Neurosurgery
High-Yield Exam Notes

All 12 lectures + past papers
(351 final-exam MCQs · 187 mini-OSCE stations · finals up to 020 batch, May 2025)

Symbol	Meaning
★★★	Must-know: repeated in past papers or a slide-highlighted fact
[PP]	Tested as an MCQ in the final-exam collection (Neurosurgery P.Ps, V2 with the corrections page applied)
[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** / **LOW**	Priority, calculated from the number of past MCQs + mini-OSCE stations on that topic

How to use this PDF

- Chapters follow the **lecture order**; the priority badge and "Exam rank" on each chapter page tell you what to study first if you are short of time. Chapters 1+2 are one topic (head injury).
- Where a slide and a past paper disagree, the **past paper wins** and the conflict is flagged in a yellow box.
- Mini-OSCE pictures are not reproduced: their **answers** are in the "OSCE spot-diagnosis" table of each chapter.
- Several keys in the papers are wrong or marked "not sure" by the compiler; those are labelled **key unclear** rather than guessed.
- Counts: 351 MCQs (9 neuroanatomy + 6 meningitis + 336 on the 10 lectures) and 187 numbered mini-OSCE stations.
- The "Functional & Epilepsy" lecture was given for the **first time** this year: no MCQs exist for it (the compiler says so), so its priority is a **data gap, not proof that it is unimportant**.

Table of contents

1. Head Injuries I: Assessment, GCS, Scalp, Skull & Brain Injury 5

2. Head Injuries II: Secondary Injury, CSF Leaks, Haematomas & Complications 9

3. Brain Tumours (incl. Pituitary, Craniopharyngioma, Schwannoma) 13

4. Raised ICP, Monro–Kellie, Monitoring & IIH 17

5. Subarachnoid Haemorrhage, Aneurysms & AVM 20

6. Hydrocephalus, CSF Physiology & Shunts 23

7. Degenerative Spinal Disease: Lumbar/Cervical Disc, Stenosis, Spondylolisthesis 26

8. Spinal Cord Injury 30

9. Spinal Tumours 33

10. Spina Bifida, Chiari Malformations & Tethered Cord 36

11. Functional & Epilepsy Neurosurgery (new lecture) 39

12. Neuroanatomy One-Liners + Meningitis / CSF (no lecture) 42

Appendix A. Drugs and Interventions Cheat-Sheet 44

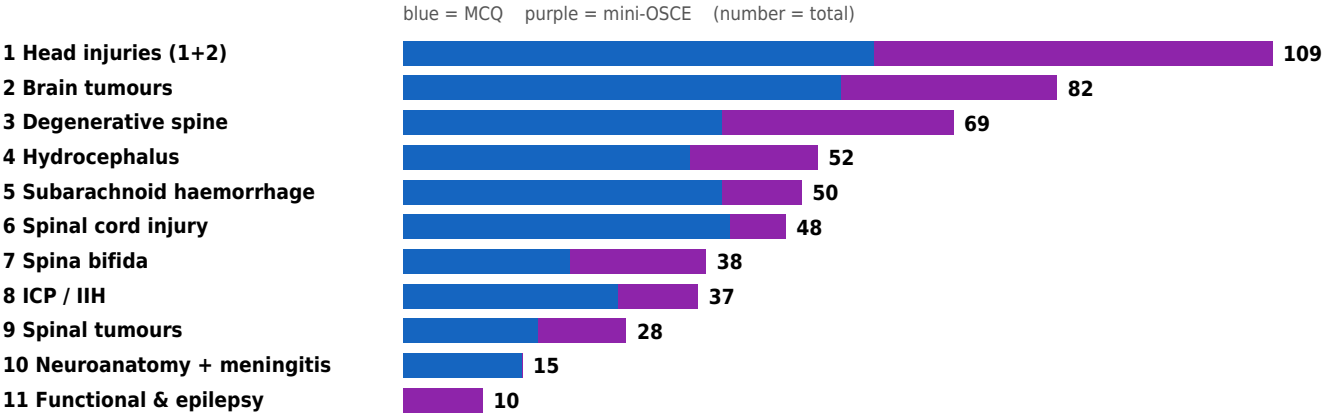
Appendix B. CT / MRI / Spot-Diagnosis Atlas for the Mini-OSCE 45

Appendix C. Numbers, Scales and Sheets for the Last Night 46

Also inside: exam-intelligence page (after the contents) · drug & intervention cheat-sheet · CT/MRI image atlas for OSCE · numbers, grading scales and root-level sheet for the last night

Exam intelligence: what was actually tested

Counts come from the files you uploaded: **351 MCQs** (index of the "Neurosurgery P.Ps Final" file, including 9 neuroanatomy and 6 meningitis questions that match no lecture) and the **187 numbered stations** of the Neurosurgery Mini-OSCE file (Head injury 1–50, brain tumours 51–77, ICP 78–87, SAH 88–97, hydrocephalus 98–113, functional 114–123, degenerative spine 124–152, SCI 153–159, spinal tumours 160–170, spina bifida 171–187).



Priority ranking of the learning objectives

#	Topic	MCQ + OSCE	Priority	Comment (slides vs exams)
1	Head injuries 1 + 2 (GCS, fractures, EDH/SDH, CSF leak)	109	VERY HIGH	The single biggest block: 25 + 34 MCQs and 50 stations (GCS calculations alone ≈ 15 stations)
2	Brain tumours	82	VERY HIGH	**Upgraded:** slides are generic, but papers test individual tumours (medulloblastoma, meningioma, pituitary, craniopharyngioma, schwannoma, oligodendroglioma)
3	Degenerative spine (lumbar/cervical disc, stenosis, spondylolisthesis)	69	VERY HIGH	Root-level questions repeat every year; surgery names (ACDF, laminectomy)
4	Hydrocephalus	52	HIGH	CSF physiology, causes, shunt infection, ETV, Dandy–Walker; setting-sun / shunt images
5	Subarachnoid haemorrhage (+AVM)	50	HIGH	Berry aneurysm facts, vasospasm timing, LP after negative CT, grading
6	Spinal cord injury	48	HIGH	Cord syndromes (Brown-Séquard, central, CES vs conus) + neurogenic shock; very few OSCE stations
7	Spina bifida / Chiari	38	MEDIUM	MM facts: 85–90 % hydrocephalus, closure timing, folic acid, Chiari II vs Dandy–Walker
8	ICP, Monro–Kellie, IIH	37	MEDIUM	CPP calculation, Cushing triad, monitoring sites, Dandy criteria; **slides are only 4 pages**
9	Spinal tumours	28	MEDIUM	Compartment + tumour type; metastasis commonest; meningioma/schwannoma/ependymoma
10	Neuroanatomy + meningitis (**no lecture**)	15	LOW	Tested although not in any slide: learn the one-liners in Chapter 12
11	Functional & epilepsy surgery	10	LOW	**New lecture, 0 historic MCQs**: DBS targets, epilepsy-surgery types and ATL are the obvious exam material

Frequency insights

- **Rarely/never tested although in the slides:** embryology of neurulation (gastrulation/secondary neurulation), WHO CNS5 molecular names (IDH, 1p/19q, H3 K27), vertebral-column anatomy, new interbody-fusion names (TLIF/PLIF/OLIF/DLIF/ALIF), thoracic disc, hereditary tumour syndromes beyond NF2.
- **Frequently tested although absent or very brief in the slides:** medulloblastoma, hemangioblastoma, pituitary adenoma, craniopharyngioma, vestibular schwannoma, oligodendroglioma/ependymoma specifics (Chapter 3); Fisher/WFNS grading and nimodipine (Chapter 5); Froin syndrome and Batson plexus (Chapter 9); LP contraindications and CSF interpretation in meningitis (Chapter 12).
- **Most repeated image stations:** GCS calculation (≥ 15 stations) · epidural / chronic subdural CT · raccoon eyes / Battle sign · ring-enhancing GBM · meningioma with dural tail · hydrocephalus infant (setting-sun) · VP shunt · SAH CT + DSA · MRI disc prolapse + root level · cervical myelopathy / ACDF · myelomeningocele.

Slide vs past-paper discrepancies (past paper wins)

Topic	Slide says	Past paper says → use this
Commonest adult primary brain tumour	Slides: not stated (generic); WHO grade list starts with GBM	MCQ Q18 errata: **meningioma**. The OSCE true/false box says GBM → read the stem: commonest primary = meningioma; commonest **malignant** primary = GBM
Steroids in head injury	HI-1: contusion/laceration "? steroids, diuretics"	MCQ keys (Final 019/020): **corticosteroids are NOT part of TBI management** (Q21, Q22). Steroids = tumour / spinal oedema only
Subdural crossing sutures	Slides stress that haematomas are "localised" (EDH) vs "widespread" (SDH)	Errata page: SDH **does cross suture lines** (but not the falx/midline); EDH is limited by sutures
Lucid interval in EDH	Classical presentation (lucid interval) in only **25 %**; non-classical 75 %	Q20: "lucid interval in > 60 %" = false (agrees). **But Q17** counts "lucid interval in 2/3" as true (answer E "most common in parietal" is the false one) → **conflict inside the papers**; temporal region is the commonest site (Q8)
Severe GCS range	Severe = GCS **8 and below**	Q19 key: "3–7 points". Learn ≤ 8, but pick "3–7" if 3–8 is not offered
Antibiotics in basal skull fracture / CSF leak	Slides: give broad-spectrum antibiotics (open basal fractures and CSF leak)	Q24 key agrees (admit + antibiotics + wait). **Q12 key E**: prophylactic antibiotics are "not indicated in all" basal fractures with leak → routine antibiotics for every basal fracture is **not** a safe true statement
Choroid plexus papilloma	Slide lists it under lateral-ventricle obstruction causes	Q5/Q9/Q10 keys: papilloma = **communicating** hydrocephalus (over-production). It is **not** a non-communicating cause
Reinsertion of shunt	Re-implant after ≥ 3 consecutive negative cultures, CSF WBC < 50, protein < 500	Q31: "re-insert after at least 2 normal CSF results" = **wrong**; "oral antibiotics for 2 weeks" also wrong
Medulloblastoma & chemo	Slide: chemo limited by the BBB; germinoma + medulloblastoma most radiosensitive	Q28/Q33: "medulloblastoma is chemo-resistant" = **wrong** → it is radio- **and** chemosensitive; repeat surgery for residual tumour is not recommended (Q34)
Vasospasm timing	Most common **4–14 days** after SAH	Q21 & Q13: "vasospasm in 1–3 days" = false; Q18: late complication (after 72 h). Rebleeding is the early one
Hunt & Hess survival	Survival: G1 70 %, G2 60 %, G3 50 %, G4 20 %, G5 10 %	Q1: grade 1 death at 3 months = **2–5 %** (post-treatment figure). Learn both; the MCQ number is the 2–5 %
Multiple aneurysms	Multiple in **15 %**	Q10 key treats "multiple in 20 %" as true (answer is the "defective external lamina" statement). Accept 15–20 %
MM closure timing	Slide: "surgical closure within 36 h" and later "within 24 h"	Q2 flags "closure within 48–72 h" as **wrong**; compiler: use **24 h**
Commonest cervical disc level	Kanaan lecture: **C5–6**; Maani lecture: C6/7 and C5/6	Q13 / Q17 clinical stems end in **C6–7** (triceps weakness). Learn: C5–6 and C6–7 together ≈ 90 %
NPH improvement order	Hakim triad: gait first ("magnet gait"), urinary incontinence, dementia	Q34 key E reads "incontinence, then gait, lastly dementia" → **key unclear** (clinical teaching: gait improves best). Only safe facts: normal-range CSF pressure, not an emergency
MS acute attack drug (OSCE 121)	—	Station key says C (alemtuzumab); **standard answer = corticosteroids (A)** → key unclear

Chapter 1 — Head Injuries I: Assessment, GCS, Scalp, Skull & Brain Injury

VERY HIGH	**25** past MCQs	**50 (head-injury total)** mini-OSCE stations	Exam rank **#1** of 11

Why is this topic important?

- Head injury is the **most-tested topic of the whole course**: 25 MCQs (HI-1) + 34 MCQs (HI-2) + **50 mini-OSCE stations** (stations 1–50).
- ★★★ **GCS calculation** appears as an OSCE station almost every year (stations 17–31 are all GCS exercises) and the answer must be written **as /15**.
- Repeated MCQ themes: skull-fracture signs (raccoon, Battle), depressed-fracture indications, who needs CT, primary vs secondary injury, DAI, what is **NOT** given in TBI (steroids, hyperventilation as routine).
- Trauma is the 4th cause of death in Jordan (after cardiac, cancer, vascular; 500–800 deaths/yr); head injury causes **over half** of trauma deaths; **road traffic = 60 %** of civil head injuries (Q1), domestic 30 %. Young > old, men > women.

Glasgow Coma Scale (GCS): the star of the OSCE

Points	Eye opening (E)	Verbal (V)	Motor (M)
6	—	—	Obeys commands
5	—	Oriented	Localises pain
4	Spontaneous	Confused	Withdraws from pain (normal flexion)
3	To voice / speech	Inappropriate words	**Flexion = decorticate** (abnormal flexion)
2	To pain	Incomprehensible sounds	**Extension = decerebrate**
1	None	None	None

Severity	GCS	Note
Mild	**14–15**	Observe/admit; CT if criteria met; **never** intubate/hyperventilate routinely (Q20)
Moderate	**9–13**	Admit (ICU/IMCU), CT, ABC; no steroids (Q21)
Severe	**≤ 8** (Q19 key: "3–7")	Intubate (GCS ≤ 8), ventilate, ICP monitoring, CT, neurosurgery

GCS rules

- ★★★ **Rules for the OSCE:** (1) add E + V + M and **write "/15"** (the station key says no "/15" = wrong); (2) if the two sides differ, score the **BEST motor response**; (3) eye closed by swelling = "C", intubated/tracheostomy = "T" after the verbal score (OSCE 20: **E3 V1T M5 = 9T, moderate**); (4) **GCS is the most important prognostic sign** in acute head injury (Q15).
- Always add the **pupils** (size/reaction) and focal deficit; lucid interval, time and type of trauma, convulsions, loss of consciousness (LOC), post-traumatic amnesia (PTA) and retrograde amnesia are the key history items.

Station (OSCE)	Key answer
17: eyes to pain, inappropriate words, decerebrate both sides	E2 + V3 + M2 = **7/15** (severe)
18: left eye spontaneous, incomprehensible, localises right, decorticate left	E4 + V2 + M5 = **11/15** (best motor = localising)
19: eyes to pain, words, localises	E2 + V3 + M5 = **10/15**, moderate; ATLS + urgent CT
23: eyes to pain, incomprehensible, decorticate R, decerebrate L	E2 + V2 + M3 = **7/15** (best motor = decorticate 3)
24 / 26: eyes to speech, confused, decerebrate + decorticate	E3 + V4 + M3 = **10/15**
29: one pupil fixed/dilated, eyes to pain, incomprehensible words, decerebrate	E2 + V2 + M2 = 6 by the scale; key printed "E2 + V3 + M2 = 7" (inconsistent: **key unclear**)
31: eyes to pain, inappropriate words, decorticate	E2 + V3 + M3 = **8/15**
36: opens eyes to voice, obeys, disoriented (RTA + chest injury, SpO_2 60 %)	E3 + V4 + M6 = **13/15**, moderate; first measure = **secure airway/oxygenate**; CT = haemorrhagic contusion (coup / contre-coup)
27: eyes closed, sounds, extension, no leg movement, bruised back, weak anal tone	E1 V2 M2 = **5/15** (key prints "M3" but total 5) severe; next step **intubation** (then CT); also suspect spinal cord injury
44: eyes spontaneous, not oriented, obeys; Battle sign	E4 V4 M6 = **14/15**, mild; basal skull fracture
47: pulse 40, BP 180/95, irregular breathing, GCS 5, dilated left pupil, right hemiparesis	**Severe**; **Cushing triad** (bradycardia + hypertension + irregular respiration); **uncal herniation**

Key problems in the stations

- OSCE keys 39/41 give "E2 V3 M4 = 9" for "flexes elbow" while 42 gives M3 (= 8). Reason: **withdrawal flexion = M4, abnormal (decorticate) flexion = M3**. If the stem says "decorticate" use M3.

- Severe-injury range: slide ≤ 8; Q19 MCQ key "3–7". Keep both in mind.

Initial management and who gets a CT

Step	Content
ABC first	Airway patent (intubate if GCS ≤ 8 or respiratory distress), IV line, oxygenate; **shock is rare in adults** (scalp bleed or other injury) but possible in infants. C-spine: x-ray/immobilise (16 % have associated cervical injury)
Best imaging	★★★ **Non-contrast CT brain** = best modality for head injury **[PP]** (MRI is better for DAI / posterior fossa / brainstem but **not** for fractures: "MRI better than CT by all except hairline fracture at temporal bone")
Indications for CT	< 5 y or > 65 y · drug/alcohol · concussion > 5 min · amnesia > 5 min · **GCS ≤ 14** · abnormal neuro signs · skull fracture · CSF leak · epilepsy · abnormal skull x-ray · multi-trauma · **"if in doubt"**
Indications for admission	Same list + co-morbidity + abnormal CT
GCS 14 (Q20)	Urgent CT, admit for observation, mild analgesia. **Not:** intubation + hyperventilation
GCS 10 (Q21)	Admit ICU/IMCU, CT, ABC. **Not:** corticosteroids
Severe TBI (OSCE 2, 38, 39, 41, 47, 49)	ATLS: airway (intubate), breathing, circulation (IV fluids, stop bleeding) → urgent CT + neurosurgical consult → **mannitol / hypertonic saline** if raised ICP, **ICP monitoring in ICU**, antibiotics + tetanus if open wound, anticonvulsants, surgery for evacuation

Scalp injuries and neonatal scalp haematomas

Lesion	Management / key point
Abrasion	Clean with antiseptic, antibacterial ointment, gauze
Contusion	No treatment; cold compresses, analgesia
Cut / lacerated wound	Shave around wound, inspect and **feel the floor for a skull fracture**, clean + remove foreign material, stop bleeding, **debridement**, close in **two layers** (deep inverted suture)
Avulsion	Partial: debride, approximate (flap/graft if needed). Complete: stop bleeding, **graft**
Subgaleal haematoma	Perinatal (vacuum extraction, torn emissary vein), under galea, **crosses the midline**, soft boggy; can cause **hypovolaemic shock** in infants (Q4). Treat by compression; **avoid aspiration** (infection); watch blood volume
Cephalohaematoma (sub-pericranial)	**[PP] Subperiosteal** (Q3). Firm swelling, **limited by sutures, does not cross midline**; same cause; compression, avoid aspiration

Skull fractures

Only **two** types: **linear** (diffuse trauma) and **depressed** (localised trauma; one fragment or comminuted). Seen on x-ray or CT **bone window**. A fracture means significant trauma → possible EDH/brain injury → **admit**.

Type	High-yield points
Linear: vault (hairline)	Heals spontaneously in weeks–months. Admit and observe; **CT only if deterioration**. Growing skull fracture is a complication of linear fractures in **children** (Q7: in adults = false)
Linear: diastatic	Runs along a suture (or hairline reaching a suture)
Linear: basilar	Anterior/middle fossae → run into paranasal sinuses and foramina → cranial-nerve and vascular injury. **Not all basilar fractures leak CSF** (Q8). Open basal fractures: antibiotics; watch nose/ear for CSF
Depressed	Simple elevation, or craniectomy + **cranioplasty** (immediate, or delayed if compound). Pond fractures in babies usually need **no** elevation (Q7/Q8)

Basal fracture site	Signs
Anterior fossa	★★★ **Raccoon / panda eyes** (periorbital ecchymosis), **subconjunctival haemorrhage**, epistaxis, **CSF rhinorrhoea**, anosmia, optic-nerve injury (blindness). OSCE 8, 16, 48: raccoon eyes = **basal (frontal) skull fracture**; nerves to test: **CN VII/VIII** (key writes 7/9)
Middle fossa / petrous temporal	★★★ **Battle sign** (retro-auricular/mastoid bruising), **haemotympanum**, **CSF otorrhoea** (petrous temporal = Q11), CN VII/VIII palsy. **Battle sign is NOT an anterior-fossa sign** (Q6)

ABSOLUTE EXAM CLASSICS: skull fractures

- **Absolute indication for surgery in skull fracture = compound (open) depressed fracture** (Q10; OSCE 12).
- Depressed fracture needs operation if: depression **> thickness of adjacent skull** (or > 1 cm) · compound/open · seizures · neurological signs · over an important area (venous sinus/eloquent cortex) · cosmetic. **Do NOT elevate if depression is less than the adjacent bone thickness** (Q9).
- MCQ trap Q12: true = "basal fractures suggested by bruising about eye or ear" and "prophylactic antibiotics not indicated in **all** basal fractures"; false = "all depressed fractures need surgery", "CSF rhinorrhoea needs prompt surgical repair".
- Which statement is FALSE? → "**All** basilar fractures develop a CSF leak" (Q8).
- Hair-line fracture of the temporal bone is the one thing MRI shows **worse** than CT (Q5).

Brain injury: mechanisms and types

Mechanisms: **direct trauma · acceleration–deceleration · shearing**. **Primary** injuries are done at impact (concussion, contusion, laceration, DAI). **Secondary** events are preventable (hypoxia, ischaemia, oedema, haematoma, brain shift). **Coup / contre-coup is a PRIMARY injury mechanism, NOT a cause of secondary injury** (Q14 + HI-2 Q1: "except counter-coup").

Type	Pathology	Exam picture / key point	Management
Concussion	Brief LOC then **amnesia**; no structural lesion	Examination normal; **CT usually normal**	Observe 24 h; post-concussion syndrome later
Contusion	Bruised brain; **under-surface and tips of lobes** (frontal/temporal poles); coup–contre-coup; acceleration–deceleration **[PP]**	**Notorious for oedema**; may blow into an intracerebral haematoma; CT: bifrontal haemorrhagic contusions + oedema	ABC, anticonvulsants, ventilation + ICP monitoring if severe, surgery if mass effect. **No steroids**
Laceration	Direct/penetrating trauma or acceleration–deceleration	Deficits are usually **permanent**	As contusion
Diffuse axonal injury (DAI)	★★★ **Shearing at the grey–white interface**, brainstem punctate haemorrhages, white-matter tract haemorrhage	RTA, **deep coma (3/15) with initially normal CT** (Q16); prolonged coma → **vegetative state** (Q17); **MRI** is the sensitive test	Ventilation, ICP monitoring, anticonvulsants (definitely)

EXAM CHECKLIST: what you absolutely need to know

- Draw the GCS table and compute 5 examples with unequal motor sides (best motor wins) and write "/15".
- Name the 3 severity bands: 14–15 / 9–13 / ≤ 8 and what is NOT done at each level (no intubation + hyperventilation for 14; no steroids for 10).
- List the CT indications (< 5, > 65, GCS ≤ 14, fracture, CSF leak, seizure…).
- Cephalohaematoma = subperiosteal (limited by sutures); subgaleal crosses the midline and can cause shock.
- Raccoon eyes/subconjunctival blood/rhinorrhoea = anterior fossa; Battle sign/haemotympanum/otorrhoea = middle fossa (petrous).
- Depressed fracture indications (compound = absolute); do not elevate if depression < bone thickness.
- DAI = coma with a normal early CT; contre-coup is primary.

Clinical connections

- **Internal medicine / surgery / ENT:** ATLS; trauma **multi-injury** with hypotension is rarely from the head alone (look for chest/abdomen); ENT consult for persistent CSF rhinorrhoea; ophthalmology for blindness; **hyponatraemia** (SIADH) after TBI (Chapter 2); **cervical spine** clearance (Chapter 8).

OSCE spot-diagnosis (answers from the stations)

Picture / question	Answer
Raccoon/panda eyes (8, 16, 48)	Periorbital ecchymosis = **basal (anterior-fossa) skull fracture**; also rhinorrhoea, subconjunctival haemorrhage, nerve deficit; best test **CT**; complications: epilepsy, haematomas, CSF leak, infection
Bruise behind the ear (14, 44)	**Battle sign** = basal skull fracture (middle fossa); facial palsy when the fracture crosses the **stylomastoid foramen/petrous bone**; CSF test = **β2-transferrin + glucose**; Rx: admit/observe, CT if deterioration, antibiotics if open
3-D CT skull with a dent (12)	**Compound depressed skull fracture**; surgery indications: compound, depressed > 1 cm, neurological damage, over an important area, cosmetic, seizures
CT bone window, depressed parietal bone with air (6)	Simple depressed skull fracture (left parietal); management ranges from observation to elevation/cranioplasty
Baby heads (33, 34, 35)	Craniosynostosis: **trigonocephaly = metopic suture**; **scaphocephaly = sagittal suture**; key for 34 says brachycephaly + **lambdoid** (textbook: brachycephaly = bilateral **coronal**) → **key unclear**
Foramina (15)	Superior orbital fissure: **III, IV, VI** (+V1, ophthalmic vein); foramen spinosum: **middle meningeal artery**; foramen rotundum: **maxillary nerve (V2)**
Dexamethasone (40)	A steroid; use in neurosurgery = **vasogenic oedema** (tumours), not TBI
Road-side RTA (50)	4 steps: park safely, warning sign, call 911, approach safely; conscious → do not move, support neck, ABC; unconscious → CPR. Opens eyes spontaneously, disoriented, obeys = **E4 V4 M6 = 14** (key prints "E4V4M5=14", sum is correct only with M6). High BP + tachycardia on admission = **anxiety/pain**; arm > leg weakness = **central cord syndrome** (Chapter 8)

Practice MCQs (past-paper style)

1. A patient with GCS 14 after a fall. Which should NOT be part of management?
✓ **Endotracheal intubation + hyperventilation** — Mild injury: urgent CT, admission/observation, analgesia (Q20).

2. Moderate head injury corresponds to GCS:
✓ **9–13** — Mild 14–15; severe ≤ 8 (Q18).

3. Which is NOT given to a GCS 10 patient?
✓ **Corticosteroids** — Steroids are not part of TBI care (Q21/Q22).

4. All are signs of anterior-fossa basal fracture EXCEPT:
✓ **Battle's sign** — Battle sign = middle fossa/mastoid (Q6).

5. Fracture causing otorrhoea:
✓ **Petrous temporal bone** — Q11.

6. Do NOT elevate a depressed fracture if:
✓ **The depression is less than the thickness of adjacent bone** — Q9; compound fractures are an absolute indication (Q10).

7. Coma (GCS 5) after RTA, initial CT normal, later punctate brainstem and white-tract haemorrhages:
✓ **Diffuse axonal injury** — Shearing injury; prolonged coma → vegetative state (Q16/Q17).

8. Cephalohaematoma is a:
✓ **Subperiosteal haematoma** — Limited by sutures; subgaleal crosses the midline and may cause shock (Q3/Q4).

9. Which is a primary (not secondary) mechanism of brain injury?
✓ **Contre-coup injury** — Secondary: hypoxia, ischaemia, oedema, haematoma, brain shift (Q14).

10. Best modality for evaluating head injury:
✓ **CT scan** — Q2.

Chapter 2 — Head Injuries II: Secondary Injury, CSF Leaks, Haematomas & Complications

VERY HIGH	**34** past MCQs	**50 (head-injury total)** mini-OSCE stations	Exam rank **#1** of 11

Why is this topic important?

- Most MCQ-dense lecture of the course: **34 MCQs**, mainly **EDH vs SDH** (Q7–Q29, 23 questions!), CSF leaks, epilepsy and secondary events.
- The OSCE shows a **CT picture** almost every year: EDH (lens), acute SDH (crescent), chronic SDH (hypodense, bilateral in elderly), contusion/ICH, hydrocephalus. See the atlas in Appendix B.
- Easy points: **source vessel**, **shape on CT**, **lucid interval**, **treatment (burr hole vs craniotomy)** and the list of **early vs late complications**.

Secondary events and the four types of brain oedema

Event	Cause / point
Hypoxia	One of the commonest, most **preventable** causes of deterioration: airway obstruction, ARDS, central respiratory depression, chest injury, unobserved fit, shock
Ischaemia	Poor perfusion (blood loss). Hypovolaemic shock is rare in adults (severe scalp laceration/other injury) but happens in **infants** (subgaleal or subdural haematoma, small blood volume)
Brain oedema	See table. It is a **secondary event**, not listed as an early complication (HI-2 Q2: "all early complications EXCEPT brain oedema")

Oedema	Mechanism	Causes / feature	Steroid response
Vasogenic	Break-down of BBB tight junctions → plasma protein + fluid into white matter (extracellular, along fibre tracts)	Tumours (mets), abscess, trauma; CT with contrast: metastasis with surrounding oedema	**Yes** (dexamethasone)
Cytotoxic	Failure of glial **Na^+/K^+ pump** → cellular retention of Na + water; **BBB intact**	Early ischaemia/stroke, hypoxia, cardiac arrest, toxins (isoniazid…), Reye syndrome, hypothermia, pseudotumour	No
Osmotic	Plasma osmolality falls below brain osmolality → water enters brain	Water intoxication, **hyponatraemia / SIADH**, haemodialysis, too-rapid glucose fall in HHS	No (correct the cause)
Interstitial	Problem at the **CSF–brain barrier (ependyma)**; periventricular, protein-free	**Hydrocephalus**; MRI FLAIR periventricular hyperintensity	No (CSF diversion)

Early and late complications of head injury

Early (first days-week)	Late
Hyponatraemia · **intracranial haemorrhage/haematoma** · **CSF leaks** · **epilepsy** (early)	**Hydrocephalus** · **chronic subdural haematoma** · **epilepsy** (late) · **post-traumatic (post-concussion) syndromes**

Complication	High-yield
Hyponatraemia	ADH (SIADH) in response to trauma → confusion, nausea, lethargy; **< 120 mmol/L** seizures; **< 105 mmol/L** status epilepticus. Treat with slow normal (or occasionally hypertonic) saline; too fast → **central pontine myelinolysis**
CSF leak	Needs **fracture + dural tear**. **Rhinorrhoea** (anterior basal fracture: **25 %** of cases; 60 % in first week; **80 % stop within 2 weeks**; **17 % infection**; may be missed because it is swallowed) vs **otorrhoea** (temporal fracture: **2 %**; 95 % dry in 2 weeks; 4 % infection). Otorrhoea is **less** common than rhinorrhoea (Q30)
Epilepsy	Early = within first week (5 %; **10 % in children < 5 y**). Late = after 1st week (5 %; **50 % in the first year**). A fit-free first week does **not** exclude later epilepsy (Q30). Risk: depressed fracture, haematoma, dural tear, contusion; DAI does **not** cause it (Q32). Drugs: carbamazepine, phenytoin, phenobarbitone. **Most teratogenic AED = valproate** (Q34)
Hydrocephalus	Blood in CSF (SAH) blocks arachnoid granulations → usually **communicating** (Q30 A). Suspect in delayed recovery: headache, mental deterioration, **ataxia, incontinence**; may need a shunt
Post-concussion syndrome	Somatic (headache, dizziness, visual/hearing/balance), cognitive, psychological (fatigue, libido, personality, insomnia, photophobia). Organic vs psychological is controversial; treatment = **reassurance + support**

CSF rhinorrhoea / otorrhoea: diagnosis and management ladder

Item	Detail
Diagnosis	★★★ Clear fluid confirmed by **β2-transferrin** **[PP][OSCE]** (also glucose); **pneumocele** on CT; **meningitis**. A patient who leans forward and has fluid drip from the nose = classic stem (Q24)
Initial	★★★ **Admit · broad-spectrum antibiotics · sterile external gauze · no examination/probing of nose or ear · no cotton-bud poking** · wait for closure. Q24 key: admit + antibiotics + wait; **not** immediate surgery, not discharge, not ENT-only
If leak persists > 2 weeks	**External lumbar CSF drain**, continue antibiotics; wait ~2 weeks; on **day 29** clamp the drain for 24 h ("challenge the fistula")
Still leaking	**Cisternography** (metrizamide via drain + coronal/sagittal HR-CT) to locate the site → **craniotomy + duroplasty**
Wrong statements (Q3)	"Treatment of choice is an LP shunt" is **wrong**; lumbar **drain** is correct; most resolve spontaneously; diagnosed by β2-transferrin; due to skull-base fracture

Intracranial haematomas: the core of the lecture

Four types: **extradural · subdural · subarachnoid · intracerebral**. Acute intracranial haematomas form during the **first 3 days** (Q4). Common presentation: **seizures** (Q5) and the classic **bradycardia + hypertension + hemiparesis + anisocoria** (Q6). Most common symptom of intracranial haemorrhage: **headache** (errata: best answer; seizure if headache not offered) (Q31).

	Extradural (EDH)	Acute subdural (ASDH)	Chronic subdural (CSDH)
Space	Between **skull and dura**	Between **dura and brain**	Same, fluid-filled, with membranes
Source	★★★ **Middle meningeal artery** (arterial) **[PP][OSCE]**. Also diploic veins, transverse and superior sagittal sinus. **Not** straight sinus (Q11)	**Bridging (pial) veins** + brain vessels **[PP]**	Small bridging-vein tears; minor/no trauma 6 weeks earlier
Fracture	**90 %** in adults; only **25 %** of children (adults ≈ 3× children, Q16)	Part of severe brain laceration/injury	No
Patient / site	Young (< 40; rare < 2 y and > 60 y, Q10/Q17); **temporal region** commonest (Q8); frontal is wrong (Q9). 3 % of head injuries	Any age; often severe TBI	**Elderly**, **anticoagulants/aspirin**, alcohol, atrophy, falls
Time	Stem of MMA < 6 h; anterior branch 6–24 h; posterior branch 24–36 h	Acute (< 3 days)	**> 14 days** (OSCE 37); trauma often ~6 weeks earlier
Course	★★★ **Lucid interval** in classical form (**25 %**): trauma → LOC → wakes → LOC (herniation). 75 % non-classical: (1) unconscious throughout, (2) conscious throughout, (3) CT negative then deteriorates	**No lucid interval**; picture dominated by the brain injury	Headache → memory disturbance → unsteadiness → deficits ± incontinence
Non-contrast CT	★★★ **Hyperdense biconvex (lens-shaped) [PP][OSCE]**; limited by **skull sutures** (Q13)	**Hyperdense crescent (semilunar)**; **crosses suture lines but not the falx/midline** (errata Q19)	**Hypodense crescent**; midline shift, sulcal effacement, ventricular compression; can be iso-/mixed; MRI: hyper/iso/hypo (Q29)
Treatment	★★★ **Emergency craniotomy + evacuation** (burr hole if no time); **"if there is time do CT; if no time do surgery"**; operate **before the second LOC** (Q16)	**Craniotomy + evacuation** (± excision of lacerated brain) + treatment of the head injury; **tranexamic acid is wrong** (Q26)	**Burr hole + subdural drain** (2 burr holes, saline wash, catheter ~48 h) **[PP]**Q28; steroids if thin and mild symptoms
Prognosis	Much **better** than SDH; mortality is NOT 75 % (Q16)	**Highest mortality** (Q23): usually due to severe underlying brain injury (Q24)	Good

ABSOLUTE EXAM CLASSICS: haematomas

- ★★★ **EDH facts that are TRUE:** source MMA, lucid interval, evacuation is treatment, temporal site, biconvex, limited by sutures, better outcome than SDH, 3 % of head injuries, rare < 2 y and > 60 y, "D: all of the above are true" (Q15).
- **EDH facts that are FALSE:** most common in the frontal region (Q9) or parietal region (Q17) · mortality 75 % (Q16) · source = straight sinus (Q11) · hypodense crescent (Q12).
- Why the delay? Time is needed for the collecting blood to **strip the dura** off the inner table.
- **SDH:** "blood clot between skull and meninges" is false (that is EDH); "most of the manifestations are due to the clot" is false — due to the **associated brain injury** (Q21/Q22). Subacute SDH does **not** show the "insular ribbon sign" (Q25).
- **Intracerebral haematoma:** usually poles of lobes/under-surface; often an enlarging **haemorrhagic contusion**; treat the head injury, craniotomy if it causes continued deterioration. OSCE 11: intraparenchymal haemorrhage; cause on that picture = **AVM**.
- **Traumatic SAH:** very common; may cause hydrocephalus by blocking arachnoid granulations; treat headache, treat hydrocephalus.

- Chronic SDH mechanism: **osmotic theory** (clot absorbs CSF through a semipermeable membrane and enlarges); fluid is **brown "motor-oil"**; "post-RTA mild injury then dementia weeks later" = chronic SDH (Q27); associated with **brain atrophy** (Q29).

DISCREPANCY: slides vs past exams (past exams win)

- Lucid interval: slides = classical presentation in only **25 %** (and Q20 calls "> 60 %" false). Q17 treats "lucid interval in 2/3 of cases" as a true statement. If both are offered, pick the question key and remember **only a minority have the full classical lucid interval**.
- SDH and sutures: older slides imply SDH is "widespread"; errata Q19 → **does cross sutures, does not cross midline**.
- Q31 key: headache is the best answer; seizures if headache is not an option. Q5 treats seizures as the frequent manifestation of acute traumatic haematomas.

EXAM CHECKLIST: what you absolutely need to know

- EDH vs SDH table from memory (source, shape, lucid interval, injury, mortality, treatment).
- CSF leak: confirm with β2-transferrin; admit + antibiotics + wait; lumbar drain at 2 weeks; cisternography then craniotomy + duroplasty.
- Rhinorrhoea 25 % (80 % stop in 2 weeks, 17 % infection) vs otorrhoea 2 % (95 % dry, 4 % infection).
- Types of oedema and examples; steroids work only in vasogenic oedema.
- Epilepsy: early (≤ 1 week, 5 %) vs late (> 1 week, 5 %, 50 % in first year); AEDs.
- Hyponatraemia: SIADH; correct slowly (CPM).
- Late complications: hydrocephalus (communicating), chronic SDH (burr holes), epilepsy, post-concussion syndrome.
- Cushing triad and uncal herniation → urgent surgery (see Chapter 4).

Clinical connections

- **Neurology / ICU / haematology:** chronic SDH in anticoagulated elderly (reverse anticoagulation, stop aspirin); SIADH vs cerebral salt wasting; AEDs and teratogenicity (valproate); hyponatraemia correction and central pontine myelinolysis; **aspirin = a risk factor** (OSCE 3, 45).

OSCE spot-diagnosis (answers from the stations)

Picture / question	Answer
Lens-shaped hyperdense frontoparietal lesion with midline shift (1, 5, 9, 10)	**Acute epidural haematoma**; definitive Rx **craniotomy + evacuation** (burr hole as rapid decompression); supportive: ABC, mannitol, hyperventilation (temporising), anticonvulsants, neuro-monitoring. Vessel = **middle meningeal artery** (32)
Bilateral frontoparietal hypodense collections, 70-year-old on aspirin (3, 45)	**Chronic subdural haematomas**; risks: age, trauma, **antiplatelets/anticoagulants**, falls, alcohol/liver disease; symptoms: confusion, cognitive deficit, hemiparesis, seizures, papilloedema; Rx **burr-hole drainage** (haematoma > 1 cm or symptomatic)
Left fronto-occipital hypodense collection (7); right fronto-parieto-occipital (37)	Chronic SDH, timing **> 14 days**, next step **burr hole** (not craniotomy). Acute SDH → craniotomy (to find the bleeding vessel)
Hyperdense crescent, midline shift, effaced sulci (13, 38, 42, 49)	**Acute subdural haematoma** (frontoparietal); DDx haemorrhagic contusion; Rx craniotomy + evacuation; ICU: airway, breathing, circulation, ICP monitoring; complications: hydrocephalus, herniation, haemorrhage, parenchymal damage
Right SDH + left oval parietal hyperdensity (46)	Acute SDH (right) + acute epidural (left), severe injury (GCS 7)
Two CT slices with basal-ganglia haemorrhage (11)	Intraparenchymal haemorrhage; cause on picture = **AVM**
43: types of oedema	Vasogenic (BBB: tumours, abscess, trauma) · cytotoxic (cell swelling: ischaemia, hypoxia, toxins) · interstitial (CSF: hydrocephalus) · osmotic (hypo-osmolar plasma: hyponatraemia) · mixed
46/47/48: herniation scenario	Unilateral dilated non-reactive pupil + contralateral hemiparesis + Cushing triad → **uncal (transtentorial) herniation**

Practice MCQs (past-paper style)

1. Most common source of an epidural haematoma:
✓ **Middle meningeal artery** — Temporal region commonest; frontal is wrong (Q7–Q9).

2. CT of an acute EDH:
✓ **Hyperdense lens-shaped (biconvex)** — Limited by sutures; SDH = hyperdense crescent (Q12).

3. EDH may bleed from all EXCEPT:
✓ **Straight sinus** — Transverse sinus, superior sagittal sinus, diploic veins, MMA can (Q11).

4. Subdural haematoma arises from:
✓ **Pial / bridging veins** — Q18; SDH crosses sutures but not the midline.

5. Highest mortality despite best treatment:
✓ **Acute subdural haematoma** — Because of severe underlying brain injury (Q23/Q24).

6. Proper surgery for chronic SDH in an adult:
✓ **Burr holes + subdural drain** — Craniotomy is for acute haematomas (Q28).

7. Fluid leaking from the nose after a skull-base fracture is confirmed as CSF by:
✓ **β2-transferrin** — Management: admit, antibiotics, wait; lumbar drain if > 2 weeks (Q24).

8. Which is NOT an early complication of head injury?
✓ **Brain oedema (a secondary event)** — Early: hyponatraemia, haematoma, CSF leak, epilepsy (Q2).

9. Post-traumatic hydrocephalus is usually of which type?
✓ **Communicating** — Blood blocks arachnoid granulations (Q30).

10. GCS-6 patient with acute SDH. Inappropriate step?
✓ **Tranexamic acid to prevent clot lysis** — Plan urgent evacuation (Q26).

Chapter 3 — Brain Tumours (incl. Pituitary, Craniopharyngioma, Schwannoma)

VERY HIGH	**55** past MCQs	**27** mini-OSCE stations	Exam rank **#2** of 11

Why is this topic important?

- **55 MCQs + 27 mini-OSCE stations = 82**: second most-tested topic. The slide deck is a short generic overview (classification, presentation, investigation, treatment) but the **papers test individual tumours**.
- ★★★ **Upgraded topics (frequent, almost absent from slides):** medulloblastoma (10 MCQs), meningioma (≈ 7), pituitary adenoma (7), vestibular schwannoma, craniopharyngioma, oligodendroglioma, ependymoma, hemangioblastoma. Everything marked **[+]** below is standard knowledge added to cover them.
- Stations: ring-enhancing GBM (52, 70, 71), meningioma with dural tail (53, 55, 56, 67, 69, 76), vestibular schwannoma / NF2 (51, 65, 75), pituitary (54, 58, 68), medulloblastoma (57, 72, 77), metastasis (73, 74).

High-yield facts: epidemiology, risk factors, classification

Item	Fact
Frequency	Brain tumours = **2 %** of all tumours (1.9 % of cancers) **[PP]**; **2nd leading cancer death in children, 3rd in adults**; M:F = **1.8 : 1**; paediatric 15 %; median age at presentation 38–42; prevalence 5–18/100 000, **Jordan 5/100 000** (Q13: "10/100 000" false; Q15 lists 5 as true)
Primary vs secondary	Most common intracranial tumour overall = **metastasis**; most common primary adult tumour = **meningioma** (errata Q18 corrected to C); most common primary tumour in children = **astrocytoma (pilocytic)**; most common malignant tumour in children = **medulloblastoma** (Q30)
Metastasis source	Most common primary that spreads to brain: **lung** (Q2) then breast, melanoma, kidney, colon **[+]**. Malignant gliomas rarely metastasise outside the CNS (Q13)
Male predominance	Most tumours are commoner in males; exceptions: **pineocytoma** (Q3) and **neuroma/schwannoma** (Q4); **meningioma** is commoner in **women**
Risk factors	**Ionising radiation** (also induces meningioma), single-gene syndromes (≈ 4 % of childhood cases): **NF1, NF2, tuberous sclerosis, Li–Fraumeni**; VHL (hemangioblastoma) **[+]**; 5–10 % family history. **Recurrent meningitis is NOT a risk factor for meningioma**; trauma, radiation, female sex are (Q40)
WHO CNS5 (2021)	Integrates **histology + molecular genetics** ("layered diagnosis": integrated diagnosis · histology · CNS WHO grade · molecular, e.g. "Diffuse astrocytoma, IDH-mutant, CNS WHO grade 2 — IDH1 R132H, ATRX, TP53"). Aim: prognosis and management. 12 groups: gliomas/glioneuronal, choroid plexus, embryonal, pineal, nerve tumours, meningiomas, mesenchymal, melanocytic, haematolymphoid, germ cell, sellar, metastases
Grades	I benign slow (**pilocytic astrocytoma, myxopapillary ependymoma**) · **II** low grade, may recur (**diffuse astrocytoma, ependymoma, atypical meningioma**) **[PP]** Q37 key "C + D" · III anaplastic (anaplastic astrocytoma/ependymoma, anaplastic meningioma) · **IV GBM**. Meningioma: grade 1/2/3 (WHO grade 3 meningioma is malignant, Q19)
Not neuroepithelial	**Hemangioblastoma** (Q17, benign WHO I, Q19) · meningioma · schwannoma · lymphoma · germ-cell · pituitary. Chordoma/"chondroma" arises from **notochord remnants** (Q16); craniopharyngioma from **Rathke pouch** **[+]**

Clinical picture, investigations, localisation

Item	High-yield
Presentation	**Headache** (↑ICP, traction on pain-sensitive structures, visual difficulty) · other ICP features · **epilepsy** (new-onset epilepsy in an adult > 20 y = tumour until proven otherwise; occurs in ≈ **30 %**) · lateralising signs of shift/herniation · subtle personality/behaviour change · progressive neurological deficit. "Mass lesion can present with ↑ICP, motor deficits, fits, cranial nerve lesions" (Q6: all of the above)
Early-morning headache	**[OSCE]** Sleep → hypoventilation → ↑$PaCO_2$ → cerebral vasodilatation (and lower cortisol/BP) → ↑ICP (OSCE 59). Vomiting is projectile, **not preceded by nausea**
Localisation	Occipital lobe: **homonymous hemianopia** (right-sided field loss = left occipital) (Q5). Left hemisphere in a right-hander: **Broca/aphasia** (OSCE 74). Midbrain lesion → **decerebrate rigidity** (Q7). Suprasellar mass: headache, visual field, endocrine, motor deficits, fits — but **not anosmia** (Q42; olfactory-groove tumour gives it). Posterior fossa: diplopia, nystagmus, vomiting, ataxia, hydrocephalus
Skull X-ray	**Calcification** (oligodendroglioma, meningioma, craniopharyngioma, ependymoma), hyperostosis, bone destruction (mets, chordoma, craniopharyngioma), sellar erosion, signs of ↑ICP, pineal shift
CT	Site, mass effect, bone destruction, enhancement, multiplicity
MRI (better than CT)	Enhancing tumours · **posterior fossa** · **high-grade glioma** · **meningioma** · **skull base** · **mets** · **acoustic neuroma** · **large pituitary tumours**. Others: MRA/angiography, PET, CSF cytology, biopsy (needle through burr hole, stereotactic, or at surgery), tumour markers
Lumbar puncture	★★★ **Brain space-occupying lesion = ABSOLUTE contraindication** (Q9; ↑ICP, herniation risk). Hypertension, pregnancy, urinary retention and disc prolapse are not

Tumour-by-tumour table (the real exam content)

Tumour	Key facts	Treatment / prognosis
Glioblastoma (GBM, grade IV)	Commonest malignant adult primary glioma. CT/MRI: **irregular ring enhancement with central necrosis + surrounding oedema**, crosses corpus callosum **[+]**. OSCE 52/71: headache, ↑ICP, seizures, deficits	**Steroids** (oedema) + **craniotomy with maximal safe resection** + RT + **temozolomide**. Poor prognosis
Astrocytoma	**Pilocytic** (grade I): children, cerebellum, cystic with mural nodule, best prognosis; diffuse astrocytoma (grade II); anaplastic (III). Most common primary brain tumour in children. In the spine: Chapter 9	Surgery (curative for pilocytic); RT/chemo for higher grades
Oligodendroglioma	★★★ **Calcification** (the commonest calcified tumour, Q22), **"chicken-wire" / fried-egg histology** (Q21), frontal lobe, seizures; **1p/19q co-deleted + IDH-mutant** (WHO CNS5)	Surgery + chemo (**TMZ** / PCV) – chemosensitive; good prognosis
Ependymoma	Arises from ependyma; **4th ventricle (children)** → hydrocephalus; **calcification: commonest posterior-fossa tumour that calcifies** (Q24); perivascular pseudorosettes; **not** "the most common cancer in adults" and **not more common than astrocytoma** (Q23, Q25 false statements)	Surgery + RT (higher grade)
Medulloblastoma	★★★ **Commonest malignant brain tumour of children (Q30)**; **posterior fossa (cerebellar vermis)**, 4-year-old, **blue small-round-cell, Homer-Wright rosettes** (Q26); occurs < 15 y (peak ≈ 5 y, OSCE 72), **males > females** (Q29: "more in females" = false); causes **hydrocephalus** (85 %); **CSF seeding = "drop metastases" to the spine** (Q27/Q31/Q32). OSCE 57/72/77: infratentorial mass, diplopia, nystagmus, projectile morning vomiting	★★★ **Radiosensitive AND chemosensitive** (Q28, Q33: "chemo-resistant" = false) · **craniospinal ("whole-axis") irradiation** · surgery + shunt/EVD for hydrocephalus (EVD first if he deteriorates, OSCE 72) · **repeat surgery for residual mass is NOT advised** (Q34) · **no residual tumour after resection = good prognosis** (Q35)
Hemangioblastoma	★★★ **Commonest posterior-fossa tumour in ADULTS (key Q20)**; benign (WHO I, Q19); cerebellar cyst + mural nodule; **VHL**; polycythaemia (EPO) **[+]**; not neuroepithelial (Q17); spinal cord = intramedullary	Surgical excision
Meningioma	★★★ **Commonest primary adult brain tumour**; from **arachnoid cap cells** (Q38), **NOT dura/pia**; **women**, estrogen receptors, **radiation** risk; **psammoma bodies** (OSCE 63); **dural tail**, hyperostosis, calcification, homogeneous enhancement; **parasagittal commonest site** (Q39); **benign, rarely metastasises** (Q36/Q41); **best prognosis** of all brain tumours (Q43); can be cured by resection (Q15)	Craniotomy + total excision (cure); steroids for oedema; RT/radiosurgery for recurrence or residual
Vestibular schwannoma (acoustic neuroma)	★★★ **Cerebellopontine-angle (CPA) tumour**: progressive unilateral **sensorineural hearing loss, tinnitus, vertigo/imbalance**, then **CN V** (↓corneal reflex, facial numbness) and **CN VII** (OSCE 51, 65). Size 2–4 cm → **facial palsy** (Q53); **hydrocephalus** is the symptom **not typical** (Q52). **Bilateral = NF2** (+ café-au-lait spots, OSCE 75). Dumb-bell shape (OSCE 64). DDx of CPA mass: meningioma, **epidermoid**, dermoid, haematoma	MRI with contrast; microsurgery (facial nerve at high risk), Gamma Knife for small tumours; test **CN VII/VIII**
Pituitary adenoma	★★★ **Micro** (< 1 cm) vs **macro** (> 10 mm, Q44/Q50); ≈ **8–14 %** of brain tumours (Q46: 1–2 % is false); **prolactinoma = commonest secreting** (Q44, Q46, Q50; "GH-secreting is commonest" is false, Q45). **Bitemporal hemianopia** from **chiasmal compression** (NOT cavernous sinus invasion, Q44). Prolactinoma: galactorrhoea–amenorrhoea, infertility (OSCE 68; best image MRI; hormone = prolactin). Cushing syndrome: adrenal, pituitary or **ectopic (lung)** tumours; breast carcinoma is not a cause (Q49)	★★★ **Transsphenoidal** approach is commonest (Q44–Q46). **Prolactinoma: medical first-line with dopamine agonist (bromocriptine / cabergoline)** (Q45, Q48); surgery for acromegaly, Cushing microadenoma, non-functioning, invasive tumours
Pituitary apoplexy (OSCE 54)	Sudden severe headache + vomiting + visual disturbance (bitemporal hemianopia) + **hypotension/confusion** in a man with a sellar mass	★★★ **IV fluids + IV hydrocortisone first** (adrenal crisis), then surgery if visual loss
Craniopharyngioma	★★★ **Child (10-y-old), short stature, bitemporal hemianopia**, **calcified cystic suprasellar mass with cholesterol crystals** (Q51; OSCE 58: DDx pituitary adenoma, meningioma, dermoid, haematoma). Arises from **Rathke pouch**; can cause hydrocephalus; **not** a drop-metastasis tumour (OSCE station table)	Surgery ± RT
Metastasis	**Ring-enhancing, multiple, grey–white junction, marked oedema**; lung/breast primaries (OSCE 73, 74 smoker with lung cancer + seizure; left hemisphere → aphasia/Broca). DDx of ring enhancement (OSCE 60, 70): **GBM, metastasis, abscess, lymphoma, resolving haematoma**	**Steroids**, surgical excision + RT/chemo, radiosurgery

Tumour	Key facts	Treatment / prognosis
Brain abscess	Ring-enhancing frontal lesion + **IV drug abuser → infective endocarditis** (Q55); child with vomiting, cerebellar signs and otitis media 2 weeks earlier → **cerebellar abscess vs tumour**, next step **CT** (Q10). Treatment: stereotactic aspiration + 4–6 weeks IV antibiotics	(Chapter 12)
Others	Choroid plexus papilloma (↑CSF production, **communicating hydrocephalus**) · germinoma (pineal; **most radiosensitive**) · neuroblastoma is **not** the commonest CNS tumour (Q11) · neurofibroma: sensory (dorsal) roots, **not** motor roots (Q12) · CNS lymphoma ring-enhancing in AIDS	—

Treatment principles (from the slides)

Modality	High-yield
Medical	Does **not** treat the tumour; only reduces oedema: **dexamethasone** (especially metastases, meningioma, GBM) **[OSCE]**. Non-surgical care: antiepileptics, analgesia, **head elevation 30°**, steroids. **Diazepam is not part of it** (Q8)
Surgery	Aims: **biopsy** · tumour removal (complete or partial = **cytoreduction**) · treat complications such as **hydrocephalus**. Approaches: craniotomy, craniectomy, **trans-sphenoidal**, trans-oral
Radiotherapy	**Radiotherapy ≠ radiosurgery** (Gamma Knife: single high-dose focused fraction). Conventional RT = adjuvant. **Most radiosensitive: germinoma and medulloblastoma**. Complications: ↑oedema, **demyelination**, **radionecrosis**, cognitive impairment, **secondary tumours (e.g. meningioma)**
Chemotherapy	Problems: **intact BBB**, small proportion of dividing cells. Solutions: mannitol to open the BBB, lipid-soluble drugs. **Temozolomide (TMZ)** = commonest single agent: oligodendroglioma and high-grade glioma
Prognosis	Depends on tumour type, treatment, quality of life; spectrum from **low-grade meningioma to high-grade glioma**

ABSOLUTE EXAM CLASSICS: brain tumours

- "Most common … " list: **primary adult = meningioma** · **primary child = astrocytoma** · **malignant child = medulloblastoma** · **posterior fossa adult = hemangioblastoma (key)** · **calcifying = oligodendroglioma** · **calcifying posterior fossa = ependymoma** · **secreting pituitary = prolactinoma** · **metastasis from lung**.
- Drop metastases via CSF: **medulloblastoma** (not oligodendroglioma, pilocytic astrocytoma, diffuse astrocytoma, vestibular schwannoma).
- Meningioma: arachnoid cap cells; metastasis is NOT common; radiation, female sex, trauma are risk factors; recurrent meningitis is not.
- 4-year-old, posterior fossa, blue cells, Homer-Wright rosettes = medulloblastoma. 10-year-old, short stature, calcified suprasellar mass = craniopharyngioma.
- Pituitary: transsphenoidal; prolactinoma → dopamine agonist, not surgery; visual loss = chiasm.
- "Schwannoma" is NOT intramedullary (Q54) and is NOT a feature that causes hydrocephalus typically; neurofibroma does not arise from motor roots.

DISCREPANCY: slides vs past exams (past exams win)

- Slide: chemotherapy is difficult because of the BBB (implies tumours are poorly chemosensitive). Papers: **medulloblastoma is chemosensitive** and oligodendroglioma responds to TMZ.
- **Most common primary tumour in adults:** MCQ Q18 (errata-corrected) = **meningioma** (and Q15 calls "GBM is the commonest paediatric tumour" false), but the OSCE file ends with a true/false box stating "meningioma is the most common primary tumour in adults = FALSE → **GBM**". Reconcile: **meningioma = commonest primary tumour overall; GBM = commonest primary MALIGNANT tumour/glioma**. Read the stem for "malignant".
- Same OSCE box: **functioning pituitary adenomas are mostly microadenomas**; craniopharyngioma does **not** cause drop metastases (medulloblastoma does); Battle sign = basal skull fracture, not hydrocephalus.
- Hemangioblastoma = "most common posterior-fossa tumour in adults" is the **Q20 key**; in the real world metastasis is the commonest adult posterior-fossa mass. Answer the question as keyed.
- Q49 (Cushing causes) key was corrected on the errata page (E→D) and the compiler marks it "not sure"; Q52 also "not sure"; Q34 "not sure".

EXAM CHECKLIST: what you absolutely need to know

- The 8 "most common" tumours above.
- Medulloblastoma: age, site, histology, drop mets, CSF seeding, radio- and chemo-sensitive, craniospinal RT, good prognosis if no residual.
- Meningioma: cap cells, ♀, psammoma, dural tail, parasagittal, benign, best prognosis, surgery.
- Pituitary: micro/macro, prolactinoma first, bromocriptine/cabergoline, TSS, bitemporal hemianopia, apoplexy → fluids + hydrocortisone.
- Vestibular schwannoma: CPA, SNHL/tinnitus/vertigo → CN V, VII; NF2 bilateral; hydrocephalus not typical.
- LP contraindicated in space-occupying lesion; dexamethasone for oedema; TMZ for glioma.
- DDx of ring enhancement: GBM, mets, abscess, lymphoma, resolving haematoma.

Clinical connections

- **Internal medicine / oncology / endocrinology:** lung and breast cancer metastases; endocarditis in IVDU; Cushing and acromegaly work-up; hypopituitarism and adrenal crisis; Li–Fraumeni and NF1/NF2 genetics; ophthalmology (visual-field defects, papilloedema); ENT (hearing loss).

OSCE spot-diagnosis (answers from the stations)

Picture / question	Answer
Ring-enhancing frontoparietal irregular lesion with oedema (52, 71)	**Glioblastoma** (grade IV). Rx: **steroids** + craniotomy/maximal resection + RT + **temozolomide**. Symptoms: morning headache, vomiting, visual problems, focal deficit, epilepsy, personality change
Same appearance in a lung-cancer patient (73, 74)	**Brain metastasis**; findings: deficits, aphasia (left hemisphere in right-hander), seizures; Rx: excision + RT ± chemo
Homogeneous enhancing extra-axial mass with dural tail (53, 55, 56, 67, 69, 76)	**Meningioma** (arachnoid cap cells; ♀; parasagittal; hyperostosis of vault); Rx **total surgical excision**; psammoma bodies; dural tail
Bilateral CPA masses + café-au-lait patches (75)	**NF2: bilateral vestibular schwannomas**; test CN VII/VIII
CPA mass with hearing loss (51, 65)	**Vestibular schwannoma**; DDx meningioma, epidermoid, dermoid, haematoma
Sagittal MRI, suprasellar mass (58); sellar mass in a woman with galactorrhoea (68)	58: suprasellar; DDx pituitary adenoma/meningioma/dermoid/craniopharyngioma/haematoma; 68: **prolactinoma** — MRI, **prolactin**, bitemporal hemianopia (optic chiasm), **bromocriptine** or **transsphenoidal resection**
Sudden headache, vomiting, hypotension, bitemporal hemianopia (54)	**Pituitary apoplexy**; initial management **IV fluids + IV hydrocortisone**
Infratentorial midline tumour in a child (57, 72, 77)	**Medulloblastoma**; DDx astrocytoma; symptoms: diplopia, nystagmus, projectile vomiting, morning headache, seizures; if sudden deterioration → **EVD** then elective surgery; peak age 5; shunt infection: CSF sample (↑WBC, ↓glucose, ↑protein, +culture); Rx: treat hydrocephalus, total excision, neuraxis RT; alternative to shunt: **EVD / ETV**
Ossification / calcification (61, 66)	Meningioma (psammoma), oligodendroglioma, ganglioglioma
Fill in (63, 64)	Psammoma bodies: **meningioma**; dural tail: **meningioma**; dumbbell/hourglass tumour: **schwannoma** (vestibular/spinal)
Communicating hydrocephalus causes (62)	Infection (meningitis), subarachnoid haemorrhage

Practice MCQs (past-paper style)

1. Most common primary brain tumour in adults:
✓ **Meningioma** — Arachnoid cap cells; benign; best prognosis (Q18/Q38/Q43).

2. 4-year-old, posterior fossa mass, blue cells, Homer-Wright rosettes:
✓ **Medulloblastoma** — Commonest malignant paediatric tumour; drop metastases (Q26/Q27/Q30).

3. Which statement about medulloblastoma is WRONG?
✓ **It is resistant to chemotherapy** — It is radio- and chemosensitive; craniospinal RT (Q28/Q33).

4. Child, short stature, bitemporal hemianopia, calcified mass with cholesterol crystals:
✓ **Craniopharyngioma** — From Rathke pouch (Q51).

5. Absolute contraindication to LP:
✓ **Brain space-occupying lesion** — Risk of herniation (Q9).

6. Commonest secreting pituitary tumour and its first-line treatment:
✓ **Prolactinoma; dopamine agonist (bromocriptine/cabergoline)** — Surgery (transsphenoidal) for non-prolactin or failure (Q45–Q48).

7. Most calcified tumour with "chicken-wire" capillaries:
✓ **Oligodendroglioma** — TMZ-responsive, 1p/19q co-deleted (Q21/Q22).

8. Visual field defect from a pituitary macroadenoma is due to:
✓ **Chiasmal compression (not cavernous-sinus invasion)** — Bitemporal hemianopia (Q44).

9. Ring-enhancing frontal lesion in an IV drug user:
✓ **Brain abscess from infective endocarditis** — Aspiration + 4–6 weeks IV antibiotics (Q55, meningitis Q4).

10. Which is NOT part of non-surgical treatment of a brain tumour?
✓ **Diazepam** — Dexamethasone, AEDs, analgesia, head up 30° (Q8).

Chapter 4 — Raised ICP, Monro-Kellie, Monitoring & IIH

MEDIUM	**27** past MCQs	**10** mini-OSCE stations	Exam rank **#8** of 11

Why is this topic important?

- **27 MCQs + 10 stations**. The ICP lecture was **replaced by new slides** this year (4 pages: concept, pathophysiology, compliance curve, monitoring, Lundberg waves, normal values, tiered management, IIH); questions on the **old Dr Walid slides** (X-ray signs, Cushing triad, herniation) are still in the papers.
- ★★★ Repeated: **CPP = MAP − ICP** (calculation), **Cushing triad**, **ICP monitor sites**, **Lundberg A waves**, **IIH (Dandy) facts + acetazolamide**, X-ray signs of chronic ↑ICP.
- Easy marks: all of them are one-liners.

High-yield facts: concept and physiology

Item	Fact
Monro-Kellie doctrine	★★★ **V_{brain} + V_{blood} + V_{CSF} = constant (K)** inside a rigid skull. An increase in one (haematoma, oedema, tumour, hydrocephalus) must be compensated by a decrease in another (CSF and venous blood displaced first) → **ICP rises only after compensation is exhausted** (Q5 C)
Pressure-volume curve	High compliance (flat) → compensation → reserve depleted → **minimal compliance** (steep rise) → microvascular collapse → ischaemia/herniation. The relation is **NOT linear** (Q5 key B false: "the relation between pressure and volume is linear")
CPP	★★★ **CPP = MAP − ICP** (Q1). MAP = (SBP + 2 × DBP)/3. Q2: BP 120/60 → MAP 80; ICP 30 → **CPP = 50 mmHg**. ICP rise → collapsed veins → compromised CPP → ↓blood flow. Normal CBF ≈ 800 mL/min ≈ 20 % of cardiac output (OSCE 80)
Normal ICP	★★★ **Adults < 10–15 mmHg**; **children 3–7**; **term infants 1.5–6** (OSCE 79: upper normal in a child = 7 mmHg)
Autoregulation	Cerebral vessels constrict when BP rises (autoregulation) and cerebral circulation is controlled mainly by local metabolic/CO_2 factors, **not mainly by the ANS** (neuroanatomy Q9)

Causes, clinical picture, signs

Item	High-yield
Causes	Intracranial bleeding, cerebral oedema, tumour (slide). Also hydrocephalus (↑ CSF/↓ absorption), venous sinus obstruction, IIH
Symptoms	**Headache (worse on waking), vomiting, visual obscurations, drowsiness**. 50-year-old with sudden occipital morning headache and vomiting → **papilloedema** (Q10 C). **Loss of consciousness is a LATE sign** (Q5 A; Q8 "LOC is an early sign" is false)
Cushing triad	★★★ **Hypertension + bradycardia + irregular (slow) respiration** (Q12: "bradycardia, bradypnoea, hypertension"). Cushing reflex does **not** cause hypotension (Q13 false statement); the cause of the vitals in OSCE 39/47 is ↑ICP/brainstem compression
Herniation	Trans-tentorial (uncal) herniation at the midbrain affects **pupil, motor system, eye movement, consciousness; not the respiratory system at that stage** (Q9). **Uncus** = medial temporal lobe; midbrain passes through the tentorial aperture. Uncal herniation: **ipsilateral dilated, fixed pupil (CN III) + contralateral hemiparesis**; "dilated left pupil looking down and out" (OSCE 86) = **uncal herniation causing 3rd-nerve palsy**; Rx decompressive craniotomy + ICP reduction; MRI to confirm
Dilated non-reacting pupil	Optic nerve injury, brainstem herniation, oculomotor injury. **Not** abducent injury and **not** loss of sympathetic tone (which gives miosis) (neuroanatomy Q8)
Plain skull X-ray (chronic ↑ICP)	★★★ **Erosion of posterior clinoids / dorsum sellae, enlarged sella, "beaten-silver / thumb-print" appearance, sutural diastasis (widened sutures; children), bone vascular invagination**. **NOT** shallow posterior fossa (Q3), **NOT** adult "skull enlargement" (Q4), **NOT** intracranial calcification (Q6), absent dural sinuses on CT (Q7)
CT/MRI (↑ICP)	**Effaced sulci, small/compressed ventricles, midline shift**. "Widening of the interhemispheric fissure" is **not** a sign of ↑ICP (Q14 key C)
Lumbar puncture	Cannot be used to measure ICP when the CT is abnormal (mass effect) (Q5 E)

ICP monitoring

Item	Detail
Devices	★★★ Invasive: **intraventricular (EVD, also drains CSF)**, **intraparenchymal**, **subdural**, **epidural** (and subarachnoid bolt/screw). Non-invasive: **optic-nerve-sheath diameter (ultrasound)**, retinal venous outflow pressure, tympanic-membrane displacement. **NOT the skull/diploe** (Q16/Q17)
Indications	**Severe TBI (GCS 3-8) with abnormal CT**, or normal CT with ≥ 2 of: **age > 40, SBP < 90, motor posturing**; post-op neurosurgery at risk of ↑ICP; hydrocephalus; cerebral oedema (Reye)
Complications	**Infection and haemorrhage** (Q18 B). "4 waveform types A, B, C, D" is wrong — there are 3 (A, B, C)
Lundberg waves	★★★ **A (plateau) waves**: up to ≥ 50 mmHg lasting **5–20 min** = **impending herniation** (Q19 key B). B: rhythmic spikes every 30–120 s (slide: ± vasospasm; ≈ every 1–2 min in older teaching). C: low-amplitude oscillations every 7–15 s = normal homeostasis

Management of raised ICP

Tier (slide)	Measures
Tier 0	ABC · head of bed > 30° · head midline / cervical-collar fit (avoid jugular constriction) · normothermia (< 38 °C) · **steroids for tumour-induced vasogenic oedema** · analgesia for pain · sedation · anti-seizure drugs if warranted · **avoid hyponatraemia**; intubate if GCS < 8 or respiratory distress
Tier 1	**Hyperosmolar therapy** (mannitol / hypertonic saline) · $PaCO_2$ goal 35–38 · **external ventricular drain** · **decompressive craniectomy** · more analgesia/sedation
Tier 2	Heavy sedation (propofol, midazolam) · serum sodium goal · **hypocapnia $PaCO_2$ 30–35** · neuromuscular blocker challenge
Tier 3	**Pentobarbital (barbiturate coma)** to EEG burst suppression · **moderate hypothermia (32–34 °C)**

ABSOLUTE EXAM CLASSICS

- **Avoid hypotension**, avoid jugular venous constriction, head up 30° (Q15, Q20 "allow hypotension" = wrong).
- **Hyperventilation** is a **temporary rescue** ($PaCO_2$ 30–35 for 1–2 h; slide "Other interventions") and is **not** a "general measure" (Q15 key D). In the safety order of HI Q23 it comes first because it is quick, then mannitol, barbiturates, hypothermia, craniotomy.
- **High-dose steroids are NOT used for traumatic ↑ICP** (HI-1 Q22); they are used for tumour oedema.
- Hypertensive intracerebral haemorrhage: **basal ganglia** is the commonest site (Q11).

Idiopathic (benign) intracranial hypertension, IIH

Item	High-yield
Who	**Young, obese women**; OCPs (and vitamin A/tetracyclines **[+]**) are risk factors
Dandy criteria (slide)	★★★ **(1) papilloedema; (2) normal neurological examination except cranial-nerve abnormalities (e.g. VI); (3) normal brain imaging (no hydrocephalus/mass); (4) normal CSF composition; (5) raised LP opening pressure** (Q22: ICP > 20 cm H_2O; "CSF protein high" false; "mass lesion in most" false; small/normal ventricles on CT). **MRV is not a Dandy criterion** (Q27); it is done to exclude venous sinus thrombosis
Symptoms	**Transient visual obscuration** (Q23) is typical; headache, diplopia (6th nerve), pulsatile tinnitus **[+]**; papilloedema is not always present in every case (diagnosis may stand with abducens palsy)
Treatment	**Weight loss**, stop OCP/contributing drugs, **acetazolamide** (carbonic anhydrase inhibitor ↓CSF production by the choroid plexus), topiramate, furosemide; steroids (methylprednisolone) **only for sight-threatening fulminant disease** (slide footnote). **Repeated LP** only if no alternative (e.g. pregnancy). Surgery: **CSF shunt (lumbo-peritoneal preferred over VP because ventricles are small**, Q24), **optic-nerve-sheath fenestration**, **venous-sinus stenting**
Acetazolamide	**[+]** Side effects: paraesthesia, metabolic acidosis, kidney stones, taste change; **contraindicated in sulfonamide allergy**. Station answer: used in ↑ICP / pseudotumour; also glaucoma. "Treated for 6 weeks" is the false statement in Q24
OSCE 87	37-year-old obese woman, BMI 38, morning headache, papilloedema, normal imaging → next step **lumbar puncture (opening pressure)**

DISCREPANCY: slides vs past exams (past exams win)

- Slide shows tiered management in which **hypocapnia sits in Tier 2**, the paper MCQ puts hyperventilation **first** in "order of safety" (Q23) yet excludes it from **general** measures (Q15). Both are keys; the common ground is that hyperventilation is brief and rescue only.
- Q21/Q27 keys treat "normal MRV" as wrong and "MRV" as not part of Dandy criteria; IIH requires **no** venous sinus thrombosis in practice. Learn the 5 Dandy items without MRV.

EXAM CHECKLIST: what you absolutely need to know

- Monro–Kellie formula + pressure–volume curve (non-linear).
- CPP calculation (MAP − ICP) with a worked example; MAP formula.
- Normal ICP: adults < 10–15; children 3–7; infants 1.5–6.
- Cushing triad; uncal herniation signs; LOC is a late sign.

- Skull X-ray signs of chronic ↑ICP (posterior clinoid erosion, thumb-printing, sutural diastasis).
- Monitor sites (intraventricular, parenchymal, subdural, epidural; NOT skull), indications, complications (infection, haemorrhage).
- Lundberg A waves = plateau 50 mmHg, 5–20 min.
- IIH: Dandy criteria, obese young women, acetazolamide, shunt/ONSF/stent.

OSCE spot-diagnosis (answers from the stations)

Picture / question	Answer
Papilloedema fundus, normal CT (78, 87)	**IIH**; Rx weight loss, stop OCP, **acetazolamide**; surgical: ONSF, VP/LP shunt, venous stenting; confirm with **LP**
Bedside drain (79)	**External ventricular drain (EVD)**; upper normal ICP in a child = 7 mmHg; other indication = CSF drainage in hydrocephalus
80	**CPP = MAP − ICP**; normal CBF ≈ 800 mL/min (20 % of cardiac output)
81 / 85	**Acetazolamide** = carbonic anhydrase inhibitor; ↓CSF production; used in IIH/raised ICP (and glaucoma)
82 / 83 / 84	Devices: intraventricular, intraparenchymal, subdural, epidural (+ non-invasive ONSD); indications: severe TBI (GCS 3–8 + abnormal CT or risk factors), post-op, hydrocephalus, oedema
Blown pupil down-and-out (86)	**Uncal herniation → 3rd-nerve palsy**; Rx decompressive craniotomy + ICP reduction; MRI

Practice MCQs (past-paper style)

1. BP 120/60 mmHg, ICP 30 mmHg. CPP?
✓ **50 mmHg** — MAP = 80; CPP = MAP − ICP (Q2).

2. Cushing triad:
✓ **Bradycardia, bradypnoea (irregular breathing) and hypertension** — Not hypotension (Q12/Q13).

3. Which is NOT a general measure to lower ICP?
✓ **Routine induced hyperventilation** — Head up 30°, avoid hypotension, avoid jugular constriction, intubate if GCS < 8 (Q15).

4. Which site is NOT used for ICP monitoring?
✓ **Skull (diploe)** — Subdural, epidural, parenchymal, intraventricular are (Q16).

5. Lundberg A waves are:
✓ **Plateau rises ≥ 50 mmHg lasting 5–20 min** — Impending herniation (Q19).

6. Which is NOT an X-ray sign of chronic raised ICP?
✓ **Shallow posterior fossa / intracranial calcification** — Q3/Q6.

7. Which is false about IIH?
✓ **A space-occupying lesion is present in most cases** — Imaging is normal; CSF composition normal (Q22/Q25).

8. Typical visual symptom of IIH:
✓ **Transient visual obscuration** — Q23.

9. Loss of consciousness in raised ICP is:
✓ **A late sign** — Q5/Q8.

10. Which equation expresses ICP?
✓ **ICP = MAP − CPP** — Q1.

Chapter 5 — Subarachnoid Haemorrhage, Aneurysms & AVM

HIGH	**40** past MCQs	**10** mini-OSCE stations	Exam rank **#5** of 11

Why is this topic important?

- **40 MCQs + 10 stations = 50**. SAH is a very "closed" topic: the same 15 facts return every year.
- ★★★ Repeated: **commonest aneurysm/site (saccular, AComA)**, **PComA → 3rd nerve palsy**, **LP if CT is negative**, **DSA = gold standard**, **vasospasm 4–14 days + nimodipine**, rebleeding, hyponatraemia, hydrocephalus, grading (Hunt–Hess/WFNS/Fisher), AVM facts.
- Briefly in slides but frequent: **Fisher scale**, **WFNS**, **nimodipine**, **antifibrinolytics**, "worst headache of life".

High-yield facts: causes, epidemiology, aneurysms

Item	Fact
Definition / causes	Blood in the subarachnoid space between pia and arachnoid. Traumatic vs **spontaneous**. **Berry (saccular) aneurysm rupture ≈ 77 %**; **AVM = 10 %** (2nd cause); unidentified ≈ 15 %. Others: fusiform/mycotic aneurysm, fibromuscular dysplasia, blood dyscrasia, **moyamoya**, amyloid angiopathy (elderly), vasculitis, tumour, spinal AVM
Epidemiology	Peak age 50; 80 % aged 40–65; rare < 10 y (0.5 %); ♀ **:** ♂ **= 3 : 2**; ↑ in 3rd trimester; higher in blacks. Incidence **6–12/100 000/yr** (Q8; slide 6–16 US); highest in Japan and Finland. SAH is **not only in adults** (Q22 A false)
Aneurysm	**Saccular = commonest type** (Q4), usually at **bifurcations at the base of the brain (circle of Willis)**; **~90 % anterior circulation**; **commonest site = anterior communicating artery** (Q3, Q9); other: MCA bifurcation, ICA bifurcation, basilar tip. Defect is in the **muscle and elastic tissue (tunica media / internal elastic lamina)**, **not the "external lamina"** (Q10/Q11 false statement). Multiple in **15–20 %**
Risk factors	**Hypertension, atherosclerosis, smoking, OCP, pregnancy, vigorous exercise**/haemodynamic stress; **Marfan** (and ADPKD, Ehlers–Danlos **[+]**); **Down syndrome is NOT** (Q7). Aneurysm size and site, age, general condition, Hunt–Hess grade are prognostic; **Fisher grade is not** a prognostic factor in Q6
Clue to site	**Posterior communicating artery aneurysm → unilateral 3rd cranial nerve palsy** (Q2). Horner syndrome is **not** typical of SAH (Q28)
Natural history	15 % die before hospital; **25 % within 24 h**; mortality ≈ 40 % at 1 week; half die in 6 months; **40 % of survivors have major deficits**; Q30: 2-hour mortality 30–50 % (as keyed). Female and black mortality higher

Presentation, diagnosis, grading

Item	High-yield
Presentation	★★★ **Sudden "worst headache of my life"** (Q26), reaching maximum in seconds; ↓level of consciousness; **meningism** (neck rigidity, vomiting, photophobia, fever; Kernig/Brudzinski, Q28); seizure; focal signs (ICH, aneurysm pressure, vasospasm). **Vertigo is not a manifestation** (Q19). Sudden headache + seizure + 2 vomits, no LOC = SAH (Q39); 50-y woman + photophobia + neck stiffness → SAH first (Q20)
Why LOC?	Raised ICP above CPP, brainstem destruction, seizures, lateral transtentorial herniation — **not** hypovolaemia (Q37)
Diagnosis ladder	★★★ **Non-contrast CT first** (hyperdense blood in basal cisterns/fissures; in trauma blood over convexity; Q34: SAH is **hyperdense**, not hypodense) → **if CT negative and suspicion high: lumbar puncture** (xanthochromia) (Q15, Q25: LP, not CT angiogram or serum β2-transferrin) → **DSA (digital subtraction angiography) = gold standard** for cause (Q29, Q36, OSCE 89, 94, 96); CTA/MRA useful; MRI detects aneurysms ≥ 5 mm and AVMs missed by DSA. **Meningitis must not be mistaken**
Hunt–Hess (clinical)	**[+]** I asymptomatic/mild headache · II moderate–severe headache, nuchal rigidity, no deficit except CN palsy · III drowsy/confused, mild focal deficit · IV stupor, moderate–severe hemiparesis · V coma, decerebrate. Slide survival: **G1 70 %, G2 60 %, G3 50 %, G4 20 %, G5 10 %**. Surgery not done in stage 4 (Q22 D) and conservative management in stage 1 (Q21 C) per papers
WFNS	**[+]** I = GCS 15 · II = 13–14, no deficit · III = 13–14 with deficit · IV = 7–12 · **V = GCS 3–6** (Q14: "GCS 9–13" is not grade V; managed in ICU; poor candidate for clipping; OSCE 97: nuchal rigidity, fully conscious = **HH I / WFNS I**)
Fisher (CT)	**[+]** 1 no blood · 2 diffuse thin (< 1 mm) · **3 thick clot / diffuse ≥ 1 mm layer** · 4 intracerebral/intraventricular haemorrhage. Q24 key: **"diffuse SAH 1 mm thick = Grade 3"** (compiler: modified scale; slide says > 1 mm)

Management and complications

Item	High-yield
General	ICU, dark room, **head up 30°**, **codeine** for headache, **laxatives** (avoid straining), mild anxiolytic, IV line + saline, Foley, bloods. **Not**: endotracheal intubation + hyperventilation in a GCS-14 patient (Q35 B) — LP after negative CT, ICU observation, urgent CT, eye exam may be normal are right
Definitive (find + treat the source)	★★★ **Surgical clipping** (craniotomy, aneurysm neck) **or endovascular coiling** (± stent assistance, flow diverters) **[OSCE]**; aneurysm with a **wide neck**: clipping or stent-assisted coiling (OSCE 88). Station 91: "clipping and coiling". Antifibrinolytics (tranexamic acid) **reduce rebleeding** (Q38) pending treatment

Item	High-yield
Rebleeding	★★★ **Greatest risk in the first 24 h (4.1 %)**; ≈ **19 % at 2 weeks**; mortality up to 78 %. Papers: mostly in the first 3 days, may occur at 3–10 days; partly due to **fibrinolytic activity in CSF** (Q23 D)
Vasospasm	★★★ Delayed: **4–14 days** (slide; "1–3 days" = false, Q13/Q21; Q18: late complication after 72 h; Q17: not an early complication). ≈ 60 % on angiography (Q16); delayed cerebral ischaemia. **Nimodipine** (Q13 key). Triple-H therapy is **no longer recommended** as a whole — only the induced **hypertension** part (compiler note); restricted water intake is wrong
Hydrocephalus	**Acute 20 %** (first 24 h); chronic 10–15 %
Hyponatraemia	10–34 %; **SIADH** and/or ANF/cerebral salt wasting; correct (OSCE 93, 97). Hypertension at presentation compensates for ↑ICP / stress
Other	**Seizures 25 %** (commonest after MCA aneurysm); acute **pulmonary oedema + hypoxia**; **cardiac arrhythmias in ~90 %** (ECG changes). **Septic meningitis and CSF fistula are NOT complications** (Q31, Q32). Q5 key lists *ischaemic stroke* as the odd one out among SAH complications, which is odd because vasospasm causes delayed ischaemia → **key unclear**; do not rely on it

Intracranial arteriovenous malformation (AVM)

Item	High-yield
What	Abnormal artery–vein connection without a capillary bed → vein "arterialised"; brain deprived of blood (**steal**); congenital; **1 : 5 vs aneurysms**, ≈ 1/1000; **younger** patients
Site	Commonest in the **MCA distribution** (Q33)
Presentation	**ICH or SAH 50 %** (smaller lesions); **seizures 45 %** (larger lesions); recurrent headache 30 %; neurological deficit 20 % (steal/pressure)
Risk	**Bleeding 1–2 %/yr**; mortality ≈ 10 %; aneurysms develop in 5–10 %. Aneurysmal SAH has a **worse prognosis than AVM** (Q22/Q40). OSCE 92: CT AVM, complication SAH/ICH, prognosis by **Spetzler–Martin** grade
Diagnosis / grading	CT then angiography (emergency); MRI + angiography (headache/seizure). **Spetzler–Martin**: grades 1–5 (+6 inoperable) from **size, eloquence of adjacent brain, venous drainage**
Treatment	**Surgical excision**, **embolisation**, **Gamma Knife** or a combination

ABSOLUTE EXAM CLASSICS

- Sudden headache + normal CT → **lumbar puncture** (not angiography first).
- **Vasospasm is late (4–14 d)**; **rebleeding is early (first 24 h)**; hydrocephalus acute within 24 h.
- Berry aneurysm: AComA commonest; PComA = CN III; bifurcation sites; **media defect**; Marfan yes, Down no.
- The "must have angiography" condition = **spontaneous SAH** (Q29).
- SAH hyperdense on CT; "hypodense in sulci" is the false statement (Q34).
- Basilar artery branches: pontine, **PCA**, SCA, AICA; **MCA is NOT** (Q27).

DISCREPANCY: slides vs past exams (past exams win)

- Q1: grade-1 aneurysm death at 3 months = 2–5 %; slide survival G1 = 70 %. Different time points: use the MCQ number when asked as in Q1.
- Slide vasospasm = 4–14 days; Q21 states "vasospasm may occur in the following 1–3 days" as the false item ✓; rebleeding "3–10 days" appears as a true statement in the same question.
- Slide says multiple aneurysms 15 %; Q10 uses 20 % as a true option. Accept both.

EXAM CHECKLIST: what you absolutely need to know

- Causes of SAH (aneurysm 77 %, AVM 10 %), commonest site AComA, PComA → CN III.
- Clinical features and what is NOT typical (vertigo, Horner, hypovolaemia).
- Diagnosis ladder: CT → LP → DSA (CTA/MRA).
- Grading: Hunt–Hess 1–5, WFNS 1–5, Fisher 1–4, Spetzler–Martin for AVM.
- Rebleeding (24 h, 4 %, 19 % at 2 w), vasospasm (4–14 d, nimodipine), hydrocephalus (20 % acute), hyponatraemia (SIADH), seizures 25 %, cardiac changes.
- Clipping vs coiling; antifibrinolytics; head up 30°, codeine, laxatives.
- AVM: MCA, seizures/haemorrhage, steal, 1–2 %/yr bleeding, treatment trio.

Clinical connections

- **Neurology / emergency / cardiology / nephrology:** thunderclap headache work-up; migraine and meningitis as DDx; hypertension management; SIADH vs cerebral salt wasting; takotsubo-type ECG changes; ADPKD screening **[+]**.

OSCE spot-diagnosis (answers from the stations)

Picture / question	Answer
52-year-old woman, worst headache while watching TV (88)	**SAH**; commonest cause **ruptured berry aneurysm**; wide neck → clipping or stent-assisted coiling; supportive: **nimodipine**, ICP control, correct hyponatraemia
Star-shaped hyperdensity in basal cisterns (89, 90, 95)	**Acute spontaneous SAH**; gold standard **DSA**; management: ABC, BP control, analgesia → clipping/coiling; complications: **vasospasm → delayed ischaemia, hydrocephalus, rebleeding**; symptoms: headache, LOC, meningism; grading Hunt–Hess + WFNS
CT with large AVM / blood (92)	**AVM** → SAH or ICH; prognosis by Spetzler–Martin grade
Severe headache, BP 180/110, Na 122 (93, 97)	SAH from aneurysm rupture; confirm with **DSA/LP**; high BP = compensation for ↑ICP / stress; low Na = **SIADH or cerebral salt wasting**; tachypnoea = compensatory/pain/↑ICP; Hunt–Hess I / WFNS I; admit, nimodipine, clip/coil, correct Na, control ICP
Hyperdense lesion left MCA region + angiogram (96)	SAH; **DSA**; ruptured aneurysm; clipping via craniotomy or coiling, nimodipine, control ICP
94	Spontaneous SAH; causes ruptured arterial aneurysm, AVM; gold standard DSA
91	Surgery for SAH: **clipping and coiling**
98	Most important risk factor for the haemorrhage shown (basal ganglia ICH): **hypertension** (answer C)

Practice MCQs (past-paper style)

1. Most common site of berry aneurysm:
✓ **Anterior communicating artery** — Q3/Q9.

2. Aneurysm causing unilateral 3rd-nerve palsy:
✓ **Posterior communicating artery** — Q2.

3. Worst headache of life, normal CT. Next step:
✓ **Lumbar puncture** — Then DSA for the cause (Q15, Q25).

4. Gold-standard test for the source of SAH:
✓ **Digital subtraction angiography** — Q29/Q36.

5. Vasospasm after SAH typically appears:
✓ **4–14 days post-bleed; treat with nimodipine** — Not 1–3 days (Q13/Q21).

6. Which is wrong about saccular aneurysms?
✓ **The defect is in the external lamina** — Media / internal elastic lamina; saccular is most common, at bifurcations, 90 % anterior (Q10).

7. Which is NOT a complication of SAH?
✓ **Septic meningitis / CSF fistula** — Rebleeding, vasospasm, hydrocephalus, hyponatraemia, ECG changes are (Q31/Q32).

8. Which artery is NOT a branch of the basilar?
✓ **Middle cerebral artery** — Q27.

9. Prognostic factor NOT in the list for aneurysm outcome:
✓ **Fisher grade** — Age, medical status, size, Hunt–Hess (Q6).

10. AVMs of the brain are commonest in the territory of:
✓ **Middle cerebral artery** — Q33.

Chapter 6 — Hydrocephalus, CSF Physiology & Shunts

HIGH	**36** past MCQs	**16** mini-OSCE stations	Exam rank **#4** of 11

Why is this topic important?

- **36 MCQs + 16 stations = 52**. Includes 5 CSF/anatomy questions and a heavy block on **shunt infection**.
- ★★★ Repeated: CSF formation/volume, **communicating vs non-communicating causes** (choroid plexus papilloma, colloid cyst, SAH, meningitis), **aqueductal stenosis = commonest congenital cause**, **Dandy-Walker**, **setting-sun sign**, **ETV vs shunt**, **shunt infection management**, NPH.
- Images: the infant with a big head (OSCE 100, 101, 103, 109), VP shunt (102, 107, 108, 111), ETV scopes (110), shunt malfunction swelling (112).

CSF physiology

Item	Fact
Formation	★★★ Mainly **choroid plexus** (Na/K-ATPase and carbonic anhydrase help); **active secretion + filtration** (Q3). Secretion is **not** the function of the arachnoid granulations (Q1 E false). "Formed solely by the choroid plexus" is false (Q2). Production **500 mL/day** (turn-over 3–4 × daily)
Volume	**150 mL** in adults (25 mL ventricles + 125 mL subarachnoid space); 40–50 mL neonates; 65–140 mL children
Composition	Clear, colourless, acellular (< 5 lymphocytes); similar Na^+, **higher Cl^-**, lower K^+ than plasma; protein 15–40 mg/dL (≈ 40; lower than plasma); glucose ≈ **2/3 of plasma**; "salty taste" is true
Pathway	**[OSCE]** Choroid plexus (lateral ventricles) → **foramen of Monro** → 3rd ventricle → **aqueduct of Sylvius** → 4th ventricle → **foramina of Magendie and Luschka** → subarachnoid space (brain + cord) → **arachnoid villi / granulations → superior sagittal sinus**
Anatomy (Q35–36)	**Septum pellucidum** separates the lateral ventricles; **inferior sagittal sinus drains into the straight sinus**

Definition, classification, causes

Hydrocephalus = accumulation of CSF in the ventricular system at inappropriate pressure (prevalence 1–1.05 %; congenital 0.9–1.8/1000 births). Almost always from **obstruction/↓absorption**; rarely from ↑production. Classifications: **communicating vs non-communicating** (obstructive), congenital vs acquired, compensated vs non-compensated, acute vs chronic, internal vs external. Progressive dilatation separates ependymal cells → **interstitial (periventricular) oedema**.

Level / mechanism	Causes
Lateral ventricle / foramen of Monro	**Choroid plexus papilloma** (0.4–0.6 % of CNS tumours; CSF production 3–4 × normal → per keys **COMMUNICATING**, Q5/Q7/Q9/Q10), **colloid cyst of 3rd ventricle (non-communicating, Q7/Q9)**
3rd ventricle	Colloid cyst, ependymal/arachnoid cysts, **craniopharyngioma**, chiasmatic–hypothalamic glioma
Aqueduct	★★★ **Congenital aqueductal stenosis = commonest cause of congenital hydrocephalus AND of hydrocephalus in children (Q6, OSCE 100/112/113)**; narrow (12–13 mm long, 0.2–0.5 cm wide); true stenosis, forking, septum, gliosis; **X-linked (< 2 %): Bickers-Adams-Edwards with "cortical thumbs"**; secondary: in-utero toxoplasma, IVH, mumps. Periaqueductal: pineal tumours, AVM (vein of Galen), low-grade astrocytoma
4th ventricle	**Dandy–Walker** (cyst, vermis hypoplasia, > 85 % hydrocephalus); tumours: **medulloblastoma 85 %, ependymoma 75 %, posterior-fossa astrocytoma 65 %, brainstem glioma 25 %**; Chiari malformation
Arachnoid granulations (COMMUNICATING)	**Bacterial meningitis** (Q4), **SAH** (Q7/Q11), trauma, meningeal carcinomatosis; **normal-pressure hydrocephalus (Q8)**
By age	**Premature**: germinal-matrix IVH · **full-term infant**: aqueduct stenosis, Chiari, Dandy–Walker, encephalocele, tumour, vein of Galen · **older child**: trauma, meningitis, tumour · **adult**: 30 % idiopathic, SAH, head injury, tumours, surgery, aqueduct stenosis, meningitis

ABSOLUTE EXAM CLASSICS: causes

- ★★★ **"Which is communicating?"** meningitis, SAH, meningeal carcinomatosis, **choroid plexus papilloma**, NPH. **"Which is NOT?"** colloid cyst, aqueductal stenosis, 4th-ventricle ependymoma, pilocytic cerebellar astrocytoma, brainstem glioma, **craniopharyngioma** (non-communicating, Q11 key A: SAH is the exception).
- **Dandy–Walker:** large cyst in 4th ventricle communicating with it, **hypoplastic/absent vermis**, **ENLARGED (not small) posterior fossa** (Q12/Q13 false statement), hydrocephalus, polydactyly; NOT part of Chiari II; "atresia of foramen of Luschka" is a DW feature (spina bifida Q10).
- **Setting-sun sign** = commonest in hydrocephalus (Q15). Mechanism (OSCE 103): ↑ICP/dilated 3rd ventricle compresses the **pretectal / dorsal midbrain → failure of upward gaze** (Q14), eyes deviate downward.
- Newborn clue: **disproportionate increase in head size** (Q16/Q18); head circumference at birth **35 cm (33–36)** (Q17).

Clinical picture and diagnosis

Item	High-yield
Infant	★★★ **Head circumference > 95th percentile**, **full tense anterior fontanelle**, **dilated scalp veins**, **suture widening**, **setting-sun eyes**, shiny skin, ± right/left abducent palsy, irritability, vomiting, flaccidity/poor feeding. Normal growth: 2 cm/month for 3 months, 1 cm/month for months 4–6, 0.5 cm/month months 7–12
Older child / adult	Headache, vomiting, **papilloedema**, lethargy, abducens palsy, upgaze palsy (Parinaud), ataxia
Imaging	**Cranial ultrasound** (premature IVH, ventricular size via fontanelle, bedside) → CT (axial only, radiation, 1976–86 era) → **MRI** (since 1986: multiplanar, better soft tissue, **shows the cause and CSF flow across the aqueduct**, no radiation). Q19: 4-day-old, suspected aqueduct stenosis → **MRI** (US only shows hydrocephalus)

Treatment

Modality	High-yield
Non-surgical (temporising)	**Acetazolamide + furosemide**, serial lumbar puncture or ventricular tap, head wrapping (not definitive). Goal = optimal neurological outcome; normal-sized ventricles are not the aim
Remove the obstruction	e.g. resect tumour/colloid cyst (endoscopic fenestration of cysts)
Endoscopic third ventriculostomy (ETV)	★★★ For obstruction **at or distal to the aqueduct**. Fenestration of the **floor of the 3rd ventricle** into the **interpeduncular cistern** (Q20; OSCE 110); **basilar artery** is the artery at risk. ETV ± **choroid plexus coagulation (CPC)**. Acceptable procedures list (Q21): ETV, VP shunt, ventricular access device with tapping, EVD
CSF shunts	Silastic tubes diverting CSF to a cavity that absorbs it: **peritoneum (VP, commonest)**, atrium (VA), pleura. Parts: **ventricular catheter, reservoir, valve, distal (peritoneal) catheter** (OSCE 111). **Ventriculo-bladder is NOT a shunt** (Q23). **Lumbo-peritoneal shunts are for communicating hydrocephalus (and IIH), not for obstructive (Q22)**. Ventriculo-subarachnoid is a (rare) shunt. Perforating septum pellucidum/corpus callosum are not treatments (Q24)

Shunt complications, infection, malfunction

Complication	High-yield
Types	(1) **mechanical failure** (obstruction, disconnection, migration/"displacement"), (2) **functional failure** (over- or under-drainage → **subdural haematoma**), (3) **infection**. Also: bleeding, epilepsy (catheter track), haematoma at the insertion site. **NOT**: "shunt rejection" (Q28), **electrolyte imbalance** (Q29)
Malfunction	**Headache, irritability, lethargy, nausea/vomiting** (↑ICP); swelling around the valve; CT + shunt-series X-rays; fix = replace occluded components. In a myelomeningocele patient always **rule out shunt malfunction** first
Infection	★★★ **1–15 %**, ↑ in premature infants; **90 % recognised within 12 months**; bacteria introduced at surgery; **Staph. epidermidis ≈ 60 %, S. aureus ≈ 30 %**, coliforms/propionibacteria/streptococci/H. influenzae the rest — "most common organisms are gram-negative" is false (Q30). Diagnosis: CSF sampled from the **shunt reservoir/valve**: WBC, protein, culture (OSCE 77, 111). Q26: WBC 450, protein 135, glucose 5 → **admit, parenteral antibiotics, remove shunt**
Treatment	★★★ **Remove the infected shunt + place an EVD + IV (± intraventricular) antibiotics by culture**. Re-implant when **≥ 3 consecutive daily negative cultures, CSF WBC < 50, CSF protein < 500 mg/dL**. **Wrong**: oral antibiotics for 2 weeks, re-insertion after only 2 normal CSF, immediate replacement, replacement by a lumbo-peritoneal shunt (Q31–Q33); Q27: in a child with shunt + fever do CSF examination **if other causes of fever are excluded** (CT has no diagnostic role)

Normal-pressure hydrocephalus (NPH) and Dandy–Walker

	High-yield
NPH	Chronic adult hydrocephalus (weeks–years, often no cause). **Hakim–Adams triad: gait disturbance ("magnet gait"), urinary incontinence, dementia**; early motor signs worst in the legs; frontal-release signs (suck/grasp); parkinsonian features. Ventricles enlarged with **CSF pressure within the normal range** (not "less than normal", Q34 B); **not an emergency**; shunting can improve it. Q34 key E gives an odd improvement order — see the flag
Dandy–Walker	See classics box: also OSCE 180/181 (MRI: DW malformation; DDx arachnoid cyst, persistent Blake pouch cyst, cerebellar hypoplasia, DW variant)

DISCREPANCY: slides vs past exams (past exams win)

- Choroid plexus papilloma: slide lists it among **obstructive lateral-ventricle causes** but also says it overproduces CSF; keys = **communicating**.
- Q34 (NPH) key E: "symptom that might improve with shunting is incontinence then gait then dementia" — contradicts the slide (gait/magnet gait is the early, most characteristic sign). **Key unclear**; know the triad and that CSF pressure is normal.
- Shunt re-insertion rule (≥ 3 negative cultures) vs Q31 "2 normal CSF results" wrong ✓.

EXAM CHECKLIST: what you absolutely need to know

- CSF facts: 150 mL, 500 mL/day, choroid plexus, composition, pathway.
- Communicating vs non-communicating causes (papilloma, meningitis, SAH vs colloid cyst, aqueduct, posterior-fossa tumours).

- Aqueduct stenosis = commonest congenital cause; Dandy–Walker features.
- Infant signs (HC, fontanelle, veins, sutures, sun-setting) and mechanism of sun-setting.
- MRI best; ETV (floor of 3rd ventricle → interpeduncular cistern; basilar artery) for obstructive; VP shunt commonest; LP shunt only communicating.
- Shunt infection: organisms, diagnosis from reservoir, remove + EVD + IV antibiotics, re-implant criteria.
- NPH triad; non-emergency.

Clinical connections

- **Paediatrics / neurology / neuro-ophthalmology:** head-circumference charts; Parinaud syndrome; meningitis and IVH of prematurity as causes; dementia work-up (NPH is a reversible cause); LP in NPH; SAH and trauma as late causes (Chapters 2 and 5).

OSCE spot-diagnosis (answers from the stations)

Picture / question	Answer
Infant with huge head, sunset eyes, dilated scalp veins (100, 101, 103, 109, 113)	**Hydrocephalus**; signs: sunset eyes, dilated scalp veins, ↑head circumference, full tense fontanelle, wide sutures; Rx **VP shunt or ETV**; commonest cause in children = **congenital aqueduct stenosis**; MRI: symmetric lateral-ventricle enlargement, dilated 3rd, normal-size 4th = aqueductal level obstruction
Parents of a shunted child at follow-up (100)	Ask about signs of malfunction/↑ICP (headache, vomiting, irritability, drowsiness), infection (fever, redness, swelling, discharge along tract), development/vision
Shunt hardware (102, 107, 108, 111)	**Ventriculo-peritoneal shunt**: ventricular catheter, valve, reservoir, peritoneal catheter. Indications: obstructive hydrocephalus, refractory IIH; complications: **infection, blockage (mechanical/functional failure), haemorrhage**; other use of valve: CSF sampling, check obstruction
Endoscopic photos (110)	**ETV**: fenestration of the **floor of the 3rd ventricle**; artery at risk = **basilar**
Infant with VP shunt, swelling by the ear (112)	**Obstructed shunt**; investigations: brain MRI/CT, shunt tap + CSF culture, shunt-series X-ray; 5 signs of hydrocephalus; commonest cause aqueduct stenosis
106	Pathway: choroid plexus → lateral ventricles → Monro → 3rd → aqueduct → 4th → Magendie/Luschka → subarachnoid space → arachnoid villi → superior sagittal sinus
105	Shunt complications: infection, blockage; pure sensory cranial nerve = **olfactory** (also optic, VIII); lumbar PID sign = **positive straight-leg raise**
CT ×3 (104)	Hydrocephalus; types communicating/obstructive; procedures CSF diversion: **ETV / VP shunt**

Practice MCQs (past-paper style)

1. Commonest cause of congenital hydrocephalus / of hydrocephalus in children:
✓ **Aqueductal stenosis** — Q6.

2. Which causes COMMUNICATING hydrocephalus?
✓ **Bacterial meningitis, SAH, choroid plexus papilloma** — Colloid cyst, aqueduct stenosis are non-communicating (Q4/Q5/Q7).

3. Dandy–Walker is NOT associated with:
✓ **A small posterior fossa** — It has a large posterior fossa, hypoplastic vermis, 4th-ventricle cyst (Q12/Q13).

4. Compression of the pretectal area in hydrocephalus causes:
✓ **Failure of upward gaze (setting-sun)** — Q14/Q15.

5. Best test to confirm aqueduct stenosis in a neonate:
✓ **MRI** — US/CT only show ventricular enlargement (Q19).

6. Endoscopic third ventriculostomy connects the third ventricle with:
✓ **Interpeduncular cistern** — Floor of 3rd ventricle; basilar artery at risk (Q20).

7. Not a treatment for non-communicating hydrocephalus:
✓ **Lumbo-peritoneal shunt** — Q22.

8. A 2-year-old with fever, shunt 1 month ago, CSF WBC 450, protein 135, glucose 5:
✓ **Admit, IV antibiotics, remove the shunt (EVD)** — Re-implant after ≥ 3 negative cultures (Q26/Q31).

9. Commonest organism in shunt infection:
✓ **Staphylococcus epidermidis** — Gram-negatives are not the commonest (Q30).

10. Which is NOT a complication of a VP shunt?
✓ **Electrolyte imbalance / "rejection"** — Infection, blockage, displacement, subdural haematoma are (Q28/Q29).

Chapter 7 — Degenerative Spinal Disease: Lumbar/Cervical Disc, Stenosis, Spondylolisthesis

VERY HIGH	**40** past MCQs	**29** mini-OSCE stations	Exam rank **#3** of 11

Why is this topic important?

- **40 MCQs + 29 stations = 69**: third most-tested topic. Two lectures (Prof. Maani: degenerative spinal diseases, 86 slides; Dr Kanaan: lumbar/cervical/thoracic disc "in pictures").
- ★★★ The exam loves **root-level logic**: which root, which reflex, which dermatome for a given disc (L4–5, L5–S1, C6–7, far-lateral L3–4), plus **neurogenic claudication**, **cauda equina vs conus**, **ACDF** and the indications for surgery.
- Image stations: MRI disc prolapse with root level (128, 133–139, 143–145, 148), canal stenosis (127, 151), spondylolisthesis (132, 135), pedicle screws (126), ACDF X-ray (140, 152), foot-drop photo (142), Spurling/Hoffman/SLR (140, 141, 148).

High-yield facts: anatomy and disc epidemiology

Item	Fact
Vertebral column	33 vertebrae: 7 C, 12 T, 5 L, 5 S (fused), 4 coccygeal. Typical vertebra: body + arch (pedicle + lamina); **7 processes** (1 spinous, 2 transverse, 4 articular). Discs form ≈ 1/4 of the column length; **none between C1–C2**, nor in sacrum/coccyx
Disc	**Annulus fibrosus** (concentric fibrocartilage, resists outward thrusts/extension) + **nucleus pulposus** (gelatinous, resists compression; lies slightly posterior). Ageing: nucleus loses water, annulus degenerates, disc thins
Disc location (Kanaan)	**Lumbar 79 %, cervical 19 %, thoracic 2 %** of all disc prolapses
Naming	The disc is named after the vertebrae **above and below** (not "above only", Q14 B false). The foramen is named after the **exiting root** (Q14 E true). **Ligamentum flavum covers the interlaminar space** — present in the cervical spine too (Q12 C false); attached to the **anterior surface of the lamina above** and the **upper border of the lamina below** (Q40). It is **not** on the vertebral bodies (Q14 A false)
Spinal canal stenosis causes	Osteophytes, ligamentum flavum hypertrophy, facet hypertrophy, disc bulges; **NOT denticulate ligament hypertrophy** (Q1)
LMN vs UMN	**Disuse atrophy** is not an LMN sign (Q8; LMN = fasciculations, fibrillations, hypotonia, areflexia, wasting). **Pure radicular signs: weakness, atrophy, sciatica, ↓reflexes — NO Babinski** (Q2, Q3)
Back-pain epidemiology	**90 %** of low-risk back-pain patients improve within 1 month with conservative treatment (Q5/Q15 key D). Low-back pain definition: pain between costal margin and buttock crease (Q9)

Lumbar disc prolapse (LDP)

Item	High-yield
Frequency	Commonest in the spine; **L4–5 and L5–S1 = 90–95 %** (L4–5 commonest, Q35 for stenosis; Q23 A). Why: 75 % of movement at the lumbosacral junction, 20 % at L4–5. Mostly **posterolateral** (PLL stops direct posterior herniation)
Which root?	★★★ **Posterolateral/paracentral → the TRAVERSING root = numerically LOWER vertebra** (L4–5 → **L5**; L5–S1 → **S1**). **Far-lateral (lateral) → the EXITING root = UPPER vertebra** (L3–4 far lateral → **L3**, Q10/Q21; L4–5 far lateral → **L4**, Q31/Q32; paraesthesia to the knee). **Central → cauda equina** (retention, saddle anaesthesia). In a typical posterolateral prolapse the "disc compresses the traversing, not the exiting, root" (Q12 D)
History	Radicular pain (sciatica = L4–S3 distribution) **more severe than back pain**; sudden, sharp, electric; ↑ cough/sneeze/Valsalva; relieved by lying with hip + knee flexed; **NO myelopathy**. Disc prolapse = commonest cause of sciatica (DDx: spondylosis, stenosis, spondylolisthesis, tumour)
Examination	**Straight-leg raise (SLR)** positive when sciatica is reproduced at **10–60°** — **sensitive but not specific** (OSCE 141: passive; best image = lumbosacral MRI). Look for buttock wasting (**horizon sign**), perianal sensation, anal tone (prone), rectal exam. Tilt: the patient tilts to the opposite side to relieve posterolateral pain; "tilting to the opposite side reproduces pain" is the false far-lateral statement (Q22); far-lateral = pain more severe, fragments common, affects the same-level (exiting) root
Investigations	★★★ **MRI = best** (Q18, OSCE 142); CT myelography if MRI contraindicated, urgent if cauda equina/progressive deficit; dynamic X-ray to exclude spondylolisthesis; ESR to exclude infection. **Modic changes** (Q16): type 1 low T1/high T2 (oedema), **type 2 high T1 + high T2 (fat)**, type 3 low/low (sclerosis)
Conservative	Bed rest ≈ 2 weeks (slide), analgesics + NSAIDs + antidepressants, physiotherapy (back-muscle strengthening), swimming, **nerve-root block** (local anaesthetic + steroid, diagnostic and therapeutic). Resolution: disc shrinkage/resorption, nerve adaptation, less inflammation. Most cases are managed conservatively (Q23 C)
Surgical indications	★★★ **Cauda equina syndrome · progressive motor deficit · pain affecting quality of life/failed conservative treatment** (Q19/Q24 key D "all of the above"); the **commonest indication is neurological deficit** (Q28 A)

Item	High-yield
Surgery	**Microscopic or endoscopic discectomy via interlaminar fenestration + sequestrectomy** (standard; removes protruding/extruded/migrated disc). Newer fusion options (TLIF, PLIF, OLIF, DLIF, ALIF): no consensus. Complications: wrong level, injury to a vessel/dural tear/nerve, infection; **gynaecological injury is NOT a complication** (Q28 A). Commonest cause of recurrent sciatica after successful surgery = **recurrent disc prolapse** (Q4). Decompressive laminectomy for stenosis

Root	Disc (typical)	Pain / sensory	Motor	Reflex
L3	L3–4 far lateral	Anterior/medial thigh	**Knee extension (quadriceps)**	↓ Knee jerk (L3–L4)
L4	L3–4 (posterolateral) · L4–5 far lateral	Anterior thigh, anterior lower leg, **medial knee/leg**	Quadriceps / tibialis anterior	**Knee jerk = L4** (Q39) (OSCE 136, 145, 148: dermatome L4, reflex knee)
L5	**L4–5**	Posterolateral thigh, lateral leg, **dorsum of foot + hallux**	**Dorsiflexion of ankle and big toe (EHL), foot drop**; hip abduction	**None** (ankle reflex is NOT affected, Q23 D)
S1	**L5–S1**	Posterior thigh + calf → **heel/lateral foot/sole**	**Plantar flexion** (heel-walk spared)	**Absent ankle jerk = S1** (Q11; "unilateral absent ankle reflex highly specific for S1")

Right L5–S1 prolapse: **low back pain + right sciatica** (Q7 A); weakness of dorsiflexion and medial-foot numbness are L5, not S1. If the patient complains of L5 sciatica, request **lumbosacral AP/lateral films**: a **sacralised L5** means the real disc level is L4–5 (Kanaan).

Cauda equina and conus medullaris syndromes: the emergency

	Cauda equina (CES)	Conus medullaris
Level	Any level between **L2 and S1** (central disc, haematoma after laminectomy; **transverse-process fracture does not cause it**, SCI Q27)	**L1–2** (where the conus lies)
First symptom	★★★ **Sciatica**; later urinary **retention** → overflow incontinence; saddle anaesthesia	★★★ **Bladder dysfunction (overflow incontinence)** usually the presenting symptom; early sphincter loss; severe back pain; perianal numbness
Neurology	**LMN**: flaccid paresis, **hypo-/areflexia**, atrophy; asymmetric; **no pyramidal signs, no Babinski** (SCI Q2, Q15, Q37)	**Anal areflexia** (SCI Q36); knee-jerk **hyperreflexia** may coexist (Q33); least common = knee-jerk hyporeflexia (SCI Q5)
Action	**Emergency**: urgent MRI + neurosurgical decompression. Triad of paraesthesia/saddle anaesthesia, urinary retention and stool incontinence = **CES** (OSCE 131, 155)	Same urgency (OSCE 154: conus syndrome at L1)

Lumbar canal stenosis (LCS) and spondylolisthesis

Item	High-yield
LCS epidemiology	Narrowing of the central canal, subarticular (lateral recess) or foramina; **commonest indication for spine surgery in > 65 y**; **L4–5 commonest** (Q35), then L5–S1, L3–4. Mostly **acquired degenerative**: disc height loss, bulging, ligamentum flavum infolding, facet hypertrophy/osteophytes/cysts
Pathophysiology	Direct/indirect compression + **ischaemia** (venular compression, ↑ intrathecal pressure). **Standing/extension ↓ canal area; flexion relieves**; walking raises metabolic demand beyond microvascular supply
Clinical	★★★ **Neurogenic claudication** (94 %): symptoms ↑ walking/standing, relieved by **sitting or flexing**; pain commonest, then numbness/weakness; mostly bilateral asymmetric; low back pain 65 %; wide-based gait/positive Romberg. "Neurological symptoms are common" is the wrong statement (Q34). Old woman with back pain worse on flexion?? (Q30 key: **MRI** to confirm)
Neurogenic vs vascular claudication	**[OSCE]** Neurogenic: cause = stenosis, **relief by sitting/flexion**, **normal pulses**, variable distance. Vascular: PAD, relief by rest regardless of posture, **diminished/absent pulses**, fixed reproducible distance. Acute sudden leg pain not relieved by NSAIDs/morphine in a diabetic with IHD = **acute arterial insufficiency** (SCI Q6)
Diagnosis	**MRI = procedure of choice** (CT myelography if MRI contraindicated); area < 76 mm² severe, < 100 mm² moderate; findings in > 20 % of asymptomatic > 60 y → interpret with the history
Management	**Decompressive laminectomy / laminotomies / fenestration** (OSCE 129): remove osteophytes, thickened ligamentum flavum; for disabling claudication, deficits (esp. bilateral) or urinary compromise. + **fusion** if spondylolisthesis; interspinous distraction. Conservative (old/co-morbid): analgesia, limit activity to claudication distance; NSAIDs, physio, **epidural steroids**
Spondylolisthesis	**Subluxation of one vertebra on another**; types: **congenital, isthmic (pars defect), degenerative, traumatic** (+ pathological **[+]**); grading **Meyerding** (OSCE 132). Back pain (> leg pain) ± sciatica ± LCS; CT bone window, MRI; NSAIDs, physio (abdominal/back strengthening), avoid prolonged sitting/heavy lifting; surgery (failed conservative or cauda equina) = **decompressive laminectomy + pedicle-screw fixation** (OSCE 126: pedicle screws for scoliosis, spondylolisthesis)

Cervical disc prolapse, spondylosis and myelopathy

Item	High-yield
Disc	**19 %** of discs; commonest **C5–6** (Kanaan) / **C6–7 and C5–6** (Maani); mostly posterolateral → **radiculopathy / brachialgia** (pain neck → periscapular → arm in root distribution, head tilted toward the lesion). **Central → cord compression → myelopathy**
Roots (upper limb)	★★★ **C5** shoulder/deltoid · **C6**: thumb/index, biceps + brachioradialis reflex, lateral arm (OSCE 148: brachioradialis; ACDF) · **C7**: **triceps weakness, ↓triceps jerk, paraesthesia of index/middle (long) finger → C6–7 disc** (Q13/Q17; OSCE 133: left C7, middle finger) · **C8**: ring + little finger/hand grip. Slide: index = C6, middle = C7, ring/little = C8. Old man, neck pain to medial/index, **absent biceps jerk, normal triceps → C6 radiculopathy** (Q20). Biceps weakness 3/5 → **ACDF** (Q38)
Signs	**Spurling test** (neck flexed to the symptomatic side + axial compression → arm pain; OSCE 140, 148: C6 root compression), **Lhermitte**; myelopathy: **Hoffman sign** (Q6), hyper-reflexia, clonus, Babinski, spasticity, spastic/ataxic gait, "myelopathy hand", urinary urgency (late). **Torticollis, atrophy of shoulder muscles, positive Spurling and inverted supinator jerk** do not prove myelopathy (Q6). Positive Romberg = **dorsal column** (Q29)
Spondylosis	Degenerative arthritis of cervical spine/discs (> 75 % of > 50-y-olds on X-ray, asymptomatic). Pathology: nucleus dehydration → end-plate stress → **osteophytes** (into canal and prevertebral space). Presentation: **neck pain (commonest)**, radicular arm pain + dermatomal sensory loss + LMN wasting, **cervical myelopathy** (cause of myelopathy > 50 y = cervical spondylosis, SCI Q29). OSCE 150: 68-y male, spastic quadriparesis, hyper-reflexia, bilateral Babinski, lost position sense = **cervical myelopathy** (dorsal-column compression), MRI multilevel stenosis + cord signal change
DDx	Spondylosis, tumour, **thoracic outlet syndrome, Pancoast tumour**, peripheral entrapment
Investigation	**MRI** (best; neck pain/how to confirm disc = cervical MRI, Q33); plain X-ray: disc space narrowing, osteophytes, subluxation (flexion/extension views)
Treatment	**Conservative 6–12 weeks** (NSAIDs, collar, physio) — but **never** if weakness or cord signs. Surgery: **ACDF (anterior cervical discectomy and fusion)** (microscope; bone graft or **cage ± plate**) — preferred because it handles central herniations, removes osteophytes in the foramen and reduces subluxation (Q36). Posterior laminectomy / key-hole foraminotomy for ligamentum flavum folding, hypertrophic facets, stenosed foramen; laminoplasty (multilevel)
ACDF complications	**[OSCE] Dysphagia, hoarseness (recurrent laryngeal nerve palsy)**, haematoma, nerve/cord injury, oesophageal/tracheal injury, pseudoarthrosis/hardware failure; posterior: kyphosis, chronic pain
Thoracic disc	**2 %**, rare; usually **central → myelopathy**; nerve-root symptoms rare; mostly conservative; decompression or **thoracoscopic discectomy**

ABSOLUTE EXAM CLASSICS

- Rule: **exiting root = upper vertebra (far-lateral); traversing root = lower vertebra (posterolateral/paracentral)**.
- L4–5 posterolateral → L5 (foot drop, dorsiflexion); L5–S1 → S1 (ankle jerk, plantar flexion). **Knee jerk L4, ankle jerk S1**.
- Neurogenic claudication: relief by sitting/flexion; vascular: absent pulses.
- **CES has no Babinski/pyramidal signs**; conus: bladder first at L1–2.
- Indications for disc surgery: CES, progressive deficit, intolerable pain (answer "all of the above"). Commonest = neurological deficit.
- Triceps weakness + ↓triceps jerk + middle finger numbness = C7 root = C6–7 disc → **ACDF**.
- "Wrong about spine anatomy": ligamentum flavum is **not** absent in cervical spine; disc is named after BOTH vertebrae.

DISCREPANCY: slides vs past exams (past exams win)

- Commonest cervical disc level: C5–6 (Kanaan) vs C6/7 and C5/6 (Maani); the stems end in C6–7. Learn both.
- Slide: bed rest for two weeks; modern practice and the papers (90 % improve in a month) emphasise **early mobilisation** — answer questions per the slide only if "bed rest" is offered as a conservative option.
- Slide: SLR is "sensitive but not specific". In stems about a positive SLR: root irritation L5/S1, MRI is the next investigation.

EXAM CHECKLIST: what you absolutely need to know

- Exiting vs traversing root for posterolateral and far-lateral discs; root table (L3, L4, L5, S1; C6, C7).
- Reflexes: biceps C5–6, brachioradialis C6, triceps C7, knee L4, ankle S1.
- Indications for surgery; surgery names (microdiscectomy, ACDF, laminectomy ± fusion, pedicle screws).
- CES vs conus; saddle anaesthesia, retention = emergency.
- Neurogenic claudication features and treatment; LCS commonest at L4–5; MRI.
- Spondylolisthesis types and Meyerding grading; Spurling, Lhermitte, Hoffman, SLR, Romberg.
- Cervical myelopathy signs; ACDF complications (dysphagia, hoarseness).

Clinical connections

- **Orthopaedics / rheumatology / vascular / neurology:** low-back-pain red flags; vascular claudication; hip OA/trochanteric bursitis as DDx; spondyloarthropathies; cervical myelopathy vs MS/ALS/B12; peripheral nerve entrapments; epidural steroid injections.

OSCE spot-diagnosis (answers from the stations)

Picture / question	Answer
Cervical MRI + patient with spastic gait (124, 147, 150)	**Cervical disc prolapse / spondotic myelopathy**. Signs: spastic LL weakness, LMN weakness in arm at the level, hyper-reflexia, Babinski, spastic/ataxic gait, "myelopathy hand", sphincter late. Rx: conservative if mild; **ACDF**, disc replacement, or laminectomy/laminoplasty if multilevel. Complications: infection, bleeding, cord injury, **recurrent laryngeal palsy (hoarseness), dysphagia**, pseudoarthrosis
Hoffman flick + MRI with ACDF plate (140, 143, 152)	**Hoffman** test; **ACDF**; level C6–7 cage in 152; complication dysphagia; provocative signs: **Spurling, Lhermitte**
Cervical MRI left C6–7 posterolateral prolapse (133)	**Cervical disc prolapse**; dermatome **left C7 (middle finger, back of arm/forearm)**; surgery indications: myelopathy, intractable pain, focal deficit, malignancy history
Lumbosacral MRI + foot drop photo (125, 128, 131, 134, 142, 144, 145)	**Lumbar disc herniation** (L4–5 or L5–S1; posterolateral); L5 → **foot drop**, EHL weakness; S1 → **absent ankle reflex**, lateral foot; tests: **SLR**, heel-walk, plantar reflex; best investigation MRI; treat **discectomy via laminectomy/fenestration** if deficit; conservative (NSAID + physio 4–6 weeks) otherwise; **cauda equina** if retention + saddle numbness + stool incontinence
MRI L3–4 prolapse (136, 145)	Dermatome **L4** (medial leg/knee); knee jerk; management: discectomy via laminectomy
Claudication 100 m, hypertensive smoker (127, 138, 151)	**Lumbar canal stenosis** → neurogenic claudication; MRI sagittal T2 shows L4–5 stenosis/ thickened ligamentum flavum; DDx **vascular claudication**; Rx decompressive laminectomy (conservative: NSAIDs, physio, activity modification, epidural steroid)
Spondylolisthesis drawing/CT (132, 135)	Spondylolisthesis (L5–S1): **Meyerding**; types congenital, traumatic, degenerative; symptoms back + leg pain, sciatica, LCS
X-ray with screws (126)	**Pedicle-screw fixation**: scoliosis, spondylolisthesis
Surgical microscope (130)	Indications: brain aneurysm, ACDF, decompressive laminectomy
Hand drawing/leg tests (146, 148, 141)	146 = **Kernig sign** (answer D); 148 = **Spurling** (cervical cord/root compression, C6, brachioradialis); 141 = **SLR** (passive; positive when sciatica reproduced at 10–60°)

Practice MCQs (past-paper style)

1. Disc prolapse at L4–5 (posterolateral) usually affects which root and what finding?
✓ **L5; weak dorsiflexion of the foot (foot drop)** — Ankle reflex is S1 (Q23/Q26).

2. Far-lateral L3–4 prolapse affects:
✓ **L3 root (exiting)** — Quadriceps weakness, knee-jerk loss (Q10/Q21).

3. Triceps weakness, ↓triceps jerk, index/middle-finger paraesthesia. Level?
✓ **C6–7** — C7 root (Q13/Q17).

4. Pure radicular manifestations do NOT include:
✓ **Babinski sign** — It is an UMN sign (Q3).

5. Which is NOT part of cauda equina syndrome?
✓ **Positive Babinski / hyper-reflexia** — LMN picture (Q2/Q15/Q37).

6. Commonest cause of sciatica after successful disc surgery:
✓ **Recurrent disc prolapse** — Q4.

7. Best investigation for a patient with L5 radiculopathy and 1/5 dorsiflexion:
✓ **Lumbar MRI** — Q18.

8. Surgery for cervical disc prolapse with radiculopathy/myelopathy:
✓ **Anterior cervical discectomy and fusion (ACDF)** — Q36/Q38.

9. Commonest site of lumbar canal stenosis:
✓ **L4–L5** — Neurogenic claudication; MRI (Q35).

10. Which is NOT a cause of spinal canal stenosis?
✓ **Denticulate-ligament hypertrophy** — Q1.

Chapter 8 — Spinal Cord Injury

HIGH	**41** past MCQs	**7** mini-OSCE stations	Exam rank **#6** of 11

Why is this topic important?

- **41 MCQs + 7 stations = 48**. Slide deck is "lectures in pictures" (6 pages: epidemiology, mechanisms, syndromes, management, imaging), but the MCQs go deeper into neuro-anatomy (cord syndromes, nerve roots, cauda equina, peripheral nerves).
- ★★★ Repeated: **central cord syndrome (commonest incomplete)**, **Brown-Séquard** (including level calculation, Q41), **cauda equina vs conus**, **neurogenic shock**, immobilisation/imaging after trauma, **Jefferson fracture**, **MRC strength grading**, **foot drop/common peroneal**.

High-yield facts: epidemiology and mechanisms

Item	Fact
Epidemiology	**M : F = 4 : 1**; **60 % aged 15–25**; head injury → 5–15 % have a spinal injury; spinal injury → 5 % head injury. Distribution: **cervical 55 %**, thoracic 15 %, thoracolumbar junction 15 %, lumbar 15 %. Above the clavicle: 15 % have C-spine injury; 5–15 % of C-spine fractures have a second (non-contiguous) fracture; slightly > 50 % of cervical trauma has neurological injury. **Most common level in RTA = cervical** (Q16); most common cause of cervical injury = **trauma** (Q19); SCI is **not** more common in paediatrics (Q38)
Causes	RTA, sports, falls, assaults. Mechanisms: **hyperflexion, hyperextension, axial loading, penetrating**. Injury = bone (fracture/dislocation), ligament, cord (complete/incomplete)
Pathophysiology	Direct trauma + traction/compression → **loss of autoregulation, spinal shock, ischaemia**. 5–10 % deteriorate after arrival (oedema? ischaemia? inadequate immobilisation?)
Associations	**High-velocity pelvic fracture → peripheral-nerve injury** (Q21). Cranial nerve most often hurt with spinal injury: **abducens (VI)** (Q23)

Cord syndromes

Syndrome	Mechanism / pathology	Findings
Complete transection	Total loss of function below the lesion	Quadri-/paraplegia, areflexia, anaesthesia below level, **loss of sphincter tone**, **spinal shock**, **neurogenic shock** (hypotension + bradycardia, no compensatory tachycardia; poikilothermia), respiratory insufficiency in high lesions
Central cord	★★★ **Hyperextension of the neck** (older patient with spondylosis) · **commonest incomplete SCI** (Q12)	**Arms weaker than legs** (Q14; OSCE 156 upper-limb weakness + sensory loss; OSCE 50 D); variable sensory loss, mostly **pain/temperature** (spinothalamic fibres cross ventral to central canal) → **dissociated, cape-like** loss
Anterior cord	**Anterior spinal artery infarction**	Paralysis + loss of **pain and temperature** below the lesion; **touch, vibration, proprioception spared**
Brown-Séquard	**Hemisection**	★★★ **Ipsilateral** motor paralysis + loss of **vibration/position** (dorsal column) + ipsilateral pyramidal signs; **contralateral** loss of **pain and temperature** beginning 1–2 segments below the lesion (Q13, Q17, Q40). "Contralateral paralysis" is NOT a feature (Q13 C, DSD Q37). At T6: loss of pain "2 levels above the lesion" is wrong; sensation is dissociated; ≈ 90 % can walk (Q30). Tracts: **spinothalamic, corticospinal, dorsal column** (OSCE 158)
Posterior cord	Rare	Loss of proprioception/vibration, sensory ataxia
Conus medullaris / cauda equina	See Chapter 7	Conus: early bladder/anal areflexia; CES: polyradiculopathy, saddle anaesthesia, LMN

ABSOLUTE EXAM CLASSICS

- ★★★ **Level of a Brown-Séquard lesion (Q41):** weakness on the LEFT leg + loss of pain/temperature on the RIGHT from the **umbilicus (T10)** downward → **left T10**.
- Dorsal-column modalities: position, vibration, fine touch, pressure — **not pain** (Q18).
- **Neurogenic shock = hypotension + bradycardia**; tachycardia is NOT a feature (Q32). Hypovolaemic shock gives tachycardia.
- Complete transection list: spinal shock, ↓sphincter tone, paraplegia, areflexia; **Q3 key is "D?" (hypothermia)** — the slide lists hypothermia with hypotension in neurogenic shock, so the key is unclear.
- **Horner syndrome** = miosis, **enophthalmos/apparent**, anhidrosis, correctible ptosis; **NOT exophthalmos** (Q4).
- **S1 lesion:** weakened plantar flexion, absent ankle reflex, lateral foot sensory loss; **extensor plantar** is not S1 (Q8).
- **Common peroneal nerve at the fibular head → foot drop** (dorsiflexion weakness) (Q9); **femoral nerve injury does not cause foot drop** (Q39).
- **Jefferson fracture = C1** (burst of the ring) (Q25).

- **MRC power:** 0 none · 1 flicker/fasciculation (visible contraction) · **2 movement with gravity eliminated** · **3 against gravity** · 4 against some resistance · 5 normal. "2 = against gravity" is the wrong statement (Q26).
- Complete block at T5 with LP + jugular compression (Queckenstedt): physiology = **no rise in lumbar CSF pressure**; Q22 key prints C ("no increase, rapid fall") → **key unclear**.

Management

Phase	High-yield
In the field	**Immobilise (C-spine)**, maintain blood pressure, maintain oxygenation, brief motor exam
In hospital	★★★ **Immobilisation** (collar), systemic care (CVS, respiratory, GIT, bladder, temperature), detailed neurological evaluation (unconscious patient: assess by **absence of deep reflexes**, Q7), radiology, **steroids** (slide) **[+]**: high-dose methylprednisolone is no longer routinely recommended in current guidelines
Imaging	**Cross-table lateral X-ray 85 % sensitive**; **AP + lateral 92 %**; **swimmer's view for C7–T1**; flexion–extension; **CT** (bone, 3-D C1–C2); **MRI** (soft tissue: cord, discs, ligaments). C7 radiculopathy after RTA: collar + X-ray + CT C1–T1 + MRI = **"all of the above"** (Q1, Q31)
Surgery	Compression (cord compression by bone/disc/haematoma) → **decompression ± instrumentation/stabilisation** (Q11: of concussion/contusion/compression/rupture/haematomyelia, the one to operate = **compression**). Then **rehabilitation**
Other	Cervical myelopathy cause > 50 y = **cervical spondylosis**; Bladder control = sacral, lumbar and descending cortical fibres (Q20); GBS: hyperreflexia is not a feature (areflexia), high+low BP (autonomic) is (Q34); Artery of Adamkiewicz supplies the lower thoracic/lumbar cord (Q35: the false statement is "denticulate ligament formed from subarachnoid matter" — it is pia mater)

EXAM CHECKLIST: what you absolutely need to know

- Epidemiology numbers (4:1; 15–25 y; 55 % cervical).
- Cord syndromes: central (arms > legs, hyperextension), anterior, Brown-Séquard (crossed pattern + level calculation), conus vs CES.
- Neurogenic vs spinal shock; neurogenic = hypotension + bradycardia.
- Field/hospital management: immobilise, BP, oxygen; imaging choices; MRI for soft tissue.
- MRC grading, S1/L5 signs, foot drop = common peroneal.
- Jefferson C1; abducens commonest cranial nerve affected; high-velocity pelvic fracture → peripheral nerve injury.

Clinical connections

- **Trauma / orthopaedics / rehabilitation / neurology:** ATLS C-spine rules; cervical collar and log-roll; neurogenic shock management with vasopressors/fluids **[+]**; bladder/bowel rehabilitation; pressure sores; GBS and transverse myelitis as DDx; vascular causes (artery of Adamkiewicz, anterior spinal artery syndrome).

OSCE spot-diagnosis (answers from the stations)

Picture / question	Answer
Sagittal CT/MRI (153, 159)	Burst (stress) fracture **L1** (153: bed rest / surgery); burst fracture **C5** (159: complications nerve-root compression, vascular injury, limb weakness)
MRI L1 (154)	**Conus medullaris syndrome** at L1
Lumbar MRI (155)	**Cauda equina syndrome**; symptoms: severe lower limb pain (early), bladder disturbance (late), saddle numbness
Body diagram with cape pattern (156)	**Central cord syndrome** (upper-limb weakness + sensory loss)
Hemicord diagram (157, 158)	**Brown-Séquard**: ipsilateral hemiparalysis + loss of vibration/proprioception/light touch; contralateral loss of pain & temperature; tracts: spinothalamic, corticospinal (anterior + lateral), dorsal column

Practice MCQs (past-paper style)

1. Commonest incomplete spinal cord injury:
✓ **Central cord syndrome** — Arms weaker than legs after hyperextension (Q12/Q14).

2. Left leg weakness + right loss of pain/temperature from the umbilicus down. Lesion?
✓ **Left T10 hemisection (Brown-Séquard)** — Q41.

3. Not a feature of Brown-Séquard:
✓ **Contralateral paralysis below the lesion** — Contralateral = pain/temperature loss (Q13).

4. Neurogenic shock is NOT associated with:
✓ **Tachycardia** — It is hypotension + bradycardia (Q32).

5. Fracture of C1:
✓ **Jefferson fracture** — Q25.

6. Cauda equina syndrome does NOT show:
✓ **Hyper-reflexia / Babinski** — LMN: flaccid paresis, hyporeflexia, saddle anaesthesia (Q2, Q15).

7. Which is NOT transmitted by the dorsal column?
✓ **Pain** — Position, vibration, fine touch, pressure are (Q18).

8. MRC grade 2 means:
✓ **Movement with gravity eliminated** — Grade 3 = against gravity (Q26).

9. Foot drop is caused by injury of:
✓ **Common peroneal nerve (fibular head)** — Not femoral (Q9/Q39).

10. Spinal injury in an unconscious patient is assessed by:
✓ **Absence of deep reflexes** — Q7.

Chapter 9 — Spinal Tumours

MEDIUM	**17** past MCQs	**11** mini-OSCE stations	Exam rank **#9** of 11

Why is this topic important?

- **17 MCQs + 11 stations = 28**. Short lecture (4 pages), but the exam asks the same compartment/tumour-type matching every year.
- ★★★ Repeated: **commonest spinal tumour = extradural metastasis**, **meningioma = intradural-extramedullary in middle-aged/older women**, **ependymoma = intramedullary**, **schwannoma/NF2**, **Batson plexus**, **Froin syndrome**, cord-compression emergency.

Classification and tumour table

Compartment	Frequency	Examples
Extradural	**55 %** (commonest; mostly metastases)	Metastases (breast, lung, prostate, kidney, thyroid, myeloma), osteochondroma (OSCE 164), plasmacytoma, lymphoma
Intradural extramedullary	**40 %**	Meningioma, schwannoma, neurofibroma, filum ependymoma
Intramedullary	**5 %**	Ependymoma, astrocytoma, hemangioblastoma (key Q4 also lists lipoma as intramedullary, plasmacytoma as not)

Tumour	Location / patient	Histology	Treatment / prognosis
Meningioma	IDEM, **thoracic** commonest, **middle-aged women** (estrogen receptors); **benign WHO I**; associated with **NF2, NOT NF1** (Q2/Q3: NF1 = false). 60-y woman with slowly progressive T10 spastic paraparesis → **dorsal meningioma** (Q6, Q10, OSCE 169)	**Whorled** spindle cells, **psammoma bodies**, **EMA +**	Surgery often curative; RT only if recurrent. **Female with benign spinal tumour: meningioma** (Q15 "schwannoma" is the wrong statement; Q17)
Schwannoma (and neurofibroma)	IDEM, cervical/lumbar; any age; **NF2** (multiple). OSCE: 45-y NF2 woman, foot drop, enhancing intradural extramedullary mass L5–S1 = **schwannoma** (Q7); **dumb-bell shape**	**Antoni A and B**, **Verocay bodies**, **S-100 +**	Resection (curative, rare recurrence); schwannomas are more easily excised than neurofibromas (NF1). Neurofibromas: **sensory roots**, not motor (Q12)
Ependymoma	**Intramedullary**, cervical; adults (**commonest adult intramedullary tumour**); **myxopapillary** type at **conus/filum terminale** (OSCE 163: L3–4 mass → filum ependymoma, schwannoma). Sausage-shaped on MRI (Q11)	**Rosettes / pseudorosettes**, **GFAP +**; WHO I–II (rarely III)	Surgery ± RT for higher grades; good prognosis (I–II). More common than astrocytoma (Q3 C true)
Astrocytoma	**Intramedullary**, thoracic in children — **commonest spinal cord tumour in children** (slide); infiltrative; I–IV	**GFAP +**, diffuse infiltrative	Limited resection ± RT/chemo; prognosis by grade
Metastasis	★★★ **Extradural, commonest spinal tumour** (Q2, Q3, Q12). Spread: **Batson venous plexus (haematogenous)** (Q13). Prostate mets → **lumbar** spine (Q3 E true; thoracic = false in Q2). 60-y heavy smoker/hilar mass, back pain then paraparesis in hours = **extradural extramedullary neoplasm** (Q9; OSCE 167: lytic bone metastasis)	Depends on primary	★★★ **High-dose dexamethasone**, **radiotherapy (SBRT)**, **surgical decompression** (unstable spine/deficit); palliative aim = neurological preservation
Hemangioblastoma	Intramedullary; VHL **[+]**	—	Excision

Clinical picture, work-up, emergencies

Item	High-yield
Symptoms	**Localised, nocturnal back pain**, radicular (dermatomal) pain, motor weakness/spasticity, sensory deficit, gait disturbance, bowel/bladder dysfunction. **Commonest first presentation in children: pain** (Q1). **Red flags**: rapid progression, saddle anaesthesia, retention, weakness, sexual dysfunction
Investigations	**MRI with gadolinium = gold standard**; CT for bone detail; plain X-ray of limited value; biopsy (image-guided or surgical); MRI spine + search for the primary in suspected mets
Management	Corticosteroids (dexamethasone) for cord oedema; surgical decompression if deficits; radiotherapy (especially mets); chemotherapy for selected tumours (lymphoma); multidisciplinary (neurosurgery, oncology, radiology)
Emergencies	**Spinal cord compression** → urgent MRI + steroids + surgical/radiation consult; **cauda equina syndrome** (saddle anaesthesia, urinary retention) → immediate neurosurgical referral

Item	High-yield
Froin syndrome	★★★ CSF **xanthochromia, high protein, spontaneous clotting**; **NOT increased cells** (Q14 false statement) = albuminocytological dissociation below a block
Slide case	55-y man with lung cancer: new thoracic back pain, urinary incontinence, leg weakness, **extradural mass compressing the cord → metastatic cord compression**; next steps: urgent MRI whole spine, **dexamethasone**, neurosurgery/oncology (decompression ± radiotherapy)

ABSOLUTE EXAM CLASSICS

- Plasmacytoma and lipoma are the "except" items in the intramedullary list (Q4 key A & E).
- **Meningioma ↔ NF2**, **neurofibroma ↔ NF1**, **schwannoma ↔ NF2**.
- "Most common spinal tumour" = **extradural metastasis**; "most common intramedullary" = **ependymoma** (adult) / **astrocytoma** (child).
- Schwannoma is NOT intramedullary (Q2 A, brain Q54).

EXAM CHECKLIST: what you absolutely need to know

- Compartment percentages (55 / 40 / 5) with examples.
- Table: meningioma, schwannoma, ependymoma, astrocytoma, metastasis (histology buzzwords).
- Batson plexus; prostate → lumbar; lung/breast/kidney/thyroid/myeloma.
- MRI with gadolinium; dexamethasone + RT + decompression for metastatic compression.
- Froin syndrome; red flags; first symptom in children = pain.

Clinical connections

- **Oncology / radiology / neurology:** metastatic cord compression is an oncological emergency; NF1/NF2 genetics; myelopathy DDx (spondylosis, MS, transverse myelitis, syringomyelia, AVM, haematoma).

OSCE spot-diagnosis (answers from the stations)

Picture / question	Answer
Intramedullary/intradural tumour DDx (160)	Ependymoma, astrocytoma, hemangioblastoma
Cervicothoracic fluid-filled intramedullary cavity C3–C7 (161)	**Syringomyelia** (not a tumour)
Child, intramedullary dorsal well-circumscribed bright lesion (162)	**Astrocytoma**
L3–4 homogeneous lesion (163)	Filum terminale ependymoma, schwannoma, nerve-sheath tumour
Classification drawing (164–166)	Extradural (osteochondroma/mets) · intradural-extramedullary (meningioma, schwannoma, neurofibroma) · intramedullary (ependymoma, astrocytoma)
60-y smoker with dyspnoea + new back pain (167)	**Bone metastasis** (lytic extradural, cord compression); DDx for myelopathy: meningioma, disc herniation, neurofibroma, lipoma, schwannoma
44-y, 1-year radiating back pain, L5 enhancing IDEM (168)	Meningioma/neurofibroma/schwannoma; symptoms: weakness, paraesthesia, incontinence, cauda equina; Rx laminectomy and excision
56-y woman myelopathy, intradural extramedullary (169)	**Meningioma**; myelopathy signs of lower limb: hyper-reflexia, clonus, spasticity; Babinski = UMN lesion
14-y girl with difficulty walking, L2–L5 intramedullary lesion (170)	**Ependymoma**; DDx syringohydromyelia, schwannoma, neurofibroma, metastasis; ask: weakness, paraesthesia, urinary incontinence, pain, gait

Practice MCQs (past-paper style)

1. Commonest spinal tumour:
✓ **Extradural metastasis** — Q2/Q12; spread via Batson plexus (Q13).

2. Intradural extramedullary tumour in a middle-aged woman, T10 sensory level, spastic paraparesis:
✓ **Spinal meningioma** — Q6/Q10/Q17.

3. Meningiomas are associated with:
✓ **NF2 (not NF1)** — Q2/Q3.

4. Which is NOT intramedullary?
✓ **Schwannoma (also plasmacytoma, lipoma per Q4)** — Q4/brain Q54.

5. Sausage-shaped intramedullary tumour:
✓ **Ependymoma** — Q11.

6. A 60-y man with hilar mass, back pain, paraplegia within 6 hours:
✓ **Extradural extramedullary neoplasm (metastasis)** — Q9.

7. Prostate metastasis usually affects which part of the spine?
✓ **Lumbar** — Q3.

8. Froin syndrome does NOT show:
✓ **Increased CSF cells** — Xanthochromia, high protein, clots (Q14).

9. First presentation of a spinal tumour in a child:
✓ **Pain** — Q1.

10. Emergency management of metastatic cord compression:
✓ **Urgent MRI + dexamethasone + radiotherapy/surgery** — Slide case.

Chapter 10 — Spina Bifida, Chiari Malformations & Tethered Cord

MEDIUM	**21** past MCQs	**17** mini-OSCE stations	Exam rank **#7** of 11

Why is this topic important?

- **21 MCQs + 17 stations = 38**. Highly predictable: the same myelomeningocele (MM) facts appear in MCQs and OSCE every year.
- ★★★ Repeated: **MM = hydrocephalus 85–90 %**, **Chiari II** associations, **closure within 24 h**, **folic acid**, **AFP**, occulta stigmata (hair tuft), **outcome depends on level**, **Dandy-Walker is NOT part of MM/Chiari II**.

High-yield facts: embryology, epidemiology, causes

Item	Fact
Definition	**Spinal dysraphism = neural tube defect (NTD)** from failure of the neural tube to close. Term "spina bifida" first used in 1685 (Observationes Medicae)
Embryology	Gastrulation (trilaminar disc, ends mid-3rd week) → **primary neurulation (weeks 3–4; tube closes by end of week 4)** → **secondary neurulation (weeks 5–6)**. MM "usually develops in the first month of pregnancy" (Q2 C true)
Epidemiology	2nd most common birth anomaly after congenital heart disease; **1–3/1000 live births; MM 0.5–2/1000** (Q4). **Lumbosacral 90 %**, thoracic 6–8 %, cervical 2–4 %. **More in females** ("male predominance" = false, Q14)
Risk factors	**Folic-acid deficiency** (MTHFR gene); family history (recurrence 2–5 % after one affected child, up to 15 % after two; but 90–95 % of cases occur in "low-risk" couples); **valproate** and other anticonvulsants; **diabetes, obesity, fever**; also inositol, B12, choline, retinoic acid, iron
Prevention	★★★ **Folic acid 4 mg/day in women with a previous affected child reduces recurrence by ≈ 70 %** (slide); periconceptional supplementation ≥ 1 month before conception (OSCE 179: 4 mg). **Folic acid prevents but does NOT reverse the defect** — "supplementation can correct the anomaly / may reverse this condition" is false (Q7, Q19)

Types

Type	Pathology	High-yield
Spina bifida occulta	Absent spinous process/lamina; **no exposed meninges or neural tissue**	5–30 % of North Americans; incidental, no link with non-specific LBP; may overlie **diastematomyelia, tethered cord, lipoma, dermoid**. **Cutaneous stigmata: hair tuft (hypertrichosis; OSCE 178, 18), dimple/dermal sinus, lipoma, capillary haemangioma**; **café-au-lait spot is NOT a stigma** (Q5); **Mongolian spot = benign, reassure** (Q17); a tuft of hair is NOT normal (Q18). Symptomatic = tethered cord
Meningocele	**Meninges + CSF sac, NO neural tissue**; defect in vertebral arches; transillumination helps	1/3 have a neurological deficit; **less common than MM** (Q16 "more common" false); hydrocephalus ~15 % (Q15)
Myelomeningocele (MM)	Meninges + **neural placode / cord or cauda equina** in the sac; skin, bone and dura defects superficial to placode	**Commonest CNS anomaly compatible with life**, mortality ≈ 10 %; leaks CSF; deficits depend on level
Lipomyelomeningocele	Lipoma attached to cord	Associated tethering

Prenatal detection and management of MM

Step	High-yield
Prenatal	**Maternal serum AFP ↑ (≥ 2 MoM at 15–20 weeks; RR 224)** (Q7 E: AFP raised); **ultrasound detects 90–95 %**; amniocentesis (6 % fetal loss in this population); fetal MRI. Plan mode of delivery, psychological support, in-utero surgery in some centres (Q7). **Folic acid cannot correct the fetal anomaly**
Newborn assessment	Spontaneous leg movement, lowest functional level; **OFC and head US within 24 h** (hydrocephalus risk), **inspiratory stridor/apnoea** (Chiari II); neonatologist (average 2–2.5 additional anomalies); **bladder: intermittent catheterisation + urology**; spine films; orthopaedics
Initial care	★★★ Cover the lesion with **wet saline dressing (Telfa)** to avoid desiccation, **Trendelenburg/prone**; measure defect; **ruptured → antibiotics** (cefazolin/vancomycin, OSCE 172); unruptured → none; CSF is the fluid leaking

Step	High-yield
Surgery	★★★ **Closure within 24 h** (after ≈ 36 h the lesion is colonised and infection risk rises); **closure lowers infection but does NOT improve neurological function** (OSCE 171/183/184/187 and Q2 A "surgery can reverse the deficits" = false). "Closure within 48–72 h" = false. Aims: **prevent infection, protect neural tissue, prevent further deterioration**, CSF leak — **cosmesis is NOT an aim** (Q13; OSCE 185 lists cosmetic as an indication anyway). Newborn with MM + hydrocephalus: **simultaneous repair and shunt** (Q20). **In-utero closure**: controversial; ↓Chiari II, maybe ↓hydrocephalus, no better distal function
Hydrocephalus	★★★ **85–90 %** of MM (Q3 "80–90 %", Q14 "80 %", Q15 "85 %"); part of Chiari II (not "aqueductal stenosis in 85 %", Q9 key C false); may appear up to 2 years, most need a shunt by 6 months. OSCE 185: large head circumference because of Chiari II obstructing CSF flow at the foramen magnum

Chiari malformations, tethered cord, late problems

Item	High-yield
Chiari I vs II	**Hindbrain malformations**. "Chiari" = type I; **"Arnold–Chiari" = type II**. **Chiari II** = cerebellar herniation through foramen magnum + **MM, hydrocephalus, syringomyelia, small posterior fossa**; atresia of the foramen of Luschka is **not** Chiari II (Q10); a **large posterior-fossa cyst communicating with the 4th ventricle (Dandy–Walker)** is **not** (Q11, Q1); "large 4th ventricle" is not (Q12 — it is small/slit-like)
Tethered cord	**Abnormally low conus** with a short thick filum terminale or intradural lipoma; most common in MM (70 % radiographically, minority symptomatic). Presents with gait disturbance, leg weakness/atrophy, urinary problems, foot deformities. MRI: thickened fatty filum. Treatment: **detethering**
Late problems	**Hydrocephalus / shunt malfunction** (rule out first when an MM patient deteriorates), **syringomyelia/syringobulbia**, tethered cord, **dermoid tumour at the MM site (≈ 16 %)**, medullary compression at the foramen magnum (symptomatic Chiari II)
Outcome	Untreated: only 14–30 % survive infancy; with modern care ≈ **85 %** survive. Early death: Chiari-related respiratory arrest/aspiration; late death: **shunt malfunction**. **80 % normal IQ**; mental retardation linked to **shunt infection**. 40–85 % ambulatory with bracing (most use wheelchairs); 3–10 % normal continence (most dry with intermittent catheterisation). **Severity of leg weakness = level of the lesion** (Q21)
Other CNS anomalies (OSCE 177)	Aqueductal stenosis, spina bifida, Chiari, Dandy–Walker, **anencephaly (OSCE 179: prevention by periconceptional folic acid)**, arachnoid cysts; occipital encephalocele (huge)

ABSOLUTE EXAM CLASSICS

- **MM = hydrocephalus 80–90 %, Chiari II** (most patients), syringomyelia, tethered cord, small posterior fossa. **Dandy–Walker is the "not related" answer.**
- Wrong statements: surgery reverses deficits · closure within 48–72 h · folic acid corrects the fetus · male predominance · meningocele commoner than MM · café-au-lait is a stigma · "tuft of hair is normal".
- Right statements: develops in the first month; prevented by folic acid; associated with hydrocephalus and raised maternal AFP; in-utero surgery in some centres; most patients have Chiari II.
- Aims of treatment: prevent infection, prevent further deficit, decrease CSF leak; **"plastic appearance" is not an aim**.
- Antenatal diagnosis counselling: plan delivery, support, in-utero surgery option; **do not promise reversal with folic acid**.

DISCREPANCY: slides vs past exams (past exams win)

- Closure timing: slide has both "within 36 hours" and "within 24 hours"; Q2 says 48–72 h is wrong; compiler: **24 h**.
- Q9 and Q13 (D vs A) are marked "not sure" by the compiler; Q15 asks for the correct statement → "all of the above".
- OSCE 185 lists "cosmetic" as an indication for MM repair, while MCQ Q13 counts "plastic appearance" as **not** an aim of treatment: write infection prevention + neural protection when asked for aims.

EXAM CHECKLIST: what you absolutely need to know

- Types: occulta vs meningocele vs MM; contents of the sac; stigmata of occulta.
- Numbers: 0.5–2/1000, lumbosacral 90 %, hydrocephalus 85–90 %, recurrence 2–5 %, folic acid 4 mg ≈ 70 %, AFP ≥ 2 MoM at 15–20 w, survival ≈ 85 %.
- Management: wet dressing, antibiotics if ruptured, closure ≤ 24 h, shunt (often simultaneous), bladder catheterisation, urology/orthopaedics.
- Chiari II associations vs Dandy–Walker; tethered cord and detethering; late shunt malfunction.
- Outcome: level determines weakness; IQ normal in 80 %; surgery does not restore function.

Clinical connections

- **Obstetrics / paediatrics / urology / orthopaedics:** antenatal screening and folic-acid advice; AED choice in pregnancy (valproate); neurogenic bladder (clean intermittent catheterisation, renal protection); scoliosis/hip deformities; latex allergy **[+]**.

OSCE spot-diagnosis (answers from the stations)

Picture / question	Answer
Back sac in newborn (171, 172, 173, 175, 183, 185, 186, 187)	**Myelomeningocele** (spina bifida aperta). Associations: **hydrocephalus, Chiari II, syringomyelia**; CSF leaks; risk factors: family history, **folic-acid deficiency, valproate, DM, obesity, fever**; hydrocephalus risk 85–90 %; repair name = **myelomeningocele repair**; surgery does **not** improve function but prevents infection/meningitis; pre-op antibiotic (cefazolin/vancomycin); counsel: early closure ↓infection only; ♀ in pregnancy: **intrauterine MM repair** (option), future prevention: folic acid 3 months before pregnancy; bilateral loss of leg sensation and motor function expected
Two drawings (174, 182, 184, 186)	A = **meningocele**, B = **myelomeningocele**; B causes leg weakness; differentiate by neurological deficit and sac contents (spinal cord/nerves vs only meninges + CSF)
CT axial with open posterior elements (176)	**Spina bifida occulta**
Hair tuft on the back (178)	**Hypertrichosis** → spina bifida occulta or **tethered cord**
Anencephaly photo (179)	**Anencephaly**; prevention: periconceptional folic acid (4 mg/day at least a month before and through the first trimester)
Midline sagittal MRI posterior-fossa cyst (180, 181)	**Dandy–Walker malformation**; DDx arachnoid cyst, persistent Blake pouch cyst, cerebellar hypoplasia, DW variant; brain tumour spread to cord = haematogenous, direct CSF invasion (**drop metastases**); "lymphatic" = wrong
Classification (175)	By **presence of spinous process**: occulta vs aperta/cystica; by contents: meningocele vs myelomeningocele; next step = surgery to prevent deterioration

Practice MCQs (past-paper style)

1. Not related to myelomeningocele:
✓ **Dandy–Walker malformation** — Chiari II, syringomyelia, hydrocephalus, neurogenic bladder are (Q1).

2. Hydrocephalus after repair of a lumbar myelomeningocele:
✓ **≈ 80–90 %** — Q3/Q14/Q15.

3. Which is wrong about MM?
✓ **Surgery can reverse the neurological deficits** — Also wrong: closure within 48–72 h (Q2).

4. Folic acid in pregnancy:
✓ **Prevents NTD; cannot correct an existing anomaly** — Q7/Q19; 4 mg if previous affected child.

5. Not a cutaneous stigma of occult spinal dysraphism:
✓ **Café-au-lait spot** — Hair patch, dermal sinus, lipoma, haemangioma are (Q5).

6. Newborn with a Mongolian spot:
✓ **Reassurance** — Q17.

7. Newborn MM + hydrocephalus:
✓ **Simultaneous repair and shunt** — Q20.

8. Severity of leg weakness in MM depends on:
✓ **Level of the lesion** — Q21.

9. Antenatal marker of NTD:
✓ **Raised maternal serum α-fetoprotein** — Ultrasound detects 90–95 %.

10. Incorrect about MM:
✓ **Male predominance** — Female predominance; first-month event (Q14).

Chapter 11 — Functional & Epilepsy Neurosurgery (new lecture)

LOW	**0 (new lecture)** past MCQs	**10** mini-OSCE stations	Exam rank **#11** of 11

Why is this topic important?

- **0 historic MCQs, 10 stations (114–123)**. The compiler states that this lecture was given for the first time, so **LOW is a data gap, not proof that it is unimportant**. A new lecture by Dr Abdallat (26 slides) is very likely to appear in the next paper: it is short, so it is cheap marks.
- ★★★ What the stations asked: **DBS and its targets (STN, GPi)**, **stereotactic frame and its uses**, **Parkinson substantia nigra pathology**, phenytoin side effects, and general neurology (MS, epilepsy diagnosis, posture, lesion localisation).
- Most probable MCQ material: **VIM/GPi/STN targets and what each treats**, **ATL = commonest epilepsy surgery**, **corpus callosotomy for drop attacks**, **VNS/RNS are palliative**, **criteria for surgery**, and **DBS vs lesioning**.

Functional neurosurgery: lesioning vs neuromodulation

Definition (slide): neurosurgical procedures aimed at **improving function rather than removing pathology**. History: early lesioning → stereotactic surgery → modern neuromodulation (DBS).

Procedure	Target	Treats	Exam notes
★★★ **Thalamotomy**	**VIM** (ventral intermediate nucleus of thalamus)	**Tremor**: Parkinson tremor, **essential tremor**	Usually **unilateral** (bilateral → speech and cognitive problems). Also done by MR-guided focused ultrasound (MRgFUS)
★★★ **Pallidotomy**	**GPi** (globus pallidus internus)	**Dyskinesias, rigidity, bradykinesia**	Popular in the 1990s before DBS became mainstream
★★★ **Subthalamotomy**	**STN** (subthalamic nucleus)	**Akinesia and rigidity**	**Risk: hemiballismus** (violent involuntary flinging movements). Gamma Knife can do a "radiosurgical subthalamotomy"
Anterior cingulotomy / anterior capsulotomy	Cingulate gyrus / anterior limb of internal capsule	**Psychiatric**: **OCD**, anxiety disorders	The only psychiatric ablative procedures named in the slides
★★★ **DBS**	**STN or GPi** (Parkinson); VIM (tremor) **[+]**	Parkinson disease, tremor, dystonia **[+]**	**Reversible, adjustable, bilateral possible**; needs implanted hardware (electrode + pulse generator in the chest) and a stereotactic frame; OSCE 114: **"Name the surgery" = DBS; "two targets" = STN + GPi**

Methods of making a lesion

Method	Key points
Radiofrequency (RF) thermocoagulation	Heat lesion through a stereotactic probe; classical method
MR-guided focused ultrasound (MRgFUS)	**Incisionless**, no hardware; thalamotomy for essential tremor and Parkinson
Gamma Knife radiosurgery	Stereotactic radiation; no incision. Uses of a frame (OSCE 115): **biopsy, DBS for movement disorders, Gamma Knife (AVM, small vestibular schwannoma, trigeminal neuralgia)**

Lesioning: advantages	Lesioning: limitations
No implanted hardware · cheaper (useful where DBS is unavailable) · **immediate effect** once lesion is made	**Irreversible** (too much tissue destroyed = permanent side effects) · **bilateral lesions are risky** (speech, cognition, swallowing) · **DBS is now preferred** (reversible, adjustable, bilateral possible)

Parkinson disease: the pathophysiology behind the surgery

KEY POINT

- ★★★ **Loss of dopaminergic neurons of the substantia nigra (pars compacta)** → imbalance in basal-ganglia circuitry (OSCE 118: image showing loss of nigral pigment → **dopaminergic neurons**, answer D).
- Result: **overactivity of the STN and GPi**, which inhibit movement. Lesioning or DBS of these overactive nuclei rebalances the circuit.
- Posture of Parkinson disease: **stooped, flexed** (OSCE 122, answer C). Cardinal features **[+]**: **tremor, rigidity, bradykinesia, postural instability**.
- **[+]** Medical treatment first (levodopa + decarboxylase inhibitor, dopamine agonists, MAO-B inhibitors). Surgery is for **drug-induced dyskinesias/motor fluctuations or tremor-dominant disease that is still levodopa-responsive**.

Epilepsy surgery

Item	High-yield
Definition / burden	Epilepsy = **recurrent unprovoked seizures**. **≈ 30 % are drug-resistant (DRE)**. Surgery when seizures are not controlled by medication. Goal: **seizure freedom or reduction with preservation of neurological function**. Earlier surgery = better outcome (especially children)
★★★ **Patient selection**	**Drug-resistant epilepsy (failure of ≥ 2 appropriate AEDs) + a localised epileptogenic zone + acceptable risk profile**. Needs a multidisciplinary evaluation
★★★ **Contraindications**	**Generalised epilepsy · poor localisation · major uncontrolled comorbidities**
Pre-surgical work-up	History, scalp EEG/video-EEG, MRI; **invasive EEG (subdural strip/grid or depth electrodes)** when non-invasive tests do not localise

Type	Operation	Indication / outcome
★★★ **1. Resective (curative)**	**Anterior temporal lobectomy (ATL) — the most common**	**Mesial temporal lobe epilepsy (MTLE)**; **seizure-free in 60–80 %** (up to 70 % in temporal lobe epilepsy: best results). Can be done awake
	Lesionectomy	Tumour, cavernoma, cortical dysplasia. Frontal/parietal/occipital resections: less common, more complex, lower (but meaningful) benefit
★★★ **2. Disconnection**	**Corpus callosotomy**	**Drop attacks / atonic seizures**; **palliative** (reduces severity, not seizure-free)
	Multiple subpial transections (MST)	**Eloquent cortex** (speech/motor areas)
★★★ **3. Neuromodulation (palliative)**	**VNS** (vagus nerve stimulation) · **RNS** (responsive neurostimulation) · **DBS of the anterior thalamus**	Not curative; usually **≈ 50 % reduction in seizures** rather than seizure freedom

Risks and complications of epilepsy surgery
Cognitive/psychological (memory, language) · **neurological deficits** (hemiparesis, **visual-field cuts** after temporal lobectomy) · surgical risks: infection, bleeding, stroke
VNS complications (neuroanatomy Q5): **dysphonia, dyspnoea, cough, hoarseness**. **Dysphasia is NOT** a VNS complication **[PP]**

Antiepileptic drug facts that were examined

Drug	Facts
Phenytoin [OSCE]	**Anticonvulsant** (OSCE 116). Side effects given in the key: **gingival hyperplasia**, vitamin deficiency, **neural-tube defect / folate deficiency**. Others **[+]**: hirsutism, coarse facies, cerebellar ataxia/nystagmus (toxicity), megaloblastic anaemia, osteomalacia, rash/Stevens–Johnson, drug interactions (enzyme inducer). IV: cardiac arrhythmia, give slowly
Others [+]	**Valproate** = most teratogenic AED (NTD) · **carbamazepine** (trigeminal neuralgia, hyponatraemia, SJS/HLA-B*1502) · **phenobarbitone** (sedation, enzyme inducer) · **levetiracetam** (irritability) · folic acid before pregnancy in all women on AEDs

DISCREPANCY: slides vs past exams (past exams win)

- **OSCE 116 key:** lists "vitamin B12 deficiency which leads to disc prolapse": this is not standard. The recognised vitamin problem with phenytoin is **folate deficiency** (and vitamin D/K). Answer with gingival hyperplasia + folate deficiency/NTD + one more standard effect (ataxia, hirsutism).
- **OSCE 121 key (MS acute attack): C = alemtuzumab** is printed, but the standard answer is **corticosteroids (A)** (IV methylprednisolone). Alemtuzumab, natalizumab, fingolimod and interferon-β are *disease-modifying* drugs, not for the acute relapse → **key unclear**.

ABSOLUTE EXAM CLASSICS: typical MCQ stems, traps and pitfalls

- Parkinson + "which structures does DBS target?" → **STN and GPi** (VIM for tremor).
- Subthalamotomy risk → **hemiballismus**. Thalamotomy: **unilateral** (bilateral → speech and cognitive problems).
- Most common epilepsy operation → **anterior temporal lobectomy** (MTLE; 60–80 % seizure-free).
- **Drop attacks** → corpus callosotomy. **Eloquent cortex** → MST.
- VNS, RNS and anterior-thalamic DBS are **palliative** (≈ 50 % reduction).
- Criteria: **≥ 2 failed AEDs**, localised focus, acceptable risk. Contraindication: **generalised epilepsy**, poor localisation.
- **Most important factor in diagnosing epilepsy = a proper history from the patient or a witness** (OSCE 119, B). Not EEG, not MRI.
- Stereotactic frame (OSCE 115): biopsy, DBS, Gamma Knife radiosurgery.

MEMORABLE FACTS / MNEMONICS

- **VIM = Very Important for tremor · GPi = Gets rid of dyskinesia/rigidity · STN = "Stops" akinesia, but may cause ballismus.**

- **Curative = Resect (ATL, lesionectomy); Palliative = Disconnect and Stimulate (callosotomy, MST, VNS, RNS, DBS).**
- Seizure-freedom ladder: ATL ≈ 70 % > extratemporal < neuromodulation (≈ 50 % reduction only).

Neuro-localisation OSCE stations that sit in this lecture

OSCE	Question	Answer
114	Elderly Parkinson patient, skull X-ray with electrodes: surgery? two targets?	**DBS**; **STN, GPi**
115	Picture of a head frame: what is it; uses?	**Stereotactic frame**; biopsy, DBS, Gamma Knife
116	Phenytoin: what is it; 3 side effects?	Anticonvulsant; gingival hyperplasia, folate deficiency/NTD (key also says B12): see flag
117	25-y woman, optic neuritis 1 year ago, now right-sided weakness; MRI?	**Multiple sclerosis** (A) *(lesions separated in time and space)*
118	Neuronal loss in substantia nigra image?	**Dopaminergic neurons** (D)
119	Most important factor for diagnosing epilepsy?	**History from patient/witness** (B)
120	NOT-correct pair for lesion localisation?	**B: "seizures and hemiparesis | pons"** (seizures = cortical). Right CN III palsy + left hemiparesis = midbrain (Weber) ✓; pure motor = AHC ✓; bilateral LL spastic = cord ✓; wrist drop = radial ✓
121	Drug for acute MS attack?	Key says C (alemtuzumab): **key unclear**; standard = corticosteroids
122	Stooped-posture drawing	**Parkinson disease** (C)
123	Lesion at site #5 (neuromuscular junction/muscle end) in the diagram	**Myasthenia gravis** (E) (NMJ: postsynaptic ACh-receptor antibodies)

EXAM CHECKLIST: what you absolutely need to know

- Targets: VIM → tremor, GPi → dyskinesia/rigidity/bradykinesia, STN → akinesia/rigidity (risk hemiballismus).
- DBS vs lesioning (reversible, adjustable, bilateral vs irreversible, no hardware, cheap, immediate).
- Substantia nigra → dopamine; stooped posture = Parkinson.
- ATL commonest; callosotomy → drop attacks; MST → eloquent cortex; VNS/RNS/thalamic DBS palliative.
- Selection criteria and contraindications; ~30 % drug-resistant.
- Phenytoin side effects; VNS complications (not dysphagia).

Practice MCQs (past-paper style)

1. Which target is lesioned for **tremor** in Parkinson disease or essential tremor?
✓ **Ventral intermediate nucleus (VIM) of thalamus** — Thalamotomy; GPi = dyskinesia/rigidity/bradykinesia; STN = akinesia/rigidity

2. A risk of subthalamotomy is:
✓ **Hemiballismus**

3. Which of the following is the **most common** epilepsy operation?
✓ **Anterior temporal lobectomy** — Best for mesial temporal lobe epilepsy; 60–80 % seizure-free

4. **Corpus callosotomy** is mainly used for:
✓ **Drop attacks / atonic seizures** — Palliative

5. All are criteria for epilepsy surgery **except**: (a) failure of ≥ 2 AEDs (b) localised focus (c) acceptable risk (d) generalised epilepsy
✓ **(d) Generalised epilepsy** — It is a contraindication

6. Which is **NOT** a complication of vagus nerve stimulation: dysphonia, dysphagia/dysphasia, dyspnoea, cough, hoarseness?
✓ **Dysphasia (option B in the paper)** — Final-exam neuroanatomy Q5

7. Why is DBS preferred over lesioning?
✓ **Reversible, adjustable and can be done bilaterally** — Lesioning is irreversible and bilateral lesions cause speech/cognitive/swallowing problems

8. Image of substantia-nigra pigment loss: which neurons are lost?
✓ **Dopaminergic** — OSCE 118

9. The most important step in diagnosing epilepsy is:
✓ **A proper history from the patient or a witness** — OSCE 119

10. Name two uses of a stereotactic frame.
✓ **Biopsy, DBS, Gamma Knife radiosurgery (any two)** — OSCE 115

Chapter 12 — Neuroanatomy One-Liners + Meningitis / CSF (no lecture)

LOW	**15** past MCQs	**0** mini-OSCE stations	Exam rank **#10** of 11

Why is this topic important?

- **15 MCQs (9 neuroanatomy + 6 meningitis) that match no neurosurgery lecture**: the compiler gives them their own sections. Both appear in the same paper as the lectures, so they are cheap marks if you know the one-liners below.
- ★★★ Pattern: **neuroanatomy = reflex arcs, eye muscles, cranial-nerve function, brachial-plexus supply**; **meningitis = LP contraindications, CSF patterns, brain-abscess management**.
- Meningitis facts appear indirectly elsewhere (shunt infection, CSF leak, LP after SAH) so this chapter also supports Chapters 5, 6 and 2.

Neuroanatomy: what was tested

Q	Fact to learn	Why
1	★★★ **Reflex arcs (afferent / efferent)**: corneal = **V / VII** · cough = **X** · gag = **IX / X** · salivary = **VII** (IX also). **Vestibulo-ocular reflex = CN VIII with III/VI/IV, NOT "II & III"** → wrong combination	Pupillary light reflex is II / III (probably why the option was written)
2	★★★ **Superior oblique** depresses the eye **when adducted** (inferior rectus depresses when abducted). Mnemonic: **SO4, LR6, rest 3** (trochlear IV)	Superior oblique, inferior oblique = IV/III; adducted eye: SO depresses, IO elevates
3	**Ophthalmic artery** is a branch of the **internal carotid**, **not** external carotid. ECA branches: **S**uperior thyroid, **A**scending pharyngeal, **L**ingual, **F**acial, **O**ccipital, **P**osterior auricular, **M**axillary, **S**uperficial temporal ("Some Anatomists Like F.O.P.M.S.")	ECA branches: lingual, facial, ascending pharyngeal, superior thyroid
4	**Dendrites** receive; **axon** conducts away; soma = cell body; Schwann cell = myelin (PNS)	
5	**VNS complications**: dysphonia, dyspnoea, cough, hoarseness (recurrent laryngeal fibres). **Not dysphasia** (see Chapter 11)	
6	**Abductor pollicis brevis = median nerve** (LOAF muscles: **L**umbricals 1–2, **O**pponens pollicis, **A**bductor pollicis brevis, **F**lexor pollicis brevis)	Thenar muscles = median (recurrent branch)
7	★★★ **Parasympathetic cranial nerves: III, VII, IX, X** ("1973"). Facial nerve carries them (lacrimal, submandibular, sublingual glands). VIII, XII, VI and IV are not parasympathetic	
8	**Dilated non-reactive pupil**: oculomotor (III) injury, **brain-stem herniation**, **optic nerve injury** (afferent defect, amaurotic pupil), blunt orbital trauma, drugs. **NOT**: **abducens injury** (no pupil fibres) and **loss of sympathetic tone** (→ **miosis**, Horner)	Key: D and E
9	**Cerebral vasoconstriction when BP rises** (autoregulation: constrict when MAP ↑, dilate when MAP ↓; range ≈ 50–150 mmHg). Cerebral circulation is controlled mainly by **local metabolic factors (CO_2, pH, O_2)** and autoregulation, not mainly by the autonomic system	Errata corrected the key to B. Links to Chapter 4 (CPP)

ABSOLUTE EXAM CLASSICS: typical MCQ stems, traps and pitfalls

- Other anatomy facts that appeared in lecture chapters: **septum pellucidum** separates the lateral ventricles (frontal horns); **inferior sagittal sinus → straight sinus**; **basal ganglia** = hypertensive ICH site; **ligamentum flavum** present at all levels.
- Cranial-nerve palsies that matter in neurosurgery: **III** = uncal herniation (dilated pupil first) · **VI** = false localising sign of raised ICP · **VII + VIII** = vestibular schwannoma / petrous fracture · **I** = anterior-fossa fracture / frontal contusion · **II** = optic nerve / chiasm (pituitary, craniopharyngioma).

Meningitis, lumbar puncture and CSF

Item	High-yield
★★★ **LP contraindications (Q1)**	**Raised ICP signs: papilloedema, focal neurological deficit (e.g. hemiparesis), decreased level of consciousness, seizures**, coagulopathy, local infection, mass lesion/shift on CT. **Daily aspirin is NOT a contraindication** (Q1 key A). If the CT is unavailable and bacterial meningitis is suspected: **do not delay antibiotics** (blood cultures + ceftriaxone ± dexamethasone first)
★★★ **Treatment timing (Q5)**	"Treatment should be deferred until the culture and sensitivity are back" = **WRONG**. Start **empirical antibiotics immediately** (do not wait for CSF or culture)
★★★ **Brain abscess (Q4)**	**Stereotactic aspiration followed by 4–6 weeks of IV antibiotics**. Not empirical antibiotics without biopsy, not oral antibiotics for 4 weeks, not radical excision as routine, not 2 weeks

Item	High-yield
Pyogenic meningitis picture (Q6)	**Meningism** (neck stiffness, photophobia, headache) + ↑ **protein,** ↓ **glucose, polymorphs/neutrophils** (± RBC) = **bacterial meningitis**

CSF	Appearance	Cells	Protein	Glucose	Opening pressure
Normal	Clear	0–5 lymphocytes	15–45 mg/dL	≈ 60 % of blood (blood 105 → ≈ 65)	10–20 cmH_2O
Bacterial [PP]	Turbid	**Neutrophils**, 100s–1000s	↑↑	↓↓	↑↑
Viral / aseptic [PP]	Clear	**Lymphocytes** (Q2: 20; Q3: 9)	Normal or mildly ↑ (63 mg%)	**Normal** (65 with blood 105)	Normal/mild ↑
TB / fungal	Clear/cobweb (TB)	Lymphocytes	↑↑	↓	↑
SAH	Bloody → xanthochromic	RBC (don't clear in tubes 1→3)	↑	Normal	↑

Q2 and Q3 pattern: clear CSF, normal pressure, lymphocytes only, protein ≈ 60, normal glucose and negative Gram stain = **viral meningitis / meningoencephalitis** (not bacterial, TB, fungal or SAH).

MEMORABLE FACTS / MNEMONICS

- **Bacterial** = Big white cells (neutrophils), Bad sugar (low), Big protein. **Viral** = Very normal sugar, lymphocytes.
- Remember "**TB = bacteria-like chemistry with lymphocytes**" (↑↑ protein, ↓ glucose, lymphocytes, slow onset, cranial-nerve palsies, hydrocephalus).
- **[+]** Common bacteria: neonates GBS/E. coli/Listeria; children and adults **pneumococcus, meningococcus**; after trauma/shunt **Staphylococci**.

EXAM CHECKLIST: what you absolutely need to know

- Reflex arcs and cranial-nerve functions; parasympathetic CN = III, VII, IX, X.
- Eye muscles: SO4 LR6; superior oblique depresses an adducted eye; VOR = VIII.
- ECA vs ICA branches (ophthalmic = ICA); median nerve supplies APB.
- Dilated pupil: III, herniation, optic nerve; NOT VI or sympathetic loss.
- LP contraindications (papilloedema, focal deficit, ↓ consciousness; not aspirin).
- CSF patterns; never delay antibiotics; brain abscess = aspiration + 4–6 weeks IV antibiotics.

Practice MCQs (past-paper style)

1. Which is a wrong combination: (a) corneal reflex V & VII (b) cough X (c) gag IX & X (d) vestibulo-ocular II & III (e) salivary VII?
✓ **(d)** — VOR is VIII with III/IV/VI

2. The adducted eyeball is depressed mainly by:
✓ **Superior oblique**

3. Which is not a branch of the external carotid artery?
✓ **Ophthalmic artery** — Branch of the ICA

4. Which cranial nerve (of VII, VIII, XII, VI, IV) carries parasympathetic fibres?
✓ **Facial nerve (VII)** — Also III, IX, X

5. Nerve supply of abductor pollicis brevis:
✓ **Median nerve**

6. All cause a dilated non-reacting pupil **except**:
✓ **Abducent nerve injury and loss of sympathetic tone** — Sympathetic loss → miosis

7. Which is **NOT** a contraindication to LP in suspected bacterial meningitis when imaging is unavailable?
✓ **Daily aspirin use** — Papilloedema, hemiparesis, seizures, low GCS are

8. Clear CSF, normal pressure, 20 lymphocytes, protein 63, glucose 65 (blood 105), negative Gram stain:
✓ **Viral meningitis**

9. Bacterial brain abscess is usually treated by:
✓ **Stereotactic aspiration + 4–6 weeks IV antibiotics**

10. Meningism + ↑ protein + ↓ glucose + neutrophils + RBC in the CSF:
✓ **Bacterial meningitis** — Never defer treatment until culture results

Appendix A — Drugs and Interventions Cheat-Sheet

All drugs and procedures that were examined or that neurosurgical stems rely on, in one place. Items marked [+] are standard knowledge that is not on your slides or in the papers.

Drug / measure	Indication	Mechanism / key fact	Side effects / warnings
Dexamethasone	Peritumoral (vasogenic) oedema, spinal cord compression from tumour, cord oedema	Reduces vasogenic oedema (not cytotoxic oedema). **NOT for TBI** (Q21/22, Chapter 1)	Hyperglycaemia, GI bleeding (give PPI), infection, psychosis, Cushingoid
Mannitol [+]	Raised ICP / herniation	Osmotic diuretic: ↓ brain water, ↓ blood viscosity	Hypovolaemia, rebound ICP, renal failure; check osmolality (< 320)
Hypertonic saline [+]	Raised ICP (3 % / 23.4 %)	Osmotic	Hypernatraemia, central pontine myelinolysis
Nimodipine	**SAH** (60 mg 4-hourly for 21 days)	Ca-channel blocker; **reduces delayed ischaemic deficit**, not angiographic vasospasm	Hypotension
Tranexamic acid [+]	Bleeding; short-term pre-op for aneurysm rebleed	Antifibrinolytic	**Contraindicated in ASDH/thrombo-embolism risk**; ↑ thrombosis
Acetazolamide	**IIH**	Carbonic-anhydrase inhibitor → ↓ CSF production	Paraesthesia, metabolic acidosis, renal stones, avoid in pregnancy 1st trimester
Phenytoin	Seizure prophylaxis (early post-traumatic seizures, 7 days), epilepsy	Na-channel blocker	**Gingival hyperplasia, folate deficiency/NTD**, ataxia, hirsutism (Chapter 11)
Carbamazepine / valproate / phenobarbitone / levetiracetam [+]	Epilepsy	Valproate most teratogenic	Carbamazepine: hyponatraemia, SJS; valproate: hepatotoxicity, weight gain
Bromocriptine / cabergoline	**Prolactinoma** (first-line medical)	Dopamine agonists	Nausea, postural hypotension, impulse control
Temozolomide + radiotherapy	**GBM** (Stupp protocol)	Alkylating agent; MGMT methylation predicts response	Myelosuppression
Folic acid	**Preconception** for NTD prevention (0.4 mg; 4–5 mg if previous NTD/on AEDs)	Prevents neural-tube defects (Chapter 10)	—
Antibiotics	Meningitis, abscess, shunt infection, open skull fracture / CSF leak	Empirical immediately; abscess = 4–6 weeks IV after aspiration; shunt infection: remove shunt, EVD, reinsert after ≥ 3 negative cultures (Chapter 6)	—
Corticosteroids (methylprednisolone) [+]	Acute MS relapse; (SCI: **no longer routinely recommended**)	Anti-inflammatory	Hyperglycaemia, infection

Intervention	Where used	Remember
EVD	Acute hydrocephalus, SAH with IVH, shunt infection, ICP monitoring	Gold standard for monitoring + drainage; risk of infection and over-drainage
VP shunt	Communicating/non-communicating hydrocephalus	Complications: **obstruction, infection (commonest early, Staph epidermidis)**, over-drainage (subdural), slit ventricles
ETV	Obstructive (non-communicating) hydrocephalus, e.g. aqueductal stenosis	Third ventricle floor fenestration; shunt-free
Craniotomy / burr hole	EDH / ASDH (craniotomy); chronic SDH (burr-hole drainage)	Chronic SDH: burr holes + drain
Decompressive craniectomy [+]	Refractory raised ICP	Last tier
Clipping vs coiling	Aneurysm	Coiling favoured in ISAT; clip for MCA/wide-neck
ACDF / laminectomy / discectomy	Cervical disc / lumbar stenosis / lumbar disc	Chapter 7
Gamma Knife	AVM, small vestibular schwannoma, trigeminal neuralgia, metastases	Stereotactic frame (OSCE 115)

Appendix B — CT / MRI / Spot-Diagnosis Atlas for the Mini-OSCE

The mini-OSCE shows an image with a short question. The images themselves are not reproduced here; this atlas tells you what each classic image looks like and what the examiner wants you to say. Features are standard descriptions ([+]).

Image	What you see	Say this
Epidural haematoma CT	**Biconvex (lens-shaped)** hyperdense lesion; does not cross suture lines	Temporal bone fracture → **middle meningeal artery**; emergency craniotomy
Acute subdural CT	**Crescentic** hyperdense, crosses suture lines, not the midline/falx	**Bridging veins**; midline shift; craniotomy if thick
Chronic subdural CT	**Crescentic hypodense or isodense** collection, elderly, mass effect	Burr-hole drainage; > 14 days
Diffuse axonal injury MRI	Small petechial haemorrhages at grey–white junction, corpus callosum, brainstem	Rotational acceleration; poor prognosis; CT may be normal
Contusion CT	Haemorrhagic foci in frontal/temporal poles; coup–contrecoup	Skull-floor surfaces; delayed enlargement
Skull X-ray: depressed fracture	Fracture fragments below the inner table	Elevation if depressed > thickness of the skull / compound
Raccoon eyes / Battle sign	Periorbital ecchymosis; mastoid bruise	**Basal skull fracture** (anterior fossa / middle fossa)
GBM	**Ring-enhancing** irregular lesion with necrosis, "butterfly" across the corpus callosum	Commonest malignant primary; poor prognosis
Meningioma	Extra-axial, **dural tail**, homogeneous enhancement, calcification	Commonest primary brain tumour; female ~2:1
Pituitary adenoma	Sellar/suprasellar mass ("snowman"), compresses chiasm	**Bitemporal hemianopia**; prolactinoma → bromocriptine
Craniopharyngioma	Calcified cystic suprasellar mass	Children; Rathke pouch remnant; bitemporal hemianopia
Vestibular schwannoma	Enhancing mass in the internal auditory meatus/CPA ("ice cream cone")	Sensorineural hearing loss; NF2 if bilateral
Medulloblastoma	Midline cerebellar mass (vermis), child; hydrocephalus	Drop metastases; radio- and chemosensitive
Hydrocephalus	Dilated ventricles (temporal horns, rounded frontal horns), transependymal oedema	Infant: **setting-sun sign**, bulging fontanelle, ↑ head circumference
SAH CT / DSA	Hyperdense blood in basal cisterns/Sylvian fissure; angiogram: **saccular aneurysm** (usually AComA)	Thunderclap headache; LP if CT negative > 6 h; xanthochromia
AVM	Tangle of vessels with draining vein; haemorrhage or seizures	Spetzler–Martin; most common: haemorrhage
Lumbar MRI	Disc material posterolateral at L4–5 / L5–S1 compressing the root	Name the level + the root (traversing root = lower vertebra)
Cervical MRI / X-ray	Multilevel stenosis with cord signal change; ACDF plate on X-ray	Myelopathy: Hoffman, Babinski
Myelomeningocele	Open lumbosacral sac with neural placode	Close within 24 h; folic acid; Chiari II + hydrocephalus
Foot drop / SLR photo	Dorsiflexion weakness; SLR positive 10–60°	L5 root; L4–5 disc

Appendix C — Numbers, Scales and Sheets for the Last Night

Everything you can memorise in 30 minutes. If you only open one page the night before, open this one.

Scale / number	Key values
★★★ **GCS**	Eyes 1–4, Verbal 1–5, Motor 1–6; **total 3–15**. Mild 13–15, moderate 9–12, severe ≤ 8 (Q19 key "3–7": pick it only if 3–8 is not offered). Motor: 6 obeys, 5 localises, 4 withdraws, 3 flexion (decorticate), 2 extension (decerebrate), 1 none. Verbal: 5 oriented, 4 confused, 3 words, 2 sounds, 1 none (T = tube). Eye: 4 spontaneous, 3 voice, 2 pain, 1 none
CPP	**CPP = MAP − ICP**; normal ICP 5–15 mmHg (> 20 treat); target CPP 60–70
Cushing triad	**Hypertension, bradycardia, irregular respirations**
★★★ **Hunt & Hess (SAH)**	1 asymptomatic/mild headache · 2 severe headache/nuchal rigidity, no deficit besides CN palsy · 3 drowsy, mild focal deficit · 4 stupor, hemiparesis · 5 coma/moribund
WFNS [+]	Based on GCS: 1 = 15; 2 = 13–14 without deficit; 3 = 13–14 with deficit; 4 = 7–12; 5 = 3–6
Fisher [+]	1 no blood · 2 diffuse thin (< 1 mm) · 3 thick clot/ > 1 mm · 4 IVH/ICH with diffuse or no SAH. Grade 3 = highest vasospasm risk (SAH Q24 "Grade 3")
Spetzler–Martin (AVM)	Size (< 3 cm = 1, 3–6 = 2, > 6 = 3) + eloquence (0/1) + deep drainage (0/1); grades 1–5
Meyerding (spondylolisthesis)	I < 25 %, II 25–50 %, III 50–75 %, IV 75–100 %, V spondyloptosis
Hydrocephalus numbers	CSF production ≈ 0.35 mL/min (≈ 500 mL/day), volume ≈ 150 mL; **85–90 %** of myelomeningocele patients develop hydrocephalus
Vasospasm	**Days 4–14** (peak 7–10); rebleeding highest in the first 24 h
Aneurysm	**Berry**: AComA commonest overall (30–35 %), then PComA, MCA bifurcation; multiple 15–20 %; **SAH commonest cause: ruptured aneurysm (85 %)**; **polycystic kidney, Ehlers–Danlos, coarctation** associations
Disc surgery	Lumbar discs L4–5/L5–S1 = 90–95 %; cervical C5–6 / C6–7; 90 % of low-risk back pain resolves in 1 month
Folic acid	0.4 mg/day preconception; 4–5 mg after previous NTD

Root-level / reflex sheet

Root	Motor	Sensory	Reflex
C5	Deltoid, biceps	Lateral upper arm	Biceps
C6	Wrist extensors, biceps	Thumb / index	Brachioradialis, biceps
C7	Triceps, wrist flexors	Middle finger	Triceps
C8	Finger flexors, hand grip	Ring / little finger	—
L3–L4	Quadriceps	Medial knee / shin (L4)	Knee jerk
L5	Ankle/big-toe dorsiflexion, foot drop	Dorsum of foot, hallux	None
S1	Plantar flexion	Lateral foot, sole	Ankle jerk

"Most common" list

Most common …	Answer
Primary brain tumour (adult)	**Meningioma** overall; **GBM** commonest malignant primary (past-paper conflict: see the discrepancy table in the exam-intelligence page)
Malignant brain tumour overall (incl. non-primary)	Metastasis; commonest **malignant childhood** = medulloblastoma (Q30 errata)
Spinal tumour	Metastasis; **intradural extramedullary** = meningioma/schwannoma; intramedullary = ependymoma (adults)
EDH site / vessel	Temporoparietal; **middle meningeal artery**
SDH vessel	Bridging veins
Cause of spontaneous SAH	Ruptured berry aneurysm
Hydrocephalus type in infants	Congenital (aqueduct stenosis) / post-haemorrhagic/ MM + Chiari II
Disc level	L4–5 / L5–S1; C5–6 / C6–7
Cervical spinal injury level	C5–C6 (vertebral) **[+]**

Eponymous signs and syndromes

Eponym	Meaning
Cushing triad	HTN, bradycardia, irregular breathing = raised ICP
Battle sign / raccoon eyes	Basal skull fracture (middle / anterior fossa)
Kernohan notch	Ipsilateral hemiparesis from contralateral herniation (false-localising)
Brown-Séquard	Hemisection: ipsilateral motor + proprioception; contralateral pain/temperature
Froin syndrome	Xanthochromic, high-protein CSF below a spinal block (Chapter 9)
Queckenstedt	Jugular compression normally ↑ CSF pressure; no rise = spinal block (OSCE key unclear, Chapter 8)
Hakim triad	NPH: gait disturbance, urinary incontinence, dementia ("wet, wobbly, wacky")
Parinaud	Upgaze palsy (pineal / hydrocephalus; setting-sun)
Lhermitte / Hoffman / Spurling	Electric shock on neck flexion · flick of the distal phalanx = UMN · neck compression reproduces arm pain (radiculopathy)
Foster Kennedy	Anosmia + ipsilateral optic atrophy + contralateral papilloedema (olfactory-groove meningioma)