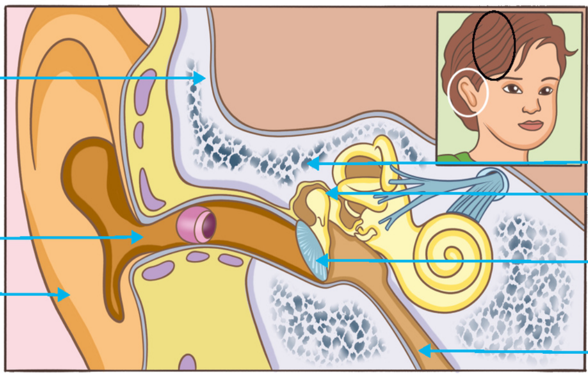
1. ANATOMY OF THE EAR

ANATOMY OF THE OUTER EAR

00:01:21

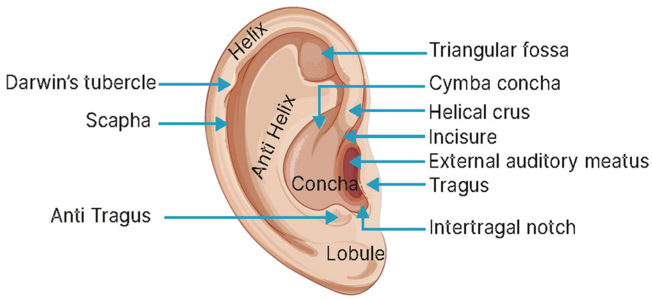


Ear anatomy and mastoid bone

- Components of the External Ear
  - Pinna.
  - External Auditory Canal (EAC).
  - Tympanic Membrane (TM)

Pinna

- Cymba conchae: cartilaginous landmark for mastoid antrum
- Sites devoid of cartilage:
  - Lobule: site to harvest fat graft for stapedectomy
  - Incisura terminalis: site of Lempert endaural incision
  - Darwin's tubercle: prominence at junction of upper ⅓ and lower ⅔ of helix



EAC

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CARTILAGENOUS EAC	BONY EAC
Outer 1/3rd (8mm)	Inner 2/3rd (16mm)
Completely developed at birth	Not developed at birth, continues to develop after birth
Directed upward, backward, and medially	Directed downward, forward, and medially
Contains thick skin (stratified squamous keratinized) with ceruminous (apocrine) glands and hair follicles	• Contains thin skin (stratified squamous keratinized) without skin appendages. • Has the narrowest part of EAC, called the isthmus, 5-6 mm lateral to TM
Has deficiency anteroinferiorly k/a fissures of santorini	Has a deficiency k/a foramen of Huschke

Yourwish

- In neonates, since the bony part of the EAC is not developed, the pinna is drawn downward and backward to view the TM
- To straighten the EAC to visualize TM, the pinna should be pulled posterosuperiorly in adults
- The bony-cartilaginous junction, fissures of Santorini (deficiency in cartilaginous part), and foramen of Huschke (deficiency in bony part) are the potential paths for the spread of infections and tumors from EAC to the base of skull and parotid and vice versa

PARTS OF TYMPANIC MEMBRANE:

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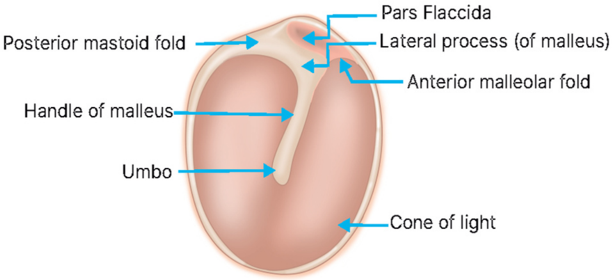
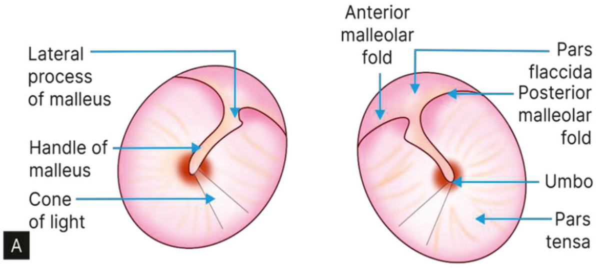
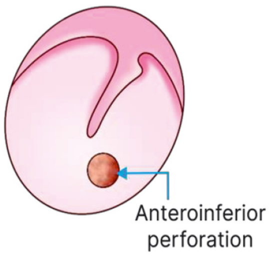


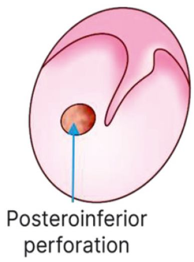
	Pars tensa	Pars flaccida
Annulus	Present	Absent
No. of layers	3	2
Umbo and cone of light	Umbo in the center and a cone of light in the antero-inferior part	

- Color: pearly gray and translucent
- Angle with EAC: 55 degrees
- Effective vibratory surface area is 55 mm^2.
- Total surface area: 90 mm^2
- Thickness: 0.1 mm
- Pars flaccida: also called Shrapnell's membrane
- Umbo: point of attachment of the tip of the handle of the malleus to the TM
- Side Identification (Right vs. Left)
  - Based on Cone of Light Position



    → Right TM: Cone of light is between 3 to 6 o'clock.
    → Left TM: Cone of light is between 6 to 9 o'clock.
  - Based on Malleolar Folds

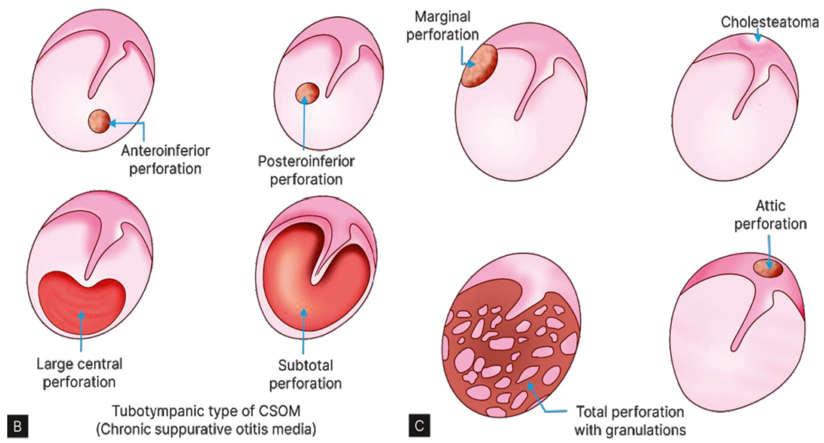




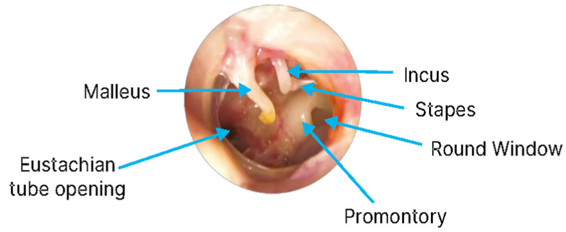
Yourwish

→ Short fold = Anterior malleolar fold.
→ Long fold = Posterior malleolar fold.

Perforations:

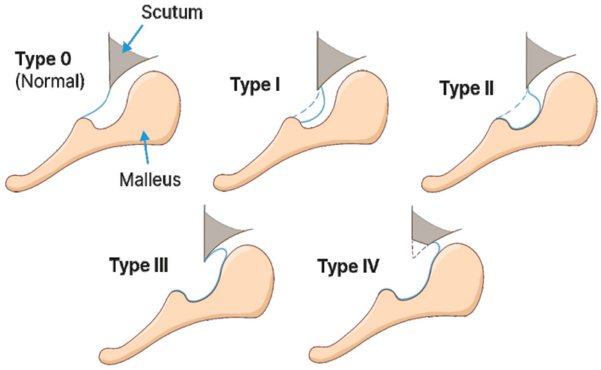


- Classification
  - Central Perforation: Located in the Pars Tensa.
  - Attic Perforation: Located in the Pars Flaccida.
  - Small Central: Occupies one quadrant of the Pars Tensa.
  - Large Central: Occupies more than one quadrant but not all; some Pars Tensa remains circumferentially.
  - Subtotal: Occupies all quadrants; Annulus remains intact.
  - Total: Occupies all quadrants; includes destruction of the Annulus.
  - Marginal: Occupies one quadrant and includes the Annulus.
- Structures Visible Through a Subtotal Perforation
  - Malleus: Specifically the handle.
  - Incus: Specifically the long process.
  - Stapes: Head, tendon, and crura.
  - Oval Window: Covered by the footplate of the stapes.
  - Round Window: Located inferior to the oval window.
  - Eustachian Tube: Opening seen antero-inferiorly.
  - Promontory: Projection on the medial wall formed by the basal turn of the cochlea.
  - Facial Nerve: Impression located above the oval window

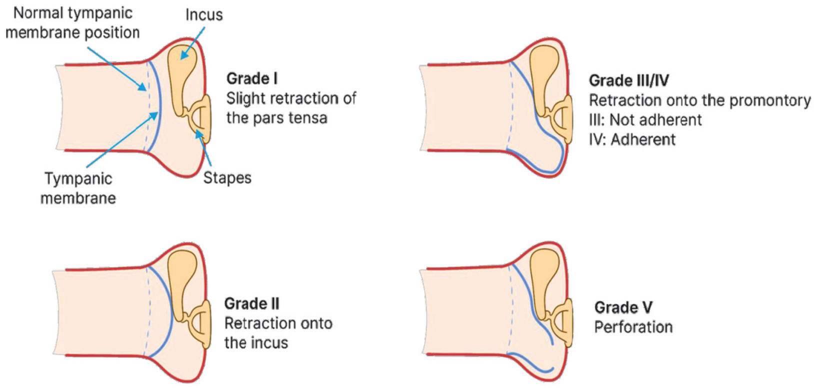


Classifications of retractions:

- Pars Flaccida: Toss Classification
  - Grade 0: Normal.
  - Grade 1: Small dimpling; does not touch the neck of the malleus.
  - Grade 2: Retracted to touch the neck of the malleus.
  - Grade 3: Adherent to the neck of the malleus and extending beyond the scutum (outer attic wall)
  - Grade 4: Retracted to the neck, extending beyond the scutum + Resorption of the outer attic wall



- Pars Tensa: Sade Classification
  - Grade 1: Membrane slightly retracted
  - Grade 2: Membrane touching the Incus
  - Grade 3: Membrane touching the Promontory but remains mobile
  - Grade 4: Membrane touching the Promontory, adherent and not mobile
  - Grade 5: Retraction with an atelectatic membrane + Perforation



MIDDLE EAR

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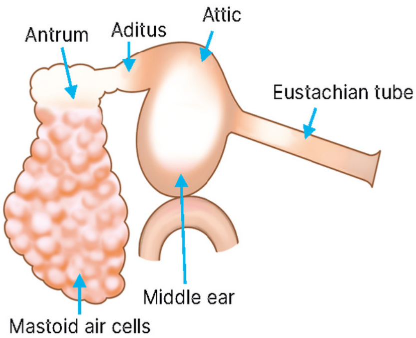
Middle Ear Cleft

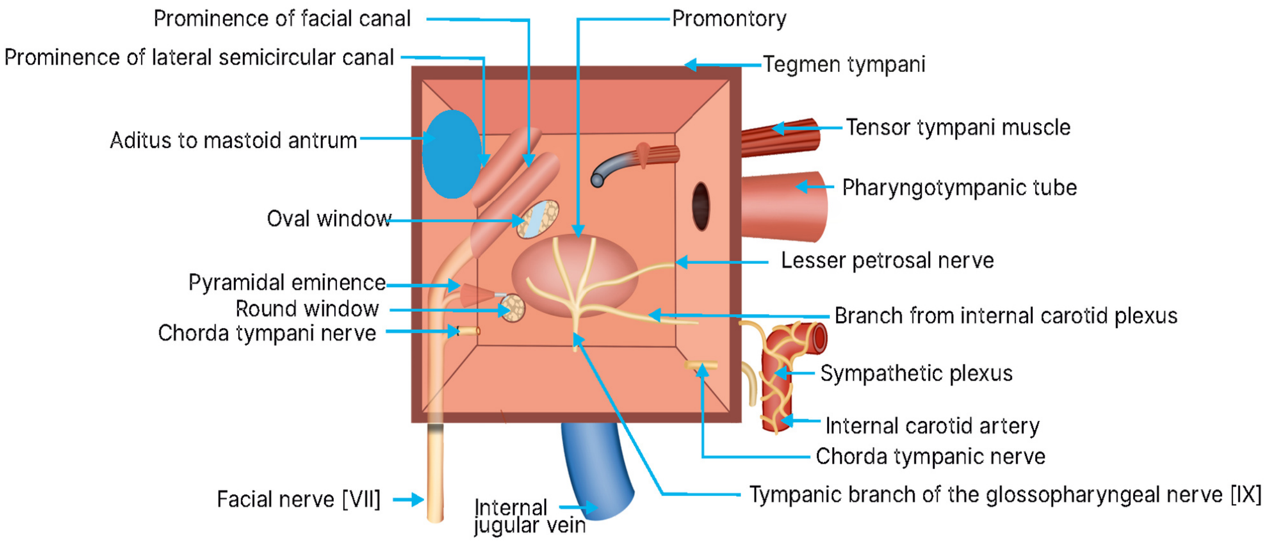
- Air enters the middle ear via Eustachian tube → Middle ear proper → Attic → Aditus → Mastoid antrum



Middle Ear Anatomy:

00:18:04

NEET PG 2022



Roof	Tegmen tympani
Floor	Bone-separating jugular bulb
Anterior wall	• Communicates with ET • Bone-separating carotid • Communicates with canal for tensor tympani
Posterior wall	Pyramid and aditus
Lateral wall	TM and outer attic wall called scutum

Medial wall	• Impression of lateral semicircular canal • Promontory: impression of cochlea • Oval window • The facial canal passes between the semicircular canal and the promontory • Round window • Processus cochleariformis
Promontory	• Formed by the basal turn of the cochlea (senses high-frequency sounds)
Processus cochleariformis	• Landmark for the first genu of the facial and geniculate ganglion • The tensor tympani takes a lateral turn from here to attach to the upper end of the malleus handle
Facial nerve tympanic/horizontal/3rd segment	• MC dehiscent segment of the facial nerve
Lateral semicircular canal bulge	• MC SCC eroded/fistula formed by cholesteatoma. • Stimulated by the caloric test • Acts as a landmark for the tympanic segment as well as the second genu of the facial nerve.
Oval window	• The foot process of the stapes present here transmits sound vibrations to the scala vestibuli
Round window	• Covered by a secondary TM, the electrodes of a cochlear implant are inserted into the inner ear (S. tympani), and drugs are delivered to the inner ear through this window.
Tympanic plexus	• Formed by JACOBSEN'S NERVE and the sympathetic plexus around ICA (superior and inferior caroticotympanic nerves), it gives sensory supply to the middle ear, mastoid, TM, ET, and parasympathetic supply to the parotid through the lesser petrosal nerve (through the otic ganglion)

Recess	Boundaries	Clinical note
Facial recess	• Medial wall: vertical segment of the facial nerve • Lateral wall: chorda tympani nerve • Superior wall: fossa incudes	• Important surgical corridor (posterior tympanotomy) to access the middle ear without damaging ossicles • Posterior tympanotomy is used for Cochlear implant surgery
Sinus tympani	• Superior boundary: ponticulus (bony ridge between oval window and facial canal) • Inferior boundary: subiculum (bony ridge between the round window and the facial canal)	• Hidden recess behind the facial nerve → notorious site for residual cholesteatoma

Yourwish

NERVE SUPPLY OF EAR

00:24:51

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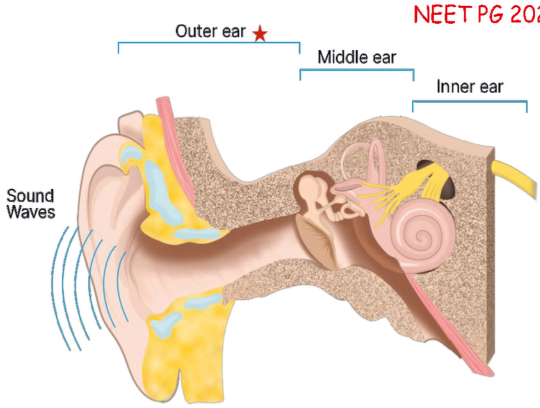
Outer Ear

- Lesser occipital nerve: a smaller portion of the pinna
- Auriculotemporal nerve: upper half anteriorly, roof, anterior TM
- Greater auricular nerve: lower half of the pinna
- Auricular branch of 10th nerve: Arnold's nerve, supplies the floor and posterior wall and the posterior TM



Middle ear:

- Supplied by Jacobson's nerve (Tympanic branch of Glossopharyngeal nerve)

Inner ear:

- Cochlea supplied by: cochlear nerve
- Vestibule supplied by: vestibular nerve

Intratympanic muscles and tympanic plexus:

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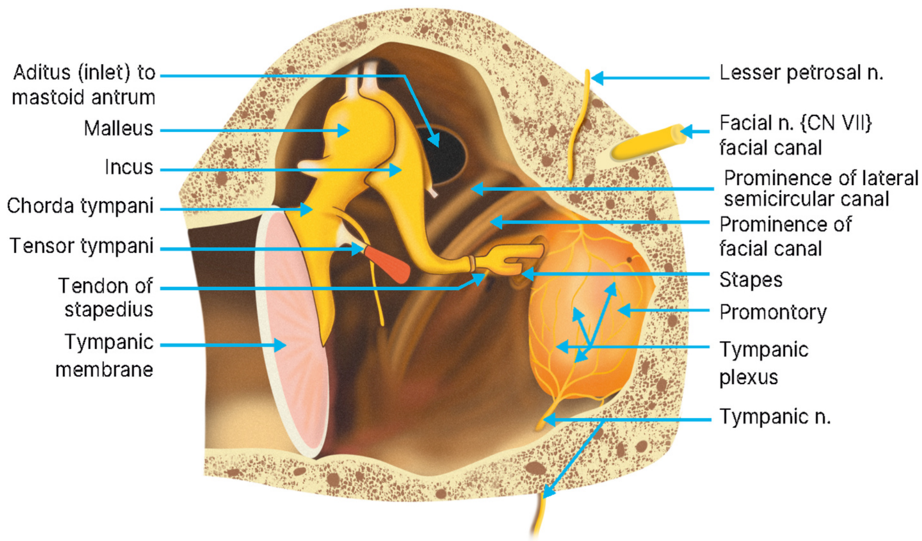

Tympanic Plexus

- Location: Situated on the promontory.
- Formed by the Glossopharyngeal nerve & Sympathetic plexus covering the carotid

PYQ:

Malleus:

- The largest ossicle of the middle ear
- The tensor tympani tendon inserts on the medial surface of the upper handle
- The chorda tympani passes just above the tendon insertion (posterior to the anterior wall)

Incus:

- The body articulates with malleus head → incudomalleolar joint (saddle-type synovial)
- Most common ossicle to undergo necrosis in otitis media → long process of incus
- The lenticular process is most vulnerable due to precarious blood supply

Stapes:

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- The smallest ossicle in the entire body
- Articulates with the lenticular process of the incus → incudostapedial joint (ball-and-socket type)
- The stapedius tendon inserts on the posterior part of the neck
- The footplate lies on the oval window and transmits sound to the inner ear
- Footplate fixation seen in otosclerosis

ANATOMY OF INNER EAR

00:29:23

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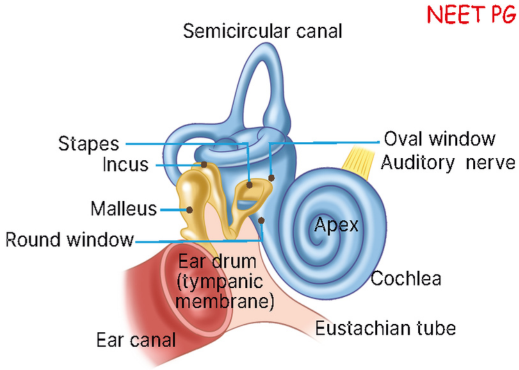
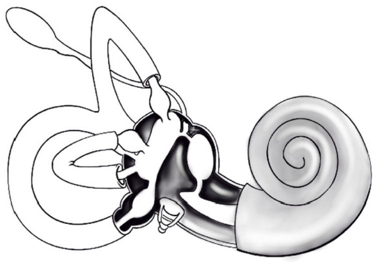
- Inner ear is aka labyrinth
- The central chamber is called the vestibule.
- Anteriorly → cochlea
- Posteriorly → semicircular canal



Vestibule:

- The spherical recess has a saccule.
- Elliptical recess has a utricle:
  - Receives the openings of ducts of the semi-circular canals
- Spherical and elliptical recess are parts of bony labyrinth, and saccule and utricle are parts of the membranous labyrinth
- Neurosensory epithelium within utricle and saccule is called maculae



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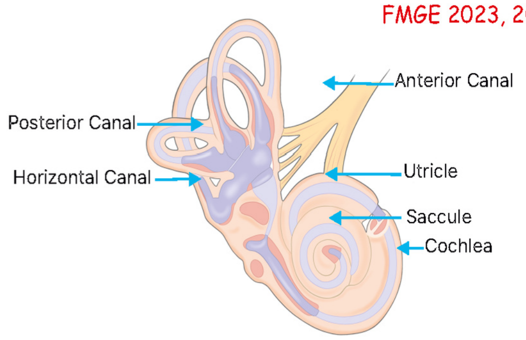
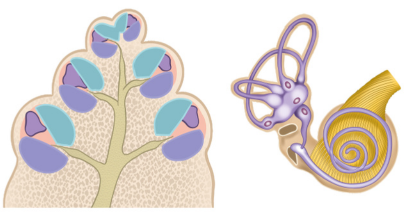
Semicircular canals:

- Responsible in maintaining body posture
- The canals have a dilated amputated end and a non-dilated end
- Crus communes: non-dilated end of superior and posterior canal joining together
- Within the amputated end, it has neurosensory epithelium and is called a "crista."



Cochlea:

- Spiral structure, has a central access called the modiolus, which has the cochlear artery and cochlear nerve
- The central chamber is called cochlear duct (scala media), between scala vestibuli and scala tympani (basilar membrane)
- Neurosensory epithelium above basilar membrane known as organ of Corti, which helps with hearing
- Neurosensory epithelium in scala media is striae vascularis which is responsible for production and absorption of endolymph



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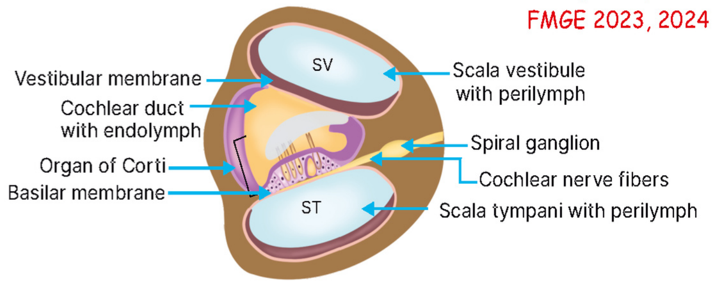
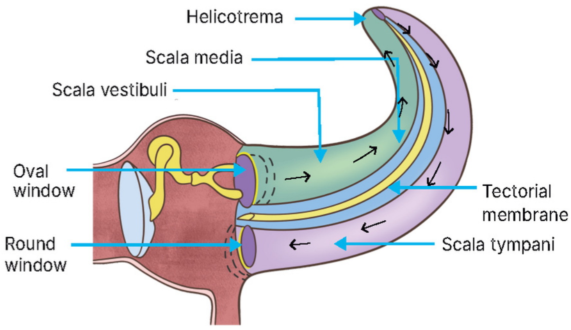
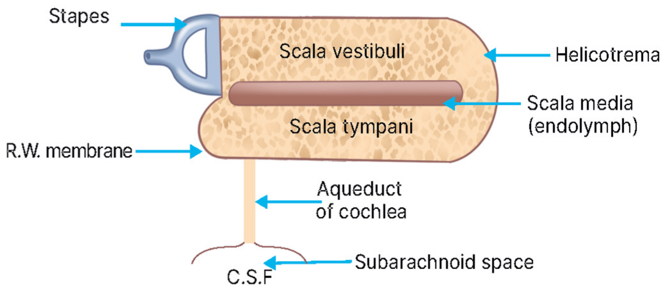


- The scala vestibuli and tympanic are bony labyrinths, and scala media is a membranous labyrinth
- In the base, scala vestibuli opens as oval window and scala tympani opens as round window
- At the apex, scala vestibuli and scala tympani communicate, known as the helicotrema
- Scala media: Situated in the middle, between the scala vestibuli and scala tympani.



Inner Ear Fluids: Production And Regulation

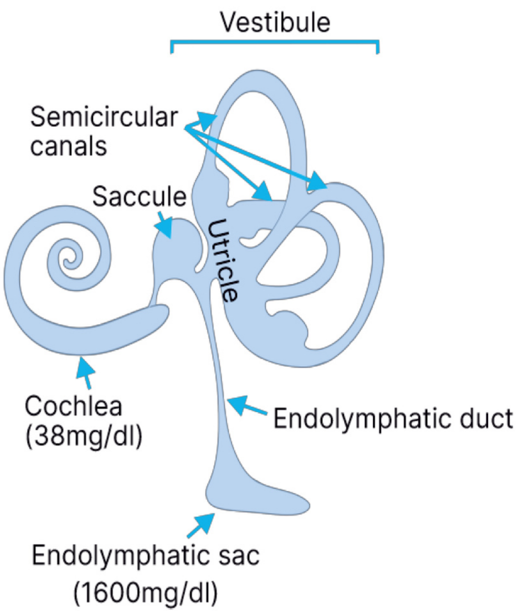
- Endolymph
  - Produced and reabsorbed by the stria vascularis.
  - Stria vascularis: Vascular epithelium located in the scala media.
  - Contains Sodium (Na+), Potassium (K+), and Chloride (2Cl-) channels for regulation.
  - Diuretic usage → affects Na+/K+/2Cl- channels → hearing loss and vertigo



- Perilymph
  - Composition: An ultra-filtrate of Cerebrospinal Fluid (CSF).
  - Flow: Originates from CSF → enters scala tympani → fills space between membranous and bony labyrinths.
  - Cochlear aqueduct: The duct facilitating communication between the scala tympani and the subarachnoid space.
  - Distribution: Endolymph is inside the membranous labyrinth; perilymph is between the membranous and bony coverings.

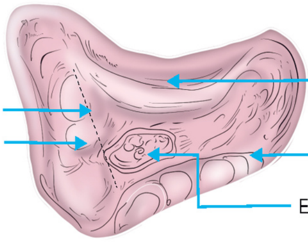
Endolymphatic Duct

- Vestibule (Central Chamber)
  - Bony part: Contains spherical and elliptical recesses.
  - Membranous part: Contains the saccule and utricle.
- Saccular duct + Utricular duct → Endolymphatic duct.
- Endolymphatic duct → Opens into the endolymphatic sac.
- Utricle: Receives the openings of the semicircular canal ducts via five openings.
- Saccule: Communicates anteriorly with the cochlea via the cochlear duct (scala media).
- Bony Coverings of Membranous Structures
  - Cochlear duct: Covered by scala vestibuli (above) and scala tympani (below).
  - Saccule: Covered by the spherical recess.
  - Utricle: Covered by the elliptical recess.
  - Semicircular canal ducts: Covered by the semicircular canals.
  - Endolymphatic duct: Covered by the vestibular aqueduct



Surface landmarkings:

- Donaldson's line: an imaginary line drawn from the posterior semicircular canal that bisects the lateral semicircular canal into 2 halves.



EMBRYOLOGY

00:37:38

Ear part	Embryonic layer	Arch
Pinna	Mesoderm	1 and 2 arch
EAC	Ectoderm	1st cleft
Tympanic membrane	All three layers	1st cleft and 1st pouch along with mesoderm
Middle ear cleft	Endoderm	1st and 2nd forms tubotympanic recess
Malleus and incus	Mesoderm	1st arch
Suprastructure of stapes	Mesoderm	2nd arch
Footplate of stapes	Mesoderm	Otic capsule
Mastoid	Mesoderm	Squamous and petrous parts of temporal bone

ONE-LINERS

00:38:43

- The part of the pinna lying between the ascending crest of the helix and tragus is called incisura terminalis
- The major part of the skin of the pinna is supplied by the greater auricular nerve
- Arnold's nerve is a branch of the vagus nerve.
- In newborns, the bony part of the EAC is absent
- Fissure of santorini are seen in the cartilaginous part of the EAC
- The cough response caused while cleaning the ear canal is mediated by stimulation of the vagus nerve
- The tympanic membrane forms an angle of 55 degrees with the EAC
- Körner's septum is a persistence of the petrosquamous suture
- The space between the pars flaccida and neck of the malleus is called Prussak's space.
- The part of the middle ear near the Eustachian tube is called the protympanum
- The site of exit of the chorda tympani from the middle ear is called the canal of Hugier.
- The scutum is the bony part of the outer attic wall
- A patulous eustachian tube is commonly seen in obese patients
- The electrodes of a cochlear implant are placed into the scala tympani via round window
- Endolymph is present in the membranous labyrinth
- The eustachian tube is typically 36 mm long
- The structure responsible for endolymph is the striae vascularis
- Duct of cochlea connecting with subarachnoid space → Aqueduct of cochlea
- The endolymphatic duct is formed by Saccular duct + Utricular duct
- The endolymphatic duct is covered by vestibular aqueduct
- Cochlear duct is → Scala media
- The cochlear duct is connected to the saccule by the ductus reunions

- The scala media is separated from scala tympani by basilar membrane
- The scala media is separated from the scala vestibuli by Reissner's membrane.

PYQs

00:42:58

Q. What is the function of the utricle and saccule?

A. Hearing high-frequency sounds

B. Linear acceleration and deceleration

C. Angular acceleration

D. Hearing low-frequency sound

Answer: B

Q. Which of the following structures in the inner ear is responsible for balance?

FMGE Jan 2024

A. Semicircular canal

B. Cochlea

C. Ampulla

D. Organ of corti

Answer: A

Yourwish

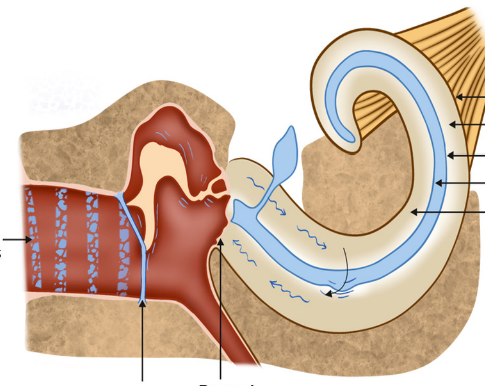
2. PHYSIOLOGY OF HEARING

CONDUCTIVE PATHWAY

00:01:00

Path Of Sound (air Conduction)

1. External auditory canal
2. Tympanic membrane
3. Malleus
4. Incus
5. Stapes (footplate)
6. Oval window



Sound Transmission In The Inner Ear

- Oval window → Scala vestibuli
- Scala vestibuli → Scala tympani (through inner ear fluid)
- Ends at the Round window

Phase Difference (space Difference)

- Sound hits the Oval window first, the round window later
- This phase difference is necessary (TIME DIFFERENCE)
- If both windows vibrate simultaneously
  - No phase difference
  - No proper mechanical vibration
  - No stimulation of the Organ of Corti
  - No conversion into electrical energy

SENSORY NEURAL PATHWAY

- Begins from the cochlea onward
- Beyond the middle ear = SENSORY NEURAL PATHWAY

Impedance Matching

00:03:00

- Middle ear = Air
- Inner ear = Fluid (Perilymph + Endolymph)
- Sound moving from air → fluid faces resistance
- The impedance matching mechanism helps overcome this resistance

Impedance Matching Mechanisms

Area Ratio (areal Ratio)

- Condensation of sound travelling from a larger tympanic membrane to a smaller foot plate of the stapes

Parameter	Value
Effective vibratory area of the tympanic membrane	45 mm^2
Stapes footplate area	3.2 mm^2
Calculation	45 ÷ 3.2 = 14:1
If vibratory area = 55 mm^2	55 ÷ 3.2 = 17:1
Area Ratio Range	14–17 : 1

Lever Ratio

- Condensation of sound travelling from a larger malleus to a smaller incus

Parameter	Value
Mechanism	Malleus (larger) → Incus (smaller)
Lever Ratio	1.3 : 1

Total Transformer Ratio

- Total transformer ratio= Areal ratio x Lever ratio

Parameter	Value
Effective vibratory area	45 mm^2/55 mm^2
Foot plate area	3.2 mm^2
Areal ratio	14:1/17:1
Lever ratio	1.3:1
Total transformer ratio	14 x 1.3= 18:1 17 x 1.3= 22:1

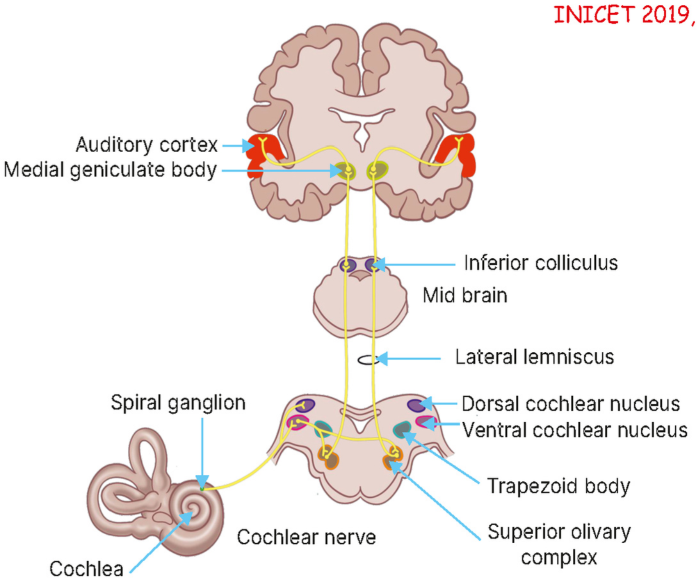
AUDITORY PATHWAY

00:06:00

INICET 2019, 2020, 2022, 2023

(Mnemonic: ECO LIMA)

- E- Eighth nerve
- C- Cochlear nucleus
- O- Superior olivary complex
- L- Lateral lemniscus
- I- Inferior colliculus
- M- Medial geniculate body
- A - Auditory cortex



Functions Of Different Levels

INICET 2019, 2020, 2022, 2023 00:08:00

Function	Site	Key Details
Frequency (Pitch) Determination	Cochlea	Tonotopic organization present
Amplitude (Intensity) Detection	Cochlear nerve	Detects the loudness of sound
Feature Detection	Higher auditory centers	Recognizing the type of sound (human, animal), human voice discrimination
Localization of Sound	Higher auditory centers	Detecting direction (right/left/front/back)

- **Tonotopic organization-** The base of the Cochlea is responsible for recognizing high-frequency sounds, but the apex of the cochlea is responsible for recognizing low-frequency sounds
- **Retrochochlear pathway defect-** Speech discrimination is affected; unable to identify phonetically similar (E.g. Fat, Bat, Rat and Fa, Ba, Ma sound similar)

TRANSDUCTION & HAIR CELLS

00:10:00

Transduction

- Conversion of Mechanical energy → Electrical energy
- Location: Organ of Corti

Hair Cells

Type 1 Cells (Inner Hair Cells)	Type 2 Cells (Outer Hair Cells)
Afferent function	Efferent function
True sensory receptors	Control Type 1 activity
Secrete Glutamate (Excitatory neurotransmitter)	Secrete GABA (Inhibitory neurotransmitter)

Supporting Cells

- Cells of Deiters
- Cells of Hensen
- Function: Support cells of the Organ of Corti

Yourwish

3. ASSESSMENT OF HEARING

TUNING FORK TESTS

00:01:40

Air Conduction And Bone Conduction

- Air Conduction (AC)
  - Tuning fork placed in front of pinna.
  - Pathway: External Auditory Canal → Tympanic Membrane → Malleus → Incus → Stapes → Inner Ear (Organ of Corti)
  - Organ of Corti converts mechanical energy to electrical energy → 8th Nerve → Brain
  - AC = Conductive Pathway + Sensory Neural Pathway.
- Bone Conduction (BC)
  - Tuning fork placed on mastoid bone.
  - Pathway: Vibrations go directly to cochlea → Brain
  - Bypasses external auditory canal and middle ear.
  - BC = Sensory Neural Pathway alone

Rinne Test

AIIMS 2020, FMGE 2020, 2021, INICET 2022, 2023
NEET PG 2023

Rinne Positive	• AC > BC ○ Sound heard longer and louder via air conduction • Inference: Seen in Normal hearing or SNHL (Sensorineural Hearing Loss)
Rinne Negative	• BC > AC ○ Bone conduction is heard longer and louder than air conduction • Inference: Seen in Conductive Hearing Loss
False Negative Rinne	• Mechanism: Trans-cranial transmission of sound • Inference: Seen in Unilateral Severe to Profound SNHL (Dead ear)

Rinne Test And Degree of Hearing Loss

256 Hz	512 Hz	1024 Hz	Degree of Hearing Loss
-	+	+	Mild (15-30 dB)
-	-	+	Moderate (30-45 dB)
-	-	-	Severe (>45 dB)

Weber Test

- Method: Tuning fork placed in midline.
- Normal: Sound distributed equally to both ears.
- Lateralization:
  - Sound goes towards Diseased Ear → Conductive Hearing Loss.
  - Sound goes towards Normal/Opposite Ear → SNHL.

- Example: Lateralization to Right ear implies:
  - Right Conductive Hearing Loss OR
  - Left SNHL.
- **Note:** Must combine with Rinne and Absolute Bone Conduction tests for diagnosis.

Absolute Bone Conduction (abc) Test

- Tests Sensory Neural Pathway (identifies SNHL)
- **Method:**
  - Patient and Examiner occlude tragus (Test assumes examiner has normal hearing sensitivity)
  - Compare BC duration of patient vs. examiner
- **Inference:**
  - **Normal:** Patient and Examiner hear for same duration
  - **SNHL:** Patient hears for shorter duration than examiner (ABC shortened)

PURE TONE AUDIOMETRY

00:11:43

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- Type of Test: Subjective test (Patient gives response)
  - Note: Not an objective test despite using a machine
- Test is Conducted in a soundproof room
- AC and BC are tested separately from higher Db to a lower Db
- Lowest threshold is marked on the Audiogram

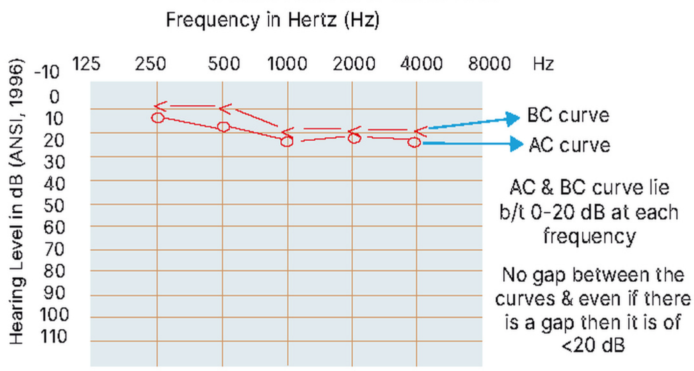
Symbols Used In Audiogram

	Right Ear	Left Ear
AC unmasked	0	X
AC masked	Δ	[]
BC unmasked	<	>
BC masked	[	]
No responses	↙O	X↘

- R-ear depicted in red colour and Left-ear in blue color

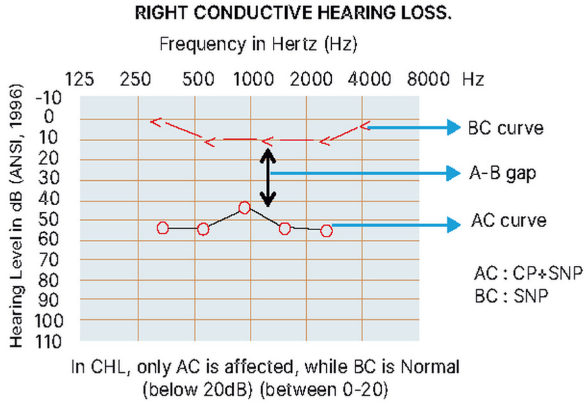
Interpreting The Audiogram

NORMAL GRAPH OF RIGHT EAR



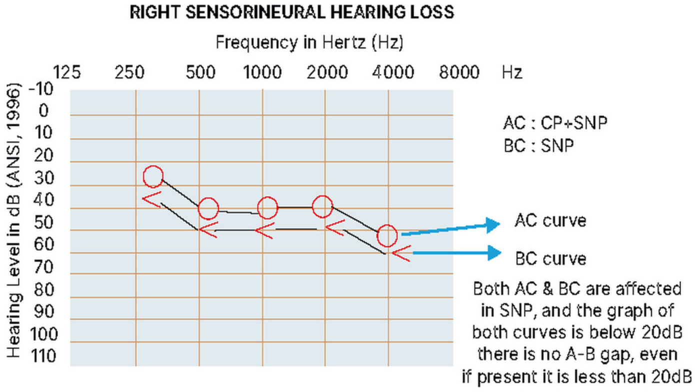
- Normal Hearing:
  - AC and BC curves lie between 0 to 20 dB.
  - No Air-Bone (AB) gap (or gap < 20 dB)

Conductive Hearing Loss



- BC Curve: Normal range (0-20 dB)
- AC Curve: Abnormal (Below normal range)
- AB Gap: Present (> 20 dB)
- Reason: Conductive pathway problem affects AC but spares BC (direct cochlear stimulation)

Sensorineural Hearing Loss (snhl)

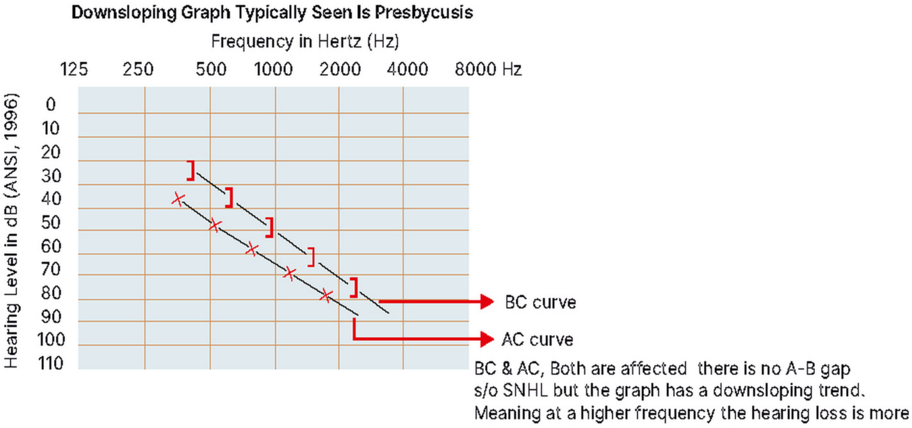


- AC Curve: Abnormal
- BC Curve: Abnormal
- AB Gap: Absent (Gap < 20 dB)
- Reason: Both AC and BC involve the sensory neural pathway, which is damaged.

Mixed Hearing Loss

- AC Curve: Abnormal
- BC Curve: Abnormal
- AB Gap: Present (> 20 dB)
- Reason: Combination of conductive and sensory neural components.

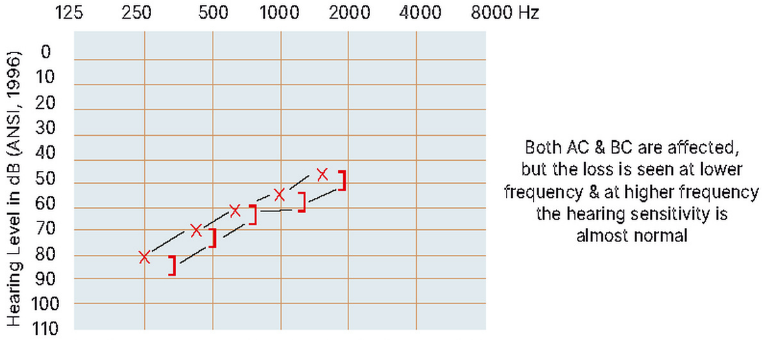
Presbycusis



- **Definition:** Age-related Sensorineural Hearing Loss (SNHL).
- **Audiogram Findings:**
  - AC (Air Conduction) is abnormal
  - BC (Bone Conduction) is abnormal.
  - Neither curve is in the 0-20 dB range
  - Down-sloping Graph Pattern → Typical of presbycusis
  - Hearing loss worsens as frequencies increase.

Meniere's Disease

Up Sloping Type Of Graph Seen In Meniere's Disease



Low frequency type of hearing loss is characteristic of Meniere's disease

- **Pathology:** Inner ear condition causing SNHL.
- **Audiogram Findings:**
  - AC abnormal; BC abnormal
  - Up-sloping graph Pattern
  - More hearing loss at lower frequencies

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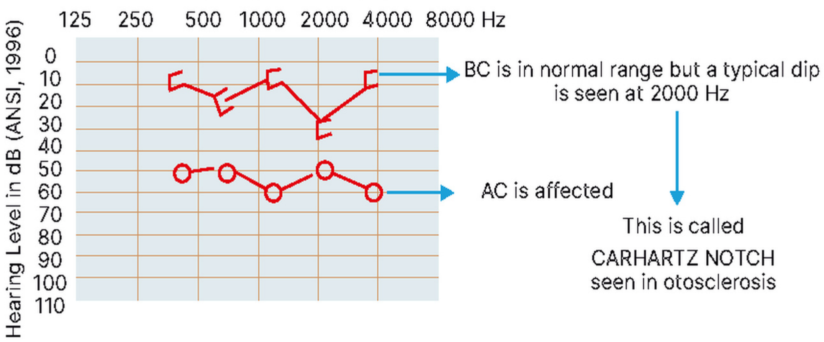
Otosclerosis

Carhart's Notch in Otosclerosis



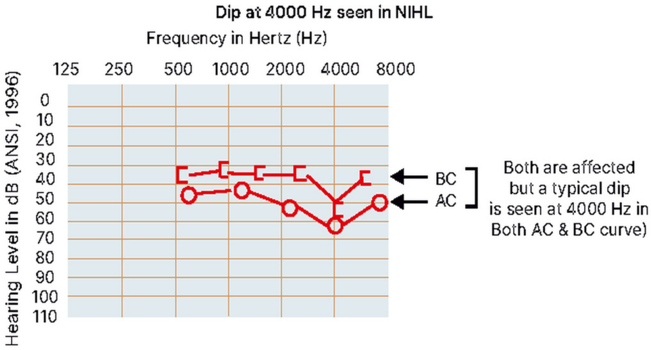
- **Pathology:** Conductive pathway problem → Conductive Hearing Loss (CHL).

Audiogram Findings

- BC is normal (0-20 dB range)
- AC is abnormal
- Air-Bone (AB) gap is present
- Specific Feature: Carhart's Notch.
  - A specific dip in the BC curve at 2000 Hz

Yourwish

Noise-induced Hearing Loss (nihl)



- **Pathology:** Noise causes damage →SNHL.

Audiogram Findings

- AC and BC are both abnormal
- Specific Feature: Boiler's Notch / Acoustic Dip.
  - A dip seen in both AC and BC curves at 4000 Hz.

Summary Table

Types of hearing loss / disease	PTA findings
Conductive hearing loss	BC normal; AC abnormal; AB gap present (>15 dB)
Otosclerosis	AB gap + dip at 2k in BC (Carhart's notch)
Sensorineural hearing loss	Both BC and AC abnormal and AB gap <15 dB
Presbycusis	No AB gap / <15 dB; Down sloping audiogram (high frequency hearing loss)
Ototoxicity	Down sloping audiogram (high frequency hearing loss)
Noise-induced hearing loss	Dip at 4k (acoustic dip) in both AC and BC
Early Meniere's	No AB gap + Upsloping audiogram (low frequency HL)
Cochlear otosclerosis	No AB gap + U shaped / trough / cookie bite audiogram
Mixed hearing loss	Both BC and AC abnormal; AB gap present (>15 dB)

IMPEDANCE AUDIOMETRY

00:23:04

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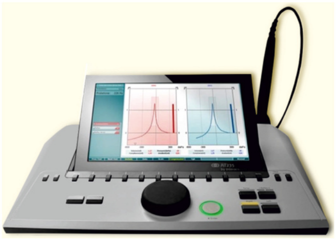
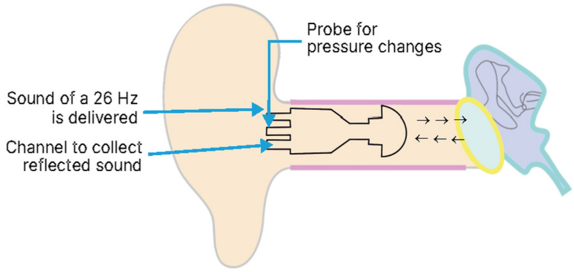
- Components: Includes two tests:
  1. Tympanometry.
  2. Stapedial Reflex

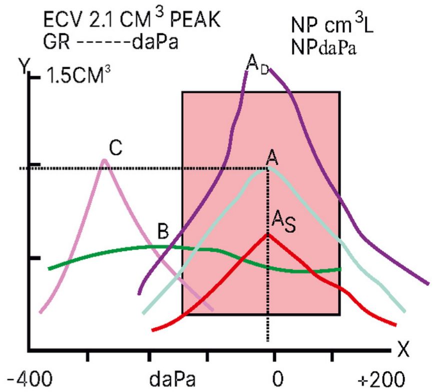
Tympanometry

- Test done to assess middle ear pathologies
- Test Type: Objective test (Machine gives response, not patient)
- Parameters Measured:
  - Middle ear pressure
  - Mobility of the Tympanic Membrane (TM).

- Mechanism:
  - Probe placed in canal
  - Pressure in canal is ↑/↓ to match middle ear pressure
  - TM vibrates at maximum when Canal Pressure = Middle Ear Pressure

Tympanogram Interpretation (graphs)



- Type A Graph:
  - Ascending and descending curve with peak at 0
  - Height: Peak occupies approx. half the length of Y-axis
  - Seen in the Normal middle ear.
- Type As Graph:
  - Peak at 0, but height is less than half of Y-axis
  - Seen in Otosclerosis
- Type Ad Graph:
  - Peak at 0 (or near it) but very high/open (off the chart)
  - Seen in Ossicular Discontinuity (e.g., following head injury/trauma).
- Type B Graph:
  - Single flat line (no peak)
  - Seen when Fluid or Effusion in middle ear (OME).
- Type C Graph:
  - Curve with peak shifted to negative pressure (-200, -300)
  - Seen in Eustachian Tube Dysfunction (Negative middle ear pressure).

Stapedial Reflex

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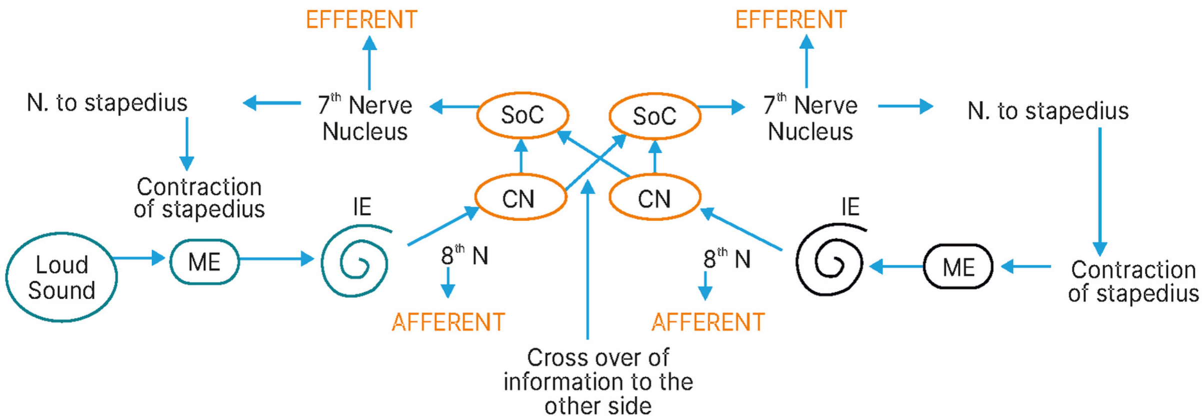
- Definition: Loud sound to one ear causes bilateral contraction of stapedius muscles
- Reflex Pathway
  - Loud sound → External/Middle/Inner Ear → Via 8th Nerve goes to Cochlear Nucleus → Ipsilateral and Contralateral Superior Olivary Complex (Note: Lateral decussation occurs here) → Stimulates B/l Facial Nerve Nucleus → Nerve to Stapedius (Branch of 7th nerve) → Contraction of Stapedius muscle



Important Points To Remember

Stapedius Reflex	Important Stapedius Reflex Results
• Afferent nerve - 8th CN • Center for stapedial reflex - Superior Olivary complex • Efferent nerve - 7th CN • Test which nerves - 8th and 7th • Giving a loud sound in the right ear → Rt. Ear 8th and 7th and left ear 7th • Bilateral reflex • 7th nerve palsy of right side → Reflex absent on Rt Side → Hyperacusis (normal sounds appear abnormally loud)	• CHL (otosclerosis, SOM) - absent • Sensory/Cochlear HL - threshold reduced (will be present at lower loudness due to recruitment) • Neural/retrocochlear HL - stapedial reflex decay present (the reflex will die out quickly inspite of continuous loud sound). • Malingers - Normal • Evaluating hearing in infants/young children unable to undergo tuning fork/audiometry

SPEECH AUDIOMETRY

00:32:30

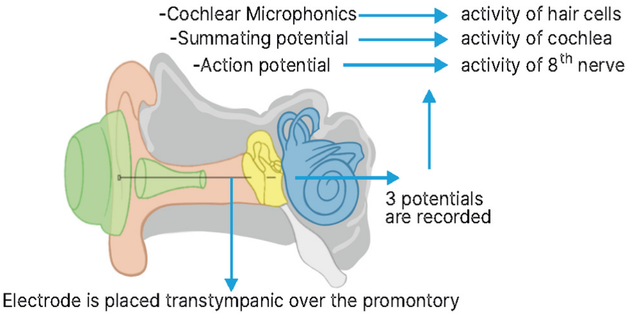
- Two tests → Speech Reception Threshold (SRT) and Speech Discrimination Score (SDS)

Speech Reception Threshold (SRT)	Speech Discrimination Score (SDS)
• It is a threshold at which 50% of spoken words are repeated correctly	• It is the ability of a patient to correctly identify phonetically balanced words like fox, box. • SDS < 20% strongly suggests retrocochlear pathology

- Both SRT and SDS are affected in Retrocochlear pathology

ELECTROCOCHLEOGRAPHY (ECOG)

00:35:20



- Type: Objective test for inner ear assessment
- Parameters: Measures inner ear potentials:
  - Cochlear microphonics.
  - Summating potential (SP).
  - Action potential (AP).
- Method: Electrode placed via tympanic membrane over the promontory (basal turn of cochlea).
- Interpretation:
  - Normal SP/AP ratio: < 30%.
  - Abnormal ratio (> 30%) → Indicates Meniere's disease.
- IOC for identifying Meniere's disease.

OTOACOUSTIC EMISSIONS (OAE)

00:36:12

- Emissions coming from Outer Hair Cells of the cochlea
- Significance:
  - Best audiometric screening test for neonates
  - Features: Non-invasive, repeatable, easily applicable, cost-effective
  - Screening investigation of choice in Neonatal Hearing Screening Program.
- Uses:

- Differentiate Cochlear vs. Retrocochlear pathology
- Early detection of Noise-Induced Hearing Loss (NIHL) in high-risk professions (factory, airline)

- Testing done in awake babies using a probe in the external auditory canal

Oae Result Interpretation

- OAE is Present ("Pass")
  - Outer hair cells/Cochlea are normal.
  - If SNHL persists → Likely Retrocochlear pathology
- OAE is Absent ("Refer")
  - Indicates abnormality (Cochlear pathology OR Middle ear pathology blocking emissions)
  - Does not confirm hearing loss; requires further testing

Management Protocol For "refer" (absent Oae)

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Result of OAE

If OAE Present it is k/a pass Conclusion- Normal inner ear/normal OHC of cochlea.

If OAE absent Refer for

Tympanometry (This is done to rule out middle ear pathology. Any middle ear pathology causing > 35dB hearing loss will not allow sufficient sound to reach inner ear and back from inner ear to the probe in the EAC)

BERA For the following 3 reasons

BERA will reconfirm cochlear pathology.

BERA will tell the exact threshold of hearing. As OAE will be absent in any cochlear pathology leading to > 30 db hearing loss, we need to find out the exact HL level by BERA

To check if nerve is functional.

If moderate/moderately Severe hearing loss patient will require Hearing aid.

If severe to profound hearing loss, patient will require cochlear implant if no response with hearing aid trial

BERA (BRAINSTEM EVOKED RESPONSE AUDIOMETRY)

00:40:46

- Typically done in a sleeping child
- Done to Assesses auditory pathway from 8th nerve up to brain stem
- Type: Non-invasive objective test
- Wave Generation: 5 to 7 waves generated; each represents a part of the pathway.

BERA Waves

Mnemonic: E-E-C-O-L-A-I

Wave	Structure Represented	Mnemonic Letter
Wave I	Distal part of CN VIII	E
Wave II	Proximal part of CN VIII near the brainstem	F
Wave III	Cochlear nucleus	C
Wave IV	Superior olivary complex	O
Wave V	Lateral lemniscus	L
Wave VI	Inferior colliculus	I
Wave VII	Inferior colliculus	I

Clinical Uses of BERA

Uses of BERA	• It is the best audiometric test • To screen hearing loss in neonates in ICU • To confirm hearing loss in neonates and infants To find hearing threshold • Differentiate between cochlear and retrocochlear HL • For retrocochlear pathology - acoustic neuroma • For nonorganic hearing loss (malingering)
BERA	Measures electrical activity in the auditory pathway from sound stimulus to 10 m/sec
MLR (Middle latency response)	Measures electrical activity in the auditory pathway 10-50 m/sec after sound stimulus
LLR (Late latency response / Cortical responses)	Measures electrical activity in the auditory pathway 50-500 m/sec after sound stimulus - tested by CERA (Cortical Evoked Response Audiometry)

- Best test for
  - Confirmatory test for hearing loss
  - Non organic hearing loss
  - Best audiological test for acoustic neuroma
  - Useful in infants and uncooperative patients
  - Helps differentiate between cochlear from retrocochlear hearing loss

RECRUITMENT: TEST FOR COCHLEAR PATHOLOGY

00:45:38

- It is a phenomenon where there is abnormal growth in sound intensity (low intensity sound perceived as loud)
- Seen in Cochlear pathology
- Type: Subjective test (Patient gives response).

SISI (Short Increment Sensitivity Index)

- Test for Recruitment (Cochlear pathology)
- Method:
  - Sound intensity increased/decreased by 1 dB every 5 seconds
  - Normal: Cannot appreciate the small change
  - Cochlear Pathology: Can appreciate the small change (Recruitment present)

Threshold Tone Decay Test

- Test for Retrocochlear pathology.
- Type: Subjective test.
- Method:
  - Sound stimulus given continuously
  - Interpretation:
  - Normal: Heard for 60 seconds or more.
  - Retrocochlear Pathology: Nerve undergoes fatigue → Heard for < 60 seconds.

Summary: Subjective Vs Objective Tests

Pathology	Subjective Tests	Objective Tests
Cochlear Pathology	• Pure tone audiometry • Speech audiometry • Recruitment (SISI)	• OAE • Electrocochleography
Retrocochlear Pathology	• Speech discrimination score • Tone decay test	• BERA (Very important) • Auditory steady-state response (ASSR)

APPROACH TO A PATIENT WITH HEARING LOSS

00:49:49

- Patient has hearing loss (No pain / No discharge / intact Tympanic membrane)

Step 1: Tuning Fork Tests

- Rinne test
  - AC > BC → Rinne positive → Normal or SNHL
  - AC < BC → Rinne negative → Conductive hearing loss
- Weber test
  - Lateralizes to diseased ear → Conductive
  - Lateralizes to opposite ear → SNHL
- Absolute bone conduction test → differentiate conductive vs sensorineural hearing loss

Step 2: Pta

- Confirms type of hearing loss
- Quantifies degree of loss
- If conductive Hearing loss (CHL) → Tympanometry
  - Assesses middle ear pressure & compliance
  - Normal TM + CHL > middle ear pathology
- If SNHL present → BERA / OAE
  - Otoacoustic Emissions (OAE): Identifies Cochlear pathology.
  - BERA: Identifies Retrocochlear pathology.

High Frequency Audiometry

- Standard Audiometry: Tests 250 Hz to 8000 Hz (Normal hearing 20-20,000 Hz).
- High Frequency Audiometry: Tests 16,000 Hz, 20,000 Hz, 25,000 Hz.
- **Indications:**
  - Identification of Noise-Induced Hearing Loss (NIHL).
  - Identification of Ototoxicity (ototoxic drugs).

Important Information

- Stapedial reflex is mediated by 8th nerve (Afferent) and 7th nerve (Efferent)
- Higher auditory center determine localize & discriminate
- Screening test for hearing loss is OAE
- Confirmatory test for hearing loss is BERA
- Objective tests for hearing are OAE / BERA / Electrocochleography
- Subjective test for hearing are TFT / PTA / SISI/ Tone decay test

DEGREE OF HEARING LOSS

00:53:53

WHO Grading

Category	Hearing Level (dB HL)
0-None	≤ 25 dB
1-Slight/Mild	26-40 dB
2-Moderate	41-60 dB
3-Severe	61-80 dB
4-Profound	≥ 81 dB

ASHA Grading (American Speech-Language-Hearing Association)

Category	Hearing Level (dB HL)
Mild	26-40 dB
Moderate	41-55 dB
Moderately Severe	56-70 dB
Severe	71-90 dB
Profound	> 91 dB

Approximate Hearing Loss by Condition

Pathology	Approximate hearing loss
Complete obstruction of the ear canal	40 dB
Perforation of TM	10-40 dB
Ossicular interruption with intact TM	54 dB
Ossicular interruption with perforated TM	38 dB (lesser than above because some sound reaching directly to the footplate through the perforation)
Complete fixation of footplate	60 dB

ERROR FILES

00:55:41

- **False Negative Rinne:** Seen in Unilateral Severe to Profound SNHL.
- **Audiogram Shapes:**
  - **Down-sloping:** Presbycusis.
  - **Up-sloping:** Meniere's Disease.
- **Test Specificity Confusions:**
  - Subjective for Cochlear → SISI
  - Objective for Cochlear → OAE, ECochG
  - Subjective for Retrocochlear → Tone Decay.
  - Objective for Retrocochlear → BERA.

Yourwish

PYQ

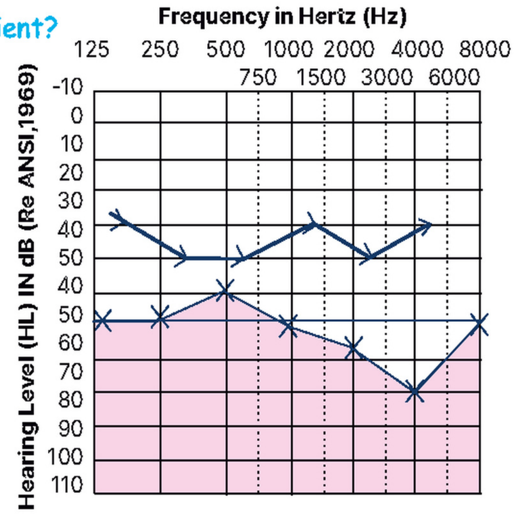
00:56:46

Patient had negative Rinne on 256 and 512 Hz tuning fork but positive Rinne on 1024 Hz. What is the air-bone gap?

a. 15 to 30 dB
b. 30 to 45 dB
c. 45 to 60 dB
d. 60 dB

Ans. B

Q. What is the interpretation of the following PTA conducted on a patient?



a. Mixed hearing loss
b. Sensorineural hearing loss
c. Conductive hearing loss
d. Auditory neuropathy spectrum disorder

Ans. B

Q. Carhart Notch is seen in which disease?

a. Otosclerosis
b. Meniere's disease
c. CHL
d. SCC dehiscence

Ans. A

Q. M/c test used in screening of neonatal hearing loss?

a. OAE
b. BERA
c. PTA
d. None of the above

Ans. A

Q. Which of the following conditions show maximum hearing loss?

a. Serous otitis media
b. Partial fixation of footplate of stapes
c. Ossicular discontinuity with intact TM
d. Ossicular discontinuity with perforated TM

Ans. C

Yourwish

4. ASSESSMENT OF VESTIBULAR SYSTEM

NYSTAGMUS

00:00:55

Approach

1. Central vs Peripheral component of nystagmus
2. Rule / Direction of nystagmus (what it indicates)
3. How to evoke nystagmus (how to stimulate the labyrinth)

3 Ways To Evoke Nystagmus

- Temperature change → Caloric test
- Pressure change → Fistula test
- Position change → Dix-Hallpike test

Central Vs Peripheral Nystagmus

00:02:45

Feature	Peripheral (Labyrinthine)	Central (Brain)
Latency	Present • Problem in balance receptors: macula + crista • Utricle/saccule/semicircular canals involved → vertigo	Absent
Fatigability	Fatigable (d/t repeated stimulation)	Not fatigable
Duration	Limited (1.5 min to 2 min)	Long-lasting
Direction	Usually fixed	Direction-changing / random
Optic fixation	Disappears	Does NOT disappear
Torsion with horizontal/ Vertical	Present	Pure Horizontal / pure vertical /pure torsional

- Latency = time from stimulation to appearance of nystagmus
- If you stimulate at 0 sec and nystagmus comes at 10 sec → latency present
- Peripheral (labyrinthine): Latency present
  - Reason: labyrinth has to be stimulated → impulses travel via vestibular nerve → vestibular nucleus → MLF → $3^{rd}/4^{th}/6^{th}$ nuclei → then nystagmus appears
- Central: No latency
  - From stimulation to nystagmus → immediately

Direction Of Nystagmus

00:07:00

- Normal eyes stay in midline because: Equal pull from both labyrinths → midline
- "Direction of nystagmus" means direction of the FAST component
  - Nystagmus has fast + slow component
  - Direction is named by fast component
  - Example: Fast to right + slow to left → direction is right

Type of Lesion	Seen in which condition	Direction of nystagmus
Hyperactive lesion of labyrinth	BPPV	Toward more active side → i.e., Toward the involved ear
Hypoactive lesion of labyrinth	Vestibular neuritis, purulent labyrinthitis	Toward more active side → i.e., Toward the normal ear

- **For example:**
  - In right PSC BPPV - Vertical nystagmus toward right
  - Right vestibular neuritis - Horizontal nystagmus to left (active) side.

Direction Based On Which Canal Is Involved

00:10:00

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Due to Involvement of	Type of Peripheral Origin Nystagmus seen	Seen in which conditions
Vertical canal (PSC, SSC)	Vertical nystagmus with torsion	Posterior and superior canal BPPV, Superior SCC Dehiscence
Superior canal	Down beating	
Posterior canal	Upbeating	
Horizontal SCC	Horizontal nystagmus	Horizontal SCC, BPPV
Complete involvement of labyrinth (hypoactive)	Horizontal nystagmus with torsion	Vestibular neuritis (Complete destruction of the vestibular nerve), purulent labyrinthitis, late stages of Meniere's

Evoke Nystagmus

Position Change → Dix-hallpike Test

00:12:37

- Investigation of choice for BBPV

AIIMS 2020

- Benign paroxysmal positional vertigo occurs due to displacement of small crystals of calcium carbonate (otoliths) in semicircular canal area
  - Vertigo in BBPV lasts a few seconds to few minutes.
- Principle of the test
- Normally, the otoliths are present in the ampulated end of the semi-circular canals.
- Putting the patients head in low position, displaces the otoliths and provokes vertigo and nystagmus

Inner ear canal involved	Most common?	Primary Diagnostic Test	What happens in the test
Posterior canal	Most common (~85-90%)	Dix-Hallpike test	Vertigo + upward & twisting eye movements (torsion)
Horizontal (lateral) canal	Less common	Supine Roll Test	Vertigo when head turned left/right while lying flat
Anterior (superior) canal	Rare	Deep Head hanging test	Vertigo when head is deeply extended

Thermal Changes- Caloric Test

00:16:00

Principle

We irrigate warm or cold water in external auditory canal

↓

Stimulation of lateral semicircular canal in the medial wall

↓

Stimulation of Superior vestibular nerve

↓

Vestibular nerve

↓

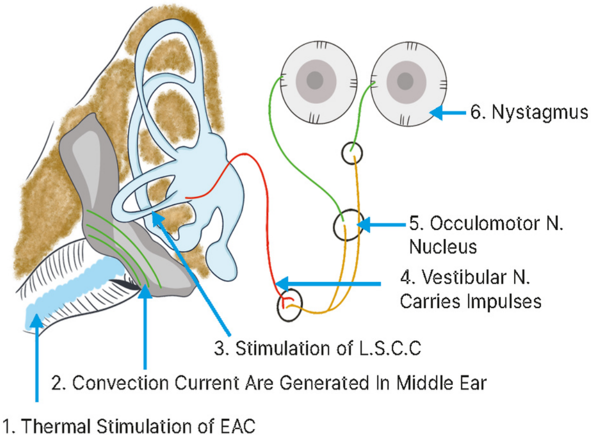
Vestibular nucleus

↓

3rd/4th/6th nuclei

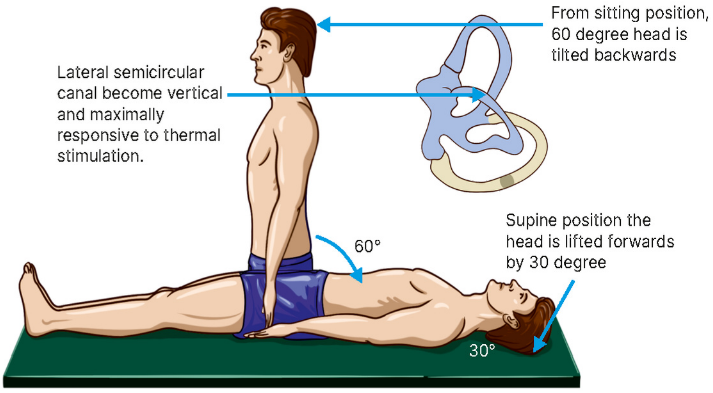
↓

Nystagmus



Position

- If supine → head up 30 degrees
- If sitting → head down 60 degrees



Procedure And Inference

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- It is a test for VOR pathway
- Unilateral testing done using caloric test (each labyrinth cane be tested)
- Temperature- Bi-thermal (Fitzgerald/Hallpike test)- 30°C to 44°C
- As body temp is 37°C, 7° below and 7° above is used
- Semicircular canal stimulted- Lateral canal
- Normal response: COWS
  - Cold water → nystagmus to Opposite side
  - Warm water → nystagmus to Same side
  - Example: Right warm → nystagmus to right; Right cold → nystagmus to left
- If no response / no nystagmus
- Hypoactive labyrinth OR
- Vestibular nerve/pathway problem
- Inner ear is not functioning

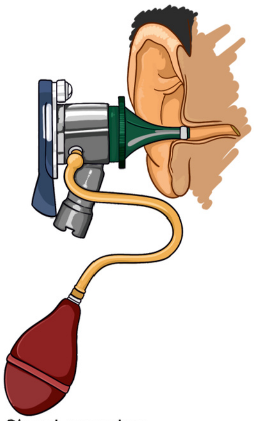
Exceptions

- Tympanic membrane perforation
  - Do NOT irrigate water → Instead use air → Dundas Grant tube test
- If no pinna and no canal → Barany's rotational chair test
  - Patient sits on rotating chair with VR glasses
  - Rotation stimulates crista (angular/rotational motion)
  - VR glasses record nystagmus

Yourwish

Pressure Change → Fistula Test

00:21:30



Siegel speculum

- Pressure stimulation of the EAC leading to labyrinthine stimulation
- Done by pressure on tragus or siegelization
  - Siegle's pneumatic speculum → inflate/deflate bulb → increase/decrease canal pressure
- Vertigo increases on:
  - Cough
  - Sneeze
  - Lifting heavy weight (because middle ear pressure increases)
- Normally there is no direct communication between middle ear and inner ear. So pressure is not transmitted to inner ear. Fistula test should be NEGATIVE in normal person
- In case of lateral semicircular canal dehiscence/Oval window rupture/Round window rupture, there is a direct communication between middle ear and inner ear. Pressure is transmitted, stimulating vestibular nerve and nucleus resulting in nystagmus

Inference

- Positive Fistula test- Communication present
- Negative Fistula test- In normal individuals
- False Positive Fistula test- No communication, but test is positive
- False negative fistula test- Communication is present, but test is negative

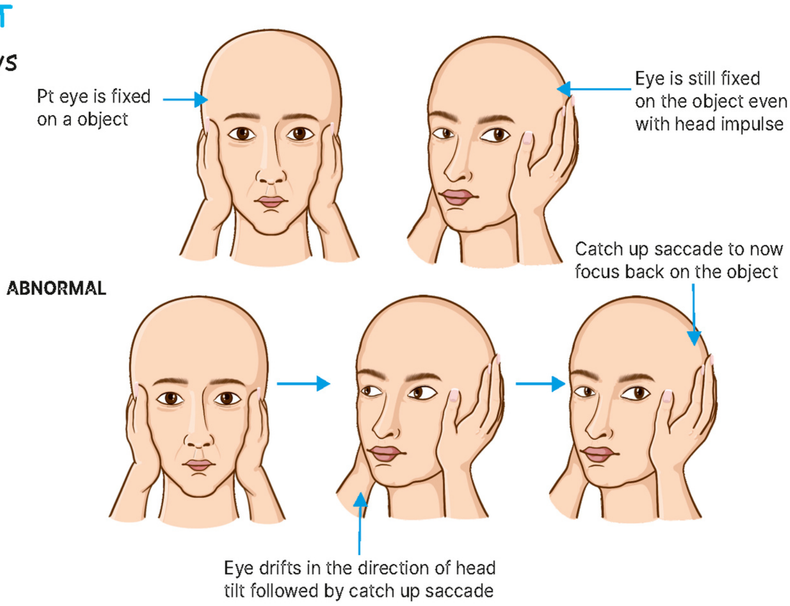
Fistula test result	Seen in which conditions
Positive (vertigo and nystagmus on doing the test)	Fistula on medial wall e.g., perilymphatic fistula, LSC erosion, fenestration operation
False positive / Hennebert sign (test +ve without fistula on medial wall)	• Meniere's • Hypermobility footplate (congenital syphilis) SCC dehiscence
False negative (test -ve in spite of fistula on medial wall)	• Dead labyrinth • Cholesteatoma covering fistula

HEAD IMPULSE TEST

00:27:30

Neet PG 2024

- Test for VOR pathways



Yourwish

Procedure

- Ask patient to fixate eyes on a target (examiner's nose/finger/pen)
- Examiner suddenly rotates head to right/left

Interpretation

- Normal: Eye remains fixed on object
- Abnormal
- Eye deflects with head movement then comes back to catch the object: This is a saccade
- Saccade present = labyrinthine / inner ear abnormality
- Abnormal on right thrust → right vestibular hypofunction

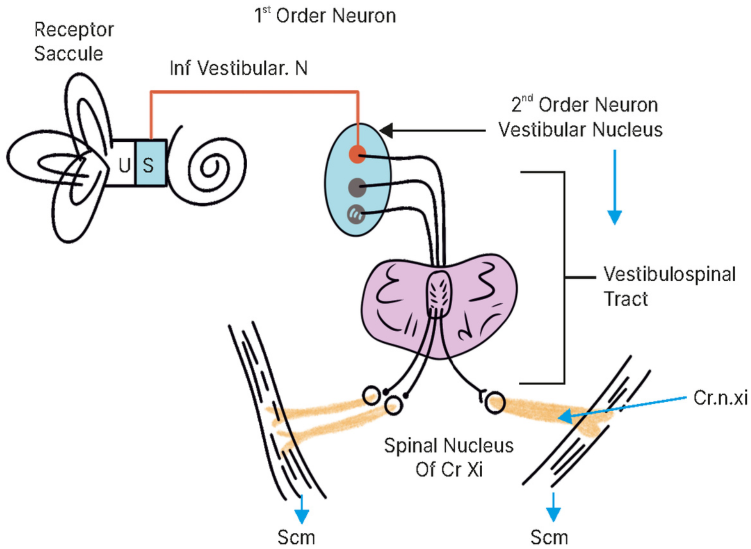
VEMP (VESTIBULAR EVOKED MYOGENIC POTENTIAL)

00:29:30

- Now this is for vestibulo-spinal reflex, not VOR
- VEMP = vestibular system stimulated → muscle contraction recorded by electrodes

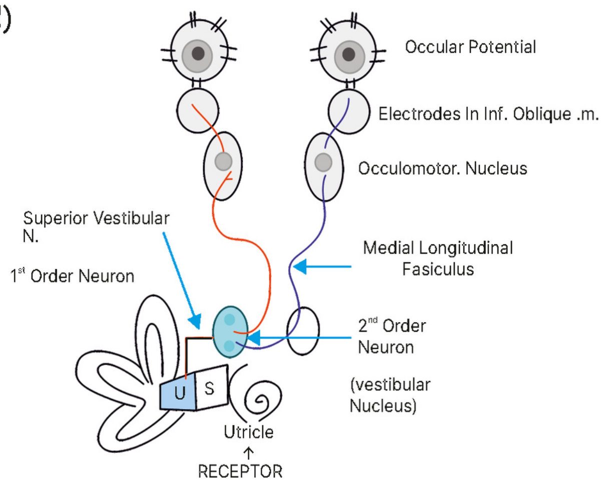
cVEMP (cervical VEMP)

- Electrode on sternocleidomastoid
- Tests inferior vestibular nerve
- Pathway described: saccule → inferior vestibular nerve → vestibular nucleus → spinal cord → spinal accessory nerve → SCM contraction



oVEMP (ocular VEMP)

- Records ocular muscle contraction (inferior oblique mentioned)
- stimulates utricle
- Impulses via superior vestibular nerve



VEMP TEST RESULT	CONDITIONS
Hyperactive response, these patients have vertigo on loud sounds (Tullio's phenomenon)	• Meniere's • fistula • canal dehiscence • Hypermobile footplate (Congenital syphilis)
Hypoactive response	• labyrinthitis • vestibular neuritis • acoustic neuroma

Common Student Errors

- Caloric test positive- Normal
- Fistula test positive- Abnormal Dix-Hallpike test positive- BBPV
- cVEMP vs oVEMP confusion
- cVEMP → cervical muscle (SCM) → inferior vestibular nerve
- oVEMP → ocular muscle → superior vestibular nerve
- Peripheral vs central nystagmus confusion
- Peripheral: Latency present; Fatigable; Limited duration
- Central: No latency; Not fatigable; Unlimited / direction changing

MCQs

00:34:10

Q. A patient is found to have acute vertigo and horizontal nystagmus with the slow component toward the left. In which of the following conditions would you see this finding?

A. Posterior canal BPPV

B. Superior canal BPPV

C. Right hypoactive labyrinth

D. Left hypoactive labyrinth

Ans. D

Explanation:

- Low component to left → Fast component to right → Direction of nystagmus is right
  - Rigth is hyperactive or left is hypoactive
- Posterior and superior BBPV- Vertical nystagmus

Q. Head Impulse Test is primarily used to assess

A. Otolith function

B. Central vestibular pathway

C. Vestibulo-ocular reflex

D. Cochlear reserve

Ans. C

5. ACOUSTIC NEUROMA

- Benign tumor
- Arises from the internal auditory canal (IAC)
- Extends toward the cerebellopontine angle (CPA)
- MC tumor of CPA → Acoustic neuroma
- Accounts for ~80% of CPA tumors
- Cell of origin → Schwann cells

Anatomy – Internal Auditory Canal (Iac)

00:00:17

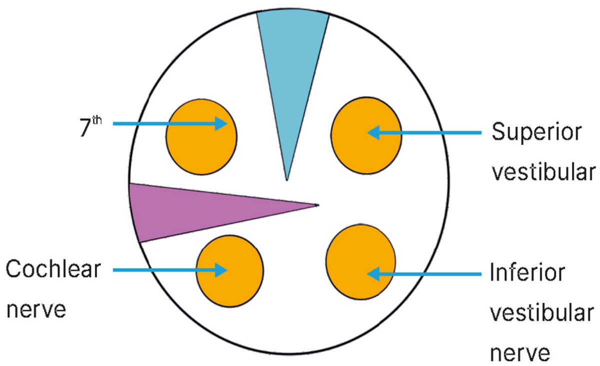
- **Structures passing through IAC**
  - Facial nerve (CN VII)
  - Vestibulocochlear nerve (CN VIII)
- **Branches of Vestibulocochlear Nerve**
  - Cochlear nerve
  - Vestibular nerve
- **Branches of the Vestibular nerve**
  - Superior vestibular nerve
  - Inferior vestibular nerve

Quadrant Arrangement In Iac

- Two bony crests divide the internal auditory canal.
  - **Bill's bar-** Vertical crest
  - **Falciform crest-** Horizontal crest

Nerve Arrangement In Quadrants

- Anterosuperior quadrant
  - Facial nerve (CN VII)
- Anteroinferior quadrant
  - Cochlear nerve
- Posterosuperior quadrant
  - Superior vestibular nerve
- Posteroinferior quadrant
  - Inferior vestibular nerve- MC site of origin of Acoustic neuroma

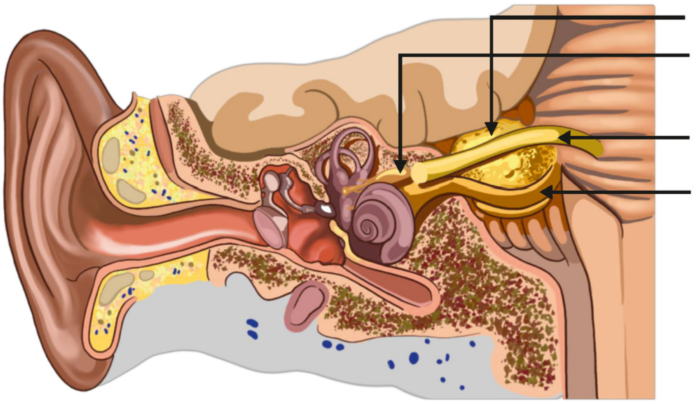


Pathology

- Benign tumor, locally invasive
- Originates from Schwann cells of the vestibular nerve, but sometimes even from the Cochlear nerve
- As it expands, it causes widening of the canal and appears in the CP angle

Yourwish

FMGE 2021



Acoustic neuroma on vestibulocochlear nerve puts pressure on facial nerve

Clinical Features

00:07:00

NEET PG 2023

- Symptoms occur due to compression of cranial nerves

Early Stage – Internal Auditory Canal

Vestibular nerve involvement	• Vertigo • Imbalance • Often compensated by the opposite vestibular system
Cochlear nerve involvement	• Retrocochlear Sensorineural hearing loss

Facial Nerve Involvement	• Early involvement: Affects sensory fibers
	  ○ Feature: Loss of sensation over the concha
	  ○ Hitzelberger's Sign: Loss of conchal sensation (indicates facial nerve sensory involvement)
	• Late involvement: LMN facial palsy

Late Stage – Expanding Tumor

- As the tumor enlarges, additional cranial nerves get compressed

Direction	Cranial Nerves Involved	Symptoms
Superior tumor expansion	CN V (Trigeminal) CN VI (Abducens)	Loss of corneal reflex Lateral rectus palsy
Inferior tumor expansion	CN IX CN X CN XI	Dysphagia Speech difficulty
Medial tumor expansion	Brainstem Cerebellum	Ataxia Raised intracranial pressure

Key Clinical Indications

- Most common age: 40-60 years
- Bilateral tumors are part of neurofibromatosis type 2

- Unilateral sensorineural hearing loss
- Poor speech discrimination
- Cranial nerve involvement
- Brainstem/cerebellum involvement

Audiometric Findings

00:09:00

Tuning Fork Tests

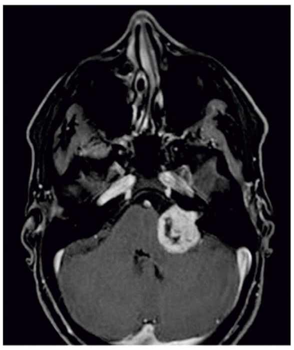
- **Rinne test-** Positive
  - False positive in severe to profound U/L SNHL (>70-90 dB)
- **Weber test-** Lateralizes to the normal ear
- **Absolute bone conduction-** Shortened
- Acoustic reflex delay- Positive
- Speech discrimination- Poor
- Tone Decay Test- Positive
  - Patient hears the tone for less than 60 seconds

Audiological Investigation Of Choice

- BERA (Brainstem Evoked Response Audiometry)
- Delay in Wave 5

General Investigation Of Choice

- MRI with gadolinium contrast- Ice Cream Cone Sign



Biopsy Findings

- Antoni A cells
- Antoni B cells
- Verocay bodies

Treatment

00:11:10

- Management depends on tumor size

Tumor <3 cm	• Radiosurgery- Single high-dose radiation to shrink the tumor
Tumor >3 cm	• Surgical excision Surgical approaches • Middle cranial fossa approach • Retrosigmoid approach • Transcochlear approach
NF2 with Acoustic neuroma	• Surgery may cause permanent sensorineural hearing loss • Hearing rehabilitation is achieved with the placement of an auditory brainstem implant in the lateral recess of the 4^{th} ventricle

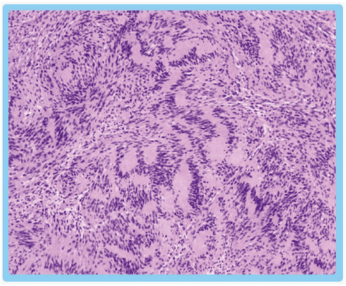
MCQs

00:13:45

Q. A young man presented with hearing loss and tinnitus. The histology image is shown below. What is the diagnosis?

INICET July 2021

A. Neurofibroma
B. Schwannoma
C. Leiomyoma
D. Rhabdomyoma



Ans: B

Yourwish

6. MIDDLE EAR DISORDER

PATHOGENESIS OF MIDDLE EAR DISEASES

00:00:55

- All middle ear diseases occur due to eustachian tube obstruction
- Causes of Eustachian Tube Obstruction
  - Nasal Causes
    - → DNS
    - → Nasal polyps
    - → Allergic rhinitis
    - → Nasal packing for epistaxis
    - → Nasal foreign body
  - Nasopharyngeal Cause
    - → Any pathology affecting **nasopharynx ventilation** can obstruct the eustachian tube.
  - Palatal Causes
    - → Cleft palate
      - Eustachian tube opening depends on Tensor veli palatini and Levator veli palatini muscles
      - If these muscles are weak → tube cannot open → middle ear ventilation decreases.

Nasal / Nasopharyngeal / Palatal pathology

↓

Eustachian tube obstruction

↓

Negative pressure in middle ear

↓

Middle ear effusion

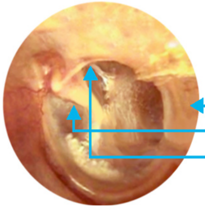
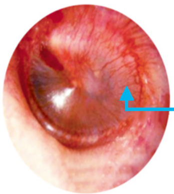
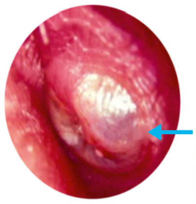
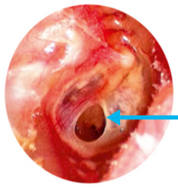
- Infected effusion : Suppurative otitis media
- Non Infected effusion : Non suppurative otitis media
- < 4 weeks: Acute Suppurative Otitis Media (ASOM)
- > 12 weeks: Chronic Suppurative Otitis Media (CSOM)

ACUTE SUPPURATIVE OTITIS MEDIA (ASOM)

AIIMS 2020
NEET PG 2018, 2022
INICET 2022, 2024, 2025
FMGE 2018, 2022, 2024, 2025

- Predisposing factors leading to eustachian tube blockage.
  - Recurrent attacks of common cold, URTI
  - Exanthematous fever like measles, diphtheria, whooping cough
  - Chronic rhinitis and sinusitis
  - Allergy
  - Nasopharyngeal tumors
  - Nasal packing for epistaxis
  - Cleft palate

STAGES OF ASOM

Stage	Pathology	Symptoms	Signs
1.TUBAL OCCLUSION	Tubal oedema of ET leading to negative pressure and retraction of TM	Ear blockMild deafness	Mild retraction of tympanic membrane 
2.PRESUPPURATION	Invasion of organisms and mild inflammation	Severe ear pain Hearing loss Fever	Blood vessels radiating from periphery to centre Cartwheel appearance 
3.SUPPURATION	Frank pus formation	Excruciating ear pain High-grade fever Hearing loss	Bulging tympanic membrane Pus discharges in pulsatile form : Pulsatile otorrhea This pus reflects the light: light house sign 
4.RESOLUTION	TM rupture with release of pus	Pus drains out Tympanic membrane perforation in anteroinferior quadrant	Pus drains out TM perforation 
5.COMPLICATIONS			

- MC organism : Streptococcus pneumoniae
- Symptoms : Child with history of URTI, Ear pain, Fever, Hearing loss
- Signs: TM retraction, Cartwheel appearance, Bulging drum, Pulsatile otorrhea, Lighthouse sign
- Investigations : Usually not required
- Diagnosis : History + Clinical examination
- Rx :

- Amoxicillin/Ampicillin (8-10 days)
- Supportive : Nasal/oral decongestants, Analgesics, Antipyretics
- Myringotomy
  → Indications
    - Excruciating pain + bulging drum
    - Incomplete resolution despite antibiotics
    - Persistent effusion >12 weeks
    - ASOM with facial palsy

  → Curvilinear incision in posterior inferior quadrant

Patient presents with c/o acute onset ear pain Wo URTI

↓ Next step

On Examination
TM cartwheel, red congested, Pulsatile otorrhea, Light house sign.

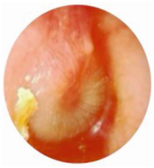
Cartwheel TM

↓

Diagnosis
ASOM
MC route-Eustachian tube

↓ Next step

Management
Antibiotics (Pneumococcus MC organismi), myringotomy (Poste anterior quad, done if TM fill, bulging or facial palsy



Posteroinferior quad, curvilinear Myringotomy

NON-SUPPURATIVE OTITIS MEDIA (SOM)

00:11:33

- Definition: Accumulation of non inflammatory exudate in the middle ear cavity
- Common in 2-6 years of age
- Occurs due to:
  - Nasal pathology
  - Nasopharyngeal pathology
  - Palatal pathology

Condition	Age Group	Cause
Bilateral SOM	Children	Adenoid hypertrophy
Unilateral SOM	Juveniles	Juvenile Nasopharyngeal Angiofibroma (JNA)
Unilateral SOM	Older Age	Nasopharyngeal carcinoma (NPC)

ETIOLOGY

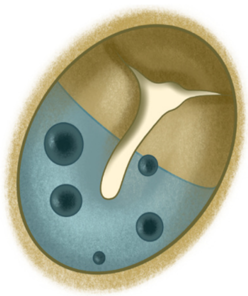
- Tubal occlusion due to various nasopharyngeal causes like adenoids benign and malignant tumour
- Allergy : Mucosal edema of eustachian tubal orifice
- Hypogammaglobulinemia predisposes to inflammatory response in the middle ear cavity

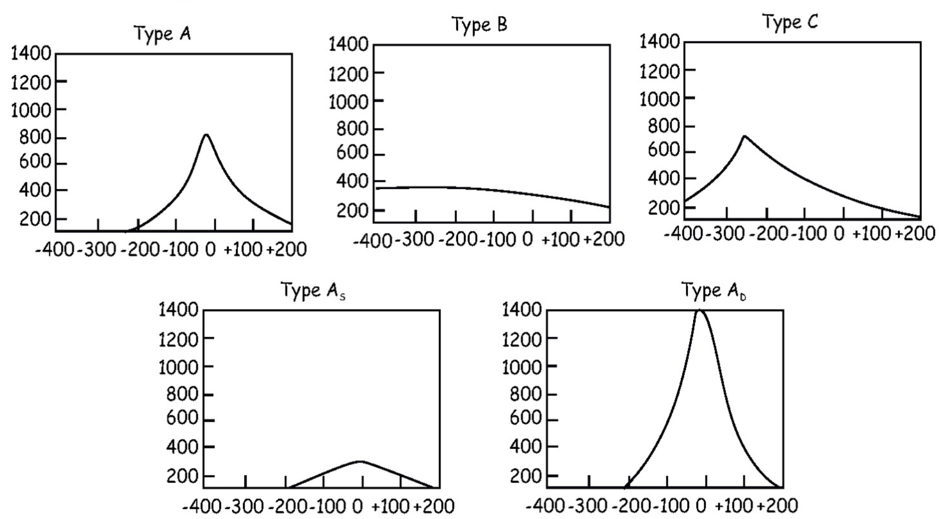
PATHOLOGY

- Sterile effusion in middle ear
- Fluid is non-infective
- No pus formation

CLINICAL FEATURES

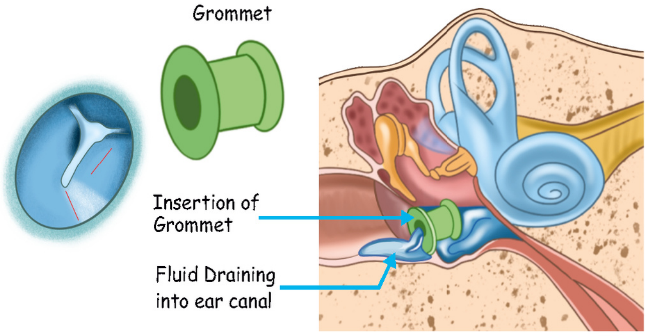
- Symptoms
  - Painless
  - Block sensation of the ear
  - CHL
  - Delayed speech
  - Poor school performance
  - Autophony
  - Nasal discharge and obstruction
  - There is no pain and no fever.
- Signs
  - Dull lusterless tympanic membrane with absent light reflex
  - Retracted tympanic membrane
  - Presence of fluid level
  - Air bubbles
  - Decreased mobility of the tympanic membrane



Hearing Tests	**Findings**
Tuning Fork Test	Rinne negative Weber lateralized to affected ear Indicates: Conductive hearing loss
Pure Tone Audiometry	Conductive hearing loss
Tympanometry(IOC)	Type B Tympanogram (indicates middle ear effusion) 

Yourwish

TREATMENT

Situation	Management
Hearing loss only	• Wait & watch for 3 months
Persistent effusion (If no change even after 3 month)	• Myringotomy +/- grommet insertion ○ Radial incision in the anteroinferior quadrant 
Adenoid hypertrophy present (Mouth breathing, Snoring, High arched palate, Failure to thrive)	Myringotomy + grommet + adenoidectomy Fees:

- Prevention of secretory otitis media :
  - Anti allergy treatment
  - Decongestants
  - Middle ear aeration repeated valsalva or politzerization

Child
Hearing loss –
No pain
No Fever → + - nasal block , mouth breathing snoring , high arch palate , dull elongated face, crowding of teeth → O/E Air bubbles /air fluid level. Audiogram-CHL Tympanometry B type +/-Xray showing adenoid hypertrophy → Wait and watch for 12 weeks . If persists then Myringotomy + grommet insertion +/-Adenoidectomy

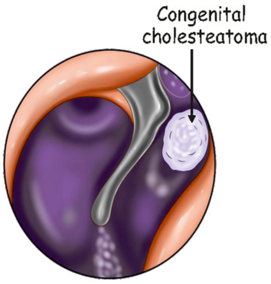
CHOLESTEATOMA

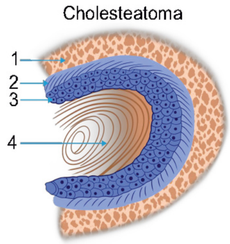
00:17:40

- Definition : Presence of stratified squamous epithelium in middle ear.

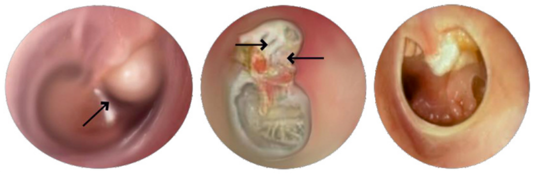
AIIMS 2020, FMGE 2021, 2025
INICET 2021, NEET PG 2019, 2020

Feature	Congenital Cholesteatoma	Acquired Cholesteatoma
Pathogenesis	EAC epithelium trapped in middle ear during development (cleft in pouch)	• Primary: No prior pathology • Secondary: TM perforation or retraction pocket
Common Sites	Middle ear, Petrous apex, Cerebellopontine angle	Attic, Posterosuperior pars tensa

Otoscopy	Whitish mass behind intact TM TM normal 	TM perforation or retraction pocket with debris 
Levenson's Criteria	White mass with intact TM, no prior otorrhea/surgery/disease,	Not applicable
Laterality	Often unilateral (commonly left side in some series)	Commonly right side



- Cholesteatoma is unsafe as it spreads like tumor because of bone destroying property
- Collagenase, alkaline phosphatase, proteolytic enzymes cause bone erosion
- Spreads along least resistance path
- MC involves lateral semicircular canal
- Symptoms
  - Hearing loss (most common)
  - Scanty foul-smelling discharge
- Diagnosis
  - Otoscopy under microscope: Whitish keratinous plaque (hallmark)
  - IOC: CT scan temporal bone (assess disease extent, bone erosion; no contrast)
  - Audiological tests : CHL
- Rx:
  - Medical therapy does not cure
  - Surgery of choice is Modified Radical Mastoidectomy (MRM)



Cholesteatoma Hearer

- Mechanism: Cholesteatoma first erodes incus (usually long process)
- Effect: Cholesteatoma bridges ossicular gap, allowing sound conduction
- Clinical significance:
  - Before surgery: Hearing relatively preserved
  - After cholesteatoma removal: Gap appears, postoperative hearing worsens

Round Window Shielding Effect

- Normal sound transmission: TM → Malleus → Incus → Stapes → Oval window → Scala vestibuli → Scala tympani → Round window
- Sequential vibration: Oval window first, round window later
- TM perforation effect: Sound reaches both windows simultaneously → Vibrations cancel each other→ Hearing loss

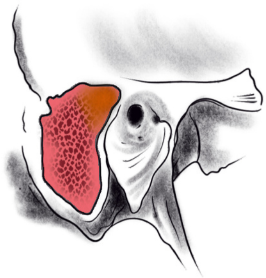
	Discharge effect on Hearing
Dry ear	Worse hearing(sound hits both windows simultaneously)
Ear with discharge	Better hearing (discharge shields round window)

Feature	Details
MC Site of Origin	Prussak's space(Between pars flaccida and neck of malleus)
MC Site of Recurrence	Sinus tympani(Aka Infrapyramidal space)
MC Ossicle Eroded	Long process of incus(Lenticular process)
MCCanal Involved	Lateral semicircular canal

Mastoidectomy

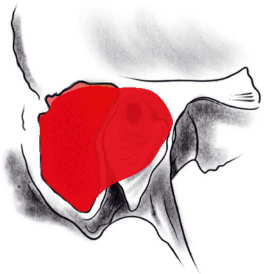
- Types
  - Cortical MastoidectomySchwartz operation
  - Modified Radical Mastoidectomy

CORTICAL MASTOIDECTOMY



- Procedure
  - Mastoid air cells removed
  - Mastoid converted into single cavity
  - Posterior canal wall kept intact
- Aka Intact canal wall , Schwartz operation

MODIFIED RADICAL MASTOIDECTOMY (MRM)



- Procedure
  - Mastoid air cells removed
  - Posterior canal wall removed
  - Mastoid + middle ear + external auditory canal connected into single cavity
- AKa: Canal wall down surgery
- After MRM, meatoplasty is done to reshape the external auditory canal

CHRONIC SUPPURATIVE OTITIS MEDIA (CSOM)

00:30:11

- Definition: Chronic middle ear infection of whole or part of cleft with ear discharge and permanent perforation
- Characteristic Feature: Permanent tympanic membrane perforation(Perforation edges lined by squamous epithelium preventing healing)

Types OF CSOM

Old Classification	New Classification
Tubotympanic	Mucosal type
Atticoantral	Squamosal type

MUCOSAL CSOM

- Inactive mucosal - dry,no pus
- Active mucosal - pus present

SQUAMOSAL TYPE (ATTICOANTRAL)

- Inactive - dry with cholesteatoma associated
- Active- pus present

Feature	Mucosal Type (Tubotympanic/Safe)	Squamosal Type (Atticoantral/Unsafe)
Old/New Classification	Tubotympanic / Mucosal	Atticoantral / Squamosal
Age	Children	Adult
Site of Perforation	Pars tensa (central perforation)	Pars flaccida / Posterosuperior pars tensa
Etiology	Eustachian tube dysfunction, Nasopharyngeal pathology	Cholesteatoma formation
Clinical Features	Profuse mucoid discharge Non-foul smelling Non-blood stained	Scanty foul-smelling discharge Blood stained
Disease Area	Anterior inferior middle ear	Posterior superior middle ear
Subtypes	Inactive: Dry perforation Active: Discharging ear	Inactive: Cholesteatoma without discharge Active: Discharging ear
Discharge	Profuse	scanty
Discharge smell	Odourless and mucoid	Foul and purulent
Safety	Safe	Unsafe
Bone Erosion	Rare	Common
Cholesteatoma	Absent	Present
Osicular necrosis	Rare	Common (Most commonly long process of incus)
Hearing loss	Mild moderate	Moderate severe
Tegmen tympani erosion	Rare	Common
Intracranial complication	Rare	Common
Polyp	Pale	Red,fleshy
Tympanoscelrosis	Common	Rare
Cholesterol granuloma	Rare	Common

Treatment	Treatment of primary pathology is the main stay + Reconstruction surgery (Myringoplasty / Tympanoplasty)	Treatment is ear surgery depending on the extent of disease + Reconstruction surgery (Myringoplasty / Tympanoplasty/ reconstruction of ossicular chain)

INVESTIGATIONS

Investigation	Purpose
Otoscopy	Detect perforation
Audiometry	Assess degree of hearing loss
Culture and sensitivity	Ear discharge
Mastoid xray	Sclerotic and extent of bone destruction
CT temporal bone	Disease extent

MEDICAL TREATMENT

- Aural toilet : Debris and aural polyp should be removed before local treatment . Do not avulse in aural polyp
- Ear drop : neomycin + polymyxin + chloromycetin or gentamycin is used
- Systemic antibiotics : Limited use only in acute exacerbation
- Keep ear dry

HISTORY-BASED DIAGNOSIS

Patient pesents with c/o Profuse, mucoid/ mucopurulent, painless, not foul smelling ear discharge, on and off for 6 months, following URTI or entry of water in the ear.

Next step

On Examination
Central perforation, Pale granulations.

Next step

Diagnosis
Chronic Mucosal/tubotympanic/safe otitis media, Active.

Next step

Management
PTA/patch test to assess ossicular status.

If active, i.e., discharging ear.
Medical mgt to make ear dry if active.

When ear inactive (dry >6 weeks).
Myringoplasty/tympanolasty Done using microscope with focal length of 2.50 mm.

TUBERCULAR OTITIS MEDIA

00:38:00

- Painless foul smelling discharge
- Multiple tympanic membrane perforations
- Facial nerve paralysis possible
- Severe hearing loss out of proportion of symptoms

Q. Which of the following signs is not associated with otitis media with effusion? INICET May 2024

A. Mostly bilateral

B. AD curve on tympanometry with conductive hearing loss

C. Adenoid hypertrophy is cause of SOM

D. Mostly resolves on its own

Answer: **B**

Q. You see a child with delayed speech development as part of a health visit at a local school. The otoscopic appearance of the ear is shown. Conductive hearing loss of 20 dB is detected in audiometric tests. What is your diagnosis? FMGE June 2022

A. Acute suppurative otitis media

B. Serous otitis media

C. Chronic suppurative otitis media

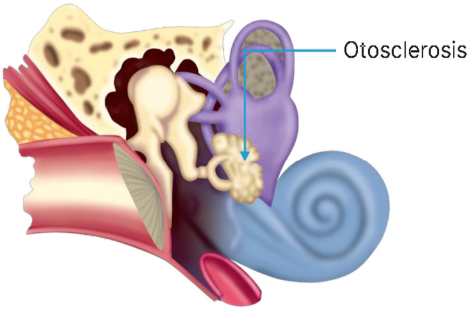
D. Glomus tumor

Answer: **B**

7. OTOSCLEROSIS

OTOSCLEROSIS

00:00:44

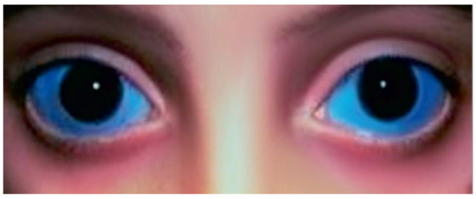


- Excessive bony deposition around the,
  - Foot plate of stapes: Stapedial type
  - Round window: Cochlear type
- Stapedial:
  - M/c Site: fistula ante fenestrum (anterior to the foot plate of stapes)
- Cochlear:
  - M/c Site: starts at the round window and goes to the scala tympani

STAPEDIAL TYPE:

Aetiology:

FMGE 2022



- Hereditary: autosomal dominant with incomplete penetrance
- Sex: F>M, but in India it is male-dominant.
- Age of onset: 20-40 years
- Increases in pregnancy and during menopause
- Measles is a provocative factor
- Vanderhoove syndrome: otosclerosis + blue sclera + osteogenesis imperfecta

SYMPTOMS OF OTOSCLEROSIS

Stapedial

- M/c presenting feature: conductive hearing loss - bilateral
- Paracusis Willisii: A condition where the patient hears better in a noisy environment as compared to a silent environment.

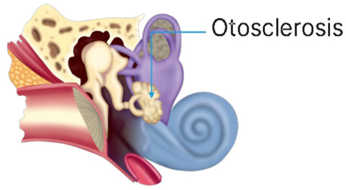
Cochlear:

- Sensorineural hearing loss
- Tinnitus

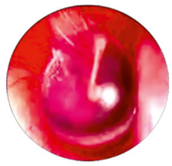
	STAPEDIAL	COCHLEAR
Incidence	Common	Less common
Hearing loss	Conductive	Sensorineural
Tinnitus, Vertigo	Rare	Common
Paracusis willisii	Common	No

Signs

- The tympanic membrane is normal (90%)



- The tympanic membrane is mobile
- Schwartz sign (10%): reddish/pinkish hue seen
  - Active lesions have a flamingo-pink hue on the promontory and can be seen through an intact tympanic membrane
- **NOTE**: Classic presentation is gradually progressive conductive hearing loss, which is B/L in a middle-aged female.



Tests

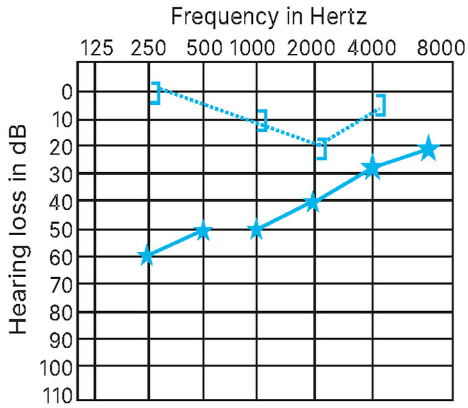
Stapedial Otosclerosis

AIIMS 2018

Rinne	Negative
Weber	Lateralized to abnormal ear
Absolute bone conduction	Normal
Gelles test	Negative
Tympanometry (IOC)	As-type graph
Stapedial reflex	Absent
Pure tone audiometry	Carhart's notch (dip in BC curve at 2000 Hz)

AUDIOMETRY

- Ac: lower frequencies are affected
- Bc: maximum dip is seen at 2000 Hz which is called Carhart's notch
- Reverses after stapedectomy



FMGE 2024
INICET 2019, 2024

Cochlear

- Cookie Bite Curve: A dip in the midfrequency range of both AC and BC is called the cookie bite curve

Treatment

Medical

- Hearing aid
- Sodium fluoride: It is given to arrest focus and prevent further sensorineural loss due to cochlear otosclerosis
  - MOA:
    → Inhibits the osteoclastic and osteoblastic activities and inhibits the release of proteolytic enzymes
    → Only prevents further progression.
  - Indication: only in active focus
  - Contraindication:

Yourwish

→ Pregnancy and lactation
→ Renal disease
→ Rheumatoid arthritis
→ Skeletal fluorosis

Surgical:
- Stapedectomy with placement of prosthesis
- Stapedotomy with placement of prosthesis
- Lempert's fenestration operation: reserved only for cases where the footplate cannot be mobilized during a stapedectomy.

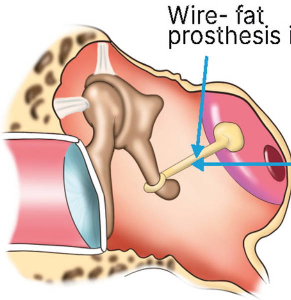
Indication for surgery	Contraindications for surgery
The hearing threshold is 30 dB, or A-B gap is 25 db or more	Only hearing ear
If there is bilateral otosclerosis, then worst ear is operated first	Pregnancy
	Occupational: pilots and divers

LOCAL ANAESTHESIA VS GENERAL ANAESTHESIA
- Local is preferred for stapes surgery, as intraoperative assessment is possible.
  - Vertigo could be assessed.
  - Facial nerve functions can be assessed

STAPEDECTOMY/STAPEDOTOMY

00:13:28

- Stapedectomy: Stapes is removed completely and replaced by a prosthesis
- Stapedotomy: A hole is made in the foot plate of the stapes, and from the incus to the oval window, an opening is made
  - Possibility for a tear in the oval window → leakage of perilymph → a fat plug is put in to prevent further leakage.
  - Treatment of choice



MANAGEMENT

Mature
- Stapedotomy (Local Anesthesia preferably) + Teflon piston (worst ear 1st) after cutting the stapedius tendon and removing stapessuperstructure the piston is put between incus long process and opening on stapes footplate.
- Other option Hearing aid, cochlear implant.

Active
- NaF (Sodium Flouride)→ increases maturation of focus by inhibiting osteoclastic and proteolytic activity and acceleratingosteoblastic activity

History-Based Diagnosis
- 20-30 years presents with b/l progressive hearing loss, which she noticed first after her pregnancy, with a similar history in her mother. Hearing better in noise (paracusis wilisii)

On Examination:

- TM: normal pearly gray (90%)
- Active cases: flamingo pink (10%), a/k/a the Schwartz sign

Diagnostic Tests:

- TFT: CHL, gelle negative
- PTA: CHL, Cahart's Notch (BC dip at 2000 Hz)
- IOC: tympanometry - As
- Stapedial reflex: absent

PYQs

00:16:59

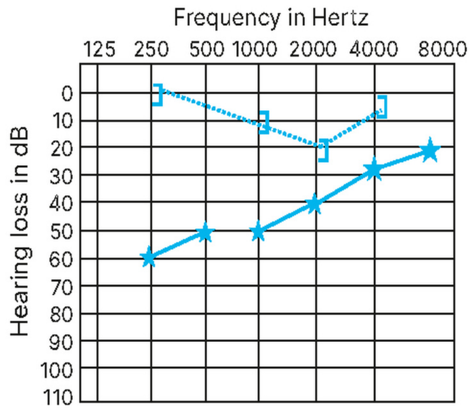
Q. A 45-year-old woman presents with progressive hearing loss that has been worsening over the past few years. Audiometry confirms conductive hearing loss, and a diagnosis of otosclerosis is made. What is the surgical treatment of choice for her condition? FMGE Jan 2024

A. Stapedectomy with the placement of a prosthesis
B. Stapedotomy
C. Stapes mobilization
D. Lempert's fenestration operation

Answer: **A**

Q. An audiogram of a 30-year-old female is given. What is the diagnosis? FMGE June 2024

A. Otosclerosis
B. Menieres disease
C. Noise-induced hearing loss
D. Presbycusis



Answer: **A**

Q. A patient presents to the OPD with complaints of bilateral hearing loss with worsened right ear hearing loss. He is diagnosed with otosclerosis and recommended a stapedectomy as a final report to the problem. What would be the findings of tuning fork tests on this patient? INI CET May 2023

A. Rinne's test: positive; Weber's test: lateralised to left ear
B. Rinne's test: positive; Weber's test: lateralised to right ear
C. Rinne's test: negative; Weber's test: lateralised to left ear
D. Rinne's test: negative; Weber's test: lateralised to right ear

Answer: **D**

Q. Carhart's notch is seen in which of the following conditions? INICET Nov 2024

A. Otosclerosis
B. Ossicular discontinuity
C. Oto syphilis
D. Serous otitis media

Answer: **A**

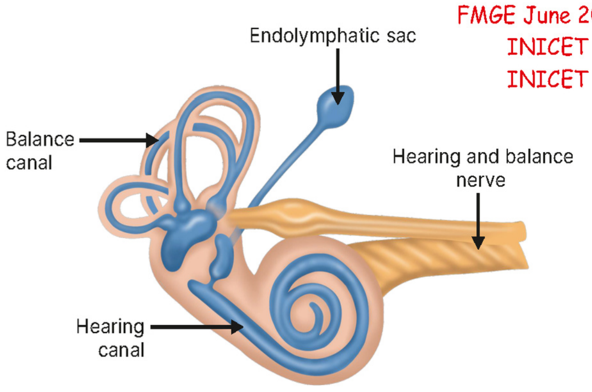
8. INNER EAR DISEASES

MENIERE'S DISEASE

00:00:48

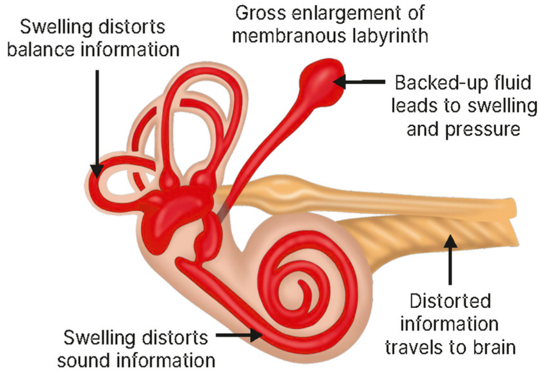
FMGE June 2022, 2024
INICET May 2023
INICET May 2025

- Disorder characterized by:
  - Vertigo
  - Sensorineural hearing loss
  - Tinnitus and aural fullness
- Increased endolymphatic pressure
  - Due to ↑ production or ↓ reabsorption of endolymph at stria vascularis



Healthy Inner Ear

Overproduction or malabsorption of endolymph
↓
Endolymphatic hypertension
↓
Gross enlargement of the membranous labyrinth
↓
Endolymphatic hydrops



Meniere's Disease

- Other predisposing factors:
  - Allergy
  - Sodium and water retention
  - Hypoadrenalism and hypopituitarism
  - Hypothyroidism

Cardinal Features

Vertigo	• Minutes to hours • Severe sudden vertigo accompanied by nystagmus, nausea, vomiting, and vagal disturbances like diarrhea, cold sweat, pallor, and bradycardia
Hearing loss	• Sensorineural hearing loss • Low-frequency hearing loss • Distortion of sound (Diplacusis) • Intolerance to loud sounds due to recruitment → Tullio phenomenon • Typically fluctuating
Tinnitus	• Low-pitched roaring type
Sense of fullness of ear	• Aural fullness

Examination And Investigations

- Otoscopy: Normal
- TFT - in favour of Sensorineural hearing loss
- Nystagmus is seen only during attack.
  - The fast component is towards the diseased ear
- Pure tone audiometry: Upsloping-low frequency SNHL
- Recruitment is positive
- Glycerol test:
  - Dehydrating agent, when given orally, reduces endolymphatic pressure and improves hearing
- Caloric tests: Canal paresis
- The diagnostic test for Meniere's is: Electrocochleography
  - SP/AP ratio > 30%

Variants

- Cochlear: Present only with cochlear symptoms and no vertigo
- Vestibular hydrops: Only vertigo with no cochlear symptoms
- Lermoyez syndrome: Tinnitus f/b hearing loss and vertigo
- Tumarkin's otolith crisis: Sudden drop attack without loss of consciousness
- Secondary Meniere's:
  - Congenital and acquired syphilis
  - Paget's disease
  - Post stapedectomy

Treatment

- Conservative:
  - Low salt diet (<1.5-2g / day)
  - Stop smoking, as nicotine causes vasospasm
  - Avoid excessive intake of water
  - Correct hormonal imbalances like hypothyroidism, hypopituitarism
  - Elimination of allergens (in 50% allergens are found)
- Medical: Vestibular sedatives
- Interventional:
  - 1st line → Intratympanic steroids
  - Next → Intratympanic gentamicin
- Surgical (if medical management fails):
  - Labyrinthectomy

Surgical Management

Conservative procedures (Preserve hearing)	Destructive procedure (Destroy hearing)
• Decompression of endolymphatic sac. • Endolymphatic shunt • Sacculotomy (Ficks procedure) • Cody tack procedure • Cochleosacculostomy (cochlear duct is punctured)	• Labyrinthectomy • Intermittent low-pressure pulse therapy with Meniett device

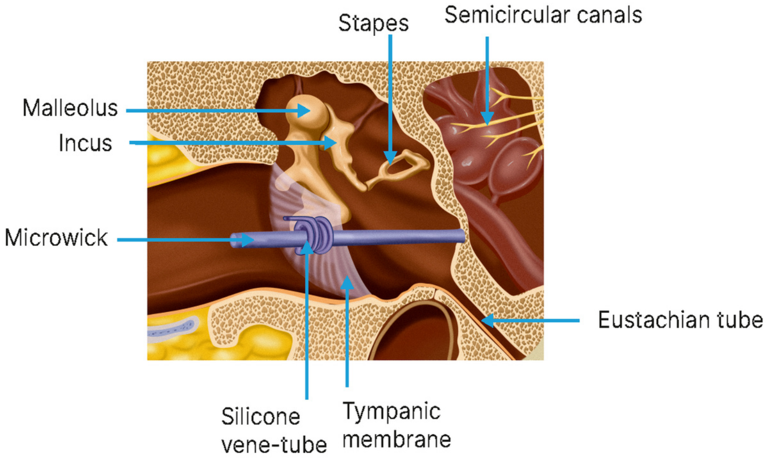
Management when medical therapy fails (intractable vertigo)

If useful hearing is still present:

- Intratympanic (transtympanic) steroid injections.
- Chemical labyrinthectomy using gentamicin (a vestibulotoxic agent), administered through the round window with a micro-wick.
- Vestibular nerve section.
- Endolymphatic sac decompression surgically guided using Donaldson's line as a landmark (the endolymphatic sac is located inferior to this line).

If there is no serviceable hearing remaining:

- Surgical labyrinthectomy



LABYRINTHITIS

00:07:18

- Inflammation of the entire labyrinth
- Vertigo lasts for days to weeks

Feature	Circumscribed	Diffuse serous	Diffuse suppurative
Pathology	• Thinning or erosion of bony capsule of labyrinth • Labyrinth is exposed to external stimuli	• Diffuse inflammation of labyrinth without pus • Labyrinth is inflamed and irritable	• Pus or infection of labyrinth • Lost vestibular and cochlear functions
Reversibility	-	Reversible	Irreversible
Fistula test	Positive (communication between middle and inner ear)	Negative	Negative
Nystagmus	Positive pressure: nystagmus to same side. Negative pressure nystagmus to opposite side	Nystagmus to same side	Nystagmus to opposite side
	Transient vertigo on applying pressure to tragus	Vestibular and cochlear symptoms	Toxic + severe symptoms of serous labyrinthitis

Differential Diagnosis Of A Patient With Vertigo And Snhl/Mixed Hearing Loss

Feature	Labyrinthitis	Perilymphatic Fistula	Meniere's Disease (Endolymphatic Hydrops)
Vertigo	Persistent vertigo lasting for several days	Triggered by coughing, straining, or loud sounds (Positive Tullio phenomenon / Hennebert sign)	Recurrent episodes lasting 20 minutes to 24 hours
Hearing loss	Sensorineural or mixed	Sensorineural or mixed; may be sudden, persistent, or fluctuating	Sensorineural hearing loss, tinnitus, and a sensation of ear fullness.
Associated features	Often preceded by or associated with a history of acute or chronic otitis media or meningitis.	• Commonly follows trauma such as stapedotomy, middle ear surgery, barotrauma, or may be associated with cholesteatoma • Ear fullness may be present	• Fluctuating hearing levels • Diplacusis (different pitch perception in each ear) • Intolerance to loud sounds, sudden drop attacks (Tumarkin crises) • Tullio phenomenon and Hennebert sign may be observed. • Sensorineural hearing loss, tinnitus, and a sensation of ear fullness. • Vertigo may be accompanied by autonomic (vagal) symptoms and sometimes an aura.

BPPV (BENIGN PAROXYSMAL POSITIONAL VERTIGO)

00:10:14

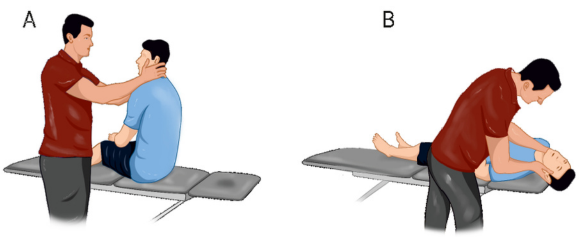
- Transient positional vertigo
- Due to the displacement of otoliths (canaliths)
  - From utricle → semicircular canal
- Cause: Trauma or sudden movement
- MC canal → Posterior semicircular canal
- Mechanism:
  - Otoliths stimulate canal receptors → sudden vertigo

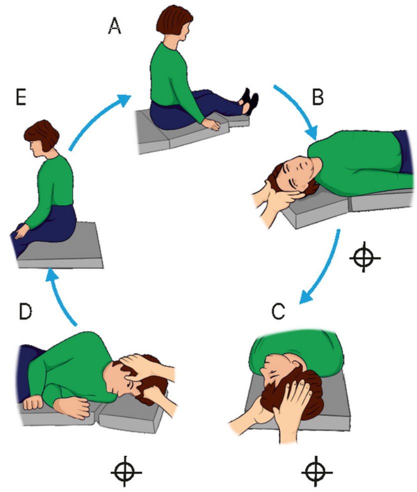
Clinical Features

- Symptoms:
  - Sudden vertigo lasting for a few seconds to minutes
- Signs: Nystagmus
  - As the cochlea is not involved → No hearing loss or tinnitus

Diagnosis

- Dix-Hallpike test
- Nystagmus pattern:
  - Posterior canal → Upbeating + torsional
  - Lateral canal → Horizontal
  - Superior canal → Downbeating





Treatment

- Epley maneuver → Canalith repositioning maneuver
  - For posterior canal involvement

VESTIBULAR NEURITIS

00:11:45

- Inflammation of the vestibular nerve only
- Sudden vertigo
  - Single long episode of vertigo lasts for a few days to weeks
- No cochlear symptoms: Because only the vestibule is involved, and cochlea is not
- Usually due to a viral infection
  - Mostly a self-limiting disease

DIFFERENTIAL DIAGNOSIS: VERTIGO WITHOUT HEARING LOSS

00:12:15

Feature	Benign Paroxysmal Positional Vertigo	Vestibular Neuritis
Definition	Transient positional vertigo Due to the displacement of otoliths	Acute inflammation limited to the vestibular nerve.
History	• Recurrent, brief episodes of spinning sensation • Each episode lasts a few seconds • Triggered by specific head movements or changes in position	• Sudden onset of severe vertigo • Single prolonged episode lasting days to weeks • Hearing remains normal • No associated central neurological signs
Examination Findings	**Dix-Hallpike Test:** • Upbeating, torsional nystagmus • Fast phase directed toward affected/hyperactive ear • Suggests posterior semicircular canal (most common)	• Peripheral type nystagmus • Fast phase directed toward the healthy (active) side • Positive head thrust test (corrective saccades present)

	• **Supine Roll Test:** • Horizontal nystagmus • Fast phase toward the involved side • Suggests horizontal semicircular canal	
Management	**For Posterior Canal:** Epley maneuver (first-line), Semont maneuver, or Brandt-Daroff exercises. **For Horizontal Canal:** Gufoni maneuver or Barbecue (log roll) maneuver.	• Short-term use of vestibular suppressants • Vestibular rehabilitation therapy

COMPARISON TABLE (HIGH YIELD)

00:14:27

Feature	BPPV	Meniere's	Labyrinthitis	Vestibular Neuritis
Duration	Seconds-minutes	Minutes-hours	Days-weeks	Days-weeks
Special feature - Vertigo	Positional	Sudden onset A/w vagal symptoms	H/O ASOM/CSOM	Post-viral
Hearing loss	No	SNHL (low frequency, fluctuating)	SNHL (constant)	No
Tinnitus	No	Yes (roaring)	Yes	No
Cause	Otolith displacement	Endolymph ↑	Infection	Post-viral
Diagnosis	Dix-Hallpike Supine roll test	ECOG	Caloric tests/ VEMP	
Treatment	Epley maneuver Barbecue (log roll) maneuver	Intratympanic Steroids → Gentamicin → Surgery	Antibiotics Clearance of disease	Antibiotics/ Antivirals Supportive

PYQ

00:16:53

Q. What could be the potential clinical diagnosis for a 35-year-old man who visited the clinic reporting intermittent dizziness, sensation of pressure and fullness in the ear, reduced hearing, and a low-frequency roaring sound in the ears? FMGE June 2022

A. Meniere's Disease
B. Benign Paroxysmal Positional Vertigo
C. Labyrinthitis
D. Syncope

Answer: A

Q. A 50-year-old male presented with vertigo, tinnitus, and hearing loss. The audiogram is given below. What is the most likely diagnosis based on the given image? FMGE June 2024

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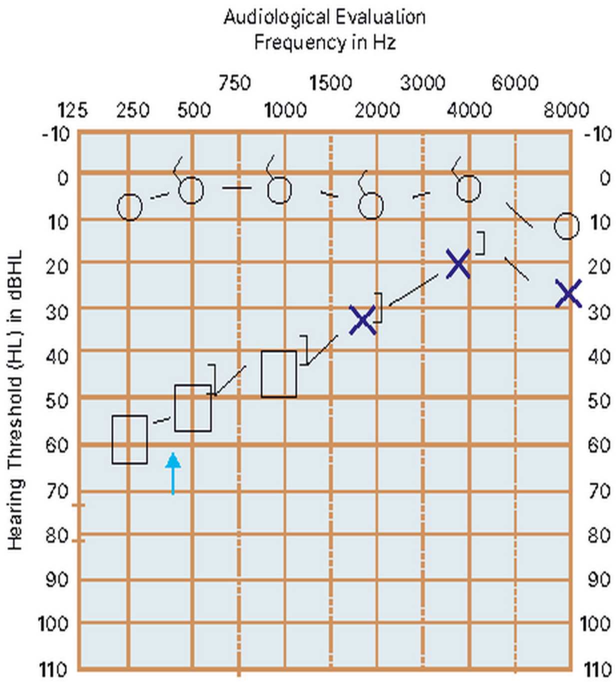
A. Bppv

B. Meniere's Disease

C. Vestibular Neuronitis

D. Presbycusis



Answer: B

Q. A patient presents to the OPD with complaints of vertigo, which is sudden in onset, sensorineural hearing loss (SNHL), and tinnitus, which lasts minutes to hours, accompanied by nausea, vomiting, and vagal symptoms. Investigations show that endolymphatic hypertension is present. What is the diagnosis of the patient?

A. Meniere's Disease

B. Presbycusis

C. Benign Paroxysmal Positional Vertigo (Bppv)

D. Acoustic neuroma

Answer: A

Q. A 45-year-old man complains of early morning vomiting that occurs after turning in bed. What is the most likely diagnosis?

A. Benign Paroxysmal Positional Vertigo (Bppv)

B. Meniere's Disease

C. Vestibular Neuritis

D. Labyrinthitis

Answer: A

Yourwish

9. EXTERNAL EAR DISEASES

CONGENITAL ABNORMALITIES OF PINNA

00:00:50

Microtia

- Pinna is completely small

Macrotia

- The pinna is completely big

Anotia

- Definition: Complete absence of pinna (no pinna at all)
- Hearing rehabilitation: BAHA (same reason as microtia)

Bat Ear

- Protrusion of the pinna

Hearing Rehabilitation

- BAHA (Bone Anchored Hearing Aid)
- Cannot accommodate a regular hearing aid due to the small/absent pinna
- BAHA bypasses the external & middle ear and transfers the sound to the inner ear

Pre-Auricular Sinus

- Embryological basis:
    - The pinna develops from 6 tubercles called Hillocks of His
    - 1st hillock → Tragus
    - Remaining hillocks → Rest of pinna
    - Incomplete fusion of 1st hillock with rest → Pre-auricular sinus
- **Clinical features:**
    - A small pit or hole near the ear
    - Can get recurrently infected
    - Results in purulent discharge from the pit/hole
- **Treatment:**
    - Repeated infections = Indication for surgery
    - Otherwise: No surgery required

ACQUIRED ABNORMALITIES OF PINNA

00:02:25

Haematoma Auris (Boxer's Ear)

- Repeated trauma to the ear (common in boxers)
- Accumulation of blood between the cartilage and the overlying perichondrium
- Clinical features
    - Swelling with pain
    - Bluish discoloration of the pinna

Treatment

- Incision and drainage
- Pressure packing (to prevent re-accumulation of blood)
- Antibiotics (mandatory)
  - Infection of haematoma → Perichondritis → Cartilage infection → Necrosis → Deformity of the pinna

Perichondritis

- Infection of the entire pinna
- Common causative organism: Pseudomonas
- Clinical features
  - The entire pinna is red, stiff, and painful
  - Hallmark sign: Sparing of the lobule
  - As the Lobule does not have cartilage and is made up of only fat

Keloid

Etiology

- Trauma (iatrogenic or accidental)
  - Iatrogenic: Surgical incision
  - Accidental: Ear piercing

Pathophysiology

- Abnormal epithelialization
- Abnormal growth of epithelium
- Hypertrophy of tissue
- Very high recurrence rate

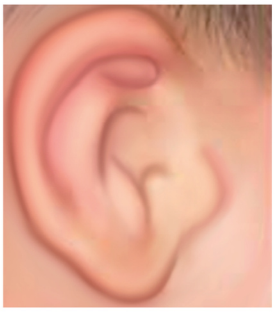
Treatment

- To prevent recurrence
- First-line therapy:
  - Intralesional hyaluronidase injections
  - Intralesional steroids
  - 8-10 injections at 4-5 day gap each
- If recurs after first-line:
  - Short course of radiotherapy
  - Short course of chemotherapy

CONGENITAL ABNORMALITIES OF THE EXTERNAL AUDITORY CANAL

00:04:45

Complete Atresia



- No canal at all
- **Rehabilitation:**
  - Cannot put in a hearing aid
  - **BAHA** (Bone Anchored Hearing Aid) required

ACQUIRED ABNORMALITIES OF THE EXTERNAL AUDITORY CANAL

00:05:00

Wax (Cerumen)

- The most common acquired cause of hearing loss in adults

Source

- Secretions from the sebaceous glands of the external auditory canal
- Specifically from the cartilaginous portion

Function

- **Acidic pH**
- Protects from microorganisms (bacteria, viruses, other microorganisms)
- Prevents anything from reaching the tympanic membrane

Causes Of Accumulation

- Excessive production
- Narrow canal → Cilia cannot beat wax completely outside

Precipitating Factor

- Water entry (during bathing/swimming)
- Wax swells up

Clinical Features

- Pain
- Hearing loss
- Ear fullness
- Tinnitus (ringing sensation in the ear)

Treatment

- Wax-solytic agents
- Manual syringing

OTITIS EXTERNA

00:06:07

Classification

Classification Basis	Types
Based on the extent	Localized / Diffuse
Based on duration	Acute / Chronic
Based on the cause	Infectious (Bacterial / Viral) / Non-infectious (Eczema, Seborrheic)

Localized Otitis Externa (Furunculosis)

- Staphylococcal infection of the hair follicle
- Cartilaginous portion of the external auditory canal
- **Clinical features:**
  - Pain is increasing with jaw movement
  - Other features:

Yourwish

→ Pain on touching the ear
→ Pain on chewing movement

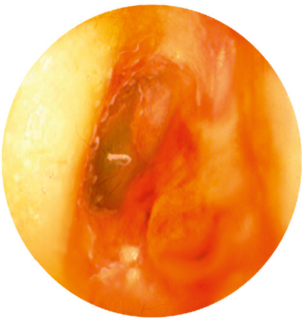
- **On examination**
  - Tragal sign positive (pressing tragus → patient winces in pain)
  - Purulent discharge
    → Purulent = Pathology in the external auditory canal
    → Mucoid/mucopurulent = Disease in the middle ear
- **Retroauricular groove:** Not obliterated (unlike mastoiditis, where there is deepening)
- **Treatment**
  - Oral antibiotics
  - Aural toileting
  - If recurrent furunculosis:
    → Look for immunosuppression or diabetes

Diffuse Otitis Externa

00:09:23

- Swimmer's ear
- Singapore ear
- Seen in immunocompetent patients

Important Information
- Pseudomonas infection in immunocompetent = Diffuse otitis externa
- Pseudomonas infection in immunocompromised = Malignant otitis externa



- Swimmer's ear/Singapore ear/Telephone ear:
  - Exposure to swimming/water
  - Exposure to moisture
  - Excessive use of the telephone
  - Tropical countries (Singapore/Malaysia) → High humidity
- **Pathophysiology:**
  - Normal: Wax pH = **Acidic** (protective)
  - Exposure to humidity/water/moisture → pH becomes **Alkaline**
  - Alkaline pH → Favors bacterial growth
  - Result: Infection in the canal
- **Clinical features:**
  - Pain
  - Purulent discharge
  - Hearing loss
  - Pain increases on jaw movement (like localized otitis externa)
- **Examination findings**
  - The entire external auditory canal is inflamed and edematous (vs. localized swelling in furunculosis)
  - Tragal sign present
- **Treatment:**
  - Anti-pseudomonal antibiotics
  - Aural toileting

Yourwish

Malignant Otitis Externa

00:11:30

- Not a malignancy - called "malignant" because its very aggressive
- Elderly patient
- Diabetic patient
- Immunosuppressed patient
- Cause: Pseudomonas
- Clinical features:
  - Excruciating pain - unable to sleep at night
  - Purulent discharge
  - Hearing loss (HOH)
  - Sometimes fever
- Examination
  - Hallmark sign- Granulation tissue at the bony-cartilaginous junction of the external auditory canal
  - Cranial nerve involvement:
  - Initially: 7th nerve (Facial nerve palsy)
    - → Reason: Pseudomonas is a bone-eating organism
    - → Causes osteoclastic activity
    - → Erodes bone
  - Later: Base of skull involvement → 9th, 10th, 11th nerve palsy

Investigations for malignant otitis externa:

- Culture- To confirm Pseudomonas
- Technetium-99 scan
  - The earliest diagnostic test
  - Radio-isotopes picked up by osteoclasts
  - Positive even at the beginning/very early stage
  - Positive even when bony erosion is not yet visible on the CT scan
  - Most important for early diagnosis
- CT scan
  - Identifies bony erosion
  - Used to identify the extent of the disease
  - But not as early as Technetium-99
- MRI- To identify the intracranial extension of the disease
- Gallium-67 scan
  - For monitoring prognosis
  - To decide whether to continue or discontinue therapy
- Mechanism:
  - Gallium is taken up by neutrophils
  - Neutrophils = Cells of acute inflammation (NOT chronic)
  - Initially (active disease): Scan positive
  - After treatment: Neutrophils disappear → Scan becomes negative → Resolution
  - If scan still positive: Neutrophils still present → Continue therapy

Management Of Malignant Otitis Externa

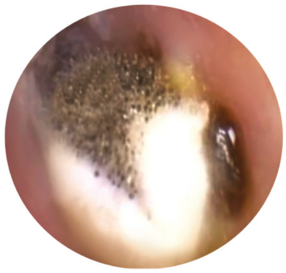
- Treatment:

- Anti-pseudomonal antibiotics
- Topical therapy
- Symptomatic therapy

- Follow-up:
  - Repeated cultures
  - Repeated scans to identify if the disease is:
    - → Localized and regressing, OR
    - → Still extensive/progressing

OTOMYCOSIS

00:16:20

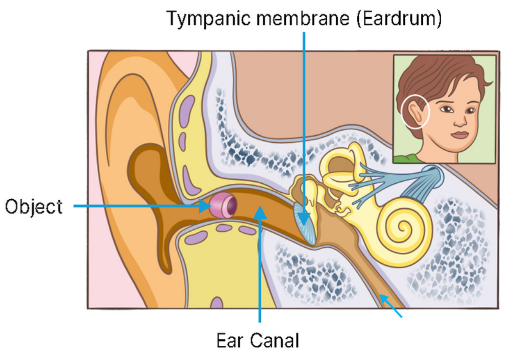


- Common causative organisms:
  - Aspergillus niger (Most common)
  - Candida
  - Aspergillus fumigatus
- Characteristic appearance: "Wet newspaper appearance"
  - White discharge
  - Black spores overlying
  - Candida cotton ball appearance
- Clinical features:
  - Most important complaint: Itching
  - Discharge
  - Pain
  - May have secondary bacterial infection
- Treatment:
  - Topical antifungal
  - Aural toileting (clean the ear, make it dry)
  - patient education on the importance of keeping the ear dry

FOREIGN BODY IN EXTERNAL AUDITORY CANAL

00:17:03

- Common in Toddlers and young children
- Clinical presentation: U/L foul-smelling discharge (ear or nose) in children → Signifies foreign body unless told otherwise



Methods Of Removal

- Inorganic bead/pellet: Remove with the probe
- Graspable non-living object (paper, rubber): Use crocodile forceps
- Living insect:
  - First asphyxiate (to prevent movement)
  - Do not use oil (not recommended)

  - Use 4% Xylocaine drops- Makes the organism immobile & asphyxiate (cannot get oxygen), then remove the insect
- Organic foreign body OR Button battery:
  - NEVER DO SYRINGING
  - Reasons:
    → Organic FB: Absorbs water → Swells up → Further occlusion
  - Button battery: Requires urgent removal with a probe

Syringing Technique

- Instrument: Simpson's aural syringe
- Water temperature: 37°C (exactly)
  - Not above or below
  - Can cause caloric reaction → Syncope
- Direction of ear pull - Posterosuperior
- Direction of water jet - Posterosuperior
  - Straight direction → Tympanic membrane perforation
- Contraindications to syringing:
  - Hygroscopic foreign body
  - Organic foreign body
  - Button battery
  - Tympanic membrane perforation
- Complications:
  - Vertigo (if water is not at body temperature, due to caloric stimulation)
  - Rupture of TM (if done too forcefully)
  - Reactivation of quiescent otitis media.

KERATOSIS OBTURANS

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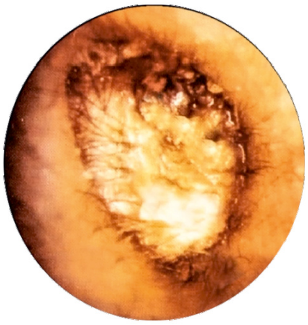


- Mass of keratin accumulating in the external auditory canal
- **Pathophysiology:**
  - Normally, cilia push dead epithelium outside
  - In keratosis obturans: Ciliary motility disorder
  - Dead epithelium cannot be pushed out
  - Layers of keratin/epithelium are organized one over another
  - "Onion skin/lamellar arrangement"
  - Effects:
    → Causes widening (NOT erosion)
    → Due to widening and pressure → 7th nerve palsy possible
- Clinical features:
  - **Severe otalgia** (extremely painful)
  - Ballooning of the canal
- Examination
  - White mass with wax in the deep meatus, ulceration, granulations, and widening of the EAC. Facial nerve palsy.
  - History of chronic sinusitis and bronchiectasis.
- Diagnosis: Clinical
- Treatment:

- Soften with wax-solytic agents
- Removal requires sedation or short GA (due to severe pain)
- Removal by instrumentation

HERPES OTICUS (RAMSAY HUNT SYNDROME)

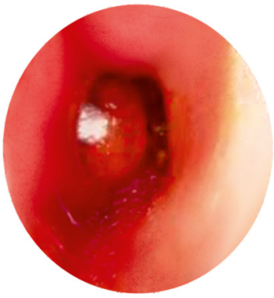
00:20:48

- Causative organism: Herpes zoster virus (Varicella-zoster virus)
- Pathophysiology:
  - Virus remains latent in the geniculate ganglion
  - Reactivation occurs due to immunosuppression (Not low immunity)
- Clinical features:
  - Pain in the area of distribution of the facial nerve
  - Vesicles in the area of distribution of the facial nerve
  - LMN type of facial nerve palsy
- Treatment:
  - Antivirals
  - Steroids
- Prognosis:
  - Poorer than Bell's palsy
  - Not as good a recovery as in facial palsy

DISEASES OF THE TYMPANIC MEMBRANE

00:21:40

Myringitis Bullosa Hemorrhagica



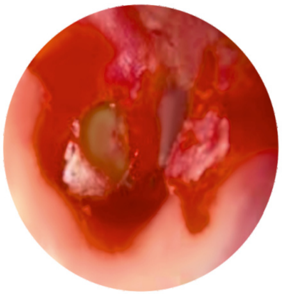
- Association: Often associated with acute otitis media
- Causative organisms:
  - Streptococcus pneumoniae
  - Mycoplasma
- Clinical features:
  - Pain
  - Fever
  - Hearing loss
  - Vesicles/blebs on the tympanic membrane
  - Sometimes, blood-stained discharge (if the vesicle ruptures)
- Investigations: NOT required
- Examination is diagnostic
- Treatment:
  - Antibiotics against Streptococcus and Mycoplasma
  - Symptomatic therapy

Granular Myringitis

- **Definition:** Chronic infection of the tympanic membrane
  - Tympanic membrane is replaced by **granulation tissue**
- **Causes:**
  - Bacterial infection
  - Fungal infection
  - Trauma

  - Post-surgery
- **Clinical features:**
  - Blood-stained ear discharge
  - Pain
  - Itching in the ear
- **Examination:** Granulations over the tympanic membrane
- **Treatment:**
  - Topical antibiotics + Systemic antibiotics
  - Cauterization (very important - to prevent further granulations)

Traumatic Perforation



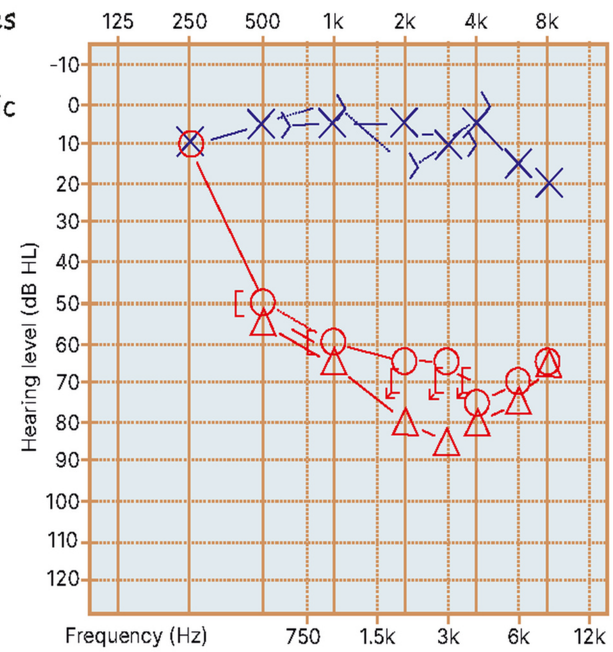
- Etiology: Trauma causing a hole/perforation in the tympanic membrane
- Clinical features:
  - Pain
  - Hearing loss
  - Blood-stained discharge
- Investigations: NOT required
- On examination: Perforation visible with blood and retracted parts
- Treatment:
  - Wait and watch
  - Will close by itself in 6-12 weeks
- If it does NOT close:
  - Surgery: Myringoplasty

10. HEARING LOSS

SUDDEN SENSORINEURAL HEARING LOSS (SSHL)

INICET May 2024, FMGE Jan 2025

- Definition: >30 dB hearing loss for 3 consecutive frequencies within 3 days (72 hours)
- Causes: Viral, autoimmune, post-infection tumors like acoustic neuroma, exposure to loud sounds
  - Conductive: Wax in the ear
  - Sensorineural: Cochlear or Retrocochlear
- Diagnosis
  - Audiometry→ MRI with contrast (used to rule out intracranial pathologies compressing the nerve).
  - The audiogram shows a right ear drop in hearing levels to 50, 60, 70 dB at 500, 1K, 2K Hz, respectively
- Treatment: The earlier the diagnosis and treatment, the better the prognosis
  - Steroids are the main Rx
  - Intratympanic Steroids and Systemic Steroids



Keys to Symbols	Right	Unspecified	Left
AC unmasked	O		X
AC masked	●		⧗
BC unmasked	<		>
BC masked	[	△	]
AC aided	H	□	V
AC sound field			

Inner Ear Condition Causing Isolated Hearing Loss
(External ear and middle ear including TM are normal → Pure SNHL)

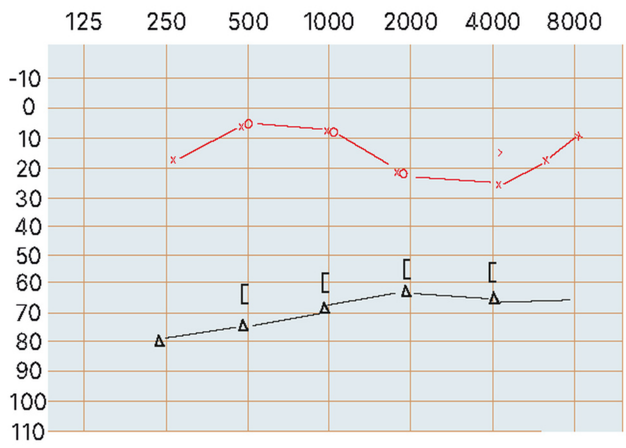
Clinical Presentation
- Patient presents with complaints of sudden hearing loss developing over a 3-day period.

Diagnostic Evaluation
- Rinne test: May be positive or negative (False negative can occur in severe SNHL)
- Diagnostic dilemma: Severe SNHL may be mistaken for CHL on tuning fork tests due to a negative Rinne.
- Pure Tone Audiometry (PTA):
- >30 dB SNHL in three contiguous frequencies

Diagnosis
- Sudden Sensorineural Hearing Loss (SNHL) – an otologic emergency
- Definition:
- Hearing loss >30 dB affecting three consecutive frequencies within 3 days

Management

- Medical treatment:
  Oral steroids, intratympanic steroids, carbogen therapy, hyperbaric oxygen
- **Rehabilitation:**
  If unilateral deafness → BAHA or CROS hearing aids
- **Imaging:**
  MRI to exclude acoustic neuroma



Important Information

- Cross hearing: A hearing aid that transmits the sound from the ear with severe hearing loss to the opposite normal ear and the brain
- >90 dB is a loud sound
- >150 dB causes acoustic trauma and permanent deafness

Conditions of the Inner Ear Causing Only Hearing Loss

Noise-Induced Hearing Loss (NIHL)

- History of hearing loss occurring after sudden or prolonged exposure to loud noise
- May result in a temporary or permanent threshold shift

Ototoxicity

- History of exposure to ototoxic agents, such as: aminoglycosides, antimalarials, analgesics, cytotoxic drugs, diuretics, vancomycin, erythromycin, or azithromycin

Presbycusis

- Occurs in individuals older than 50 years
- Hearing loss is slowly progressive, bilateral, and symmetrical
- Most common cause of SNHL in adults

Diagnostic Tests

- Pure Tone Audiometry (PTA): Down-sloping curve indicating high-frequency hearing loss
- Acoustic dip at 4 kHz characteristic of NIHL
- High-frequency audiometry: Demonstrates high-frequency hearing loss
- Otoacoustic emissions (OAE): Absent in NIHL and ototoxicity due to early involvement of outer hair cells

Management

- Hearing aids
- Cochlear implant

Frequently Asked PYQs

- Safe noise exposure limit: 85 dB for 8 hours/day, 5 days/week
- Prevention of NIHL: Ear plugs (30 dB protection) and ear muffs (40 dB protection)
- Aminoglycosides and cytotoxic drugs cause irreversible hearing loss
- Cochleotoxic aminoglycosides (Mnemonic: KAN) — Kanamycin, Amikacin, Neomycin (most toxic)
- Streptomycin, Gentamicin, Tobramycin are predominantly vestibulotoxic
- Loop diuretics block the Na^+-K^+-$2Cl^-$ channel of the stria vascularis
- Most common type of presbycusis: Neural
- Other types include sensory, cochlear conductive, and strial

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CHILDHOOD HEARING LOSS

00:08:20

Etiology of Childhood Hearing Impairment

Congenital Causes of Hearing Loss (Prenatal) — 2/3

Genetic Causes (50%)	Non-Genetic Causes (50%)
Non-syndromic: 70%	Maternal infections: CMV (most common), rubella, syphilis, toxoplasmosis
Syndromic: 30%	• Drug exposure and maternal factors: • Use of ototoxic drugs, substance abuse, and endocrine disorders during pregnancy

- The above factors affect **labyrinth development during the first trimester**.

Acquired Causes (Perinatal and Postnatal) — 1/3

- Infections:
  Meningitis (most common), measles, mumps, varicella, herpes, toxoplasmosis, chronic otitis media
- Hypoxia:
  ARDS, prolonged difficult labor, prematurity
- Hyperbilirubinemia
- Ototoxic drugs
- Noise trauma / head trauma
- NICU admission for more than 5 days:
  Associated with a high incidence of Auditory Neuropathy Spectrum Disorder

AUDITORY NEUROPATHIC SPECTRUM DISORDER

- In auditory neuropathy spectrum disorder, patients will hear sounds but have poor speech discrimination

Auditory Neuropathy Spectrum Disorder (ANSD)

A higher incidence of ANSD is observed in **neonates admitted to the ICU**.

Auditory Neuropathy Spectrum Disorder (ANSD)

Pathophysiology of ANSD – Important Concept

- Dysfunction occurs at the level of the cochlear inner hair cells (IHC), resulting in inadequate transmission of signals to the auditory nerve.
- Demyelination of the auditory pathway nerves is seen.
- There is loss of axons.
- This leads to dyssynchrony.
  Sound continues to travel, reach, and be perceived by the auditory cortex; however, speech (complex sounds) cannot be identified due to loss of synchronization.

Presentation of a Child with ANSD

- The child is able to hear sounds and responds to sound.
- However, the child does not understand complex sounds, such as speech, which require synchronization.
- Hence, the condition is usually detected when the child is slightly older.

Test Results Pointing Toward ANSD

- Pure Tone Audiometry (PTA): Normal or mild to moderate SNHL, as the child is able to perceive sound stimuli.

Management

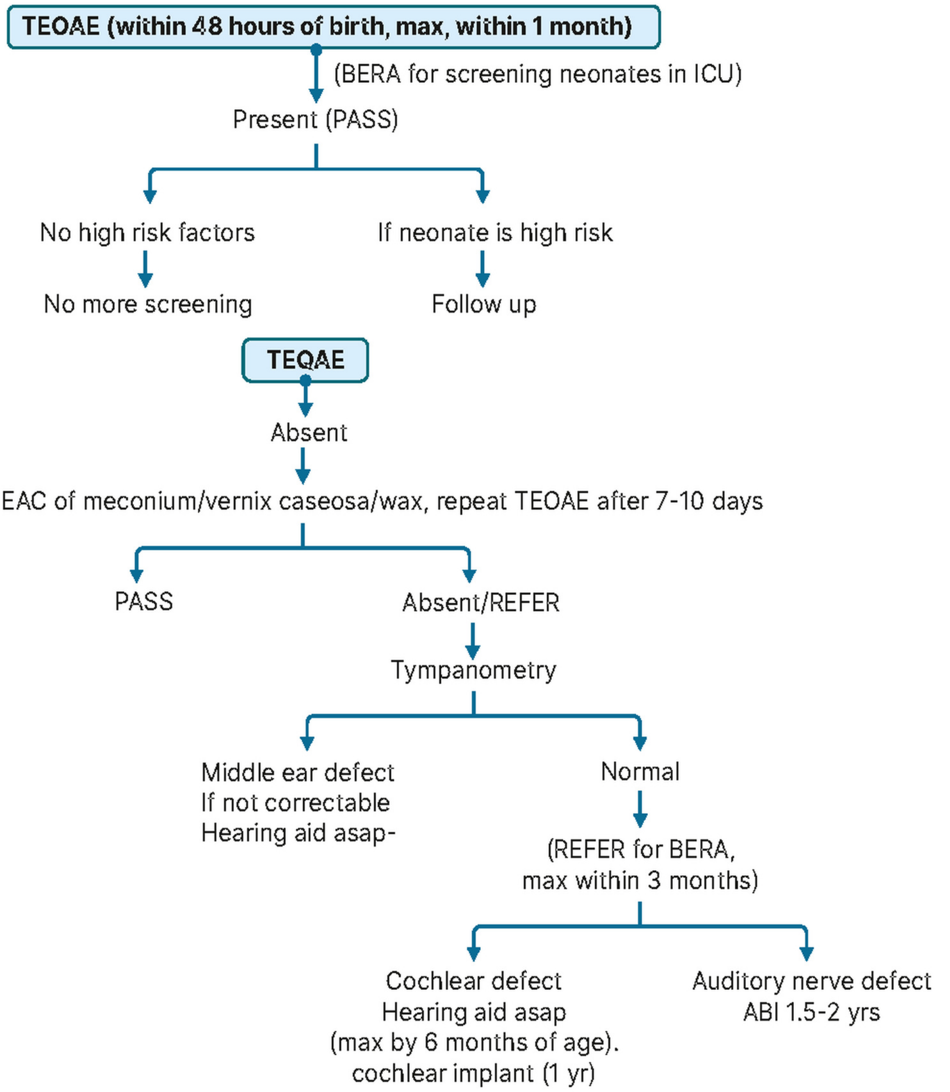
- Hearing aids
- Cochlear implant

- Speech audiometry / speech recognition / speech discrimination: Speech intelligibility is disproportionately poorer compared to the degree of hearing loss.
- Otoacoustic emissions (OAE): Present, as outer hair cells are normal; therefore, BERA is used for hearing screening in NICU neonates, since OAE may be normal (PASS) and ANSD can be missed.
- **BERA:** Abnormal.
- **MLR (middle latency response: 12–50 ms)** and **LLR / cortical responses (50–500 ms)** assessed by **CERA** may be abnormal or absent

NEONATAL HEARING SCREENING

- Every child at birth should undergo an auto acoustic emission test
- If OAE is normal, then the patient passes, and no higher tests are required

Protocol for Neonatal Hearing Screening



1-3-6 rule-screening test within 1 month of birth, referral test within 3 months, rehabilitation within 6 months.

BEHAVIOURAL OBSERVATION AUDIOMETRY

- Done in those children in whom tuning fork tests cannot be done

Behavioural Observation Audiometry (BOA)

BOA is a test used to assess a child's hearing by observing changes in the child's behavior or response following the presentation of a sound stimulus.

When to Perform BOA

BOA is performed in children older than 6 months who present with complaints of hearing loss.

↓

This is followed by detailed history taking and clinical examination.

↓

If findings are normal up to the tympanic membrane, BOA is carried out.

↓

If BOA findings are abnormal or if the child is unresponsive, the child is subjected to electrophysiological tests, starting with OAE, followed by BERA.

Behavioural Observation Audiometry (BOA)

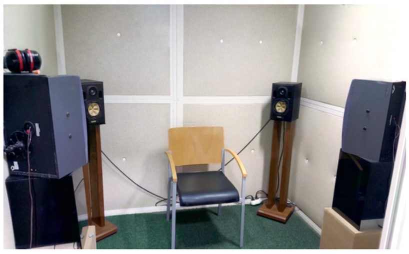
Important Tests to Remember in BOA

Age:	**Developmental milestone:**	**BOA tests:**
5-24 Months	The child begins to localize sounds and turns the head toward the sound source.	· Free field audiometry · Visual reinforcement audiometry
2-5 Years	The child develops some vocabulary and is able to follow simple instructions.	Play audiometry

Note : When the child is older than 5 years, preferably above 7 years, Pure Tone Audiometry (PTA) can be performed.

PLAY AUDIOMETRY

- The child is made to sit in the chair
- Music is played from the speakers surrounding
- If the child localises the sound, hearing is intact



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REHABILITATION

Hearing loss	Rehabilitation
Moderate to moderately severe SNHL/CHL	Hearing aid
External auditory canal abnormality / chronic discharging ear in an old patient	BAHA
Unilateral severe to profound SNHL	BAHA
Bilateral severe to profound SNHL	Cochlear implant
Otosclerosis	Surgery

BAHA- BONE ANCHORED HEARING AID

- A titanium screw is integrated into the squamous temporal bone
- Once it is integrated with the bone(usually in 6 months), the external component is put to fit over the screw
- The processor sends sound to the opposite ear and also to the same ear
- Hence, it is used in U/L sensorineural hearing loss

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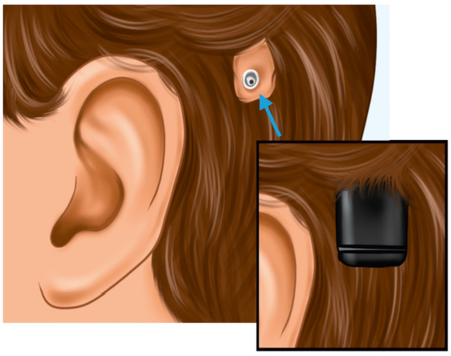

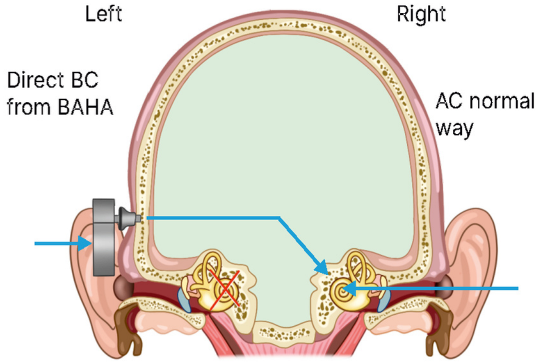

COCHLEAR IMPLANTS

Cochlear Implant

Inventor

- Developed by **William F. House**, who is regarded as the **Father of Neurotology**.

Indications

- **Severe to profound hearing loss in both ears** with **no significant benefit from hearing-aid use**.
- Implantation can be considered **from 1 year of age onwards**.

Contraindications

- **Non-formation of the cochlea** (Michel aplasia)
- **Absence of the cochlear nerve**
- Presence of **central auditory pathway lesions**

Components of the Implant

Internal Components

- Receiver–stimulator unit
- Electrode array

External Components

- Microphone
- Speech processor
- Transmitting coil

Commonly Asked PYQs

- The procedure may be performed **starting at 1 year of age**.
- Entry into the **middle ear** is achieved via the **facial recess**.
- Entry into the **inner ear** occurs through the **round window**.
- The electrode is positioned in the **scala tympani**.
- It functions as a substitute for the **organ of Corti**.
- Neural activation occurs at the level of the **cochlear nerve**.

- Has an external and internal component
- The external component has a microphone and the speech processor
- It transfers the sound to the internal component (Receiver/speech stimulator)
- The reference electrode is in the squamous temporal region
- The internal electrode is in the scala tympani of the cochlea

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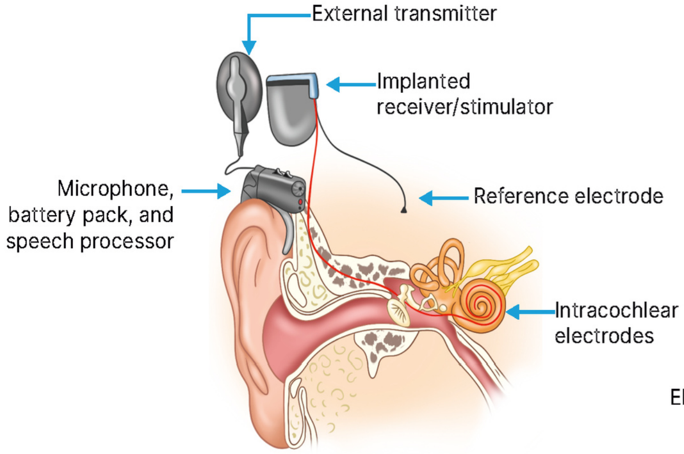
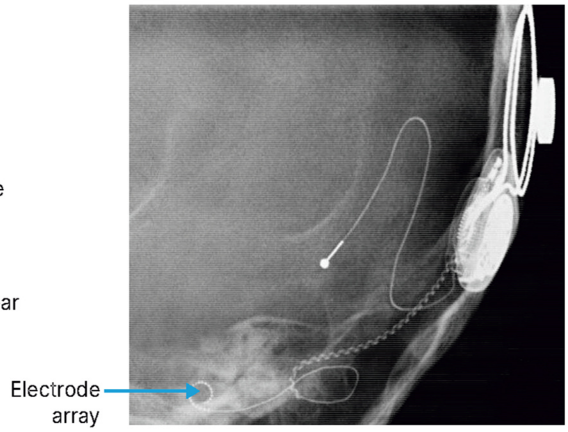
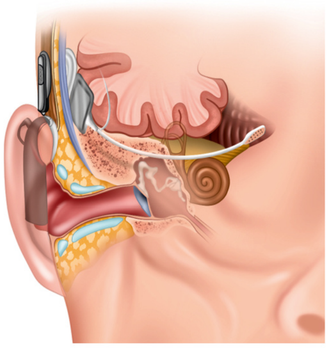




AUDITORY BRAINSTEM IMPLANT

- Used in patients with B/L acoustic neuroma and undergone surgery/absent or dysfunctional 8^{th} nerve



DEFINITION OF DEAF

00:14.42

- Calculating Hearing Disability
- Calculate Monaural (One Ear) Loss:
  - Perform this for the left and right ears individually:
  - Determine Pure Tone Average (PTA): Add the hearing thresholds at 500, 1000, 2000, and 3000 Hz and divide by 4
  - Apply the "Low Fence": Subtract 25 dB from the average (as 25 dB is considered the limit of normal hearing)
  - Multiply by 1.5: Every decibel above the 25 dB baseline equals 1.5%
  - Formula: (PTA-25) x 1.5= % Monoaural impairment
- Calculate Binaural (Both Ears) Loss
  - To find the total disability percentage, the "better ear" is weighted more heavily because it contributes more to daily functioning.
  - Weighted Average:
  - Formula: [(% Better Ear x 5) + (% Worse Ear)] ÷ 6 = % Binaural Hearing Disability

PYQs

00:15:45

Q. A patient presents to the OPD with hearing loss. On examination: Rinne test - Positive in the left ear and negative in the right ear.Weber's test - Lateralization towards the left.Bone conduction test - Reduced in the right ear and similar in the left ear

FMGE Jan 2025

Interpret the findings:

A. Sensorineural hearing loss in the left ear

B. Sensorineural hearing loss in the right ear

C. Conductive hearing loss in the left ear

D. Conductive hearing loss in the right ear

Answer: **A**

- Rinne test: Right ear negative → suggests Conductive hearing loss (CHL)
- Weber test:
  - Sound goes to the CHL ear or better ear in SNHL
  - Here → Lateralizes to left→ Either left CHL OR right SNHL
- Bone conduction:
  - Reduced in right ear → Confirms SNHL in right ear

Q. Which of the following interventions should not be done in an 8-year-old boy with bilateral sensorineural hearing loss? INICET May 2024

A. Preferential sitting in the classroom
B. Adenoidectomy with grommet insertion
C. Hearing aid
D. Cochlear implant

Answer: **B**

- Adenoidectomy with grommet insertion is done in conductive hearing loss

11. COMPLICATIONS OF ASOM AND CSOM

ROUTES OF SPREAD OF INFECTION FROM MIDDLE EAR

00:00.34

- **Natural Communications**
  - Oval window and Round window
  - These are natural communications between middle ear and inner ear
- **Bony Erosion**
  - Caused by cholesteatoma or atticoantral type of CSOM
  - Proteolytic enzymes produced lead to bony erosion, facilitating infection spread.
- **Venous Spread**
  - The sigmoid sinus is located posteriorly in the mastoid
  - Venous spread → Sigmoid sinus thrombosis (Lateral sinus thrombosis)
  - There is no arterial route of spread for infection from middle ear

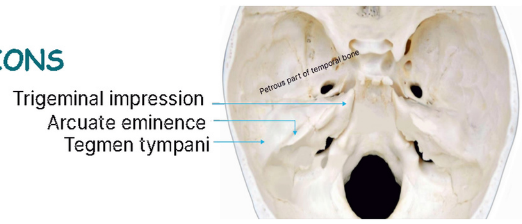
CLASSIFICATION OF COMPLICATIONS

00:01:30

Type	Complications
EXTRACRANIAL COMPLICATIONS	Mastoiditis; Labyrinthitis; Petrositis; Osteomyelitis; Septicaemia; Facial nerve palsy
INTRACRANIAL COMPLICATIONS	Meningitis; Extradural abscess; Subdural abscess; Brain abscess; Otitic hydrocephalus; Lateral sinus thrombosis

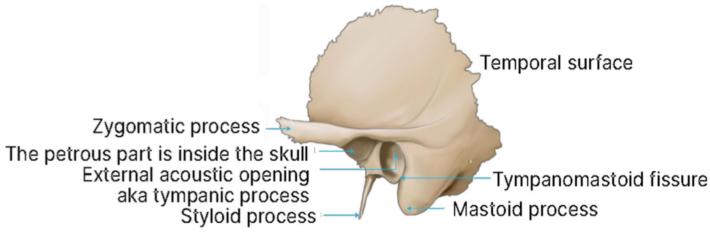
Feature	Acute Otitis Media	Chronic Otitis Media
Rule	The answer usually ends with "**-itis**"	The answer usually **does not end with "-itis"**
Most common extracranial complication	Mastoiditis	Post-auricular abscess
Most common intracranial complication	Meningitis	Intracranial abscess (Brain abscess)

ANATOMICAL BASIS OF EXTRACRANIAL COMPLICATIONS



PARTS OF TEMPORAL BONE:

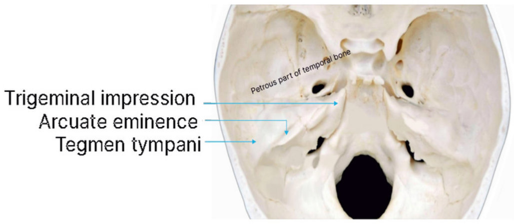
- Petrous part (leaf-like bone)
  - Contains inner ear
  - The internal auditory canal is present here
- Tympanic part
  - Forms part of external auditory canal
- Squamous part



- Tegmen tympani = roof of middle ear
- Mastoid part
  - Contains mastoid air cells

EXTRACRANIAL COMPLICATIONS:

- Spread to Mastoid air cells → Mastoiditis
- Spread medially to Inner ear → Labyrinthitis (pus in inner ear)
- Spread medially to Petrous bone apex → Petrositis
- Spread to Squamous temporal bone → Osteomyelitis
- Blood spread → Septicaemia
- Spread to the facial nerve (travels from IAC → Inner ear → Middle ear → Mastoid) → Facial nerve palsy

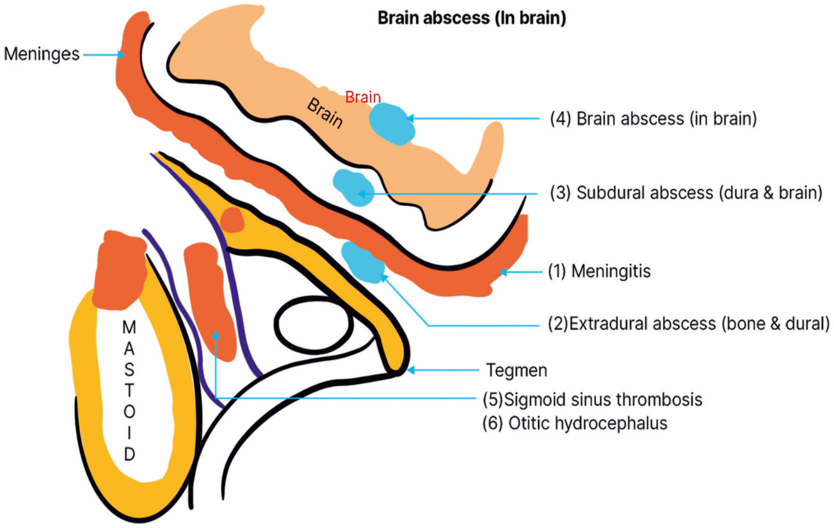


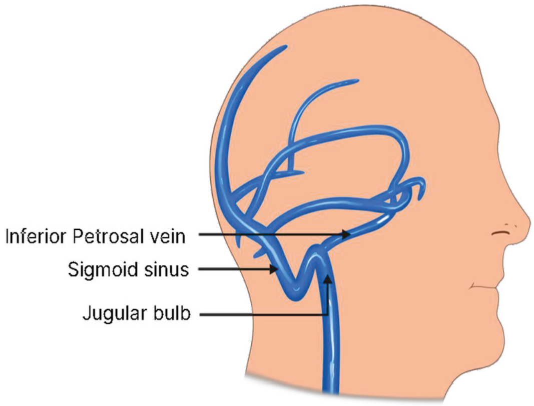
ROUTES OF INTRACRANIAL COMPLICATIONS

- Route 1 (Most Common):
  - Middle ear disease → Breakthrough Tegmen tympani (roof of middle ear) → Enters Middle cranial fossa → Contains Temporal lobe of brain → Most common site for intracranial complications
- Route 2 (Less Common):
  - Middle ear → Inner ear → Petrous bone → Cerebellum

INTRACRANIAL COMPLICATIONS

- Disease erodes Tegmen → Inflammation of meninges → Meningitis
- Pus between bone and dura → Extradural abscess
- Pus breaks through dura → lies between dura and brain parenchyma → Subdural abscess
- Pus goes inside brain → Brain abscess (Intracerebral abscess)
- Disease reaches Sigmoid sinus → Thrombosis of sigmoid sinus → Lateral sinus thrombosis
- Sigmoid sinus thrombosis → Cranial circulation cannot drain → Fluid retention in ventricles → Otitic hydrocephalus





EXTRACRANIAL COMPLICATIONS

00:07:20

ACUTE MASTOIDITIS

- Most common extracranial complication of Acute Otitis Media
- Causative Organism: Streptococcus pneumoniae (same as AOM)

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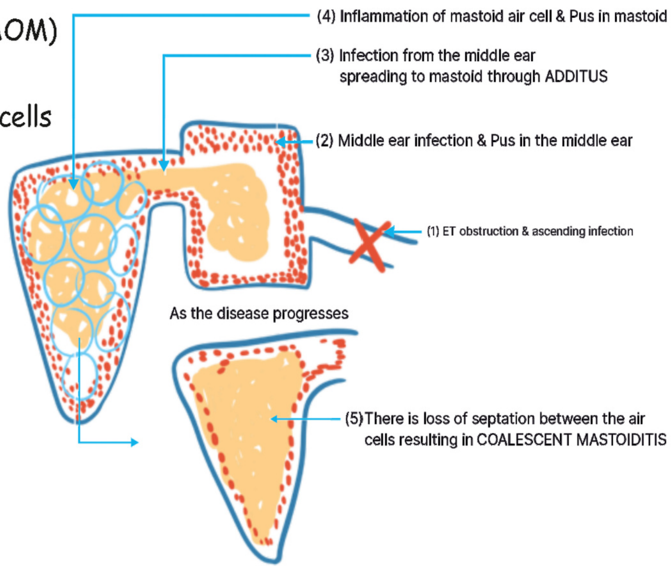
PATHOPHYSIOLOGY:

- Eustachian tube blockage → Pus collects in middle ear (AOM) → Pus travels via Aditus → Reaches Mastoid antrum → Inflammation of mastoid air cells → Pus fills mastoid air cells → Septa between air cells break → Air cells merge into single pus-filled cavity → Coalescent mastoiditis



SYMPTOMS (EXAGGERATED ASOM SYMPTOMS):

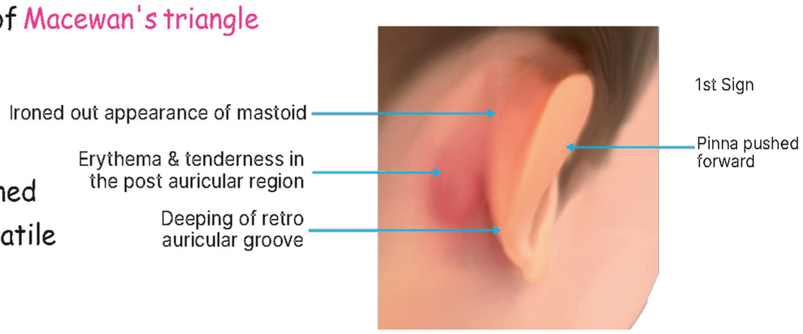
- Pain (more severe, also behind pinna)
- Fever
- Hearing loss
- Ear discharge
  - profuse and persistent can be pulsatile
  - Lighthouse sign
- Tenderness positive

SIGNS:

- "Ironed out appearance" of mastoid
  - Skin is stretched, red, oedematous.
  - This is the first sign of acute mastoiditis
- Pinna Changes:
  - Pinna pushed outwards and forward
- Sagging of posterior meatal wall
- Tenderness on the mastoid region on the area of Macewan's triangle
- Retroauricular Groove:
  - Deepening of retro-auricular groove
  - Due to swollen, edematous mastoid
  - Gives apparent feeling that groove is deepened
- Discharge on otoscopy reflects light and is pulsatile
  - Pulsatile otorrhoea
  - Called Lighthouse sign
  - Also seen in ASOM (Non-specific sign)
- Specific sign (only in mastoiditis):
  - Reservoir sign

    → Pus in the external auditory canal (mucopurulent)

    → After removing the pus, the canal will immediately fill with pus again.
  - If it takes time to reappear, it is likely AOM rather than mastoiditis.



DIAGNOSIS:

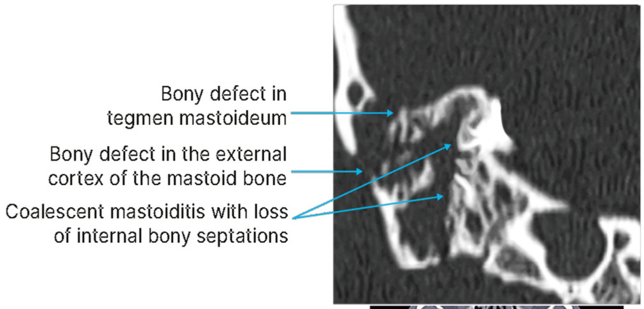
- Clinical:
  - History and examination findings

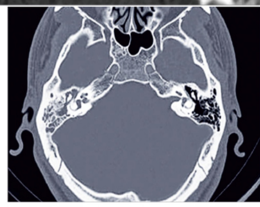
    → Ironed out appearance

    → Pinna pushed outwards and forwards

    → Deepening of retro-auricular groove

→ Reservoir sign positive
- Imaging:
  - X-ray or CT scan
- CT Findings:
  - Coalescence of air cells visible
  - Destruction/defect in roof of mastoid
  - Haziness in mastoid
  - Compare with opposite side: the diseased side is hazy (not black/air-filled)



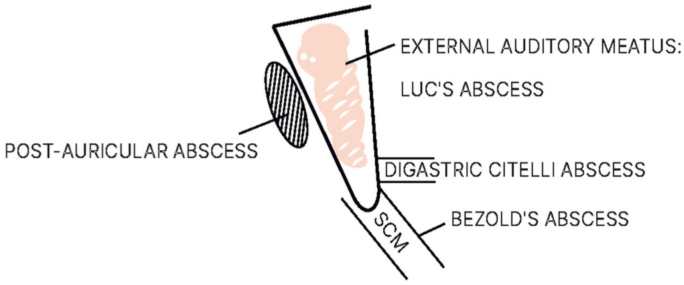


TREATMENT

- Surgery: Cortical Mastoidectomy
- Procedure:
  - Delineate the entire mastoid from:
    → Roof (superiorly)
    → Sigmoid sinus (posteriorly)
    → Tip cells (inferiorly)
    → Posterior wall of external auditory canal (anteriorly)
  - Remove all diseased air cells
- Medical: IV antibiotics

LOCAL ABSCESSES RELATED TO MASTOID

- **BEZOLD'S ABSCESS**
  - Pus breaks through the tip of the mastoid.
  - Goes into the sternocleidomastoid muscle
  - Present in upper part of neck
- **POST-AURICULAR ABSCESS**
  - MC abscess
  - Pus breaks through the outer cortex of the mastoid.
  - Presents as abscess behind the pinna
- **LUC'S ABSCESS**
  - Pus breaks into the external auditory meatus.
  - Memory aid: L follows M
    → Luc's = Meatus
- **CITELLI'S ABSCESS (DIGASTRIC ABSCESS)**
  - At tip of mastoid = Posterior belly of digastric muscle
  - Abscess in digastric region
  - Memory aid: C follows D
    → Citelli's = Digastric



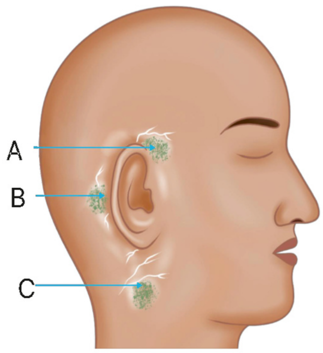


Image based

- Near zygomatic bone → Zygomatic abscess
- Behind pinna → Post-auricular abscess (MC)

- Upper part of neck in SCM → Bezold's abscess
- Near angle of mandible → Digastric (Citelli's) abscess
- In external auditory meatus → Luc's abscess

PETROSITIS

00:14:03

- Definition: Inflammation of petrous apex cells
- Anatomy:
  - Petrous bone = Leaf-like bone
  - At apex of petrous bone: Two cranial nerves
    - → 5th cranial nerve (Trigeminal)
    - → 6th cranial nerve (Abducens)

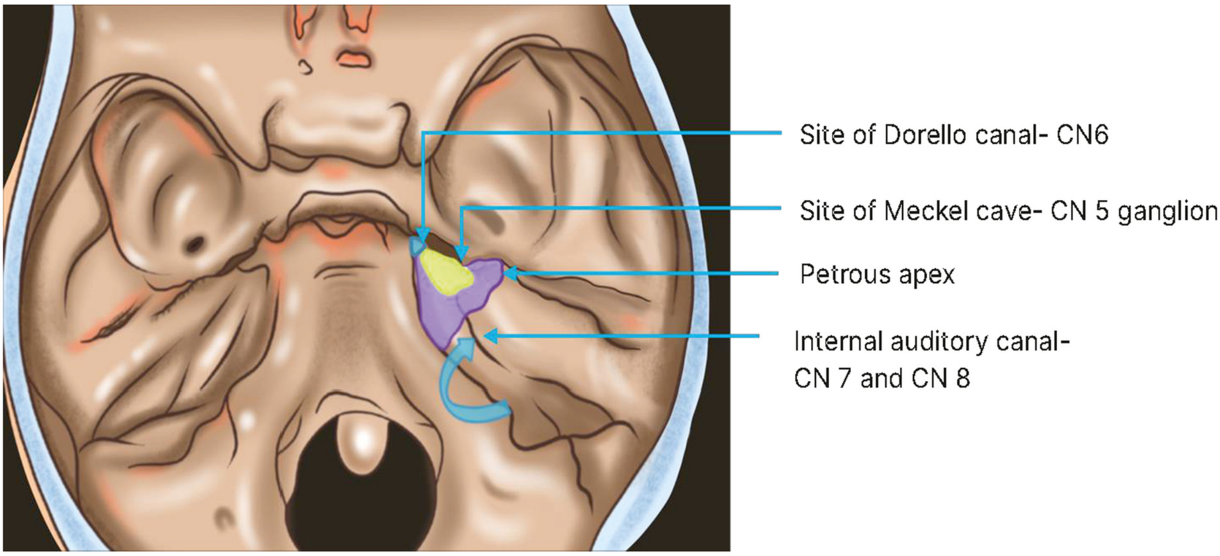
PATHOPHYSIOLOGY

- Infection spreads from middle ear to the petrous apex
- Pus/inflammation at petrous apex
- Involves 5th and 6th cranial nerves

CLINICAL FEATURES

GRADENIGO'S TRIAD

- Persistent Ear Discharge
  - Constant otorrhoea from middle ear disease
- Deep-Seated Retro-Orbital Pain
  - Due to 5th nerve involvement (Trigeminal nerve)
  - Pain around the eye
- Lateral Rectus Palsy (Diplopia)
  - Due to 6th nerve involvement (Abducens nerve)



LABYRINTHITIS

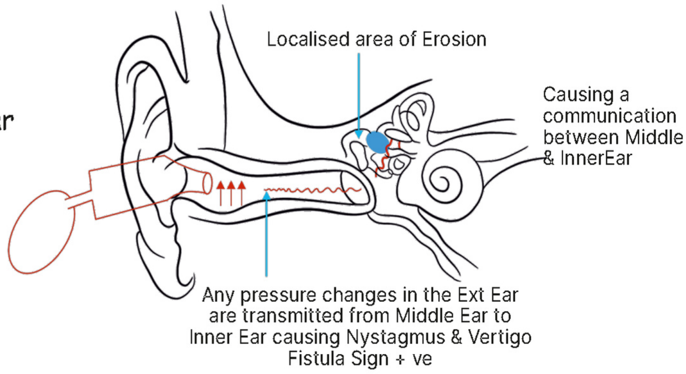
00:15:18

- Definition: inflammation of the inner ear

THREE FORMS:

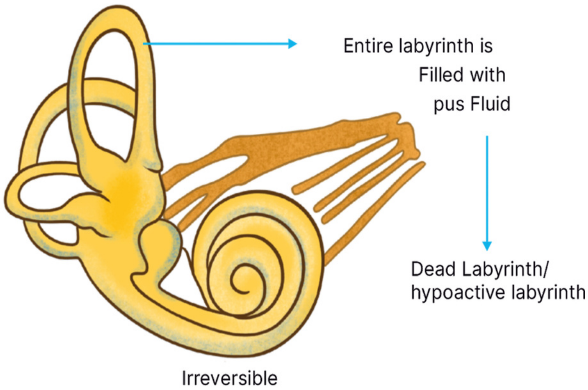
CIRCUMSCRIBED LABYRINTHITIS

- Pathology:
  - Localized area of labyrinth involved
  - Small area of erosion between middle ear and inner ear
  - Communication formed between middle and inner ear
- Clinical Features:
  - Fistula sign: positive
  - Mechanism: Increased pressure in external auditory canal → Pressure reaches middle ear → Through the erosion area →infection reaches inner ear
  - Results in transient vertigo when pressure applied
- Prognosis: Localized, can be managed



SEROUS (DIFFUSE SEROUS) LABYRINTHITIS

- Pathology:
  - The entire labyrinth filled with Sterile fluid
  - No pus present
  - Liberation of bacterial toxins causes sterile inflammation
- Hyperactive labyrinth (irritated)
- Clinical Features:
  - Vertigo:
    - → Single, long episode
    - → Lasts few days to few weeks
  - Nystagmus:
    - → towards the same side (diseased side)
    - → Rule: Hyperactive labyrinth → Nystagmus towards same side
  - Sensorineural Hearing Loss (SNHL)
  - Tinnitus
  - NO fever (no pus = no toxic features)
- Prognosis:
  - Reversible condition
- With appropriate antibiotics
- Clear infection/disease
- Can reverse the condition



SUPPURATIVE (DIFFUSE SUPPURATIVE) LABYRINTHITIS

- Pathology:
  - The entire labyrinth filled with PUS
  - Purulent fluid throughout inner ear
- Hypoactive labyrinth (destructive)
- Clinical Features:
  - Vertigo:

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- → Severe vertigo
    - Nystagmus:
        - → Towards opposite side (away from diseased side)
        - → Rule: Hypoactive labyrinth → Nystagmus towards opposite side
    - Sensorineural Hearing Loss (SNHL)
    - Tinnitus
    - HIgh grade fever (pus = toxic features)
    - Toxic symptoms present
- Prognosis:
    - Irreversible condition
    - Requires immediate attention
- Treatment:
    - Labyrinthine sedatives
    - Mastoid exploration (MRM)
    - Clear disease source
    - IV antibiotics
    - If not treated → Progresses to intracranial complications

Feature	Circumscribed Labyrinthitis	Diffuse Serous Labyrinthitis	Diffuse Suppurative Labyrinthitis
Pathology	Thinning or erosion of bony capsule of labyrinth	Diffuse inflammation of labyrinth without pus	Pus infection of labyrinth
Labyrinth status	Labyrinth exposed to external stimuli	Labyrinth inflamed and irritable	Loss of vestibular and cochlear functions
Reversibility	Reversible	Reversible	Irreversible
Fistula test	Positive	Negative	Negative
Nystagmus	Positive pressure → nystagmus to same side; Negative pressure → nystagmus to opposite side	Nystagmus to same side	Nystagmus to opposite side
Symptoms	Transient vertigo on applying pressure to tragus	Vestibular and cochlear symptoms	Toxic severe symptoms of serous labyrinthitis

KEY RULE FOR NYSTAGMUS:

- Hyperactive/Irritated labyrinth (Serous) → Nystagmus Towards same side
- Hypoactive/Destroyed labyrinth (Suppurative) → Nystagmus Towards opposite side

APPROACH TO PATIENT WITH AOM + COMPLICATIONS

Intratemporal complications of otitis media

Patient of Otitis Media presents with

Child with Fever, ear discharge, Postauricular edema and tenderness

Next step ↓

On Examination

- Pinna pushed outward and downward
- Postauricular - Ironed out
- EAC -Reservoir sign, Sagging of posterosuperior meatal wall.
- Abscess following mastoiditis Postauricular (MC).
- Bezold's -In relation to SCM.
- Citelli's -In relation to posterior belly of digastric/ occipital region.
- Luc's -In relation to posterior wall of EAC.

↑ **Diagnosis:** Mastoiditis (MC caused by-Pneumococcus)

↑ **Management:** IV antibiotics + cortical/simple mastoidectomy Schwartze operation

Persistent Ear discharge + retroorbital pain (5th inv.) + Diplopia (6th palsy) - Gradenigo triad (due to abscess reaching Petrous Apex)

↓

Diagnosis: Petrositis

↓

Management: IV antibiotics + MRM + drainage of petrous air cell.

Mixed HL, Vertigo

↓

Diagnosis:
- Labyrinthitis (erosion is seen MC of → lateral semicircular canal).

↓

Management: Labyrinthine sedative IV antibiotics + if has followed chronic otitis media then MRM.

Deviation of face to the normal side

↓

Diagnosis: Facial palsy

↓

Management: MRM with facial nerve decompression.

INTRACRANIAL COMPLICATIONS

MENINGITIS

00:21:05

- Most common intracranial complication of AOM
- Causative Organism: Streptococcus pneumoniae (same as AOM)
- Clinical Features:
  - High grade fever
  - Projectile vomiting
  - Projectile headache
  - Altered sensorium/unconsciousness
  - Irritability
- Specific Signs:
  - **BRUDZINSKI'S SIGN** (Neck Sign):
    - → Flexion of neck → Automatic flexion of hip and knee
    - → Tests meningeal irritation
  - **KERNIG'S SIGN:**
    - → Thigh flexed towards abdomen
    - → Attempt to extend leg → Pain
    - → Tests meningeal irritation
    - → Both signs = Specific for meningitis
- Diagnosis:
  - Gold Standard: Lumbar puncture

  - Send CSF for analysis
  - Based on CSF analysis → Treatment decided
- Treatment:
  - Based on CSF findings
  - IV antibiotics with mastoid exploration

EXTRADURAL ABSCESS

- Location:
  - Between dura and bone
  - Outside the dura (that's why "extra-dural")
- Characteristic Feature:
  - Usually Silent
  - May not present with dramatic symptoms
- Treatment:
  - Modified Radical Mastoidectomy
  - abscess is drained with IV antibiotics

SUBDURAL ABSCESS

- Location:
  - Between dura and brain parenchyma
- Characteristic Feature:
  - Very Rare complication
  - Not a common complication
- Clinical Features:
  - Fever
  - Headache
  - Projectile vomiting (raised ICP)
  - Some localizing signs
- Treatment:
  - IV antibiotics and drugs which reduce ICP
  - Mastoid exploration

BRAIN ABSCESS (INTRACEREBRAL ABSCESS)

NEET PG 2021

- Most Common Type: Intracerebral abscess (Brain abscess)
  - NOT extradural
  - NOT subdural
- Location:
  - Temporal lobe is most commonly involved
  - Disease spreads from middle ear → Tegmen → Temporal lobe
- Two Types of Features:
  - Due to raised intracranial tension

    → Headache, Projectile vomiting, Papilloedema, Drowsiness, Confusion, Stupor Bradycardia
  - Localising features

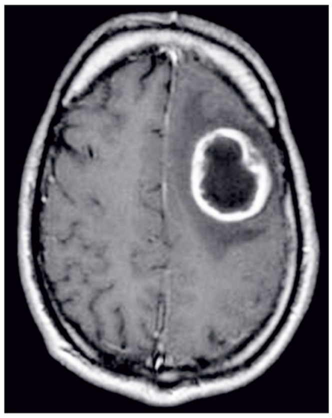
    → Temporal lobe abscess

      - Speech cortex → Aphasia

- Motor cortex → Hemiplegia
- Sensory cortex → Sensory loss
- Visual cortex → Hemianopia

→ If Cerebellar Abscess:

- Ataxia
- Dysmetria
- Dysdiadochokinesia



- Diagnosis: MRI with Contrast
  - Characteristic Finding: Ring sign
    - → Central dark area (necrotic pus)
    - → Surrounded by enhancing ring (capsule)
    - → Ring sign = Brain abscess
- Treatment:
  - Medical Management:
    - → IV antibiotics, dexamethasone
    - → Medications to reduce intracranial pressure: Mannitol
  - Neurosurgical Drainage:
    - → Drain the abscess first
  - Ear Surgery:
    - → Modified Radical Mastoidectomy for CSOM/Cholesteatoma
- MC type of brain abscess: Intracerebral abscess
- Lobe involved is temporal
- Ring sign on MRI see in intracerebral abscess

LATERAL SINUS THROMBOSIS (SIGMOID SINUS THROMBOSIS)

00:24:10

FMGE 2018, 2020

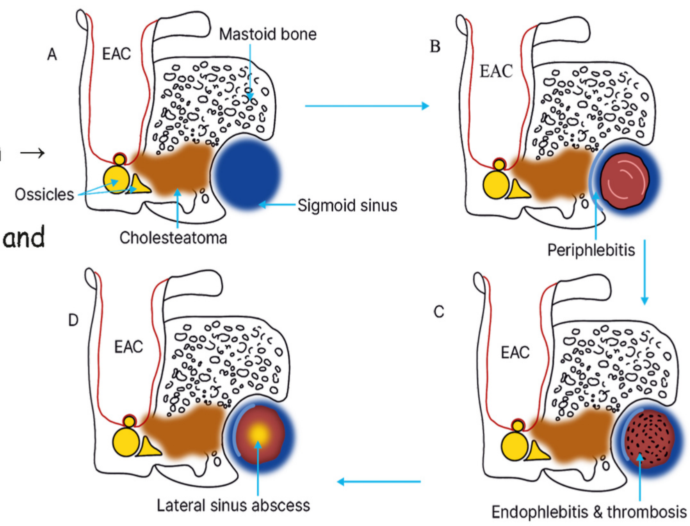
ANATOMY

- The sigmoid sinus forms posterior border of mastoid
- Part of venous drainage of brain

PATHOPHYSIOLOGY

- Disease spreads from Middle ear → Mastoid air cells
- Involves outer wall of sigmoid sinus → Periphlebitis
- Then involves inner wall → Endophlebitis
- Periphlebitis/Endophlebitis → Platelet aggregation → Thrombus formation (infective thrombus) →Later forms abscess and blocks sigmoid sinus

Lateral sinus thrombosis



CLINICAL FEATURES:

- **HECTIC PICKET FENCE FEVER:**
  - Constant fever
  - Does NOT touch baseline
  - Characteristic pattern
  - Due to emboli release to circulation

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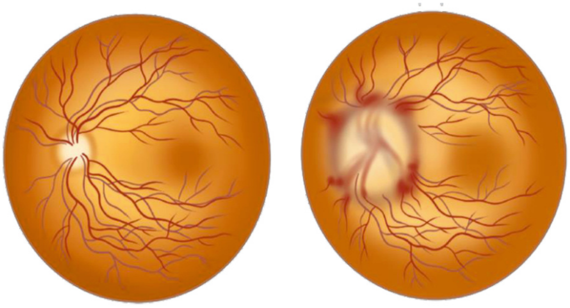
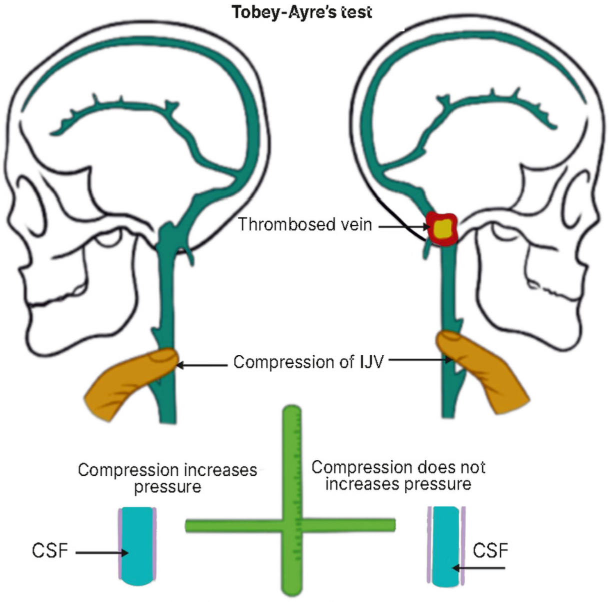
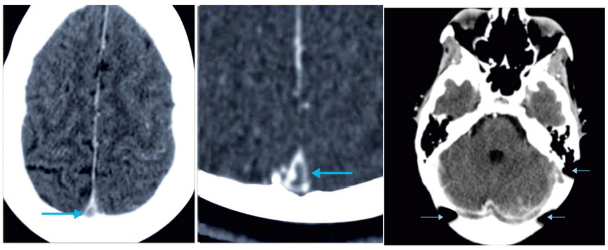
- **GRIESINGER SIGN:**
  - Edema and bluish discoloration of mastoid
  - Due to improper drainage of mastoid emissary veins
- **RAISED INTRACRANIAL PRESSURE:**
  - Presenting with papilloedema
- **TOBEY-AYER TEST (Historical):**
  - Not done now
  - Was used in past
  - Compression of IJV on the healthy side produces rise in CSF pressure
- **CROW BECK TEST(Historical):**
  - Not done now
  - Was used in past
  - Compression of IJV on the healthy side produces engorgement of retinal veins





DIAGNOSIS:

- Modern Investigation: Contrast-Enhanced CT/MRI
- Characteristic Finding: delta sign or empty delta sign
  - Diagnostic of sigmoid sinus thrombosis



COMPLICATIONS:

OTITIC HYDROCEPHALUS:

- Sigmoid sinus thrombosed
- Cranial circulation cannot drain
- Obstruction to venous drainage
- Fluid retention in ventricles
- Dilatation of ventricles = Hydrocephalus
- C/F
  - Headache,Papilloedema,Projectile vomiting
- Diagnosis by CT: dilated ventricles

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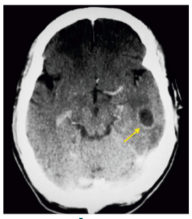
- Rx
  - Medical treatment to reduce ICP
  - VP Shunt (Ventriculoperitoneal shunt) to redirect CSF

Patient of Otitis Media presents with

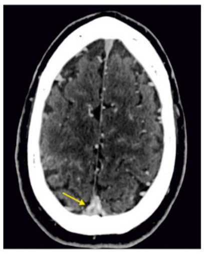
- Nominal aphasia, Homonymous supra-quadrantanopia, Headache, Seizures, Contralateral hemiparesis
- CT/MRI-Ring sign



Diagnosis : Temporal lobe abscess

Management: Abscess drainage + IV antibiotics + MRM when the patient is stable

- Picket fence fever , tenderness and edema over the mastoid k/a Griesinger's sign (mastoid emissary vein thrombosis).
- Tenderness on the neck over the jugular vein area
- Tobey Ayer test/(Queckenstedt's test) -Positive (increased CSF pressure on compression of normal jugular vein)
- Crowe Beck sign (retinal vein engorgement/papilledema) on IJV compression of normal side-present.
- **CT/MRI:** Delta sign or Empty triangle sign



Diagnosis : Lateral sinus thrombophlebitis

Management : IV antibiotics + MRM

Fever headache, vomiting, drowsiness, neck rigidity and irritability, Kernig's, Brudzinski's sign (+)

Diagnosis: MeningitisMC intracranial complication (through cochlear aqueduct).

Management: IV antibiotics + MRM when patient stable.

COMMON ERRORS TO AVOID

- Routes of Spread
  - Three routes:
    - → Natural communications (oval window, round window)
    - → Bone destruction (proteolytic enzymes)
    - → Venous spread (sigmoid sinus)
  - No arterial route of spread
- Pulsatile Otorrhea (Lighthouse Sign)
  - It is a Non-specific sign
  - Lighthouse sign seen in Both:
    - → AOM (Acute Suppurative Otitis Media)
    - → Acute Mastoiditis
  - Specific Sign for Mastoiditis:
    - → Reservoir sign Pus removed → Immediately refills
- Gradenigo's Triad
  - Seen in Petrositis
  - At petrous apex: 5th and 6th cranial nerves
  - Triad:
    - → Persistent ear discharge
    - → 5th nerve → Retro-orbital pain
    - → 6th nerve → Lateral rectus palsy (diplopia)

- Lateral Sinus Thrombosis Signs
  - Griesinger Sign:
    → Edema and bluish discoloration of mastoid
    → Due to improper venous drainage
  - Tobey-Ayer Test: (Historical)
  - Queckenstedt Test: (Historical)
  - Delta Sign/Empty Delta Sign:On contrast CT/MRI

MCQ

Q. A 4 year old boy was suffering ear infection and tonic spasms of limbs, with fever and neck rigidity. Which of the following is the likely diagnosis? INICET May 2025

A. Meningitis
B. Bezold
C. Sigmoid sinus thrombophlebitis
D. Tetanus

Answer: **D**

Q. A patient with CSOM was presented to the OPD with seizures. On examination and evaluation, homonymous hemianopia and epilepsy were present. Identify the condition with the CT scan given below?

A. Temporal abscess
B. Cerebellar abscess
C. Extradural abscess
D. Meningitis

Answer: **A**

Q. Which of the following are symptoms of Gradenigo syndrome?

A. Ear discharge, retro-orbital pain, and diplopia
B. Nasal discharge, retro-orbital pain, and diplopia
C. Ear discharge, retro-orbital pain, and headache
D. Retro-orbital pain, Diplopia, and hearing loss

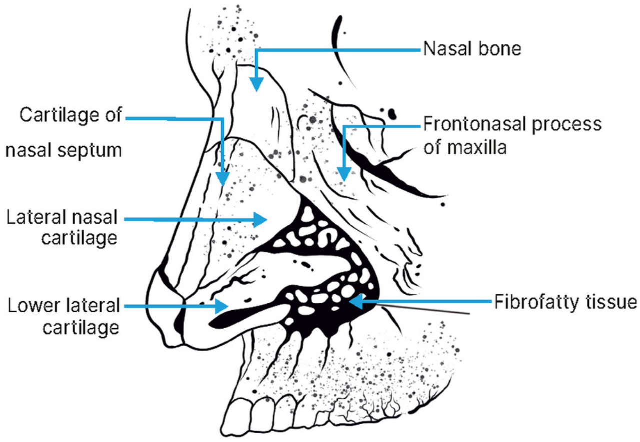
Answer: **A**

12. RHINOLOGY PART-1

ANATOMY OF THE NOSE

00:02:11

External Nose Anatomy



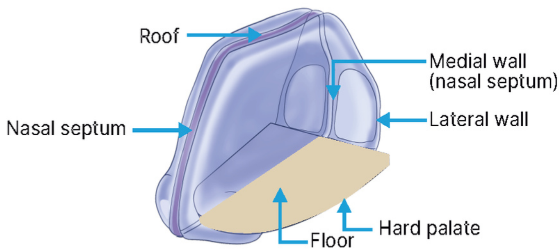
Bony pyramid	Cartilaginous pyramid
• upper 1/3rd **Paired bones** • Nasal bone • Ascending process of the maxilla **Unpaired bones** • Frontal bone	• lower 2/3rd **(PYQ)** **Paired cartilage** • Upper lateral cartilage • Lower lateral cartilage • Small sesamoid cartilage **Unpaired cartilage** • Septal cartilage (comes from below and gives support to the dorsum of the nose)

Nasion	• Part of the bone where the frontal bone meets the nasal bone in the midline
Rhinion	• The nasal bone unites with the upper lateral cartilage in the midline (PYQ)
Limen Nasii	• Lower border of the upper lateral cartilage; this is the site of incision in internal rhinoplasty • It forms the boundary of the internal nasal valve (the narrowest portion of the nasal cavity)

Important Information

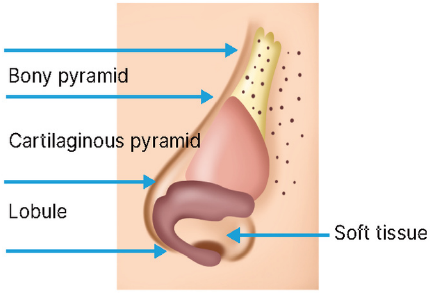
- Site of incision for external rhinoplasty- incision on the outside of the columella of the nose)

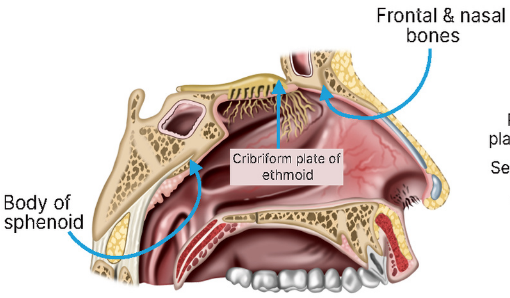
Internal Nose Anatomy

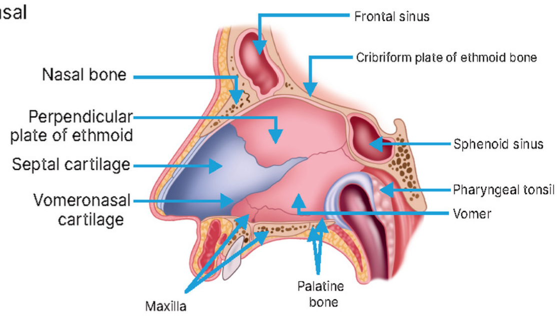


Nasal Cavity

- The nasal cavity proper has got 6 walls

<table>
<tr>
<td>Inlet- Vestibule</td>
<td>
• The only area in the nose lined by stratified squamous epithelium with hair follicles and sebaceous glands (the rest is pseudostratified ciliated columnar epithelium)
• Folliculitis is most common in this region
• Contains an internal nasal valve
• Formed by
o Medially- Septum
o Superiorly- Lower border of the upper lateral cartilage
o Laterally- Inferior turbinates






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<tr>
<td>Outlet- Choana</td>
<td>• Communication between the nose and the nasopharynx</td>
</tr>
<tr>
<td>Superiorly- Roof</td>
<td>
• Has specialised sensory epithelium- the olfactory epithelium (perceives smell)
• Separates nasal cavity from the cranial cavity
• Formed by
o Anterior 1/3rd- nasal bone and frontal bone
o Middle 1/3rd- cribriform plate of ethmoid bone
o Posterior 1/3rd- sphenoid bone
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<tr>
<td>Inferior- Floor</td>
<td>
• Separates the nasal cavity from the oral cavity
• Formed by
o Crest of the maxilla
o Crest of the palatine bone
</td>
</tr>
<tr>
<td>Medially- Septum</td>
<td>
• Separates the right and left halves of the nose
• Made of cartilaginous and bony parts
• Cartilage- septal cartilage/quadrangular cartilage/quadrilateral cartilage
• Bone- perpendicular plate of the ethmoid and vomer
o Other small contributions- Nasal spine of the frontal bone, Rostrum of the sphenoid bone, & Crest of the maxilla and the palatine bone

Blood Supply to the septum
• Internal carotid artery- Upper half
• Anterior ethmoidal artery- Anterosuperior portion of the septum
• Posterior ethmoidal artery- Posterosuperior portion of the septum
• External carotid artery- Lower half
• Superior labial artery- Anteroinferior portion of the septum
• Sphenopalatine and greater palatine artery- Posteroinferior portion of the septum
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INICET 2019, FMGE 2021

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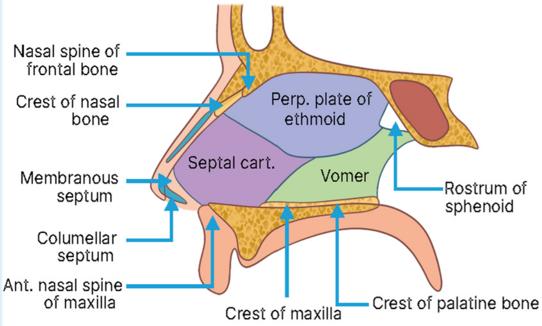

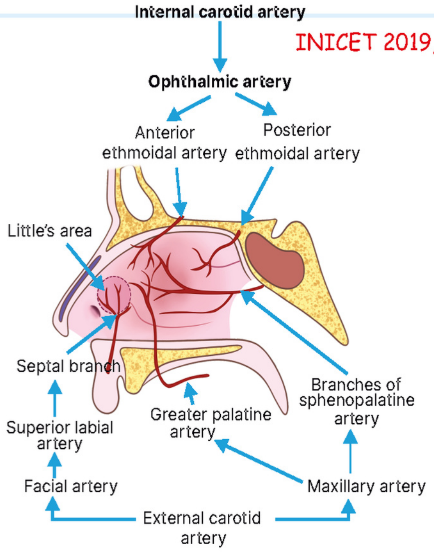

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<tr><td>Laterally- Lateral wall of the nose</td><td>• Has bony projections called turbinates</td></tr>
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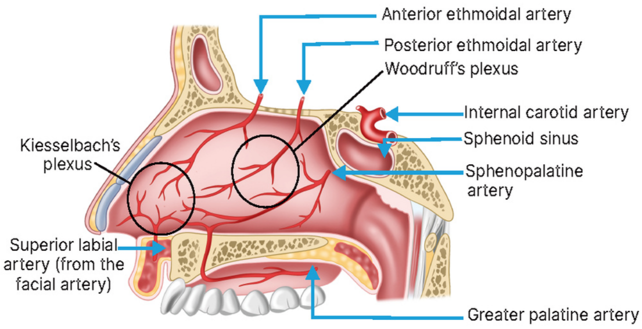
Kiesselbachs And Woodruffs Plexus

00:13:40



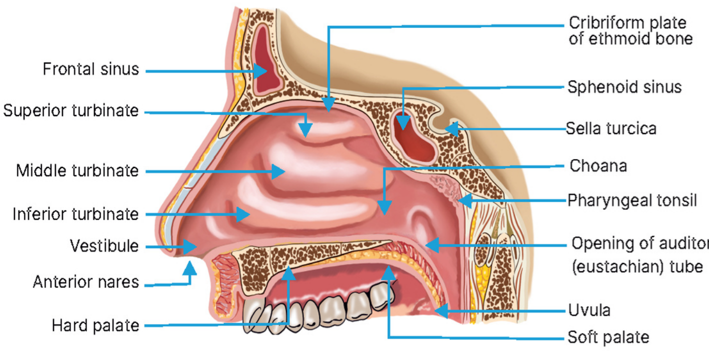
- Kiesselbach's (Little's Area)- An arterial plexus located in the anteroinferior portion of the septum, where anastomosis of all the arteries of the septum except the posterior ethmoidal artery
- Woodruff's venous plexus is at the posterior end of the inferior turbinate. Venous anastomosis causes posterior epistaxis

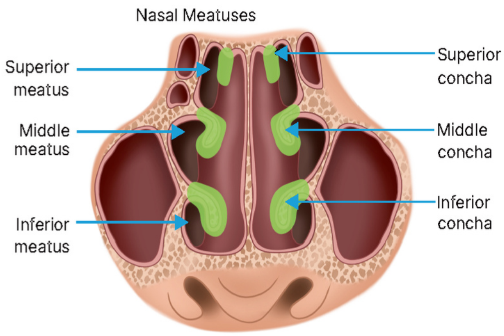
Lateral Wall Of Nose

00:15:10

INICET 2020, 2021

- 3 bony projections (turbinates/chonca)
- Meatus (spaces between bony projections)





Inferior meatus	• Receives the opening of the nasolacrimal duct guarded by the valve of Hasner
Middle meatus	• Receives the opening of the anterior group of sinuses (frontal, maxillary, and anterior ethmoidal sinuses) • Area to operate for FESS, sinusitis, and polyps **Uncinate process** • A boomerang-shaped bone is present anteriorly. • Behind it is the bulla ethmoidalis. • The space between the uncinate and bulla is the hiatus semilunaris (receives drainage of the frontal and anterior ethmoidal sinus), which leads inferiorly to the infundibulum (receives the drainage of the maxillary sinus) **Osteomeatal complex / Picardy Circle** • The final common point of drainage of all 3 sinuses is from the frontal, anterior ethmoidal, and maxillary sinuses.
Superior meatus	• Receives the opening of the posterior ethmoid

Note: The sphenoid sinus drains into the sphenoethmoidal recess

MCQs

00:19:43

Q. The external nose is formed from

a. 3 paired and 3 unpaired cartilages
b. 3 paired and 1 unpaired cartilage
c. 3 paired and 4 unpaired cartilages
d. 1 paired and 1 unpaired cartilage

Ans: c

Q. Osseocartilaginous junction on the dorsum of the nose is

a. Nasion
b. Rhinion
c. Columella
d. Glabella

Ans: b.

Q. The ethmoid bone forms all except

a. Superior turbinate
b. Inferior turbinate
c. Middle turbinate
d. Uncinate process

Ans: b.

Q. All the structures are present on the lateral wall of the nose except

a. Bulla
b. Vomer
c. Hassner's valve
d. Aggar nasi

Ans: b.

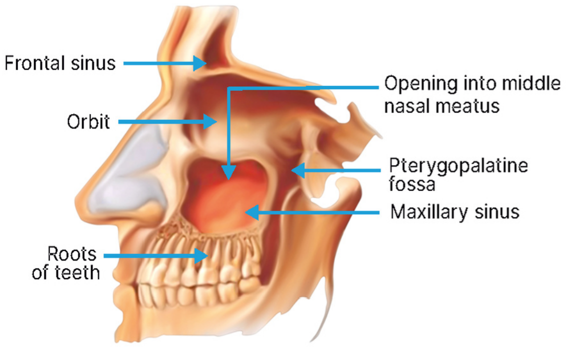
PARANASAL SINUSES

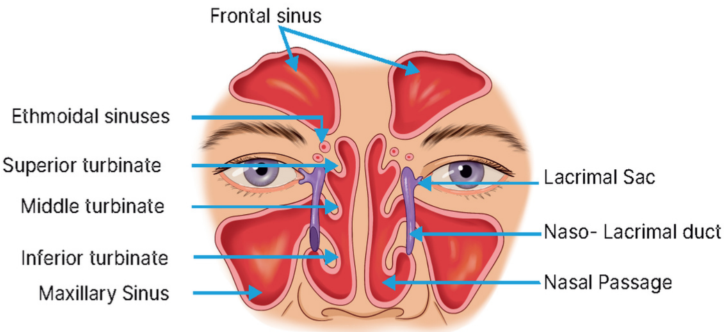
00:22:18

FMGE 2023

- 4 sinus groups

Maxillary Sinus



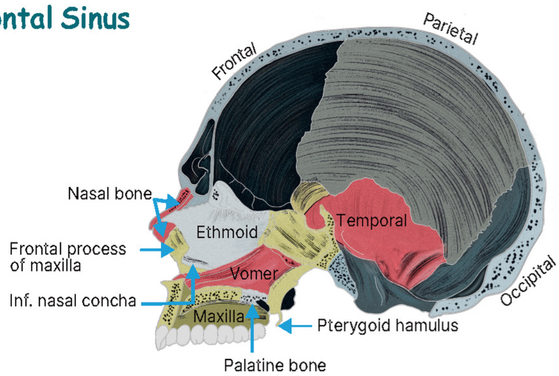


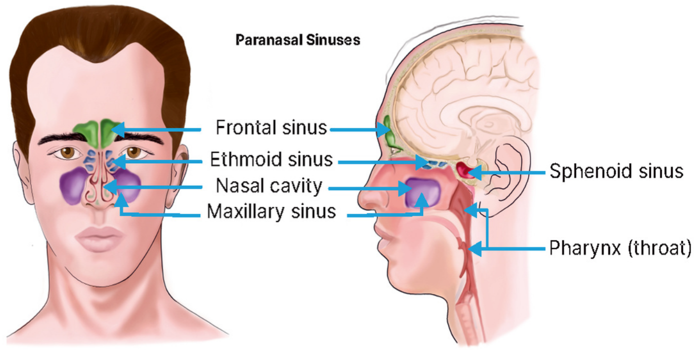
- AKA **Antrum of Highmore**
- The first sinus to develop and be visible radiologically
- Largest sinus
- MCC of sinusitis in adults

Boundaries

- Base- Separates the maxillary sinus from the lateral wall of the nose
- Apex- At the level of the zygoma
- Roof- Formed by the floor of the orbit (# of floor of orbit results in a tear drop sign)
- Floor- Related to the second premolar and first molar tooth
- Anterior wall- Skin and subcutaneous tissue
- Posterior wall- Pterygopalatine fossa, which contains the internal maxillary artery that divides into the sphenopalatine artery (through the sphenopalatine foramen) and the greater palatine artery (through the greater palatine foramen)

Frontal Sinus





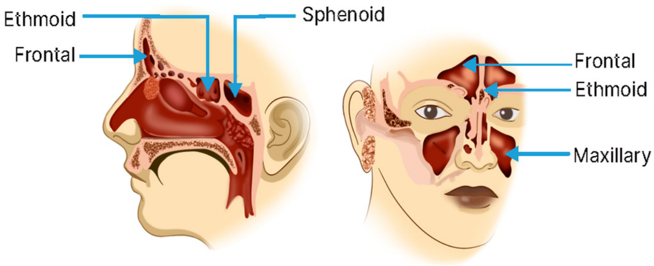
Yourwish

Yourwish

- Last sinus to develop
- Absent at birth, therefore not visible radiologically at birth
- The frontal sinus is an air-filled cavity within the frontal bone.
- Pyramidal in shape, with anterior and posterior walls
  - The anterior wall- Formed by the anterior table of the frontal bone.
  - Posterior wall- Formed by the posterior table of the frontal bone.
- Chronic frontal sinusitis can erode the frontal sinus posteriorly and affect the frontal lobe of the brain, causing a frontal lobe abscess, causing personality changes, features of raised ICP, headaches, projectile vomiting, and an altered sensorium.
- The floor of the frontal sinus is related to the roof of the orbit, causing orbital complications
- Medially, the right and left frontal sinuses are separated by the interfrontal septum

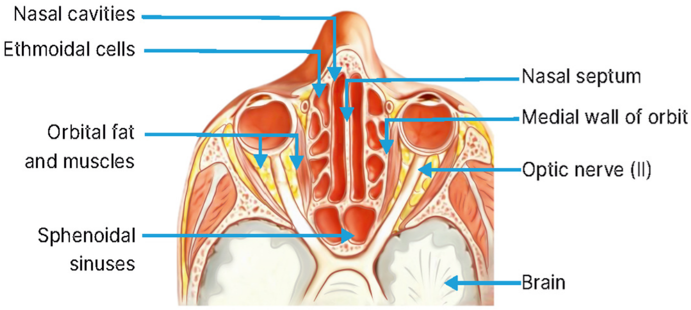
Ethmoid Sinus

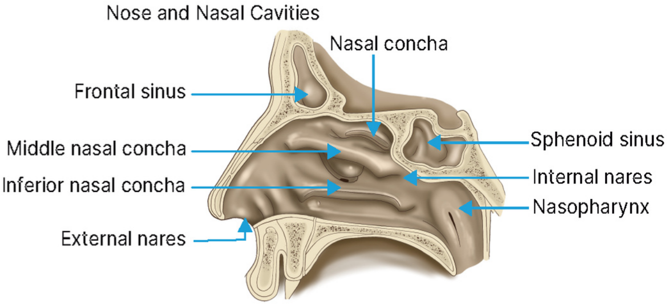
FMGE 2020, 2022, AIIMS 2020



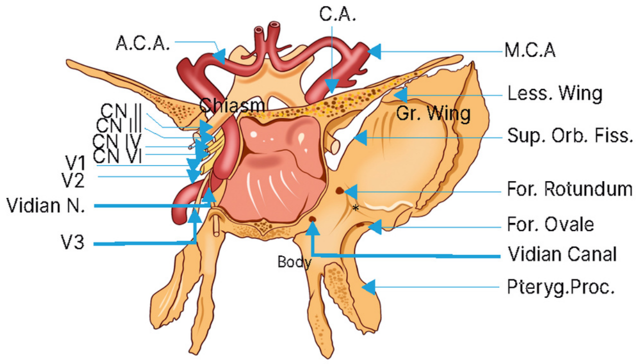
- Most pneumatized sinuses at birth
- Sandwiched between the frontal sinus anteriorly and the sphenoid sinus posteriorly
- Roof- A thin plate separates from the anterior cranial fossa, called the fovea ethmoidalis.
- Medially related to the middle turbinate. The anterior and posterior ethmoids are divided by the basal lamella of the middle turbinate
- Laterally by the medial wall of the orbit
- Air cells
  - Agar nasii- Anteriormost ethmoidal cell
  - Bulla ethmoidalis- The biggest ethmoidal air cell
  - Haller cell- Ethmoidal cell in relation to the floor of the orbit.
  - Onodi cells- Posterior ethmoidal cells extending into the sphenoid sinus. May have the optic nerve and internal carotid artery

Sphenoid Sinus





Yourwish



- The posterior-most sinus of the sphenoid bone
- Sella turcica- Depression in the roof of the sphenoid sinus that lodges the pituitary gland

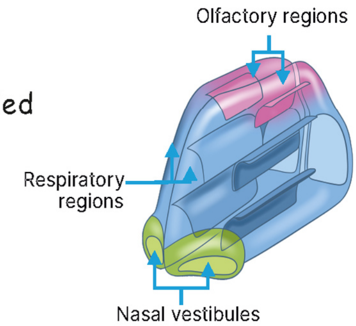
Relations Of The Sphenoid Sinus

- Anterior- Posterior ethmoidal cells
- Posterior- Sphenoid bone.
- Lateral- Optic nerve, cavernous sinus (CN 3, 4, V1, V2, 6, ICA)
- Floor- Foramen rotundum above and vidian canal below.

LINING MEMBRANE OF NOSE

00:36:12

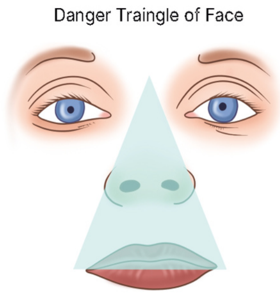
- Schneidunedian membrane/respiratory epithelium/Pseudostratified ciliated columnar epithelium lines the entire nasal cavity
- Exceptions
  - Vestibule- Stratified squamous columnar epithelium with hair follicles
  - Roof of the nose- Olfactory epithelium

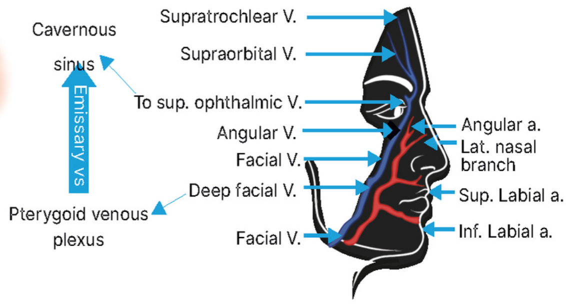


DANGEROUS TRIANGLE OF NOSE

00:37:03

NEET PG 2018, 2020, FMGE 2021, 2023





- Area bounded between the nasion and the angle of the lips, as there is a very high possibility of infection going retrograde, which causes cavernous sinus thrombosis
- Pterygoid plexus of veins - as the veins are valveless, infections travel retrograde to the cavernous sinus and are therefore better treated with antibiotics

One Liners:

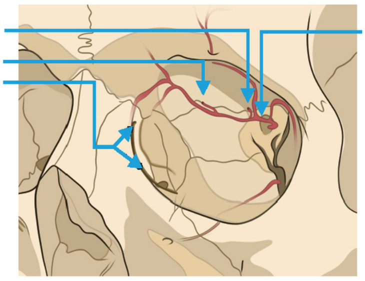
1. Turbinate, which is not a part of the ethmoid bone: Inferior turbinate
2. Sinus draining into the hiatus semilunaris: Frontal sinus, and the anterior ethmoidal sinus
3. Sinus draining into the infundibulum: Maxillary sinus
4. Sinus draining in the superior meatus: Posterior ethmoid
5. The sphenoid sinus drains into the sphenoethmoidal recess
6. Sinus absent at birth: Frontal sinus

7. The sinus whose development coincides with the development of secondary dentition is the maxillary sinus
8. The earliest sinus to develop and become visible radiologically is the maxillary sinus
9. Largest sinus: maxillary sinus
10. The last sinus to develop was the frontal sinus
11. The most common sinusitis in children is ethmoidal sinusitis
12. The most common sinusitis in adults maxillary sinus

EXTRAEDGE

00:40:30

Medial Wall Of Orbit



- 3 important structures on the medial wall:
  - Anterior ethmoidal foramen
  - Posterior ethmoidal foramen
  - Optic canal
- The anterior lacrimal crest is 24 mm from the anterior ethmoidal foramen
- 12 mm between the anterior ethmoidal and posterior ethmoidal foramina
- 6 mm posterior to the ethmoidal foramen to the optic canal


Nasociliary/anterior Ethmoidal nerve block 1 cm Above medial canthus


Infratrochlear nerve block -just medial to medial end of eyebrow


External nasal nerve block

- Nerve block given medially- Nasociliary block - nerve that gives rise to the anterior ethmoidal nerve
- Nerve block given to the dorsum of the nose- Anterior ethmoidal foramina block
- Greater palatine block- Given near the 3rd molar

MCQs

00:43:00

Q. The frontonasal duct opens into:

a. Inferior meatus
b. Middle meatus
c. Superior meatus
d. Inferior turbinate

Ans: **b.**

Q. Paranasal sinus openings in the middle meatus are

a. Maxillary
b. Anterior ethmoid
c. Posterior ethmoid
d. Frontal
e. Sphenoid

Ans: a, b & d

Q. The maxillary sinus opens into the middle meatus at the level of

a. Hiatus semilunaris
b. Bulla ethmoidalis
c. Infundibulum
d. None of the above

Ans: c

Q. Quadrilateral cartilage is attached to all except

a. Ethmoid
b. Vomer
c. Sphenoid
d. Maxilla

Ans: c

Q. The nasal valve is formed by

a. Upper lateral cartilage
b. Lower lateral cartilage
c. Lower end of the upper lateral cartilage
d. Upper end of the lower lateral cartilage

Ans: c

Q. All these structures are found in the lateral nasal wall except the following:

a. Superior turbinate
b. Vomer
c. Agger nasi
d. Hasner's vale

Ans: b

Q. The nasal valve is formed by all except:

a. Septum
b. Middle turbinate
c. Lower end of the upper lateral cartilage

Yourwish

d. Inferior turbinate

Ans: b

Q. Onodi cells and Haller cells are seen in relation to

a. Optic nerve and floor of the orbit
b. Optic nerve and frontal sinus
c. Optic nerve and ethmoidal air cells
d. Orbit, chiasma, and nasolacrimal duct

Ans: a

Q. The osteomeatal complex (OMC) connects the following:

a. Nasal cavity with maxillary sinus
b. Nasal cavity with sphenoid sinus
c. The two nasal cavities
d. Ethmoidal sinus with ethmoidal bulla

Ans: a

Q. Which of the following is known as the fourth turbinate?

a. Superior turbinate
b. Aggernasi
c. Supreme turbinate
d. Bulous turbinate

Ans: a

Q. Ethmoid bone forms all except:

a. Superior turbinate
b. Middle turbinate
c. Inferior turbinate
d. Uncinate process

Ans: c

Q. During inspiration, the main current of airflow in a normal nasal cavity is through the

a. The middle part of the cavity in the middle meatus is in a parabolic curve
b. The lower part of the cavity in the inferior meatus is in a parabolic curve
c. Superior part of the cavity in the superior meatus
d. Through the olfactory area

Ans: a

Q. A 19-year-old man is brought to the emergency department after a motor vehicle collision. On examination, the patient has a swollen face with closed eyes. An X-ray confirms a fracture involving the largest paranasal sinus. Which of the following sinuses is most likely involved?

a. Frontal
b. Ethmoid
c. Sphenoid
d. Maxillary

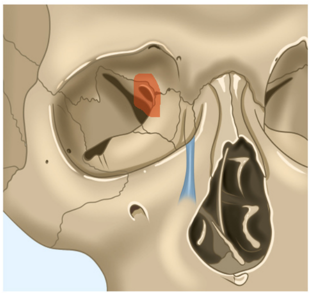
Ans: d

Q. The location of the woodruff plexus is

a. Posterior end of the middle turbinate
b. Anterior end of septum
c. Posterior end of the inferior turbinate
d. Posterior end of the superior turbinate

Ans: a

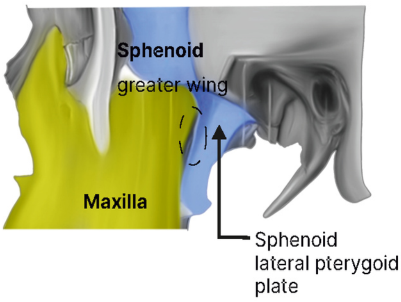
Q. The foramen shown is



a. Superior orbital fissure
b. Inferior orbital fissure
c. Optic canal
d. Anterior ethmoidal canal

Ans: c

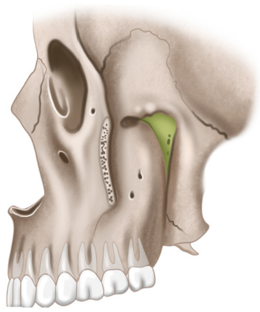
Q. The foramen shown is



a. Sphenopalatine foramen
b. Greater palatine foramen
c. Inferior orbital fissure
d. None

Ans: a

Q. The artery that is present in this fossa is



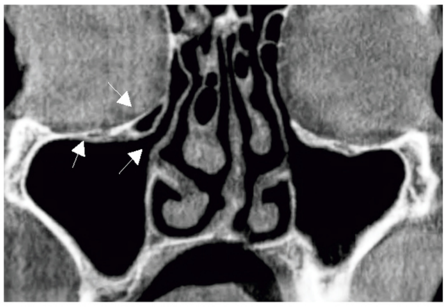
a. Ethmoidal artery
b. Internal maxillary artery
c. External carotid artery
d. Facial artery

Ans: b

Q. The arrow represents

a. Aggar nasi
b. Onodi cell

c. Haller cell
d. Billa ethmoidalis



Ans: c

Q. The direction of the nasolacrimal duct is
a. Downwards, backwards, and medially
b. Downwards, backwards, and laterally
c. Downwards, forwards, and medially
d. Downwards, forwards, and laterally

Ans: b

Q. Which type of sphenoid is a contradiction for the transnasal endoscopic approach to the pituitary gland?
a. Conchal
b. Presellar
c. Sellar
d. There is no contraindication

Ans: a

Q. The ciliary movement rate of the nasal mucosa is
a. 1-2 mm/min
b. 2-5 mm/min
c. 5-10 mm/min
d. 10-12 mm/min

Ans: c

Q. Odour receptors are present in
a. Olfactory epithelium
b. Olfactory tract
c. Amygdala
d. Olfactory bulbs

Ans: a

Q. The function of the mucociliary action of the upper respiratory tract is
a. Temperature regulation
b. Increased velocity of inspired air
c. Traps pathogenic organisms in inspired air
d. Has no physiological role

Ans: c

Q. Haller cells are present in

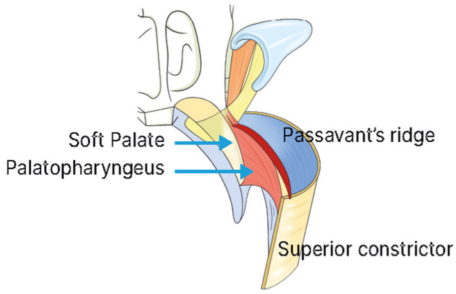
a. Roof of the maxillary sinus
b. Floor of the maxillary sinus
c. Posterior wall of the sphenoid sinus
d. Lateral wall of the sphenoid sinus

Ans: a

Q. A 7-year-old child with a recurrent cold and cough was diagnosed to have adenotonsillar hypertrophy. Parents complained of a nasal intonation of voice. This condition is,

a. Rhinolalia aperta
b. Rhinolalia clausa

Ans: b



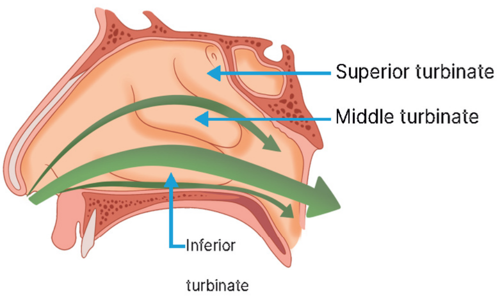
Passavant's Ridge

- Formed by the fibers of the palatopharyngeous muscle.
- Clinical Significance: If these are incompetent, they could increase vocal resonance by increasing airflow, leading to rhinolalia aperta.

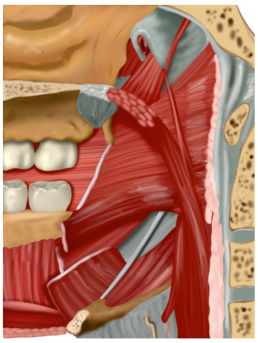
Inspiratory and expiratory current

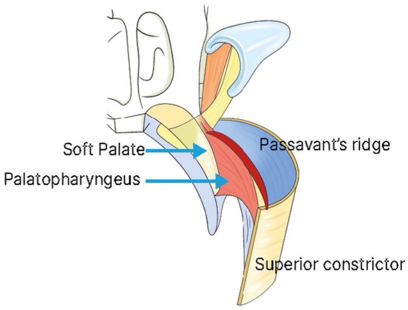
- Maximum inspiratory current goes in a parabolic curve in the middle meatus

Inspiratory and expiratory current



Passavant's Ridge





- Formed by the fibers of the palatopharyngeous muscle.
- Clinical Significance: If these are incompetent, they could increase vocal resonance by increasing airflow, leading to rhinolalia aperta.

Yourwish

One Liners:

1. Hyposmia is a decreased perception of smell
2. Anosmia is the lack of perception of smell
3. Presbyosmia is an age-related decrease in the perception of smell
4. Paraosmia (Cacosmia or dysosmia) is an altered perception of smell
5. Phantosmia is the perception of smell even without a stimulus

Q. Oroantral fistula commonly occurs following the extraction of which tooth

a. Incisor
b. Canine
c. Premolar
d. 3rd Molar

Ans: c

Q. Pneumatization patterns of the sphenoid are all except the following:

a. Pre-seller
b. Post-seller
c. Concha bullosa
d. Conchal

Ans: c

Q. The roof of the nose is formed by all except:

a. Nasal process of the frontal
b. Cribriform plate of the ethmoid
c. Sphenoid
d. Palatine process of the maxilla

Ans: d

Q. The Eustachian tube is located at

a. Posterior to the superior turbinate
b. Posterior to the middle turbinate
c. Posterior to the inferior turbinate
d. At the sphenoethmoidal recess

Ans: c

Q. Which turbinate is seen only on nasal endoscopy?

a. Superior
b. Middle
c. Inferior
d. Eustachian tube

Ans: a

Q. The Vidian nerve is

a. Auricular branch of vagus
b. Nerve of the pterygoid canal
c. Tympanic branch of the glossopharyngeal nerve
d. Lesser petrosal nerve

Ans: b

Q. The following are used to assess nasal mucociliary clearance, except

a. Sachharin
b. Electron microscopy
c. Scintigraphy
d. Charcoal

Ans: b

13. RHINOLOGY PART 2

CHOANAL ATRESIA

00:00:01

- Due to persistence of bucconasal membrane
- Associated with CHARGE syndrome
  - C- Coloboma
  - H- Heart defect
  - A - Atresia
  - R - Retardation (growth and mental retardation)
  - G - Genital malformation
  - E - Ear abnormalities
- Can be Unilateral or Bilateral
  - B/l atresia → emergency

Bilateral Choanal Atresia

- Presents as an emergency at birth.
  - Infants are obligate nasal breathers until 3 months of age
  - Choana fails to communicate with the nasopharynx → patient is unable to breathe.
- Cyclical cyanosis: Cyanosis is present at rest and disappears on crying
  - Mechanism: At rest, nose and mouth are blocked → cyanosis
  - On crying, negative intrathoracic pressure opens the mouth → air enters lungs → cyanosis improves
- Crying improves stridor

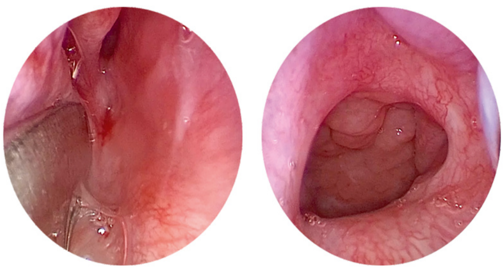
Unilateral Choanal Atresia

- Not an emergency; presents later in life.
- Triggered during a cold or upper respiratory tract infection (URTI) → difficulty breathing and stridor
- Constant unilateral Rhinorrhea
  - Secretions on the normal side drain into the nasopharynx
  - Secretions on the atresia side cannot drain posteriorly → come anteriorly
  - Results in constant unilateral rhinorrhea, crusting, and skin excoriation
- Crusting, excoriation of skin present

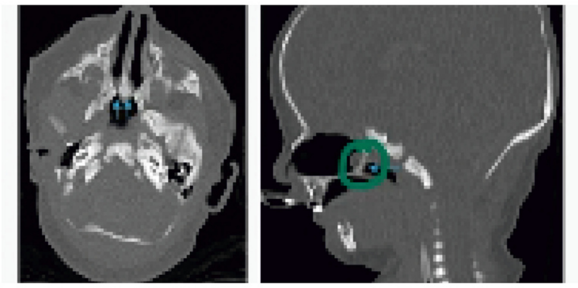
FMGE 2023

Diagnosis

- Simple bedside test: Pass a Foley's catheter through the nose
  - Normal → Passes into nasopharynx and down to oropharynx
  - Resistance/inability to pass → Indicates choanal atresia.
- Endoscopy examination under anesthesia



- CT scan
  - Confirms diagnosis by showing no communication between the nose and nasopharynx.



Treatment

Bilateral Choanal Atresia:

- Step 1: McGovern's technique
  - Provide a feeding nipple (McGovern's nipple) to allow simultaneous breathing and feeding
  - Restores the airway temporarily.
- Step 2: Tracheostomy to bypass the upper airway and secure it for a longer period.
- Step 3: Definitive repair at 1 to 1.5 years of age.

Unilateral Choanal Atresia:

- Requires no intervention at birth
- Direct surgical repair is performed at 1 to 1.5 years of age

Error Files

- Choanal atresia
  - Cyclical cyanosis → cyanosis that gets better on crying
  - Crying improves stridor
- Crying worsens stridor in
  - Acute epiglottitis
  - Croup
  - Laryngomalacia

SEPTAL DISEASES

00:08:30

Deviated Nasal Septum

NEET PG 2022, FMGE 2023

- Septum does not lie in the midline and fails to divide the nasal cavities into equal halves.
- Extremely common (affects ~95% of patients)

Indiations Of Surgery

- Presence of symptoms, not resolving with medical therapy
- Symptoms include
  - Nasal blockade
  - Headache
  - Sinusitis
  - Smell abnormalities
  - Facial pain
  - External deformities of nose
- Types of Surgery
  - Septoplasty-very conservative type of surgery

Yourwish

- SMR
- No septal surgery preferred tilL17 years of age

- Cottle's Line
  - Imaginary line drawn from the frontal spine to the anterior nasal spine.
  - Anterior deviations (anterior to line) → Treated only with Septoplasty.
  - Posterior deviations (posterior to line) → Treated with either Septoplasty or SMR

	Septoplasty	SMR
Children	Yes	No
Elevation of flap	single	both
Anterior deviation	Preffered	–
Risk of complication	Very less	High
Risk of recurrence	High	Less

Septal Abscess V/s Septal Hematoma

00:13:30

- Both present with bilateral septal swelling, nasal blockade, pain, and breathing difficulty.
- Septal Hematoma:
  - History of trauma
  - Accumulation of blood between cartilage/bone and overlying perichondrium/mucosa
- Septal Abscess:
  - History of infection or untreated septal hematoma
  - Accumulation of pus between septum and overlying mucosa

	SEPTAL ABSCESS	SEPTAL HEMATOMA
PRESENTATION	Nasal blockade	Nasal blockade
HEADACHE	Yes	No
LYMPHADENOPATHY	Yes	No
FEVER	Yes	NO
EARLY INTERVENTION	• Incision and Drainage ○ Early intervention is strictly required ○ Present in dangerous area of face ○ Infection can travel retrograde into the cavernous sinus → Cavernous sinus thrombosis ○ Abscess → Necrosis of underlying cartilage → Saddle nose deformity	• Incision and drainage + Pressure packing

Septal Perforation

00:16:03

- Hole in the septum allowing communication between left and right nasal cavities
- Cartilaginous portion perforations:
  - Most common site.
  - Causes:

→ Trauma (finger, nose rings)
→ Inhalation of fumes (asbestos, mustard gas)
→ Cocaine sniffing
→ Diseases (tuberculosis, leprosy, sarcoidosis)

- Bony portion perforations:
  - Typically seen in Syphilis.
- Total septal perforations:
  - Typically seen in Wegener's granulomatosis

Presentation

- Small perforation → Whistling sound during respiration.
- Large perforation → Air causes drying of edges → Crusting → Crust removal leads to bleeding

Treatment

- Most are asymptomatic and require no intervention.
- If symptomatic → Insert a Silastic button

MCQ

Q. A patient presents with chronic sinusitis, nasal crusting, and saddle nose deformity. What is the most likely diagnosis?

FMGE Jan 2026

a. Granulomatosis with polyangiitis
b. Allergic rhinitis
c. Nasal polyposis
d. Rhinoscleroma

Ans: A

Explanation

- Allergic rhinitis & Polyps → Non-erosive, do not cause bone destruction.
- Rhinoscleroma → Causes woody hard granuloma and stenosis, but no saddle nose deformity.
- Granulomatosis with polyangiitis (Wegener's) → Causes total septal perforation, crusting, and bone destruction resulting in a saddle nose deformity

NASAL POLYPS

00:20:07

- Definition: Chronically inflamed, edematous tissue that prolapses out.

FMGE 2023

Antrochoanal Polyp

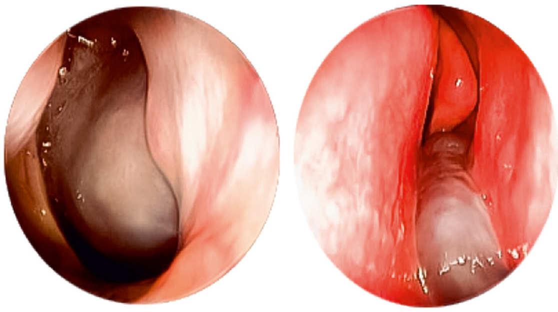
- Origin: Maxillary antrum
- It grows into the nasal cavity reaching nasopharynx
- Single / unilateral mass
- Etiology: Infection (commonly Streptococcus pneumoniae)
- Young Age
- Male predominant

Presentation

- U/l nasal blockade
- Nasal obstruction, discharge
- Widening of nose
- Hyposmia

Diagnosis

- O/e → Greyish white polypoidal mass growing posteriorly



- Next step: CT Scan → Shows unilateral haziness

Treatment

- No role for medical therapy.
- Surgery → FESS (Functional Endoscopic Sinus Surgery).

FESS

- Bulla ethmoidalis lies behind the uncinate process
- Sequence of FESS

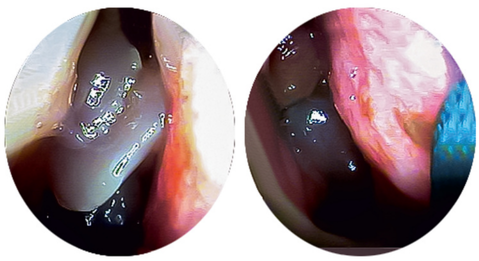
1. Uncinectomy
2. Maxillary sinusotomy
3. Anterior ethmoidectomy
4. Posterior ethmoidectomy
5. Sphenoidotomy
6. Frontal sinusotomy

- FESS has largely replaced the Caldwell-Luc procedure

NEET PG 2022, FMGE 2023

Ethmoidal Polyp

- Arises from ethmoidal air cells
- Occur secondary to allergy
- Affect both sides of nose affected
- Multiple masses/polypoidal tissue growing anteriorly to vestibule of nose
- Bilateral



- Bunch of grape appearance on examination
- Associated syndromes:
  - Chronic rhinosinusitis
  - Asthma
  - Cystic fibrosis
  - Kartagener's syndrome: Bronchiectasis, sinusitis, situs inversus.
  - Young syndrome: Sinopulmonary syndrome and azoospermia.
  - Churg-Strauss syndrome:
  - Asthma, fever, eosinophilia, vasculitis,
  - Granuloma
  - Sampter's triad: Nasal polyps, asthma, aspirin intolerance.

Treatment

- Step 1: Medical therapy
  - Steroid → primary
  - Antiallergics
  - Mast cell stabiliser
- If medical therapy fails → CT-scan → FESS

	AC POLYP	ETHMOIDAL POLYP
AGE	Young	Older
ETIOLOGY	Infection(Strep. Pneumonia)	Allergy
NUMBE	Single	Multiple
LATERALLITY	Unilateral	Bilateral
ORIGIN	Maxillary Sinus	Ethmodial Air Cells
GROWTH	Posteriorly	Anteriorly
MEDICAL TREATMENT	No Role	Yes
SURGERY	FESS	FESS
RECURRENCE	Low	High

MCQ

Q. A 54-year-old male presented with nasal obstruction. On examination there was an irregular mass protruding from the choanae. What is the possible diagnosis?

a. Thornwaldt cyst

b. Antro-choanal polyp

c. Hypertrophic rhinitis

d. Adenoid hypertrophy

Ans: B

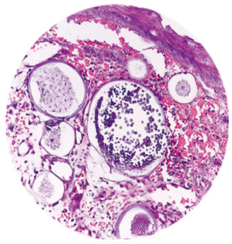
GRANULOMATOUS DISEASES OF THE NOSE

00:34:08

- Rhinosporisiosis
- Rhinoscleroma

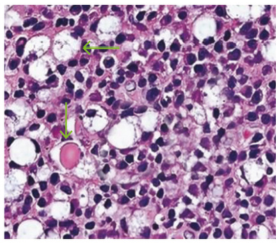
Rhinosporidiosis

NEET PG 2018



- Caused by protozoa→ rhinosporidium seeberi
  - Aquatic protozoa
  - Endemic in South India.
  - Transmission: Waterborne route (contact with contaminated ponds)
- Presentation: Nasal blockade and bleeding
- O/e
  - Red mass with whitish dot on surface →strawberry mass
- CT scan can be done
- Treatment: Cauterize the base + excision of mass
- HPE: Shows multiple sporangia with spores inside

RHINOSCLEROMA



- Granulomatous condition by bacteria → Klebsiella rhinoscleromatous/frisch bacillus
  - Endemic in North India.
  - Transmission: Air droplets.
- Stages of Disease:

1. Atrophic Stage: Bacteria destroys mucin-producing cells → Nose becomes dry → Crusting and foul smell
2. Granulomatous Stage: Immune response creates a central necrotic area surrounded by inflammatory cells → "Woody hard granuloma" → Results in a "Hebra nose" deformity
3. Stage of Cicatrization: Healing via fibrosis → Stenosis/narrowing of the nose → Results in a "Tapir nose" deformity

- Histopathology: Presence of Mikulicz cells and Russell bodies
- Culture on mcckoney agar
- Management:
  - Medical therapy: Streptomycin, Tetracycline, and Rifampicin for 4-6 weeks
  - Therapy is stopped only after two consecutive cultures (4 weeks apart) are negative

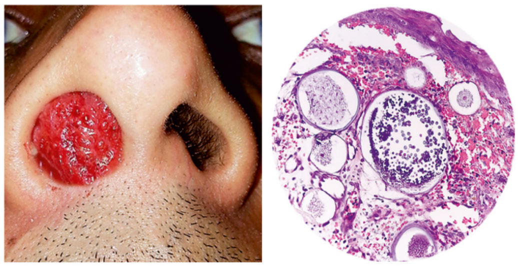
Feature	Rhinosporidiosis	Rhinoscleroma
Causative organism	Rhinosporidium seeberi (aquatic protozoan-like organism)	Klebsiella rhinoscleromatis
Mode of transmission	Water exposure	Air droplets
Common region	South India	North India
Symptoms	Nasal blockage + bleeding	Crusting, foul smell Granuloma Narrowing / stenosis of nose
Characteristic appearance	Strawberry-like mass	
Nasal deformity	—	Hebra nose, Tapir nose

Diagnosis	• HPE-final diagnosis • Excision and cauterization of base • Dapsone to prevent recurrence	• Culture ○ Positive on MacConkey agar • Mikulicz cells, Russell bodies on HPE
Treatment	Excision and cauterization of base	• Treated with tetracyclin, streptomycin and rifampicin • Debridement of mass if needed

MCQ

Q. South Indian male farmer presents to the ENT OPD with complaints of reddish mass coming out from the nose and histopathology image as given below. What is the likely diagnosis?

a. Rhinosporidiosis
b. Rhinoscleroma
c. Rhinophyma
d. Nasal polyp



Ans: A

RHINITIS

00:45:22

ALLERGIC RHINITIS	NON ALLERGIC RHINITIS/VASOMOTOR RHINITIS

• Serum IgE elevate
• Presentation
  ○ Sneezing
  ○ Itching
  ○ Watery discharge
  ○ Nasal blockade
• Mucosa is Pale, Boggy, edematous
• Management
  ○ First line: Intranasal corticosteroids + Antihistamines + Decongestants
• If unresolved:
  ○ Skin prick test / Radioallergosorbent test to find specific allergen → Immunotherapy (Subcutaneous or Sublingual)
  ○ Immunotherapy types: SCIT, SLIT
• Specific Signs
  ○ Allergic shiners: Dark circles around the eyes.
  ○ Allergic salute: Constant upward rubbing of the nose.
  ○ Darier's line: Dark transverse crease on the nasal dorsum.
	• Serum IgE normal
	• Presentation
	  ○ Sneezing
	  ○ Itching
	  ○ Watery discharge
	  ○ Nasal blockade
	• Pathophysiology:
	  ○ Imbalance of autonomic nervous system (Parasympathetic hyperactivity + Sympathetic hypoactivity)
	• O/e
	  ○ Mulberry turbinate or hypertrophic turbinate
	• Management:
	  ○ 1st Line: Intranasal corticosteroids + Antihistamines+ Decongestants
	  ○ If medical therapy fails → Surgical reduction of inferior turbinates
	  ○ Final surgical option → Vidian neurectomy.

MCQ

Q. A patient was presented to the OPD with complaints of greenish black matter in the nose with merciful smelling. What is the diagnosis?

a. Allergic rhinitis
b. Atrophic rhinitis
c. Rhinitis caseosa
d. Rhinitis sicca

Ans: B

- Atrophic Rhinitis:
  - Atrophy of entire sinus mucosa, nasal mucosal glands, and olfactory epithelium.
  - Results in a dry nose, greenish foul-smelling crusts, and merciful anosmia.
  - Merciful Anosmia: Patient does not perceive the foul smell due to olfactory epithelium atrophy, but people around them do.

Other Rhinitis Conditions

- Rhinitis sicca
  - Similar to atrophic rhinitis but limited only to the anterior 1/3rd of the nose.
  - Etiology: Constant exposure to dry air currents, hot/humid environments.
  - Symptoms: Nasal crusting, foul smell, nasal blockade.
  - Treatment: Saline irrigation spray and changing profession
- Rhinitis caseosa
  - Accumulation of cheesy material within sinuses.
  - Etiology: Chronic obstruction of nose/sinuses (e.g., polyp, foreign body, DNS) → retention of secretions
  - Symptoms: Cheesy, thick, mucoid, foul-smelling discharge with crusting
  - Treatment: Surgical removal of the obstruction to clear secretions and restore patent airway
- Tuberculosis
  - Primary TB: Occurs directly inside the nose.
  - Secondary TB: Occurs secondary to an active pulmonary TB focus.
  - Presentation: Granuloma, usually affecting the cartilaginous portion of the nose
  - Complication: Septal perforation.
  - Diagnosis: GeneXpert or growth on LJ (Lowenstein-Jensen) medium.
  - Treatment: Anti-tubercular therapy (ATT).
- Lupus vulgaris
  - Low-grade, indolent tubercular infection of the nose
  - Usually not associated with active pulmonary TB
  - Specific Sign: Apple jelly nodule
    → Nodule blanches upon application of pressure.
  - Treatment: ATT.
- Sarcoidosis
  - Non-caseating granuloma inside the nose or sinuses.
  - Specific Sign: "Strawberry mucosa"
    → Differential Note: "Strawberry polyp" indicates Rhinosporidiosis.
  - Complications: Destructive lesions affecting the cartilaginous septum → Saddle nose deformity, chronic sinusitis
  - Can be associated with systemic sarcoidosis manifestations.

Atrophic Rhinitis

00:56:22

- Atrophy of all nasal structures (mucosa, sinus mucosa, olfactory epithelium, mucus-producing cells)
- Symptoms: Dry nose, crusting, foul smell
- Examination Findings:
  - Dry crusting visible
  - Nasal cavity appears wide and roomy due to shrinkage
- Paradoxical symptom: Patient complains of nasal blockade despite wide roomy chambers (loss of sensation of airflow)
- Merciful anosmia present
- Causes (Mnemonic: HENIA + R):
  - H → Hereditary
  - E → Endocrinological problems
  - R → Racial
  - N → Nutritional deficiencies (Vitamin A, D, E)
  - I → Infective causes (Klebsiella ozaenae, most common cause, also called Perez bacillus)
  - A → Autoimmune causes
- Treatment:
  - Step 1: Medical therapy.
    - → Irrigate nose to keep it clean and moist.
    - → Solution: Alkaline nasal douching solution.
    - → Composition (mixed in 280 ml water): 2 parts sodium chloride + 1 part sodium bicarbonate + 1 part sodium biborate.
    - → Other options: Placental extracts, estrogen/estradiol spray, Kemecetine anti-ozaena solutions
  - Step 2: Surgery (If medical therapy fails)
    - → Young's operation: Complete surgical closure of the nasal cavity (elevating mucosa on septum, lateral wall, and floor).
  - Modified Young's operation: Leaves a 10 mm gap for breathing
  - Lautenschlager's operation: Medialization of the lateral wall of the nose.

EPISTAXIS

01:01:49

- Any bleeding from nose

Blood Supply Of Nasal Septum

- Upper half: Internal Carotid Artery (ICA) circulation.
  - ICA → Ophthalmic artery.
  - Ophthalmic artery → Anterior ethmoidal artery (supplies anterosuperior septum) + Posterior ethmoidal artery (supplies posterosuperior septum).
- Lower half: External Carotid Artery (ECA) circulation.
  - ECA → Facial artery + Internal maxillary artery.
  - Facial artery → Superior labial artery.
  - Internal maxillary artery → Greater palatine artery + Sphenopalatine artery (both supply posteroinferior septum)
- Vascular Plexuses:
  - Little's area / Kiesselbach's plexus:

→ Anastomosis at the anteroinferior part of the nose

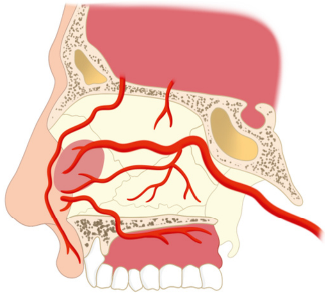
→ Any bleed → Anterior epistaxis

- Woodruff's plexus:

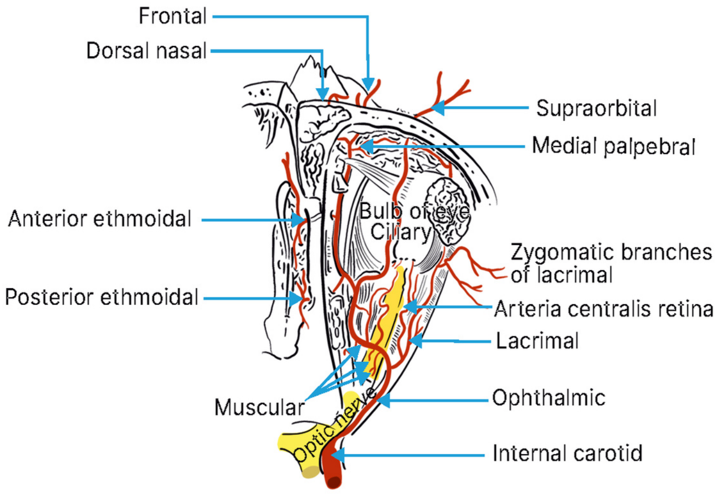
→ Venous plexus at the posterior end of the inferior turbinate

→ Any bleed → Posterior epistaxis

- Artery of epistaxis: Sphenopalatine artery.

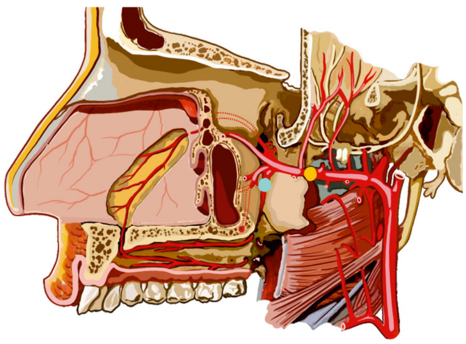


Course Of Anterior And Posterior Ethmoidial Artery



- Internal carotid artery gives a branch → ophthalmic artery
- Ophthalmic artery crosses optic nerve (lateral to medial) and enters medial wall of orbit
- Divides into Anterior and Posterior ethmoidal arteries along the medial wall
- Rule of 24-12-6 (Using anterior lacrimal crest as landmark):
  - Anterior ethmoidal artery: 24 mm behind crest.
  - Posterior ethmoidal artery: 12 mm behind anterior ethmoidal artery.
  - Optic canal: 6 mm behind posterior ethmoidal artery.
- Anterior ethmoidal artery passes through anterior ethmoidal foramen and ethmoidal air cells to supply septum
  - Surgical Risk: Can be traumatized during ethmoidectomy

Course Of Sphenoplatine And Greater Palatine



- Internal Maxillary Artery Branches:
  - Runs within the pterygopalatine fossa (behind posterior wall of maxillary sinus).
- Ligation of the internal maxillary artery is done in the pterygopalatine fossa.
- Sphenopalatine artery: Ligated ~8 to 10 mm behind the middle turbinate.
- Greater palatine artery: Dips down to palate, ligated near the 3rd molar

Causes Of Epistaxis

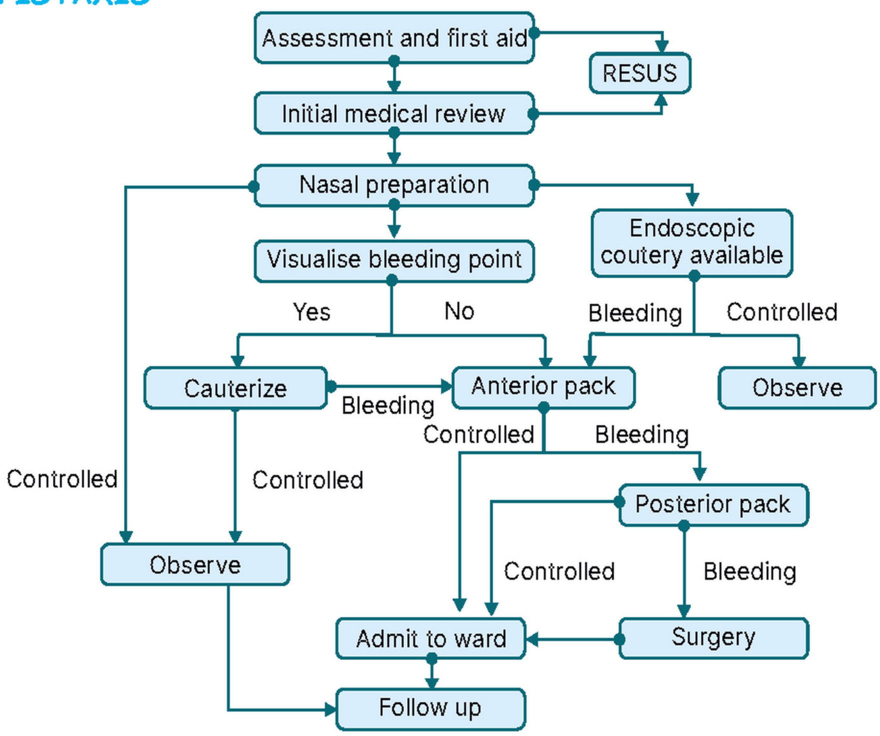
- Local Causes: Trauma, tumor, granulomatous diseases, rhinosporidiosis
- Systemic Causes:
  - Hypertension (most common systemic cause).

- Blood disorders: Hemophilia, von Willebrand's disease, sickle cell anemia.
- Coagulation/Bleeding disorders.
- Blood vessel disorders: Hereditary hemorrhagic telangiectasia.
- Medications: Oral anticoagulants, thrombolytics, antiplatelets, OCPs
- Liver disease (e.g., cirrhosis due to alcoholism or drugs)
- Renal disease

	ANTERIOR EPISTAXIS	POSTERIOR EPISTAXIS
Incidence	More common	Less common
Site	Littles area	Woodruff plexus/ SPA
Age	children	Ager 40 years of age
Cause	Trauma	HTN
Bleeding	Mild can be controlled by local pressure of anterior pack	Bleeding is severe,requires hospitalization and postnasal pack

PROTOCOL FOR EPISTAXIS

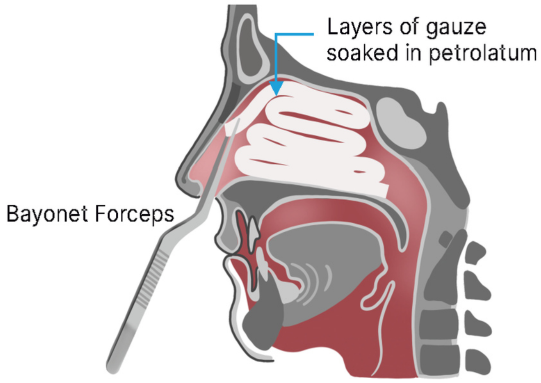
01:10:20



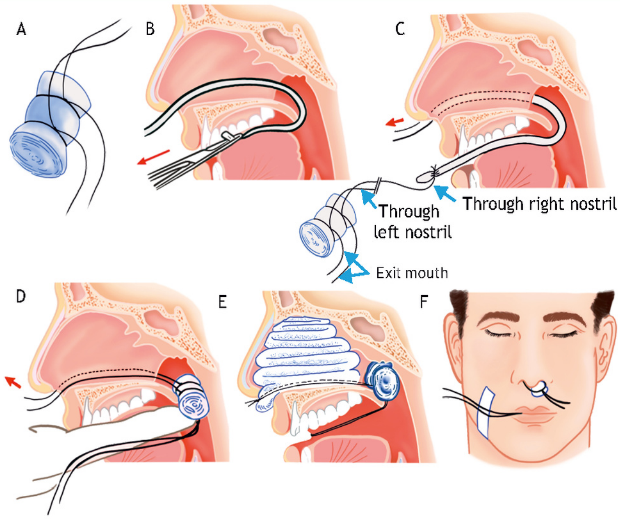
- Step 1: Trotter's Method.
  - Pinch nose and bend forward for ~15 minutes
- Step 2: Initial medical review and resuscitation.
- Step 3: Nasal preparation for Endoscopy.
  - Spray Xylocaine (numbing) and Adrenaline (reduces bleeding)
- Step 4: Endoscopic Cauterization.
  - If a single bleeding point is seen → Use chemical cautery (Silver nitrate solution) or electrical cautery (monopolar/ bipolar).
- Step 5: Anterior Nasal Packing.
  - Done if no bleeding point is seen, endoscopy is unavailable, or cautery fails.

- Step 6: Posterior Nasal Packing.
  - Done if anterior packing fails.
- Step 7: Surgical Ligation of Artery (Last resort).
  - Order of ligation:

1. Sphenopalatine artery
2. Internal maxillary artery
3. External carotid artery (if bleeding is from lower half)
4. Ethmoidal artery (if bleeding is from upper half)



Anterior Nasal packing



Posterior Nasal Packing

- Procedure: Pass Ryle's/infant feeding tube through nose to mouth → attach threaded ribbon gauze → retract tube from nose → gauze sits in nasopharynx → then block anterior nose.

MCQ

Q. Ligation of artery

a. Sphenopalatine A
b. Internal maxillary artery
c. Ethmoidal artery
d. External carotid artery

Ans: Sphenopalatine A → Internal maxillary artery → Ethmoidal artery or External carotid artery

One Liners

- Most common cause of epistaxis is Trauma
- Most common cause of epistaxis in children is finger trauma
- Most common cause of epistaxis with foul smelling nasal discharge which is unilateral in children is → foreign body
- Most common cause of recurrent unprovoked profuse epistaxis in adolescent male is JNA
- Most common cause of epistaxis in elderly is HTN
- Most common site of epistaxis is from Sphenopalatine Artery
- Anterior epistaxis if venous occurs from the Reterocolumella vein
- The artery of epistaxis is Sphenopalatine Artery
- Posterior epistaxis occurs from Woodruff plexus or Sphenopalatine artery
- TESPAL stands for Transnasal Endoscopic sphenopalatine artery ligation

Yourwish

MCQ

Q. A 70 year old patient with epistaxis, patient is hypertensive with BP of 200/100 mm hg. On examination no active bleeding is noted next step in the management is

a Observation

b. Internal maxillary artery ligation

c. Anterior and posterior nasal packing

d. Anterior nasal packing

Ans: A

Q. Source of epistaxis after ligation of external carotid artery is

a Maxillary artery

b. Greater Palatine artery

c. Superior labial artery

d. Ethmoidal Artery

Ans: D

Q. In case of uncontrolled epistaxis ligation of internal maxillary artery is done in the

a. Maxillary antrum

b. Pterygopalatine fossa

c. At the neck

d. Medial wall of orbit

Ans: B

Q. Initial treatment of severe epistaxis

a. The patient should be placed head down supine with a pillow under the shoulders.

b. Trotter's method includes encouraging the patient to swallow the blood, to allay psychological stress and thereby reduce blood pressure.

c. A postnasal pack should be considered when the haemoglobin falls below 10 /litre.

d. Epistaxis balloons should be inflated with sterile water.

e. A central venous pressure line is mandatory

Ans: C

FRACTURES OF FACE

01:20:58

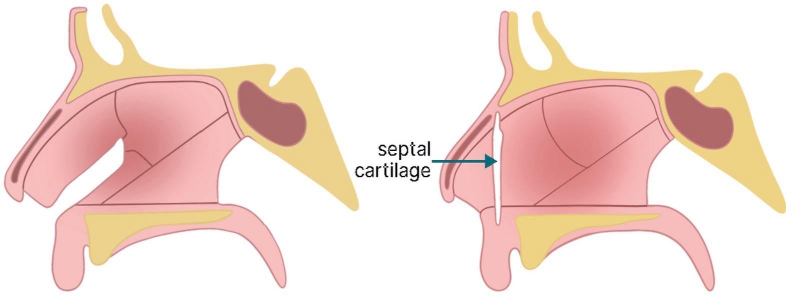
- Middle third and lower thyroid mostly
- Nasal fracture (M/c)> zygomatic fractures> maxillary fractures> floor of orbit fractures

Nasal Fractures

- Class 1-Chevallet fracture
  - Vertical fracture line
  - Direction of injury from below

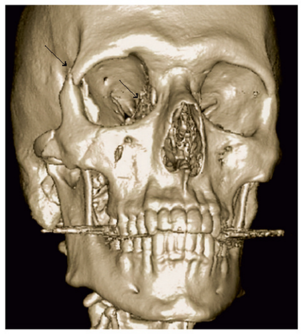
- Class 2- Jarjaway fracture
  - Horizontal fracture line
  - Direction of injury from front
- Class 3- Naso orbital ethmoid fracture
  - Entire component gets crushed rotated nasal upwards → pig nose deformity
  - High risk of CSF leak

FMGE 2022, 2025 INICET 2024, 2025



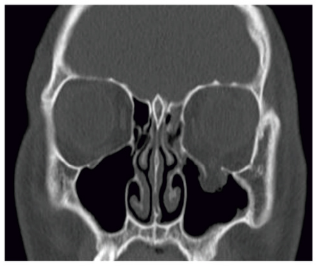
Zygomatic Fracture'

- Three fracture line
  - Zygomaticomaxillary suture
  - Zygomaticofrontal suture
  - Zygomaticotemporal suture
- Tripod fracture
- Crush of zygoma → step deformity



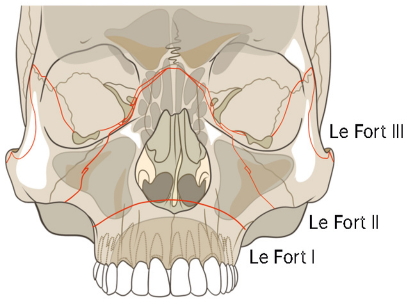
Floor Of Orbit Fracture

- Floor of orbit has no support inferiorly because of the maxillary sinus.
- Called Blow-out fracture
- Orbital contents herniate into maxillary sinus → tear drop sign
- Inferior rectus and inferior oblique gets entrapped → diplopia



Maxillary Fracture

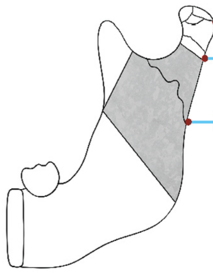
- A/k/a Lefort fracture

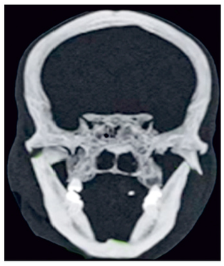


Le forte 1	• Fracture through floor of nose and floor of maxilla • Aka Transverse fracture / Guerin's fracture • Greater palatine artery rupture → bluish discolouration of palate called geurin's sign • Hanging palate and hanging teeth seen
Le Forte 2	• Pyramidal or pyramid-shaped fracture. • Course of fracture line: Starts at the Nasion → Lacrimal bone → Medial wall of the orbit → Floor of the orbit → Maxilla. • Key characteristic feature: Hanging maxilla
Le Forte 3	• Course of fracture line: Nasion → Lacrimal bone → Medial wall of the orbit → Floor of the orbit → Lateral wall of the orbit → Zygoma. • Key characteristic feature: Disconnects the cranial cavity from the facial skeleton • Aka Craniofacial disjunction • Associated with a high risk of CSF leak (CSF rhinorrhea)

Yourwish

Fracture Of Mandible





- M/c site: Subcondylar region
  - Fractures rarely occur at the direct site of trauma
  - Impact forces are transmitted to the opposite side (counter-coup effect) → resulting in an opposite subcondylar fracture.
- Guardsman fracture / Parade ground fracture
  - Patient falls forward directly on the symphysis menti (common in guards/marching personnel)
  - Fracture at the symphysis menti + Bilateral subcondylar fractures
- Management of Mandibular Fractures
  - Treated via closed reduction with internal fixation OR open reduction with internal fixation.
  - Do NOT immobilize the mandible for more than 3 to 4 weeks.
  - Prolonged immobilization (>4 weeks) → Leads to permanent TMJ ankylosis and inability to open the mouth

One Liners

- Most common site of mandibular fractures is at Subcondylar region
- Subcondylar fractures occur due to trauma to body of mandible from opposite side
- When a closed reduction is done, mandible should not be immobilized for 3-4 weeks.
- Other name for guardsman fracture Parade ground fracture

MCQ

Q. Most important primary care in faciomaxillary trauma is to

a. Assess level of consciousness

b. Ensure adequate airway

c. Look for CNS injury

d. Immediate fracture reduction

Ans: B

Q. Ideal time for correction of fracture nasal bone is

a. Immediately

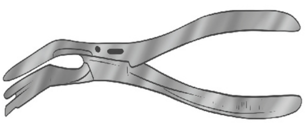
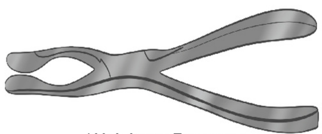
b. After 1 week

c. After 3 weeks

d. After 6 weeks

Ans: B

Forceps

ASH SEPTUM FORCEPS	WALSHAM SEPTUM FORCEPS
• Has angle • Used for Nasal septum  Asch's Forceps	• Used for Nasal bone reduction  Walsham Forceps

MCQ

Q. Tripod fracture is seen in

a. Mandible

b. Maxilla

c. Nasal bone

d. Zygoma

Ans: D

Q. Nerve to be traumatized in zygomatic fractures are

a. Facial nerve

b. Zygomaticotemporal nerve

c. Supraorbital nerve

d. Infraorbital nerve

Ans: D

CSF RHINORRHEA

01:34:40

- Leakage of cerebrospinal fluid into the nasal cavity.
- M/c cause: Trauma (95%)
- Rare cause:
  - ↑ Intracranial pressure (e.g., Benign Intracranial Hypertension) → Thinning of the bone separating the cranial and nasal cavities → Leakage
- Clinical presentation:
  - History of trauma followed by watery nasal discharge

Diagnosis

- Clinical Bedside Tests (To differentiate CSF from nasal mucin):
  - Sniff Test: Nasal fluid can be sniffed back; CSF cannot be sniffed back.
  - Handkerchief Test: Nasal fluid stiffens the cloth on drying; CSF does not stiffen the cloth
  - Reservoir Sign: Bending forward in a gravity-dependent position → ↑ Watery discharge
  - Halo Test / Double Ring Sign / Target Sign (For traumatic cases with mixed blood): Filter paper showing a central red dot surrounded by a clear peripheral ring
  - Valsalva Maneuver / Coughing: Increases intracranial pressure → ↑ CSF flow.
  - Note: All clinical tests are non-specific
- Confirmatory Laboratory Investigations:
  - IOC: Beta-2 Transferrin test (Protein specific to CSF, aqueous humor, and perilymph)
  - Newer highly selective test: Beta-trace protein (Specific only to CSF)

Radiological Investigations

- HRCT : Used to identify the exact site of the bony defect
- CT Cisternography: Used to identify active leaks
- MRI: Used to compare fluid intensity (CSF vs. nasal fluid)

Management:

- Transnasal Endoscopic Repair of the defect.

MCQ

Q. Target sign is suggestive of

a. Traumatic CSF rhinorrhea

b. Spontaneous csf rhinorrhea

c. Angiofibroma

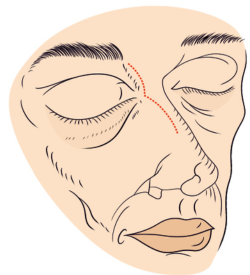
d. Glomus tympanicum

Ans: A

TUMOURS OF NOSE AND PNS

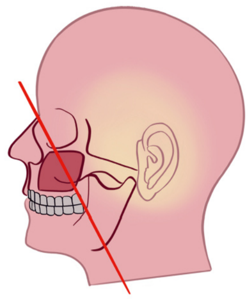
01:41:02

Osteoma

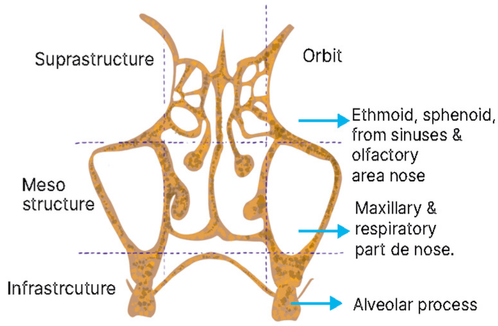


- MC benign tumour of PNS
- Site: frontal > frontoethmoid region
- HPE: Dense lamellar bone lacking Haversian canals.
- Associated Condition: Gardner Syndrome (Osteomas + Colorectal polyps).
- Management:
  - Lynch-Howarth external frontoethmoidectomy
    - → The Lynch-Howarth incision starts at the medial edge of the eyebrow and curves down midway between the nasal dorsum and medial canthus and extended downwards to access frontal and ethmoid sinus

Sino-nasal Malignancies



- Etiology: Exposure to carcinogens (smoke, alcohol, tobacco).
- M/c histopathological type: Squamous Cell Carcinoma.
- Woodworkers inhaling wood dust are at high risk for Adenocarcinoma.
- Prognostic Classifications:
  - Ohngren's Line:
    - → Imaginary line from the medial canthus to the angle of the mandible.
    - → Tumors below the line → Good prognosis
    - → Tumors above the line → Poor prognosis
  - Lederman's Classification:
    - → 2 imaginary line from medial wall of orbit and 2 from floor of maxillary sinus
    - → Higher the tumor location → Poorer the prognosis.
    - → Lower the tumor location → Better the prognosis



- Presentation
  - Dull pain over maxillary sinus
  - Ipsilateral epiphora
  - Blood stained nasal discharge
  - Nasal obstruction
  - Toothache
- Diagnosis:
  - Investigation of choice: Biopsy
  - Radiological studies are done prior to Biopsy.
- Management
  - Surgical Management:

Yourwish

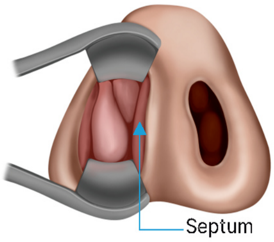
→ Total Maxillectomy is performed to achieve negative margins.
→ Structures removed: Maxilla, ipsilateral palate, ipsilateral eyeball, lateral wall of nose, ethmoidal air cells.
→ Incision used: Weber-Fergusson incision.
- Course of Weber-Fergusson: Lower eyelid → Nasofacial sulcus → Winds around the nasal ala → Crosses philtrum to the upper lip

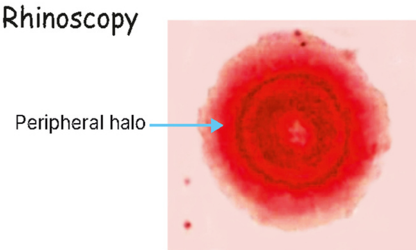
IMAGE BASED QUESTION

01:48:26

<table>
<tr>
<td>ANTERIOR RHINOSCOPY</td>
<td>

- Only the inferior and middle turbinates are visible
- The Superior turbinate cannot be seen on anterior rhinoscopy
- Medial wall is septum
- Instruments for Rhinoscopy
  - Thudicum's or Killian's nasal speculum → Used for Anterior Rhinoscopy
  - St. Clair Thomson mirror → Used for Posterior Rhinoscopy
- Endoscopic Nasal View
- Superior turbinate is only visible endoscopically after decongestion and xylocaine application





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<tr>
<td>ALLERGIC RHINITIS</td>
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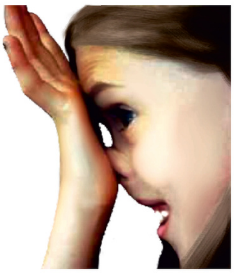
- Dark circles around the eyes → Allergic shiners
- Repeated upward rubbing of the nose → Allergic salute
- Transverse dark line on the dorsum of the nose → Allergic crease or Darriers line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<tr>
<td>RHINOPHYEMA</td>
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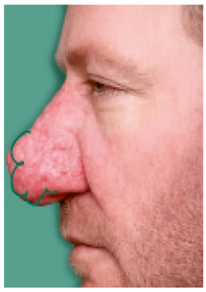
- Hypertrophy of sebaceous glands
- Treatment: Laser debridement with skin grafting



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<tr>
<td>ANTERIOR DEVIATION OF NASLA SEPTUM</td>
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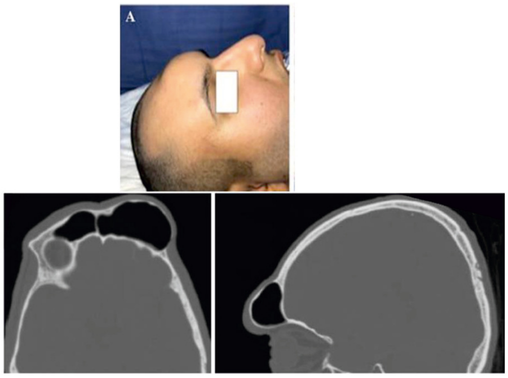
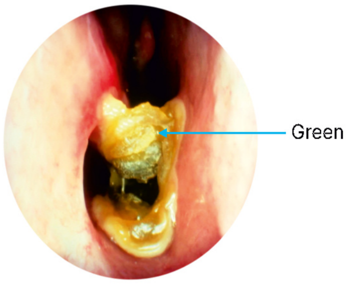
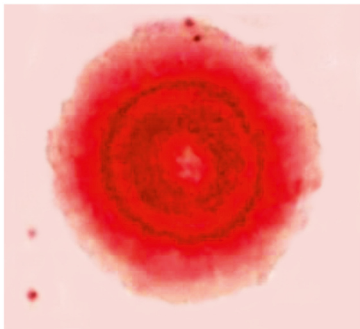
Yourwish

PNEUMATOCELE	• Air filled frontal sinus 
ORBITAL CELLULITIS	• Secondary to ethmoid sinus infection 
RHINITIS SICCA & ATROPHIC RHINITIS	• Green crust present seen in ○ Rhinitis sicca → anterior 1/3rd of nose ○ Atrophic rhinitis → entire nose 
TARGET SIGN	

PYQ

01:54:50

Q. A 40-year-old patient presents with recurrent and severe nosebleeds from the anterior nasal septum. The bleeding has been refractory to nasal packing and chemical cautery. A decision is made to proceed with surgical ligation to control the bleeding. Which of the following arteries is the primary target for ligation in the management of this patient's anterior epistaxis?

a. Sphenopalatine artery

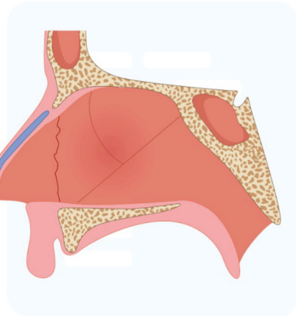
b. Anterior ethmoidal artery

c. Facial artery

d. Internal maxillary artery

Ans: A

Q. Identify the fracture given in diagram:



a. Chevallet fracture
b. Jarjaway fracture
c. Le fort 1
d. Simple fracture

Ans: A

Q. A 45-year-old male was admitted with respiratory distress. CT showed a nasal polyp with fluid collection in the sinus. Drainage of which of the following is obstructed?
a. Ethmoidal sinus
b. Sphenoidal sinus
c. Frontal sinus
d. Maxillary sinus

Ans: D

Q. What is the preferred initial management for a patient presenting with cerebrospinal fluid (CSF) rhinorrhea?

a. Functional Endoscopic Sinus Surgery (FESS)
b. Administration of steroids
c. Bed rest with head elevation and avoidance of straining activities
d. Immediate surgical repair without initial medical management

Ans: C

Q. Which structure does the anterior ethmoidal sinus drain into?
a. Middle meatus
b. Inferior meatus
c. Superior meatus
d. Sphenoethmoidal recess

Ans: A

14. SINUSITIS AND COMPLICATIONS

SINUSITIS

00:00:10

FMGE July 2023
INI CET July 2021, May 2023

- Inflammation of mucosa of paranasal sinuses is called sinusitis
- Duration less than 3 weeks → Acute sinusitis
- Duration 3 to 12 weeks → Subacute sinusitis
- Duration more than 12 weeks → Chronic sinusitis
- Recurrent sinusitis
  - 4 or more episodes per year
  - Each episode lasts 7 to 10 days
- Most common sinus affected in adults: Maxillary sinus
- Most common sinus affected in children: Ethmoid
- Least common sinus affected: Sphenoid sinus

Etiology

- Exciting factors :
  - Nasal infection: Most acute sinusitis starts as viral infections followed by bacterial invasion
  - Swimming & driving
  - Trauma
  - Dental infection (Especially because maxillary sinus is close to first molar and second molar)
- Predisposing factors :
  - Obstruction to ventilation of sinuses (Polyp, Edema, Rhinitis)
  - Stasis of secretion in nasal cavity (cystic fibrosis)
  - Allergy
- Systemic factors:
  - Attack of exanthematous fever (measles,chicken pox,whooping cough)
  - Nutritional causes
  - Immune deficiencies

Bacteriology

- Bacteria:
  - Streptococcus pneumoniae (M/c organism)
  - H. influenza
  - Moraxella
  - Streptococcus pyogenes
  - Staph aureus
- Anerobic organism and mixed infections are seen in sinusitis of dental origin

Clinical Features Of Acute Sinisitis

Major	Minor
• Nasal obstruction	• Headache

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• Facial pain or pressure • Purulent nasal discharge • Fever • Nasal congestion • Hyposmia or anosmia • Facial congestion or fullness	• Headache • Cough • Halitosis • Ear pain and pressure • Dental pain

- For diagnosis :2 major symptoms OR 1 major + 2 minor symptoms

	Maxillary	Frontal	Ethmoid	Sphenoid
Headache	Usually seen over cheeks and forehead and can be confused with frontal sinusitis	Localised to frontal sinuses above medial canthus	Localised over bridge of nose, medial and deep to the eye	Occiput or vertex
Tenderness	Cheek	Over frontal sinus	Bridge of nose	Nil
Redness and oedema	Cheek	Upper eyelid puffiness	Both eyelids become puffy	Nil
Site of nasal discharge	Middle meatus	Vertical streak of mucopus high up in anterior portion of middle meatus	Seen in middle or superior meatus depending on involvement of anterior or posterior group	Seen on posterior rhinoscopy on the roof and posterior wall of nasopharynx
Early complications	Orbital cellulitis, Osteomyelitis, Frontal sinusitis	Orbital cellulitis, Osteomyelitis, intracranial abscess	Orbital cellulitis, vision loss, cavernous sinus thrombosis, intracranial abscess	

Diagnosis

Acute

- Clinical
- Diagnostic nasal endoscopy
- X-ray is first investigation that is done
- CT scan
  - No role in uncomplicated acute sinusitis
  - Done only if complication is suspected
- Gold standard for diagnosis: Sinus puncture and bacterial culture
- Accurate method of diagnosis is sinuscopy and biopsy

Chronic Sinusitis

- NCCT of Nose and Paranasal sinus is done for diagnosis

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NEET PG 2022

Treatment

Acute Sinusitis

- Mainly medical treatment: Antibiotics + decongestants + analgesics + Hot fomentation
- Surgery
  - If no response to medical treatment
  - If it is progressing to complication
  - FESS (Functional endoscopic sinus surgery)/ Ethmoidectomy/ Trephination of frontal sinus

Chronic Sinusitis

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- Maximum medical therapy: Antibiotics with antral irrigation is tried and Intranasal corticosteroids for 3 months along with Nasal wash
- If symptoms persist after this → FESS

Fess

- First open the maxillary sinus
- Uncinate process → Boomerang-shaped bone in anterior part of nose
- Behind uncinate process is Bulla ethmoidalis
- Space between uncinate and bulla → Hiatus semilunaris / infundibulum
- Opening of maxillary sinus is in Infundibulum
- Steps

Uncinectomy
↓
Middle meatal antrostomy
↓
Remove anterior ethmoidal cells
↓
Remove posterior ethmoidal cells
↓
Sphenoidotomy
↓
Frontal sinusotomy

INI CET July 2021
00:10:44

Fungal Sinusitis

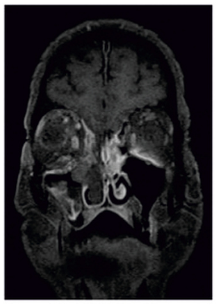
NON-INVASIVE FUNGAL SINUSITIS	INVASIVE FUNGAL SINUSITIS
• Occurs in immunocompetent patients • Caused by Aspergillus and dematiaceous species	• Occurs in immunocompromised patients • Caused by: ○ Aspergillus fumigatus ○ Rhizopus, Mucor
• Presents as: ○ Fungal ball ○ Allergic fungal rhinosinusitis	• Presents as: ○ Invasive aspergillosis ○ Mucormycosis • Present chronically as Chronic invasive sinusitis
• Antifungals usually not required	• Antifungals are required along with radical debridement

Bent And Kuhn Criteria For Afrs

Major	Minor
↑ IgE → Type I hypersensitivity	Asthma
Nasal polyposis	Unilateral disease
Characteristic CT findings (Double density)	Bone erosion
Eosinophilic mucin without invasion	Fungal cultures
Positive fungal stain	Charcot-Leyden crystals
	Serum eosinophilia

Mucormycosis

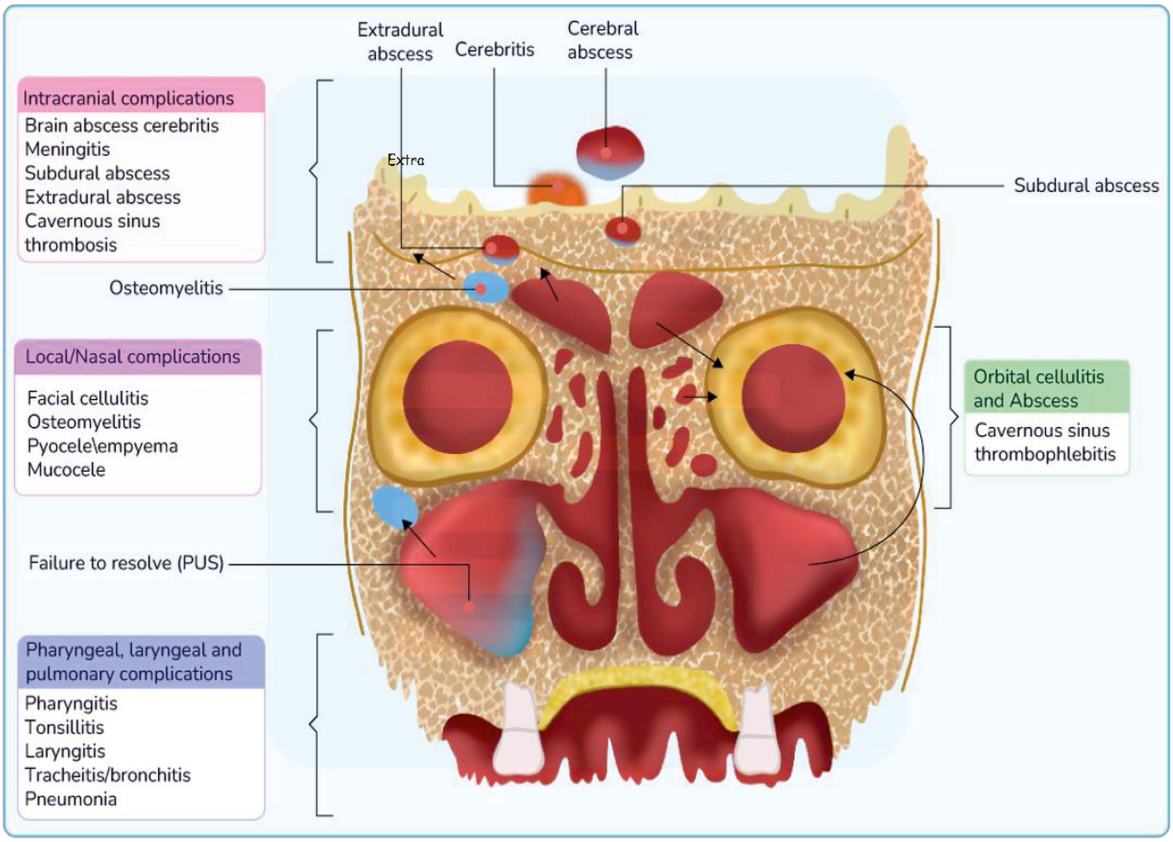
- Black turbinate sign → seen in mucormycosis
- Caused by Mucoraceae family
- Spread is via blood vessels / vascular invasion
  - Black turbinate sign on MRI
  - Black eschar on clinical examination
- Treatment
  - Radical debridement of all dead tissue f/b liposomal amphotericin B



Complications Of Sinusitis

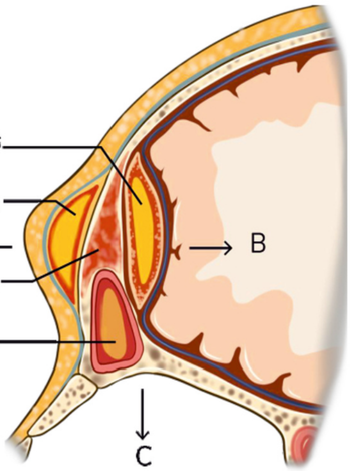
00:15:45

- Divided into
  - Local complications
  - Orbital complications
  - Intracranial complications



Local Complications

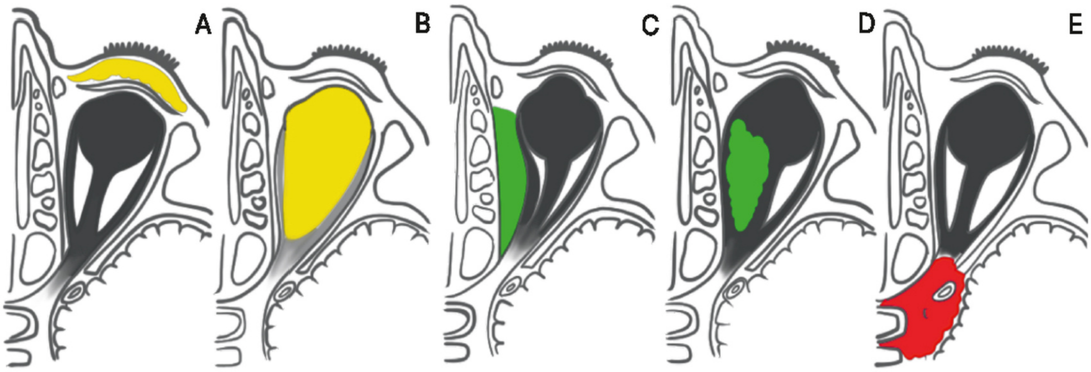
- Retention cyst
  - Cystic transformation of mucosa
- Mucocele
  - Due to blockage of ostium
  - Retention of secretion in an epithelial-lined sac
- Pyocele
  - Infected mucocele
- Orbital osteomyelitis
  - If infection spreads to adjacent bone / orbit
- Frontal bone osteomyelitis → Pott's puffy tumor



  - Osteomyelitis with swelling over frontal bone

Orbital Complications

- Preseptal cellulitis
- Orbital cellulitis
- Subperiosteal abscess
  - Pus accumulates between bone and periosteum
- Orbital abscess
  - Infection breaks periosteum and enters orbit
- Cavernous sinus thrombosis
  - Infection spreads from orbit via ophthalmic veins to cavernous sinus



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Intracranial Complications

- Meningitis
- Extradural abscess
  - Pus between bone and dura
- Subdural abscess
  - Pus between dura and brain
- Brain abscess
  - Infection enters brain parenchyma

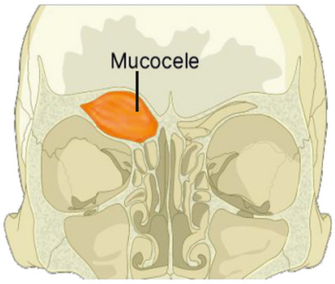
Descending Infections

- Nasal infection can spread to
  - Pharynx → pharyngitis
  - Larynx → laryngitis
  - Adenoids → adenoiditis
  - Tonsils → tonsillitis

MUCOCELE

00:19:50

- Most common involves Frontal sinus
- Least commonly involves sphenoid sinus
- Site: Superomedial quadrant of orbit
- Symptoms: Eye is displaced forward, downward, laterally
- Swelling: Cystic, non-tender, egg shell cracking
- X-ray: Loss of scalloped margins
- Treatment: Frontoethmoidectomy to promote drainage of frontal sinus



Intracranial Complications

- Extradural abscess
- Subdural abscess
- Meningitis
- Encephalitis
- Brain abscess
- Cavernous sinus thrombosis

CAVERNOUS SINUS THROMBOSIS

- Aetiology: Infection of ethmoids or sphenoid sinuses is most common cause
- But infection can spread from nose, ear, throat, orbit also
- Orbital cellulitis can secondarily lead to cavernous sinus thrombosis
- Treatment:
  - Immediate drainage of abscess and start IV antibiotics
  - Role of anticoagulants is not clear

Cavernous Sinus Thrombosis Vs Orbital Cellulitis

	Cavernous sinus thrombosis	**Orbital cellulitis**
Source	Nose, sinuses, orbit, ear or pharynx	Ethmoid sinuses

Onset	Abrupt with chills and rigors	Slow
Toxemia	Present	Late
Laterality	Bilateral	Unilateral
Oedema of eyelids	Bilateral oedema of eyelids, chemosis and proptosis	Unilateral oedema of eyelids, near the inner canthus leading to chemosis and proptosis
Cranial nerve involvement	Involves individually and sequentially	Involved concurrently with complete ophthalmoplegia

Other Syndromes Similar To Cavernous Sinus Thrombosis

Condition	Cranial nerves involved	Cranial nerves not involved
Orbital apex syndrome	II, III, IV, VI ± V2	–
Superior orbital fissure syndrome	III, IV, VI ± V2	II
Cavernous sinus syndrome	III, IV, VI	II, V2

PYQ

00:24:07

Q. An infant developed difficulty in breathing. His symptoms improve with crying. In which disease, do symptoms improve with crying?

FMGE July 2023

A. Atrophic rhinitis
B. Acute rhinosinusitis
C. Allergic rhinitis
D. Choanal atresia

Answer: **D**

Q. During the discharge of a COVID patient who was treated with steroids and remdesivir, which of the following will you inform him about?

INI CET July 2021

1. Repeat RT-PCR after 7 days of discharge
2. Watch for the persistence of Anosmia
3. Watch for headache and nasal discharge
4. Monitor glucose levels
5. Watch for Sinusitis like symptoms

A. 1, 3 and 4
B. 2, 3 and 4
C. 3, 4 and 5
D. 1,2,3,4 and 5

Answer: **C**

Q. A 30-year-old woman present with upper respiratory tract infection and orbital pain. What is the likely diagnosis?

INI CET May 2023

A. Atrophic rhinitis
B. Acute rhinosinusitis
C. Allergic rhinitis
D. Choanal atresia

Answer: **B**

Q. A patient presents with acute exacerbation of asthma; he gives a history of sinusitis and headaches for which he had self-medicated. Examination reveals nasal polyposis; which of the following drugs is likely implicated in this episode of asthma in this patient?
A. Cotrimoxazole
B. Co-amoxiclav
C. Aspirin
D. Chloramphenicol

Answer: **C**

Q. A 30-year-old patient with chronic sinusitis and nasal congestion, which anatomical structure is the most likely drainage pathway for the bulla ethmoidalis?
A. Middle meatus
B. Superior meatus
C. Inferior meatus
D. Middle concha

Answer: **A**

Q. Which of the following is not considered a major diagnostic criteria for allergic fungal sinusitis?
A. Fungal culture
B. Presence of Allergic Mucin
C. Characteristic CT findings: Double Density
D. Positive KOH stain

Answer: **A**

Q. Which of the following is true about orbital cellulitis?

NEET PG 2025

A. It is present anterior to the orbital septum
B. Treated effectively with topical antibiotics
C. Presents with proptosis, orbital swelling, normal pupil, and extraocular movements
D. Ethmoid sinusitis is the most common etiology

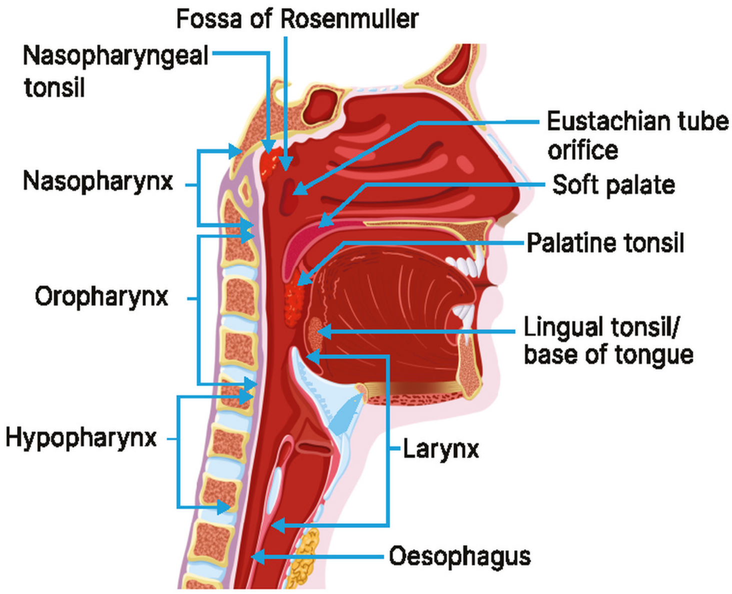
Answer: **D**

15. PHARYNX PART-1

ANATOMY OF PHARYNX

00:01:50

- Pharynx is a fibromuscular tube
- Extending superiorly from the base of the skull
- Inferiorly extends up to the lower border of the Cricoid cartilage corresponding to C6 vertebrae
- 3 subsegments of the pharynx: Nasopharynx, Oropharynx, & Hypopharynx



Nasopharynx

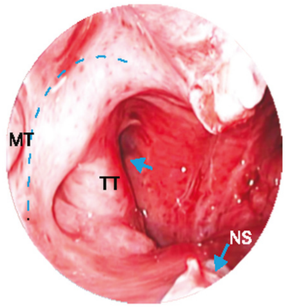
- Extends superiorly from the base of the skull and inferiorly up to the imaginary line that goes through the palate
- Corresponding vertebrae → C1

Boundaries

- Anteriorly → Communicates with the nasal cavity through choanae
- Posteriorly → Related to the C1 vertebrae
- Roof and posterior wall → Continuous with each other

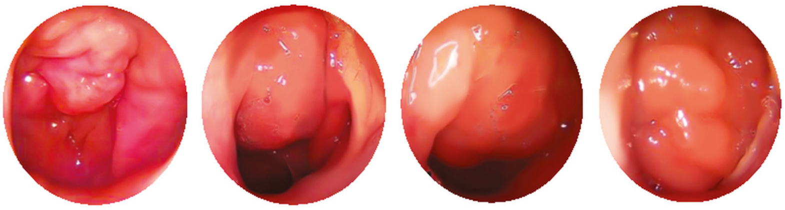
Structures Of The Lateral Wall

- Opening of the Eustachian tube (yellow arrow)
- Torus tubarius (TT)
- Fossa of Rosenmuller (blue arrow) → MC site of origin for Nasopharyngeal cancer
- Sphenopalatine foramen → Communication between the nasopharynx and pterygopalatine fossa



Adenoids

- Lymphoid tissue in the midline of the medial wall of the nasopharynx
- Especially seen in children
- Can be identified by endoscopically /X-ray /Portable endoscopes



Yourwish

- Grading of adenoids- Based on the choanal space occupied
  - Grade 1- 0-25%
  - Grade 2- 25-50%
  - Grade 3- 50-75%
  - Grade 4- >75%

Passavant's Ridge

- Present between the nasopharynx and oropharynx
- Formed by the fibers of the palatopharyngeus muscle
- Prevents nasal regurgitation
- Injury during adenoidectomy/tonsilectomy leads to nasal regurgitation

Oropharynx

- Extends
  - Superiorly from the imaginary line that goes through the palate
  - Inferiorly up to the imaginary line passing through the tip of the epiglottis corresponding to the Hyoid bone
- Corresponding vertebrae → C2 & some portion of C3

Boundaries

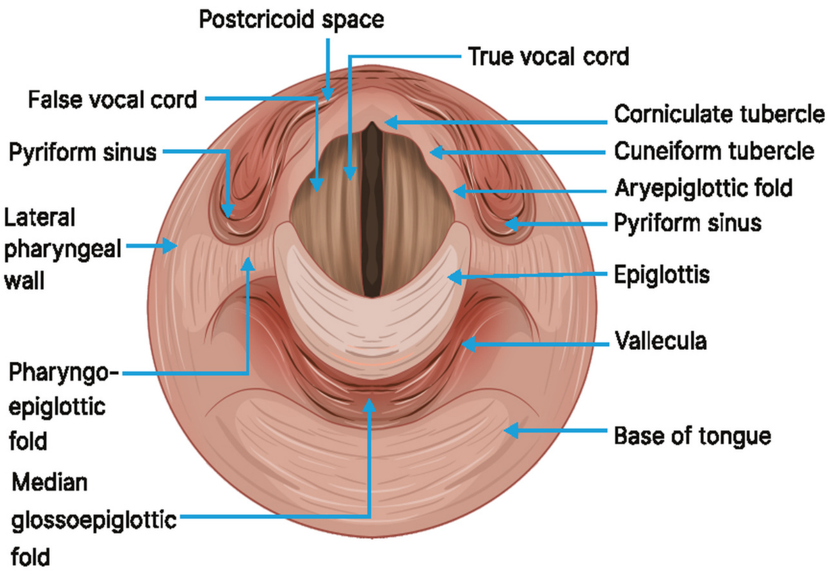
- Anteriorly → Oral cavity
- Posteriorly → C2 vertebrae

Structures of The Lateral Wall

- 2 pillars
  - Anterior → Formed by Palatoglossus
  - Posterio → Formed by Palatopharyngeus
- Palatine/Paucial/Pharyngeal tonsil → Lymphoid tissue between Palatoglossus & Palatopharyngeus

Contents

- Tonsil
- Posterior 1/3rd of the tongue (base)
- Median glossoepiglottic fold
- Lateral glossoepiglottic fold
- Valecula → Space between the median and lateral glossoepiglottic fold



Oral Cavity

00:16:05

FMGE 2021
NEET PG 2018

- Boundaries of the oral cavity
  - Anteriorly → Lips
  - Posteriorly → Anterior pillar
  - Superiorly → Hard palate
  - Inferiorly → Anterior 2/3rd of the tongue (presses on the floor of the mouth)

Tongue Development And Nerve Supply

00:16:36

Anterior 2/3rd

- Derived from the 1st pharyngeal arch
- Formed by the fusion of:
  - Two lingual swellings
  - Tuberculum impar
- Nerve Supply (1st Arch)
  - General sensation → Lingual nerve (Branch of mandibular division of Trigeminal nerve)
  - Taste (special sensation) → Chorda tympani (Branch of Facial nerve)
- Pathology in Anterior 2/3rd (ulcer, cancer) → Referred otalgia
  - Mediated via Lingual nerve (branch of Trigeminal nerve)
  - The trigeminal nerve supplies the ear via the auriculotemporal nerve

Posterior 1/3rd

- Develops from the Hypobranchial eminence, which has two parts (Cranial and Caudal)
- Cranial Part
  - Derived from the 3rd arch
  - Forms most of the posterior 1/3rd (base of tongue)
  - General sensation → Glossopharyngeal nerve
- Caudal Part
  - Derived from the 4th arch
  - Forms the vallecula
  - General sensation → Vagus nerve

Motor nerve supply of the tongue

- All muscles of the tongue are supplied by the hypoglossal nerve
- Exception → Palatoglossus

Hypopharynx

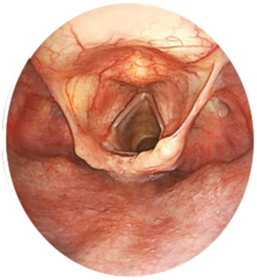
00:21:50

- Also called the laryngopharynx
- Lies behind the larynx

Boundaries

- Superiorly from an imaginary line through the tip of the epiglottis
- Inferiorly up to the lower border of the cricoid cartilage corresponding to C6 vertebrae
- Anterior → Related to larynx
- Posterior → Related to the vertebrae C3, C4, C5, and C6

Subdivisions of the Hypopharynx



- Pyriform fossa
- Post cricoid region
- Post pharyngeal wall

Pyriform Fossa

- Superior laryngeal nerve (internal branch) traverses through the pyriform fossa
- Pathology of ILN
- E.g., A pt complains of impaction of a fish bone in the pyriform fossa. During the extraction, the SLN could be injured.
- ILN is sensory to the larynx above the level of the vocal cord → Injury leads to loss of sensation
- AKA, Smuggler's pouch

Post Cricoid Region

- MC site for carcinoma in Plummer-Vinson syndrome

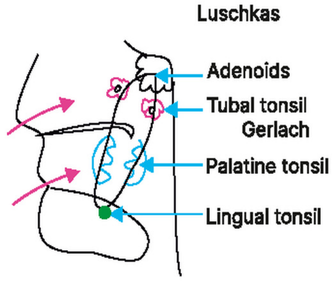
Waldeyers Ring

00:27:03

- Ring of lymphoid tissue in the upper aero-digestive tract
- Protective tissue → Traps pathogens entering the body

Composition of Waldeyers Ring

- Superiorly → Adenoids (AKA Luschka's tonsil)
- Lateral wall → Tubal tonsil (lymphoid tissue around the Eustachian tube, AKA Gerlach tonsil), Palatine tonsil
- Base of tongue → Lingual tonsil

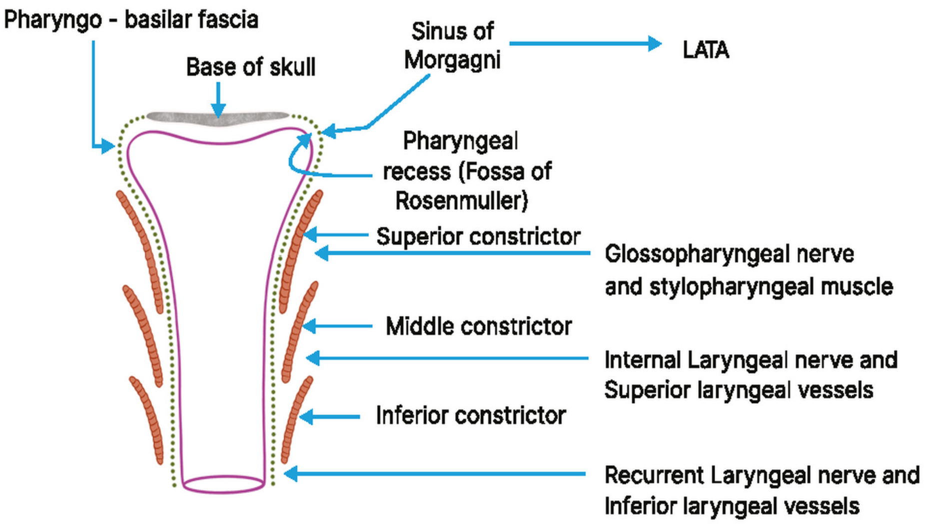


Pharyngeal Wall Layers

00:28:56

- Innermost layer (1st layer) → Mucosa
- 2nd layer → Pharygobasilar fascia
- 3rd layer → Muscular layer; External row → Superior, middle, and inferior constrictor
- 4th layer → Buccopharyngeal fascia

Structures Passing Through The Pharyngeal Wall



Area	Structures passing through
Sinus of Morgagni • Gap between the base of the skull and the superior constrictor muscle • At the level of the nasopharynx	**(Mnemonic: LATA)** • Levator veli palatini (helps open ET) • Auditory tube (Eustachian tube) • Tensor veli palatini (helps open ET) • Ascending palatine artery
Between the superior and middle constrictor muscle • At the level of the oropharynx	• Glossopharyngeal nerve • Stylopharyngeal muscle
Between the middle and the inferior constrictor muscle • At the level of the hypopharynx	• Internal laryngeal nerve • Superior laryngeal vessels
Below the inferior constrictor muscle • At the level of the larynx	• Recurrent laryngeal nerve • Inferior laryngeal vessels

One Liners

00:35:10

- Lower limit of nasopharynx is imaginary line passing through the Palate
- Lower limit of oropharynx is imaginary line passing through the tip of the epiglottis corresponds to Hyoid bone
- Lower limit of hypopharynx is lower border of cricoid cartilage corresponding to C6 vertebra
- Capsule of the tonsil is formed by Phargobasilar fascia
- Killian's dehiscence is seen Between the fibers of inferior constrictor muscle (Oblique fibers of thyropharyngeus and horizontal fibers of cricopharyngeus)
  - Zenker's diverticulum is outpouching of Killian's dehiscence
- Passavant's ridge is formed by Palatopharyngeus
- Sinus of Morgagni lies between the base of the skull and the superior constrictor muscle
- Luschka's tonsil is the adenoids
- Gerlach tonsil is the tubal tonsil
- Eustachian tube opens in the nasopharynx approximately 1 cm behind the inferior turbinate
- Sphenopalatine foramen passes 8-10 mm behind the middle turbinate
- Lining epithelium of the adenoid is Pseudo-stratified ciliated columnar epithelium
- Lining epithelium of tonsil → Stratified squamous epithelium
- Crypts/Capsules are seen in the tonsil (Hemi-encapsulated)
- Bag of worm feel on palpation of Adenoid
  - The internal carotid artery (ICA) lies close to the adenoids
  - Palpation helps detect pulsations of an aberrant ICA
  - If strong pulsations are felt:
    - → Surgery is stopped
    - → Angiography is performed to identify the ICA position
- Hot potato voice is seen in Quinsy (peritonsillar abscess)
- Referred otalgia from
  - Oral lesions → From the 5^{th} nerve
  - Oropharyngeal lesions → From the 9^{th} nerve
  - Hypopharyngeal and laryngeal lesions → From the 10^{th} nerve

Yourwish

ADENOID HYPERTROPHY

00:41:45

FMGE 2020, 2021

- Age of presentation – 19-14 yrs

Presentation

- Adenoid facies → Pinched nose, a high-arched palate, crowded teeth, dull expression
- Nasal obstruction
- Sinusitis
- Middle ear disease (d/t obstruction of ET by adenoid hypertrophy)
- Sleep apnea (d/t adenoid & tonsillar hypertrophy)
- Rhinolalia clausa (nasal twang)

Diagnosis

- Endoscopy
- X-ray, lateral view of nasopharynx
  - Draw two imaginary lines:
    - → One along the base of the skull
    - → One along the hard palate
  - This divides the nasopharyngeal airway into 4 equal compartments (≈25% each)
    - → Grade 1 → 0-25%
    - → Grade 2 → 25-50%
    - → Grade 3 → 51-75%
    - → Grade 4 → >75%

Treatment

- Grade 1 & 2 → Conservative treatment with intranasal corticosteroids and antihistamines
- Grade 3 & 4 → Surgery
- Adenoid hypertrophy + Serous otitis media → Adenoidectomy + Myringotomy with Grommet

Indication For Surgery

- Absolute indications
  - Obstructive sleep apnea
  - Grade 3 & 4 hypertrophy
- Relative indications
  - Recurrent infections
  - Recurrent cold
  - Acute otitis media

Contraindication For Surgery

- Age <3 yrs (compromises the immunity)
- Cleft palate (causes lifetime nasal regurgitation)
- HB <10 mg/dl
- Active URTI
- Bleeding disorder

ADENOID HYPOTROPHY

History and Examination
- Child with nasal obst., pinched nose, absent nasolabial crease, open mouth (PYQ), crowding of anterior upper teeth, high arched palate, (adenoid facles PYD sleep apnea.
- Recurrent infections (sinusitis, ADM)
- B/L decreased hearing due to SOM
- Rhinolalia clausa
- Failure to thrive (PYO

Investigations
- Endoscopy to assess the size.
- X-ray nose and nasopharynx lateral view IDodd/
crescent sign-ve(PYQ)-crescent of air not present between mass and pharyngeal wall as he mass arises from the pharyngeal wall itself).
- B type tympanogram(PYQ)

Aden old hypertrophy-Important points to remember

Initial management
Medical

Surgical Management
- Adenoidectomy grommet insertion(PYQ)
- Position-Rose's
- Cold-Blind curettage, microdebrider
- Hot-Monopolar suction diathermy, coblation

Indications for SX(PYQ)
- Sleep apnea
- Chronic SOM
- Recurrent infections (sinusitis, AOM)
- Dental malocclusion

C/or Sx(PYQ)<3yr
- Velopharyngeal insufficiency
- Acute infection
- Bleeding diathesis

Corpplications of SX(PYQ)
- Hemorrhage (MC)
- Unmask Velopharyngeal insufficiency
- Grisel syndrome- Nontraumatic inflammatory atlantoaxial subluxation.

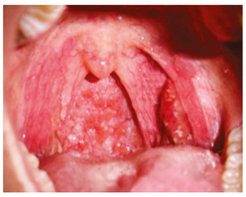
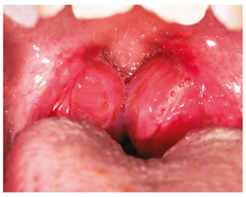
TONSILITIS

00:54:48

- Organism- Group A Beta hemolytic streptococcus
  - Has cross reactive antigens against myocardium, glomerulus & joints, resulting in complications like Rheumatic fever, Myocarditis, Subacute bacterial endocarditis, arthritis
  - Responsible for causing both acute & chronic tonsillitis

Types

Acute	• Duration of infection- <4 weeks • Acute superficial → Tonsils are red, with no enlargement • Acute follicular → Yellowish-white dots seen as infection spreads into the crypts

Acute	• Acute parenchymal → Tonsils are red, enlarged, and touch each other at the midline • Acute membranous → Dead bacteria and tonsillar tissue form a true membrane over the tonsils; no bleeding on peeling; membrane is limited to the tonsils Acute superficial tonsillitis  Acute follicular tonsillitis  Acute parenchymal tonsillitis  Acute membranous tonsillitis 
Chronic	• Duration of infection → > 12 weeks • Chronic follicular tonsillitis → Yellowish-white dots • Chronic parenchymal tonsillitis → Tonsils are red and enlarged • Chronic fibroid tonsillitis → Tonsils are small due to prolonged antigen-antibody reaction leading to fibrosis • Irwin Moore Sign ○ Used to differentiate chronic fibroid tonsillitis from normal tonsils ○ Pus oozes out on applying pressure on the crypts of the tonsils ○ Seen in chronic fibroid tonsillitis
Subacute	• Duration of infection- 4-12 weeks

Symptoms

- Throat pain
- Fever- High grade, malaise, fatigue
- Dysphagia
- Odynophagia
- Drooling of saliva
- Difficulty in swallowing
- On examination- Cervical lymphadenopathy

Treatment

Medical treatment	• Acute tonsillitis
Surgical treatment (Tonsillectomy)	• Absolute indication of tonsillectomy is ○ Obstructive sleep apnea ○ Ca Tonsils • Relative indications of tonsillectomy ○ Chronic tonsillitis, recurrent tonsillitis (≥7 episodes in 1 yr, ≥5 episodes in 2 yrs or ≥3 episodes in 3 consecutive yrs) ○ 2^{nd} episode of Quincy ○ Streptococcal infections • Non-tonsillar indications of tonsillectomy ○ Excision of the styloid process

	→ Elongation of the styloid process d/t calcification of the stylohyoid ligament → Eagle syndrome → External route or intra-oral route → Intra-oral route → Tonsil is removed to access the styloid ○ Palatal Sx → Uvulopalatopharyngoplasty (UPPP) → Reshape the uvula, palate, and pharynx in obese pts to treat sleep apnea ® Tonsil is removed as part of the Sx
Complications of tonsillitis	• Streptococcal-related complications • Neck abscesses (peritonsillar, parapharyngeal, retropharyngeal, and prevertebral space) • Referred otalgia
Complications of tonsillectomy	• Hemorrhage ○ Primary → Occurs intraoperatively ○ Reactionary → within 24 hrs of Sx → D/t slippage of the ligature → T/t- Emergency re-exploration and ligation ○ Secondary → After 24 hrs -14 days → D/t infections → T/t- IV antibiotics and watch, Re-exploration if bleeding continues • Injury to teeth • Injury to gums • Injury to TMJ • Aspiration (rare)

Membrane Over Tonsil

01:11:15

Tonsilitis	Diphtheria
• Pearly white in colour	• Greyish white in colour
• True membrane	• Pseudo membrane
• Avascular (from dead bacteria & tonsillar tissue)	• Vascular (from exotoxin liberated by the bacteria)
• No bleeding on peeling	• Bleeds on peeling
• Limited to tonsils	• Spreads
• No bull neck or toxemia	• Bull neck, Toxemia
	

Yourwish

Yourwish

MCQs

01:13:30

Q. A child with a mild cold who also has adenoid facies has been identified as having chronic adenoid hypertrophy. Which is the best surgical management for this condition? FMGE July 2023

A. Coblator

B. Microdebrider

C. Curettage

D. Breathing exercise and symptomatic treatment

Ans. **A.**

Explanation:

- Coblation- Less tissue damage & less bleeding
- Microdebrider- Does not seal the cut ends
- Curettage- No control over tissue damage and bleeding
- Breathing exercise and symptomatic treatment- Recommended in mild enlargement

16. PHARYNX PART 2

JUVENILE NASOPHARYNGEAL ANGIOFIBROMA

00:00:01

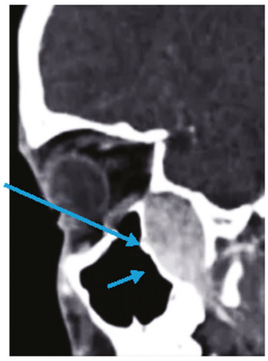
- M/C benign tumor of the nasopharynx
- Benign but locally invasivae
- Most commonly seen in the juvenile age group
- JNA occurs only in males because the tumor is dependent on testosterone for its growth
- Site of origin
  - Sphenopalatine foramen → located 8-10mm behind the posterior end of the middle turbinate
  - Sphenopalatine foramen is related to the posterior wall of the maxillary sinus

Clinical Presentation

- Bleeding
- U/L SOM → CHL
- Frog Face → Proptosis, Widening of the nasal bridge
- Tumor spread superiorly → Sphenoid sinus → Cavernous sinus → nerve involved
  - Nerves palsy
    → IInd cranial nerve → At the roof of the sphenoid
    → IIIrd, IVth, Vth, VIth → Cavernous sinus
- Classification system
  - Radkowskis
    → Stage 1- Limited to the nose, nasopharynx, and sinuses
    → Stage 2- Orbital, pterygopalatine fossa, or infratemporal fossa involvement
    → Stage 3- Cranial involvement
  - FISCH
  - SESSIONS

Investigation

- Biopsy, FNAC, Probe test, Digital palpation → C/I
- HPE → JNA is a vascular tumor → Lacks Tunica media
- CECT → IOC
  - Holman Miller sign → Anterior bowing of the posterior maxillary sinus
  - Hondousa sign → widening of jap between the maxilla and mandible
- Axial CT
  - Chopstick sign → Erosion of the pterygoid base
- MRI → To know about the Intracranial extension
- Angiography → To identify the feeding vessel
  - M/C feeding artery → Internal Maxillary artery



Treatment

- Angioembolization and surgical resection

NASOPHARYNGEAL CARCINOMA

00:06:20

- Bimodal age distribution → mostly affects the older population
- Males > Females
- Etiology
  - Chinese / Mongoloid population
  - Smoking, Tobacco
  - Smoke from an incense stick
  - EBV → Screening
    → IgA virus capsid antigen → most widely used
    → IgA against early antigen → most specific
- Site of origin
  - Fossa of Rosenmuller → lies behind the torus tubaris in the lateral wall of the nasopharynx

Clinical Presentation

- Neck nodes → cervical lymphadenopathy
- Blood-stained nasal discharge
- U/L SOM → CHL
- Nerve palsy → IInd, IIIrd, IVth, Vth, VIth, IXth, Xth, Xith
  - Tumor invades the base of the skull and the skull foramina
- Horner's syndrome
- Trotter's triad
  - Conductive hearing loss due to SOM
  - Vth nerve palsy → Pain along the distribution of the Vth nerve
  - Xth nerve palsy → palatal paralysis
- HO'S triangle → site for lymphadenopathy
  - Medial end of clavicle
  - Lateral end of clavicle
  - Junction of neck and shoulder
- Classification
  - WHO
  - HO'S
- Variant
  - Well differentiated
  - Moderately differentiated
  - Anaplastic → poor prognosis

Investigation

- Biopsy → IOC

Treatment

- Early stage → Radiotherapy
- Late stage → Chemoradiation

INICET May 2025

Q. Which of the following is not seen in JNA?

a. Recurrent epistaxis
b. Unilateral nasal obstruction
c. Exclusively to adolescence boys
d. Biopsy under anaesthesia to diagnose

Ans: d

RANULA

00:18:34

- Extravasated cyst from the sublingual salivary gland
- Location → Paramedian
- It is due to injury to the duct of the sublingual salivary gland

Ranula
↓
Pierces the mylohyoid muscle
↓
Comes into the neck
↓
Plunging ranula

- Features of swelling
  - Translucent
  - Bluish and cystic swelling in the floor of the mouth
  - Transillumination test - Positive
- Investigation
  - History / Examination
  - USG
- Treatment
  - Marsupialization with excision of the sublingual gland

PHARYNGEAL SPACES

00:20:48

Peritonsillar Space

NEET PG 2024, INICET 2024, FMGE 2025

Tonsil is encapsulated → formed by pharyngobasillar fascia
↓
Superior constrictor muscle
↓
Buccopharyngeal fascia

- Space between Pharyngobasillar fascia and
- Superior constrictor muscle

Quinsy (Or) Peritonsillar Abscess

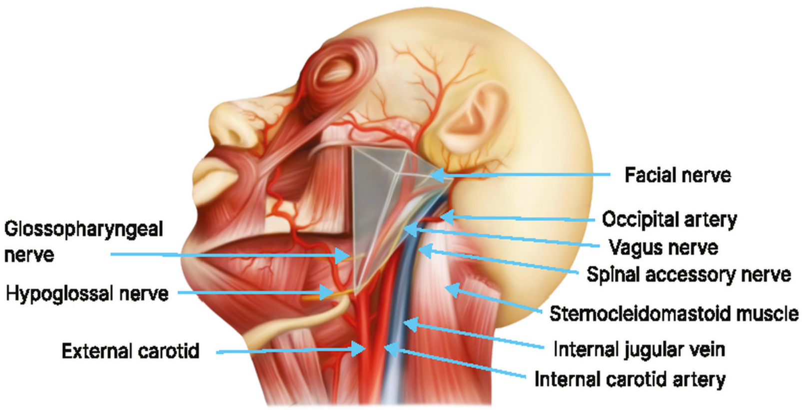
- Etiology- Tonsillitis
- M/C in the adult / elder population → because the crypts of tonsils are deeper and infection spreads into the peritonsillar space easily

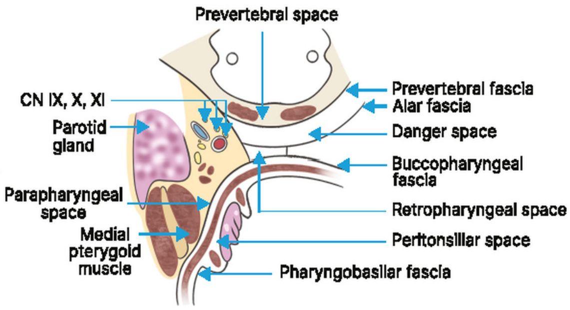
Yourwish

- Clinical features
  - Throat pain
  - Difficulty in swallowing
  - Drooling of saliva
  - Hot potato voice or muffled voice
  - U/L bulge of tonsil with uvula pushed to the opposite side
- Treatment
  - Hot tonsillectomy
    - → I&D + tonsillectomy
  - Interval tonsillectomy
    - → I&D → wait for 4 to 6 weeks → tonsillectomy
    - → Preferred

Parapharyngeal Space

- Largest space
- Boundaries
  - Superiorly → Base of skull
  - Inferiorly → Hyoid bone
  - Laterally
    - → Angle of mandible
    - → Masseter and Medial pterygoid
    - → Parotid
  - Anteriorly and medially
    - → Buccopharyngeal space
  - Posteriorly
    - → Carotid sheath and its content
      - ICA
      - IJV
      - IX^{th}, X^{th}, XI^{th}, XII^{th} cranial nerve
  - Posteromedially communicates with the retropharyngeal space
- 2 compartments
  - Divided based on the styloid process
  - Pre-styloid compartment
  - Post-styloid compartment



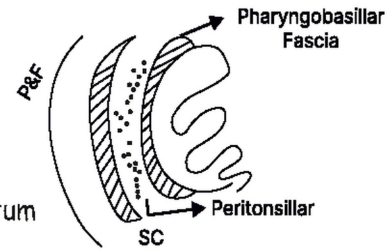


Pre Styloid Compartment Abscess

- U/L bulge of tonsil
- Neck swelling in the upper third of the sternocleidomastoid muscle

Post Styloid Compartment Abscess

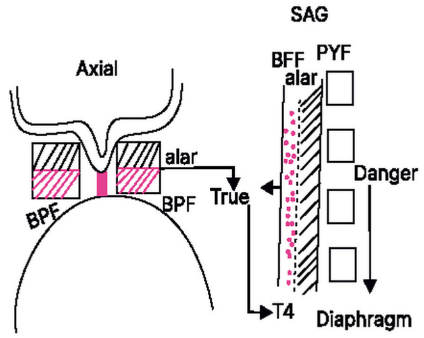
- Bulge behind the posterior pillar



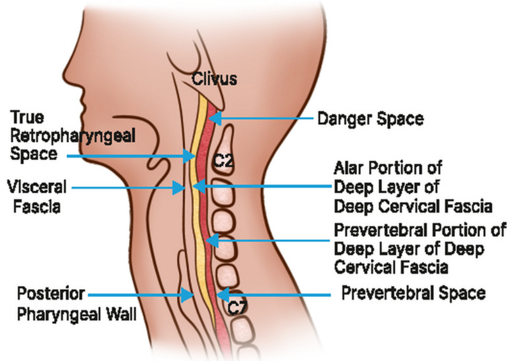
Retropharyngeal Space

- Space behind the pharyngeal wall
- Buccopharyngeal fascia and Prevertebral fascia fuse in the midline to form a septum
  - Divides the retropharyngeal space into 2 compartments

Yourwish



- Boundaries
  - Anteriorly- Buccopharyngeal fascia
  - Posteriorly- Prevertebral fascia
  - Superiorly- Base of skull
  - Inferiorly- At the level of T4
- Divided into 2 spaces by the Alar fascia
  - Anterior compartment
    - → Space between buccopharyngeal fascia and alar fascia → True Retropharyngeal space → extends up to T4
    - → True Retropharyngeal fascia, AKA Space of Gillette. It contains the Node of Rouvier, which drains the tonsil and the adenoids
  - Posterior compartment
    - → Space between alar fascia and prevertebral fascia → Danger space → extend upto diaphragm → It can cause Mediastinitis



True Retropharyngeal Space Abscess

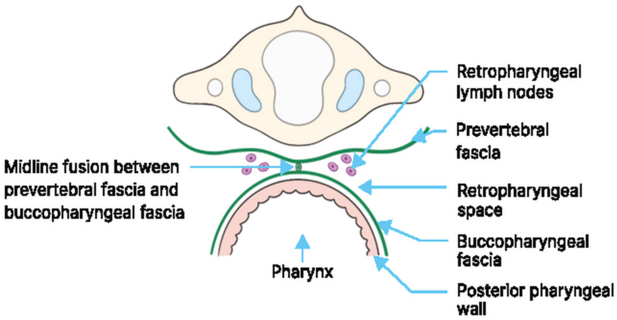
- Etiology
  - Infection from tonsil and adenoid
  - Common in children
  - Acute condition
- Clinical presentation
  - Present as a bulge on one side of the midline

Danger Space Abscess

- Etiology
  - TB Spine
  - Common in adult
  - Chronic condition
- Clinical presentation
  - Present as a bulge on one side of the midline

Prevertebral Space

- Boundaries
  - Anteriorly- Buccopharyngeal fascia
  - Posteriorly- Body of a vertebra
  - Superiorly- Base of skull
  - Inferiorly- Ends at the level of the coccyx
- Unpaired/single/Midline space



Prevertebral Abscess

- Etiology- TB spine
- Clinical presentation- Presents as a single swelling in the midline

Investigation Of Pharyngeal Space Infection

- CECT

Treatment Of Pharyngeal Space Infection

- Incision and Drainage
- IV antibiotics
- Secure the airway

One Liners

- Peritonsillar space is between the **pharyngobasilar fascia** and the **superior constrictor muscle**
- All the pharyngeal spaces extend superiorly from the **base os skull**
- Parapharyngeal space extends inferiorly upto **Hyoid**
- True retropharyngeal space extends inferiorly upto **T4**
- Danger space extends inferiorly upto **Diaphragm**
- Prevertebral space extends inferiorly upto **Coccyx**
- Smallest space is the **Peritonsillar**
- Commonest cause of a parapharyngeal abscess is **Tonsil**
- Node of Rouvier is **the retropharyngeal node**
- Space of Gillette is **the retropharyngeal fascia**
- Danger space is between the **Alar** fascia and the **prevertebral fascia**

Difference between Retropharyngeal abscess and Prevertebral abscess

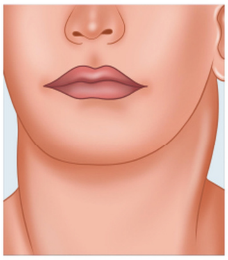
	Retropharyngeal abscess		Prevertebral space
Extent	True compartment- Upto T4	Danger space- Upto diaphragm	Upto coccyx
Cause	True compartment- Tonsil / Adenoid	Danger space- TB spine	
Presentation	Bulge on one side of the midline		Single midline bulge
Diagnosis	CECT		CECT
Treatment	I&D, IV antibiotics, and secure the airway In case of TB → start ATT		I&D, IV antibiotics, and secure the airway

Peritonsillar Abscess

- U/L bulge of tonsil with uvula shifted to the opposite side

Parapharyngeal Abscess

- U/L bulge of tonsil with uvula shifted to the opposite side
- A/W with neck swelling

Retropharyngeal Abscess

- Swelling on one side of the pharyngeal wall
- Prevertebral soft tissue shadow is >2 times the body of the vertebrae
- Presence of air level/gases
- Reversal of normal cervical lordosis

Q. Which of the following is not true regarding acute retropharyngeal abscess?

a. It is common in children
b. Produces difficulty in breathing and suckling
c. It is limited to one side of the midline
d. Incision and drainage are done from outside through the carotid sheath
e. It forms due to suppuration in the retropharyngeal lymph node

Ans: d

LUDWIG'S ANGINA

00:47:24

- AKA Vincent Angina
- Swelling in the floor of the mouth
- Pushes the tongue upwards and backward
- Goldring's criteria
  - It is Cellulitis, not an abscess
  - Always B/L in presentation
  - Presence of serosanguinous fluid and not pus
  - Spread is via tissue space, not by lymphatics
  - Sparing of the submandibular gland
- Source of infection
  - Infections from the tooth, gums, buccal mucosa, submandibular, and sublingual salivary glands
  - Mixed infection
  - Borrelia Vincenti
- Treatment
  - Presents with stridor
    - → Tracheostomy
    - → I&D
    - → IV antibiotics
  - With no features of stridor

Yourwish

→ Fibreoptic intubation
→ I&D
→ IV antibiotics

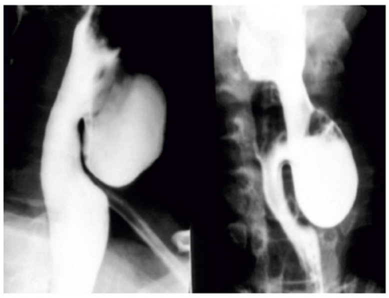
One Liner

- Etiology of Ludwig's angina: **Anaerobic / Mixed**
- Etiology of Vincent's angina **Borrelia Vincenti**
- **Woody hard** feel on palpation in Ludwig's angina
- **Mylohyoid muscle** divides the submandibular space into two compartments
- If the airway is endangered, treatment is **Tracheostomy**

PHARYNGEAL POUCH

00:51:31

- Outpouching of the mucosa through the Killian's Dehiscence
- Killan's Dehiscence
  - AKA Zenker diverticulum
  - Between Thyropharyngeus (Oblique fibres) and cricopharyngeus (Horizontal fibres) of Inferior Constrictor muscle
- False diverticulum
- Seen in the older population
- Etiology
  - Loss of satiety
  - Gurgling sound → BOYCE SIGN
  - Dysphagia
  - Sleep → Cough
- Investigations- Barium swallow
- Treatment
  - Dohlman's operation → Endoscopic diverticulectomy



ORAL AND OROPHARYNGEAL CANCERS

00:53:38

- M/C carcinoma → Squamous cell carcinoma
- M/C site worldwide → Lip (lower lip 98%)
- M/C carcinoma of upper lip → Basal cell carcinoma
- Prolonged exposure to sunlight is an important predisposing factor for carcinoma lip
- M/C site in India → Gingivobuccal sulcus
- M/C carcinoma of
  - Oropharynx → Tonsil
  - Hypopharynx → Piriform fossa
- Risk factor → smoking, tobacco chewing, repeated trauma by ill-fitting/sharp denture, alcohol, HPV
- Premalignant condition
  - Erythroplakia
  - Leucoplakia
  - Submucous fibrosis
  - Chronic hyperplastic candidiasis
- HPV (16, 18) → leading cause of carcinoma oropharynx, seen in the younger age group, and has a better prognosis than Non-HPV SCC

- Submucosal fibrosis pathology

Betel nut
↓
Presence of arecoline
↓
Normal tissue is replaced with fibrous tissue
↓
Blanching of the oral mucosa and trismus

- Submucosal fibrosis treatment
  - Intralesional steroids (Triamcinolone)
  - Hyaluronidase
  - Antioxidants
  - Cessation of betel nut chewing
- Lymph node metastasis in oral and oropharyngeal carcinoma is classified as Level I, II, III, and IV
- Midline tumors or tumors that cross the midline can have B/L lymph node metastasis
- M/C site of metastasis → Lung
- Verrucous carcinoma
  - A/K/A Ackerman's tumor
  - Well differentiated
  - Slow-growing SCC
  - Low malignant potential
  - Presents as → fungating / warty soft tissue papillary lesion of the oral cavity
- Plummer-Vinson syndrome
  - A/K/A Patterson-Kelly-Brown syndrome / Sideropenic dysphagia
  - Presents as a triad of
    → Post cricoid dysphagia
    → Hypopharyngeal/upper esophageal webs
    → IDA
- M/C carcinoma in females suffering from Plummer-Vinson syndrome is post-cricoid cancer

PYQ

00:57:10

Q. What could be the next step in managing the symptoms of a 7-year-old who underwent a tonsillectomy and now presents with snoring, palpitations, mouth breathing, slight hearing loss, high arched palate, and a decline in school performance, causing concern to the mother? FMGE June 2022

a. Adenoidectomy
b. Myringoplasty
c. Adenoidectomy with grommet insertion
d. Conservative management

Ans: c

Q. The image given below is from a chronic smoker's oral examination. Identify the lesion given.

a. Erythroplakia FMGE June 2021
b. Leucoplakia

c. Fordyce's granules
d. Koplik's spot

Ans: b

Q. What is the most common site of a ranula?
a. Floor of the mouth
b. Tonsil
c. Uvula
d. Cingula

Ans: a

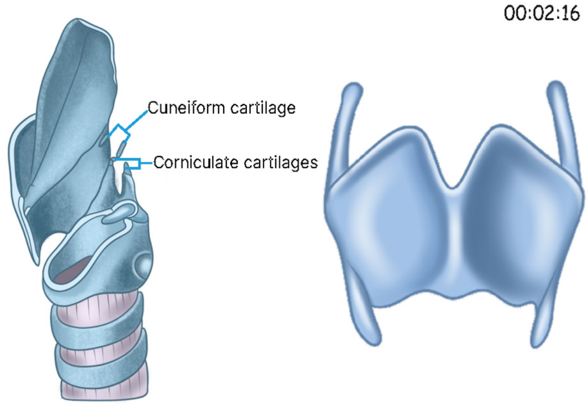
Q. A 13-year-old boy presents with right-sided nasal obstruction and recurrent epistaxis for the past 6 months. What is the most likely diagnosis? INICET May 2024
a. JNA
b. Allergic rhinitis
c. Coagulation disorder
d. Antrochoanal polyp

Ans: a

17. LARYNX

CARTILAGES OF LARYNX

00:02:16



- Larynx is made of cartilages
- Largest- Thyroid cartilage
  - Has 2 ala like a butterfly
    - → Meet at an angle of 90°- Adams apples
    - → 120° in females
  - Muscles attached to the oblique line
    - → Sternothyroid
    - → Thyrohyoid
    - → Thyropharyngeus
- Below the Thyroid cartilage- Cricoid cartilage (Signet ring cartilage)
- Inner surface of thyroid epiglottic cartilage
- Over the superior facet of the cricoid cartilage- Arytenoid
- Above the arytenoid cartilage- Cuneiform cartilage

Paired cartilages	Unpaired cartilages
• Arytenoid • Corniculate • Cuneiform	• Thyroid • Cricoid • Epiglottis

- Some cartilages calcify with age, called hyaline cartilage
  - Thyroid
  - Cricoid
  - Arytenoid
- Elastic cartilage opens and closes the laryngeal inlet
  - Epiglottis
  - Circulate
  - Cuneiform
- The only complete cartilaginous ring in the airway is the cricoid cartilage

Cricoid Cartilage

00:06:22

- Only signet ring-shaped cartilage
- The narrow arch anteriorly, & the lamina is wider
- On line 2 facets
  - Superior facets- Attachment to the arytenoid cartilage
  - Inferior facets- Attachment to the inferior horn of the thyroid cartilage
- Laryngeal crepitus can be seen
  - Movement of the cricoid cartilage against the vertebra- Gritty sensation felt
  - Normally present in everyone

- Absent laryngeal crepitus- Boccas's sign seen in
  - → Post-cricoid cancer
  - → Retropharyngeal abscess
  - → Prevertebral abscess

Epiglottic Cartilage

00:08:56

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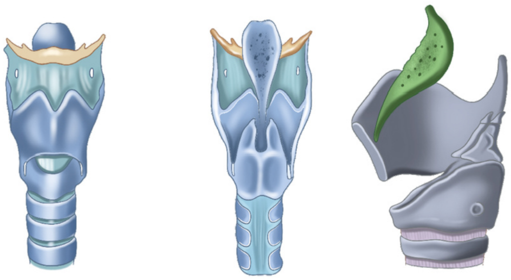
- Leaf-like cartilage is attached to the inner surface of the Thyroid cartilage
- Surfaces
  - Suprahyoid
  - Infrahyoid
- Surface that faces the base of the tongue- Lingual surface
- Surface that faces the larynx- Laryngeal surface
- Superiorly free
- Attached inferiorly to the thyroid cartilage



Arytenoid Cartilage

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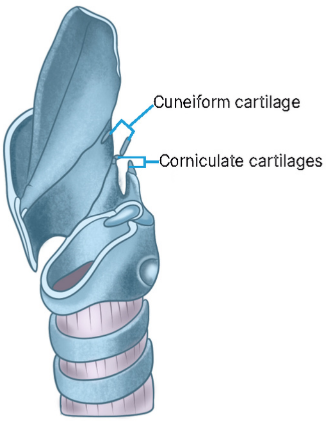
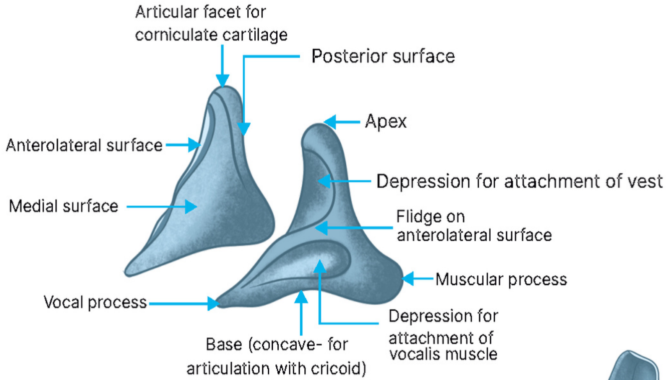
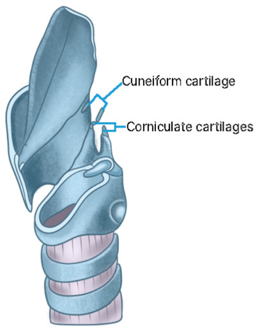
- Pyramid-shaped cartilage
- Base rests on the superior facet of the cricoid cartilage
- Apex- Cornciculate, cuneiform cartilage
- Medially, a vocal process is present that attaches to the vocal cords
- Muscular process that provides attachment to the muscle



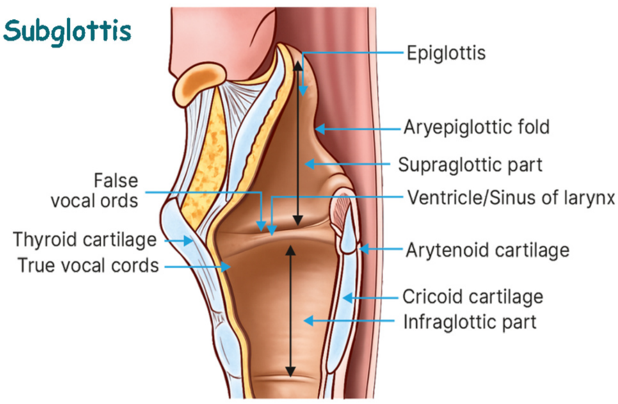


Corniculate And Cuneiform Cartilage

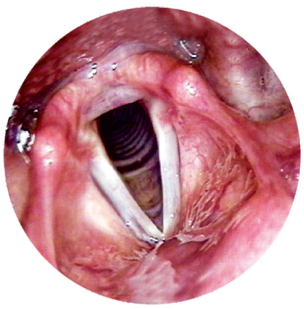
- Corniculate, AKA Cartilage of Santorini
- Cuneiform cartilage, AKA Cartilage of Wrisberg



Glottis, Supraglottis & Subglottis



Sagittal section of larynx



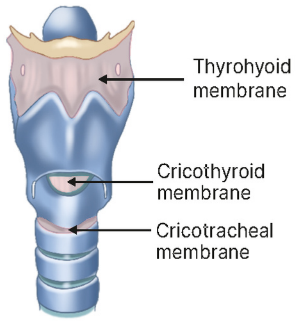
- The larynx is classified into 3 subdivisions
- Glottis- At the level of the vocal cords and 1 cm below
- Supraglottis- Above the level of the vocal cords
- Subglottis - 1 cm below the vocal cord to the lower border of the Cricoid cartilage

Development

00:12:44

- Supraglottis develops from the 4th arch
- Glottis & Subglottis develop from the 6th arch

MEMBRANES OF LARYNX

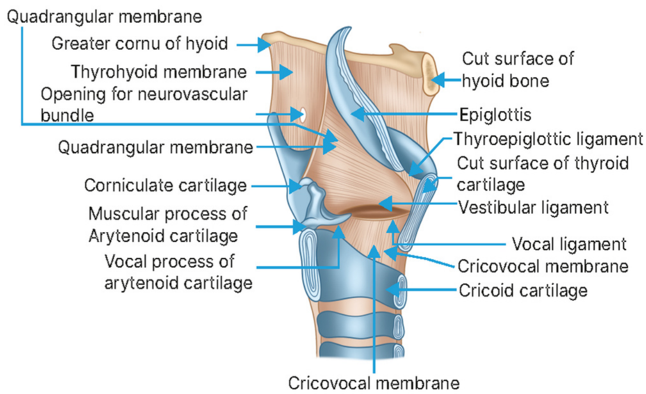


Extrinsic

- Connects the laryngeal structure to an external structure
  - Thyrohyoid membrane- SLN nerve block
  - Cricotracheal membrane

Intrinsic

- Connects the laryngeal structure to another laryngeal structure
- Cricothyroid membrane- Emergency airway access
- Quadrangular membrane
  - Has 4 sides
  - Extends between the epiglottis, thyroid, and arytenoid cartilages
  - Lower fibres condense to form false cords (Vestibular ligament originates)
- Cricovocal
  - Cone-shaped, AKA Conus elasticus
  - Gives rise to the vocal ligament
  - Upper fibres condense to form true cords



LARYNGEAL CAVITY

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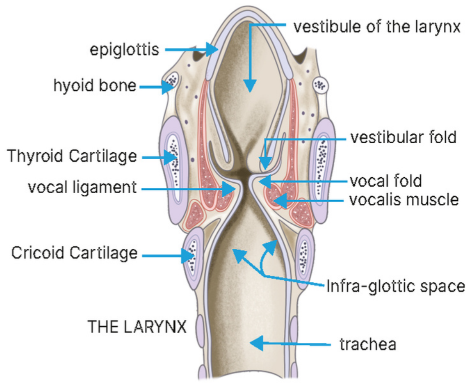


- Superiorly begins- Inlet of larynx
- Quadrangular membrane
- Below cricovocal membrane
- Space between 2 quadrangular membranes- Vestibule of the larynx
- Space between 2 false chords- Rima vestibuli
- Space between 2 true chords- Rima glottis

- Space between the false and true chords- Ventricle of the larynx
- Below the rima glottis- Subglottis

EPITHELIUM OF THE LARYNX

00:21:45

- Lined by pseudostratified ciliated columnar epithelium
- Except for 3 sites
    - Vocal cords
    - Aryepiglottic fold
    - Superior surface of the epiglottis

LYMPHATICS

00:22:35

- Supraglottis- Drains into the upper deep cervical lymph nodes
- Subglottis- Pre-laryngeal and pre-tracheal lymph nodes into lower deep cervical lymph nodes or mediastinal nodes
- Glottis- No lymphatics

Summary

Anatomy of Larynx

Sites

Supraglottis
- Epiglottis, aryepiglottic folds, arytenoids (the above three together form the inlet of larynx-also k/a epilarynx) false vocal cords, Ventricle
- Drains into upper and middle deep cervical LN

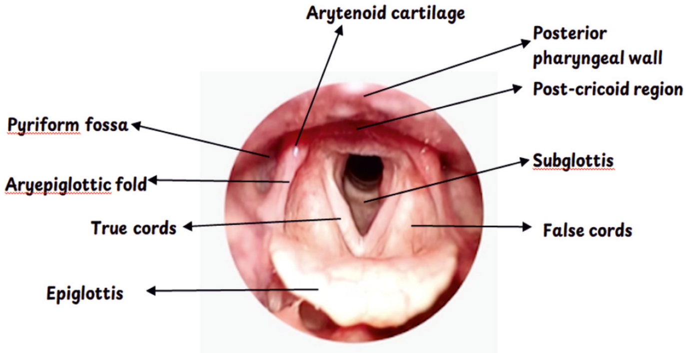
Glottis
True Vocal Cords (TVC), Anterior and posterior commissure
- Narrowest part of the larynx in adults The true vocal cords (TVC):
- Lined by Stratified squamous nonkeratinized epithelium columnar pseudostratified epithelium.
- Has no lymphatics acts as a watershed for lymphatics

Subglottis
- Narrowest part of the larynx in children.
- Drains into lower deep cervical and anterior LN.

Cavity of Larynx
In sequential order from above to below-inlet of larynx-also K/a epilarynx
Vestibule, Rima vestibuli, Ventricle (also known as sinus of Morgagni of larynx) → leads to saccule →site of origin of Laryngocele
Rima glottidis, Subglottis

Spaces
- Pre-epiglottic space/space of Boyer-upper boundary-hyoepiglottic ligament, between thyroid, thyrohyoid membrane and epiglottis.
- Paraglottic space/space of Tucker-lateral to the quadrangular membrane and conus elasticus.
- Reinke's space-submucosal space of TVC. edema, nodule, polyp arise from here.

Endoscopic View Of The Larynx



METHODS OF EXAMINING THE LARYNX

00:27:24

- Indirect laryngoscopy- Mirror placed behind the uvula
- Direct laryngoscopy
- Rigid endoscopy with 70°
- Fibreoptic laryngopharyngeoscopy
- Stroboscopy- Mucosal wave can be seen
    - Absent mucosal wave- Carcinoma & Cyst

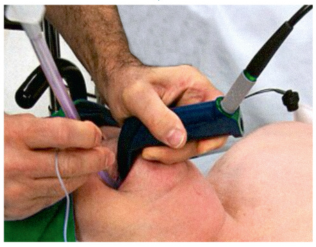
Indirect laryngoscopy

Endoscopy with or without stroboscope (visualization of mucosal wave in slow motion to differentiate lesions and site of involvement)

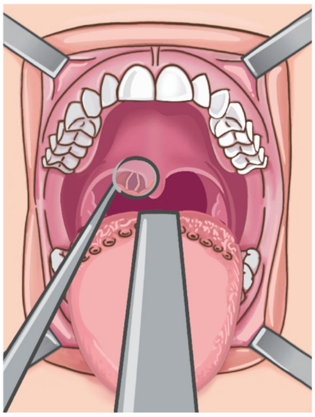
Flexible endoscopy

Rigid Endoscopy
Tips of different angles (70-90)

Direct laryngoscopy



Boyce position
Chevalier Jackson/Barking dog/sniffing morning air- Flexion at cervical spine and extension at atlanto-occipital joint.



Yourwish

MUSCLES OF THE LARYNX

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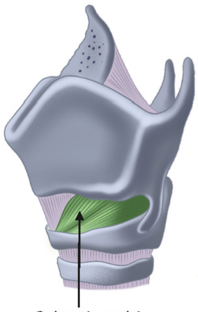
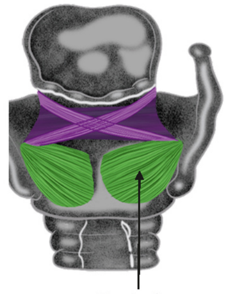
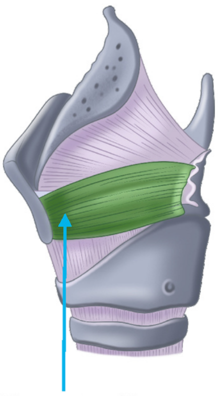
- Abductor of the vocal cord/safety muscle of the larynx- Posterior cricoarytenoid
- Tensor of the vocal cord/secondary adductor- Cricothyroid
    - Has 2 bellies
    - Supplied by the external branch of SLN
- Adduct- All muscles of the larynx except the posterior cricoarytenoid
- Adductor + tensor- Cricothyroid and vocalis
- Increase tension/pitch/length- Cricothyroid (only intrinsic muscle lying outside)
- Decrease tension /pitch/length- Vocalis
- Only unpaired- Interarytenoid/transverse arytenoid
    - Receives dual innervation



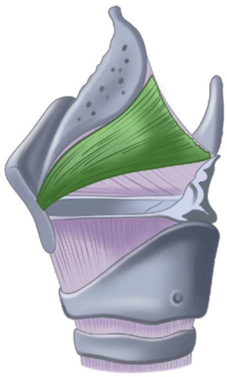
Cricothyroid

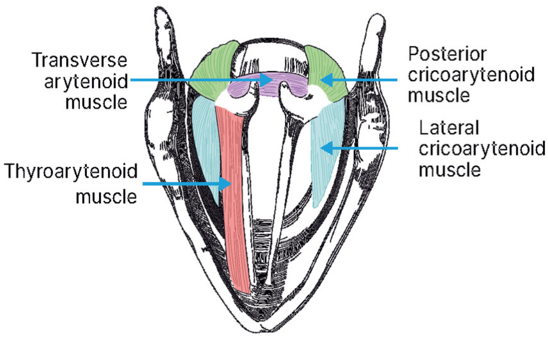


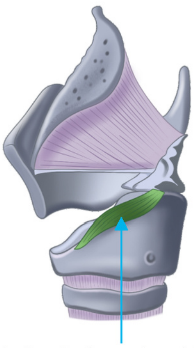
Posterior cricoarytenoid



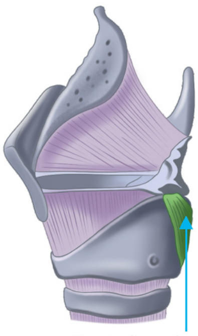
Thyroarytenoid



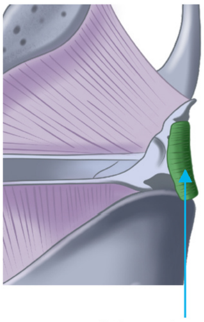




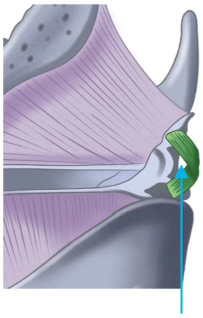
Lateral cricoarytenoid



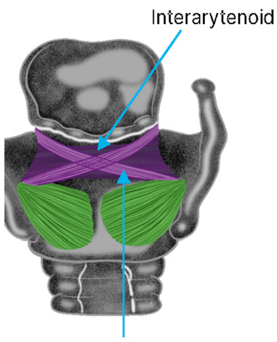
Posterior cricoarytenoid



Interarytenoid



Oblique arytenoid



Oblique arytenoid

SPACES OF LARYNX

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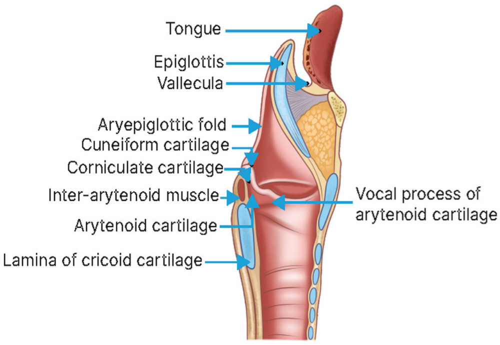
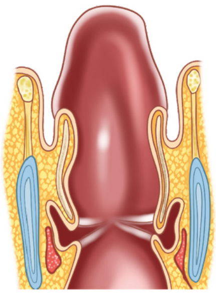
- Preepiglottic space of Boyer
- Paraglottic space of Tucker
- Reinke's space

PREIPIGLOTTIC SPACE OF BOYER 	• Space is in front of the epiglottis • Boundaries ○ Anteriorly- Thyrohyoid membrane ○ Superiorly- Hyoepiglottic ligament ○ Posteriorly- Epiglottis
PARAGLOTTIC SPACE OF TUCKER 	• Lies on the sides of the larynx • Boundaries ○ Laterally by the Thyroid cartilage ○ Medially Quadrangular membrane ○ Below- Cricovocal membrane and ventricles
REINKE'S SPACE	• There are 4 layers of the vocal cords ○ Epithelium ○ Superficial lamina propria ○ Vocal ligament ○ Vocalis muscle • The space between the epithelium and the superficial lamina propria is called Reinke's space

FUNCTIONS OF THE LARYNX

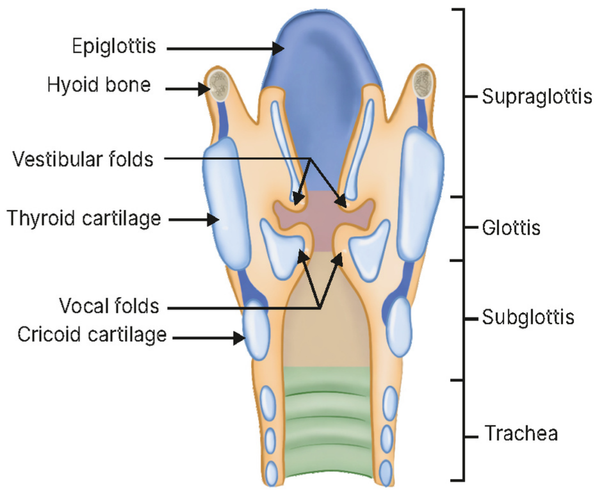
00:44:44

- Protection of airways
- Phonation
- Respiration
- Fixation of the chest

	INFANTS	ADULTS
POSITION	C2-C3	C3-C6
EPIGLOTTIS	Curled	Leaf shaped
THYROID RTILAGE	Flat	Angulated
NARROWEST PART	Subglottis	Glottis
SUBMUCOSAL TISSUE	More	Less
CARTILAGES	Soft	Ossified

ONE LINERS

- Larynx develops from the 4th and 6th arches
- Supraglottis develops from the 4th arch
- Glottis and subglottis develop from the 6th arch
- Larynx lies against C3-C6
- Laryngeal crepitus occurs due to the movement of the cricoid against the vertebrae
- Laryngeal crepitus is absent in post-cricoid cancer, prevertebral abscess, and retropharyngeal abscess
- Hyaline cartilages in the larynx are the thyroid, cricoid, and arytenoid
- Elastic cartilages is epiglottis, cuneiform, and corniculate
- Largest cartilage in the larynx thyroid
- Signet ring cartilage is cricoid
- Angle at which the thyroid meets the ala
  - In males- 90°
  - In female- 120°
- Oblique line of the thyroid cartilage gives attachment to the sternothyroid, thyrohyoid, and thyropharyngeus
- 2 surfaces of the epiglottis- lingual and laryngeal surfaces
- Parts of the epiglottis
  - Suprhyoid
  - Infrahyoid
- Only complete cartilaginous ring in the entire airway cricoid cartilage
- Narrowest portion of the adult larynx is the glottis, and in the paediatric larynx is the subglottis
- Cartilage of Santorini is Corniculate
- Cartilage of Wrisberg is Cuneiform
- Membranous portion is 2/3rd, and the cartilaginous portion is 1/3rd
- Sinus of Morgagni of the larynx-ventricles
- Rima vestibuli is the space between the false cord
- Rima glottidis is the space between the true cord
- Space of Tucker is a paraglottic space
- Space of Boyer is the pre-epiglottic space
- Only unpaired laryngeal muscle is the interarytenoid/transverse arytenoid
- Only muscle that receives dual innervation is the interarytenoid/transverse arytenoid
- Only abductor of the vocal cord is the postcricoid arytenoid
- Tensor is cricothyroid



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COMMON ERRORS

- Nerve supply
  - Sensory above the vocal cords- Internal branch SLN
  - Below the vocal cord- RLN
  - Motor supply- All muscles by RLN except cricothyroid, which is supplied by the external branch of SLN
- Muscles
  - Cricothyroid- Only muscle with 2 bellies lying outside- Adducts and lengthens the vocal cord
  - Vocalis- shortens and adducts the vocal cord
  - Posterior cricoarytenoid- Only abductor of the vocal cord

Yourwish

CONGENITAL ANOMALIES OF THE LARYNX

- M/c Congenital Anomaly of Larynx:
  - 1st m/c = Laryngomalacia
  - 2nd m/c = Congenital Vocal Cord Paralysis
  - 3rd m/c = Subglottic Stenosis

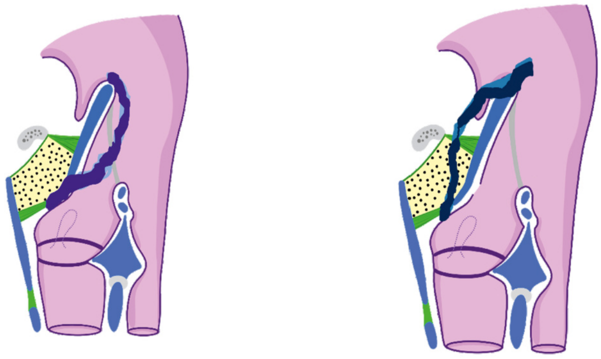
LARYNGOMALACIA

00:51:44

FMGE 2020

- Definition: A condition where there is excessive flaccidity of the epiglottis or supraglottis
  - Supraglottis: Part of the larynx that lies above the vocal cords

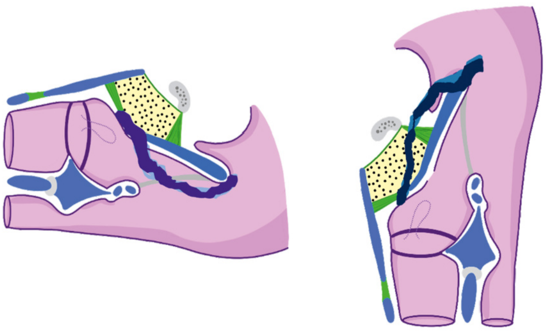
Mechanism Of Obstruction



- During inspiration:
  - Air gets sucked in
  - Epiglottis falls on the airway → obstructs the airway
  - Results in inspiratory stridor
- During expiration:
  - Air comes from below (from the trachea)
  - Pushes the epiglottis away
  - No stridor during expiration

Clinical Findings & Presentation

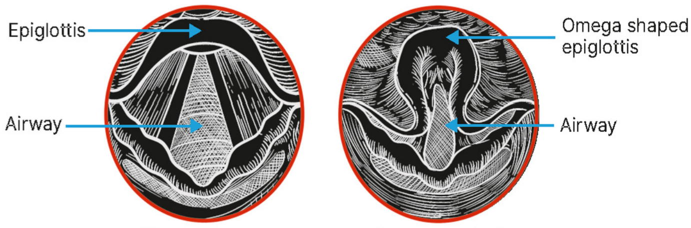
- Characteristics of Stridor:
  - Inspiratory stridor at birth
  - No stridor during expiration
- Effect of crying on stridor: Increases stridor
  - Crying → negative intrathoracic pressure → Pulling air inside → epiglottis gets sucked in → increased stridor
  - Cry/voice at birth: Normal
    - → Because epiglottis are involved, not the vocal cords
- Effect of Position



  - Supine position:
    - → Epiglottis collapses and falls over the laryngeal inlet → obstruction to the glottis → worsens stridor
  - Prone position:
    - → Epiglottis falls away from the larynx → relief of stridor

Laryngoscopic Examination

- Examination Method:
  - Done under short general anesthesia or sedation
  - Laryngomalacia Finding:
    - → Epiglottis have collapsed
    - → Omega-Shaped Epiglottis



Normal Larynx (Axial view)

Laryngomalacia (Axial view)

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Treatment

- Conservative: Wait and watch
  - Spontaneous resolution happens at 1-2 years of age
  - May need epiglottic surgeries if not resolved

CONGENITAL VOCAL CORD PALSY

- M/c congenital CNS abnormality causing vocal cord palsy: Arnold-Chiari Malformation

Clinical Presentation

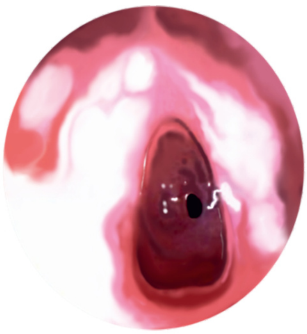
- Unilateral Vocal Cord Paralysis
  - Usually asymptomatic, or may have a weak cry
- Bilateral Vocal Cord Paralysis
  - Stridor at birth
    - → Biphasic stridor (because of a lesion at the level of the vocal cords)
  - Difficulty in breathing
  - Cyanosis
  - Respiratory distress at birth
  - Cry/Voice:
    - → Weak cry
    - → Aphonia or no cry at all
  - Effect of Crying: increases stridor

Treatment

- Unilateral: Wait and watch
  - One cord is paralyzed, but the other cord is still working
- Bilateral:
  - Tracheostomy (to get access to the airway)
  - Vocal cord lateralization (creates airway space for respiration)

SUBGLOTTIC STENOSIS

- **Definition:** Excessive thickening of the cricoid cartilage leading to narrowing of the subglottic lumen
  - The subglottis lies at the level of the cricoid cartilage
  - The subglottis is the narrowest portion of the larynx in children
- Subglottis diameter is abnormal if:
  - < 4 mm in full-term neonates
  - < 3 mm in premature neonates



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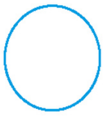
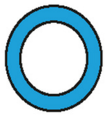
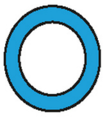
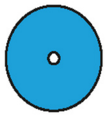
Cotton-Myers Classification

- Used for classifying acquired subglottic stenosis, but applicable to congenital stenosis too.
  - **Grade 1**: obstruction up to 50%
  - **Grade 2**: 51-70% obstruction
  - **Grade 3**: 71-99% obstruction

- **Grade 4**: complete obstruction (100%)

Classification	From	To	Endoscopic appearance
Grade I	No Obstruction 	50% Obstruction 	
Grade II	51% 	70% 	
Grade III	71% 	99% 	
Grade IV	No Detectable Lumen		

Clinical Presentation

- Do not present at birth.
- The airway is narrowed but not completely blocked, resulting in minimal or very minor symptoms, which may include noisy breathing.
- Crying is essentially normal.
- Effect of crying: No increase in stridor

EFFECT OF CRYING

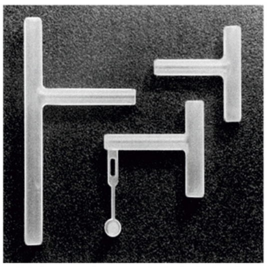
Condition	Crying effect on Stridor
Laryngomalacia	Increase/Worsen
Acute epiglottitis	
Congenital vocal cord paralysis	

Subglotic stenosis	No effect
Choanal atresia bilateral	Improve

Treatment Based On Grade

Grade	Management	Key Concept / Procedure
Grade 1	Observation	Usually resolves with growth; cartilages enlarge/expand with age
Grade 2	Endoscopic dilatation	Dilatation of the narrowed airway using endoscopic techniques
Grade 3	Laryngotracheal reconstruction	Rib cartilage graft used to expand the subglottic region
Grade 4	Partial Cricotracheal resection	Remove cricoid cartilage and 1st tracheal ring; connect larynx with trachea.

- Post surgery
  - Montgomery t-tube (Stent): Used in Grade 3 and Grade 4 reconstructions
  - Prevents further stenosis after surgery
    - Mitomycin-c (Antiproliferative drug)
  - Prevents fibrosis and adhesions

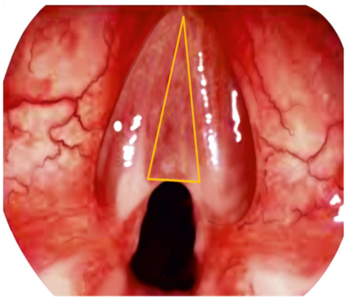


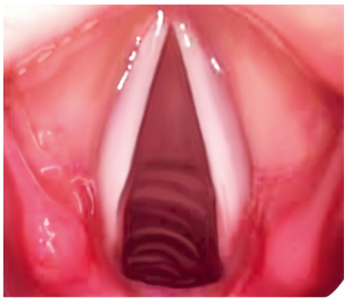
LARYNGEAL WEB

- Embryological Cause: Incomplete canalization of the larynx at the level of the vocal cords
- M/c site: At the level of the glottis

Types

- Partial web:
  - Only partially occupies the anterior 2/3 of the vocal cord
    → Weak cry
    → Noisy/Difficulty breathing
- Complete web:
  - It occupies the vocal cord completely.
  - Presents with no cry
  - The effect of crying will increase the stridors.





Yourwish

Treatment

- Partial web: Not an emergency
  - Eventually release the web
- Complete web: Emergency
  - Tracheostomy (to get access to the airway)
  - After tracheostomy → release the web

Common Error Files

01:05:08

- Conditions presenting at birth:
  - Laryngomalacia
  - Congenital vocal cord paralysis
  - Complete laryngeal web
- Stridor types:
  - Inspiratory: Laryngomalacia
  - Biphasic: Congenital vocal cord paralysis, laryngeal web
- Cry status:
  - Normal: Laryngomalacia, subglottic stenosis
  - Weak or absent: Congenital vocal cord paralysis, laryngeal web
- Effect of crying on stridor:
  - Increases: Laryngomalacia, Vocal cord paralysis, Laryngeal web, Epiglottitis
  - No effect: Subglottic stenosis
  - Improves: Croup/laryngotracheitis
- Effect of position: Seen in Laryngomalacia
  - Supine → worsens
  - Prone → improves
- Classification system:
  - Cotton-Meyer's classification is used for subglottic stenosis

INFLAMMATORY CONDITIONS OF LARYNX

01:09:54

Acute Epiglottis

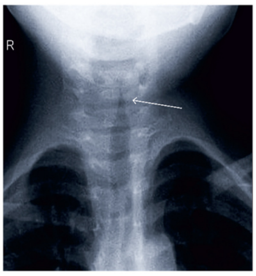
- M/c in the age group: 3-7 years
- Causative organisms
  - Streptococcus pneumoniae - M/c
  - Haemophilus influenzae - Incidence is reduced due to vaccination
- Clinical presentation
  - Dysphagia
  - Odynophagia with drooling of saliva → dehydration
  - Absence of cough / Hoarseness of voice
  - Dyspnoea and Inspiratory stridor
    → Due to obstruction in supraglottic area
  - Increased chance of Laryngospasm on examination
  - Child sits in tripod position

Yourwish

- Investigations
  - X-ray lateral view → Thumb sign → Inflammation of epiglottis
- Treatment
  - Secure the airways
  - Antibiotics against specific organisms
  - Steroids can be given to reduce the edema and to prevent airway obstruction
  - Voice rest and cough suppressants are not required
  - Racemic adrenaline nebulization or injection → Bronchodilator
  - Hydration is important
  - Intubation or tracheostomy may be required

Croup

- A/K/A Laryngo - Tracheo-Bronchitis
- M/c in the age group 3 months - 3 years
- Causative organisms
  - Parainfluenza virus type I and II (M/c) → Secondary infection by bacteria
  - Respiratory syncytial virus
  - Rhinovirus
  - Influenza virus
- Clinical presentation
  - H/o cold /URTI
  - Barking seal type of cough
  - Hoarseness of voice / change in cry is present
  - Sore throat absent
  - Dyspnoea and Biphasic stridor
    → Due to obstruction of sub-glottic area
  - Increased chance of Laryngospasm on examination
- Investigations
  - X-ray AP view → Steeple sign → narrowing of subglottis
- Treatment
  - Secure the airways
  - Antibiotics for secondary infections
  - Steroids can be given to reduce the edema
  - Racemic adrenaline nebulization with Helium and oxygen → Bronchodilator
  - Voice rest and cough suppressants are required
  - Hydration is important
  - Intubation or tracheostomy may be required



Q. In acute epiglottis in children, death occurs due to?

a. Atelectasis

b. Aspiration

Yourwish

c. Laryngospasm
d. Airway obstruction

Ans: d

- Cause of death during examination → Laryngospasm

Q. A A 4-year-old child presented with sore throat, difficulty in swallowing, and difficulty in breathing. The child has a high-grade fever with tachypnoea. There is an inspiratory stridor with a recession of suprasternal and intercostal spaces. No strider is observed during expiration. The clinical picture is suggestive of:
a. Bronchopneumonia
b. Lower tracheal obstruction
c. Intrathoracic obstruction
d. Extrathoracic obstruction

Ans: d

BENIGN LESIONS OF LARYNX

01:18:33

Vocal Nodule

- A/K/A Teacher's nodule / Singer's nodule
- B/L symmetrical lesions on the vocal cords
- Location: At the junction of anterior 1/3rd and middle 1/3rd
- Occurs due to gradual or chronic voice abuse
- Treatment
    - Voice rest
    - Microlaryngeal surgery

Vocal Polyp

- U/L lesion on the vocal cords
- Locations: At the junction of anterior 1/3rd and middle 1/3rd
- Occurs due to sudden voice abuse
- Presents with Diplophonia
- Treatment
    - Microlaryngeal surgery

Reinke's Edema

- B/L symmetrical swelling of the vocal cords
- Location: At membranous or anterior 2/3rd of the vocal cords
- Cause - Smoking and GERD
- Presents with Diplophonia and low-pitch voice
- Appears as a bag of water
- Treatment
    - Voice rest
    - Antireflux therapy
    - Decortication / Stripping of the vocal cord epithelium
      → Initially, one vocal cord after 4 - 6weeks another vocal cord

→ Stripping of the vocal cord is not done simultaneously because it leads to adhesions of the vocal cord

Important Information

- Hoarseness is rough/harsh quality of voice
- Dysphonia is difficulty in speaking or any impairment of voice

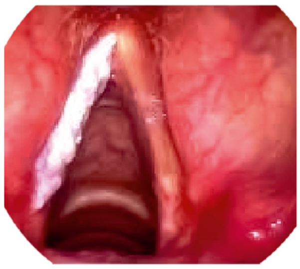
HOARSENESS OF VOICE

Gradual voice abuse	Sudden voice abuse	Smoking / LPR/reflux	Voice abuse/ Trauma /intubation
o/ e bilateral symmetrical swellings on vocal cord at junction of ant and middle 1/3	Pedunculated lesions at junction of ant 1/3 and middle 1/3	Bilateral /Bag of water	u/l or b/l nodular mass at arytenoid
Vocal nodule Voice rest MLS	Vocal polyp MLS	Voice rest MLS	Contact ulcer / intubation granuloma MLS

Contact Ulcer

- A/K/A Pachyderma Laryngitis
- Cause - Trauma, reflux, and voice abuse → Hypertrophy of epithelium on one side with depression of another epithelium
- Pseudoulcer
- Affects the posterior part of the vocal cord

Keratosis Larynx



- A/K/A Leucoplakia

Smoking, Tobacco chewing
↓
Chronic irritation
↓
Transformation of epithelium to white plaque-like lesions

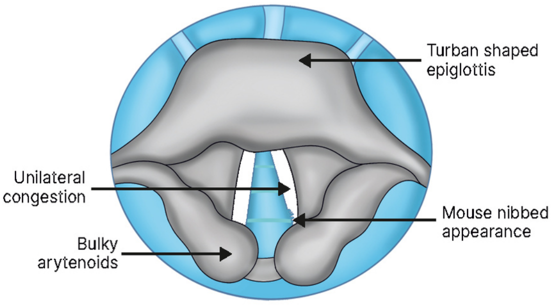
- Treatment
  - Stop the offending agents
  - Decortication/stripping of vocal cord or excisional biopsy of the vocal cord

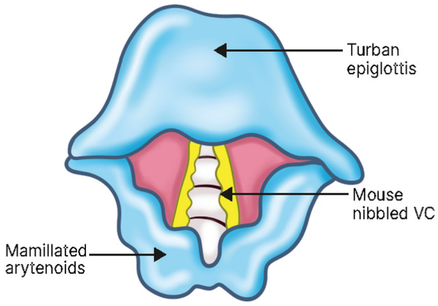
TB LARYNX

01:24:37

- It can be a/w with pulmonary tuberculosis
- It can also occur as low grade indolent form → Lupus Larynx
- Symptoms
  - Presents as painful ulcer → Odynophagia
  - Low-grade fever, cough, and weight loss

- Signs
  - Starts in the posterior part of the vocal cord
  - Hyperemia / Redness of the vocal cord with sluggish movement of vocal cord
  - Discontinuous ulcer → Moth-eaten / Mouse-nibbled
  - Swelling of arytenoids → Mamillated arytenoids
  - Swelling of epiglottis → Turban epiglottis





- Investigations
  - HPE → Caseating granuloma
  - CBNAAT
  - GeneXpert
  - Culture on LJ medium
- Treatment
  - Antitubercular drugs

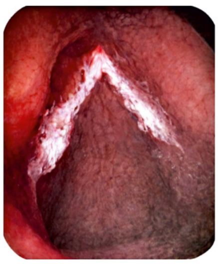
	TB Larynx	Lupus Larynx
Pulmonary TB	Yes	No
Activity of TB	Active	No
Parts affected	Posterior	Anterior
Symptomatic	Yes	No

Conditions of Larynx Presenting with Hoarseness

Clinical History
Hoarseness in an elderly with H/o smoking results Laryngopharyngeal reflux

Next step

Examination finding
O/E-white patches on both vocal cords.



Clinical History
Elderly, chronic smoker, presented with the complain of Hoarseness for one month and above

Next step

Examination finding
O/E-Ulceroproliferative growth on the TVC.

Yourwish

Diagnosis
Laryngeal keratosis/ Leukoplakia
Premalignant

Management
Cessation of smoking excision by MLS and biopsy.

Diagnosis
Biopsy-Squamous, cell Carcinoma

Investigations
- Neck examination for LN and crepitus
- CT to see tumor extent, spread and
- MRI best for seeing cartilage invasion

One Liners

- Vocal nodules and polyps occur at junction of Anterior 1/3rd and Middle 1/3rd
- Sessile is Nodule and pedunculated is Polyp
- Diplophonia is seen in Vocal polyp / Reinke's edema
- Microlaryngeal surgery is the treatment of choice in Vocal polyp
- Voice rest is the treatment of choice in Vocal nodule
- Bilateral and symmetrical lesions are Vocal nodule
- Ulcer on one side and heaped up epithelium on the other is seen in Contact ulcer
- Microlaryngeal surgery involves using a microscope to excise the lesion with a focal length of 400nm
- Pachyderma laryngitis involves posterior part of vocal cords
- Not a true ulcer is Contact ulcer
- Painful laryngeal condition is TB
- Premalignant condition is Keratosis
- Stripping of vocal cord is done in Reinke's edema

Error Files

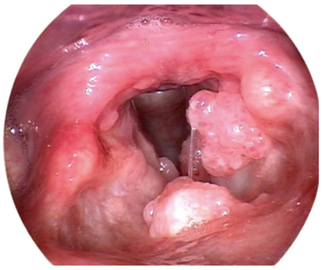
- Diplophonia → Vocal polyp
- Low-pitched voice → Reinke's edema
- Bilateral lesions
  - Vocal nodule
  - Reinke's edema
- Unilateral lesions:
  - Vocal polyp
  - Vocal cyst
  - Contact ulcer
  - Leukoplakia
- Condition involving the posterior part of the larynx:
  - Pachyderma laryngitis / Contact ulcer

LARYNGEAL PAPILLOMA

01:32:49

NEET PG 2019
FMGE 2023

- Causative organisms
  - HPV 6 and 11
- 2 Types
  - Juvenile onset
  - Adult onset

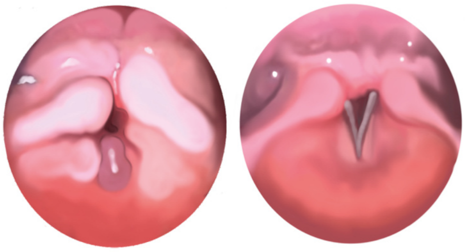


	Juvenile papilloma's	Adult onset papilloma's
Age	Infants and young children	30-50years
Sex		It is twice more common in male
Number	Multiple lesion	Single lesion
Location	Multiple subsites -True and false vocal cords and epiglottis	Single subsite - Anterior half of vocal cord or anterior commissure
Aggressive	Aggressive, recurrence is common after surgical excision	Less aggressive, does not recur after excision
Recurrence	High	Less

- Treatment
  - Surgical excision using Microdebrider, coblation
  - Surgical excision with laser is not done
    - → Because it generates fumes which mix with papilloma virus and forms Plumes which move to the lower trachea and cause distal seedling → Tracheal papilloma and Bronchial papilloma

VOICE AND SPEECH DISORDERS

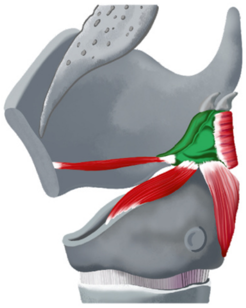
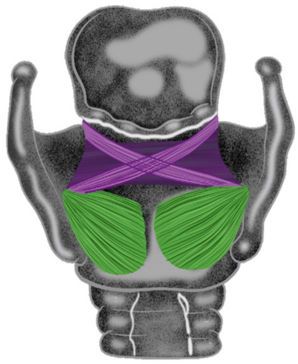
Dysphonia Plica Ventricularis



- Voice is being generated by false vocal cords
- Cause
  - True vocal cord pathology - Inability of the true vocal cords to adduct
  - Psychological condition
  - Voice abuse
- Hypertrophy of the false vocal cord
- Treatment
  - Speech therapy
  - Reduction of the false vocal cord

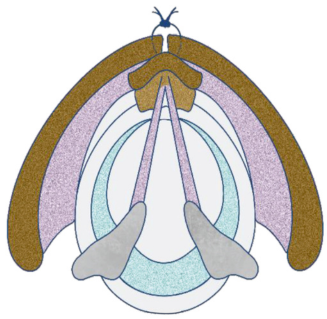
Spasmodic Dysphonia

- Spasm of the phonatory muscle
- Cause
  - Neurological Disorder
    - → Parkinsonism disease
    - → Alzheimer's disease
  - Associated with other dystonias like Oromandibular dystonia and Blepharospasm

Types of Dysphonia		
Adductor dysphonia	**Abductor dysphonia**	**Mixed dysphonia**
• Spasm of vocalis muscle (medial fibres of the thyroarytenoid) • Scratchy, Croaky, strangulated type of voice 	• Spasm of posterior cricoarytenoid • Breathy type of voice is produced 	• Adductor + Abductor dystonia

- Treatment
  - Adductor dysphonia - Inj.Botox in thyroarytenoids muscle
  - Abductor dysphonia - Inj.Botox in cricoarytenoid muscle

Puberphonia



- Normally, in males during puberty, a transformation of voice occurs to produce an adult quality of voice, which is low-pitched
- In puberphonia, there is high pitch voice
- Pathology:
  - It occurs due to no correlation between development of the thyroid cartilage and vocal cord

Thyroid cartilage develops at a faster rate in comparison to vocal cord

↓

As a result vocal cord is pulled and stretched

↓

Produce a female quality of voice

- Diagnosis
  - Gutzmann pressure test

Applying pressure on the thyroid cartilage

↓

The vocal cord is relaxed

↓

Improvement in voice is seen → Male quality of voice produced

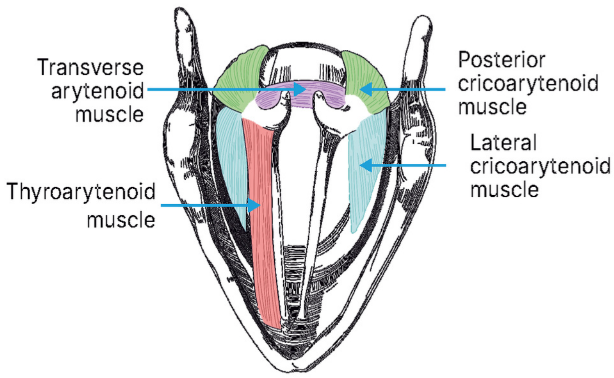
- Treatment
  - Speech therapy
  - Type III thyroplasty → Shortening the vocal cord → Release the tension on vocal cord

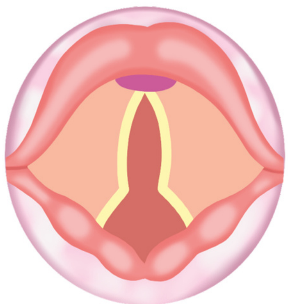
Important Information

- Type I Thyroplasty - Medialization of the vocal cord
- Type II Thyroplasty - Lateralization of the vocal cord
- Type III Thyroplasty - Shortening of the vocal cord
- Type IV Thyroplasty - Lengthening of the vocal cord

Phonasthenia

- Phonasthenia means weakness of the phonatory muscle
- The vocal cord lies between thyroid cartilage and the arytenoid cartilage
- Muscles between thyroid and the arytenoid cartilage → Thyroarytenoid
- Muscles between the 2 arytenoid cartilages → Interarytenoid muscle
- Keyhole appearance of the glottis
  - Weakness of Thyroarytenoid muscle → Anterior bowing of vocal cord
  - Weakness of Interarytenoid muscle → Posterior bowing of vocal cord



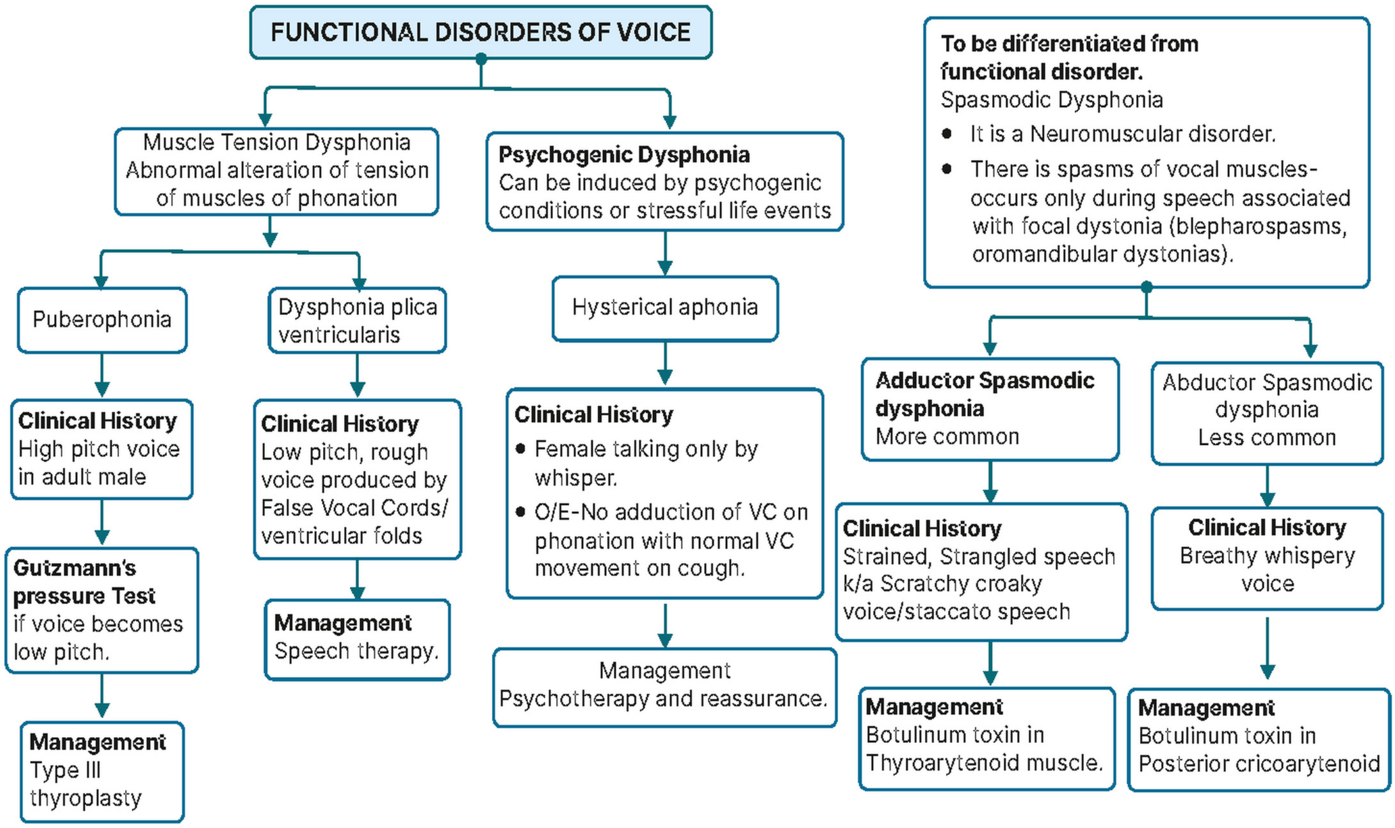


Functional Aphonia

- A/K/A Hysterical aphonia
- Seen in emotionally labile individuals
- Predisposing factors
  - Stress / Anxiety
  - Sudden emotional shock
- It is not associated with a neurological deficit
- Diagnosis

IDL examination / Laryngeal examination
↓
Asking the patient to cough
↓
Adduction of the vocal cord is seen
↓
Suggests vocal cord is mobile - Normal

- Treatment
  - Psychotherapy and Reassurance



One Liners

- Gutzmann pressure test is used for the diagnosis of Puberphonia
- Keyhole appearance of the vocal cord is seen in Phonasthenia
- Adductor spasmodic dysphonia occurs due to Thyroarytenoid spasm
- Abductor spasmodic dysphonia occurs due to Posterior cricoarytenoid spasm

VOCAL CORD PARALYSIS

Superior Laryngeal Nerve

At the upper half of the neck
↓
At the level of hyoid bone - between bifurcation of carotid
↓
SLN divides into

External laryngeal nerve ↙ ↘ Internal laryngeal nerve

Internal laryngeal nerve
↓
Pierces thyrohyoid membrane in the upper part of the neck
↓
Sensory supply of larynx above vocal cord

External laryngeal nerve → Motor supply to circothyroid muscle

Recurrent Laryngeal Nerve

- In right side → given at the level of the right subclavian artery

- In left side → given at the level of the arch of aorta

Important Information

- Left recurrent laryngeal nerve is the only nerve enters the mediastinum

Nerve Injury In Relation To Thyroid Surgery

- In thyroid surgery, M/c affected RLN is Right
- Overall, M/c injured RLN is the left because of its longer course
- External laryngeal nerve can be injured while ligating the superior thyroid artery
- Recurrent laryngeal nerve can be injured while ligating the inferior thyroid artery
- In thyroid surgery, injury to the external laryngeal nerve > the recurrent laryngeal nerve

Nerve Supply Of Larynx

- Sensory
  - Supraglottis - Internal laryngeal nerve
  - Glottis - Recurrent laryngeal nerve
  - Subglottis - Recurrent laryngeal nerve
- Motor
  - All muscles except cricothyroid - Recurrent laryngeal nerve
  - Cricothyroid - External branch of the laryngeal nerve

Nerve Palsy

Nerve	Supply	Effect of injury / Palsy
ILN	Sensory to Supraglottis	• Aspiration
ELN	Supplies cricothyroid muscle, which is tensor and adductor of vocal cord	• Inability to raise the pitch
SLN	ILN+ELN	• Aspiration • Inability to raise the pitch
RLN	All muscles except cricothyroid	• Position of vocal cord - Median / Paramedian (Wagner and Grossman theory) - K/a - Abductor / Incomplete palsy • U/L palsy - Asymptomatic / Hoarseness • B/L palsy - Stridor
SLN+RLN	Complete palsy	• Complete / adductor palsy • Position of vocal cord - Cadaveric/intermediate position

Clinical Significance Of Course Of Vagus

Surgeries in which areas	Can injure which branch to the larynx
Base of the skull	SLN,RLN,Complete palsy
Neck (carotid triangle)	SLN and its branches ELN , ILN
Thyroid triangle	Upper pole - ELN Lower pole - RLN
Mediastinal (Bronchogenic Ca , Aneurysm of arch of aorta , cardiovascular surgery - Bypass and grafting)	Left RLN

Management

- U/L RLN - Conservative management
- B/L RLN - Stridor - Tracheostomy followed by Lateralization by Cordectomy, Woodman's, Kashima Thyroplasty type II.
- Complete - Aphonia and aspiration - Medialization by Teflon, Fat, hydroxyapatite injection, thyroplasty type I

Position Of Vocal Cord In Health & Disease

Position	Location of cord from midline	Situations in	
		Health	Disease
Median	Midline / paramedian	Phonation	RLN paralysis
Intermediate (Cadaveric)	3.5mm This is the neutral position of the cricoarytenoid joint. Abduction takes place from this position	Maintained by the pull of Posterior cricoarytenoid, supplied by RLN, which pulls away from midline, and Cricothyroid, supplied by SLN, which pulls toward the midline	Combined paralysis of both RLN and SLN
Gentle abduction	7mm	Quiet respiration	Paralysis of adductors
Full abduction	9.5mm	Deep inspiration	

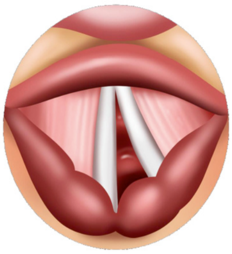
One Liners

- Sensory innervation below the vocal cord is RLN
- Sensory innervation above the vocal cord is SLN (ILN)
- Sensory anastomoses between ILN and RLN is called Galen's anastomoses
- All muscles receive motor innervation from RLN except Cricothyroid
- M/c cause of RLN palsy is Idiopathic >Traumatic
- M/c cause of RLN palsy on left side is Bronchogenic Ca, Aneurysm of aorta, mediastinal pathology

LARYNGEAL NERVE PALSIES

02:00:00

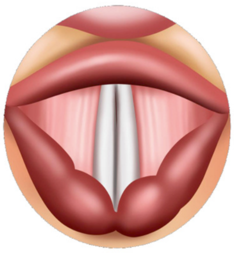
UNILATERAL RECURRENT LARYNGEAL NERVE (RLN) PALSY



Example: Right Recurrent Laryngeal Nerve Palsy

- Sensory Loss:
  - Right side of larynx, below the level of vocal cords
    - → The recurrent laryngeal nerve is sensory below the level of the vocal cord
  - Left side: No sensory loss (because of unilateral palsy)
- Motor Loss
  - Right Side (Affected Side):
    - → All muscles are paralyzed except the cricothyroid muscle
      - → Cricothyroid is spared because it is supplied by the external branch of the superior laryngeal nerve (SLN)
  - Left Side (Normal Side):
    - → All muscles functional (no palsy)
- Position of Vocal Cord
  - Normal position: Intermediate position (cadaveric position)
  - In RLN palsy:
    - → Posterior cricoarytenoid is paralyzed → abduction function lost
    - → Adduction and tension function is retained
    - → The paralyzed cord lies in the median or paramedian position
- Effects on Phonation → No major change
  - Paralyzed cord already in median/paramedian position
  - Opposite cord can come to the midline
  - Both cricothyroids are functional
  - Adduction happening normally
  - May have mild change in voice due to paralysis of other adductors
- Effects on Respiration
  - Paralyzed cord cannot move away from midline (abductor paralyzed)
  - Normal cord can move away from midline
  - Result: No stridor, but dyspnea on exertion present
- Treatment: Wait and watch

BILATERAL RECURRENT LARYNGEAL NERVE (RLN) PALSY

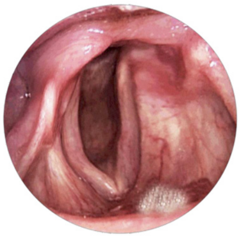


- Sensory Loss
  - B/L sensory loss below the level of the vocal cords
- Motor Loss
  - Both posterior cricoarytenoids affected and paralyzed
  - Bilateral paralysis of all muscles except cricothyroid
- Position of Vocal Cord
  - Both vocal cords lie in the midline or paramedian position
    - → Abductor is paralyzed on both sides
- Effects on Phonation
  - Both cords are already in the midline
  - Cricothyroid is functional

Yourwish

- Result: No major change in voice
- Some change may occur due to paralysis of other adductors (thyroarytenoid, interarytenoid)
- Effects on Respiration
  - Both vocal cords are unable to move away from the midline → Stridor
    → As B/L Posterior cricoarytenoid is paralyzed
  - Stridor is a feature of bilateral RLN palsy
- Treatment
  - Immediate: Tracheostomy
  - After tracheostomy: Create space for air
    → Lateralize the cord
    → Resect some tissue to create space
  - Surgical Procedures (Type 2 Thyroplasty):
    → Arytenoidectomy: Remove only the arytenoid to create space
    → Cordectomy: Remove only the posterior 2/3rd of the vocal cord
    → Kashima's Operation: Remove arytenoid + posterior 2/3rd of cord

UNILATERAL SUPERIOR LARYNGEAL NERVE (SLN) PALSY



- Superior laryngeal nerve → Internal laryngeal nerve
  - Sensory to the larynx above the level of vocal cord

Example: Right Superior Laryngeal nerve palsy

- Sensory Loss:
  - Right side: Sensory loss above the level of vocal cords
  - Left side: Normal sensation
- Motor Loss:
  - Right Side (Affected):
    → Only the cricothyroid muscle is paralyzed
    → Rest of muscles are functional (supplied by recurrent laryngeal nerve)
  - Left Side:
    → All muscles functional (unilateral SLN palsy)
- Position of Vocal Cord:
  - The adductor and tensor (cricothyroid) are paralyzed
    → Posterior cricoarytenoid has more power
    → Pulls the vocal cord to the abducted position
  - ASKEW Position:
    → Normal cord in intermediate position + Paralyzed cord in abducted position
    → Seen in: Unilateral SLN palsy because the cricothyroid is paralyzed on that side.
- Effects on Phonation
  - Paralyzed cord cannot go to the midline, as the cricothyroid is paralyzed
  - Other adductors can pull it, but cannot do the tensor function
  - Result: Definite change in voice → Cannot increase pitch or tone
- Effects on Respiration
  - Paralyzed cord already in the abducted position
  - Normal cord can go to the abducted position
  - Result: No effect on respiration

- Moderate risk of aspiration
- Treatment
  - Aim: Reduce aspiration
  - Procedure: Medialize the cord → Type 1 Thyroplasty
    → Put fat graft in the paraglottic space
    → Push the cord medially
    → Fat injection in the vocal cord

BILATERAL SUPERIOR LARYNGEAL NERVE (SLN) PALSY

- Sensory Loss:
  - Bilateral sensory loss above the level of the vocal cord
- Motor Loss
  - Bilateral cricothyroid muscles are paralyzed
  - Rest of muscles are functional
- Position of Vocal Cord
  - Posterior cricoarytenoid has more power → Vocal cord in abducted position
- Effects on Phonation
  - Cannot come to midline, cannot stretch
  - Aphonia is a feature of bilateral SLN palsy
- Effects on Respiration
  - Both paralyzed cords in the abducted position
  - Result: No problem with respiration
- Risk of Aspiration
  - Highest risk of aspiration
    → Bilateral sensory loss above the level of the vocal cords
    → Both cords are 7mm away from midline → Total 14mm gap
- Treatment
  - Initially: Tracheostomy (protect airway)
  - For intractable aspiration: Tracheoesophageal diversion + Permanent tracheostomy
    → Divert 1st tracheal ring with the upper esophagus
    → Any aspiration through larynx → goes through the 1st tracheal ring into the esophagus
    → From the 2nd tracheal ring → bring out as a permanent tracheostomy

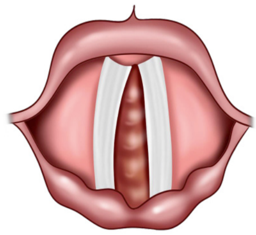
UNILATERAL COMBINED PALSY (SLN + RLN on ONE side)

Example: Right side SLN + RLN palsy

- Sensory Loss
  - Right hemilarynx: Anesthetized
  - Left hemilarynx: Completely functional
- Motor Loss
  - Right Side: All muscles are paralyzed
  - Left Side: All muscles functional
- Position of Vocal Cord
  - Affected cord → Intermediate position with bowing
  - Opposite cord → Normal intermediate position
- Effects on Phonation

- Difficulty in speaking
- Mild change in voice
- Effects on Respiration
  - No stridor
  - Dyspnea on exertion +
- Moderate risk of aspiration
- Treatment:
  - Tracheostomy to protect the airway
  - Type 1 Thyroplasty: Medialize the paralyzed cord after tracheostomy

BILATERAL COMBINED PALSY (Bilateral SLN + RLN) 02:15:28

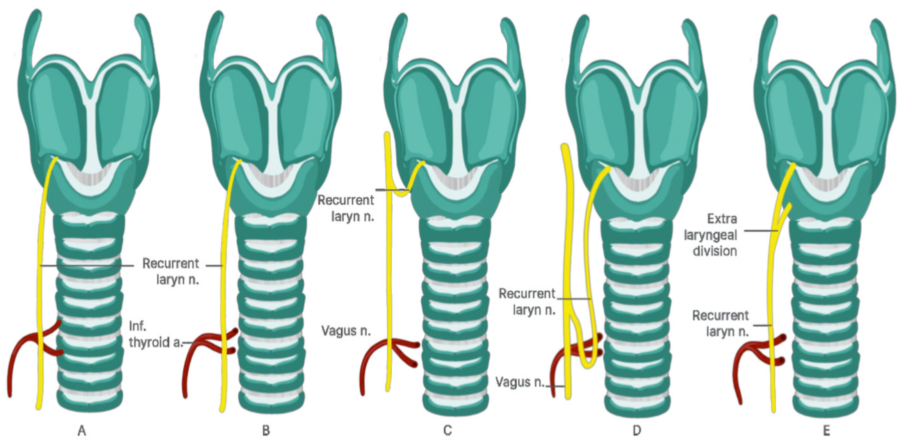


- Sensory Loss
  - Sensory loss in the complete larynx
- Motor Loss
  - All muscles are paralyzed bilaterally
- Position of Vocal Cord
  - Both cords are in intermediate position, but bowing
- Effects on Phonation
  - Both cords cannot come to the midline → aphonia
  - Aphonia is feature of bilateral SLN palsy and bilateral combined palsy
- Effects on Respiration
  - Dyspnea on exertion
  - Not stridor
- Risk of Aspiration
  - Complete sensory loss of larynx   High risk of aspiration
- Treatment
  - Directed towards aspiration
  - Tracheostomy to protect airway

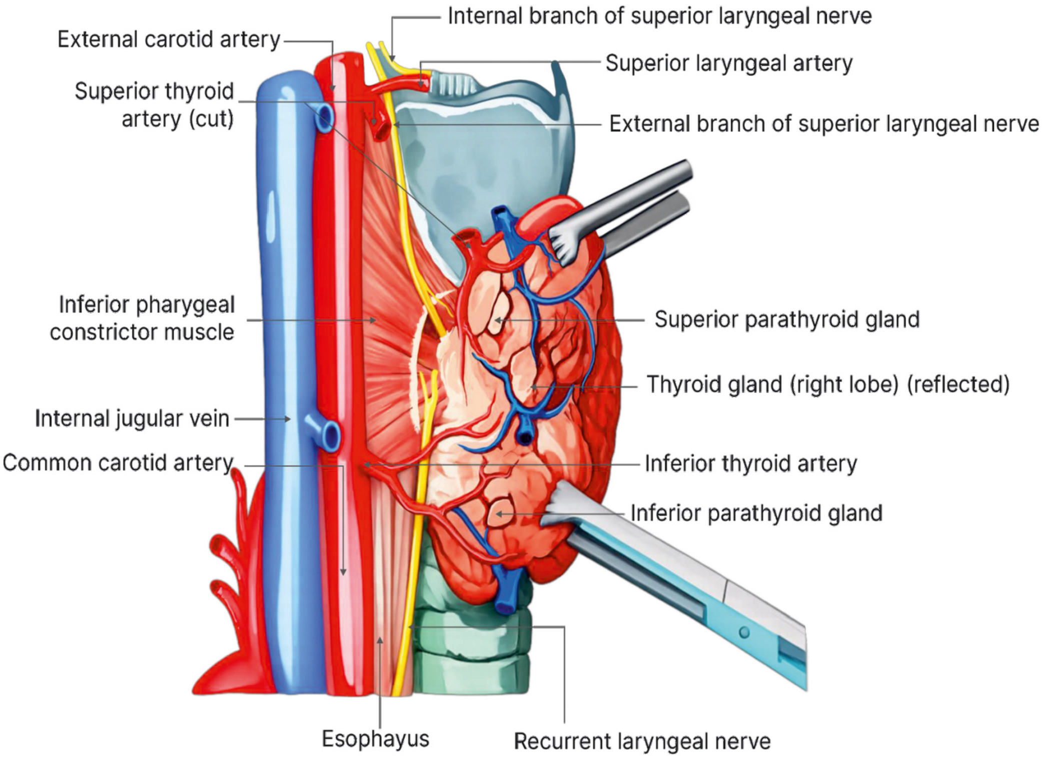
ANATOMICAL RELATIONS AND TRIANGLES 02:16:40

RELATION TO INFERIOR THYROID ARTERY

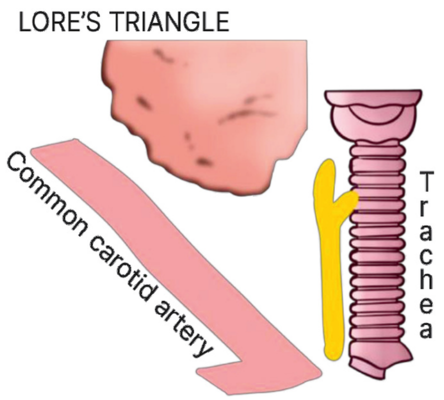
- Recurrent laryngeal nerve in close proximity to inferior thyroid artery
  - When ligating inferior thyroid artery on right side → High risk of recurrent laryngeal nerve palsy

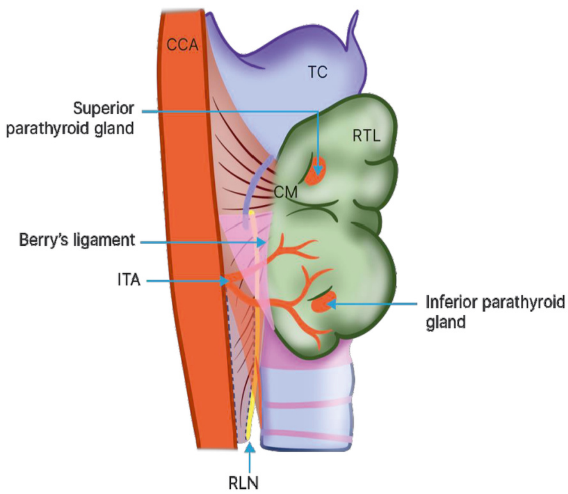


TRIANGLES ASSOCIATED WITH RECURRENT LARYNGEAL NERVE



- Common Landmarks :
  - Laterally: Common carotid artery
  - Medially: Recurrent laryngeal nerve in the tracheoesophageal groove
- BEAR'S TRIANGLE
  - Superior boundary: Inferior thyroid artery
- LOWRY'S TRIANGLE
  - Superior boundary: Lower pole of thyroid
- SIMON'S TRIANGLE
  - Superior boundary: Cricothyroid muscle





TRIANGLE ASSOCIATED WITH SUPERIOR LARYNGEAL NERVE

02:19:25

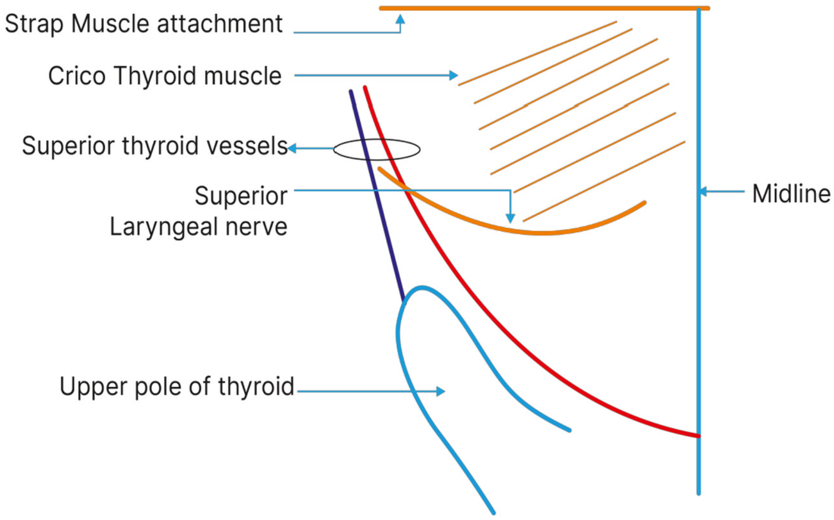
JOLLS'S TRIANGLE

- Boundaries:
  - Medially: Midline
  - Laterally: Upper pole of thyroid (with superior thyroid vessels and superior laryngeal vessels)

Yourwish

- Superiorly: Insertion of strap muscles
- Floor: Cricothyroid muscle (supplied by external branch of SLN)

Joll's Triangle



Important Information

- Thyroid:
  - Lower pole related to the recurrent laryngeal nerve
  - Upper pole related to the external branch of SLN

ANESTHESIA FOR INTERNAL LARYNGEAL NERVE

- Injection given below the greater cornua of the hyoid bone
- The internal laryngeal nerve is found at this location
- Given off from the superior laryngeal nerve at this part → Pierces the thyrohyoid membrane
  - Gives sensation to the larynx above the level of vocal cord

ERROR FILES

- Strider:
  - Seen only in bilateral RLN palsy
- Aphonia is seen in:
  - Bilateral SLN palsy
  - Bilateral combined palsy
- Vocal cord position in midline: In RLN palsy
- Vocal cords in abducted position: In SLN palsy
- Askew position:
  - Paralyzed cord in abducted position and bowing
  - Normal cord in intermediate position
  - Seen in unilateral SLN palsy
- Highest risk of aspiration: Bilateral SLN palsy
  - Vocal cords are away from each other in abducted position
  - Bilateral loss of sensation above the level of vocal cord

Yourwish

LARYNGEAL CANCER

02:22:10

Feature	Supraglottis	Glottis	Subglottis
Incidence	Intermediate	Most common	Least common
Site	Most common in epiglottis	Free edge & superior surface of anterior & middle 1/3 of vocal cord	Midline in anterior half
Appearance	Suprahyoid - Exophytic Subhyoid - Ulcerative	Nodule/ulcer/thickening of the vocal cord	Submucosal nodule
Vocal cord involvement	Very late → hoarseness is a late feature	Early involvement → early hoarseness Fixation very late (bad prognostic sign) → Indicates infiltration of thyroarytenoid muscle	Late
Metastases	• Very early (rich lymphatics) • Bilateral nodes in epiglottic carcinoma (midline) • Upper & middle deep cervical nodes	None (scant lymphatics in vocal cords)	• Early • Bilateral • Lower deep cervical, pre-tracheal, para-tracheal
Symptoms	Silent until late Late: Dysphagia, throat pain, referred ear pain, respiratory distress	Hoarseness of voice	Silent Respiratory distress (late)
Nature	Anaplastic, highly malignant	Well differentiated, less malignant	–
Prognosis	Bad → Late symptoms + early lymphatic spread + high malignancy	Good → Early detection (HOV) + no lymphatic spread + well differentiated	

PYQ POINTS

- MCn carcinoma: Squamous cell carcinoma
- MC site is at the level of the glottis
- Gender: Usually seen in males
- Presentation: Hoarseness of voice
- Smokers, > 50, males, hoarseness of voice for > 3 weeks → evaluate for malignancy
- Lymphatic metastasis:
  - Least/no metastasis: Glottic cancers

  - Maximum lymphatic spread: Supraglottic malignancies
  - Bilateral metastasis: Epiglottic cancer
- Pain in the ear in carcinoma larynx is referred via the vagus nerve
  - Vagus gives auricular branch called Arnold's nerve
- Laryngeal ligaments and membranes act as barriers to prevent tumor spread

TNM STAGING

02:24:50

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Stage	Criteria
Stage 1	T1, N0, M0
Stage 2	T2, N0, M0
Stage 3	T3, N0, M0 or T1/T2/T3+ N1, M0 Rule: N1 → Stage 3
Stage 4a	T4A, N0, M0 or T1/T2/T3/T4a + N2, M0 Rule: N2 → Stage 4A
Stage 4b	T4B, N0, M0 or T1/T2/T3/T4a/T4b + N3, M0 Rule: N3 → Stage 4B
Stage 4c	Any T, Any N, M1 Rule: Any metastasis → Stage 4C

T Stage	Description
T1	Tumor in one subsite of the larynx (glottis/supraglottis/subglottis) The vocal cord is fully mobile
T2	Tumor in >1 subsite of the larynx The vocal cord is completely or partially mobile
T3	Tumor in >1 subsite of the larynx ANY of: Vocal cord fixed Involves pre-epiglottic / paraglottic space Involves inner perichondrium
T4a (Local spread)	Tumor breaks inner + outer perichondrium Extends outside larynx: Anterior → Strap muscles Superior → Base of tongue Posterior → Hypopharynx Inferior → Trachea

T4b (Advanced/distant spread)	Extends to: Retropharyngeal/prevertebral space via hypopharynx Advanced unresectable spread

N Stage	Description
N0	No neck nodes
N1	Node < 3 cm
N2	Nodes 3-6 cm
N2a	Single ipsilateral node
N2b	Multiple ipsilateral nodes
N2c	Contralateral nodes
N3	Node > 6 cm
N3a	No extranodal spread
N3b	Extranodal spread present

M Stage	Description
M0	No distant metastasis
M1	Distant metastasis present

INVESTIGATIONS

- IOC: Biopsy
- First line investigation → Radiological: Contrast-enhanced CT scan
  - MRI is indicated only when cartilage or spaces around the larynx are involved

TREATMENT

STAGE 1 AND STAGE 2 (PRIMARY PATIENT)

- First-line treatment: Radiotherapy
  - Voice preserved
  - Exception:
    → Carcinoma of the middle 1/3rd of the vocal cord → Microlaryngeal surgery
- Recurrence in Stage 1 and 2
  - Cannot give radiation again Conservative surgery
    → Partial laryngectomy (based on lesion)

STAGE 3 OR EARLY 4A (PRIMARY)

- Treatment: Concurrent chemo-RT
  - Cisplatin/ Carboplatin/ Cetuximab

Yourwish

- Large T3 or T4a with one arytenoid spared → Near total laryngectomy
    - Remove the entire larynx except the arytenoid not involved in the disease
- Advanced disease - B/L arytenoids involved → Total laryngectomy
- Stage T3 or T4a with recurrence → Total laryngectomy
- Patient cannot take chemo-rt (e.g., prior chemoradiation) → Total laryngectomy
- Carcinoma of the epiglottis spreading to the pre-epiglottic space:
    - If a small lesion on the epiglottis is just going to the pre-epiglottic space with no nodal spread → Partial laryngectomy

VOICE REHABILITATION (After Total Laryngectomy)

02:36:49

- Esophageal speech: Can speak only a few words
- Tracheoesophageal speech: Serviceable speech, can talk sentences
- Electrolarynx: Artificial larynx, not commonly used

NECK DISSECTION IN CARCINOMA LARYNX

02:37:05

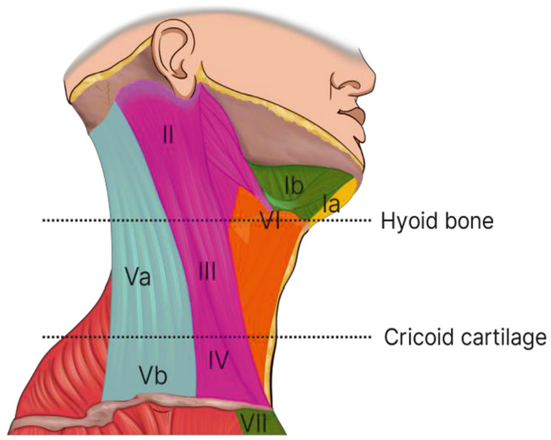
NECK DISSECTION IN CARCINOMA LARYNX

Indication of Neck Dissection in Carcinoma Larynx

- If any neck node is present, it should be managed by neck dissection if the primary is treated by surgery and by RT if the primary is treated by RT.
- In No neck-if chances of occult LN is > 15% →e.g. supraglottic Carcinoma → Selective lateral neck dissection (removal of only selective LN and no non lymphatic structures) should be done

Lateral neck dissection removes LN II, III and IV. Anterior compartment neck dissection removes level VI. (Delphian node)

Levels of Lymph Node in the Neck



Levels Ia : Submental
Level Ib : Submandibular
Level II : Upper deep cervical
Level III : Middle deep cervical
Level IV : Lower deep cervical

Levels Va : Posterior triangle
Level Vb : Supraclavicular
Level VI : Anterior compartment (lymph nodes)
Level VII : Superior mediastinal

NECK DISSECTION IN CARCINOMA LARYNX

Radical ND
LN removed-I to V
Nonlymphatic structures removed
- Nerve -Spinal accessory
- Vein- IJV
- Muscle- SCM
- tail of Parotid, submandibular salivary gland, omohyoid

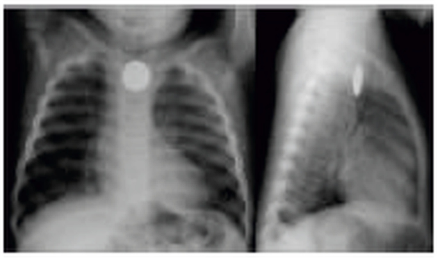
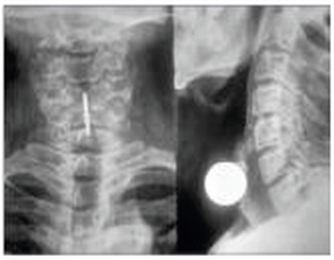
Modified RND
LN removed-I to V
Structures preserved
- Spinal accessory nerve-MRND 1
- Spinal accessory nerve+IJV→ MRND II
- Spinal accessory nerve+IJV+SCM →MRND III also k/a funtional neck dissection/Comprehensive neck dissection

ERROR FILES – LARYNGEAL CANCER

- Best prognosis: Glottic malignancies (early presentation + no lymphatic spread)
- T3 → 3 rules:
  - Vocal cord fixation
  - Spaces involved
  - Inner perichondrium involved
- First investigation: Contrast-enhanced CT scan
- Role of MRI: Only when cartilage or space involvement
- Total laryngectomy indications:
  - Bilateral arytenoid involvement in a primary patient with a large malignancy
  - Patient who cannot tolerate chemo-RT
  - Stage T3 or T4A with recurrence

FOREIGN BODY IN AIRWAY AND ESOPHAGUS

02:39:50

FOREIGN BODY IN TRACHEA	FOREIGN BODY IN UPPER ESOPHAGUS
• X-ray AP view: Appears SLIT-LIKE rim • X-ray lateral view: Appears ROUND 	• X-ray AP view: Appears ROUND • X-ray lateral view: Appears SLIT-LIKE • Airway seen anterior to the coin 

FOREIGN BODY IN AIR PASSAGE

- Presentation:
  - Common in the younger age group (1-4 years)
  - MC FB → Nuts and peanuts
  - Earliest symptoms: Sudden onset, paroxysmal coughing, choking, gagging
  - Later: Hoarseness, hemoptysis, stridor

MANAGEMENT

FOREIGN BODY LARYNX

↓

Management

↓

First aid

- If no resp distress, able to speak-Back blows and encourage coughing.
- If Conscious with Universal choking sign (inability to speak, breathe, cough) → Heimlich maneuver also k/a abdominal thrustes.
  - **Complications**
    Gastric and esophageal perforation, rib fracture, injury to abdominal organs.
  - **Contraindication**
    - Age-< 1yr
    - Unconscious-give sternal compression
    - Pregnancy-give chest thrust (over the sternum).
- If F.B visible-finger sweep maneuver

IF FIRST AID FAILS:

- In CICO (Cannot intubate, cannot oxygenate)
  - Do emergency Cricothyrotomy - For temporary access to the airway
    ↓
  - Minitracheostomy – Vertical incision given in the cricothyroid membrane.
    ↓
  - Removal by rigid Laryngotracheobronchoscopy


Cricothyroid membrane site of cricothyrotomy

HEIMLICH MANEUVER

- Patient held from behind, sudden inward and upward thrusts given over the epigastrium below the sternum
- To do when the patient is conscious & showing signs of distress

MCQ

Q1. A singer is finding difficulty in raising the pitch of her voice. On examination, her vocal cords were depressed and bowing. Which of the following muscles is involved?

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a. Cricothyroid
b. Interarytenoid
c. Posterior cricoarytenoid
d. Lateral arytenoid

Answer: **a**

Q2. Which of the statements is true regarding laryngomalacia?

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a. Expiratory stridor
b. Breathing improves in supine position
c. Most common congenital abnormality in infants
d. Surgical management is required in most children

Answer: **c**

Q3. A child is brought to the hospital with respiratory distress and biphasic stridor. The radiograph is shown below. What is the diagnosis?
a. Acute epiglottitis
b. Acute laryngotracheobronchitis
c. Foreign body aspiration
d. Laryngomalacia

Answer: **b**

Q4. A 55-year-old patient comes with hoarseness of voice and difficulty swallowing. The patient was diagnosed with laryngeal carcinoma, and surgical management was done. The post-operative image of the patient is given below. Which of the following surgery was done on this patient?

a. Partial laryngectomy

b. Percutaneous tracheostomy

c. Standard tracheostomy

d. Total laryngectomy

Answer: d

Yourwish

18. FACIAL NERVE

- Is it a sensory, motor, or mixed nerve?
  - Mixed nerve (Sensory, motor & secretomotor root)
- What is the sensory root called?
  - Nerve of Wrisberg (Nervus intermedius)
- Where is the facial nerve nucleus present?
  - Pons
- What is the meaning of supranuclear and infranuclear palsy?
  - **Supranuclear** → Lesion in the cerebral cortex above the pons
  - **Infranuclear** → Lesion below the level of the nucleus in the pons
- Why is the forehead spared?
  - D/t B/L innervation from the cerebral cortex
  - **UMN palsy** → Forehead involved
  - **LMN palsy** → Forehead spared

ANATOMY OF FACIAL NERVE

00:02:01

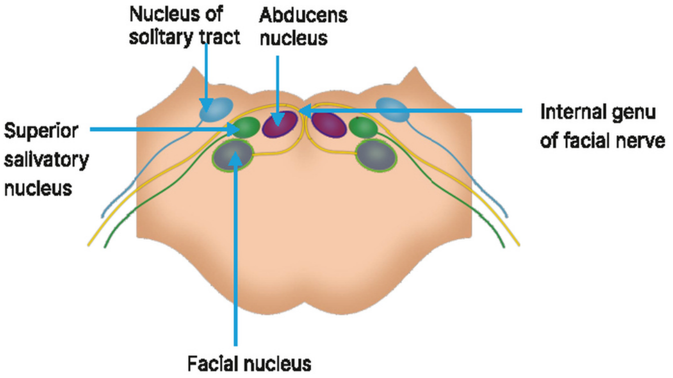
Subsegments of The Facial Nerve

INTRACRANIAL	• Nucleus in the pons → Internal auditory meatus (IAM)
INTRATEMPORAL	• IAM → Inner ear (labyrinthine segment) → Middle ear (tympanic segment) → Mastoid
EXTRACRANIAL	• Comes out of the mastoid through the stylomastoid foramen → Parotid gland → 5 terminal branches

Facial Nerve In The Brainstem

Facial Colliculus

- The facial nerve winds around the nucleus of the abducens, forming the facial colliculus & exits at the cerebello-pontine junction

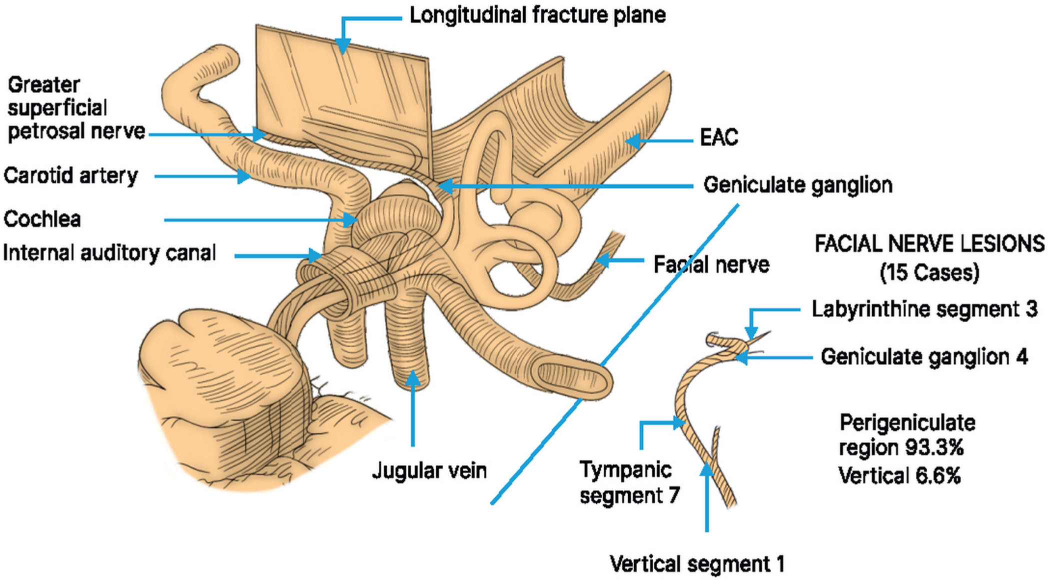


- **What happens when there is a lesion in the brainstem?**
  - 7^{th} & 6^{th} nerve palsy
  - C/L hemiplegia

    → This condition is also called Millard-Gubler syndrome

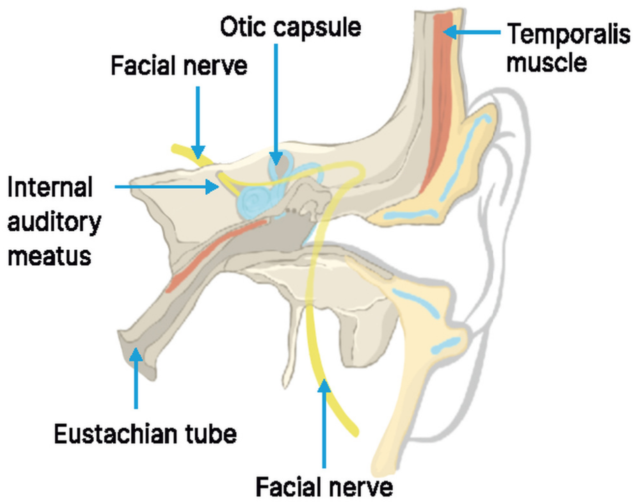
Intracranial Course Of The Facial Nerve

- Pons → Internal auditory meatus



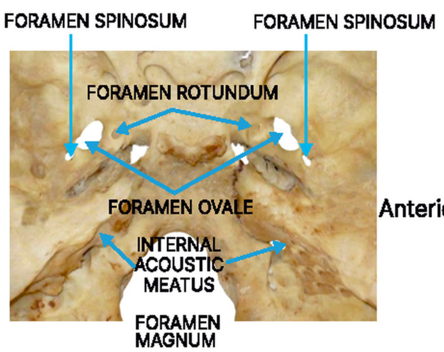
Intratemporal Segment of The Facial Nerve

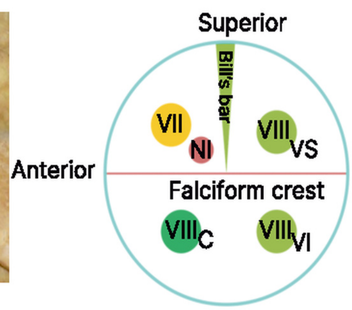
- The intratemporal segment is the longest
- Only cranial nerve to run most of its course through a bony canal (Fallopian canal)
  - Bony canal → Dehiscent in 50%
  - Most common site of dehiscence → Horizontal part
- Divided into:
  - Meatal segment
  - Labyrinthine segment
  - Tympanic segment
  - Mastoid segment



Meatal Segment

- Length- 8-10 mm
- Seen in the IAM- Facial nerve travelling with the Cochlear nerve
- Vertical crest on bone in the superior part → Bill's bar
- Horizontal crest → Falciform crest
- Anterosuperior quadrant- Facial nerve
- Inferior quadrant- Cochlear nerve



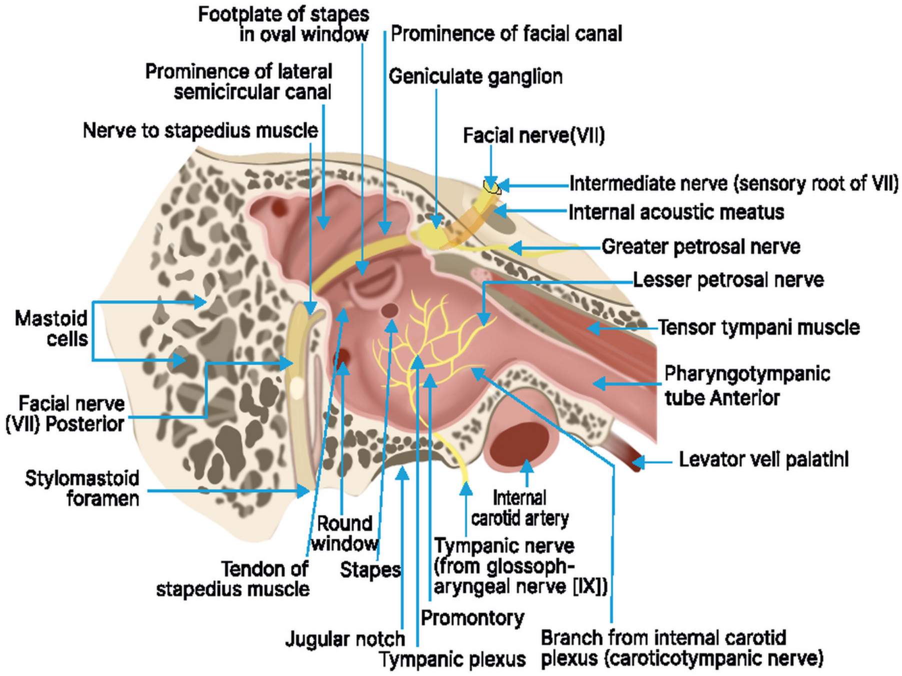


Labyrinthine Segment

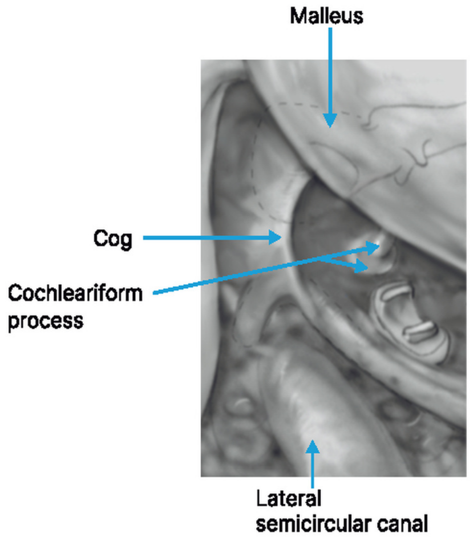
- Inner ear segment
- 3-4 mm in length and 0.7 mm in diameter → shortest & narrowest → prone to ischemia & edema (Bell's palsy)
- Travels over the vestibule in the inner ear
  - Anteriorly → Cochlea
  - Posteriorly → Semicircular canals

Tympanic Segment

- Horizontal segment - 11 mm & Vertical - 13mm
- From the inner ear, it enters the medial wall of the middle ear, making a turn → First genu/Geniculate ganglion
  - Landmark for first genu: Cochleariform process
- Horizontal segment: Runs above the oval window & below the lateral SCC
- Goes to the mastoid to make the second turn: Second genu
  - Landmark: Pyramidal process

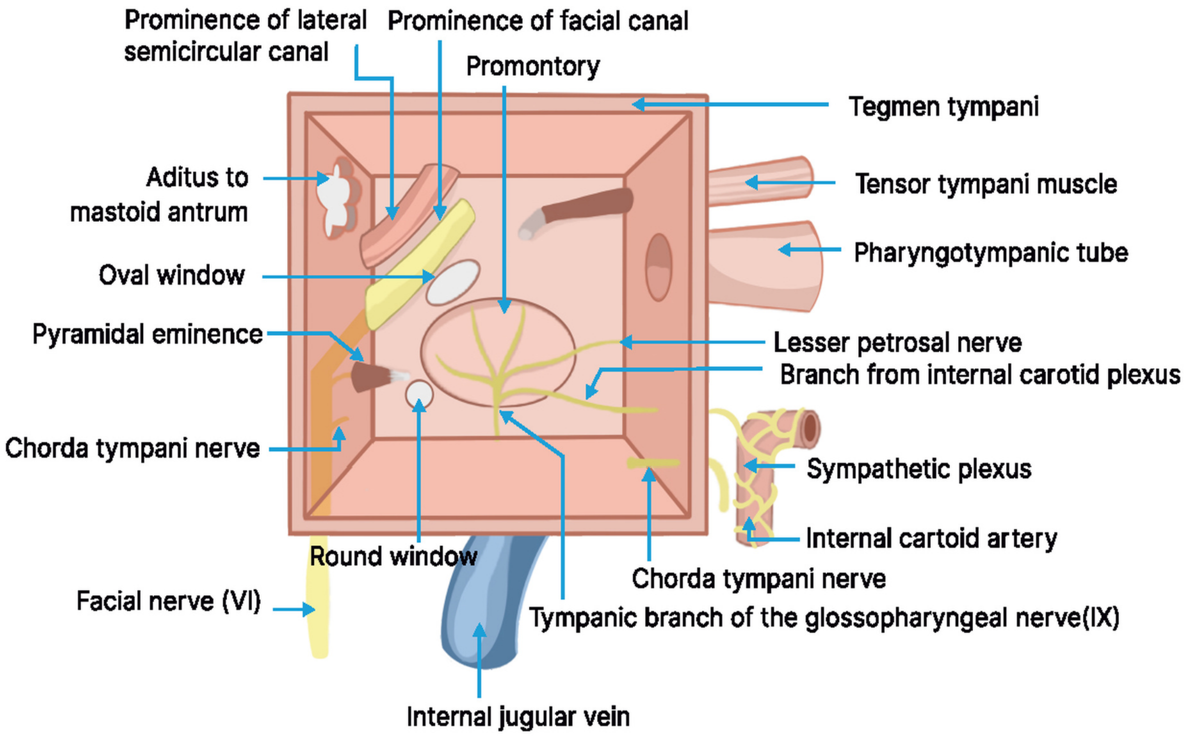


Right medial wall of the middle ear



Mastoid Segment

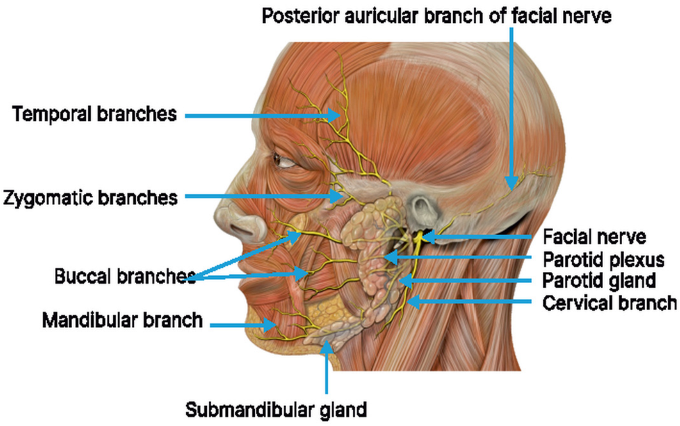
- The nerve runs vertically, also known as the mastoid segment
  - Landmark: Tympanomastoid suture



Extracranial Segment Of The Facial Nerve

00:10:07

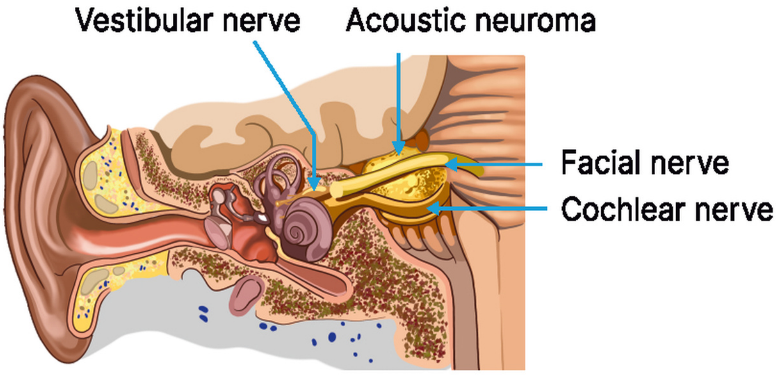
- Exits through the stylomastoid foramen → Between the superficial & deep lobes of the parotid gland → gives 5 terminal branches
  - Temporal, Zygomatic, Buccal, Marginal mandibular & Cervical



Subsegments & Features

Part	Special Feature	Landmarks	Branches
Meatal segment	Present within the Internal Auditory Meatus (IAM).	Separated from the superior vestibular nerve by a bony ridge called Bill's bar	None
Labyrinthine segment	Located in the inner ear, the shortest and narrowest segment of the facial nerve canal		None
Tympanic / Horizontal segment	Runs along the medial wall of the middle ear; a common site for congenital dehiscence of the fallopian canal	Processus cochleariformis Cog Between the bulge of lateral SCC above & oval window below	1st **branch - Greater superficial petrosal nerve**: arises from geniculate ganglion; controls lacrimation and nasal & palatal secretions via sphenopalatine ganglion; assessed by Schirmer's test.
Mastoid / Vertical segment	Located on the posterior wall of the middle ear, prone to iatrogenic injury during mastoid surgery	Nerve lies laterally and posterior to the pyramid	2nd **branch - Nerve to stapedius (Mediates stapedial reflex)**: lesion causes hyperacusis 3rd **branch - Chorda tympani**: taste from the anterior 2/3rd of the tongue and parasympathetic supply to the submandibular & sublingual glands; tested by electrogustometry & salivary flow 4th **branch - Sensory auricular branch**: supplies the pinna & external auditory canal; involved in the Hitzelberger sign (Acoustic neuroma)

Yourwish



BRANCHES OF THE FACIAL NERVE

00:12:46

- GSPN → Lacrimation (Assessed by Schirmer's test)
- Nerve to stapedius → Stapedial reflex
- Chorda tympani → Taste from anterior 2/3rd
- Sensory auricular branch to pinna & EAC
- Branches to the submandibular & sublingual glands
- 5 terminal branches → Motor muscles of facial expression

Topodiagnosis

A) Lesion above the first genu - Suprageniculate lesion:

- Loss of lacrimation, stapedial reflex, taste on anterior 2/3rd, dry mouth & LMN type of facial palsy

B) Lesion at the horizontal segment/Infrageniculate/Suprastapedial:

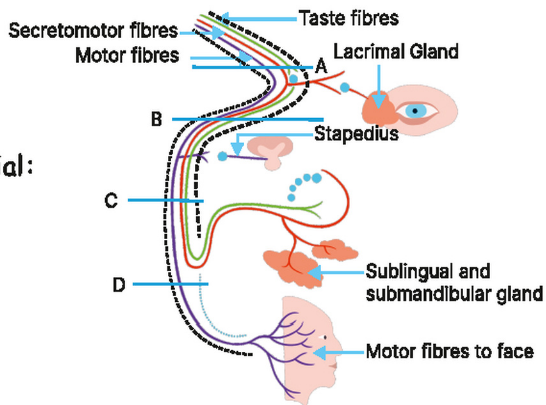
- Lacrimation is preserved & rest of the functions are lost

C) Lesion at the vertical/Mastoid segment:

- Schirmer's & acoustic reflex are preserved & the rest are lost

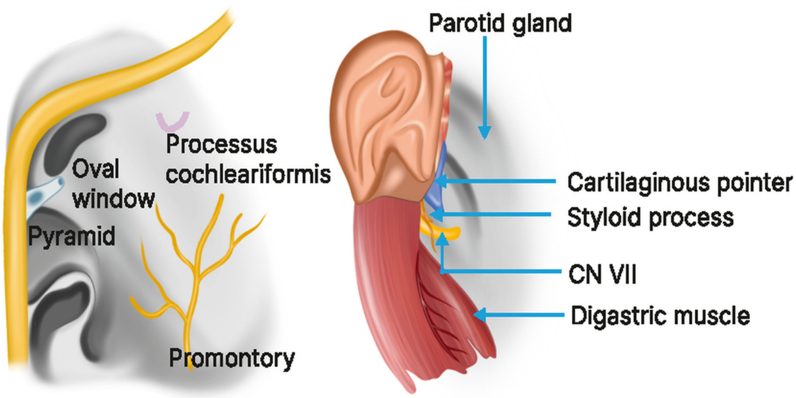
D) Lesion outside the temporal bone:

- Motor paralysis of the face, along with sparing of all the nerves



Surgical Landmarks

00:16:38



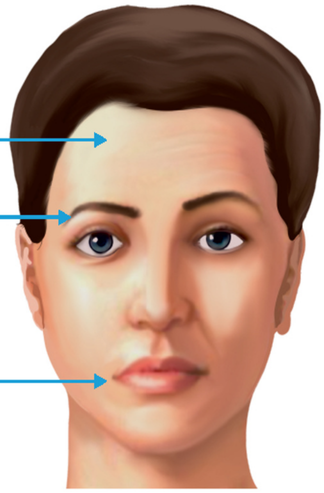
- Processus cochleariformis: The geniculate ganglion lies in front of it
- Oval window and Horizontal canal: The facial nerve lies between them
- Pyramid and fossa incudis
- Digastric ridge

Yourwish

Bell's Palsy

00:16:59

- Idiopathic facial nerve palsy
- Peripheral facial lesions are more common than central, and about **2/3rd** of peripheral lesions are **Bell's palsy**
- Risk is **3x greater** in pregnancy, especially in the **3rd trimester**
- Most commonly associated with **HSV** or **EBV**
- Increased risk with diabetes
- **Clinical features:**
  - Sudden onset symptoms, usually hours with maximal weakness w/in 48 hrs
  - Unilateral
  - Eyebrow sagging
  - Inability to close the eye
  - Loss of nasolabial fold
  - Decreased tearing
  - Hyperacusis
  - Loss of taste to the anterior 2/3rd of the tongue
  - Mouth droop
- **Diagnosis:** Is by exclusion
- **Supportive treatment:** Care of the eye and physiotherapy
- **Medical Management:** Prednisolone (1 mg/kg/day)
  - 10 days for recovery
  - 20 days if recovery is incomplete
- **Surgical Management:** Vertical, tympanic +/- labrynthine segments are decompressed
- **Prognosis: 90%** recover. Good recovery in incomplete Bell's palsy



Merkelson Rosenthal Syndrome

- Recurrent facial nerve palsy
- Swelling of the lips
- Fissured tongue


Swelling of lips   Fissured tongue

FMGE Jan 2023

Recurrent Facial Nerve Palsy

- Melkerson syndrome
- Diabetes
- Sarcoidosis
- Tumours

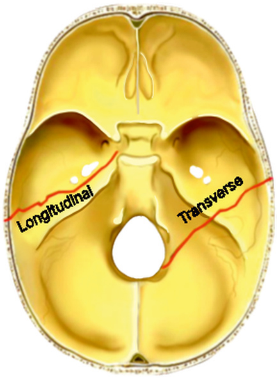
Ramsay Hunt Syndrome/herpes Zoster Oticus

- **Treatment:** Acyclovir/Valacyclovir + Steroids
- Poorer prognosis than Bell's palsy


Vesicles over External   Facial nerve palsy

FRACTURES OF THE TEMPORAL BONE

00:19.38



- Which is common?
  - Longitudinal
- TM perforation occurs commonly in?
  - Longitudinal
- Facial nerve palsy is higher in?
  - Transverse (Facial nerve runs parallel to the longitudinal)
- CHL & CSF otorrhea seen in → Longitudinal
- SNHL seen in → Transverse
- CSF rhinorrhea seen in → Both Longitudinal & Transverse

ELECTROPHYSIOLOGICAL TESTS

00:21:30

Electroneuronography	Electromyography
• If >90 decrease in CMAP within 14 days of paralysis, then the chances of spontaneous recovery is negligible - consider surgical decompression	• Procedure Interpretation - if motor unit potentials are present, then it means the nerve is regenerating • If fibrillation potentials are present, then the chances of spontaneous recovery is negligible • No electric output, then facial reanimation may be considered

Tests for Facial Nerve Palsy

00:22:35

- Topodiagnostic tests - Used to determine the site of nerve lesion:
  - Schirmer test → Assesses lacrimation (dry eye)
  - Stapedial reflex → Absence suggests hyperacusis
  - Evaluation of taste and salivation
- Electrophysiological tests - Helpful in assessing prognosis:
  - Electroneuronography (ENoG): Should not be performed before 3 days, as Wallerian degeneration begins after this period.
  - Electromyography (EMG): Usually performed after >3 weeks

ONE LINERS

- First branch of the facial nerve → GSPN
- Nerve involved in hyperacusis → Nerve to stapedius
- Lacrimation is affected when the facial nerve is injured at what level → 1st genu
- Taste is affected when the facial nerve is injured at what level → Vertical
- The most common cause of facial nerve palsy → Idiopathic / Trauma
- Iatrogenic facial palsy occurs most commonly in which surgery → Mastoid
- The segment of the facial nerve affected first in ischemia and edema → Labyrinthine segment
- Which segment of the facial nerve is affected first in iatrogenic trauma → 2nd genu/Mastoid
- Which fracture of the petrous bone is responsible for facial nerve injury → Transverse
- Crocodile tears occur due to faulty reinnervation with → Gustatory lacrimation due to faulty innervation of GSPN with the chorda tympani nerve

IMPORTANT PYQs ON TRAUMATIC FACIAL NERVE PALSY

- MC iatrogenic cause - Parotid Sx
- 2nd MC iatrogenic cause - Mastoid Sx
- MC site injured in mastoid Sx → 2nd genu followed by vertical segment
- Non-iatrogenic Trauma - More common in a transverse fracture of the temporal bone
- Overall incidence of Longitudinal > transverse fracture
- Ecchymosis behind the ear following basilar skull fracture - k/a Battle's sign
- Best investigation for petrous temporal bone fracture - HRCT
- Following trauma, late-onset palsy management - Steroids
- Following trauma, sudden onset palsy management - Re-exploration and repair
- Aberrant regeneration of the facial nerve can lead to crocodile tears and synkinesis.

SYNDROMES ASSOCIATED WITH THE FACIAL NERVE

- Millard-Gubler
- Melkersson-Rosenthal
- Heerfordt syndrome
- Ramsay Hunt syndrome

FAULTY INNERVATION

- **Crocodile tears** - Injury is before the geniculate ganglion, and reinnervating fibres anastomose with the CT nerve
- **Frey's syndrome** - Gustatory sweating - faulty reinnervation with AT nerve

PYQs

00:25:15

Q. Which diagnosis is most likely for a patient experiencing painful vesicles in the external auditory meatus and over the tympanic membrane, along with facial nerve palsy? Furthermore, which specific site is affected in this case?

a. Ramsay Hunt syndrome and basal ganglion — FMGE Jan 2023
b. Ramsay Hunt syndrome and geniculate ganglion
c. Melkersson syndrome and the trigeminal ganglion
d. Melkersson syndrome and otic ganglion

Ans: **b.** Ramsay Hunt syndrome and geniculate ganglion

- Virus remains latent in the geniculate ganglion

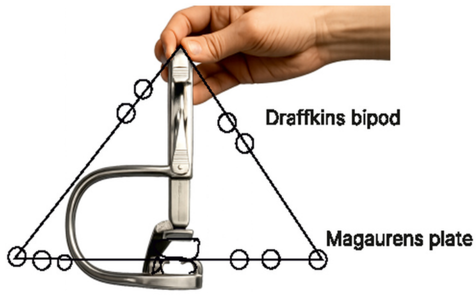
19. INSTRUMENTS

INSTRUMENTS USED IN TONSILLECTOMY

00:00.19

Boyle Davis Mouth Gag With Tongue Blade

- Self-retracting mouth gag
- Stabilised by Draffkin's bipod on Magaurens plate
- The upper end with two blades retracts the upper jaw
- The lower end with the tongue blade retracts the lower jaw



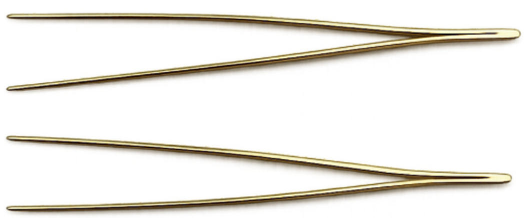
Mollison Tonsillor Dissector

- The tonsil is pulled medially with tonsil holding forceps and dissected from the tonsillar bed using Mollison tonsillor dissector
- This has also got an anterior pillar retractor to retract the anterior pillar and visualise the bed of tonsil to check for a bleeder

Mollison pillar retractor with dissector

Waughs Tenaculum Forceps

- To hold the tissue
- Can be toothed or untoothed



Waugh's Tenaculum forceps

Eve's Tonsillar Snare

- Used to dissect the lower pole of the tonsil
- The pedicle is engaged in the snare and pulled so that the base of the tonsil is crushed and cut

Yonkos Suction

- Used to suction the bed of the tonsil to clear the bleeding

INSTRUMENTS USED IN ADENOIDECTOMY

St Clair Thompson Adenoidectomy Curette

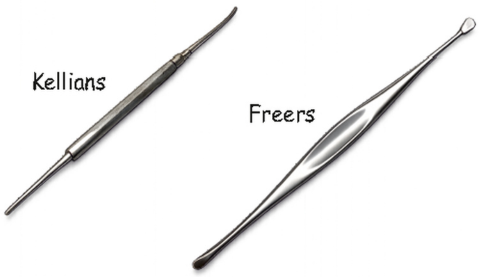
- It has a detachable cage
- Held like a dagger, goes from the oropharynx to the nasopharynx above, and the adenoid is churned off from bed
- Initially used with a cage to prevent chunks of adenoid aspiration
- Later used without a cage to smoothen the bed of tonsil

BULLS LAMP AND HEAD MIRROR

- The head mirror is concave
- Reflects the light from the bull lamp onto the area of interest

FREERS ELEVATOR AND KELLIANS ELEVATOR

- To palpate or elevate the tissue



JOBSONS HORNE PROBE WITH RING CURETTE

- To remove wax or a foreign body

SIEGELS PNUEMATIC SPECULUM

- To assess the mobility of the tympanic membrane
- To increase the pressure in the EAC to elicit the fistula sign
- The speculum end goes into the EAC
- Cuffed end to increase and decrease the pressure

OTOSCOPE

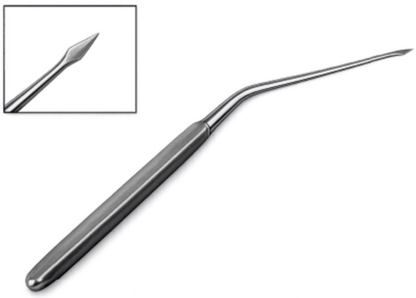
- To visualise the outer ear and tympanic membrane
- Magnification of 2 to 2.5 times is obtained

SIMPSONS AURAL SYRINGE

- Used in syringing to remove the non-hygroscopic foreign body
- It is directed posterosuperiorly to avoid hitting the Tympanic membrane directly
- The temperature of the water used is of body temperature
- 7°C above or below the body temperature can be used, but elicits a caloric reaction in the caloric test

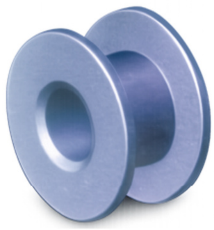
MYRINGOTOME

- Used to make hole in the tympanic membrane to drain the pus in ASOM OR CSOM



GROMMET

- Ventilating tube used in serous otitis media



MASTOID RETRACTORS

Mollison Self-Retaining Hemostatic Mastoid Retractor

- An equal number of prongs on both blades
- Eg: 4 and 4 or 3 and 3

Withlaner Self-Retaining Hemostatic Mastoid Retractor

- An unequal number of prongs on both blades
- Eg: 4 and 3 or 3 and 2

Flesters Self-Retaining Hemostatic Mastoid Retractor

- 4 prongs on one side and 3 on the other side, but one prong is longer than the other two

Perkins Self-Retaining Hemostatic Mastoid Retractor

- 1 prong on one side and 3 OR 4 on the other side

INSTRUMENTS USED IN NASAL EXAMINATION

Thudicums Nasal Speculum

Killians Nasal Speculum

- Self-retaining speculum used in surgery
- Can be used for examination, diagnostic, and therapeutic purposes

Ring Currette

- Used to remove foreign bodies or any other pathologies

Ballinger's Sweivels Knife

- Was used in SMR, which is not done nowadays
- Not used in septoplasty
- Cuts the cartilage and bone with its rotatory motion

Yourwish

Yourwish

Endoscopes

Rigid Endoscopes

- Available in 0°,45°,70°,90°

Fibreoptic Flexible Endoscopes

- To visualize the vocal cords' mobility and their vibration

Asher's Forceps Vs Walshams Forcep

ASHER'S FORCEPS	WALSHAM'S FORCEP
• Asher's forceps is angulated • Used in nasal septal reduction • Both prongs are bare	• Walsham's is straight • Used in nasal bone reduction • It has got rubber tubing on one of the prongs to avoid injury to the orbit • The prong with rubber tubing lies outside the nasal cavity, while the bare one is inside the cavity

Lichwitz Trochar And Canula

- Used for antral wash when the maxilla is opened
- Not used now