ENT

MBBS Recap: high-yield notes for revision

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Revision notes for the MD/MS entrance: the ear, nose, throat, larynx and neck facts an examiner asks, with the modern practice beside the classic answer.

Ear anatomy and hearing tests

Anatomy worth knowing

- **External auditory meatus**: about 24 mm; **outer third cartilaginous (hair follicles, ceruminous glands), inner two thirds bony**. Furuncles occur only in the cartilaginous part because only it has hair follicles. The narrowest point is the isthmus in the bony part.
- **Sensory supply of the ear canal and drum**: auriculotemporal nerve (anterior), **auricular branch of the vagus (Arnold's nerve)** (posterior wall and floor), tympanic branch of the glossopharyngeal (Jacobson's nerve; inner surface of the drum and the whole middle ear mucosa through the tympanic plexus on the promontory). The facial nerve supplies a small patch in the concha (the site of zoster vesicles).
- **Arnold's ear-cough reflex**: stimulating the meatus (wax, syringing, speculum) provokes cough, or even syncope, through the vagal auricular branch.
- **Referred otalgia** follows the nerve of the source: teeth, oral cavity, TMJ and anterior tongue via V3; tonsil and pharynx via IX (tympanic branch); larynx and hypopharynx via X. **Adult with ear pain and a normal ear: examine the pharynx, larynx and hypopharynx for cancer.**
- **Middle ear**: tensor tympani (V3) and **stapedius (VII; the smallest skeletal muscle)**. The stapes is the smallest bone. Impedance matching (drum-to-footplate area ratio about 17:1 plus the ossicular lever) gives about 25–30 dB of gain; loss of this gain is why conductive loss is at most about 60 dB.
- **Hair cells**: inner hair cells (about 3,500; the true sensory cells, afferent signals) and outer hair cells (about 12,000; cochlear amplifier, motor protein prestin, produce **otoacoustic emissions**). Outer hair cells are more vulnerable to noise and ototoxic drugs.
- The cochlea is tonotopic: base high frequency, apex low frequency. The endolymph (scala media) is high in K^+ and is made by the stria vascularis.
- **Michel aplasia** (complete absence of the inner ear) and **Mondini dysplasia** (cochlea of about 1.5 turns; commonest congenital cochlear malformation) are the malformations asked; **Scheibe** is the commonest membranous (cochleosaccular) dysplasia; Alexander has a deficient basal turn.

Auditory pathway

Cochlear nerve, then **cochlear nuclei (dorsal and ventral)**, **superior olivary complex** (first site of binaural interaction and sound localisation; centre of the stapedial reflex), **lateral lemniscus**, **inferior colliculus**, **medial geniculate body**, auditory cortex (Heschl's gyrus). Above the cochlear nuclei each side carries signals from both ears, so a unilateral central lesion hardly impairs hearing.

Tuning fork tests

Test	Normal	Conductive loss	Sensorineural loss
Rinne (AC vs BC, same ear)	AC > BC, positive	**BC > AC, negative**	AC > BC, positive
Weber (midline)	central	**lateralises to the worse (affected) ear**	lateralises to the **better** ear
Absolute bone conduction	equals examiner	normal	shortened
Schwabach (meatus open)	equals examiner	lengthened	shortened

- **512 Hz** is the routine fork: lower forks give vibration and exaggerate bone conduction, higher ones fade too fast. 128 Hz is for vibration sense; 1024 Hz is the highest used.
- A **false-negative Rinne** appears in severe unilateral sensorineural loss: the stimulus crosses the skull by bone conduction and the better cochlea hears it. Weber (to the good ear) and masking sort it out.
- A negative Rinne means an air-bone gap of at least about 15–20 dB (512 Hz); Rinne can miss gaps below that.
- Weber is the most sensitive of the forks to a small difference between ears; Rinne gives the type of loss in each ear.

Audiometry

- **Pure tone audiometry** gives air and bone thresholds. The air–bone gap is conductive loss. **Hearing grades** (older ISO scale): 26–40 mild, 41–55 moderate, 56–70 moderately severe, 71–90 severe, over 90 profound. **WHO 2021** regraded it on the better-ear average of 0.5, 1, 2 and 4 kHz: normal under 20 dB, mild 20–34, moderate 35–49, moderately severe 50–64, severe 65–79, profound 80–94, complete 95 or more; **disabling loss is 35 dB or more** (moderate or worse, at any age).
- **Tympanometry** (impedance): **A** normal; **As** shallow (stiff: otosclerosis, malleus fixation, tympanosclerosis); **Ad** deep (flaccid: ossicular discontinuity, thin scar); **B** flat, read with the **equivalent ear canal volume**: normal volume = fluid (glue ear) or a middle ear mass; **large volume (over about 2 mL in an adult) = perforation or patent grommet**; small volume = wax or the probe against the canal wall; **C** peak at negative pressure (eustachian tube dysfunction, early or resolving effusion).
- **Acoustic (stapedial) reflex**: sound in one ear causes stapedius contraction in both. **Afferent limb VIII, central connections in the superior olivary complex, efferent limb VII.** Absent in otosclerosis and in facial palsy proximal to the

stapedius branch; reflex decay suggests retrocochlear disease.

- **Recruitment** is an abnormally rapid growth of loudness: a **cochlear** sign (Ménière's, noise). Tests: ABLB (Fowler), **SISI** (a high score, 70–100%, means recruitment; retrocochlear lesions score 0–20%), and an acoustic reflex threshold close to the hearing threshold. **Retrocochlear** lesions show abnormal tone decay, absent recruitment, a low SISI score and poor speech discrimination out of proportion to the pure tone loss.
- **Evoked otoacoustic emissions (OAE)** come from the **outer hair cells**. They are the newborn screen and are absent once loss exceeds about 30–40 dB and in middle ear effusion; they miss auditory neuropathy.
- **BERA (ABR)**: seven waves in 10 ms; **wave V is the most robust** and is followed to the threshold. Generators, **exam answer (Dhingra, "E COLI")**: I **E**ighth nerve, II **C**ochlear nucleus, III superior **O**livary complex, IV **L**ateral lemniscus, V **I**nferior colliculus. **Current physiology** (Møller; Scott-Brown): I distal and II proximal cochlear nerve, III cochlear nucleus, IV superior olivary complex, **V the lateral lemniscus where it ends in the inferior colliculus**; give whichever the options allow. Uses: infant and uncooperative-patient thresholds, retrocochlear lesions (prolonged I–V interval), coma. ASSR and ECochG are other objective tests; ECochG (SP/AP ratio raised) supports Ménière's.
- **Newborn screening** (OAE, then ABR): screen by 1 month, diagnose by 3, intervene by 6.
- **Non-organic (feigned) hearing loss**: the **Stenger test** detects a feigned **unilateral** loss. Only the louder of two identical tones given to both ears at once is heard; a tone just above threshold in the good ear and louder in the "deaf" ear is heard only in the "deaf" ear, so a malingerer denies hearing anything although the good ear alone would hear it. Others: **Lombard** (noise in the good ear makes a person with a truly deaf other ear raise the voice), Erhardt, delayed speech feedback, and objectively **ABR, ASSR and OAEs**, which settle the true thresholds.

Common causes of hearing loss

- **Noise-induced hearing loss**: a **notch at 4000 Hz** (3–6 kHz) in **both air and bone curves**, starting with high frequencies; Carhart's notch of otosclerosis is at 2000 Hz in bone conduction only. WHO's community guideline is 70 dB (24-hour average) to avoid damage; the occupational limit is about 85 dB for 8 hours (NIOSH). Impulse noise above about 140 dB (blasts, gunfire) injures the ear at once (acoustic trauma).
- **Presbycusis**: the commonest sensorineural loss of the elderly, bilateral high-frequency downslope.
- **Sudden SNHL**: at least 30 dB over three contiguous frequencies within 72 hours; **oral steroids within 2 weeks** (prednisolone about 1 mg/kg a day, up to 60 mg, for 7–14 days), intratympanic steroid as salvage at 2–6 weeks, hyperbaric oxygen with steroids an option within 2 weeks, or within 1 month as salvage (AAO-HNS 2019; the 2012 version allowed 3 months); MRI (or ABR) to exclude a vestibular schwannoma.
- **Ototoxic drugs**: aminoglycosides (cochleotoxic: neomycin, amikacin, kanamycin; vestibulotoxic: streptomycin, gentamicin), cisplatin, loop diuretics, salicylates and quinine (the last two usually reversible).
- **Cochlear implant**: severe to profound bilateral sensorineural loss with little hearing aid benefit; early (about 12 months) in children. **Absolute contraindication: Michel aplasia** (no cochlear lumen for the electrode array) and absent cochlear nerve; such patients need an auditory brainstem implant. **After vestibular schwannoma removal**: a cochlear implant if the cochlear nerve is anatomically preserved; an **auditory brainstem implant** (electrodes on the cochlear nucleus in the lateral recess of the fourth ventricle) when the nerve is cut, classically in **NF2** with both nerves lost. Active middle ear infection is a temporary contraindication.
- **Conductive causes at a glance**: wax, otitis externa, perforation, otitis media, otosclerosis, ossicular discontinuity.

External ear conditions

Condition	Key facts
Furunculosis	Staphylococcus aureus, outer (hairy) canal; pain on tragal pressure or pulling the pinna, normal drum, scanty discharge
Diffuse otitis externa	Pseudomonas; treated with aural toilet and topical quinolone ± steroid
Otomycosis ("Singapore ear")	**Aspergillus niger: black or grey-black wet "blotting-paper" debris**; A. fumigatus green; Candida white; itching, fullness; aural toilet and topical antifungals (clotrimazole)
Malignant (necrotising) otitis externa	elderly diabetic or immunocompromised; Pseudomonas; severe night pain, granulation at the bony–cartilaginous junction (pathognomonic), facial nerve first cranial nerve involved; Tc-99m bone scan for diagnosis, gallium for follow-up; long antipseudomonal course (ciprofloxacin, ceftazidime)
Cauliflower (boxer's, wrestler's) ear	untreated auricular haematoma (blunt trauma) leads to cartilage necrosis and fibrosis; drain and use pressure dressing
Bullous myringitis	painful haemorrhagic bullae on the drum; classically viral or Mycoplasma (exam answer); cultures now show mostly the organisms of acute otitis media, chiefly S. pneumoniae, so it is treated as AOM; may add SNHL
Impacted wax	hearing loss, fullness, cough (Arnold's reflex); softening drops, then syringing, curette or microsuction; **no syringing with a perforation** or a past mastoid cavity
Keratosis obturans	young, often bilateral; a laminated keratin plug widening the bony canal, with bronchiectasis and sinusitis; differs from **canal cholesteatoma** (older, unilateral, bone erosion of the floor)

- **Pre-auricular sinus**: a developmental defect from incomplete fusion of the hillocks of His (first and second arches), at the **root (ascending limb) of the helix**, just in front of the ear; often bilateral and familial; recurrent infection treated by excision of the whole tract. **Perichondritis** follows trauma or surgery, with Pseudomonas, and a red, tender pinna sparing the lobule; it needs an antipseudomonal quinolone, and drainage of any abscess.
- **Otitic barotrauma**: Eustachian tube fails to equalise during descent of a flight or diving; ear pain, retracted drum and middle-ear effusion or haemotympanum (Teed grading); once the pressure difference reaches about 90 mmHg the tube locks shut; treat with decongestants, Valsalva (only if safe) and grommet or myringotomy; delay flying during an upper respiratory infection.
- **Exostoses ("surfer's ear")**: multiple, bilateral, sessile bony swellings of the deep bony canal after repeated cold-water exposure; an osteoma is single and pedunculated. Removed (drill) only if they block the canal or trap wax and water.

- **Septal haematoma**: see Nose; drain at once, since cartilage necrosis (saddle nose) follows.
- **Foreign body in the ear**: children; live insects are killed first (mineral oil or lignocaine), then syringing; **never syringe vegetable matter or a button battery** (swells; burns). Hooks or loops for hard round bodies; general anaesthesia for an uncooperative child.

Otitis media, complications, cholesteatoma and otosclerosis

Acute otitis media (ASOM)

- **Commonest organism: Streptococcus pneumoniae**, then non-typeable Haemophilus influenzae and Moraxella catarrhalis; viral triggers. The pneumococcal conjugate vaccine has lowered the burden.
- **Children are prone** because the eustachian tube is **short (about 18 mm vs 36 mm), wider and more horizontal**, adenoids sit near its mouth, and immunity is immature; bottle-feeding supine and smoke exposure add to risk.
- **Stages**: tubal occlusion, hyperaemia ("cartwheel" vessels), **suppuration (bulging drum, "lighthouse" pulsation)**, resolution, coalescence (mastoid), complications.
- **Treatment** (AAP 2013): analgesia; **amoxicillin 80–90 mg/kg/day** at once for infants under 6 months, severe disease (toxic, otalgia over 48 hours, fever 39 °C or more), otorrhoea, and bilateral AOM under 2 years; **watchful waiting** for 48–72 hours allowed for non-severe unilateral AOM at 6–23 months and non-severe AOM from 2 years; amoxicillin–clavulanate if it fails or after amoxicillin in the past 30 days. **Myringotomy** is for a bulging drum with severe pain, an unresolving drum with persistent deafness despite antibiotics, or complications: a curvilinear cut in the **posteroinferior** quadrant for ASOM, where the bulge is greatest, away from the ossicles and chorda tympani of the posterosuperior quadrant (a high jugular bulb in the floor is the hazard); a radial cut in the **anteroinferior** quadrant for a grommet in glue ear. The perforation of ASOM is small and central, in the pars tensa.

Otitis media with effusion (glue ear)

Conductive loss of about 20–40 dB, **type B tympanogram**, dull retracted drum with fluid level or bubbles. **Watch for 3 months** (most resolve). **If persistent bilateral effusion with loss of about 25–30 dB or more**, insert **grommets (ventilation tubes)** by myringotomy, with adenoidectomy when the child is 4 or older or has nasal obstruction or chronic adenoiditis (AAO-HNS 2016; NICE NG233, 2023, adds hearing aids as an alternative to grommets). In an adult with **unilateral** persistent effusion always examine the nasopharynx (carcinoma).

Chronic suppurative otitis media (CSOM)

	Tubotympanic (mucosal, "safe")	Atticoantral (squamosal, "unsafe")
Disease site	anteroinferior (mesotympanum, tube)	posterosuperior (attic, antrum, mastoid)
Perforation	central, annulus preserved (pars tensa)	marginal or attic (pars flaccida)
Discharge	profuse, mucoid, odourless, intermittent	scanty, purulent, foul, continuous, may be bloody
Pathology	mucosal, no cholesteatoma	**cholesteatoma**, granulation, osteitis
Complications	rare	common

Treatment: aural toilet and **topical fluoroquinolone** drops for mucosal disease, then myringoplasty or tympanoplasty (Wullstein types I to V) once dry; surgery for squamosal disease. **Investigation of choice before surgery: HRCT of the temporal bone** (scutum, ossicular, tegmen, sigmoid plate and facial canal erosion, a lateral canal fistula); MRI is added for suspected intracranial spread. An **aural polyp** is never avulsed: it may arise from or hide an exposed facial nerve, a dehiscent canal or a glomus; remove it under the microscope and send it for histology.

Cholesteatoma

- **Keratinising squamous epithelium in the middle ear** that erodes bone. **Commonest site: Prussak's space (attic).**
- **Theories**: **invagination or retraction pocket of the pars flaccida (Wittmaack; the most accepted for attic disease)**, epithelial invasion (Habermann), basal cell hyperplasia (Ruedi), squamous metaplasia (Sade).
- **Sade's grades of pars tensa retraction**: I slight retraction; II touching the incus or stapes; III atelectasis touching the promontory but not adherent; IV adhesive (adherent).
- Features: **foul scanty discharge, white debris in a retraction pocket**, conductive loss. Eroded ossicles (the long or lenticular process of the incus first), lateral canal fistula (commonest site) and the tegmen are the bony targets.
- Imaging: HRCT temporal bone; **non-echo-planar diffusion-weighted MRI** finds residual or recurrent disease. **Definitive treatment is surgery: tympanomastoidectomy**, canal wall up (intact canal; more recurrences, better anatomy) or canal wall down (modified radical; lower recurrence, mastoid cavity care).

Complications of otitis media

- **Extracranial**: acute mastoiditis (postauricular swelling, pinna pushed forward and down; sagging of the posterosuperior meatal wall), subperiosteal abscess, **Bezold's abscess** (pus breaks through the thin medial side of the mastoid tip and tracks **deep to sternocleidomastoid** into the upper neck), **Citelli's** (along the **posterior belly of digastric**, into the digastric triangle and occipital region), **Luc's** (exam answer, as Indian texts teach it: a **subperiosteal abscess in the deep meatus bulging its posterior or posterosuperior wall, without mastoid tenderness**; Luc's own 1913 description and current literature: subperiosteal **deep to temporalis**, from the middle ear through the notch of Rivinus), zygomatic abscess, **petrositis**, labyrinthitis, facial palsy.
- **Gradenigo's syndrome**: ear discharge, **deep retro-orbital pain (V)** and **diplopia on lateral gaze from abducens palsy at Dorello's canal**.
- **Intracranial**: meningitis, extradural and subdural abscess, **brain abscess (commonest site: temporal lobe**, then cerebellum), **lateral sinus thrombosis**, otitic hydrocephalus.
- **Lateral sinus thrombophlebitis**: hectic "picket-fence" fever, **Griesinger's sign** (oedema over the mastoid emissary), Tobey–Ayer and Crowe–Beck jugular compression tests; **"delta sign" on plain CT is a dense clot, the "empty delta sign" on contrast CT is an enhancing wall round non-**

enhancing thrombus; treat with mastoidectomy and IV antibiotics (anticoagulation is debated).

- The Chandler-type orbital grading is for sinusitis, not ear disease.

Otosclerosis

- **Autosomal dominant with reduced penetrance**; commonest in young adult women, **worsens in pregnancy**; bilateral painless progressive **conductive** loss, tinnitus, paracusis Willisii (hears better in noise).
- **Commonest site: fissula ante fenestram** (anterior to the oval window); stapedial otosclerosis is the commonest type; cochlear otosclerosis (foci in the otic capsule round the cochlea) causes sensorineural loss and a **double-ring (halo) sign** on HRCT; the round window niche is the second commonest site.
- Signs: normal drum, **Rinne negative, Weber to the worse ear**, **Carhart's notch at 2000 Hz** in bone conduction, **tympanogram type As**, absent stapedial reflex. **Schwartz sign** (pink flush on the promontory) marks active disease. Van der Hoeve syndrome: otosclerosis, osteogenesis imperfecta, blue sclera.
- **Treatment: stapedotomy with a piston prosthesis** (laser or drill fenestra of the footplate; safer than total stapedectomy), or a hearing aid. Sodium fluoride may slow active or cochlear disease.

Glomus tumours and other points

- **Glomus tympanicum**: from glomus bodies along **Jacobson's nerve on the promontory** (IX); glomus jugulare from the jugular bulb along Arnold's nerve (X). Benign, vascular, the commonest benign middle ear tumour. **Pulsatile tinnitus**, red "rising sun" mass behind the drum, **Brown's sign** (blanches on Siegel pressure), Aquino's sign (blanches on carotid compression). Jugulare extends to IX, X, XI (Vernet's syndrome). HRCT and contrast MRI ("salt and pepper"); embolise, then surgery or stereotactic radiosurgery. Head and neck paragangliomas are **hereditary in up to 30–40%** (SDHD commonest, then SDHB; multiple tumours in familial cases); only a few secrete catecholamines, so screen plasma metanephrines before surgery.
- **Tuberculous otitis media**: painless, scanty, watery otorrhoea that does not respond to antibiotic drops, **multiple perforations** of the pars tensa (the classic sign, though they soon fuse into one large perforation and are seldom seen now), **pale granulation tissue** filling the middle ear, hearing loss out of proportion to the disease (sensorineural if the labyrinth is involved) and **early facial palsy** (especially in children); diagnose by biopsy of the granulations (histology, culture, PCR or Xpert) with chest imaging, and treat with standard antituberculous drugs.
- **Traumatic perforation** (a slap, blast or cotton bud): **keep the ear dry**, no syringing and no drops unless it becomes infected; most heal by themselves within about 3 months, and myringoplasty is for those that do not. Vertigo, a sensorineural loss or nystagmus after the injury suggests stapes subluxation or a perilymph fistula and needs early exploration.
- **Blue drum**: haemotympanum (trauma) or **cholesterol granuloma** (a chronic effusion; brownish fluid with cholesterol crystals); a glomus is a red mass behind the drum.
- **Tympanosclerosis**: chalky hyaline plaques in the drum and middle ear after past infection or grommets; a white crescent on the drum, conductive loss if the ossicles are fixed. In CSOM the ossicle that necroses first is the **long (lenticular) process of the incus**.
- **Malignant (necrotising) otitis externa** (table under Ear): the danger is **skull-base osteomyelitis**; Pseudomonas aeruginosa (Aspergillus in some immunocompromised patients) spreads from the canal floor through the **fissures of Santorini** (cartilaginous canal) and the bony-cartilaginous junction to the skull base, the stylomastoid foramen (**facial nerve first**) and the jugular foramen (IX–XI); CT shows bone erosion, MRI the soft tissue; weeks of antipseudomonal therapy (ciprofloxacin, or intravenous ceftazidime) with strict glucose control.

Facial nerve and vertigo

Facial nerve anatomy and tests

- **Segments in the temporal bone**: meatal (about 8 mm, in the internal auditory canal), **labyrinthine (about 4 mm; the narrowest segment, so swelling compresses the nerve there first)**, tympanic (horizontal, above the oval window; often dehiscent), mastoid (vertical).
- Branches: **greater petrosal nerve (first branch, at the geniculate ganglion)**, nerve to stapedius, **chorda tympani** (taste of the anterior two thirds of the tongue and submandibular and sublingual secretion; leaves by the petrotympanic fissure), then at the stylomastoid foramen the posterior auricular nerve, nerves to the posterior belly of digastric and stylohyoid, then the five terminal branches in the parotid (temporal, zygomatic, buccal, mandibular, cervical). **The facial nerve does not supply the parotid** (that is the glossopharyngeal secretomotor route).
- **Topognostic tests (site of lesion)**: **Schirmer** (tears) abnormal proximal to the geniculate ganglion; **stapedial reflex** abnormal proximal to the stapedius branch; **taste and salivary flow** abnormal proximal to the chorda tympani; all normal at or beyond the stylomastoid foramen.
- **House-Brackmann grading**: I normal; II mild weakness; III obvious weakness, eye closes with effort, not disfiguring; IV disfiguring asymmetry, cannot close eye; V barely perceptible movement; VI no movement.
- **Sunderland grades**: I neurapraxia; II axon only; III axon and endoneurium; IV all but epineurium; V transection. I–II recover, IV–V need surgery.

Facial palsy syndromes

Syndrome	Features
Bell's palsy	commonest cause of LMN palsy; idiopathic, HSV-1 reactivation; peaks within 48 hours
Ramsay Hunt	**varicella zoster reactivation in the geniculate ganglion**; vesicles in the concha and ear canal, pain, may add SNHL and vertigo; worse prognosis than Bell's
Melkersson–Rosenthal	recurrent facial palsy, granulomatous cheilitis (lip swelling), fissured tongue
Heerfordt (uveoparotid fever)	sarcoidosis: parotid enlargement, uveitis, facial palsy
Möbius	congenital bilateral facial and abducens palsy
Frey's (auriculotemporal) syndrome	gustatory sweating after parotid surgery: **aberrant regeneration of parasympathetic fibres of the auriculotemporal nerve** into sweat glands; Minor's starch-iodine test; botulinum toxin

Syndrome	Features
Bogorad's (crocodile tears)	gustatory lacrimation after facial palsy recovery

- **Bell's palsy treatment**: **oral prednisolone about 50–60 mg for 10 days, started within 72 hours** (AAN 2012; AAO-HNS 2013); an antiviral adds little; eye care (artificial tears, night ointment, taping) always. About 70–85% recover fully. Ramsay Hunt: steroids plus valaciclovir or aciclovir.
- **Temporal bone fractures** (exam classification): **longitudinal** (about 80%; from a temporoparietal blow; ear canal and drum tear, conductive loss, facial palsy in about 20%, usually delayed) versus **transverse** (about 20%; frontal or occipital blow; **sensorineural loss and vertigo, facial palsy in about 50%, often immediate and permanent**, intact drum, haemotympanum). **Current practice classifies them as otic capsule-sparing or otic capsule-violating**, which predicts SNHL, CSF leak and facial palsy better. Signs of the base-of-skull fracture by fossa: **anterior**, periorbital ("raccoon") bruising and CSF rhinorrhoea (see Nose); **middle (petrous temporal)**, CSF otorrhoea, haemotympanum, VII and VIII palsies (VI at the petrous apex); **mastoid bruising (Battle's sign)**, which appears after a day or two, is taught in MCQs as the posterior fossa's sign and in surgical texts as a petrous temporal (middle fossa) fracture's.
- **Traumatic palsy**: steroids and eye protection for all. **Observe** if palsy is delayed, incomplete (House-Brackmann II–V) or ENoG shows under 90% degeneration. **Explore and decompress** if onset is immediate and complete, **ENoG shows over 90% degeneration within about 3–14 days**, and EMG shows no voluntary units. Penetrating parotid wounds are explored at once. Repair: **neurorrhaphy within 72 hours** (distal stump still stimulates), cable graft (greater auricular or sural) for a gap, nerve transfer (hypoglossal or masseteric) for chronic cases after 12–18 months.
- **Timing of ENoG**: **Wallerian degeneration takes 2–3 days to appear**, so a test in the first 72 hours underestimates the damage; do ENoG at 3–5 days, EMG at 10–14 days, CT at once for the fracture.

Vestibular physiology

- **Semicircular canals** sense angular (rotational) acceleration; **the macula of the utricle senses linear acceleration in the horizontal plane (a car accelerating forwards, tilt of the head)**; the macula of the saccule senses vertical linear acceleration (a lift).
- **Nystagmus** is named by its fast phase, which is the corrective flick. In an acute **destructive** peripheral lesion the slow drift is toward the lesion and the **fast phase beats away from the weak ear**: right-beating horizontal nystagmus means a **left** peripheral loss. Irritative lesions (early Ménière's, BPPV) beat toward the affected ear.
- Vertical canals (posterior and superior) give vertical-torsional nystagmus; the horizontal canal or a whole labyrinth gives horizontal nystagmus.
- **Caloric test (horizontal canal)**: **COWS**: cold water, nystagmus to the Opposite side; warm, Same side. Fitzgerald–Hallpike bithermal test: 30 °C and 44 °C water, head 30° up so the horizontal canal is vertical. A reduced response ("canal paresis") means a hypofunctioning labyrinth; **directional preponderance** means the nystagmus is stronger to one side.
- **Peripheral vs central**: peripheral nystagmus is horizontal-torsional, one direction, suppressed by visual fixation, fatigable, with severe nausea. Central is vertical or direction-changing, not suppressed, with other neurological signs; use the **HINTS** exam (head impulse, nystagmus, test of skew) for acute vertigo with spontaneous nystagmus, since it beats early MRI for stroke.

BPPV

- Commonest cause of vertigo; **posterior semicircular canal** in about 85–90%. Brief spells (under a minute) on turning in bed or looking up.
- **Dix–Hallpike**: **upbeating, torsional nystagmus toward the undermost ear, with a latency of a few seconds, lasting under a minute, fatiguing on repetition**. Horizontal canal BPPV is diagnosed by the supine roll test.
- **Treatment: Epley's canalith repositioning manoeuvre** (Semont is an alternative; barbecue roll or Lempert for horizontal canal). Drugs have no role in the spells.

Ménière's disease

- Endolymphatic hydrops: **fluctuating low-frequency SNHL, tinnitus, episodic vertigo (20 minutes to 12 hours), aural fullness** (Bárány 2015 criteria). Audiogram rises in the early stage, then flattens.
- Variants: **Lermoyez** (hearing improves with the attack), **Tumarkin otolithic crisis** (sudden fall without loss of consciousness), diplacusis, **Tullio phenomenon** (**vertigo and nystagmus provoked by loud sound**; also in superior canal dehiscence, perilymph fistula, congenital syphilis and a fenestration cavity with a mobile footplate: a "third window" lets sound move the endolymph).
- **Hennebert's sign**: pressure on the tragus produces vertigo and nystagmus in Ménière's or congenital syphilis: a **false-positive fistula test** (no actual fistula, the saccule is adherent to the stapes footplate). A true positive fistula test occurs with a cholesteatoma eroding the lateral canal; a false negative with a dead labyrinth.
- Treatment: low-salt diet, betahistine (the classic answer; the BEMED trial, 2016, found it no better than placebo), diuretics, **intratympanic steroid**, **intratympanic gentamicin** (chemical labyrinthectomy), endolymphatic sac surgery, vestibular nerve section, labyrinthectomy.

Vestibular neuritis and labyrinthitis

- **Vestibular neuritis**: often after a viral upper respiratory infection; **abrupt, continuous vertigo for days** with vomiting, **spontaneous horizontal-torsional nystagmus beating away from the affected ear**, an **abnormal head impulse test toward it** (corrective saccade), falling toward it, and **normal hearing**. **With hearing loss as well, it is labyrinthitis** (viral; bacterial labyrinthitis comes from otitis media or meningitis and is suppurative). Commonly the superior vestibular nerve.
- In acute continuous vertigo, a **normal head impulse test, direction-changing nystagmus or skew deviation points to a stroke** (HINTS, above), not neuritis.
- Treatment: vestibular suppressants (prochlorperazine, cinnarizine) for **no more than about 3 days**, early mobilisation and **vestibular rehabilitation**, which speeds central compensation; steroids within 3 days improve caloric recovery but not long-term symptoms (Cochrane 2011), so they are optional.

Vestibular schwannoma (acoustic neuroma)

- Arises from the **vestibular nerve, not the cochlear** (classic texts: the superior division; surgical series now find the

inferior division more often) at the glial–Schwann junction (Obersteiner–Redlich zone) in the internal auditory canal; the commonest benign cerebellopontine angle tumour. **Unilateral progressive SNHL, tinnitus, poor speech discrimination out of proportion**, then imbalance. The corneal reflex (V) is the first reflex lost; **Hitzelberger's sign** is hypoaesthesia of the posterosuperior meatal wall (facial nerve sensory fibres).

- **Investigation of choice: contrast MRI of the internal auditory canals (T1 gadolinium, high-resolution T2)**: "ice-cream cone"; BERA screens (prolonged I–III and I–V intervals; an interaural wave V difference over 0.2 ms). Antoni A (with Verocay bodies) and B areas, S-100 positive. **Bilateral tumours mean NF2** (chromosome 22, merlin; renamed **NF2-related schwannomatosis**, 2022); bevacizumab can shrink growing NF2 tumours.
- Management: observation for small tumours in the elderly, stereotactic radiosurgery for small and medium ones, microsurgery (translabyrinthine, retrosigmoid, middle fossa) for larger ones.

Nose, sinuses and epistaxis

Anatomy and drainage

- **Lateral wall**: three turbinates (the inferior is a separate bone). The **middle meatus** receives the frontal sinus, **maxillary sinus** and anterior ethmoid cells through the **ostiomeatal complex** (hiatus semilunaris, infundibulum, uncinate process, ethmoid bulla). This is why a single block there can cause disease in several sinuses, and why functional endoscopic sinus surgery (FESS) opens the complex rather than the sinuses.
- **Posterior ethmoid sinus → superior meatus. Sphenoid → sphenoethmoidal recess. Nasolacrimal duct → inferior meatus.**
- Septum: quadrilateral cartilage, perpendicular plate of ethmoid, vomer. Haller cells lie in the orbital floor; Onodi cells (posterior ethmoid) abut the optic nerve.
- **Nasal valve**: the **internal nasal valve** (between the septum and the caudal edge of the upper lateral cartilage, an angle of about 10–15°) is the **narrowest part of the airway** and gives most of its resistance. **Cottle test**: drawing the cheek laterally opens it; relief of obstruction means **valve narrowing or inspiratory collapse** (after rhinoplasty, ageing, a deviated caudal septum). Treated by spreader grafts or lateral wall support, not by turbinate surgery alone.
- **Septal perforation**: commonest after septal surgery and trauma (nose picking); also cocaine, chrome and other industrial fumes, long-term nasal steroid or decongestant sprays, granulomatosis with polyangiitis, and infection: **tuberculosis and leprosy perforate the cartilaginous septum, syphilis (gumma) the bony septum** (with saddle nose). Small anterior ones whistle; a biopsy of the edge is taken when the cause is unclear.
- **Development**: maxillary and ethmoid sinuses are present at birth; sphenoid appears at about 5 years; frontal (last) at about 7 years. Maxillary is largest and, in adults, the commonest sinus in sinusitis; ethmoid in children. Frontal sinus is the commonest site of mucocele and of osteomyelitis (Pott's puffy tumour).
- **Imaging**: CT (HRCT or non-contrast CT PNS) is the investigation of choice; Water's (occipitomental) view is best for the maxillary sinus, Caldwell's for frontal and ethmoid, submentovertical for sphenoid.

Epistaxis

- **Anterior epistaxis**: **Kiesselbach's plexus on the anterior septum** (Little's area), from nose picking, dry air or trauma. **Posterior** bleeding, in older hypertensive patients, comes from the **sphenopalatine artery** (the artery of epistaxis) via Woodruff's plexus.
- **Kiesselbach's plexus is made by four arteries**: anterior ethmoidal, sphenopalatine (septal branch), greater palatine and the septal branch of the superior labial (Dhingra; Gray's). The posterior ethmoidal supplies the upper septum and is added in some lists of the septum's arteries, not the plexus.
- **First step: sit upright and lean forward, pinch the soft (cartilaginous) part of the nose for 10–15 minutes**, with ice, and spit out blood; do not tilt the head back. Then a decongestant spray (oxymetazoline) and topical tranexamic acid, **silver nitrate or electrocautery** for a visible bleeding point, anterior packing or an expandable sponge, and a balloon or posterior pack for posterior bleeds. If bleeding persists: **endoscopic sphenopalatine artery ligation (or clipping)** (AAO-HNS 2020: assess for arterial ligation or embolisation when packing or cautery fails), internal maxillary artery embolisation, and ethmoidal artery ligation (the ethmoidals are from the internal carotid system via the ophthalmic artery). The internal carotid is never ligated.
- Look for causes in adults: hypertension, anticoagulants, hereditary haemorrhagic telangiectasia (Curaçao criteria), tumours; in a boy, think juvenile angiofibroma.

CSF rhinorrhoea

- Commonest cause: trauma (an **anterior cranial fossa fracture**, with bilateral periorbital "raccoon eye" bruising, CSF rhinorrhoea and anosmia); commonest sites cribriform plate and fovea ethmoidalis; organism in meningitis **Streptococcus pneumoniae**.
- Features: clear, watery, unilateral, **increases on bending forward (reservoir or teapot sign)**, salty, glucose over about 30 mg/dL (about two thirds of blood), halo ("double-ring") sign on blotting paper.
- **Confirm that the fluid is CSF: beta-2 transferrin (or beta-trace protein)**, the specific test. **To locate the defect: HRCT of the skull base**, then MR (T2) or CT cisternography when unclear; intrathecal fluorescein shows the leak during surgery. The textbook "investigation of choice" depends on the question: confirm = beta-2 transferrin; localise = HRCT.
- Management: conservative for about 1–2 weeks (head up, avoid straining, acetazolamide, lumbar drain if needed), then **endoscopic repair** with graft for persistence or a high-flow leak.

Polyps and inflammatory disease

	Antrochoanal polyp	Ethmoidal polyp
Age	children, young adults	adults
Side	**unilateral, single**	bilateral, multiple
Origin	**maxillary sinus mucosa, through the accessory ostium** into the middle meatus, then the choana	ethmoid sinuses, middle meatus
Cause	infection	allergy, eosinophilic CRS
Recur-rence	uncommon	frequent

	Antrochoanal polyp	Ethmoidal polyp
Treatment	endoscopic removal including the antral stalk	steroids, endoscopic ethmoidectomy

- **Samter's triad (aspirin-exacerbated respiratory disease)**: **nasal polyps, asthma and aspirin (NSAID) intolerance**.
- **Chronic rhinosinusitis** (over 12 weeks; EPOS 2020): CRS with or without polyps; type 2 inflammation. Treatment: saline, intranasal steroids, short oral steroids, FESS; for severe polyposis **biologics** (dupilumab, omalizumab, mepolizumab). A unilateral polyp in an adult needs biopsy (inverted papilloma, cancer, encephalocele).
- Orbital complications of sinusitis (**Chandler**): I preseptal cellulitis, II orbital cellulitis, III subperiosteal abscess, IV orbital abscess, V cavernous sinus thrombosis. Ethmoid sinusitis causes most orbital complications.
- **Atrophic rhinitis (ozaena)**: Klebsiella ozaenae, poverty, wide roomy nose with crusts and **foul smell that the patient cannot smell, because the olfactory mucosa has atrophied (anosmia, "merciful anosmia")**; saline or alkaline douches, local antibiotics; Young's operation (closing the nostril) in resistant cases. Empty nose syndrome is iatrogenic after excess turbinectomy.
- **Rhinoscleroma**: Klebsiella rhinoscleromatis; Mikulicz cells and Russell bodies; stages atrophic, granulomatous, cicatricial; treated with tetracycline or ciprofloxacin. **Rhinosporidiosis**: Rhinosporidium seeberi (an aquatic protist of the Mesomycetozoea, not a true fungus, so antifungals fail), a friable, bleeding polypoid "strawberry" mass with white spots (sporangia) after bathing in stagnant water (endemic in South Asia); **wide excision with cautery of the base**; recurrence is common, and **dapsone** after surgery is used to reduce it (small series only).
- **Allergic fungal rhinosinusitis**: eosinophilic mucin ("peanut butter"), double density on CT, Bipolaris; surgery plus steroids. **Rhinitis medicamentosa**: rebound congestion after topical decongestants (oxymetazoline, xylometazoline) are used beyond about 5–7 days; **stop the drops** (one nostril at a time if needed) **and give an intranasal steroid**, with a short oral steroid course in severe cases; turbinate reduction only if a structural cause remains. **Rhinophyma** ("potato nose"): sebaceous gland and connective tissue overgrowth of the nasal tip in late rosacea, mostly in men; not alcohol's doing; shaved down by scalpel, CO_2 laser or electrosurgery. Allergic rhinitis: intranasal steroid first line, then antihistamines, immunotherapy for selected patients (ARIA).
- **Acute invasive fungal sinusitis (mucormycosis)**: Rhizopus; in **diabetic ketoacidosis** or immunosuppression (an epidemic with COVID-19 and steroids). Facial pain, **black necrotic eschar on the turbinate or palate**, orbital swelling, vision loss. Aseptate, broad, ribbon-like hyphae branching at right angles. **Emergency: surgical debridement plus liposomal amphotericin B**, with control of the diabetes; posaconazole or isavuconazole for step-down.

Tumours and fractures

- **Osteoma** is the commonest benign sinus tumour, **in the frontal sinus**. Inverted papilloma (commonest benign nasal cavity tumour; lateral wall; malignant change in about 10%) needs endoscopic or medial maxillectomy. **Squamous cell carcinoma** is the commonest malignant tumour (maxillary sinus commonest). **Ohngren's line** (medial canthus to the angle of mandible): tumours above it do worse. Hardwood dust causes ethmoid adenocarcinoma. Esthesioneuroblastoma arises from the olfactory epithelium.
- **Nasal bone is the most fractured facial bone**; reduce within about 7–10 days after the swelling settles, and always exclude a **septal haematoma** (drain it: cartilage necrosis causes saddle nose).
- **Foreign body in the nose**: **unilateral foul, blood-stained discharge in a child is a foreign body until proved otherwise**; button batteries and **paired magnets** are emergencies (septal necrosis); remove with a hook past the object, never push it back.
- **Le Fort fractures**: **I** (Guérin) low transverse, floating palate; **II pyramidal, apex at the nasofrontal suture, floating maxilla**; III craniofacial disjunction (floating face), most often with CSF rhinorrhoea. The mandible and zygoma (tripod or zygomaticomaxillary complex fracture) come next; among midface fractures the zygoma is second only to the nasal bones. **Blowout fracture**: orbital floor, inferior rectus entrapment, **"teardrop" sign on Water's view**, enophthalmos, diplopia on upgaze, cheek numbness (infraorbital nerve); CT is the investigation of choice.

Nasopharynx, oral cavity and pharynx

Nasopharyngeal carcinoma (NPC)

- Commonest malignant tumour of the nasopharynx; **commonest site the fossa of Rosenmüller (pharyngeal recess)**. **EBV-associated**, squamous histology (WHO: keratinising, non-keratinising, basaloid); common in southern China and South-East Asia, with a bimodal age pattern (teens and 50–60 years). Plasma EBV DNA helps screening and follow-up.
- **Commonest presentation: a neck node, upper jugular (level II) and posterior triangle (level V)**, often bilateral. Other presentations: **unilateral serous otitis media (eustachian tube block)**, nasal blockage, epistaxis, cranial nerve palsies (III–VI through the cavernous sinus, **VI the commonest**; IX–XII through the parapharyngeal space).
- **Trotter's triad (sinus of Morgagni syndrome)**: **conductive deafness (tube block), temporoparietal neuralgia (V3) and palatal paralysis (X)**. Samter's triad (polyps, asthma, aspirin sensitivity) is in the nose notes; do not mix them.
- **An adult with unilateral persistent serous otitis media, or an upper jugular node, needs nasopharyngeal endoscopy and biopsy first**, then MRI to stage the skull base. Do not give grommets alone.
- **Treatment: radiotherapy (IMRT) for stage I**, concurrent cisplatin chemoradiation from stage II (selectively) and III–IVA, now with **induction gemcitabine–cisplatin** first in locally advanced disease (Zhang, NEJM 2019); neck dissection for residual neck disease. Surgery is not the primary treatment because of the anatomy. Recurrent or metastatic disease: gemcitabine–cisplatin with a **PD-1 inhibitor** (toripalimab, FDA 2023).

Juvenile nasopharyngeal angiofibroma (JNA)

- Commonest **benign** nasopharyngeal tumour; **adolescent boys only**; arises near the sphenopalatine foramen and the base of the pterygoid plates; locally invasive through the pterygopalatine fossa; very vascular (no tunica media), fed by the **internal maxillary artery** (sphenopalatine branch).

- **Vignette: recurrent profuse unilateral epistaxis and progressive nasal blockage in a teenage boy; a red mass behind the middle turbinate.**
- **Do not biopsy** (haemorrhage). Investigation: **contrast CT or MRI** (± angiography). Signs: **Holman–Miller (anterior bowing of the posterior wall of the maxillary sinus)**, widened pterygopalatine fossa. Treatment: preoperative embolisation and **endoscopic excision**; radiotherapy for residual disease; hormonal therapy is not routine.

Adenoids, tonsils and the oral cavity

- **Waldeyer's ring**: the adenoid (nasopharyngeal tonsil), tubal tonsils, palatine tonsils and lingual tonsil, joined by the lateral pharyngeal bands.
- **Adenoid hypertrophy**: mouth breathing, adenoid facies, snoring, recurrent otitis media with effusion; lateral X-ray shows nasopharyngeal soft tissue; adenoidectomy (care with submucous cleft palate).
- **Nasal resonance**: **rhinolalia clausa = hyponasal speech** (blocked nose or nasopharynx: adenoids, polyps, a cold, nasopharyngeal mass); **rhinolalia aperta = hypernasal speech** (the palate fails to close the nasopharynx: cleft or submucous cleft palate, **palatal paralysis after diphtheria** or from X palsy, adenoidectomy in a short palate), with nasal regurgitation of fluids in the palsies.
- **Vincent's angina**: a fusospirochaetal infection (**fusiform bacilli with spirochaetes, Borrelia vincentii**) giving a painful, foul, ulcerated tonsil with a grey slough that wipes off and leaves a bleeding ulcer, usually one-sided, in poor oral hygiene; the gum form of the same infection is acute necrotising ulcerative gingivitis (trench mouth). **Penicillin with metronidazole**, oral hygiene and peroxide mouthwash. Diphtheria's membrane is adherent and comes with toxaemia.
- **Acute tonsillitis** is usually viral; Group A streptococcus needs penicillin for 10 days (rheumatic fever prevention). **Tonsillectomy** for recurrent tonsillitis (Paradise: 7 episodes in 1 year, 5 a year for 2 years or 3 a year for 3 years), obstructive sleep apnoea, and quinsy that recurs; not during acute infection.
- **Peritonsillar abscess (quinsy)**: sore throat, trismus, **muffled "hot-potato" voice**, drooling, **swollen soft palate with the uvula pushed to the opposite side**. **Treatment: needle aspiration or incision and drainage**, antibiotics (penicillin and metronidazole); **interval tonsillectomy 4–6 weeks later** (the classic answer); current practice keeps it for recurrent tonsillitis or a second abscess.
- **Tonsillectomy bleeding**: commonest complication. **Primary** = at surgery; **reactionary = within 24 hours (a dislodged clot or slipped ligature); this bleeding needs a return to theatre, not observation** (after resuscitation and checks); secondary = 5–10 days (infection); treat with antibiotics, and theatre if the bleeding is heavy.
- **Thyroglossal duct cyst** (details under Neck): the tract runs from the **foramen caecum** of the tongue past (often through) the hyoid; a midline swelling that **rises on protruding the tongue**. **Sistrunk operation**: the cyst, the tract, the **central part of the hyoid body** and a core of tongue base to the foramen caecum; recurrence about 3–5%, against up to about half after simple excision. A **lingual thyroid** at the foramen caecum may be the only thyroid tissue.
- **Retropharyngeal abscess**: young children (under 5, because of the lateral retropharyngeal nodes of Rouvière); neck stiffness and torticollis, drooling, widened prevertebral shadow; incision and drainage by the intraoral route. In adults, it follows trauma or foreign bodies; chronic cases are tuberculous (spine).
- **Oral cancer**: squamous cell carcinoma is by far the commonest (tobacco, betel quid, alcohol; **reverse smoking → palate**). **Commonest site: the tongue in the West, the buccal mucosa and gingivobuccal sulcus in South Asia** (where quid is held). **Commonest site within the tongue: lateral border**. **Oral submucous fibrosis** (areca nut; trismus, blanched fibrous bands) is premalignant. AJCC 8th adds **depth of invasion** to the T stage (T1 $\leq$ 2 cm and DOI $\leq$ 5 mm; T3 over 4 cm or DOI over 10 mm); leukoplakia is the commonest premalignant lesion, **erythroplakia is the most likely to be malignant**. Geographic tongue is benign and needs no treatment. Plummer–Vinson syndrome (dysphagia, iron deficiency, postcricoid web) raises the risk of postcricoid (hypopharyngeal) cancer.
- **HPV-positive oropharyngeal cancer** (HPV-16; tonsil and base of tongue; younger non-smokers; small primary with a large **cystic node**; **p16 immunostaining** the surrogate test): far better survival and its own AJCC 8th stage; cisplatin with radiotherapy stays standard (cetuximab was worse in RTOG 1016 and De-ESCALaTE, 2019); transoral robotic surgery for small primaries.

Zenker's diverticulum

- **A false (pulsion) pouch of mucosa and submucosa through Killian's dehiscence, between the thyropharyngeus (oblique) and cricopharyngeus (transverse) fibres of the inferior constrictor**, in the posterior pharyngeal wall; elderly patients. Not a traction diverticulum.
- Features: dysphagia, regurgitation of undigested food, halitosis, gurgling (Boyce's sign), aspiration. **Barium swallow** for diagnosis; blind endoscopy risks perforation. Treatment: **endoscopic stapler diverticulotomy** (cricopharyngeal myotomy; the older Dohlman's was cautery division) or open diverticulectomy with myotomy.

Salivary glands

- **Rule of 80s**: about 80% of salivary tumours are in the parotid, 80% of parotid tumours are benign, and 80% of those are **pleomorphic adenoma**, the commonest salivary tumour overall (women around 40, superficial lobe, slow, painless). The smaller the gland, the likelier a tumour is malignant (submandibular about half, sublingual and minor glands most).
- **Pleomorphic adenoma**: an incomplete capsule with pseudopod-like extensions, so **enucleation leaves tumour and causes recurrence**; malignant change (carcinoma ex pleomorphic adenoma) in about 3–5% after many years (sudden growth, pain, facial palsy). **Treatment: superficial parotidectomy with the facial nerve identified and preserved** (Patey's); extracapsular dissection or partial superficial parotidectomy is now accepted for small, mobile, superficial tumours. **Deep-lobe tumour** (the tonsil and lateral pharyngeal wall pushed medially; on MRI a dumbbell through the stylomandibular tunnel into the prestyloid parapharyngeal space): **total conservative parotidectomy, preserving the facial nerve**, by a transcervical-transparotid approach.
- **Warthin tumour** (papillary cystadenoma lymphomatosum): the second commonest benign tumour; older **smokers** (the male excess is now smaller), parotid tail, soft or cystic, **often bilateral or multifocal**; its oncocytic, mitochondria-rich epithelium makes it **hot on Tc-99m pertechnetate scan** (an

oncocytoma is hot too); malignant change is very rare (under 1%).

- **Malignant**: **mucoepidermoid carcinoma is the commonest malignant salivary tumour and the commonest in the parotid** (and in children; graded low to high). **Adenoid cystic carcinoma** is the **commonest malignancy of the submandibular and minor salivary glands** (exam answer; some series now find mucoepidermoid as common in the minor glands): **perineural spread** (pain, facial or lingual palsy, skip lesions along the nerve), late local recurrence and lung metastases even after 10 years. A parotid mass with **facial palsy, pain, fixity or nodes** is malignant until shown otherwise. Treatment: surgery with the nerve kept unless it is invaded, and radiotherapy for high grade, positive margins or perineural spread.
- **Investigation**: ultrasound with FNAC first (Milan reporting system, 2018); MRI for deep-lobe and malignant tumours. Open biopsy of a parotid lump is not done.
- **Salivary stones**: **80–90% in the submandibular gland** (Wharton's duct): its saliva is mucoid, more alkaline and richer in calcium, and it flows **uphill through a long duct** with a narrow opening. Pain and swelling at meals; most stones are radio-opaque on an occlusal film (most parotid ones are not). Small duct stones are removed by sialendoscopy or transoral incision (the **lingual nerve** hooks under the duct, so incise along the duct); gland excision for stones in the hilum or a damaged gland. Parotid duct: Stensen's.

Larynx, stridor and tracheostomy

Anatomy and nerves

- **Adductors**: lateral cricoarytenoid, transverse arytenoid (the only unpaired muscle), thyroarytenoid. **Abductor: the posterior cricoarytenoid, the only one, the "safety muscle" of the larynx.** Tensor: cricothyroid. Cricoid is the only complete ring.
- **All intrinsic muscles are supplied by the recurrent laryngeal nerve except the cricothyroid, which is supplied by the external branch of the superior laryngeal nerve.** The internal branch is sensory above the cords; the recurrent nerve is sensory below.
- **Position of the larynx**: hyoid at C3, thyroid notch and carotid bifurcation at C4, cricoid at C6; the epiglottis tip lies about C3 in adults (higher, C1–C2, in infants).
- In infants the larynx is higher and the **narrowest part is the subglottis (cricoid)**, so a little oedema is critical.
- **True cords** have stratified squamous epithelium, no submucosal glands and few lymphatics; **supraglottis** is rich in lymphatics.

Vocal cord paralysis

- **Unilateral RLN palsy**, **left more often** (longer course round the aortic arch; thyroid surgery, bronchial carcinoma, aortic aneurysm, mediastinal nodes, Ortner's syndrome from mitral stenosis): weak breathy voice, aspiration risk; the cord lies in the paramedian position. Manage with voice therapy; **injection laryngoplasty** early; **Isshiki type I thyroplasty (medialisation)** if permanent.
- **Bilateral RLN palsy**: **cords paramedian: they still meet, so voice is nearly normal but the airway is narrow, causing stridor and effort breathing**. Tracheostomy, then posterior cordotomy or arytenoidectomy later.
- **Isshiki thyroplasty types**: I medialisation (unilateral palsy); II lateralisation (adductor spasmodic dysphonia); III shortening and relaxation, lowering pitch (puberphonia, female-to-male); IV lengthening and tensioning, raising pitch (androphonia, male-to-female).
- **External branch of the superior laryngeal nerve** (supplies the cricothyroid; next to the superior thyroid pedicle) injury: **cannot reach high pitch, voice tires, e.g. a singer cannot sing high notes, though the airway and cough are normal.** Internal laryngeal injury gives aspiration; combined vagal injury gives aphonia with aspiration. In thyroid surgery the recurrent nerve is the nerve most at risk overall, but the external branch is the one the textbooks often call the commonest injured and "forgotten" nerve.
- **After total thyroidectomy: stridor with perioral tingling a day later is hypocalcaemia** (tetany and laryngospasm; Chvostek and Trousseau signs); treat with IV calcium gluconate. Immediate stridor in the recovery room points to bilateral RLN palsy or a neck haematoma.

Stridor in infants and children

- **Inspiratory stridor** = supraglottic or glottic; **biphasic** = subglottic; expiratory = lower trachea or bronchi.
- **Laryngomalacia is the commonest cause of congenital stridor** (omega-shaped epiglottis, inspiratory stridor, worse supine and when crying, **normal cry**, better prone). Most resolve by 12–24 months with reassurance and observation; supraglottoplasty for severe feeding or growth problems. Vocal cord paralysis is the second commonest cause. Laryngeal webs give an abnormal cry. Subglottic stenosis is the commonest acquired cause after prolonged intubation (graded by Cotton–Myer, I–IV).
- **Croup (laryngotracheobronchitis)**: age 6 months–3 years, parainfluenza virus, low fever, **barking cough, subglottic, steeple sign on AP neck X-ray**. Treat with **dexamethasone** (single dose), **nebulised adrenaline** in moderate to severe, humidified oxygen; antibiotics are not needed.
- **Acute epiglottitis**: age 2–6 years, abrupt, high fever, **drooling, muffled voice, refuses to lie down (tripod position), no cough**; **thumb sign** on lateral neck X-ray. Classically Haemophilus influenzae type b (now rare after vaccination; other organisms and adults are now seen). **Do not examine the throat or lie the child down. The priority is to secure the airway in theatre with ENT and anaesthetist present**, then IV ceftriaxone or cefotaxime.
- **Bacterial tracheitis, foreign body, retropharyngeal abscess and diphtheria** (grey membrane, bull neck) are other causes of acute airway obstruction.
- **Juvenile recurrent respiratory papillomatosis**: the commonest benign laryngeal tumour of children; **HPV 6 and 11** (11 more aggressive), acquired at birth from the mother's genital tract; hoarse cry, stridor, recurrent growth; microdebrider or laser excision, adjuvant antivirals; HPV vaccination is lowering the incidence.

Benign lesions of the adult larynx

- **Vocal nodules**: bilateral, at the **junction of the anterior third and posterior two thirds** of the cord, voice abuse; speech therapy first. Polyp: unilateral, microsurgery. **Reinke's oedema**: smokers, women, low-pitched voice; not premalignant; stop smoking; **exam answer: microlaryngeal stripping (decortication)**, **current practice: a microflap** that sucks out the gelatinous matter and keeps the epithelium,

one side at a time to avoid an anterior web. Intubation granuloma: posterior third (vocal process). **Laryngocele**: a dilated saccule in glassblowers, bulging through the thyrohyoid membrane; may hide a carcinoma. **Laryngopharyngeal reflux**: the classic gold standard is **24-hour dual-probe pH monitoring**; current practice uses **hypopharyngeal–oesophageal multichannel intraluminal impedance-pH** (detects non-acid reflux) and an empirical trial of a proton pump inhibitor. **Laryngeal TB**: hoarseness, pseudo-oedema of the posterior commissure, "turban" epiglottis.

- Hoarseness lasting **over 4 weeks** needs laryngoscopy, sooner if cancer is suspected (AAO-HNS 2018); in the UK, **persistent unexplained hoarseness at 45 or over** calls for a suspected-cancer referral (NICE NG12, no fixed duration).

Carcinoma of the larynx

- Squamous cell carcinoma; tobacco and alcohol act together. **Glottic is commonest** in the West (then supraglottic, subglottic); in South Asian series supraglottic cancer is as common or commoner.
- **Glottic carcinoma presents early with hoarseness and spreads little to the neck (sparse lymphatics) so it has the best prognosis**; supraglottic cancers present late (throat discomfort, dysphagia, referred otalgia) with early bilateral nodes; subglottic is rare with the worst outcome.
- Staging (AJCC 8th): T1 limited to cords with normal mobility (T1a one cord, T1b both); T2 supraglottic or subglottic extension or impaired mobility; **T3 cord fixation** or paraglottic space or inner thyroid cartilage; T4a through the cartilage.
- **Treatment**: early glottic (T1–T2) by **radiotherapy or transoral laser microsurgery**; advanced disease by chemoradiotherapy for larynx preservation (RTOG 91-11) or **total laryngectomy** with neck dissection for T4 or failures; voice rehabilitation with a tracheo-oesophageal puncture prosthesis. Commonest distant site: lung.

Tracheostomy and emergency airway

- Indications: upper airway obstruction, prolonged ventilation (over 10–14 days), poor pulmonary toilet, protection from aspiration, before major head and neck surgery.
- **Open tracheostomy is made at the 2nd–4th rings (usually 2nd–3rd), below the isthmus or splitting it. A tube placed through or at the first ring or the cricoid risks perichondritis and subglottic stenosis**; a very low tube risks the innominate artery, the pleura (children) and the great vessels. Vertical incision in emergencies, horizontal electively.
- **Complications**: immediate haemorrhage (commonest, venous), apnoea (loss of hypercapnic drive after relief of chronic obstruction), pneumothorax; early tube blockage (crusting), displacement, surgical emphysema, infection; late tracheal stenosis, tracheo-innominate fistula (herald bleed), tracheo-oesophageal fistula. Cuffed tubes cause pressure necrosis; keep cuff pressure about 20–25 cmH_2O.
- The tract matures in about 7–10 days; a partly blocked tube is suctioned, a completely blocked one is removed.
- **Cricothyroidotomy** (through the cricothyroid membrane) is the emergency airway in adults; in children under about 12 use needle cricothyroidotomy. In the "can't intubate, can't oxygenate" adult, the Difficult Airway Society (2015) recommends **scalpel–bougie–tube** cricothyroidotomy.

Foreign bodies in the airway

- **Airway (bronchus)**: toddlers, **peanuts**; choking, then a silent phase; **right main bronchus commonest** (wider, shorter and more vertical; the angles are more symmetrical in young children, where the right is still somewhat commoner). Signs: unilateral wheeze, reduced air entry, **obstructive emphysema** from a **check-valve** (air in, not out) on an expiratory film or a lateral decubitus film showing no deflation of the obstructed lung; treatment is **rigid bronchoscopy**, in the **Boyce position** (neck flexed on the chest, head extended at the atlanto-occipital joint, so the mouth, pharynx and larynx line up; the same for direct laryngoscopy; Rose's position, the head extended over a shoulder pad, is for tonsillectomy); a vegetable body (peanut) causes a severe chemical (arachidic) bronchitis. Jackson's valves: bypass (partial), check-valve (emphysema), ball-valve (air out, not in: collapse), stop-valve (complete: collapse).
- **A coin on an AP film**: in the **oesophagus it is seen face-on (a full disc)**, because the oesophageal lumen is a slit widest from side to side; in the **trachea it is seen edge-on** (face-on on the lateral film), because the coin passes the sagittal glottic chink and the trachea, open behind (C-shaped rings), holds it front to back. A lateral film settles it.
- **Choking adult or child**: back blows, **abdominal thrusts (Heimlich manoeuvre)** in a conscious adult or child over 1 year with severe obstruction (chest thrusts and back blows in infants under 1 year), CPR if unconscious, then laryngoscopic or bronchoscopic removal.

Obstructive sleep apnoea

- Repeated collapse of the pharyngeal airway in sleep: loud snoring, witnessed apnoeas, gasping, **daytime sleepiness** (Epworth score), morning headache; risks obesity, a large neck, retrognathia, big tonsils; consequences hypertension, arrhythmia, stroke, road accidents. Screen with **STOP-BANG**.
- **Polysomnography in the sleep laboratory is the gold standard**; a home sleep apnoea test is acceptable in uncomplicated adults with a high pre-test probability (AASM 2017). **Apnoea-hypopnoea index (events an hour) in adults: 5–14 mild, 15–29 moderate, 30 or more severe.** Drug-induced sleep endoscopy maps the site of collapse before surgery (the Müller manoeuvre was the older awake test).
- **Treatment**: weight loss, sleep position, no alcohol or sedatives at night; **CPAP is first-line for moderate and severe OSA** (and symptomatic mild); mandibular advancement devices for mild to moderate disease or CPAP intolerance; surgery (uvulopalatopharyngoplasty, maxillomandibular advancement, **hypoglossal nerve stimulation**) when CPAP fails or a clear anatomical obstruction exists. Tirzepatide was approved for moderate to severe OSA with obesity (FDA 2024). **In children, adenotonsillectomy is first-line.**

Neck spaces and neck dissection

Deep cervical fascia and the spaces

Layer	Encloses	Point an examiner asks
Investing (superficial layer of deep fascia)	sternocleidomastoid, trapezius, parotid and submandibular glands	splits round the two muscles and two glands; forms the roof of the posterior triangle

Layer	Encloses	Point an examiner asks
Pretracheal (middle layer): muscular and visceral parts, the buccopharyngeal fascia behind the pharynx	infrahyoid muscles, thyroid, trachea, oesophagus, pharynx	attached to the hyoid and laryngeal cartilages, so **the thyroid moves on swallowing**
Prevertebral (deep layer) with its **alar** part in front	vertebrae, prevertebral and scalene muscles, phrenic nerve, brachial plexus roots	the alar layer is the front wall of the danger space
Carotid sheath (from all three)	common and internal carotid, internal jugular vein, **vagus**	ansa cervicalis lies on its front; the **sympathetic chain lies behind it, not in it**

Space	Limits	What matters
Retropharyngeal	between buccopharyngeal and alar fascia; skull base to about T1–T4, where they fuse	nodes of Rouvière (lateral retropharyngeal) in children; midline raphe keeps an acute abscess to one side
Danger space	between alar and prevertebral fascia; **skull base to the diaphragm**	infection falls straight into the posterior mediastinum
Prevertebral	behind the prevertebral fascia; skull base to the coccyx	tuberculous cold abscess of the cervical spine: midline bulge
Parapharyngeal	inverted pyramid, skull base to the hyoid; split by the styloid and its fascia	**prestyloid**: fat, deep lobe of the parotid (tumours: **pleomorphic adenoma commonest**); **poststyloid**: internal carotid, internal jugular, IX–XII, sympathetic chain (tumours: paraganglioma, schwannoma)
Submandibular	floor of mouth to hyoid, split by the **mylohyoid** into sublingual (above) and submaxillary (below) parts, which meet round its free back edge	the space of Ludwig's angina

Deep neck infections

- **Commonest deep neck infection overall: peritonsillar abscess.** Sources: **dental in adults, tonsil and upper respiratory tract in children**; diabetes, drug injection and immunosuppression add risk (Klebsiella pneumoniae in diabetics). **Contrast CT is the investigation of choice** (rim-enhancing collection against cellulitis); ultrasound for superficial collections and in children.
- **Ludwig's angina**: bilateral cellulitis of the **submandibular space (sublingual and submaxillary parts) with the submental space**, usually from the **second or third lower molar, whose roots lie below the mylohyoid line**, so pus enters the submaxillary part. Mixed oral flora (viridans streptococci, anaerobes such as Prevotella and Fusobacterium, Staphylococcus). Hard, brawny, non-fluctuant swelling. **The floor of the mouth rises and pushes the tongue up and back: death is from airway obstruction.** Treatment: **airway first** (awake fibreoptic intubation, or tracheostomy under local anaesthesia), high-dose IV antibiotics (penicillin with metronidazole, or amoxicillin–clavulanate; clindamycin if allergic), dental extraction, drainage of any collection. Many now settle without open drainage when caught early; mortality has fallen from about 50% before antibiotics to under 10%.
- **Parapharyngeal abscess** (from tonsils, teeth, a quinsy or mastoid): **prestyloid** collection gives **trismus (medial pterygoid), the tonsil pushed medially** and swelling behind the angle of the jaw; **poststyloid** gives little trismus but carries the vessels and nerves: **carotid erosion, IJV thrombosis, Horner's, IX–XII palsies**. Drain **externally** (through the neck, at the anterior border of sternocleidomastoid), not through the mouth.
- **Lemierre syndrome**: **Fusobacterium necrophorum**; after pharyngitis or quinsy in a young adult, **septic thrombophlebitis of the internal jugular vein** with septic lung emboli; long IV antibiotics (penicillin or a β-lactam with metronidazole).

Retropharyngeal abscess, acute against chronic:

	Acute	Chronic
Age	**children under 5** (nodes of Rouvière, which shrink by about 5)	adults
Cause	suppurating retropharyngeal node after URTI; in adults trauma or a fish bone	**tuberculosis of the cervical spine** (prevertebral, behind the prevertebral fascia) or of the retropharyngeal nodes
Bulge	**to one side** of the midline	**midline**
Drainage	**intraoral**, head low, airway protected	**external**, through the neck behind sternocleidomastoid, with antitubercular drugs; never intraoral (a chronic sinus results)

- **Lateral neck X-ray in retropharyngeal abscess: prevertebral soft tissue over about 7 mm at C2, or over about 14 mm in children (22 mm in adults) at C6**, is abnormal; CT confirms.
- **Complications of deep neck space infection**: airway obstruction, **descending necrotising mediastinitis** (through the retropharyngeal and danger spaces; CT chest and thoracic drainage), carotid blowout, IJV thrombosis, sepsis.

The neck lump

- **Age decides the likely cause**: children, mostly inflammatory, then congenital; young adults, inflammatory and congenital; **over 40, a lateral lump is malignant until proven otherwise** (usually a metastatic squamous node). The teaching "rule of 80" (80% of non-thyroid neck masses in adults are neoplastic, 80% of those malignant, most metastatic, most from above the clavicle) is an aid, not a statistic to quote.
- **Commonest causes of cervical lymphadenopathy in South Asia: reactive and tuberculous nodes**; in the West, reactive nodes in the young and metastases in the old.
- **Work-up**: full ENT examination with flexible endoscopy, **ultrasound-guided FNAC** (first tissue test), then CT or MRI. **No open (incisional or excisional) biopsy of a suspected metastatic node before the primary is searched for**: it seeds the neck and worsens outcome. Exceptions: **lymphoma needs architecture, so a core biopsy or excision of a whole node**; and **never biopsy a carotid body tumour**. Test the aspirate for **p16 or HPV** (oropharynx) and **EBV** (nasopharynx).
- **Metastasis of unknown primary** (about 3–5% of head and neck cancers; a squamous node, primary not found on examination): **PET-CT before panendoscopy** (NCCN), then examination under anaesthesia with biopsies, **palatine tonsillectomy** and lingual tonsillectomy (often transoral robotic surgery). **The hidden primary is most often in the**

tonsil or base of tongue, then the nasopharynx and pyriform sinus.

- **Virchow's node** (left supraclavicular, **Troisier's sign**): spread from below the clavicle (stomach, pancreas, lung, testis) by the thoracic duct.

Lumps the examiner names

Lump	Facts
Thyroglossal cyst	**commonest congenital neck mass**; midline (slightly left when off midline), **subhyoid commonest**; **moves upward on protruding the tongue** and on swallowing; infection makes a fistula (**a thyroglossal fistula is never congenital**); papillary carcinoma in about 1%. **Ultrasound first to show a normal thyroid** (the lump may be the only thyroid). **Sistrunk operation**: cyst, tract, **central part of the hyoid** and a core of tongue base to the foramen caecum (recurrence falls from about 50% to about 3–5%)
Branchial (second cleft) cyst	young adults (20s); **deep to the anterior border of sternocleidomastoid at the junction of its upper and middle thirds**; lined by squamous epithelium with lymphoid tissue in the wall; **cholesterol crystals in the aspirate**. In an adult over about 40, a "branchial cyst" is a **cystic metastasis (HPV-positive oropharyngeal cancer or papillary thyroid cancer)** until proven otherwise
Branchial (second cleft) fistula	external opening in the **lower third** of the anterior border of sternocleidomastoid; tract passes **between the internal and external carotids, superficial to IX and XII, deep to the posterior belly of digastric**, into the **tonsillar fossa**. Third and fourth pouch sinuses open into the **pyriform fossa**: recurrent **left-sided** neck abscess or acute suppurative thyroiditis in a child
Cystic hygroma (macrocystic lymphatic malformation, ISSVA 2018)	**posterior triangle**, soft, **brilliantly transilluminant**; at birth or by 2 years; with Turner's and trisomies when found on fetal scans; **sclerotherapy** (OK-432, bleomycin, doxycycline) or excision; sirolimus for extensive disease
Dermoid	submental midline; **moves with the skin, not with the tongue**; contents keratin and skin appendages
Plunging ranula	mucus-extravasation pseudocyst of the **sublingual gland** spreading through or behind the mylohyoid into the neck; **excise the sublingual gland**
Carotid body tumour (paraganglioma)	at the **carotid bifurcation**; **more common in people living at high altitude** (chronic hypoxia causes carotid body hyperplasia); **moves side to side but not up and down (Fontaine's sign)**, transmitted pulsation, bruit; **"lyre sign"** (splayed ICA and ECA) on angiography, "salt and pepper" MRI; **up to 30–40% hereditary** (SDHD, SDHB; SDHD passes only from the father); **no biopsy**; **Shamblin I–III** grades the vessel encasement; surgical excision (preoperative embolisation optional), radiotherapy or observation in the elderly
Tuberculous lymphadenitis (scrofula)	**commonest extrapulmonary TB in South Asia**; upper deep cervical (level II) and posterior triangle nodes; stages: adenitis, matted nodes (periadenitis), cold abscess, **collar-stud abscess**, sinus. **FNAC (granulomas with caseation) with Xpert MTB/RIF Ultra on the aspirate** (WHO). **Treatment is medical: 2HRZE/4HR for 6 months** (WHO 2022); enlargement during treatment is often a **paradoxical reaction**, not failure; aspirate an abscess through healthy skin, do not incise and drain. Non-tuberculous mycobacterial nodes in children are excised

Oesophageal foreign bodies

- **Oesophagus**: sites of impaction are the **cricopharynx (commonest, about 15 cm from the incisors)**, aortic arch (about 22.5 cm), left main bronchus (about 27.5 cm), then the diaphragm (about 37.5 cm). Coins in children, meat bolus or fish bone in adults. Sharp objects, batteries and magnets need urgent endoscopic removal.
- **Button (disc) battery in the oesophagus**: the **current generated by the tissue completing a circuit makes hydroxide at the negative pole**, producing **alkali burns within about 2 hours**, with perforation, tracheo-oesophageal fistula or aorto-oesophageal fistula later. Remove as an emergency (do not wait for fasting); honey (10 mL every 10 minutes, up to six doses, within 12 hours of ingestion, children over 1 year) at home or on the way, and sucralfate in hospital, reduce the injury, unless perforation is suspected (NASPGHAN, 2021); after removal, watch for late fistula and aortic erosion (CT or MRI when the burn is deep). A coin is observed 12–24 hours if the child is well and it is in the distal oesophagus.

Nodal levels

Level	Boundaries	Drains
I	**Ia** submental (between the anterior bellies of the digastrics, above the hyoid); **Ib** submandibular (digastric bellies and the mandible)	lip, floor of mouth, anterior tongue, anterior nose (Ia); oral cavity, submandibular gland (Ib)
II upper jugular	skull base to the hyoid (lower border); **IIa in front of the spinal accessory nerve, IIb above and behind it**	oral cavity, oropharynx, nasopharynx, larynx, parotid; **the jugulodigastric node is the tonsil's node**
III mid jugular	hyoid to the lower border of the cricoid	oral cavity, oropharynx, larynx, hypopharynx
IV lower jugular	cricoid to the clavicle	larynx, hypopharynx, thyroid, cervical oesophagus
V posterior triangle	sternocleidomastoid, trapezius and clavicle; **Va above, Vb below the lower border of the cricoid**	**nasopharynx**, oropharynx, posterior scalp, thyroid
VI central	hyoid to the suprasternal notch, between the carotids	**thyroid**, subglottis, hypopharynx, cervical oesophagus
VII	suprasternal notch to the innominate artery (superior mediastinum; AJCC 8th)	thyroid, oesophagus

Levels II–IV lie between the lateral border of sternohyoid in front and the posterior border of sternocleidomastoid behind. Nasopharyngeal cancer is the one that fills levels II and V together.

Nodal staging (AJCC 8th, 2017; clinical, for non-HPV cancers)

- **N1** single ipsilateral node $\leq$ 3 cm without extranodal extension (ENE); **N2a** single ipsilateral 3–6 cm; **N2b** multiple ipsilateral $\leq$ 6 cm; **N2c** bilateral or contralateral $\leq$ 6 cm; **N3a** over 6 cm; **N3b any node with clinically overt ENE**. **ENE was added in the 8th edition** because it is the strongest nodal predictor of outcome.

- **HPV (p16)-positive oropharyngeal cancer has its own, kinder staging** (cN1 ipsilateral nodes ≤ 6 cm; cN2 bilateral or contralateral; cN3 over 6 cm); nasopharyngeal cancer has its own too (N3 over 6 cm or below the cricoid).

Neck dissection

Type	Removes	Keeps
Radical (Crile, 1906)	**levels I–V, sternocleidomastoid, internal jugular vein, spinal accessory nerve**, with the submandibular gland and tail of the parotid	carotid arteries, vagus, hypoglossal, phrenic, brachial plexus, lingual nerve
Modified radical (types by **Medina 1989**)	levels I–V	**type I the spinal accessory nerve; type II the accessory nerve and internal jugular vein; type III the accessory nerve, internal jugular vein and sternocleidomastoid** ("functional" neck dissection of **Bocca and Suárez**)
Selective (AHNS/AAO-HNS, Robbins 2002, 2008)	only the levels at risk	all three structures. **Supraomohyoid I–III: oral cavity. Lateral II–IV: larynx, oropharynx, hypopharynx. Posterolateral II–V with suboccipital and postauricular nodes: posterior scalp skin and melanoma. Central (anterior) VI: thyroid and subglottis**
Extended	a radical plus another node group (retropharyngeal, VII) or structure (carotid, hypoglossal, skin)	

The current classification names a selective dissection by the side and the levels removed, e.g. "SND (I–III, SCM spared)".

- **When to dissect a clinically negative (cN0) neck**: when the risk of occult nodes is over about 15–20%. **In early oral cancer elective dissection improves survival over wait-and-watch** (D'Cruz, NEJM 2015: 3-year overall survival about 80% against 68%); NCCN recommends it at a **depth of invasion over 3–4 mm** (DOI also enters the T stage of oral cancer in AJCC 8th). **Sentinel node biopsy** is an accepted alternative for T1–T2 N0 oral cancer in trained centres (SENT, 2015; Hasegawa, 2021).
- **After chemoradiotherapy: PET-CT at about 12 weeks; dissect only if it shows residual disease** (PET-NECK trial, NEJM 2016: as good as planned dissection, with far fewer operations).
- **Complications**:
  - **Spinal accessory nerve** (crosses level II, then the posterior triangle): **shoulder syndrome**, a drooping shoulder, pain, **inability to abduct above 90°** and lateral winging of the scapula (trapezius).
  - **Chyle leak** (1–3%): usually **left**, from the thoracic duct at level IV near the jugulo-subclavian junction; milky drain fluid, triglycerides over about 100 mg/dL with chylomicrons. Pressure, a medium-chain-triglyceride diet or nil by mouth with parenteral feeding, octreotide; **re-explore for persistent output over about 500–1,000 mL a day**.
  - **Marginal mandibular nerve** (level I, deep to platysma below the mandible; protected by ligating the facial vein low and reflecting it up, the Hayes Martin manoeuvre): drooping of the lower lip. Hypoglossal (level II), vagus, phrenic (on scalenus anterior, under the prevertebral fascia), sympathetic chain (Horner's) and lingual nerves are also at risk.
  - **Bilateral internal jugular vein ligation**: facial and cerebral oedema, raised intracranial pressure, SIADH, blindness; **stage the two sides (about 4–6 weeks apart) or keep one vein**.
  - **Carotid blowout**, mostly after radiotherapy, wound breakdown or a fistula; often a **herald bleed**; pressure, resuscitation, then endovascular stenting or occlusion.

Sources

- Dhingra, Diseases of Ear, Nose and Throat; Scott-Brown's Otorhinolaryngology; Cummings Otolaryngology; Bailey & Love; Gray's Anatomy; Nelson Textbook of Pediatrics.
- AAO-HNS guidelines: Bell's palsy (2013), sudden hearing loss (2019), hoarseness (2018), tonsillectomy in children (2019), otitis media with effusion (2016); AAP acute otitis media guideline (2013); AAN Bell's palsy (2012); EPOS 2020; Bárány Society criteria for Ménière's disease (2015); AJCC 8th edition TNM; NICE NG233 otitis media with effusion (2023); NICE NG12 suspected cancer; AAO-HNS epistaxis (2020); WHO hearing loss grading (2021); AJCC 8th edition N staging with extranodal extension and HPV-positive oropharynx (2017); AHNS/AAO-HNS neck dissection classification (Robbins 2002, 2008); Medina 1989 (modified radical types); ISSVA classification of vascular anomalies (2018); WHO consolidated TB guidelines (2022); NCCN head and neck cancers; Difficult Airway Society (2015).
- Trials: D'Cruz, elective neck dissection in oral cancer (NEJM 2015); PET-NECK (Mehanna, NEJM 2016); Zhang, induction chemotherapy in nasopharyngeal cancer (NEJM 2019); RTOG 1016 and De-ESCALaTE (2019); BEMED, betahistine in Ménière's (2016).
- First Aid for the USMLE Step 1 (2022) for auditory pathway and embryology checks.
- NASPGHAN position paper on button battery ingestion in children (Mubarak and others, JPGN 2021).