABSOLUTE EXAM CLASSICS: typical MCQ stems, traps and pitfalls**

- "Which is FALSE about the cornea?" → **epithelium cannot regenerate** (false), **Descemet cannot regenerate** (false per key), **stroma 50 %** (false, it is 90 %), **keratoconus can rupture** (false per key).
- Trap: **Hutchinson sign belongs to zoster (HZO)**, not simple herpes.

- Trap: **Acanthamoeba = ring infiltrate**, not a "white circular ulcer"; treat with chlorhexidine + propamidine.
- Trap: graft rejection is **type IV**; HLA/ABO matching not needed; success ≈ 80 %; "most common indication is corneal ectasia" is false (bullous keratopathy).
- Trap: KC causes **myopia + astigmatism**, not hypermetropia; it does **not** abolish the red reflex.
- Trap: steroids in a dendritic ulcer = **worse**. Topical steroid side effects: bacterial keratitis risk, corneal thinning/perforation, ↑ IOP, cataract.

## OSCE spot-diagnosis (answers from the stations)

| Picture / question | Answer |
|---|---|
| Sutures on a cornea | Keratoplasty; commonest complication/failure: **rejection**; drops: **topical steroid** |
| Green dye + blue light, branching lesion | **Dendritic ulcer**; fluorescein; topical aciclovir; HSV-1; epithelium; steroids = worse |
| White infiltrate + layered pus in AC | **Bacterial keratitis with hypopyon**; signs: hypopyon, ciliary flush, white opacity; RF: KCS, contact lens, steroids; Rx broad-spectrum topical antibiotics |
| Cone-shaped cornea, V-shaped lower lid | **Keratoconus** (Munson); topography; options: glasses, CL, CXL, ring, graft |
| Riboflavin drops + UV light | Cross-linking; stroma; indication = progressive KC |
| Arc segments in the stroma | **Intrastromal corneal ring segment** (KC) |
| Segmental redness, otherwise white eye | **Episcleritis** (vs scleritis) |
| Vesicles on forehead, tip of nose | **HZO**; Hutchinson; V1 pain; **systemic aciclovir** + derma |
| Ring-shaped infiltrate, contact lens | **Acanthamoeba**; chlorhexidine + propamidine; may need graft |
| Match: chalazion, scleritis, episcleritis, keratitis, pterygium | Chalazion = lid lump; scleritis = deep red painful; episcleritis = sectoral redness; keratitis = white corneal spot; pterygium = fleshy wedge of conjunctiva onto the cornea |

### MEMORABLE FACTS / MNEMONICS

- **KC treatment ladder = "S-C-X-R-G"**: Spectacles, Contact lenses, X-linking, Rings, Graft.
- **Endothelium never regrows**; **epithelium** regrows from the **limbus**.
- **LASIK = flap (in situ) + keratomileusis**; dryness is the commonest complication.

### EXAM CHECKLIST: what you absolutely need to know

- ☐ 5 layers + which regenerate ☐ KC signs, topography, CXL (riboflavin + UV-A), ring, graft
- ☐ HSV vs HZO (Hutchinson), steroid danger ☐ Acanthamoeba treatment ☐ Graft: 80 %, no HLA/ABO, rejection type IV
- ☐ LASIK contraindications ☐ Episcleritis vs scleritis (RA)

### Clinical connections

- **Clinical connections:** RA/SLE (scleritis) → Rheumatology; zoster vaccine / post-herpetic neuralgia → Medicine; contact-lens hygiene → public health; post-LASIK ectasia → thin cornea; dry eye (Sjögren) → Chapter 3.

## Practice MCQs (past-paper style)

**1.** Which statement about the cornea is **false**? A. Stroma is 90 % B. Endothelium does not regenerate C. Epithelium cannot regenerate D. Bowman is acellular
✓ **C** — Epithelium regenerates from limbal stem cells.

**2.** Hutchinson sign is associated with: A. HSV keratitis B. Herpes zoster ophthalmicus C. Acanthamoeba D. Keratoconus
✓ **B** — Nasociliary involvement; vesicle on the tip of the nose.

**3.** Commonest cause of vision loss in keratoconus? A. Corneal oedema B. Scar C. Irregular myopic astigmatism D. Hyaline deposits
✓ **C** — Hydrops/scars are secondary.

**4.** Which is **not** an indication for corneal transplant? A. Pseudophakic bullous keratopathy B. Severe KC C. High myopia D. Corneal scarring
✓ **C** — High myopia is treated with glasses/laser/lens.

**5.** Contact-lens wearer with severe pain and ring-shaped infiltrate: treatment? A. Pyrimethamine B. Chlorhexidine + propamidine C. Topical steroid D. Aciclovir
✓ **B** — Acanthamoeba. Pyrimethamine is for toxoplasma.

**6.** Which is FALSE about graft rejection? A. Type IV B. Vessels at the junction raise risk C. HLA matching essential D. Treated with steroids
✓ **C** — Avascular cornea: no HLA/ABO matching.

**7.** Commonest complication after LASIK? A. Endophthalmitis B. Dry eye C. Glaucoma D. Blepharitis
✓ **B** — Dryness.

**8.** A young woman with sectoral redness and mild discomfort: A. Scleritis B. Episcleritis C. Keratitis D. Uveitis
✓ **B** — Commonest cause of localised redness; self-limiting.

# Chapter 2 — Diabetic Retinopathy

| VERY HIGH | **19** past MCQs | **17** mini-OSCE stations | Exam rank **#2** of 12 |
|---|---|---|---|

## Why is this topic important?

- Second most-tested lecture: **36 questions**. The 2016-2018 mini-OSCE alone shows a DR fundus photo in more than 10 stations.
- Patterns: "name 3 findings → PDR → laser/anti-VEGF", "earliest sign = microaneurysm", "DR with macular oedema → anti-VEGF", "most common cause of vision loss = macular oedema".

## High-Yield Facts

| Fact | Detail |
|---|---|
| **Definition** | Progressive **microangiopathy** of retinal vessels from chronic hyperglycaemia; features of both leakage and occlusion |
| **Epidemiology** | ★★★ Most common cause of moderate–severe vision loss at 25–74 y; most common cause of impaired vision **worldwide in the working-age group** [PP] |
| **Risk factors** | Duration, poor control, **HTN, nephropathy**, hyperlipidaemia, smoking, obesity, **pregnancy**. **Not**: ocular hypertension, **myopia** [PP] |
| **Pathogenesis** | **Pericyte loss** → microaneurysms + blood-retinal-barrier breakdown (oedema, hard exudates) · basement-membrane thickening, endothelial damage, platelet aggregation → **capillary occlusion → hypoxia → VEGF** → new vessels |
| **Earliest sign** | ★★★ **Microaneurysm** (red dots; confirm by fluorescein angiography) [PP][OSCE] |
| **Hallmark of PDR** | ★★★ **Neovascularisation** (NVD at disc, NVE elsewhere, NVI on iris) [PP] |
| **Most common cause of vision loss in DM** | ★★★ **Macular oedema** (not vitreous haemorrhage/RD) [PP][OSCE] |
| **Symptoms** | Silent early, usually bilateral; blurred vision, colour impairment, floaters, patches blocking vision, poor night vision, sudden total loss |

## Signs & classification (International scale)

| Stage | Findings | Memory hook |
|---|---|---|
| **No DR** | Normal | |
| **Mild NPDR** | **Microaneurysms only** (earliest clinically detectable lesion) | |
| **Moderate NPDR** | More than mild but less than severe: dot/blot haemorrhages in >1 quadrant, **cotton-wool spots (soft exudates)**, hard exudates, venous beading in one quadrant | Cotton-wool spots = **moderate** [PP] |
| **Severe NPDR** | **4-2-1 rule**: haemorrhages/microaneurysms in **4** quadrants, venous beading in **2**, **IRMA** in **1** | [PP] **Iris neovascularisation is PDR, not severe NPDR** |
| **PDR** | **Neovascularisation**, **pre-retinal / vitreous haemorrhage**; later traction RD, rubeosis, NVG | Any of NV, pre-retinal or vitreous bleed |

| Sign | Mechanism / note |
|---|---|
| **Dot-and-blot haemorrhage** | Deeper retinal layers; flame/splinter-shaped = superficial layer [PP] |
| **Hard exudates** | Breakdown of blood-retina barrier: serum protein + lipid **leakage**; ring around a leaking microaneurysm = **circinate** pattern |
| **Cotton-wool spots** | **Ischaemia**: nerve-fibre-layer infarct from precapillary arteriole occlusion. Not a leakage sign [PP] |
| **IRMA / venous beading** | Ischaemia; abnormal sinuous shunt vessels next to non-perfused retina; sign of severe NPDR |
| **DME severity** | Mild (away from centre) → moderate (approaching) → severe (**involves the centre**). **CSME** (ETDRS): thickening/exudate within **500 µm** of the centre, or a zone of thickening ≥1 disc diameter partly within 1 disc diameter |

## Treatment: must know

| Situation | Treatment | Note |
|---|---|---|
| **Mild-moderate NPDR** | No specific retinal treatment; **good glycaemic control**, treat HTN, anaemia, renal failure | Fundus exam at least yearly for every diabetic |
| **Severe NPDR** | Close follow-up by the ophthalmologist (slide); PRP considered in high-risk eyes | |

| Situation | Treatment | Note |
|---|---|---|
| **DME / CSME** | ★★★ **Intravitreal anti-VEGF = first line** (e.g. bevacizumab/Avastin); focal/grid laser to leakage points as adjunct | NPDR + macular oedema in one eye → anti-VEGF to that eye only **[PP][OSCE]** |
| **PDR** | **Pan-retinal photocoagulation (PRP)**: scattered burns over the whole retina sparing the disc and macular area; ablates ischaemic retina and ↓ VEGF. **± anti-VEGF** (shrinks new vessels) | PDR + oedema → PRP **and** anti-VEGF **[PP]** |
| **Non-clearing VH / traction RD** | Vitrectomy **[+]** | |
| **Rubeosis / NVG** | PRP + anti-VEGF; glaucoma treatment | Painful red eye, ↑ IOP, distorted pupil |

**PRP & lasers**

- **PRP complications [OSCE]**: pain during treatment, transient ↑ IOP, **↓ peripheral visual field**, **impaired dark adaptation / night vision**, **macular oedema**. Laser marks = brown dots all over the retina (suggests prior PDR).
- **3 laser types:** photo-**coagulation** (DR) · photo-**ablation** (excimer, refractive) · photo-**disruption** (YAG, posterior capsule).

## Complications / blindness

- Vitreous haemorrhage → **traction RD** → **rubeosis iridis** → **neovascular glaucoma** → blindness; macular ischaemia. NVG: new vessels block the angle, pupil distorted, painful red eye.
- Investigations: HbA1c / blood glucose, **OCT** (macular thickness, oedema, CSME), **fluorescein angiography**.
- Prevention: early treatment, early detection, **routine fundus examination of all diabetics (at least yearly)**, referral.
- Other diabetic eye disease: **snowflake cataract** (young patients) and earlier age-related cataract, rubeosis/NVG, ocular neuropathies, corneal abnormalities.

**ABSOLUTE EXAM CLASSICS: typical MCQ stems, traps and pitfalls**

- "Sign of PDR?" → **neovascularisation** or **pre-/sub-hyaloid / vitreous haemorrhage** (not cotton-wool spots, venous changes, IRMA, dot-blot).
- "NOT related to microvascular *leakage*" → **cotton-wool spots** (ischaemia). Leakage = hard exudates, circinate, cystic/focal macular oedema.
- "NOT a feature of severe NPDR" → **iris neovascularisation**.
- "Wrong association" → **cotton-wool + dot-blot = severe NPDR** (they are moderate).
- "Not a cause of vision loss in DR" → **sub-retinal haemorrhage** (sub-hyaloid is a cause). "Not a manifestation" → **cataract**. "Doesn't affect DR" → **ocular hypertension**. "Doesn't cause macular oedema" → **acute angle closure**.
- Fundus with haemorrhages + exudates: **NPDR vs hypertensive retinopathy (control BP) vs retinal vein occlusion**.

**DISCREPANCY: slides vs past exams (past exams win)**

- Slide: microaneurysm rupture produces dot, blot **and flame** haemorrhages. Past-paper key (Q61): flame-shaped haemorrhages are **not** from microaneurysm rupture (superficial capillaries). Use the key.
- Slide lists cataract under "diabetic eye disease"; the key says cataract is not a manifestation of diabetic *retinopathy*.

## OSCE spot-diagnosis

| Picture / question | Answer |
|---|---|
| Fundus: microaneurysms, dot/blot, NV ± cotton-wool ± pre-retinal bleed | **PDR**; treat: PRP + anti-VEGF (Avastin) |
| Fundus: hard exudates, haemorrhages, no NV | **NPDR** (DDx hypertensive retinopathy, RVO). Mild–moderate: control; DME → anti-VEGF |
| Rings of exudates round the macula | **Circinate maculopathy** / DME |
| OCT with fluid cysts | **Macular oedema**; causes: DR, post-cataract surgery, retinitis pigmentosa; Rx anti-VEGF, laser, topical steroid. (Answer "OCT" alone was not accepted: name it Optical Coherence Tomography) |
| Brown dots all over retina | **PRP laser marks**; stage = PDR; complications night-vision loss, macular oedema |
| New vessels on iris | **Rubeosis iridis** (PDR, chronic uveitis) |
| Blood layered in front of the retina | **Pre-retinal (sub-hyaloid) haemorrhage** in PDR |
| Man with DM, blurry vision × 1 year | **Macular oedema** (commonest cause of vision loss in DM) |

**MEMORABLE FACTS / MNEMONICS**

- **"4-2-1"**: 4 quadrants haemorrhage, 2 venous beading, 1 IRMA = severe NPDR.
- **Leak vs Ischaemia**: Leak = hard exudate, oedema · Ischaemia = cotton-wool, IRMA, beading, NV.
- **First sign = Micro-aneurysm; hallmark of PDR = New vessels; commonest vision thief = Macular oedema.**

**EXAM CHECKLIST: what you absolutely need to know**

- ☐ Earliest sign, hallmark, commonest cause of vision loss ☐ Classification (mild/moderate/severe/PDR)
- ☐ Treatment by stage (anti-VEGF for DME; PRP ± anti-VEGF for PDR) ☐ PRP complications ☐ Risk factors / non-risk factors
- ☐ NVG pathway ☐ Investigations OCT/FFA/HbA1c

**Clinical connections**

- **Clinical connections:** Endocrinology (HbA1c targets, pregnancy), Nephrology (nephropathy co-exists), Cardiology (HTN, lipids), Obstetrics. Rubeosis → Glaucoma (Ch. 4); vitreous haemorrhage → Loss of vision (Ch. 6).

## Practice MCQs (past-paper style)

**1.** Earliest clinical sign of DR? A. Macular oedema B. Microaneurysm C. Dilated veins
✓ **B** — Confirm on fluorescein angiography.

**2.** Which indicates **proliferative** DR? A. Pre-retinal haemorrhage B. Cotton-wool spots C. IRMA D. Venous changes
✓ **A** — B–D are NPDR signs.

**3.** 55-y-old diabetic, NPDR both eyes, macular oedema right eye. Management? A. Anti-VEGF right eye B. PRP both C. Grid laser then PRP
✓ **A** — DME → intravitreal anti-VEGF first line.

**4.** PDR with macular oedema: best plan? A. PRP + anti-VEGF B. Anti-VEGF alone C. PRP alone D. Focal laser
✓ **A** — Treat both processes.

**5.** Most common cause of vision loss in diabetics? A. Macular oedema B. RD C. Vitreous haemorrhage
✓ **A**

**6.** NOT related to microvascular leakage: A. Hard exudates B. Circinate exudates C. Focal oedema D. Cotton-wool spots
✓ **D** — Ischaemic.

**7.** NOT a risk factor for DR: A. Pregnancy B. Nephropathy C. Myopia D. Hypertension
✓ **C**

**8.** Which is a PRP complication? A. Improved night vision B. Reduced peripheral field and dark adaptation C. Lens dislocation
✓ **B**

**9.** Painful red eye, new iris vessels, IOP 45 in a diabetic: A. Neovascular glaucoma B. POAG C. Uveitis
✓ **A** — Rubeosis closes the angle.

# Chapter 3 — Lids & Lacrimal System

| VERY HIGH | **14** past MCQs | **19** mini-OSCE stations | Exam rank **#3** of 12 |
|---|---|---|---|

## Why is this topic important?

- **33 questions**, more than the slides suggest. Mostly one-word answers: **ectropion**, **entropion**, **ptosis causes**, **BCC**, **chalazion vs stye**, **dry eye**, **DCR**.
- OSCE favourites: ice-pack test (myasthenia), dermoid cyst, congenital ptosis → amblyopia, dacryocystitis, xanthelasma.

## High-Yield Facts

| Fact | Detail |
|---|---|
| **Lid muscles** | **Levator** (CN III) = main elevator · **Müller** (sympathetic) = weaker elevator · **Orbicularis** (CN VII) = closure |
| **Layers** | Anterior lamella (skin + orbicularis) · posterior lamella (**tarsus** with **Meibomian glands**, conjunctiva). Orbital septum separates lid from orbital fat |
| **Meibomian glands** | Oil layer of tear film; prevents evaporation; blocked in **posterior blepharitis/MGD** and chalazion |
| **Tear film (3 layers)** | **Mucin** (goblet cells, inner) · **Aqueous** (lacrimal gland) · **Lipid** (Meibomian, outer). Functions: lubrication, smooth refraction, $O_2$ to cornea, debris removal, antibacterial (IgA, lysozyme, lactoferrin) |
| **Drainage** | Puncta → canaliculi → common canaliculus → sac → nasolacrimal duct → **inferior meatus** [PP] |

## Abnormal lid position

| | Ptosis | Entropion | Ectropion |
|---|---|---|---|
| **Definition** | Drooping upper lid (normally covers 1–2 mm of limbus) | Lid margin **turns inward** (lashes rub cornea; usually lower lid) | Lid margin **turns outward** (eversion) |
| **Causes** | **Most common acquired = levator aponeurosis disinsertion (elderly)** [PP]; **congenital = maldeveloped levator** [OSCE]; neurogenic: **CN III** (big pupil, diplopia), **Horner** (small pupil, anhidrosis); myogenic: **myasthenia** (fatigue), dystrophy, botulism; mechanical: lid lump/oedema/scar | Involutional (elderly, weak lower-lid retractors, orbicularis override), **cicatricial** (conjunctival scarring, **trachoma**), spastic | Involutional (orbicularis laxity), **CN VII palsy**, cicatricial (periorbital skin scarring) |
| **Symptoms / signs** | Reduced palpebral aperture, absent/high lid crease; amblyopia if visual axis covered | Red irritated tearing eye | Dry irritable eye + epiphora (poor drainage) [OSCE] |
| **Treatment** | Treat cause (myasthenia: medical); otherwise **surgery**; congenital: surgery ± patching of good eye | Taping, lubricants, botulinum toxin, **surgery** | Lubricants, **surgery** |

**KEY POINT**

- **Ice-pack test** (cooling improves myasthenic ptosis) = most available clinic test; serious differential = **myasthenia gravis** [OSCE]. Edrophonium test, AChR antibodies; Rx neostigmine, thymectomy (strabismus lecture).
- **Horner = ptosis + miosis + anhidrosis** [PP]. **Marcus Gunn jaw-winking** is a cause of ptosis; **facial palsy does NOT cause ptosis** [PP]; facial palsy gives ectropion, lagophthalmos, exposure keratitis, depressed brow, lacrimation, **not entropion** [PP].

## Lid margin & lid lumps

| Condition | Key features | Treatment |
|---|---|---|
| **Anterior blepharitis** | Lashes: scales, **collarettes**, redness, ulceration (Staph), lash loss; marginal keratitis. **Commonest cause of lash loss** [PP][OSCE] | Lid hygiene (bicarbonate / baby shampoo), topical antibiotic (fusidic acid), ± steroid |
| **Posterior blepharitis** | **MGD**: thick cloudy secretions, injected margin; associated with rosacea, atopy, seborrhoeic dermatitis | Hot compress + lid hygiene, **oral doxycycline/tetracycline or azithromycin**, artificial tears |
| **Chalazion** | **Lipogranuloma** from blocked Meibomian gland; **painless**; resolves within ~6 months | Incision & curettage through the conjunctiva if persistent |
| **Hordeolum** | Internal = painful abscess of Meibomian gland; **stye** (external) = very painful abscess of a lash follicle | Hot compress, epilate lash, topical antibiotic, drainage |
| Molluscum contagiosum | Pox virus lesion on lid margin → **follicular conjunctivitis**; children, HIV | Excise |
| Cysts | Cyst of **Moll** (sweat gland, translucent), **Zeis** (opaque, obstructed accessory sebaceous gland) | Excision |
| Xanthelasma | **Hypercholesterolaemia** → check blood cholesterol | Excise for cosmesis |

| Condition | Key features | Treatment |
|---|---|---|
| Keratoacanthoma | Fast growth over 3–6 weeks, central keratin crater; excise because it may be malignant | Excision + histology |
| Dermoid cyst | Congenital, superior-lateral/medial orbit, child **[OSCE]** | Excision (CT if deep stalk) |
| **BCC** | ★★★ **Most common malignant lid tumour (90 %)**; lower lid ~2/3; painless nodular/**rodent ulcer** that **bleeds**; slow, locally invasive, **no metastasis**. RF: fair skin, blue eyes, sun **[PP][OSCE]** | **Excision with safe margins / Mohs**; cryo, radiotherapy are alternatives. **Radiation is NOT first [PP]** |
| SCC | 5 % of lid tumours, faster, hard nodule/scaly patch, metastasises to regional nodes; can arise from actinic keratosis | Excision with safe margin |
| Trichiasis | Lashes toward globe with lid margin in normal position (vs entropion); associated with trachoma | Epilation, electrolysis/cryo, resection |

## Lacrimal system disorders

| Condition | Key features | Treatment |
|---|---|---|
| **Aqueous-deficient dry eye (KCS)** | Elderly women; **Sjögren** (primary: dry mouth; secondary: RA, SLE, scleroderma; anti-Ro/La, minor salivary gland biopsy). Burning, grittiness, photophobia, heavy lids, ocular fatigue, **worse in the evening**. Signs: early tear break-up (<5 s), punctate fluorescein staining, filamentary keratitis **[OSCE]** | Artificial tears, shielded spectacles, punctal plugs/occlusion, topical cyclosporin/mild steroid |
| **Evaporative dry eye** | MGD, ectropion, lagophthalmos (CN VII palsy), proptosis, infrequent blinking (Parkinson) | Treat MGD; lubricants; botulinum toxin to levator; **lateral tarsorrhaphy** |
| Cicatricial conjunctival disease | **Stevens-Johnson**, chemical burn, trachoma, vit A deficiency (xerophthalmia); loss of goblet cells, **symblepharon** | Lubricants |
| Congenital NLD obstruction | Watery eye, **white eye**; distal duct fails to canalise; pressing the sac gives discharge | **Mostly resolves in the 1st year**; else **probing** |
| Adult NLD obstruction | Epiphora worse in cold/wind; test: syringing, fluorescein disappearance, dacryocystogram | **DCR** (dacryocystorhinostomy) |
| **Dacryocystitis** | Staph/Strep; **painful swelling medial to the eye (below medial canthus)** | **Systemic antibiotics**, then DCR |
| Mucocele | Painless collection of mucus in an obstructed sac (uninfected) | DCR |

**ABSOLUTE EXAM CLASSICS: typical MCQ stems, traps and pitfalls**

- "Not present in 7th nerve palsy?" → **entropion**. "Ptosis not caused by" → **facial nerve palsy**.
- "Entropion – which is wrong?" → leads to **eversion** and epiphora (that is ectropion). "Not present in blepharitis" → **entropion**.
- "BCC – which is NOT part of management?" → **radiation as first step**; BCC = 85–95 % of lid malignancies; 2/3 lower lid.
- "Congenital ptosis – wrong" → **levator is normal** (it is maldeveloped).
- "Not a symptom of aqueous-deficient dry eye" → **decreased visual acuity** (key). "Commonest cause of lash loss" → **blepharitis**. "Commonest acquired ptosis" → **levator dehiscence**.
- "Ectropion – does NOT occur" → **medial canthal weakness** (key C).

**DISCREPANCY: slides vs past exams (past exams win)**

- Q113 (entropion is caused by all except...) has a blank key; by the slides, facial palsy causes **ectropion**, so facial palsy is the exception. Q114 key "A or D?" is unclear; see the exam-intelligence page.

## OSCE spot-diagnosis

| Picture / question | Answer |
|---|---|
| Lower lid turned out, dry eye + tearing | **Ectropion** (age-related laxity, CN VII, scarring); symptoms dry irritable eye + tearing; surgery |
| Lower lid turned in, lashes on cornea | **Entropion**; cause in elderly: involutional |
| Lashes with collarettes/scales | **Anterior blepharitis** (Staph) |
| Painless lid lump, 6 months | **Chalazion** |
| Painless bleeding lid lesion × 3 months | **BCC**; rodent ulcer; excision/Mohs |
| 1-year-old, lid-rim cyst | **Dermoid cyst** |
| Child, ptosis left, vision disturbed | **Congenital ptosis** (maldeveloped levator) → **amblyopia** if it covers the visual axis; surgery ± patch the good eye |
| 32-y-old woman with ptosis | Serious DDx **myasthenia gravis**; **ice-pack test**; the finding is worse in the evening |
| Swelling medial & below the eye, painful | **Dacryocystitis**; systemic antibiotics; surgery DCR; commonest organism **Staph. aureus** |
| Yellow plaques, medial upper lids | **Xanthelasma** → cholesterol |

| Picture / question | Answer |
|---|---|
| Female 23 y, watery eye × 6 months | **Acquired nasolacrimal duct obstruction** |

**MEMORABLE FACTS / MNEMONICS**

- **Lid cranial nerves: Levator = 3, Orbicularis = 7, Müller = sympathetic** ("3 lifts, 7 closes").
- **Ec-tropion = out; En-tropion = in**. Facial palsy → **ectropion**.
- **Chalazion = Chronic, painless. Hordeolum = Hot, painful.**

**EXAM CHECKLIST: what you absolutely need to know**

- ☐ Lid muscle innervation ☐ Ptosis causes + ice-pack test ☐ Entropion vs ectropion (+ causes) ☐ Blepharitis anterior vs posterior
- ☐ Chalazion vs hordeolum ☐ BCC facts ☐ Dry eye (Sjögren) ☐ NLD obstruction congenital vs adult, DCR ☐ Inferior meatus

**Clinical connections**

- **Clinical connections:** Neurology (Horner, CN III/VII, myasthenia), Rheumatology (Sjögren), Dermatology (BCC, rosacea, molluscum), ENT (DCR), Paediatrics (NLD obstruction, dermoid).

## Practice MCQs (past-paper style)

**1.** Not seen in facial (VII) nerve palsy: A. Entropion B. Depressed brow C. Exposure keratitis D. Tearing
✓ **A** — Gives ectropion/lagophthalmos.

**2.** Nasolacrimal duct opens into the: A. Superior meatus B. Middle meatus C. Inferior meatus
✓ **C**

**3.** Ptosis + miosis + anhidrosis on the right:
✓ **Horner syndrome**

**4.** Most common acquired ptosis: A. Myasthenia B. Levator disinsertion C. CN III palsy D. Congenital
✓ **B** — Elderly aponeurotic.

**5.** Which is NOT part of BCC management? A. Radiation as first step B. Excision with margins C. Mohs
✓ **A** — Surgery first.

**6.** Painless lid lesion bleeding for 3 months: A. SCC B. BCC C. Chalazion
✓ **B**

**7.** Commonest cause of eyelash loss: A. Blepharitis B. Trichiasis C. Ectropion D. Entropion
✓ **A**

**8.** Not a symptom of aqueous-deficient dry eye: A. Grittiness B. Photophobia C. Ocular fatigue D. Reduced VA
✓ **D** — Key answer (see flag).

**9.** Congenital NLD obstruction: A. Resolves in most in year 1 B. Needs DCR at 2 months C. Always conjunctivitis
✓ **A** — Probe if persistent.

# Chapter 4 — Glaucoma

| VERY HIGH | **16** past MCQs | **16** mini-OSCE stations | Exam rank **#4** of 12 |
|---|---|---|---|

## Why is this topic important?

- **32 questions**: drug side effects, acute angle-closure management, tonometry, congenital glaucoma, "false statement" questions.
- Topics that came up in exams but were minor on the slides: **congenital glaucoma**, **post-traumatic glaucoma**, **PRP/steroid/cyclopentolate/acetazolamide side effects**.

## High-Yield Facts

| Fact | Detail |
|---|---|
| **Definition** | Optic neuropathy: **cupping** + **nerve-fibre-bundle field defects**. **Peripheral** field goes first, central later. Damage is **irreversible** |
| **IOP** | Normal mean 15.5 (10–21 mmHg). Measured by **Goldmann applanation (GAT) = standard** (fluorescein + cobalt-blue light) **[OSCE]**. IOP is **neither necessary nor sufficient**: normal-tension glaucoma (never >21) and ocular hypertension (high IOP, no damage) **[PP]** |
| **Aqueous** | Made by **non-pigmented ciliary epithelium** (2.5 µL/min; total 250 µL; turnover ~100 min); drains: **conventional 80–90 %** (TM → Schlemm → episcleral veins), **uveoscleral 10–20 %**. Raised IOP = **outflow** problem |
| **Commonest type** | ★★★ **POAG [PP]**: asymptomatic until late, open angle, IOP 20–40, myopes; **responds well to medical treatment** ("poor response" is the false option **[PP]**) |
| **Risk factors** | IOP (most important), age, ethnicity (**"Caucasian race" was the non-risk-factor answer [PP]**), family history, **myopia**, female/high myopia (OSCE), steroids, trauma, surgery, vascular dysregulation |
| **Diagnosis of AACG** | Does **not** need IOP ≥ 21 to be diagnosed (intermittent/sub-acute) **[PP]**; closed angle on gonioscopy |

## Types

| Type | Mechanism / examples | Key points |
|---|---|---|
| **POAG** | Idiopathic ↑ TM resistance | Silent; cup/disc enlargement; field defects; **no disc oedema** (cupping/atrophy) **[PP][OSCE]** |
| **Secondary open-angle** | Clogging: RBC (hyphema), WBC (uveitis), pigment, protein (pseudoexfoliation, lens protein) · ↑ **episcleral venous pressure** (carotid-cavernous fistula, Sturge–Weber, SVC obstruction) · scarring (angle recession) · **steroids** | Post-traumatic: immediate (angle-closure type) or delayed |
| **Primary angle closure** | Peripheral iris blocks TM (**pupil block**). RF: **hyperopia / shallow AC**, age >60, female, Inuit/Asian, mydriasis (darkness, drops, stress), drugs (**sulfonamides, TCA, MAOi, antihistamines**) **[OSCE]** | Hyperopia → closed angle; **myopia → open angle [PP]** |
| **Secondary angle closure** | PAS/posterior synechiae (uveitis), lens luxation/large cataract, **rubeosis (neovascular glaucoma)** | NVG = secondary angle closure (not open angle) |
| **Congenital** | Excessive watering, photophobia, **large cornea (buphthalmos)**, **Haab striae**, cupping; **progressive myopia** (not hypermetropia); surgery. **Corneal hydrops is NOT a feature** (it belongs to keratoconus) **[PP]** | Treated surgically |

## Acute angle closure (emergency)

| | Detail |
|---|---|
| **Symptoms** | Sudden severe pain, **hard red eye**, photophobia, tearing, headache, **nausea/vomiting**, blurred vision, **halos** |
| **Signs** | ↓ VA, **fixed non-reactive oval pupil**, **cloudy oedematous cornea**, **shallow AC**, closed angle on gonioscopy, **IOP > 40**, ciliary flush |
| **Management** | ★★★ 1) **Lower IOP**: IV **acetazolamide** / mannitol, oral acetazolamide, topical **timolol**, α-agonist, CAI, **pilocarpine** (miosis pulls the iris off the TM; first-line drop with IV acetazolamide **[PP]**) · 2) **YAG laser iridotomy** / surgical iridectomy · 3) examine and treat the **fellow eye** prophylactically |
| **NOT part of acute treatment** | **Surgical drainage** (initial), **anterior chamber paracentesis**, cycloplegics/mydriatics (worsen the angle) **[PP]** |

## Drugs: mechanism, side effects, contraindications

| Class | Mechanism | Frequency | Side effects / contraindications |
|---|---|---|---|
| **Prostaglandin analogues** ★★★ | ↑ **uveoscleral** outflow | Once daily | Hyperaemia (pro-inflammatory); **[+]** lash growth, iris darkening |
| **β-blockers** (timolol) ★★★ | ↓ aqueous **production** | Twice daily | **CI: bradycardia, heart block, asthma [PP][OSCE]** |
| **Carbonic anhydrase inhibitors** (acetazolamide) | ↓ production | Systemic/topical | **Sulfonamide derivative: sulfa allergy CI**; **paraesthesia, metabolic acidosis, kidney stones**; hypokalaemia **[OSCE][PP]** |
| **α2-agonists** | ↓ production, neuroprotective | | Severe allergic reaction / contact dermatitis |
| **Pilocarpine** ★★★ | ↑ **conventional** outflow (NOT uveoscleral **[PP]**) | | Miosis, **myopic shift**, ↑ RD risk; **CI in hyphema [PP]** |
| **Hyperosmotic** (mannitol IV) | Draws fluid out of the eye | Emergency | |
| **Cyclopentolate** | Cycloplegic/mydriatic | | **Can precipitate acute angle closure**, photophobia **[OSCE]** |
| **Topical prednisolone** | Steroid | | Cataract (PSC), ↑ IOP (steroid glaucoma), corneal thinning/perforation, ↑ bacterial keratitis **[OSCE]** |

## Diagnosis tools & treatment modalities

| Tool | Point |
|---|---|
| **Gonioscopy** | Always performed when glaucoma is possible; open/narrow/closed; compression (4-mirror) separates appositional vs synechial closure **[OSCE]** |
| **Tonometry & pachymetry** | **Thin cornea → falsely low IOP; thick → falsely high**; post-LASIK = thin |
| **Optic disc** | Cup:disc ratio, **ISNT rule [+]** (Inferior ≥ Superior ≥ Nasal ≥ Temporal), notch, **Drance haemorrhage**, asymmetry; **disc cup size alone is not diagnostic [PP]** |
| **Field & imaging** | **Visual field** (damage before the patient notices), **OCT**, HRT, GDx. "3 tests to confirm": **GAT, gonioscopy, visual field, OCT [OSCE]** |
| **Laser** | **Trabeculoplasty** (↑ outflow), **iridotomy** (break pupil block), **cyclodiode** (↓ production) |
| **Surgery** | **Trabeculectomy** (fistula AC → subtenon space), drainage devices |

### ABSOLUTE EXAM CLASSICS: typical MCQ stems, traps and pitfalls

- "Wrong about glaucoma" → **all glaucoma has ↑ IOP** (NTG exists), **disc cup size is definitive**, **pilocarpine increases uveoscleral drainage**, **IOP ≥ 21 is needed to diagnose closed angle**.
- "Optic disc oedema in all EXCEPT" → **open-angle glaucoma** (cupping/atrophy). "Acute angle closure: all EXCEPT" → **surgical drainage** / **AC paracentesis**.
- "In glaucoma treatment all true EXCEPT" → **cycloplegia**. "Ocular trauma, IOP 35: FALSE statement" → **mydriatics should be used** (they narrow the angle).
- "Which use of a drug is incorrect?" → **riboflavin for staining in retinal surgery** (riboflavin is for cross-linking); "acetazolamide causes severe hypokalaemia" and "β-blockers CI in heart block" are accepted as true.
- "Does not cause open-angle glaucoma" → **neovascular glaucoma** (angle closure); key was blank, answer by mechanism.
- "Not a risk factor for POAG" → **Caucasian race**. "Myopia may be associated with" → **open-angle** glaucoma.
- "Irreversible loss, treatable, unnoticed by the patient" → **open-angle glaucoma [PP]**. "Congenital glaucoma EXCEPT" → **corneal hydrops**; "wrong" → **progressive hypermetropia**.

## OSCE spot-diagnosis

| Picture / question | Answer |
|---|---|
| Red cloudy eye, 71-y-old, halos, vomiting | **Acute angle-closure glaucoma**; timolol/PGA drops, mannitol/acetazolamide, **YAG iridotomy** or surgical iridectomy |
| Optic disc with large cup | **Cupping** = glaucoma; non-IOP risk factors: older age, female, high myopia; drug contraindicated in sulfa allergy: **acetazolamide** |
| Goldmann tonometer | Measures IOP in **mmHg**; normal 10–21; fluorescein + cobalt-blue light; the false statement is "least accurate" |
| Hyphema after trauma | Findings: hyphema, ciliary flush; glaucoma type: **secondary open-angle (RBC clogging)** |
| Orbital CT, hyperdense metallic foreign body | Prophylactic antibiotics, tetanus, urgent ophthalmology, NPO (Ch. 10) |
| Side effects: cyclopentolate / acetazolamide / prednisolone | Cyclopentolate: acute angle closure, photophobia · acetazolamide: paraesthesia, metabolic acidosis, stones · prednisolone: corneal thinning/perforation, ↑ IOP, PSC cataract |

**MEMORABLE FACTS / MNEMONICS**

- **PGA = once daily; β-blocker = twice daily**. **PGs open the Uveoscleral door; pilocarpine the Conventional door**.
- **β-blocker contraindications "3 B"**: Bradycardia, Block, Bronchospasm.
- **Hyperopes close, myopes open.**

**EXAM CHECKLIST: what you absolutely need to know**

- ☐ Definition & IOP numbers ☐ POAG vs AACG ☐ Secondary types ☐ Congenital glaucoma signs ☐ Drug table (MoA, SE, CI)
- ☐ AACG management + what NOT to do ☐ Gonioscopy / pachymetry / GAT ☐ Laser/surgery

**Clinical connections**

- **Clinical connections:** Cardiology/Respiratory (β-blocker CI), Nephrology (acetazolamide stones, acidosis), Endocrine (rubeosis in diabetes), Paediatrics (congenital glaucoma), Pharmacology (sulfonamide allergy).

## Practice MCQs (past-paper style)

**1.** Most common glaucoma: A. POAG B. PACG C. Secondary open D. Secondary closed
✓ **A**

**2.** Which is NOT done in acute angle closure? A. β-blocker drops B. Pilocarpine C. Mannitol D. Surgical drainage E. Acetazolamide
✓ **D** — Not initial emergency treatment.

**3.** Optic disc oedema is found in all EXCEPT: A. Papilledema B. Hypertensive retinopathy C. POAG
✓ **C**

**4.** Which is NOT a feature of congenital glaucoma? A. Epiphora B. Haab striae C. Cupping D. Corneal hydrops
✓ **D**

**5.** Which statement about POAG is FALSE? A. Poor response to medication B. Progressive visual loss C. Open angle on gonioscopy
✓ **A** — Responds well to drops.

**6.** Mechanism of pilocarpine: A. ↑ uveoscleral outflow B. ↑ conventional outflow C. ↓ production
✓ **B** — Miosis opens the TM.

**7.** Post-LASIK, GAT readings are: A. Falsely high B. Falsely low C. Accurate
✓ **B** — Thin cornea.

**8.** Which drug is contraindicated in asthma and bradycardia? A. Timolol B. Latanoprost C. Brimonidine
✓ **A**

**9.** Cycloplegia in angle closure: A. Helps B. Dangerous (mydriasis narrows the angle)
✓ **B**

# Chapter 5 — Lens & Cataract

| VERY HIGH | **14** past MCQs | **17** mini-OSCE stations | Exam rank **#5** of 12 |
|---|---|---|---|

## Why is this topic important?

- **31 questions**. Core: **cataract types**, **phaco vs ECCE**, **PCO + YAG**, **endophthalmitis**, **leukocoria**, **ectopia lentis**.
- OSCE images: nuclear / cortical / PSC cataract, mature cataract, ectopia lentis, multifocal-toric IOL, posterior capsule opacification.

## High-Yield Facts

| Fact | Detail |
|---|---|
| **Lens** | Transparent biconvex, ectoderm-derived, avascular, 1/3 of refraction; capsule (collagen IV, zonule attachment); **epithelium only anteriorly**; mature fibres lose their nuclei; hardens with age |
| **Cataract** | **Opacification of the lens; most common cause of treatable blindness**; painless progressive loss, glare, refractive change, amblyopia in infants |
| **Signs** | ↓ VA (especially measured in light), opacity on slit lamp, **black spot against the red reflex**; **mature cataract = absent red reflex + leukocoria** **[PP][OSCE]** |
| **Indication for surgery** | **Cataract reducing quality of life**; no need to wait for ripening; "early cataract in adults should be operated as soon as possible" is FALSE **[PP]** |

## Types

| Type | Features | Symptoms |
|---|---|---|
| **Nuclear (commonest)** | Nuclear sclerosis + brown pigment | **Shift to myopia**, distance blurry, **reading less affected** **[PP]** |
| **Cortical** | Fissuring from water changes in the periphery of the lens | **Glare** and light scattering at night |
| **Posterior subcapsular (PSC)** | Back of lens; disproportionate symptoms for size (light focuses toward the back) | **Glare + ↓ contrast sensitivity** **[PP]** |
| **Immature / mature** | Immature: some transparent protein; mature: all lens protein opaque | Absent red reflex (mature) |
| **Congenital** | Lamellar, polar, sutural; may be found in adults | Leukocoria, amblyopia; **unilateral dense = most urgent surgery** (key: "mostly A") **[PP]** |

### Causes

- **Causes (slide list): age** (UV-B, smoking, glucose); ocular: trauma, uveitis, high myopia, **topical steroids**, intraocular tumours; systemic: **DM**, galactosaemia, hypocalcaemia, Fabry, **systemic steroids, chlorpromazine**, congenital rubella, myotonic dystrophy, **atopic dermatitis** (anterior subcapsular "shield" cataract), Down, **Lowe** (X-linked recessive: cataract, hypotonia, proximal tubular acidosis, glaucoma ~50 %), radiation. Bilateral in 70 %; 10 % of cases develop at 15–30 y.

## Ectopia lentis / aphakia terms

| Term | Fact |
|---|---|
| **Ectopia lentis** | Displaced lens with visible zonules. Causes: **trauma, Marfan, homocystinuria** **[OSCE]** |
| **Aphakia** | No lens: needs **contact lens or IOL; spectacles cannot be used in unilateral aphakia** **[PP]** |
| **Pseudophakia** | Artificial IOL. Multifocal (rings) and toric (axis marks) IOLs exist (image station) |
| **Anisometropia / aniseikonia** | Power difference between eyes (usually >2 D) / image-size difference |
| **Diabetic lens swelling** | High glucose swells the lens and changes refractive index; vision normalises within days–weeks of glucose control (loss-of-vision slide) |

## Surgery

| | Phacoemulsification | ECCE | ICCE |
|---|---|---|---|
| **Technique** | Two clear-corneal cuts, capsulorhexis, ultrasound emulsification, irrigation/aspiration, foldable IOL in the bag, wound sealed by hydration | 10–12 mm incision, sutured; nucleus expressed, capsule left. MSICS = self-sealing scleral tunnel, no sutures | Lens + capsule removed in one piece through a large incision |
| **Notes** | ★★★ **Earliest visual rehabilitation**, ↓ astigmatism, small incision, no suture **[PP][OSCE]** | Useful for very hard cataracts | **Rarely done**, high complication rate |

- Day case; topical, local (sub-Tenon) or general anaesthesia; post-op short course of steroid + antibiotic drops; near vision needs glasses or multifocal IOL (no accommodation).

## Complications

| Complication | Notes |
|---|---|
| **Posterior capsule opacification (PCO)** | ★★★ **Most common complication** (~20 %), residual epithelium forms a scar; months after surgery; **out-patient Nd:YAG laser capsulotomy [PP][OSCE]**. YAG = photo-**disruption**. It is a **late** complication (the "early complications except..." question) **[PP]** |
| **Endophthalmitis** | Incidence 0.3 %; **painful red eye, ↓ VA, hypopyon within days**. Staph epidermidis/aureus, Pseudomonas; patient's own flora most often. **Emergency: intravitreal broad-spectrum antibiotics [PP]** |
| **Vitreous loss** | Risk of glaucoma / retinal traction → vitrectomy at the time, delay IOL |
| **Iris prolapse** | Immediately post-op; inadequate suturing or poor vitreous-loss management; excise tissue + resuture |
| **Other** | Corneal astigmatism (tight sutures), macular oedema (topical NSAIDs + steroids), **retinal detachment**, wound leak (Seidel sign), IOL dislocation |
| **NOT a complication** | **Leukocoria** (a sign of disease) **[PP]** |

**ABSOLUTE EXAM CLASSICS: typical MCQ stems, traps and pitfalls**

- "Earliest visual rehabilitation" → **phacoemulsification + IOL**. "Advantage of phaco over ECCE" → **less astigmatism**.
- "3 months post cataract surgery, ↓ vision, opacity behind IOL" → **YAG laser**. "Most common complication" → **PCO** (not RD, not vitreous loss).
- "After cataract surgery, painful red eye" → **bacterial endophthalmitis**. "Day-1 complications other than endophthalmitis" → **iris prolapse, vitreous loss** (also Seidel/wound leak, RD, macular oedema).
- "69-year-old, 6 months blur, can still read" → **bilateral nuclear cataract**. "Glare + ↓ contrast" → **PSC**.
- "Loss of lens in the pupil" → **aphakia** (not anisometropia/aniseikonia).
- "Most urgent congenital cataract" → **unilateral dense** (key: mostly A).

## OSCE spot-diagnosis

| Picture / question | Answer |
|---|---|
| White pupil, adult | **Mature cataract**: complete opacity, leukocoria; surgery phaco/ECCE; complications endophthalmitis, PCO, iris prolapse, vitreous loss |
| Spoke-like lens opacities | **Cortical cataract** |
| Brown central lens | **Nuclear cataract** (nuclear sclerosis) |
| Child with white pupil | **Leukocoria**: retinoblastoma, congenital cataract (also congenital glaucoma, ROP); adults: cataract, retinal detachment |
| Lens displaced up/down with zonules | **Ectopia lentis**: trauma, Marfan, homocystinuria |
| IOL with rings and axis marks | **Multifocal + toric pseudophakic lens** |
| Hazy membrane behind IOL | **PCO → YAG** |
| Day-1 post-phaco, 2 complications | Iris prolapse, vitreous loss (also leak, RD, macular oedema) |
| How is phaco better than ECCE? | Small incision, no suturing, fewer complications |

**MEMORABLE FACTS / MNEMONICS**

- **Nuclear = Near okay (myopic shift), Cortical = Clefts/Glare, PSC = disproportionate symptoms.**
- **3 lasers**: photo-**coag**ulation (DR) · photo-**abl**ation (LASIK) · photo-**disrupt**ion (YAG, PCO).

**EXAM CHECKLIST: what you absolutely need to know**

- ☐ 3 cataract types + symptoms ☐ Causes (steroids, DM, atopic dermatitis, Lowe) ☐ Phaco vs ECCE vs ICCE
- ☐ Complications + PCO/YAG ☐ Endophthalmitis ☐ Aphakia/pseudophakia terms ☐ Ectopia lentis causes ☐ Leukocoria DDx

**Clinical connections**

- **Clinical connections:** Endocrinology (DM, galactosaemia), Dermatology (atopic eczema), Paediatrics (red-reflex screening, rubella), Genetics (Marfan, homocystinuria, Lowe), Infection control (endophthalmitis).

## Practice MCQs (past-paper style)

**1.** Earliest visual rehabilitation: A. Phaco + IOL B. ECCE C. ICCE + glasses D. ECCE without IOL
✓ **A**

**2.** 3 months after surgery: ↓ vision, posterior capsule opacity. Treatment? A. Excimer B. Keratoplasty C. YAG laser
✓ **C**

**3.** Most common cataract-surgery complication: A. RD B. Vitreous loss C. PCO
✓ **C**

**4.** 69-year-old, blurry distance, near preserved: A. Nuclear cataract B. AMD
✓ **A**

**5.** Post-op painful red eye: A. Endophthalmitis B. Blepharitis C. Conjunctivitis
✓ **A**

**6.** Glare and ↓ contrast sensitivity: A. PSC B. Nuclear C. Cortical
✓ **A**

**7.** Not a complication of cataract surgery: A. Leukocoria B. RD C. Iris prolapse D. PCO
✓ **A**

**8.** Most urgent congenital cataract: A. Unilateral dense B. Bilateral nuclear C. Lamellar
✓ **A** — Amblyopia risk.

**9.** Unilateral aphakia cannot be corrected by: A. Contact lens B. IOL C. Spectacles
✓ **C** — Aniseikonia.

# Chapter 6 — Loss of Vision

| VERY HIGH | **11** past MCQs | **19** mini-OSCE stations | Exam rank **#6** of 12 |
|---|---|---|---|

## Why is this topic important?

- **30 questions**. Two repeated patterns: (1) **painful vs painless / sudden vs gradual** classification, (2) **retinal detachment, CRAO/CRVO, optic neuritis, papilloedema** images, plus **visual-field localisation**.
- Many items are "which is NOT a cause of painless vision loss": learn the sorting table below.

## High-Yield Facts

| Fact | Detail |
|---|---|
| **WHO levels (better eye)** | **Mild** ≥ 6/18 · **Moderate** < 6/18 to ≥ 6/60 · **Severe** < 6/60 to ≥ 3/60 · **Blindness** < 3/60 |
| **Onset** | **Sudden** = seconds to a few days; **transient** < 24 h (amaurosis fugax) vs **persistent** > 24 h. **Gradual** = weeks to years, generally painless, usually bilateral |
| **Cataract** | **Most common cause of reversible vision loss** (gradual, painless) |
| **Most common cause of *sudden* loss in an elderly patient** | **Wet AMD** (not CRAO/CRVO) **[OSCE]** |
| **Glaucoma (POAG)** | **Irreversible, treatable and unnoticed by the patient [PP]** |

## Sorting table: onset × pain (very high yield)

| | Painless | Painful |
|---|---|---|
| **Sudden** | ★★★ **CRAO** (cherry-red spot), **CRVO/BRVO**, **rhegmatogenous RD**, **vitreous haemorrhage**, **wet AMD**, ischaemic optic neuropathy (non-arteritic), papilloedema (obscurations) **[PP][OSCE]** | **Acute angle-closure glaucoma**, **microbial keratitis**, **acute anterior uveitis**, **endophthalmitis**, **hyphema**, optic neuritis (pain on eye movement), giant-cell arteritis, **keratoconus hydrops [PP]** |
| **Gradual** | **Cataract**, **POAG**, refractive error, dry AMD, diabetic retinopathy/maculopathy, keratoconus, optic atrophy | **Herpes zoster ophthalmicus** (match question) **[OSCE]** |
| **Transient** | **Migraine** (match question) **[OSCE]**; amaurosis fugax: carotid disease, cardio-emboli, GCA, vasospasm; AION, papilloedema, optic neuritis, disc drusen, subacute angle closure | |

### ABSOLUTE EXAM CLASSICS: typical MCQ stems, traps and pitfalls

- "NOT a cause of painless vision loss" → **optic neuritis** (painful) · **hydrops of keratoconus** (painful). "Isn't a cause of painful vision loss" → **rhegmatogenous RD**. "All painful EXCEPT" → **CRAO**.
- "Sudden painless unilateral loss" → **CRVO** (not cataract, angle closure or optic neuritis).
- "Irreversible, treatable, unnoticed" → **POAG**. "Elderly woman, sudden loss, most common cause" → **wet AMD**.
- Match: sudden painful = **angle closure**; sudden painless = **CRVO**; gradual painful = **HZO**; gradual painless = **cataract**; transient = **migraine**.
- Risk factors of sudden painless loss (OSCE): **DM, glaucoma, hypertension, atrial fibrillation**; other causes besides RD: **ischaemic optic neuropathy, CRVO, vitreous haemorrhage**.

## Causes by site (slide structure)

| Site | Causes |
|---|---|
| **Uncorrected refractive error** | Myopia (commonest), hyperopia, astigmatism, presbyopia |
| **Cornea** | **Keratoconus** (progressive irregular myopic astigmatism), oedema, scar, keratitis, dystrophies, degeneration |
| **Aqueous** | **Hyphema** (RBCs; trauma/surgery; non-traumatic: rubeosis iridis (NVI), anterior uveitis, tumours, sickle-cell/bleeding disorders), **hypopyon** (WBCs = severe anterior segment inflammation/infection) |
| **Lens** | Cataract; **ectopia lentis** (trauma, Marfan, homocystinuria); lenticonus; diabetic lens swelling (resolves with glucose control) |
| **Vitreous** | Vitritis (toxoplasma, endophthalmitis, Behçet, sarcoid); **vitreous haemorrhage** (trauma, complicated PVD, retinal/choroidal neovascularisation; vision loss proportional to the blood) |
| **Retina** | DR, RVO, RAO, AMD, **retinal detachment**, macular hole, epiretinal membrane, posterior uveitis, retinitis pigmentosa, Stargardt |
| **Optic nerve** | **Optic neuritis** (young), **ischaemic optic neuropathy** (old), **papilloedema** |
| **Pathway** | Chiasm, tract, radiation, cortex (visual-field defects) |

## Retinal causes: details

| Condition | High-yield |
|---|---|
| **Rhegmatogenous RD** | ★★★ Break/tear lets liquefied vitreous enter the subretinal space; usually preceded by **PVD**. New **floaters, photopsia (flashes)**, a missing portion of field, "**curtain**"; **painless, white eye**; dulled red reflex, elevated retina with folds; RAPD if extensive; macula-off → severe VA loss. RF: PVD, age, **myopia**, **cataract/intra-ocular surgery**, trauma, lattice degeneration, family history. Rx: **urgent surgical repair (vitrectomy, scleral buckle, retinopexy)**; bed rest until repair. Tractional (DM) and exudative (inflammation) are the non-rhegmatogenous types **[PP][OSCE]** |
| **CRAO** | Sudden painless severe loss, **cherry-red spot** at the macula, RAPD. Rx (OSCE key): **dislodge the embolus / revascularise**; look for carotid/cardiac source **[OSCE]** |
| **CRVO / BRVO** | Sudden painless loss; DM, HTN, glaucoma. Complications: macular oedema, rubeosis → NVG. Treatment is supportive and aimed at complications (anti-VEGF, laser) **[OSCE]** |
| **Wet AMD** | Choroidal neovascularisation (vitreous slide); commonest cause of *sudden* loss in the elderly (key). **[+]** Anti-VEGF injections |
| **Vitreous haemorrhage** | Sudden painless loss in a 65-y-old: PDR (commonest), trauma, retinal tear; may signal tear/RD |

## Optic nerve causes

| | Optic neuritis | Ischaemic optic neuropathy | Papilloedema |
|---|---|---|---|
| **Age / side** | Young adults (20–40, women), unilateral | Older patients, unilateral | **Bilateral** disc swelling (↑ ICP) |
| **Symptoms** | **Pain on eye movement**, ↓ VA, **colour desaturation** | Sudden **painless** loss, colour desaturation | Transient obscurations (cough, sneeze, bending); mild blur; **no RAPD** |
| **Signs** | **RAPD**; disc **normal in retrobulbar** neuritis (most cases do NOT show disc swelling **[PP]**) | Disc swelling; arteritic (GCA: ↑ESR, urgent steroids **[+]**) vs non-arteritic | Bilateral disc swelling |
| **Associations** | **Multiple sclerosis** (presenting feature in 15–20 %; occurs in 50 % during the disease) | HTN, DM, GCA | Pseudotumour cerebri, malignant HTN, brain tumour **[OSCE]** |

### OSCE links

- **Station 151** (35-y-old woman, sudden painful loss, RAPD, VA 6/60): optic disc usually **normal** (retrobulbar) or swollen (papillitis); loss is due to **optic-nerve inflammation/demyelination**; Rx IV steroids **[+]**; think MS.
- **Station 160** (31-y-old woman, headache + vomiting): **papilloedema** (need both eyes to call it); causes ↑ICP, uncontrolled HTN, pseudotumour cerebri, brain tumours. "Optic disc oedema in all EXCEPT" → **open-angle glaucoma**.

## Visual-field localisation (MCQ favourites)

| Lesion | Defect | Note |
|---|---|---|
| **Optic nerve** | **Monocular** field loss | |
| **Optic chiasm** | **Bitemporal** hemianopia | Pituitary adenoma (OSCE: visual field test + OCT; DDx pituitary adenoma) |
| **Optic tract** | **Contralateral** homonymous hemianopia | **"Ipsilateral" is the false statement [PP]** |
| **Lateral geniculate body** | Contralateral homonymous hemianopia | |
| **Main optic radiation** | **Contralateral congruous** homonymous hemianopia **[PP]** | Right congruous HH → **left main radiation** (Q106) |
| **Visual cortex** | Contralateral homonymous hemianopia with **macular sparing** | |

### DISCREPANCY: slides vs past exams (past exams win)

- Slide: cataract is the commonest cause of *treatable* blindness and of reversible vision loss. Exam key (Q154): for **sudden** loss in an **elderly** patient the answer is **wet AMD**. Read the stem: sudden vs gradual.

## OSCE spot-diagnosis

| Picture / question | Answer |
|---|---|
| Fundus: cherry-red macular spot | **CRAO**; Rx dislodge embolus; DDx: CRVO, wet AMD |
| Retina elevated with folds, curtain, flashes | **Rhegmatogenous RD**; floaters, scotoma, vision loss; Rx surgical repair (vitrectomy) |
| Blood in the vitreous, 65-y-old, painless | **Vitreous haemorrhage**; PDR, trauma (Q159) |
| Fundus with diffuse haemorrhages and a swollen disc | **Retinal vein occlusion** (CRVO/BRVO) |
| Pale / swollen / cupped discs (3 pictures) | A. **Pallor** (optic atrophy) · B. **Disc oedema** · C. **Cupping** (glaucoma) |
| Visual-field chart + pituitary question | **Bitemporal hemianopia** → chiasm lesion (pituitary adenoma) |

| Picture / question | Answer |
|---|---|
| Match sudden/gradual × painful/painless | See classics box |

**MEMORABLE FACTS / MNEMONICS**

- **"CRAO = Cherry; CRVO = blood & thunder"** [+]: CRAO pale retina, cherry spot; CRVO diffuse haemorrhages.
- **Optic neuritis hurts when you MOVE the eye; AION does not hurt.**
- **Optic tract/GL/radiation → CONTRA-lateral; chiasm → BI-temporal.**

**EXAM CHECKLIST: what you absolutely need to know**

- ☐ WHO impairment levels ☐ Sudden/gradual × painful/painless sorting ☐ RD symptoms, RF, Rx ☐ CRAO vs CRVO
- ☐ Optic neuritis vs ischaemic ON vs papilloedema ☐ Wet AMD = commonest sudden loss in elderly ☐ Visual-field localisation

**Clinical connections**

- **Clinical connections:** Neurology (MS, pituitary, pseudotumour), Cardiology/Vascular (emboli, carotid), Rheumatology (GCA), Endocrinology (DM), Neurosurgery (↑ICP).

## Practice MCQs (past-paper style)

**1.** NOT a cause of painless vision loss: A. Optic neuritis B. CRAO C. CRVO D. Retinal detachment
✓ **A** — Optic neuritis hurts on eye movement.

**2.** All cause sudden painful vision loss EXCEPT: A. CRAO B. Anterior uveitis C. Acute angle closure
✓ **A**

**3.** Irreversible but treatable, unnoticed by the patient: A. Uveitis B. Corneal ulcer C. Closed-angle glaucoma D. Open-angle glaucoma
✓ **D**

**4.** Optic tract lesion causes: A. Ipsilateral homonymous hemianopia B. Contralateral homonymous hemianopia C. Bitemporal hemianopia
✓ **B** — The "ipsilateral" option is the false one.

**5.** Right congruous homonymous hemianopia is due to: A. Chiasm B. Right tract C. Left main optic radiation
✓ **C**

**6.** Optic neuritis: which is FALSE? A. Women 20–40 B. Most cases show disc swelling C. Pain on movement D. Colour desaturation E. RAPD
✓ **B** — Retrobulbar: normal disc.

**7.** Sudden painless unilateral loss: A. CRVO B. Cataract C. Angle closure D. Optic neuritis
✓ **A**

**8.** Elderly woman, sudden vision loss, most common cause: A. CRVO B. CRAO C. Wet AMD D. Vitreous detachment
✓ **C** — OSCE key.

**9.** Sudden floaters + flashes + curtain, painless white eye:
✓ **Rhegmatogenous retinal detachment** — Urgent surgical repair.

# Chapter 7 — Strabismus & Amblyopia

| VERY HIGH | **12** past MCQs | **17** mini-OSCE stations | Exam rank **#7** of 12 |
|---|---|---|---|

## Why is this topic important?

- **29 questions**. Frequent: **yoke muscles**, **esotropia in a baby**, **causes of esotropia/exotropia**, **6th & 3rd nerve palsy**, Graves → **inferior rectus**, **amblyopia treatment**.
- The lecture ends with take-home messages: strabismus is a sign like fever; parents are always right about the squint.

## High-Yield Facts

| Fact | Detail |
|---|---|
| **Nerves** | **CN III**: MR, IR, SR, IO · **CN IV**: superior oblique · **CN VI**: lateral rectus. Structures inside the muscle cone: optic nerve, both divisions of III, nasociliary, VI; **trochlear lies outside** the cone **[PP]** |
| **Yoke muscles** | ★★★ Right MR + Left LR; Right SR + Left IO (up-right); Right IR + Left SO (down-right); mirrored on the left **[PP]** |
| **Binocular single vision** | Both eyes fixate the same object; images fused centrally. Stereopsis: wider field, no blind spot, better binocular acuity, depth perception |
| **Definitions** | Esotropia (in), exotropia (out), hypertropia (up), hypotropia (down); phoria = latent. **Strabismus is a sign**; it may herald life-threatening disease (retinoblastoma, tumour) |

## Concomitant vs paralytic

| | Concomitant (non-paralytic) | Paralytic (incomitant) |
|---|---|---|
| **Movements** | Both eyes can move fully; angle **constant** | Reduced action of muscle(s); angle **depends on gaze direction** |
| **Onset** | Usually congenital, or in a child with hypermetropia/blurred vision | **Acquired** |
| **Symptoms** | **No diplopia**; **amblyopia** can occur | **Diplopia** |
| **Treatment** | Glasses → patch the better eye (if amblyopia) → surgery | Treat cause; prisms; surgery |

## Esotropia

| Type | Key points |
|---|---|
| **Infantile (congenital)** | ★★★ First **6 months** in an otherwise healthy child; **large angle**; **NOT associated with hypermetropia**; **commonest strabismus <1 year** **[PP]**; amblyopia occurs (17–50 %); Rx **recession of both medial recti** |
| **Accommodative** | Moderate **hypermetropia**: accommodation drives convergence (synkinesis). Rx **glasses (plus/convex lenses)** **[OSCE]**. "Glasses are not an alternative to surgery or vice-versa" |
| **Non-accommodative** | Stress/illness, sensory deprivation (untreated congenital cataract, optic atrophy), **retinoblastoma** |
| **Causes in a 4-year-old** | Hypermetropia, falling, **cerebellar astrocytoma**, IIH, corneal opacity, optic atrophy; but **PCom aneurysm is NOT** (3rd nerve gives exotropia) **[PP]** |

## Exotropia

- **Intermittent exotropia**: onset <5 y; appears with visual inattention, fatigue, stress, illness; bright light closes one eye.
- **Constant exotropia**; **Crouzon** (FGFR2, AD, craniosynostosis, shallow orbits, hypertelorism, PDA, coarctation of the aorta).
- Causes of exotropia: 3rd nerve palsy, PCom aneurysm, craniosynostosis, fatigue; **myopia is the least likely** **[PP]**.

## Nerve palsies

| Nerve | Deficit | Causes |
|---|---|---|
| **III** | Failure of adduction, elevation and depression; **ptosis**, ± dilated pupil, diplopia; eye "down and out" (exotropia) **[OSCE]**. Painful 3rd with big pupil → **PCom aneurysm** (neurological emergency, ocular-triangle lecture) | Aneurysm, diabetes/HTN, tumour, trauma, raised ICP |
| **IV** | Defective depression of the adducted eye → vertical/tilted diplopia | Trauma, vascular |
| **VI** | **Failure of abduction** → esotropia, horizontal diplopia **[OSCE]** | **Raised ICP**, DM, HTN, neoplasia (meningioma, acoustic neuroma, glioma), sarcoid/vasculitis (incl. GCA), Guillain–Barré, trauma, cavernous sinus thrombosis. Work-up: CBC, ESR, ANCA, fundoscopy, CT/MRI |

### Muscle / NMJ causes

- **Extra-ocular muscle diseases causing incomitant squint:** thyroid (dysthyroid) eye disease: lymphocytic infiltration + GAG deposition → **restriction not paralysis**, **inferior rectus** most often → eye pulled down **[PP][OSCE]**; **myasthenia gravis** (AChR Ab, females 15–50 y, ~40 % ocular only; variable diplopia and ptosis with fatigue; edrophonium test; neostigmine, thymectomy); ocular myositis; ocular myopathy; Brown and Duane syndromes.

## Examination & amblyopia

| Item | Detail |
|---|---|
| **Work-up** | History (frequency, onset, family), VA, epicanthus (**its presence does NOT exclude strabismus**), facial asymmetry, **cover-uncover** (tropia), **alternate cover** (phoria), **cycloplegic refraction** (atropine/cyclopentolate), **prism bar** to measure the angle **[OSCE]** |
| **Amblyopia** | Unilateral permanent ↓ VA **without organic pathology**. Types: **strabismic** (prolonged constant squint), **anisometropic** (unequal refraction), **form-deprivation** (cataract, corneal scar, ptosis, lid haemangioma). Optic atrophy is organic → **not** amblyopia **[PP]** |
| **Amblyopia treatment** | Correct refraction; **patch the better eye**; **never total prolonged occlusion** (can cause amblyopia in the good eye) **[PP]**; in an adult with amblyopia, surgery is cosmetic |

### ABSOLUTE EXAM CLASSICS: typical MCQ stems, traps and pitfalls

- "2-month-old with inward eyes" → **fundoscopy is a must** (retinoblastoma, papilloedema); epicanthal folds do **not** reassure; family history is important; "reassure mum" is wrong.
- "Causes of esotropia EXCEPT" → **3rd nerve palsy** / PCom aneurysm. "Not a cause of esotropia" → **wide nasal bridge** (pseudo-esotropia).
- "Yoke muscles" → **R medial rectus + L lateral rectus**. "Look up and right" → **R SR + L IO**.
- "20-year-old with esotropia and amblyopia: NOT done" → **total cover of the good eye**.
- "Most common strabismus <1 y" → **infantile esotropia**. "Least cause of exotropia" → **myopia**.
- Graves with the eye pulled **down** → **inferior rectus**.

### DISCREPANCY: slides vs past exams (past exams win)

- Slide take-home: "There is nothing called pseudo-strabismus." Exams treat a wide nasal bridge as **pseudo-esotropia**. Use the exam wording, but still examine every parent-reported squint.
- Slide: "Never patch the eye of a child." Exam: patching the **good eye** is standard amblyopia therapy; **total/long** occlusion is the wrong answer.

## OSCE spot-diagnosis

| Picture / question | Answer |
|---|---|
| One eye turned in (child), glasses on / off | **Accommodative esotropia** from hypermetropia; plus (convex) lenses |
| Eye turned in, cannot abduct | **6th nerve palsy**: raised ICP, DM, neoplasm, vasculitis; complaint = **diplopia**; RF DM, HTN, head trauma |
| Eye turned out + droopy lid | **3rd nerve palsy**: aneurysm, tumour, DM/HTN, raised ICP |
| Eye pulled down in Graves | **Inferior rectus** |
| Match: leukocoria / anisocoria / hypertropia / aniseikonia / amblyopia | White pupil / unequal pupils / upward deviation / unequal image size / lazy eye |
| Causes of anisocoria | **Horner, Adie (tonic pupil)**, 3rd nerve palsy |
| Device for angle of deviation | **Prism bar** |
| Esotropia at 3 y (not congenital) | **Hypermetropia (accommodative)**, non-accommodative (cataract, retinoblastoma) |

### MEMORABLE FACTS / MNEMONICS

- **"LR6 SO4 AO3"**: Lateral rectus = VI, Superior oblique = IV, All Others = III.
- **Hyperopia pushes the eyes IN** (accommodation–convergence).
- **III = down-and-out + ptosis ± big pupil.**

### EXAM CHECKLIST: what you absolutely need to know

- ☐ Nerve supply & yoke muscles ☐ Concomitant vs paralytic ☐ Esotropia types (infantile vs accommodative)
- ☐ 3rd/6th nerve palsy causes ☐ Cover test ☐ Amblyopia types + treatment ☐ TED/myasthenia as muscle causes

### Clinical connections

- **Clinical connections:** Neurology/Neurosurgery (aneurysm, raised ICP, tumours), Endocrinology (Graves), Paediatrics (red-reflex & strabismus screening), Genetics (Crouzon), Oncology (retinoblastoma).

## Practice MCQs (past-paper style)

**1.** Yoke muscles are: A. R MR + L LR B. R MR + L MR C. R SR + L SO
✓ **A**

**2.** Look up and to the right: A. R SR + L IO B. R IR + R SO C. R SR + R IO
✓ **A**

**3.** 2-month-old with convergent squint. True: A. Epicanthus rules out serious disease B. Fundoscopy is a must C. Reassure
✓ **B**

**4.** All cause esotropia EXCEPT: A. 3rd nerve palsy B. Hypermetropia C. Nystagmus D. Infantile
✓ **A** — Gives exotropia.

**5.** Commonest cause of strabismus under 1 year: A. Accommodative esotropia B. Infantile esotropia C. Hypertropia
✓ **B**

**6.** Amblyopia + esotropia in a 20-year-old, NOT done: A. Cover test B. Glasses C. Total patching of the good eye D. Cosmetic surgery
✓ **C**

**7.** Least likely cause of exotropia: A. 3rd palsy B. PCom aneurysm C. Craniosynostosis D. Myopia E. Fatigue
✓ **D**

**8.** Graves, left eye pulled down: which muscle?
✓ **Inferior rectus** — Restrictive myopathy.

**9.** Which cannot cause amblyopia? A. Esotropia B. Lid haemangioma C. Optic atrophy D. Corneal clouding
✓ **C** — Organic cause.

# Chapter 8 — The Orbit

| HIGH | **15** past MCQs | **12** mini-OSCE stations | Exam rank **#8** of 12 |
|---|---|---|---|

## Why is this topic important?

- **27 questions**. Graves (thyroid eye disease) is a spot diagnosis nearly every year; also **orbital cellulitis**, **proptosis causes**, **Hertel**, **carotid-cavernous fistula**, **rhabdomyosarcoma/neuroblastoma**, **blow-out fractures**.
- Orbital tumour detail (lymphoma, glioma, meningioma) was rarely tested: skim those.

## High-Yield Facts: anatomy

| Fact | Detail |
|---|---|
| **Bones (7)** | **Frontal, ethmoid, lacrimal, sphenoid, maxillary, palatine, zygomatic**. **Nasal bone is NOT part of the orbit** [PP] |
| **Shape** | Four-sided pyramid, ~30 cc: crowded, next to brain and sinuses |
| **Weak points** | **Floor** (posteromedial maxillary) → **blow-out fracture**; **medial wall (lamina papyracea)** → ethmoid sinusitis spreads to orbit; roof defects → pulsatile proptosis |
| **Optic canal** | Optic nerve, ophthalmic artery, central retinal vein (slide) |
| **Superior orbital fissure** | **CN III, IV, VI**, lacrimal, frontal, nasociliary nerves, superior ophthalmic vein |
| **Inferior orbital fissure** | Infraorbital & zygomatic nerves, parasympathetic fibres to lacrimal gland, infraorbital vessels, inferior ophthalmic vein |
| **Inside the muscle cone** | Optic nerve, superior + inferior divisions of III, nasociliary, abducent. **Trochlear nerve arises outside the cone** [PP] |
| **Lacrimal gland** | **Superolateral** orbit (not superomedial [PP]); lacrimal sac on the anterior medial wall |
| **Orbital septum** | Separates lid from orbital fat; attaches to orbital rim periosteum (preseptal vs orbital cellulitis divide) |
| **Blood supply / veins** | Ophthalmic artery (ICA): central retinal, lacrimal, short/long posterior ciliary, anterior ciliary. **Superior ophthalmic vein → cavernous sinus**; facial "danger triangle" infection → cavernous sinus thrombosis |

## Proptosis

| Fact | Detail |
|---|---|
| **Measurement** | **Hertel exophthalmometer**: normal **10–21 mm**; mild 21–23, **moderate 24–27** (26 mm = moderate), severe ≥ 28; **difference ≥ 2 mm between eyes** is abnormal. Measures from the **lateral orbital rim to the corneal apex** (not the lens) [PP][OSCE] |
| **Adults** | ★★★ **Commonest cause (uni- and bilateral): Graves/thyroid eye disease**; also orbital inflammatory syndrome, lymphoma, meningioma, metastases (breast ♀, lung/prostate ♂), vascular (CCF, varix) |
| **Children** | **Commonest unilateral: orbital cellulitis** [PP]; bilateral: TED; rapid growth: **rhabdomyosarcoma**; commonest benign tumour: **capillary haemangioma** [PP] |
| **Direction clue** | **Extraconal** lesion (lacrimal gland tumour) → eye displaced sideways/down; **intraconal** (meningioma, optic glioma) → axial forward proptosis |
| **Pseudoproptosis** | Buphthalmos, high axial myopia, contralateral enophthalmos, ipsilateral lid retraction, contralateral ptosis |
| **Enophthalmos** | Orbital fractures, Horner (pseudo), fat atrophy, congenital |
| **Not a cause** | **Horner syndrome** (causes enophthalmos/ptosis, not exophthalmos) [PP] |

## Thyroid eye disease (TED, Graves ophthalmopathy)

| Item | High-yield |
|---|---|
| **Pathogenesis** | Autoimmune: **TSH-receptor antigen on orbital fibroblasts/adipocytes** → T-cell activation + cytokines (TNF) → fibroblasts make **GAGs (hyaluronic acid)** → osmotic fluid → muscle swelling → ↑ orbital pressure → proptosis |
| **Association** | 90 % hyperthyroid; can occur in hypothyroid and euthyroid patients |
| **Muscle** | **Inferior rectus most commonly affected**; then medial; restricted movement ([OSCE] eye pulled down) |
| **Signs** | ★★★ **Lid retraction** (staring look, sympathetic overactivity), **lid lag** on down-gaze, **proptosis**, **chemosis**, periorbital oedema, red painful eye, **diplopia** (restriction, **not paralysis** [PP]), ↓ VA. Often asymmetric. Station answers: "chemosis, lid retraction, proptosis → Graves" |
| **Work-up** | **TSH, T3, T4, TRAb/TSI**; CT/MRI shows enlarged muscles (OSCE) |
| **Complications** | **Exposure keratopathy** (ulcer, perforation) · **compressive optic neuropathy** (field loss, blindness) |
| **Treatment** | Urgent complications: **systemic steroids, orbital decompression**. Aims: protect the globe, ↑ movement, cosmesis: lubricants, prisms for diplopia, corrective surgery (decompression, muscle, eyelid). Assessment: **NO SPECS** |

| Item | High-yield |
|---|---|
| **Vision loss in Graves** | **Optic nerve compression** and **corneal ulceration** (OSCE) |

**MEMORABLE FACTS / MNEMONICS**

- **NO SPECS** = No signs · Only signs (lid retraction) · Soft-tissue involvement · Proptosis · Extra-ocular muscle involvement · Corneal involvement · Sight loss.

## Orbital infection

| | Preseptal cellulitis | Orbital cellulitis |
|---|---|---|
| **Site** | Anterior to septum (lid skin/muscle) | Posterior to septum (fat + muscles); **ocular and medical emergency** |
| **Cause** | Periorbital trauma or skin infection | Spread from **ethmoid sinusitis** (via lamina papyracea), teeth, trauma; Staph, Strep. Children, elderly, immunocompromised |
| **Features** | Tender swollen erythematous lids ± low fever; **normal VA, pupils and eye movements; NO proptosis** | Red eye, **proptosis, ophthalmoplegia, pain on movement**, chemosis, ↓ VA ± **RAPD**, headache, fever. **Fever does not discriminate** (also in preseptal) **[PP]** |
| **Treatment** | Oral/topical antibiotic; treat as orbital if severe or child < 1 y | **Admit, blood cultures, CT, IV antibiotics (ceftriaxone + vancomycin)**, drain abscess, optic nerve decompression if compromised; **topical antibiotics alone are wrong [PP]** |
| **Complications** | → orbital cellulitis | **Optic neuritis, cavernous sinus thrombosis, meningitis, brain abscess**, blindness, death |

- **Mucormycosis**: rapid painful proptosis, fungal (diabetic/ketoacidosis **[+]**).
- Imaging: **CT** or MRI. Most dangerous DDx of a swollen red lid = **orbital cellulitis** (OSCE).

## Vascular, trauma, tumours

| Condition | High-yield |
|---|---|
| **Carotid-cavernous fistula** | Head trauma → **proptosis with normal VA** weeks later, dilated "corkscrew" conjunctival vessels, chemosis, ↑ IOP, ↑ episcleral venous pressure **[PP]** |
| **Orbital varix** | Venous malformation; proptosis only with ↑ venous pressure (Valsalva) |
| **Blow-out fracture** | Floor/medial wall break; **inferior rectus** (not inferior oblique) entrapment → vertical diplopia, restricted up-gaze; enophthalmos; emphysema from ethmoid **[PP]** |
| **Orbital compartment syndrome** | **Emergency** (Ch. 10): **lateral canthotomy + inferior cantholysis** |
| **Rhabdomyosarcoma** | **Commonest primary malignant orbital tumour in children** (6–9 y), rapid, primitive striated muscle; chemotherapy **[PP]** |
| **Capillary haemangioma** | Commonest benign orbital tumour in children (key: "right about haemangioma") |
| **Neuroblastoma** | **Commonest metastatic orbital tumour in children** (sympathetic chain primary) **[PP]**; periocular haemorrhage; also Ewing, Wilms, leukaemia |
| **Adult metastases** | Breast (♀), lung (♂); spread **haematogenously** (orbit has no lymphatics); poor prognosis |
| **Optic nerve glioma** | Associated with **neurofibromatosis (NF1)**; slow-growing (OSCE CT: well-defined hyperdense mass on axial cut) |
| **Meningioma / lymphoma / lacrimal gland tumours** | Meningioma: intra-conal, forward proptosis; lymphoma: systemic work-up, chemo vs local radiotherapy; malignant lacrimal tumours: poor prognosis |
| **Dermoid cyst** | Congenital ectodermal rest at the superior orbit rim; excise for cosmesis/to avoid rupture |

**ABSOLUTE EXAM CLASSICS: typical MCQ stems, traps and pitfalls**

- "Wrong about proptosis/orbit" → **lacrimal gland in the superomedial orbit** (it is superolateral); **"the most common symptoms are orbital"**.
- "Hertel – except" → measures to the **lens** (false; it is the cornea apex). 26 mm = **moderate**.
- "Dysthyroid eye disease – wrong" → **diplopia due to rectus paralysis**. "Most common cause of bilateral proptosis in adults" → TED.
- "Blow-out fracture – wrong" → **inferior oblique entrapment** (it is the inferior rectus).
- "Orbital cellulitis – wrong" → **only topical antibiotics**. Differentiators from preseptal: ↓ vision, proptosis, ↓ motility, conjunctival hyperaemia; **fever is not a differentiator**.
- "Will NOT cause exophthalmos" → **Horner**. "Nerve outside the cone" → **trochlear**. "Not an orbital bone" → **nasal**.
- "70-y-old, head injury 2 weeks ago, proptosis, normal vision" → **carotid-cavernous fistula**.

## OSCE spot-diagnosis

| Picture / question | Answer |
|---|---|
| Proptosis + lid retraction + chemosis (± bilateral) | **Graves ophthalmopathy**; signs: lid retraction, lid lag, chemosis, ophthalmoplegia, periorbital oedema (the key also lists "ptosis"); work-up TSH, T3/T4, TRAb, CT/MRI; complications optic nerve compression, corneal ulceration |
| Unilateral swollen red lid, discharge | **Orbital vs preseptal cellulitis**; admit, blood culture, IV antibiotics, drain abscess, optic nerve decompression |
| Right eye proptosis, redness, swelling | Graves, orbital pseudotumour; TSH, free T4, T3, TRAb |
| Unilateral proptosis DDx list | TED, orbital cellulitis, lymphoma, meningioma; tests: CBC, thyroid function, ESR, orbital CT/MRI |
| Congenital eye proptosis + high myopia | Congenital glaucoma (buphthalmos) can mimic proptosis |
| Corkscrew vessels after head injury | **Carotid-cavernous fistula** |
| Axial CT, hyperdense well-defined mass along the nerve | **Optic nerve glioma** (NF1) |
| Child with rapid proptosis / spontaneous periocular bleeding (slide, not a station) | **Rhabdomyosarcoma** / **neuroblastoma** metastasis (age < 11 months: better prognosis) |
| Hertel device | **Hertel exophthalmometer** (proptosis measurement) |

**EXAM CHECKLIST: what you absolutely need to know**

- ☐ 7 orbital bones, cone contents, fissures ☐ Hertel numbers ☐ TED pathogenesis, signs, muscle, complications, Rx
- ☐ Preseptal vs orbital cellulitis + treatment ☐ Children: cellulitis, rhabdomyosarcoma, neuroblastoma, haemangioma
- ☐ CCF ☐ Blow-out fracture muscle (inferior rectus)

**Clinical connections**

- **Clinical connections:** Endocrinology (Graves, smoking), ENT (sinusitis, endoscopic decompression), Oncology (rhabdomyosarcoma, neuroblastoma, lymphoma, metastases), Neurosurgery (CCF, meningioma), Paediatrics, Radiology (CT/MRI).

## Practice MCQs (past-paper style)

**1.** Orbit bones EXCEPT: A. Ethmoid B. Frontal C. Lacrimal D. Maxillary E. Nasal
✓ **E**

**2.** Hertel: which is FALSE? A. ≥2 mm difference abnormal B. Tests proptosis C. Measures to the anterior lens D. 26 mm is moderate
✓ **C** — To the corneal apex.

**3.** Commonest primary malignant orbital tumour in children:
✓ **Rhabdomyosarcoma**

**4.** Wrong about dysthyroid eye disease: A. Diplopia due to rectus paralysis B. Commonest cause of bilateral proptosis in adults
✓ **A** — It is restriction.

**5.** 70-y-old woman, head injury 2 weeks ago, proptosis, normal VA: A. TED B. Varix C. Haemangioma D. Carotid-cavernous fistula E. Dermoid
✓ **D**

**6.** Blow-out fracture: limitation of movement is due to entrapment of: A. Inferior oblique B. Inferior rectus
✓ **B**

**7.** Orbital cellulitis: which is wrong? A. Topical antibiotics only B. Commonest unilateral proptosis in children C. Pain and ↓ vision
✓ **A** — Needs IV antibiotics.

**8.** Which differentiates orbital from preseptal cellulitis EXCEPT: A. Fever B. ↓ vision C. Proptosis D. ↓ motility
✓ **A**

**9.** Commonest orbital metastasis in children: A. Neuroblastoma B. Lung C. GIT D. Kidney
✓ **A** — Sympathetic chain primary.

**10.** Nerve outside the muscle cone: A. Optic B. Trochlear C. Abducent D. Inferior division of III
✓ **B**

# Chapter 9 — Optics & Refraction

| HIGH | **13** past MCQs | **9** mini-OSCE stations | Exam rank **#9** of 12 |
|---|---|---|---|

## Why is this topic important?

- **22 questions**. Rated medium on the slides but heavily repeated: **hypermetropia causes**, **myopia vs OAG / hyperopia vs angle closure**, **LASIK**, **aphakia**, **cylindrical lenses**.
- High-scoring because answers are logical: understand which lens corrects which error and which diseases follow each.

## High-Yield Facts

| Fact | Detail |
|---|---|
| **Refraction** | Light bends passing between media. Diopter = 1/focal length (m) |
| **Power of the eye** | ★★★ **2/3 cornea** (air/tear interface; fixed) · **1/3 lens** (accommodates). Because cornea > air, lens > aqueous/vitreous, and both are convex **[PP]** |
| **Lens types** | **Negative = concave = diverging → myopia** (biconcave) · **Positive = convex = converging → hypermetropia** (biconvex) · **Cylindrical → astigmatism** **[PP]** |
| **Emmetropia / ametropia** | Parallel rays focus on the retina in the non-accommodating eye / do not |
| **Causes of ametropia** | Eyeball too long/short, corneal shape, ageing lens |
| **Symptoms** | Blurred vision, double/hazy vision, glare/halos, squinting, headaches, eye strain |

## Refractive errors: comparison

| | Myopia | Hypermetropia | Astigmatism | Presbyopia |
|---|---|---|---|---|
| **Focus** | In front of retina | Behind retina | Different meridians focus differently | Behind retina (loss of accommodation) |
| **Blurred** | **Distance**; near is clear **[PP]** | Near ± distance; hyperopes accommodate even for distance → eye strain, headaches | Fine detail at all distances; distortion | Near tasks; after ~45 y, universal |
| **Cause** | Long eye; keratoconus (pathological); begins 6–14 y, worsens until early 20s; **rarely starts > 25 except DM or cataract** | Short eyeball (physiologic in children), abnormal corneal/lens shape, **ectopia lentis**, aphakia | Non-spherical cornea/lens, unknown; present from birth. Also after cataract/pterygium surgery | Ageing lens |
| **Correction** | **Concave (biconcave)** lens, surgery | **Convex (biconvex / plus)** lens, surgery | **Cylindrical** lens, toric lenses, laser | Reading (convex) glasses, multifocal IOL |
| **Associations** | RD, macular hole, **open-angle glaucoma** **[PP]** | **Angle-closure glaucoma** (shallow AC), esotropia (accommodative), amblyopia **[PP]** | Amblyopia | Patients are hypermetropic (key) **[PP]** |

### Pearls

- **Keratoconus causes myopia and astigmatism**, so it is the answer to "does not cause hypermetropia / not associated with hypermetropia" **[PP]**.
- Final 020: "**Not a risk factor for myopia**" → **old age**. Risk factors: long axial length, keratoconus, post-cataract surgery.
- Causes of myopia in a 33-y-old woman (OSCE): **DM, cataract, keratoconus**. Causes of hypermetropia in a 5–6-y-old: **short axial length, abnormal corneal shape, abnormal lens shape** (and ectopia lentis).
- Hypermetropia patient presents with **inability to see near** objects (OSCE); treated with convex lens or surgery. Aphakia = no lens (**post-operative or congenital**).

## Alternatives to glasses

| Option | Points |
|---|---|
| **Contact lenses** | **Soft / rigid**. Complications: giant papillary conjunctivitis, **corneal hypoxia**, neovascularisation, abrasion, ulcer, **keratitis** (Acanthamoeba) |
| **Corneal refractive surgery** | PRK, LASEK, LASIK (see Ch. 1) |
| **Lens surgery** | Clear-lens exchange / IOL; in aphakia IOL or contact lens (**not glasses** in unilateral aphakia **[PP]**) |
| **Prerequisites for surgery** | Age, stability. **Contraindications:** collagen tissue disease, **pregnancy, lactation, keratoconus, active corneal disease, dryness**. **Make-up is NOT** a contraindication **[OSCE]** |
| **Surgery complications** | Incomplete/free flap, flap subluxation, corneal opacification, perforation, under/over-correction, recurrence, ectasia. **Commonest: dryness** **[PP]** |

| Option | Points |
|---|---|
| **Astigmatism after surgery** | Cataract, pterygium and corneal sutures cause it; **retinal detachment surgery is the key exception [PP]** |

**ABSOLUTE EXAM CLASSICS: typical MCQ stems, traps and pitfalls**

- "Myopia can be associated with" → **open-angle glaucoma**; closed angle comes with **hypermetropia**.
- "Major contributor to refractive power" → **cornea**. "Cylindrical lenses" → **astigmatism**. "Biconvex lenses for myopia" is the false statement.
- "Distant objects blurry, near clear" → **myopia**.
- "Cannot be used in unilateral aphakia" → **spectacles** (aniseikonia).
- "LASIK contraindication" → **pregnant 26-y-old** (mild dryness is not the key answer). Commonest complication → **dryness**. "Not an indication for graft" → **high myopia**.
- "Presbyopia is NOT associated with..." → **keratoconus** (key: presbyopes are hypermetropic).

## OSCE spot-diagnosis

| Picture / question | Answer |
|---|---|
| Two causes for wearing glasses (child/adult) | Short eyeball, ectopia lentis (hypermetropia), astigmatism |
| Patient wearing thick plus lenses ("eyes look bigger") | **Hypermetropia**/accommodative esotropia: **positive (convex) glasses**; complaint: cannot see near objects; treat with convex lens or surgery |
| What refractive errors does the patient have? (glasses image) | Right eye: astigmatism + myopia; left eye: myopia |
| LASIK: 2 contraindications | Keratoconus, severe dryness, pregnancy, lactation, active corneal disease |
| Contraindication in a male patient other than KC | Dryness / active corneal disease; **make-up is not** |
| Cause of vision loss in a cone-shaped cornea | Progressive myopia + astigmatism |

**MEMORABLE FACTS / MNEMONICS**

- **Myopia = Minus lens (concave); Hyperopia = Hyper = plus (convex).**
- **"Hyperopes Close the angle; myopes Open it."**
- **Cornea = 2/3, lens = 1/3 of focusing power.**

**EXAM CHECKLIST: what you absolutely need to know**

- ☐ Cornea 2/3, lens 1/3 ☐ Which lens for which error ☐ Myopia vs hypermetropia features/associations
- ☐ Keratoconus = myopia + astigmatism ☐ Aphakia/pseudophakia ☐ LASIK contraindications & commonest complication

**Clinical connections**

- **Clinical connections:** Paediatrics (amblyopia, accommodative esotropia screening), Ophthalmic surgery (LASIK), Endocrinology (diabetic myopia shift), Neurology (accommodation reflex).

## Practice MCQs (past-paper style)

**1.** Myopia can be associated with: A. Closed-angle glaucoma B. Open-angle glaucoma
✓ **B** — Hypermetropia goes with angle closure.

**2.** Which does NOT cause hypermetropia? A. Keratoconus B. Short eyeball C. Aphakia
✓ **A** — KC → myopia/astigmatism.

**3.** Major contributor to refractive power: A. Axial length B. Cornea C. Lens
✓ **B**

**4.** Cylindrical lenses are prescribed for: A. Astigmatism B. Presbyopia C. Myopia D. Squint
✓ **A**

**5.** Distance objects appear blurry while near objects clear:
✓ **Myopia**

**6.** Unilateral aphakia cannot be corrected by: A. Contact lens B. IOL C. Glasses
✓ **C**

**7.** Commonest complication after LASIK: A. Endophthalmitis B. Dryness C. Glaucoma
✓ **B**

**8.** LASIK contraindication: A. Pregnant 26-y-old B. Mild dryness C. 22-y-old student D. 40-y-old businessman
✓ **A** — Pregnancy/lactation.

**9.** Not a risk factor for myopia: A. Old age B. Long axial length C. Keratoconus D. Post-cataract surgery
✓ **A**

**10.** Which surgery does NOT cause astigmatism? A. Retinal detachment B. Pterygium C. Cataract
✓ **A** — Key answer.

# Chapter 10 — Eye Emergencies & Red Eye

| MEDIUM | **7** past MCQs | **12** mini-OSCE stations | Exam rank **#10** of 12 |
|---|---|---|---|

## Why is this topic important?

- **19 questions** but **photo stations recur**: chemical burn, hyphema, acute angle closure, hypopyon, orbital foreign body CT.
- Rules to remember: **irrigate first** for chemical injury, **never use pilocarpine in hyphema**, **NPO + antibiotics + tetanus** in open globe.

## Red-eye triage (slide)

| Benign | Serious (emergency / urgent) |
|---|---|
| Stye, chalazion, blepharitis, subconjunctival haemorrhage, conjunctivitis (bacterial / viral / allergic), corneal abrasion or foreign body (follow-up in 24–48 h), contact-lens overwear, dry eye, **episcleritis** | **Emergency:** acute angle closure, hyphema, hypopyon, bacterial keratitis. **Urgent:** iritis (anterior uveitis), viral keratitis, scleritis |

**ABSOLUTE EXAM CLASSICS: typical MCQ stems, traps and pitfalls**

- "Does not require emergency management" → **anterior uveitis** (urgent, not emergency); emergencies = corneal ulcer, orbital floor fracture.
- "Two painful red eyes other than conjunctivitis" → **scleritis, bacterial keratitis** (also angle closure, anterior uveitis).
- "Commonest cause of localised eye redness" → **episcleritis**.

## Chemical burns

| Item | High-yield |
|---|---|
| **Agents** | **Alkali more severe than acid** (alkali penetrates deeper; acid causes coagulative necrosis forming a protein barrier). In severe alkali burns the eye looks **white** (ischaemic conjunctival/scleral vessels) **[PP]** |
| **Symptoms** | Decreased vision, severe pain, **blepharospasm**, photophobia, red eye; later **symblepharon** |
| **Management** | ★★★ **IRRIGATE IMMEDIATELY** (first step) with water/saline until neutral pH, usually **30–60 min** (Morgan lens); gentler if globe rupture suspected. Painkillers and discharge is wrong **[PP][OSCE]** |
| **OSCE** | Chemosis, corneal opacification, ciliary flush / limbal ischaemia → chemical burn; Rx water irrigation 30–60 min |

## Hyphema

| Item | High-yield |
|---|---|
| **Definition** | Blood in the AC (macro: layered; micro: dispersed RBCs); from tears of **iris or ciliary body** vessels after blunt trauma |
| **Other causes** | Surgery, **rubeosis iridis**, anterior uveitis, tumours, **sickle-cell**/bleeding disorders, vascular anomalies, drugs |
| **Signs** | Visible blood level, photophobia, ↓ VA, anisocoria, iridodialysis, ↑ IOP, ciliary flush |
| **Management** | Monitor IOP, **eye shield**, limit activity, **cycloplegia** for pain, **steroid drops** to ↓ re-bleeding. **Pilocarpine contraindicated [PP]**. Surgery: ≥ grade III for > 10 days, early corneal blood staining, IOP ≥ 50 for > 5 days |
| **Complications** | **Secondary haemorrhage (usually LARGER than the first bleed [PP])**, ↑ IOP / secondary open-angle glaucoma (RBC clogging), corneal blood staining |
| **Not expected** | **Hypopyon** is not a trauma complication (it signals infection/inflammation) |

## Open globe injury

| Item | High-yield |
|---|---|
| **Types** | **Rupture** (blunt) vs **laceration** (sharp): **penetrating** (entry only) vs **perforating** (entry + exit) |
| **Signs** | Markedly ↓ VA, **RAPD**, **eccentric / teardrop pupil**, vitreous extrusion, uveal prolapse, tenting of cornea/sclera, **low IOP**, **Seidel sign** |
| **Management** | ★★★ **Urgent ophthalmology, NPO, prophylactic antibiotics, tetanus prophylaxis, primary closure within 24 h**. Gentle irrigation. CT (axial) for intra-orbital foreign body; **MRI is contraindicated if metallic FB [OSCE]** |
| **Aims for AC laceration** | Retain normal anatomy, prevent infection and vision loss. **Evisceration "to avoid sympathetic ophthalmitis" is NOT an aim [PP]** |

## Other emergencies

| Condition | High-yield |
|---|---|
| **Acute angle closure** | See Ch. 4; elderly, painful hard red eye, halos, vomiting |
| **Orbital compartment syndrome** | Trauma/retrobulbar haemorrhage → ↑ orbital pressure: ↓ VA, proptosis, RAPD, tight lids, ↓ retropulsion, ophthalmoplegia. **Do not delay: lateral canthotomy + inferior cantholysis**; head up 45°, cough/vomit/straining control |
| **Corneal abrasion / foreign body** | Severe pain, photophobia, foreign-body sensation, **normal VA and pupils**, fluorescein defect |
| **Eyelid laceration** | Ocular injury accompanies in up to 2/3; check lid margin, tear drainage system |
| **Vitreous haemorrhage** | May indicate retinal tear/RD; abusive head trauma in infants |
| **Retinal trauma** | RD (bed rest, urgent repair); **commotio retinae** = retinal whitening, usually resolves |
| **Traumatic optic neuropathy** | Indirect (blow to brow/temple) more common; ↓ VA, colour desaturation, **RAPD** |
| **Carotid-cavernous fistula** | Corkscrew episcleral vessels, chemosis, mild proptosis, ↑ IOP |
| **Endophthalmitis / hypopyon** | Emergency; causes of hypopyon: anterior uveitis, endophthalmitis, bacterial keratitis; Behçet |

## OSCE spot-diagnosis

| Picture / question | Answer |
|---|---|
| Cloudy white cornea, chemosis, ciliary flush | **Chemical (alkali) burn**; irrigation 30–60 min |
| Blood layer in the AC | **Hyphema**: trauma, surgery, rubeosis, sickle cell; complications: secondary haemorrhage, ↑ IOP, secondary open-angle glaucoma, corneal blood staining; Rx monitor IOP, shield, steroids, cycloplegia |
| Hypopyon + white cornea | **Bacterial keratitis**; topical broad-spectrum antibiotic |
| Subconjunctival / vitreous / hyphema (3 pictures) | A. **Subconjunctival haemorrhage** · B. **Vitreous haemorrhage** · C. **Hyphema** |
| Axial CT head, hyperdense body in the orbit | **Metallic intra-orbital foreign body**: antibiotics, tetanus, urgent ophthalmology, NPO |
| Painful eye + halos + vomiting, 71-y-old | **Acute angle closure** |
| Sudden painless "red patch" on the white of the eye | **Subconjunctival haemorrhage**: check BP (Q3) |
| Traumatised eye: limbal ischaemia + hyphema | Glaucoma type: **secondary open-angle (RBC clogging)** |

**MEMORABLE FACTS / MNEMONICS**

- **"IRRIGATE, don't investigate"** for chemicals; alkali = deeper = white eye.
- **Open globe: "NPO, Abx, Tetanus, Close in 24 h".**
- **Hyphema: no pilocarpine; re-bleed is bigger.**

**EXAM CHECKLIST: what you absolutely need to know**

- ☐ Chemical burn first step & duration ☐ Alkali vs acid ☐ Hyphema management + pilocarpine CI + re-bleed
- ☐ Open-globe signs & management ☐ OCS: canthotomy ☐ Emergency vs urgent red-eye causes

**Clinical connections**

- **Clinical connections:** Emergency medicine/Trauma (life-threatening injuries first), Neurosurgery (CT, orbital fractures), Haematology (sickle cell), Infection (tetanus, endophthalmitis).

## Practice MCQs (past-paper style)

**1.** First step in a chemical eye injury: A. Irrigation B. Painkillers C. Referral D. Fluorescein
✓ **A**

**2.** Alkali burn: most appropriate management? A. Flood with saline 10–20 min B. Painkillers and discharge
✓ **A** — Continue to neutral pH (30–60 min).

**3.** Wrong about alkaline trauma: A. Immediate irrigation B. Acid penetrates more than alkali
✓ **B**

**4.** Contraindicated in hyphema: A. Pilocarpine B. Eye shield C. Cycloplegic
✓ **A**

**5.** Hyphema: which is wrong? A. Source iris/ciliary body B. Re-bleeding is usually smaller than the original
✓ **B** — Larger.

**6.** Not an aim in AC laceration treatment: A. Prevent infection B. Retain anatomy C. Evisceration to avoid sympathetic ophthalmitis
✓ **C**

**7.** Doesn’t require emergency management: A. Anterior uveitis B. Orbital floor fracture C. Corneal ulcer
✓ **A**

**8.** Hypopyon is:
✓ **A collection of white cells in the anterior chamber**

# Chapter 11 — Uveitis

| MEDIUM | **10** past MCQs | **8** mini-OSCE stations | Exam rank **#11** of 12 |
|---|---|---|---|

## Why is this topic important?

- **18 questions**, fewer than the lecture length suggests, but **very predictable**: HLA-B27/ankylosing spondylitis, sarcoid KP + ACE, JIA (white eye, ANA), Fuchs, toxoplasma, CMV/AIDS, Behçet, treatment (steroid + cycloplegic).
- 50 % of patients with uveitis have a systemic disease.

## High-Yield Facts

| Fact | Detail |
|---|---|
| **Uvea** | Middle vascular layer: **iris, ciliary body, choroid** |
| **Classification** | **Anterior** (iritis, iridocyclitis; AC) · **Intermediate** (pars planitis; vitreous) · **Posterior** (choroiditis, retinitis; choroid) · **Panuveitis**. Anterior = 52 % of uveitis |
| **Anterior causes** | Idiopathic 34 %, **seronegative spondyloarthropathy 10 %**, **sarcoid** 9.6 %, JRA 5.6 %, SLE, Behçet, AIDS |
| **Posterior causes** | **Toxoplasma 24.6 % (commonest, MCQ)**, idiopathic, **CMV**, SLE, sarcoid |
| **Etiology groups** | Infection, systemic immune-mediated, syndromes confined to the eye, idiopathic |
| **Symptoms** | **Acute anterior**: pain, redness, photophobia, tearing, ↓ VA over hours–days. **Chronic**: blurred vision, mild redness, little pain. **Posterior/intermediate**: **floaters, blurred vision, little pain**, minimal external signs |
| **Emergency?** | Anterior uveitis is **urgent, not an emergency [PP]** |

## Signs of anterior uveitis

| Sign | Notes |
|---|---|
| **Ciliary injection** | Perilimbal redness (ciliary flush) |
| **Aqueous cells & flare** | WBCs + protein leak seen with the slit-lamp beam; **hyphema is NOT a feature [PP]** |
| **Hypopyon** | WBC layer in the AC (severe inflammation). DDx: endophthalmitis, bacterial keratitis, Behçet |
| **Keratic precipitates (KP)** | Clumped cells on the corneal endothelium, **inferior** (superior in Fuchs). **Fine/stellate** (Fuchs, non-granulomatous) vs **large "mutton-fat" (granulomatous: sarcoid)** |
| **Posterior synechiae** | Iris stuck to the lens → irregular pupil, **pupil-block glaucoma**. Indicates chronic/recurrent disease **[OSCE]** |
| **Peripheral anterior synechiae** | Iris to TM/cornea → angle closure |
| **Miosis** | Common; direct and consensual photophobia |
| **Iris nodules** | Granulomatous disease (sarcoid) |

**KEY POINT**

- **Intermediate/posterior:** vitreous cells, retinal/choroidal foci, **macular oedema** (cystoid, e.g., pars planitis), vascular sheathing, exudative RD (Vogt–Koyanagi–Harada), **Dalen-Fuchs nodules** (sarcoid).
- Reduction of vision in posterior uveitis: destruction by retinitis (toxo, CMV) or **macular oedema**.

## Investigations

| Situation | Tests |
|---|---|
| **Mild unilateral non-granulomatous (trauma, known disease, no systemic hint)** | Lab tests unlikely to help |
| **Bilateral / granulomatous / recurrent / unremarkable history** | CBC, ESR, ANA, RPR/VDRL, PPD, Lyme, **HLA-B27**, chest X-ray |
| **Ankylosing spondylitis** | **HLA-B27 typing**; pelvic X-ray (sacroiliitis) **[OSCE]** |
| **Sarcoidosis** | Large KPs, iris nodules; **chest X-ray, serum ACE, serum calcium** (+ lymphadenopathy) **[OSCE]** |
| **Toxoplasmosis** | Clinical appearance; creamy focus at the margin of an old pigmented scar; antibody test only suggestive (many are IgG positive) |

## Treatment

| Item | Detail |
|---|---|
| **Aims** | Relieve pain/inflammation; prevent damage to macula and optic nerve |
| **Anterior uveitis** | ★★★ **Topical steroids + cycloplegic (mydriatic) drops** (cyclopentolate, atropine) **[PP]**: relieve ciliary-spasm pain and **prevent/break posterior synechiae**. Break synechiae: intensive cyclopentolate + phenylephrine; sub-conjunctival mydriatic |
| **Posterior uveitis** | Systemic steroids or sub-Tenon injection; specific antiviral/antibiotic; **azathioprine/cyclosporin** in severe forms (Behçet) |
| **Complications** | Cataract, glaucoma (synechiae, steroid response), macular oedema, band keratopathy **[+]**, RD |

## Specific conditions

| Condition | High-yield |
|---|---|
| **Seronegative spondyloarthritis** | Anterior uveitis is the commonest extra-articular feature; **HLA-B27**. Features: inflammatory back pain (IPAIN: Insidious onset, Pain at night, Age < 40, Improves with exercise, No improvement with rest), peripheral arthritis, **enthesitis, dactylitis, bamboo spine**. **Ankylosing spondylitis, psoriatic, reactive ("can't see, can't pee, can't climb a tree"), IBD-associated**. 50-y-old man with low back pain + AU → steroid + cycloplegic **[PP][OSCE]** |
| **Sarcoidosis** | Granulomatous: **large (mutton-fat) KPs**, iris nodules; lung/lymphadenopathy; scleritis, lacrimal gland. **Stellate KPs are NOT characteristic [PP]** |
| **JIA (juvenile chronic arthritis)** | Seronegative; **pauciarticular/oligoarticular (≤ 4 joints), ANA+** = highest uveitis risk (**not polyarthritis [PP]**); **chronic, white eye, asymptomatic**; cataract, glaucoma; ~70 % bilateral; **screen children regularly** |
| **Behçet disease** | **Oral ulcers, genital ulcers, skin lesions**; recurrent **hypopyon uveitis**; severe → azathioprine/cyclosporin **[OSCE]** |
| **Fuchs heterochromic iridocyclitis** | Young adult, chronic, **no systemic association**; **white eye**, heterochromia, **stellate KPs**, **cataract (70 %) = commonest presentation [PP]**; vitreous cells; **steroids are NOT effective**; do well with cataract surgery; treat glaucoma conventionally |
| **Toxoplasmosis** | **Commonest cause of posterior uveitis [PP]**. Congenital reactivated or acquired. Retinochoroiditis: creamy focus at the margin of an old pigmented atrophic scar, vitreous haze. Rx: **systemic steroids + clindamycin/sulphadiazine** when macula/optic nerve threatened. **Pyrimethamine** is used for toxoplasma, not Acanthamoeba |
| **AIDS / CMV retinitis** | **CMV retinitis** = commonest opportunistic ocular infection; **CD4 < 50**; floaters/blurred vision; haemorrhage + infiltrates + cotton-wool spots ("pizza"). **AIDS-defining [PP]**. Rx **ganciclovir (IV/oral valganciclovir), foscarnet, cidofovir**; HAART reduces incidence; prolonged treatment to prevent recurrence. Early AIDS: microvascular cotton-wool spots |
| **Sympathetic ophthalmitis** | Slide: title only. Bilateral uveitis after penetrating injury **[+]**; evisceration is not a routine aim (MCQ) |
| **Bilateral vitritis** | Think **lymphoma [PP]** |
| **Crohn's + floaters + blurred vision** | **Intermediate uveitis** (vitreous cells) **[PP]** |

**ABSOLUTE EXAM CLASSICS: typical MCQ stems, traps and pitfalls**

- "Not characteristic of sarcoid" → **stellate KP**. "Not present in anterior uveitis" → **hyphema**. "Doesn't need emergency management" → **anterior uveitis**.
- "Most common cause of posterior uveitis" → **toxoplasma**. "Fuchs: commonest presentation" → **cataract**.
- "Systemic uveitis – false" → **JIA presents most commonly with polyarthritis** (it is oligoarticular). "CMV retinitis is an AIDS-defining disease" (true).
- "Uveitis – incorrect" → **mostly caused by bacterial infection** (most are non-infectious/immune; also "cells in the AC are neutrophils" is not accepted).
- "Young male with red eye, photophobia, lacrimation, pain" → **anterior uveitis**. "50-y-old man with low-back pain, VA 6/12, ciliary flush, cells, fine KP" → **topical steroids + cycloplegics**.

**DISCREPANCY: slides vs past exams (past exams win)**

- Slide: cataract surgery is helpful in Fuchs while steroids "are not effective". Exam: same. No conflict, but note the OSCE key that matches **Hashimoto thyroiditis with lid retraction** (thyroid eye disease) in the "match" question; learn it as given.

## OSCE spot-diagnosis

| Picture / question | Answer |
|---|---|
| Irregular pupil, iris stuck to lens | **Posterior synechiae** → AS (pelvic X-ray: sacroiliitis); **HLA-B27** |
| Large KPs, sarcoid patient | **Keratic precipitates**; CXR, serum ACE, serum calcium |
| Hypopyon, photophobia | **Anterior uveitis** (also endophthalmitis, bacterial keratitis); complications: synechiae, glaucoma, cataract, macular oedema |
| Heterochromia, fixed dilated pupil | **Fuchs heterochromic iridocyclitis** |
| Oral ulcer + hypopyon | **Behçet disease** (DDx bacterial keratitis) |
| Match sarcoid / Wilson / AIDS / Hashimoto / Marfan | Scleritis / corneal deposits (KF ring) / CMV retinitis / lid retraction / lens dislocation |
| Creamy retinal focus beside a pigmented scar | **Toxoplasma retinochoroiditis** |

### MEMORABLE FACTS / MNEMONICS

- **AU = steroid + cycloplegic (STeroid for Inflammation, Cycloplegic for pain + synechiae).**
- **HLA-B27 → AS, reactive, psoriatic, IBD.**
- **Posterior uveitis #1 = Toxo; HIV with CD4 < 50 = CMV.**

### EXAM CHECKLIST: what you absolutely need to know

- ☐ Classification + commonest causes ☐ Signs of AU (KP, cells/flare, hypopyon, synechiae) ☐ Treatment steroid + cycloplegic
- ☐ HLA-B27/AS, sarcoid tests, JIA, Fuchs, Behçet, toxo, CMV

### Clinical connections

- **Clinical connections:** Rheumatology (SpA, JIA, Behçet, SLE), Respiratory (sarcoid, TB), Infectious disease/HIV (CMV, toxo, syphilis), Gastroenterology (IBD, Whipple), Paediatrics (JIA screening).

## Practice MCQs (past-paper style)

**1.** NOT characteristic of sarcoidosis: A. Large KP B. Stellate KP C. Lymphadenopathy ± ACE
✓ **B**

**2.** Commonest presentation of Fuchs heterochromic iridocyclitis: A. Floaters B. Painful red eye C. Cataract
✓ **C**

**3.** NOT present in anterior uveitis: A. Hyphema B. Posterior synechiae C. KP D. Cells in AC
✓ **A**

**4.** Commonest cause of posterior uveitis: A. CMV B. Sarcoid C. Syphilis D. Toxoplasma
✓ **D**

**5.** 50-y-old with low-back pain, red eye, photophobia, fine KP, 3+ cells: best treatment
✓ **Topical steroids + cycloplegic** — AS-associated AU.

**6.** Crohn's disease, floaters and blurred vision: expected finding? A. RAPD B. Intermediate uveitis C. Fixed dilated pupil
✓ **B**

**7.** Uveitis in JIA is most associated with: A. Polyarthritis B. Oligoarticular, ANA-positive
✓ **B**

**8.** Which is incorrect about uveitis? A. Steroids work B. Posterior synechiae C. Mostly caused by bacteria
✓ **C**

# Chapter 12 — Anatomy & Other Recurrent Facts

| MEDIUM | **12** past MCQs | **0** mini-OSCE stations | Exam rank **#12** of 12 |
|---|---|---|---|

## Why is this topic important?

- **12 MCQs + scattered OSCE items** (anatomy labelling, instruments). Individually small, but cheap marks.
- Includes: **accommodation**, **ora serrata**, **Argyll-Robertson pupil**, **leukocoria**, **direct ophthalmoscope image**, **CMV / lymphoma / retrobulbar neuritis**.

## High-Yield Facts

| Fact | Detail |
|---|---|
| **Ora serrata** | **Boundary between retina and ciliary body**; anterior limit of the sensory retina **[PP][OSCE]** |
| **Accommodation** | ★★★ **Ciliary muscle contracts → zonular fibres relax → lens becomes more globular/convex** (near vision). **Ciliary body is the most important structure for accommodation [PP][OSCE]** |
| **Ciliary body** | Two parts: **pars plicata** (anterior, makes aqueous) and **pars plana [OSCE]** |
| **Direct ophthalmoscope image** | **Virtual, erect, magnified [PP]** |
| **Argyll-Robertson pupil** | **Light-near dissociation**: no constriction to light, normal constriction to accommodation **[PP]** (neurosyphilis **[+]**) |
| **Horner syndrome** | Ptosis + miosis + anhidrosis; one cause of anisocoria (with **Adie tonic pupil**, 3rd nerve palsy) |
| **Cornea** | 0.5 mm thick (OSCE), 11–12 mm diameter; 2/3 of refraction |
| **Vitreous** | **80 % of the eye volume**; collagen, hyaluronic acid, water |
| **Conjunctiva** | Non-keratinised stratified squamous epithelium with goblet cells; palpebral, bulbar, fornix. Bulbar conjunctiva does not cover the cornea |
| **Sclera** | Collagen; thickest around the optic nerve; episclera, sclera proper, lamina fusca; attachments of EOM; **limbus contains stem cells** |
| **Retina** | Macula (central vision), fovea (centre), ora serrata (peripheral dentate edge). Blood: central retinal artery (inner retina) + choroid |
| **Choroid** | Pigmented, vascular, between sclera and retina; from optic nerve to ciliary body |
| **Vascular supply** | Ophthalmic artery (ICA) → CRA (inner retina), **short posterior ciliary** (choroid, optic nerve head), **long posterior ciliary** (anterior uvea), anterior ciliary (rectus muscles, anterior segment) |
| **Lacrimal gland** | Parasympathetic via **CN VII** → pterygopalatine ganglion; sympathetic from superior cervical ganglion; sensory = lacrimal nerve (V1) |
| **Danger triangle** | Facial infection → ophthalmic veins → **cavernous sinus thrombosis** |

## Other recurrent MCQ facts

| Question | Answer |
|---|---|
| **Leukocoria in a 5-month-old: causes** | **Retinoblastoma, congenital cataract, retinopathy of prematurity**, congenital glaucoma, retinal detachment, toxoplasmosis; "gout" is not a cause **[PP][OSCE]** |
| **Causes of amblyopia (except)** | Esotropia, lid haemangioma, corneal clouding, infant patching; **not optic atrophy** (organic) **[PP]** |
| **"CMV" question (Q142)** | Stem says "CMV hepatitis" with answer "an AIDS-defining illness": **key unclear (typo)**. Learn: **CMV retinitis IS an AIDS-defining illness** (Q89) **[PP]** |
| **Bilateral vitritis** | **Lymphoma [PP]** |
| **Retrobulbar neuritis (except)** | **Most cases show disc swelling** is false (disc normal); true: women 20–40, pain on movement, colour desaturation, RAPD **[PP]** |
| **Hypotony** | IOP < 6: leaking wound, globe rupture, RD, uveitis (Dr Shafei notes) |
| **↑ IOP causes** | Open/closed-angle glaucoma, uveitis, ↑ episcleral venous pressure, steroids, TCA, sulfonamides, post-phaco |
| **Three lasers** | Photo-**coagulation** (PDR), photo-**ablation** (refractive), photo-**disruption** (PCO, YAG) |
| **Eyelid layers (OSCE)** | Anterior lamella: skin + orbicularis (anterior blepharitis, anterior chalazion); posterior lamella: tarsal plate + conjunctiva (posterior blepharitis/MGD, posterior chalazion) |
| **Subluxated lens / PXF** | Zonular fibres seen: Marfan, homocystinuria; pseudoexfoliation = dandruff-like material on the lens |
| **Multifocal-toric IOL** | Rings = multifocal; marks at 2 and 8 o'clock = toric axis |

**DISCREPANCY: slides vs past exams (past exams win)**

- Q133 asks the boundary between retina and ciliary body (**ora serrata**). The OSCE key for "most anterior part of the sensory retina" says "inner neurosensory retina": by anatomy the answer is the **ora serrata**; learn both. Q135 (orbital septum) and Q139 (leukocoria exception) have **blank keys**.

**EXAM CHECKLIST: what you absolutely need to know**

- ☐ Ora serrata ☐ Accommodation mechanism ☐ Direct ophthalmoscope image ☐ Argyll-Robertson / Horner / Adie
- ☐ Leukocoria causes ☐ Ciliary body parts ☐ Vitreous 80 %

## Practice MCQs (past-paper style)

**1.** Boundary between retina and ciliary body:
✓ **Ora serrata**

**2.** Most important structure for accommodation: A. Anterior capsule B. Posterior capsule C. Ciliary body D. Iris
✓ **C**

**3.** Direct ophthalmoscope image is: A. Virtual, inverted, magnified B. Virtual, erect, magnified C. Real, inverted
✓ **B**

**4.** Light-near dissociation: A. Argyll-Robertson B. Horner
✓ **A**

**5.** Bilateral vitritis suggests:
✓ **Lymphoma**

**6.** Cannot cause leukocoria: A. Retinoblastoma B. Congenital cataract C. Gout D. ROP
✓ **C**

**7.** Contraction of the ciliary muscle: A. Lens flattens B. Zonules relax and the lens becomes more convex
✓ **B**

# Appendix A — Ophthalmic drug cheat-sheet

General principle first: **steroids** help inflammation but **harm herpes epithelial disease, bacterial/fungal/Acanthamoeba keratitis**; **mydriatics/cycloplegics** dilate the pupil (bad in angle closure); **miotics** constrict (bad in hyphema/uveitis). Then learn the differences below.

| Drug / class | Use | Mechanism | Side effects / contraindications |
|---|---|---|---|
| **Timolol** (β-blocker) ★★★ | POAG, ocular HTN, AACG | ↓ aqueous production; BD | **Bradycardia, heart block, asthma** |
| **Latanoprost** (PGA) ★★★ | POAG | ↑ uveoscleral outflow; once daily | Hyperaemia, **[+]** lash growth, iris darkening |
| **Acetazolamide** (CAI) ★★★ | AACG (IV), POAG | ↓ production | **Sulfa allergy**; paraesthesia, metabolic acidosis, kidney stones, hypokalaemia |
| **Brimonidine** (α2-agonist) | Glaucoma | ↓ production, neuroprotective | Allergy / contact dermatitis |
| **Pilocarpine** ★★★ | AACG (miosis opens the angle) | ↑ conventional outflow | Miosis, myopic shift, RD risk; **CI hyphema** |
| **Mannitol** IV | AACG | Hyperosmotic | Fluid load |
| **Cyclopentolate / atropine** | Uveitis (break synechiae, pain), cycloplegic refraction | Cycloplegia + mydriasis | **Can precipitate angle closure** (avoid in narrow angles), photophobia, blurred vision |
| **Phenylephrine** | Break synechiae (with cyclopentolate) | α1 mydriatic | Angle closure |
| **Topical prednisolone** ★★★ | Anterior uveitis, graft rejection, post-op | Anti-inflammatory | Cataract (PSC), ↑ IOP, corneal thinning/perforation, ↑ bacterial keratitis; **worsens dendritic ulcer** |
| **Aciclovir** | HSV dendritic ulcer (topical); HZO (oral) | Antiviral | Avoid steroids in epithelial HSV |
| **Ganciclovir / valganciclovir, foscarnet, cidofovir** | CMV retinitis | Antiviral | IV or oral valganciclovir; prolonged therapy |
| **Chlorhexidine + propamidine** | Acanthamoeba keratitis | Anti-amoebic | Months of therapy; may end in graft |
| **Fluoroquinolone** drops | Bacterial keratitis (monotherapy possible) | Broad spectrum | |
| **Fusidic acid** ointment | Anterior blepharitis | Anti-staphylococcal | |
| **Doxycycline / azithromycin** (oral) | Posterior blepharitis/MGD | Anti-inflammatory / antibacterial | |
| **Clindamycin + sulphadiazine** (+ steroids) | Toxoplasma retinochoroiditis | Antiprotozoal | Pyrimethamine is NOT used for Acanthamoeba |
| **Anti-VEGF** (bevacizumab/Avastin) intravitreal | DME (first line), PDR, wet AMD | Blocks VEGF | Endophthalmitis (rare) |
| **Riboflavin (B2) + UV-A** | Keratoconus cross-linking | Collagen cross-links | **Thiamine is wrong** |
| **Neostigmine / edrophonium** | Myasthenia (treatment / test) | Anticholinesterase | |
| **Systemic steroids** | Posterior uveitis, scleritis, TED optic neuropathy, GCA | Immunosuppression | |
| **Azathioprine / cyclosporin** | Severe uveitis (Behçet), dry eye (topical cyclosporin) | Immunosuppression | |
| **Artificial tears** | Dry eye, lagophthalmos, TED | Lubrication | |

# Appendix B — OSCE instrument & image atlas

## Instruments

| Instrument | Use / key point |
|---|---|
| **Hertel exophthalmometer** | Proptosis; normal 10–21 mm |
| **Prism bar** | Measures the angle of deviation in strabismus |
| **Trial lens frame** | Subjective refraction / lens testing |
| **Goldmann applanation tonometer** | IOP (mmHg); fluorescein + cobalt-blue light; normal 10–21 |
| **Fluorescein strip** | Epithelial defect/dendritic ulcer (green), tear break-up, tonometry |
| **Direct ophthalmoscope** | Fundus; image virtual, erect, magnified |
| **Slit lamp** | Anterior segment: cells/flare, KP, synechiae, cataract |
| **Gonioscopy lens** | Angle: open/narrow/closed; compression gonioscopy |
| **Corneal topography / tomography** | Keratoconus diagnosis |
| **Pachymeter** | Corneal thickness (before LASIK, IOP interpretation) |
| **OCT** | Macular oedema, disc/RNFL imaging (write "optical coherence tomography") |
| **Fluorescein angiography** | Microaneurysms, leakage, non-perfusion, NV |
| **Cross-linking device** | UV-A + riboflavin for progressive keratoconus |
| **IOL (pseudophakic lens)** | Artificial lens after cataract surgery; multifocal, toric |
| **Visual-field machine** | Glaucoma/chiasm lesions |

## If you see … say

| Image | Diagnosis (± one-liner) |
|---|---|
| Haemorrhages + exudates + NV, laser dots | PDR → PRP ± anti-VEGF |
| Chemosis + lid retraction + proptosis | Graves ophthalmopathy → TSH/T3/T4/TRAb |
| Hyphema | Trauma / rubeosis / sickle cell → shield, steroid, cycloplegic, no pilocarpine |
| Cloudy white cornea + chemosis | Alkali burn → irrigate 30–60 min |
| Dendritic branching on fluorescein | HSV keratitis → aciclovir, no steroid |
| Hypopyon + white corneal infiltrate | Bacterial keratitis → broad-spectrum antibiotic |
| Cone cornea / V lower lid | Keratoconus → CXL / ring / graft |
| Corneal sutures | Keratoplasty → rejection, steroids |
| White pupil, adult | Mature cataract |
| White pupil, child | Leukocoria: retinoblastoma, congenital cataract, ROP, congenital glaucoma |
| Hazy membrane behind IOL | PCO → YAG |
| Lower lid out / in | Ectropion / entropion |
| Rodent ulcer on lower lid | BCC → excision / Mohs |
| Medial lower-lid swelling, painful | Dacryocystitis → antibiotics, DCR |
| Cherry-red macular spot | CRAO |
| Retina elevated, folds | Rhegmatogenous RD → surgery |
| Optic disc cupping / pallor / oedema | Glaucoma / optic atrophy / papilloedema or neuritis |
| Eye turned in + hyperopia | Accommodative esotropia → convex glasses |
| Eye turned in, cannot abduct | 6th nerve palsy: raised ICP, DM, tumours |
| Eye down-and-out + ptosis | 3rd nerve palsy: aneurysm, DM, tumour |
| Hypermetropic child squint at 2 months | Fundoscopy is a must |
| Oral ulcer + hypopyon | Behçet |
| Posterior synechiae + pelvic X-ray | Ankylosing spondylitis, HLA-B27 |
| Corneal ring infiltrate, contact lens | Acanthamoeba |
| Orbital CT hyperdense body | Metallic foreign body: antibiotics, tetanus, NPO |
| Axial CT orbital mass along optic nerve | Optic nerve glioma (NF1) |
| Heterochromia + fixed pupil | Fuchs heterochromic iridocyclitis |
| Vesicles on forehead and nose tip | HZO, Hutchinson sign |

# Appendix C — Last-night rapid-fire sheet (every line was tested)

### Cornea
★ Diameter 11–12 mm, 0.5 mm thick; stroma 90 %; endothelium never regenerates; epithelium does.
★ KC: progressive irregular myopic astigmatism; Munson; topography; CXL (riboflavin + UV-A, stroma); ring; graft.
★ Graft: 80 %, no HLA/ABO, rejection = commonest failure, type IV, steroids; not for high myopia.
★ Hutchinson = HZO. Dendritic ulcer: aciclovir, no steroids. Acanthamoeba: chlorhexidine + propamidine.
★ LASIK: pregnancy/lactation, KC, dryness CI; makeup OK; dryness = commonest complication.

### Diabetic retinopathy
★ First sign microaneurysm; hallmark of PDR neovascularisation; commonest vision loss = macular oedema.
★ Moderate: cotton-wool spots; severe: 4-2-1; DME → anti-VEGF; PDR → PRP ± anti-VEGF.
★ PRP: ↓ night vision, ↓ peripheral field, macular oedema. Not RF: myopia, ocular HTN.

### Lids / lacrimal
★ Levator III, orbicularis VII, Müller sympathetic. Acquired ptosis = levator disinsertion; congenital = maldeveloped levator.
★ Ectropion: facial palsy; entropion: not in facial palsy. Ice-pack test = myasthenia.
★ BCC: 90 %, rodent ulcer, excision/Mohs (not radiation first). Chalazion painless, stye painful.
★ NLD → inferior meatus; congenital resolves in year 1; adult → DCR; dacryocystitis → antibiotics.

### Glaucoma
★ POAG commonest; AACG: oval fixed pupil, IOP > 40, halos; IV acetazolamide/mannitol + pilocarpine + timolol, then YAG iridotomy; treat other eye.
★ PGA ↑ uveoscleral (once daily); β-blocker ↓ production (CI asthma, bradycardia, heart block); pilocarpine ↑ conventional; acetazolamide: sulfa allergy, acidosis, stones.
★ Myopia → open angle; hyperopia → closed angle. Thin cornea → low IOP reading. Congenital: buphthalmos, Haab, no hydrops.

### Lens
★ Nuclear = distance blur, near ok; PSC = glare + ↓ contrast; mature = absent red reflex.
★ Phaco = earliest rehab, less astigmatism; PCO = commonest complication → YAG; painful red eye post-op = endophthalmitis.
★ Aphakia: no spectacles if unilateral; ectopia lentis: Marfan, homocystinuria, trauma.

### Loss of vision
★ Painless sudden: CRAO, CRVO, RD, vitreous haemorrhage, wet AMD (commonest sudden in the elderly).
★ Painful: AACG, keratitis, uveitis, endophthalmitis, optic neuritis (pain on movement).
★ Optic neuritis: women 20–40, RAPD, normal disc; MS. Papilloedema bilateral, no RAPD.
★ Fields: chiasm bitemporal; tract/LGB/radiation contralateral homonymous; radiation congruous; cortex macular sparing.

### Strabismus
★ Yoke: R MR + L LR; up-right: R SR + L IO. Trochlear outside the cone.
★ Infantile ET: first 6 months, not hyperopia, commonest <1 y; accommodative = hyperopia → glasses.
★ 2-month-old with squint → fundoscopy. 3rd palsy → exotropia; 6th → esotropia. Graves → inferior rectus.
★ Never total occlusion of the good eye; amblyopia types: strabismic, anisometropic, deprivation.

### Orbit
★ 7 bones (no nasal). Lacrimal gland superolateral. Hertel 10–21 mm, ≥ 2 mm difference.
★ TED: commonest proptosis in adults; inferior rectus; restriction not paralysis; TSH/T3/T4/TRAb; complications keratopathy, optic neuropathy.
★ Orbital cellulitis: admit, CT, IV antibiotics; fever does not discriminate; kids: commonest unilateral proptosis. RMS (kids), neuroblastoma (met).
★ CCF after head injury: proptosis with normal VA. Blow-out: inferior rectus.

### Emergencies
★ Chemical: irrigate first, 30–60 min, alkali worse. Hyphema: no pilocarpine, re-bleed larger.
★ Open globe: NPO, antibiotics, tetanus, close < 24 h. OCS: canthotomy. Anterior uveitis = urgent not emergency.

### Uveitis
★ AU: steroid + cycloplegic. HLA-B27/AS. Sarcoid: large KP, CXR/ACE/Ca. JIA: oligoarticular, ANA+, white eye.
★ Fuchs: cataract, steroids ineffective. Toxoplasma = commonest posterior; CMV: CD4 < 50, AIDS-defining. Behçet: oral ulcers + hypopyon.

### Misc
★ Ora serrata = retina/ciliary body boundary. Accommodation: ciliary contraction → lens rounder.
★ Argyll-Robertson: light-near dissociation. Direct ophthalmoscope: virtual erect magnified. Bilateral vitritis: lymphoma.