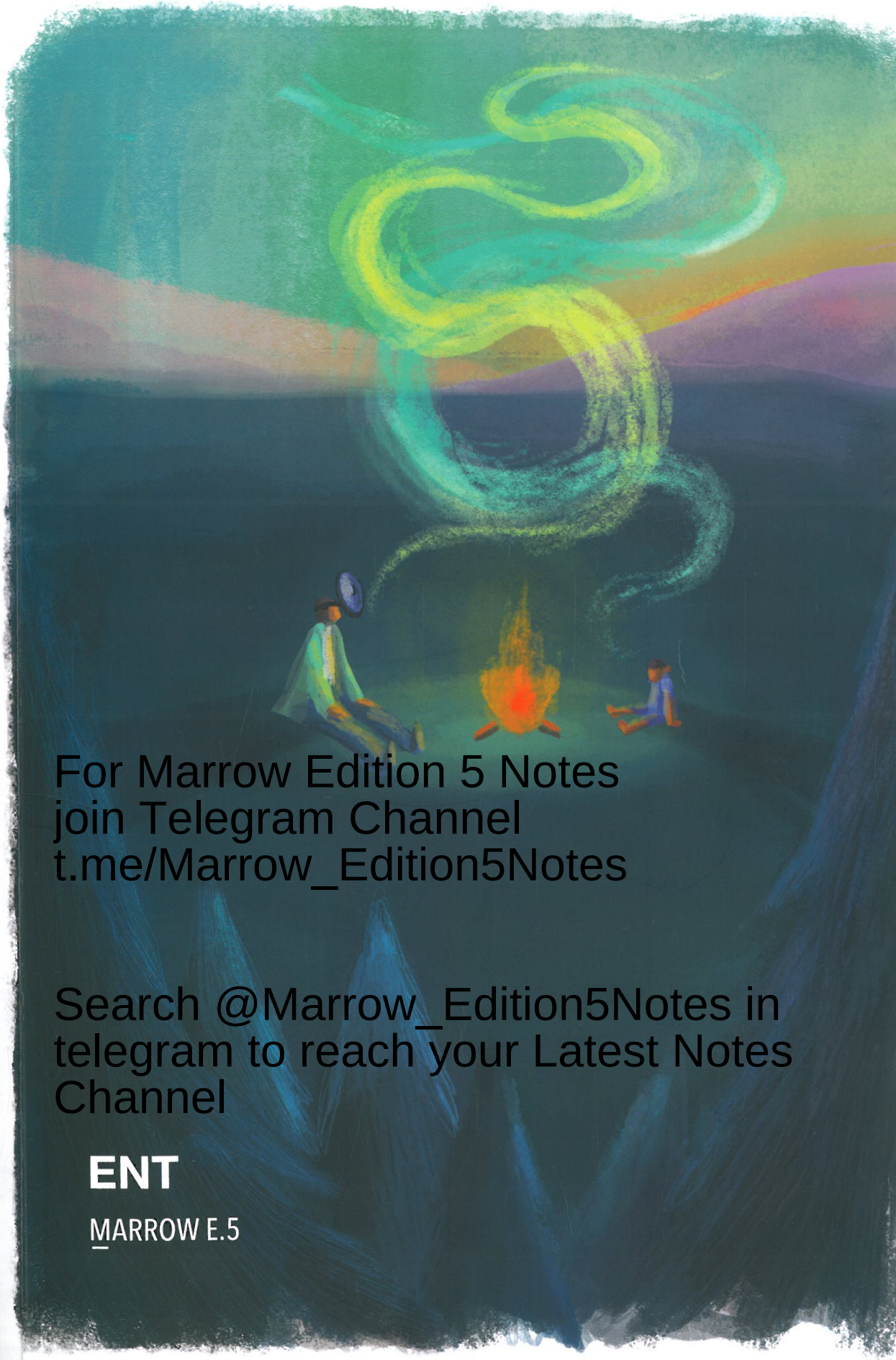

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ENT

MARROW E.5

Dr. Manisha Sinha Budhiraja
MS, DNB (ENT)

Dr. Manisha Sinha Budhiraja is an eminent ENT surgeon and the author of the bestselling & highly recommended book "ENT for Entrance Exams (EEE)". She has been teaching ENT for the past 18 years all across India and is the most renowned and sought after ENT faculty. She has an immense command over ENT and is greatly recognised for her ability to make the subject easy and interesting to learn.

ENT

Marrow Edition 5

MARROW

Contents

Ear

Nose

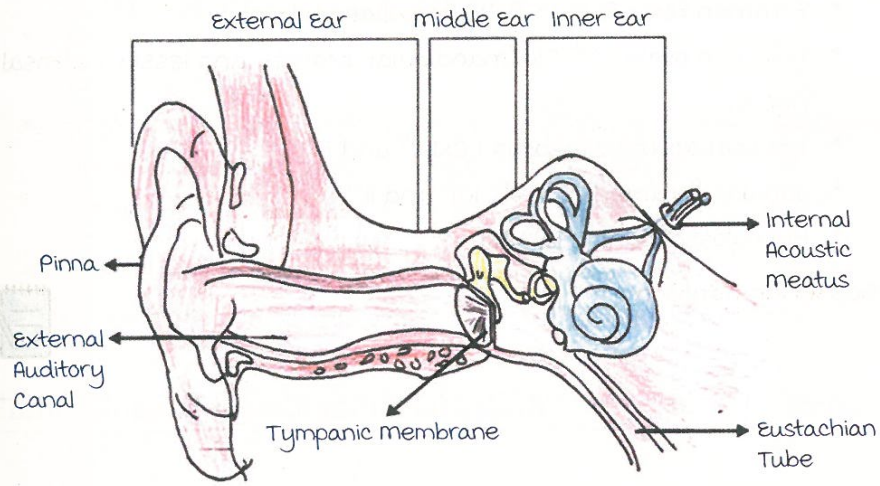
Pharynx

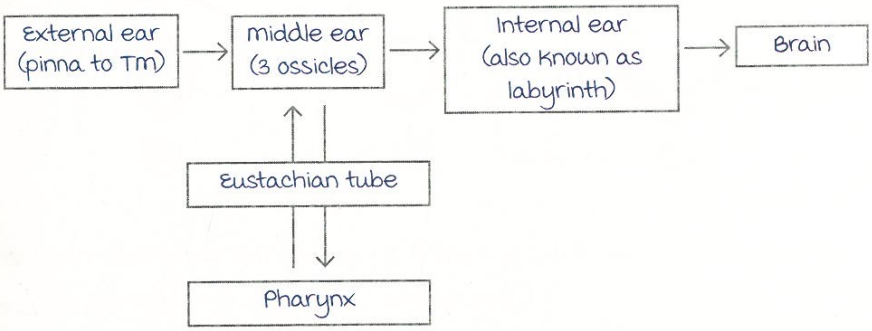
Larynx

BASICS OF EAR

Anatomy of ear

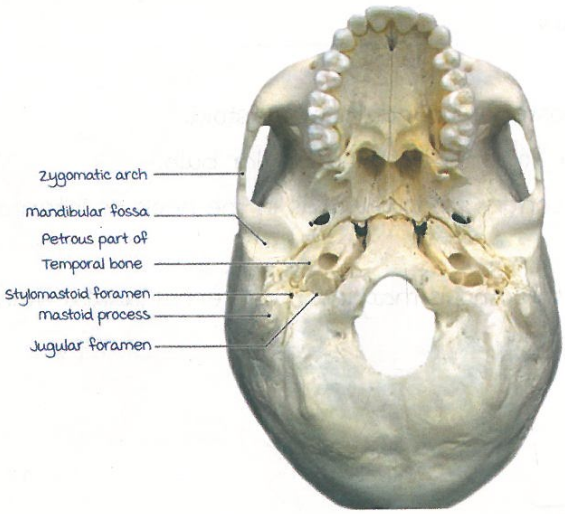
00:03:20





Base of skull and cranial nerves

00:11:38



Active space

Various foramens and structures passing through them :

- Superior orbital fissure : CN 3rd, 4th, 6th and 5th (ophthalmic branch).
- Foramen rotundum : 5th CN (maxillary branch).
- Foramen ovale : 5th CN (mandibular branch) and lesser petrosal nerve.
- Internal acoustic meatus : CN 7th and 8th.
- Jugular foramen : CN 9th, 10th and 11th.
- Hypoglossal canal : 12th CN.

Gasserian ganglion :

Sigmoid sinus

00:27:40

It forms the posterior boundary of mastoid.
Ends in jugular foramen forming jugular bulb.
Sigmoid sinus continues downwards in the neck as internal jugular vein.
Sigmoid sinus thrombosis may lead to internal jugular vein thrombosis.

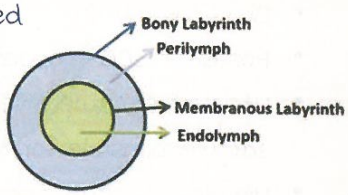
Active space

EMBRYOLOGY OF INNER EAR

Basic structure

00:01:20

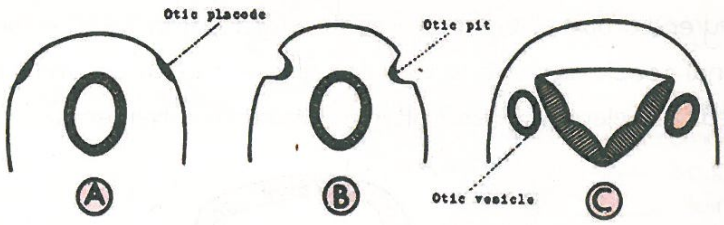
- membranous labyrinth is surrounded by bony labyrinth.
- membranous labyrinth has endolymph ; bony labyrinth has perilymph.



- Inner ear is laterally connected (by openings in bony labyrinth) to middle ear and, medially connected to cranium (brain).

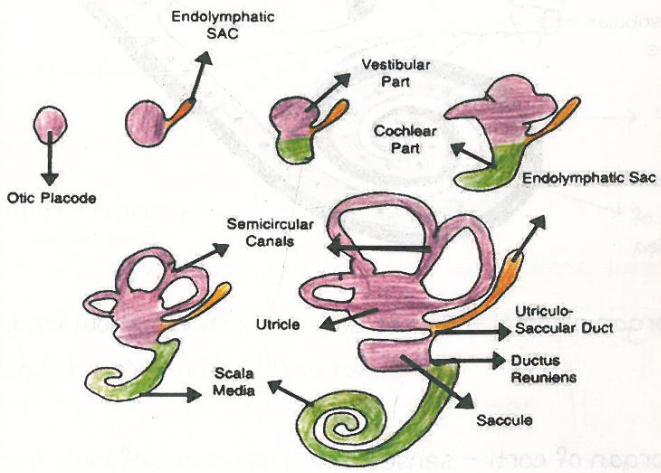
Embryology of membranous labyrinth

00:03:23



membranous labyrinth develops from the surface ectoderm.
(otic placode ⟶ otic pit ⟶ otic vesicle)

Outpouchings develop from otic vesicle, from which rest of the membranous labyrinth develops.



Active space

Parts of membranous labyrinth :

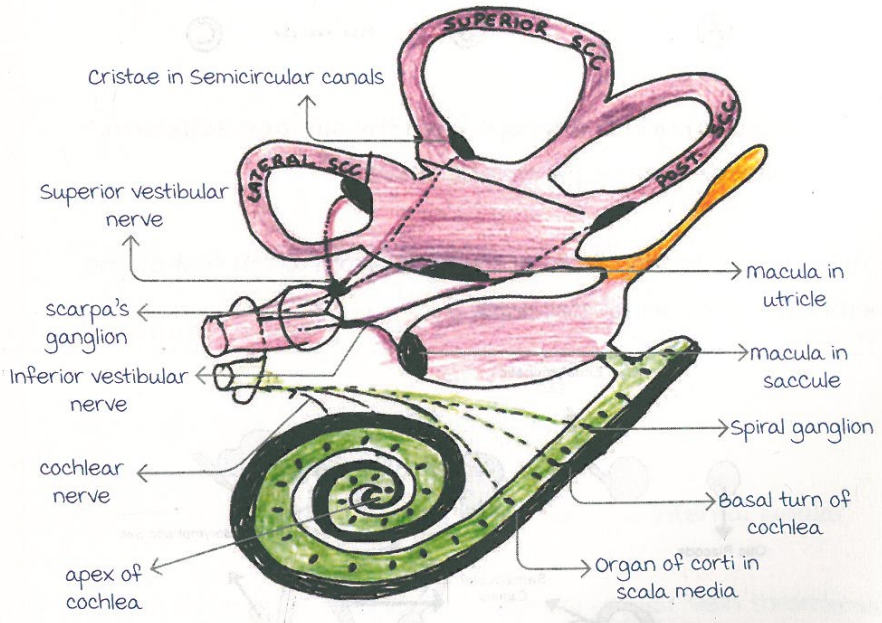
- 3 semi-circular canals (SCC) – superior (anterior), posterior and lateral SCC.
- Crus commune – common opening for superior & posterior SCC.
- Posterior SCC – opens into utricle & saccule through 5 openings.
- Utricle & saccule gives 2 ducts that joins to form endolymphatic sac (responsible for absorption of endolymph).
- Utricle & saccule opens into scala media / membranous cochlea (takes 2.5 to 2.75 turns around modiolus / bony pyramid).

Functions of membranous labyrinth 00:12:11

Major functions – hearing and balance.

Sensory end organ of hearing – organ of corti (present in scala media).

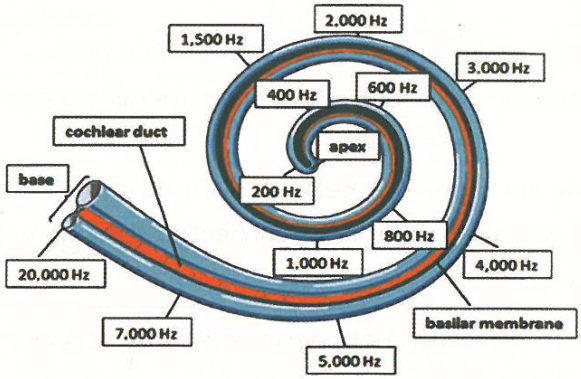
Sensory end organ of balance – cristae (present in 3 SCC – for rotational acceleration), and maculae (present in utricle and saccule for linear acceleration, head tilt & gravitational movements).



Apex of organ of corti – senses sound vibrations of low frequency (affected early in meniere's disease).

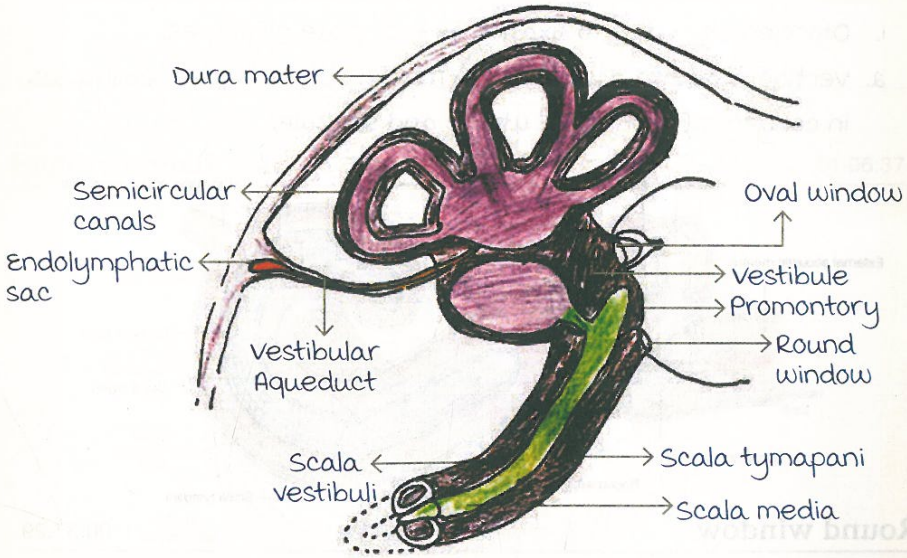
Base of organ of corti – senses sound vibrations of high frequency.

Active space



Bony labyrinth

00:20:11



Bony labyrinth develops from mesoderm by enchondral ossification, and then differentiates into cartilage and bone.

Parts of bony labyrinth :

1. Three SCC –
   Superior SCC : bulges on the anterior slant of petrous bone, into the base of skull ;
   clinical significance – superior SCC dehiscence syndrome or, 3rd window syndrome.
   Posterior SCC : bulges towards the mastoid.
   Lateral SCC : bulges towards the middle ear.

2. Vestibule – part of bony labyrinth around utricle & saccule.

Active space

3. Scala media – divides bony labyrinth into 2 parts :
   Scala vestibule – present above scala media ; opens into vestibule.
   Scala tympani – present below scala media.

Scala vestibule & scala tympani are connected through helicotrema.

Oval window

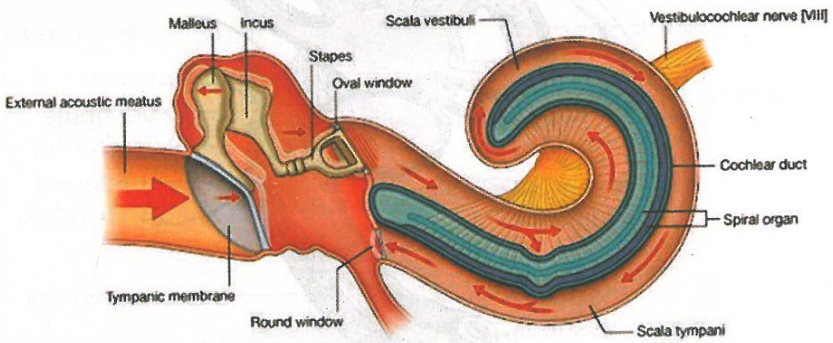
00:29:32

Oval window is a connection between middle ear and inner ear.

Function – conduction of sound.

Abnormalities :

1. Otosclerosis – due to fixation of foot plate of stapes.
2. Vertigo – due to dilation (as in meniere's), or hypermobility (as in congenital syphilis) of utricle and saccule.



Round window

00:37:29

Connects middle ear to scala tympani (inner ear).

Covered by secondary tympanic membrane (very thin, 3 layered, tympanic membrane like structure).

Function – sound transmission.

Clinical significance :

1. Cochlear implant :
   Passed through – round window.
   Placed in – Scala tympani.
   Replaces – organ of Corti.
   Stimulates – Cochlear nerve.
2. Drugs (like Gentamycin, steroids) are injected through round window.

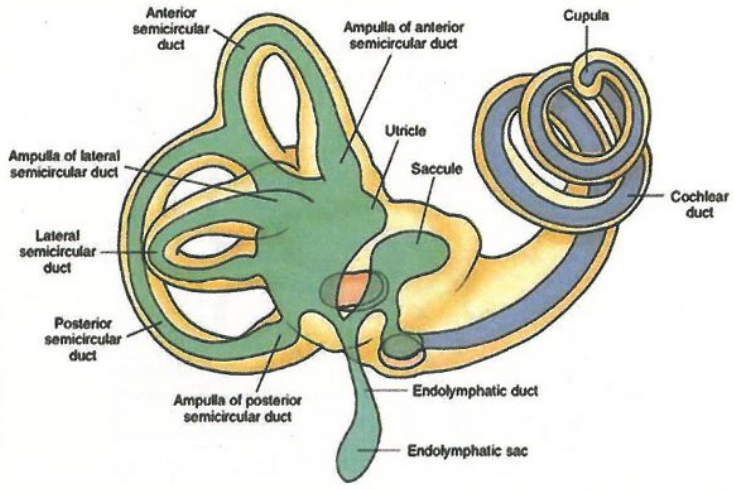
Active space

Cochlear aqueduct

00:51:01

Endolymphatic sac

01:06:37



It lies intradural / in between 2 layers of dura (meningeal & endosteal layer of dura).

Congenital anomalies of inner ear

01:08:21

Inner ear develops in two parts :

Pars superior - development of 3 SCC and utricle.

Pars inferior - development of saccule and cochlea.

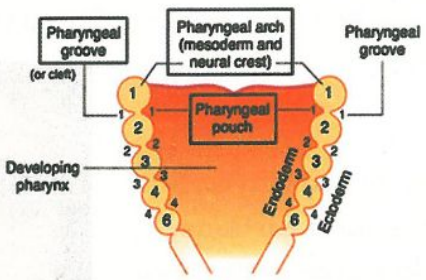
1. Michel aplasia : total non-development of inner ear ; contraindication for cochlear implant.
2. Alexander aplasia : deformity of basal turn ; high frequency sound affected.

Active space

3. Mondini aplasia : cochlea has 1.5 turns only.
4. Scheibe aplasia : deformity of saccule & cochlea (most common).

Active space

EMBRYOLOGY OF EXTERNAL AND MIDDLE EAR



In the neck of the developing fetus, 6 branchial arches are being formed, out of which the 5th one disappears.

Ectodermal lining (on outside) → Ectodermal (cleft) → External Auditory Canal (EAC) develops from: 1st cleft

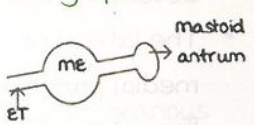
Mesoderm (in middle) → Mesodermal Arch (Brachial Arch)

Malleus Incus (1st arch)
Stapes (2nd arch)
Otocyst
External auditory canal (1st branchial cleft)
Meatal plug
Tubotympanic recess

Otic Capsule
1st pouch
2nd pouch
First cleft
External ear
Tubo-tympanic recess
Eustachian tube
Middle ear

Cartilaginous part (Present at birth)
Bony part (Develops later)

Endodermal lining (on inside) → Endodermal Pouch → 1st Endodermal Pouch → Tubotympanic recess



Tubo-tympanic Recess

1st Arch
Malleus
Incus

2nd Arch
Supra structure of stapes

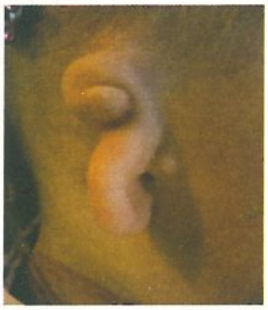
Proximal
Eustachian tube

Distal
Middle ear
mastoid
Antrum

Active space

External auditory canal 00:02:00

- Develops from the first cleft and only the cartilaginous part is present at birth.



Meatal Atresia :

- Pinna and external auditory canal develop from the same cartilage.
- Defect in the formation of the pinna (Anotia, Microtia) is associated with meatal atresia.
- Hearing loss.
- Treatment :

  Bone anchored hearing aid [BAHA] (invasive surgery)

  Reconstruction of the pinna :
  - Done with costal rib cartilage.
  - Done after 6 years of age.
  - done in 2-3 steps.

Callaural fistula :

- All the cleft during the formation of the external auditory canal develops in the neck.
- The lateral part fuses and the medial part leads to the formation of the EAC.

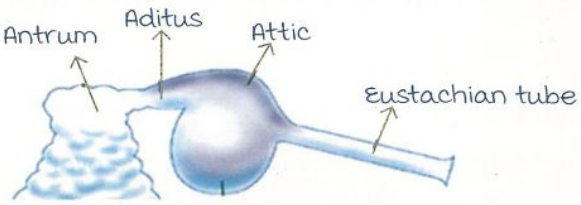
- If the lateral part remains unfused, it leads to the formation of an opening in the neck called a callaural fistula.

Tubo Tympanic Recess 00:12:40

- 1st pouch.
- Leads to formation of :
  - Proximal part : Eustachian tube.
  - Distal part : Tympanic cavity (middle ear + mastoid antrum).

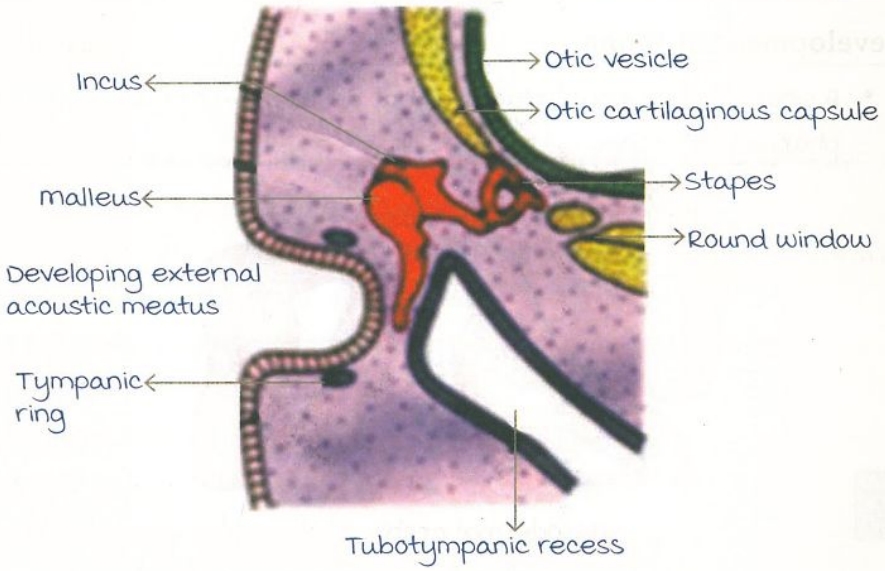
Active space

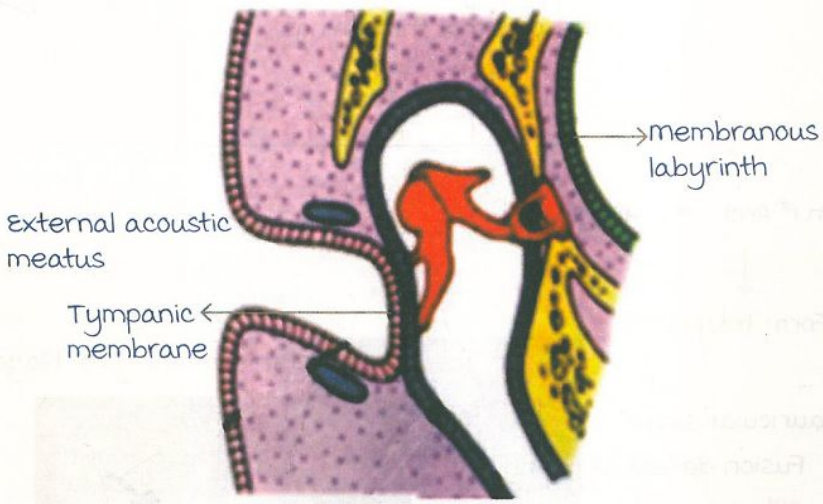
MIDDLE EAR CLEFT



Ear Ossicles

00:15:33





- 1st arch leads to the formation of malleus and incus.
- 2nd arch leads to the formation of the supra structure of stapes. (whereas footplate develops from bony labyrinth)

Active space

- The fusion of the 1st arch and 1st cleft leads to the formation of the tympanic membrane (contains all 3 germ layers).

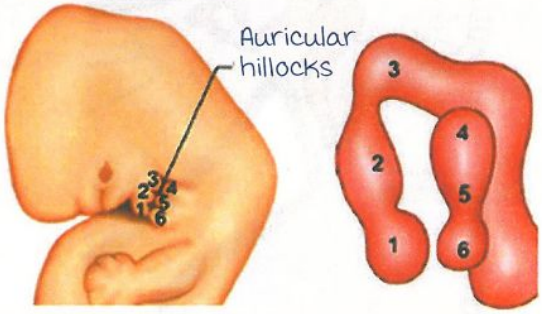
Otosclerosis :

- Congenital anomaly.
- Fissula ante fenestrum lies anterior to the oval window. It remains cartilaginous throughout life, thus retaining the ability to divide. This leads to the fixation of the footplate. This is called otosclerosis.

Development of Pinna

00:25:01

- A single cartilaginous structure that develops from two pharyngeal arches



Mesodermal arch

↓

6 mesodermal thickenings (Hillocks of His)

From 1st Arch → 1st Hillock

↓

Form tragus

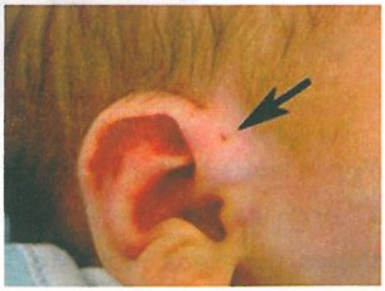
From 1st Arch → Remaining 5 Hillocks

↓

Form remaining cartilage

Periauricular sinus :

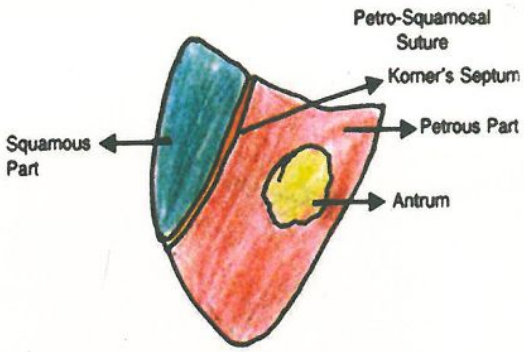
- Fusion defect of 1st and 2nd arch.
- Located above tragus or at the root of the helix.



Active space

Development of mastoid

00:28:35



- Korner's septum : persistence of petro-squamosal suture. It can be confused with the medial most wall of the antrum when drilling mastoid to remove the infection.
- The medial most wall of the mastoid antrum divides the antrum and posterior cranial fossa.
- Indication to stop the surgery, Lies 1.5 cm from the skin.

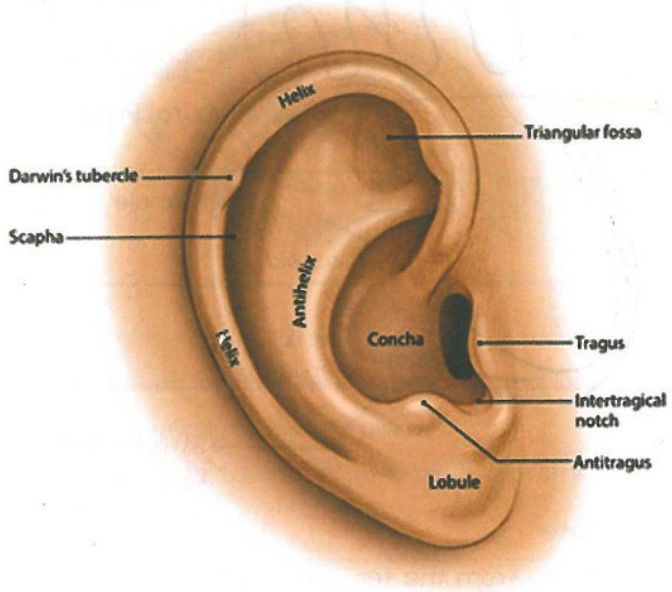
mastoid antrum :

Active space

ANATOMY OF EXTERNAL EAR

Anatomy of pinna

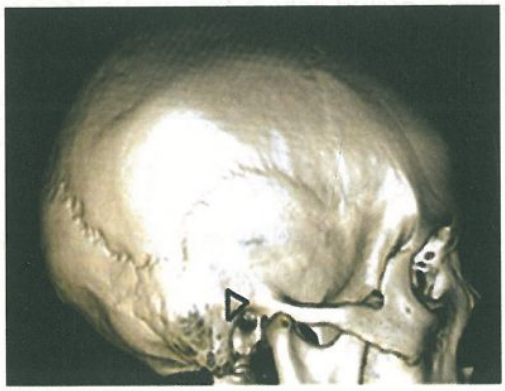
00:00:33



Pinna is a folded piece of cartilage.

Important structures :

- Helix
- Antihelix
- Tragus
- Antitragus
- Concha
- Cymba concha : Cartilagenous landmark for Antrum.
- Macewen's triangle : Bony landmark for Antrum.

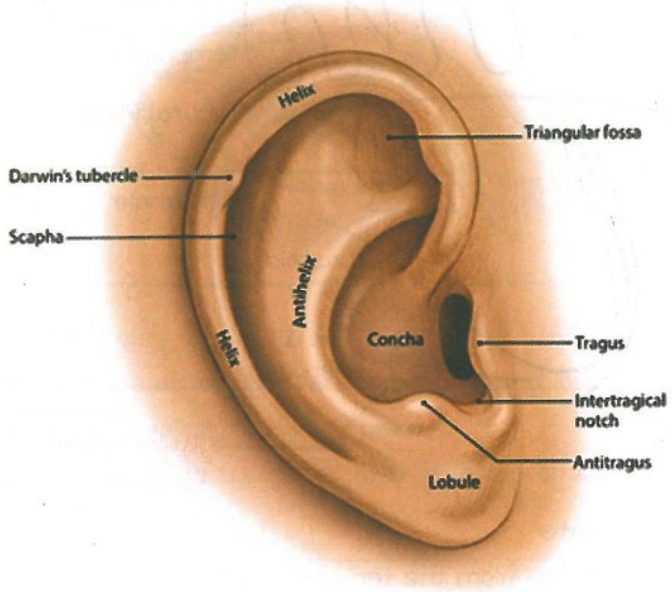


Active space

ANATOMY OF EXTERNAL EAR

Anatomy of pinna

00:00:33



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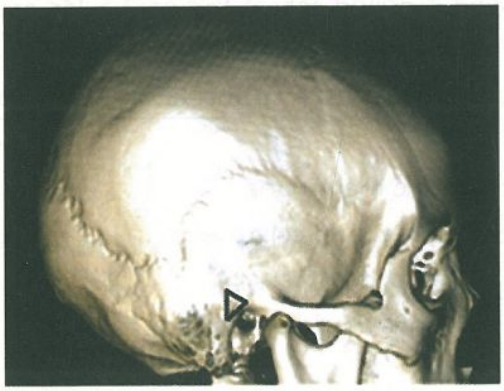
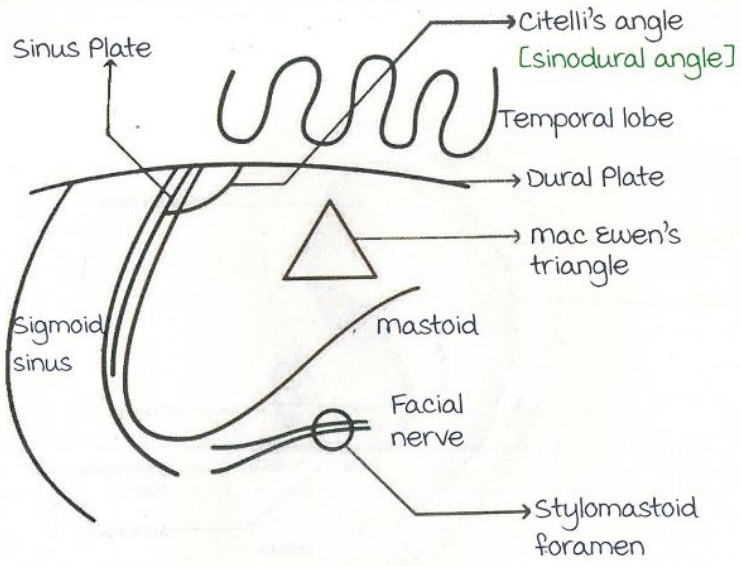


Active space

Boundaries of Mastoid antrum 00:04:46



Superiorly : Dural plate

- Separates antrum from the temporal lobe.
- Temporal lobe abscess is the most common infection after middle ear infection.

Posteriorly : Sinus plate

- Separates antrum from sigmoid sinus.

Inferiorly : Stylomastoid foramen with Facial nerve

Citelli's angle :

- Also known as Sinodural angle.
- Angle between sinus plate and dural plate.

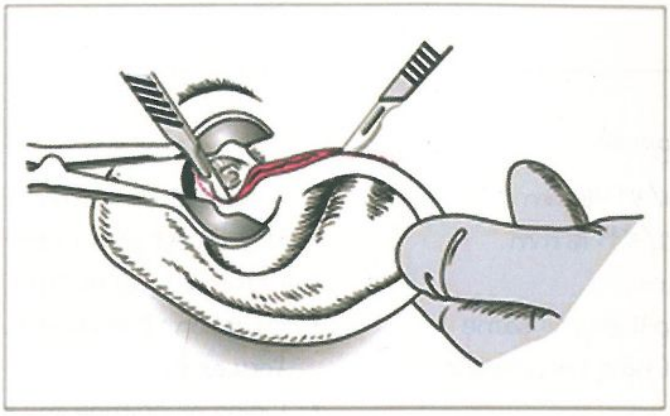
mac Ewen's triangle : mastoid is drilled only in this particular area.

Approach to middle ear and Darwin's tubercle 00:08:51

Approach to middle ear/ tympanic membrane :

- EAC is not used : Cartilage tends to collapse.
  Risk of perichondritis.
- Endaural approach : Incision is made on incisura terminalis (between tragus and helix)

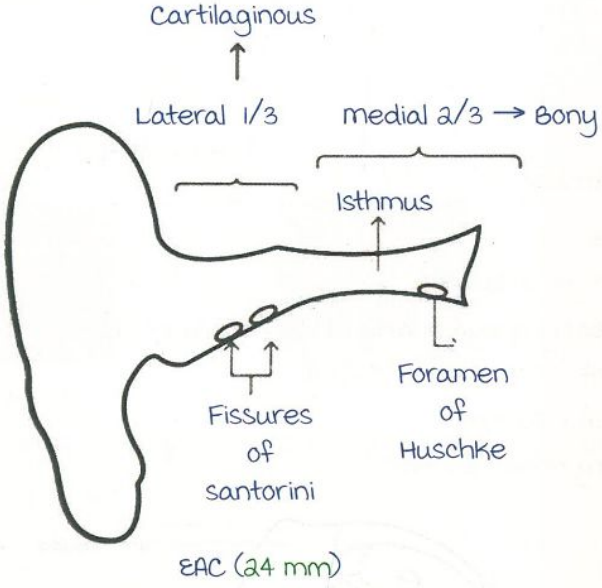
Active space



Darwin's tubercle :

- Prominence at junction of upper 1/3rd and lower 2/3rd, on the postero-superior margin of pinna.
- Atavistic feature (primates also have a prominence on pinna).

External auditory canal 00:16:45



Warning: Not all points are covered in the notes, especially conceptual explanations. Please use the notes in conjunction with marrow masterclasses.

Active space

EAC (24 mm)

Cartilaginous

- Lateral 1/3rd : 8 mm
- Medial 2/3rd : 16 mm backwards.
- Lining epithelium : same as skin (hair, ceruminous glands).
- Furuncle of ear : Localised to cartilaginous part
- Fissure of Santorini

↓ Infection

1. Parotid
2. Base of the skull (Roof and floor of EAC)

Bony

- Medial 2/3rd : 16 mm
- Narrowest part : Isthmus (6 mm lateral to TM)
- Direction : Downwards and forwards.
- Lining of epithelium : Stratified squamous epithelium (without skin appendages).
- If foreign body lodges in isthmus, surgical instruments required for removal.
- Foramen of Huschke : Closes by 4 – 5 years of age.

↓ Infection

1. Parotid
2. Base of the skull

Tympanic membrane

00:35:35

Window of middle ear.

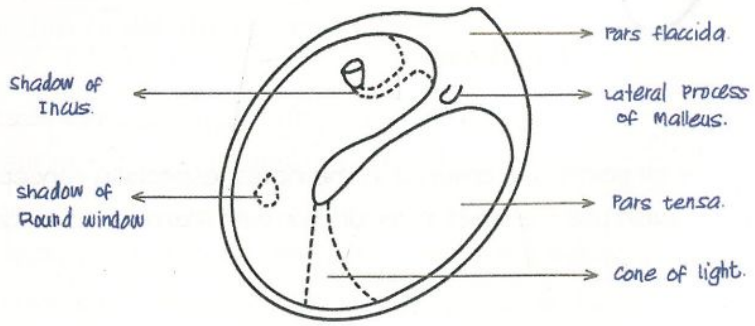
Derived from all 3 germ layers.

Normal colour : Pearly grey/ pearly white (translucent).

Makes an angle of 55° at the horizontal.

Total surface area : 90 mm^2

Effective vibratory area : 55 mm^2



Active space

Borders :

Identification of the ear from the tympanic membrane 00:46:02

By observing :

1. Cone of light
2. Upper tilt of tympanic membrane

TM

Right ear	Left ear	Perforated TM
		
Upper tilt : To right Cone of light : To right	Upper tilt : To left Cone of light: To left	Upper tilt : To right Therefore, Right ear

Active space

ANATOMY OF MIDDLE EAR - I

Middle ear cavity 00:01:45

Middle ear is a 6 walled cavity.

Lateral wall : common wall between external ear and middle ear.

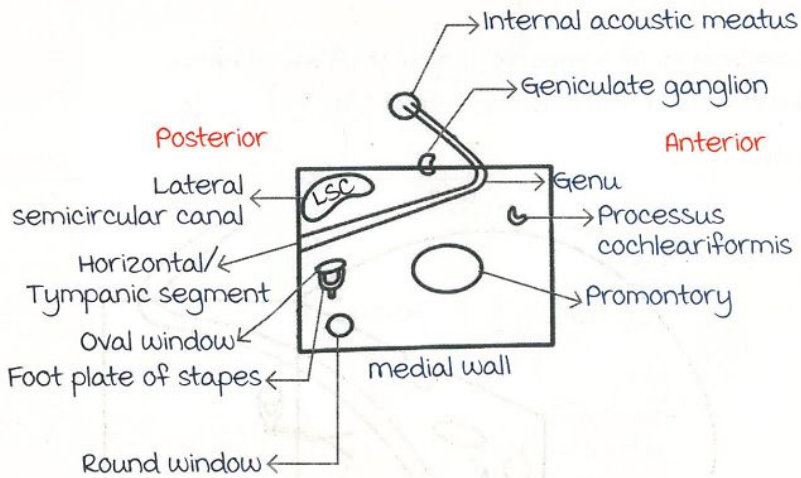
Medial wall : common wall between middle ear and inner ear.

Anterior wall : separates middle ear and pharynx.

Posterior wall : separates middle ear and mastoid.

Roof : separates middle ear and middle cranial fossa.

Medial wall of middle ear 00:07:24



Promontory

- Bulge produced by basal turn of cochlea.
- Senses sound of high frequency.

Oval window

- Covered by foot plate of stapes.
- Connects to vestibule.

Round window

- Covered by secondary tympanic membrane.
- Connects to scala tympani.

Active space

Lateral semicircular canal

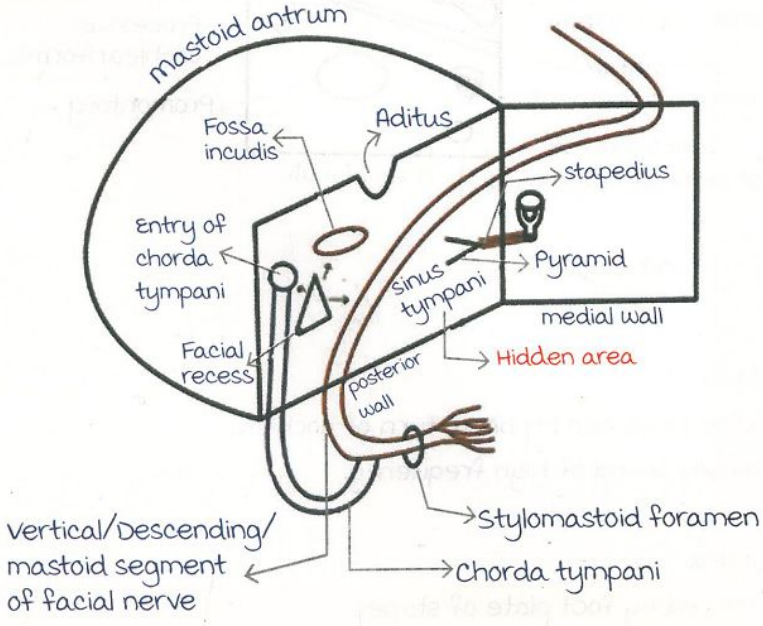
- Forms bulge on the medial wall.

Processus cochleariformis

- Projection of bone from cochlea.
- Tensor tympani muscle takes a turn, moves laterally and attaches to the handle of malleus.
- Tensor tympani reduces loud excessive noises like during chewing.
- Tensor tympani and mastication muscles are supplied by the mandibular branch of trigeminal nerve.
- Processus cochleariformis acts as a landmark of 1st genu of facial nerve.
- Landmarks of tympanic segment of facial nerve : Above oval window, below lateral SSC.

Posterior wall

00:24:07



Facial nerve :

Runs horizontal on medial wall.

↓

Takes a turn at the junction of medial & posterior wall.

↓

Runs vertically (vertical/mastoid segment of facial nerve)

Active space

↓

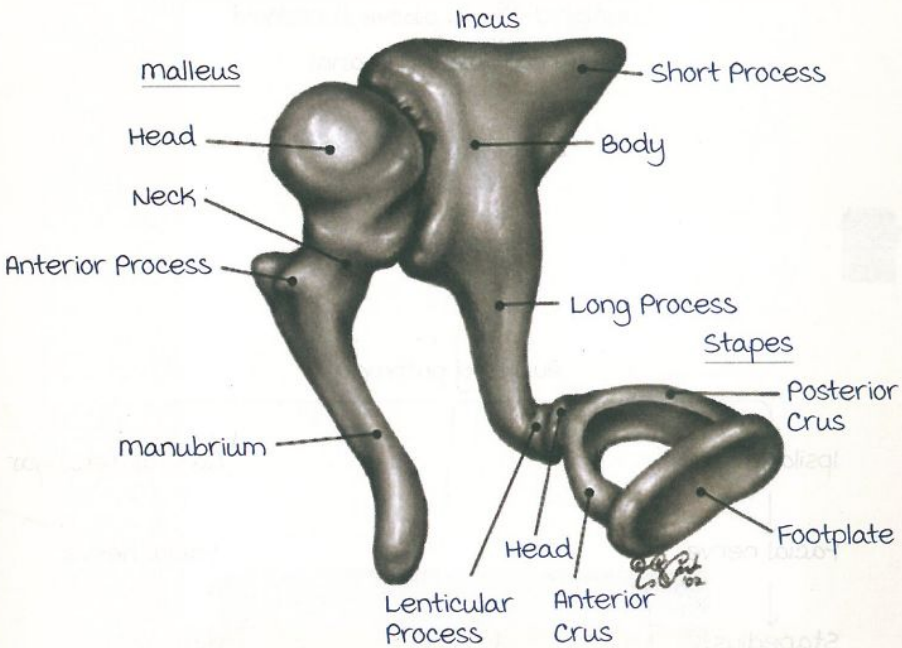
Exits through stylomastoid foramen.

most common segment of facial nerve to be injured during mastoid surgery is the vertical/mastoid segment of facial nerve.

Chorda tympani

- Opening on posterior wall.
- Passes through middle ear and exits through anterior wall.

Fossa incudis - Depression produced by short process of incus.



In between malleus and incus- saddle joint.

In between incus and stapes- ball & socket joint.

Facial recess area/ suprapyramidal recess

- Medially : vertical segment of facial nerve
- Laterally : entry for chorda tympani
- Superiorly : fossa incudus

Electrodes for cochlear implant are introduced through round window.

Sinus tympani area/ infrapyramidal recess

- Hidden area of middle ear.

MC site of residual disease (cholesteatoma).

Active space

From the promontary, two crest of bones

Superior - ponticulus

Inferior - subiculum

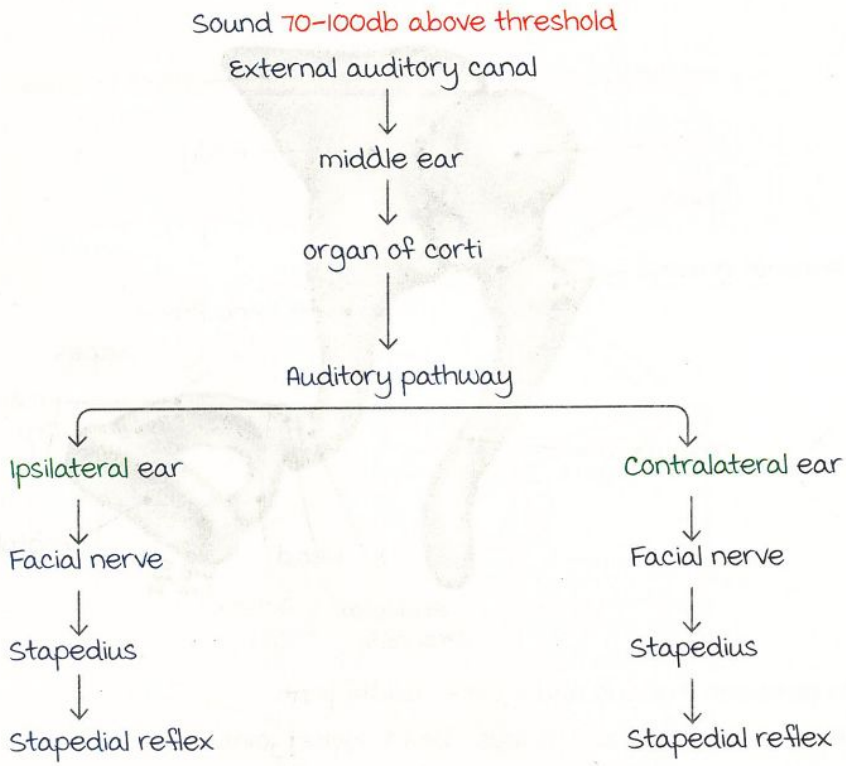
Pyramid

Stapedius muscle arises from it.

Stapedius muscle attaches on the neck of stapes - tenses the stapes.

Stapedial reflex/ acoustic reflex

00:48:54



Stapedial reflex is a bilateral reflex.

In disruption of 8th nerve of one side - reflex absent in both sides.

In facial (7th) nerve palsy of one side, stapedial reflex absent only in that side.

Anterior wall

01:00:35

There are 3 openings :

Opening for chorda tympani - canal of huguier

Opening for tensor tympani

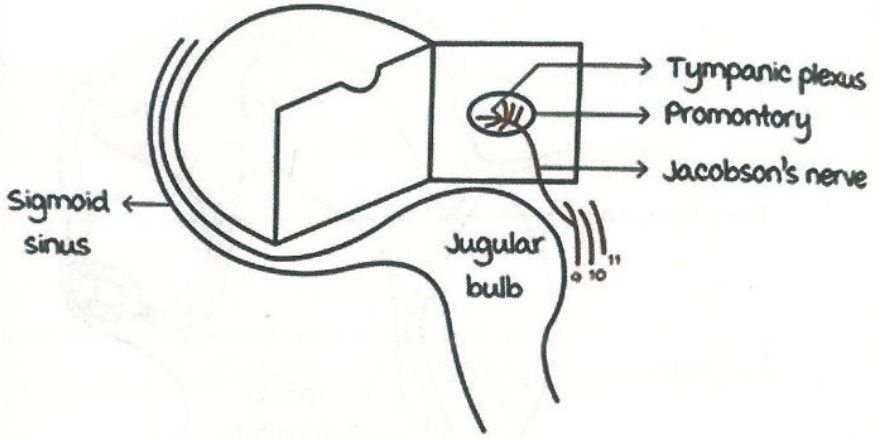
Active space

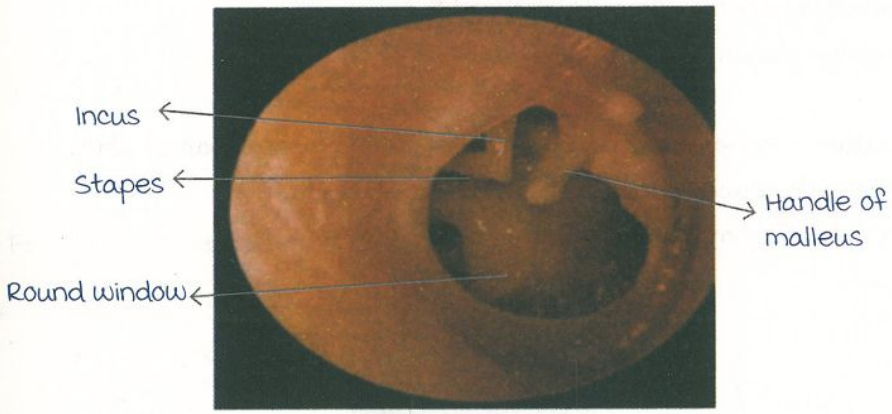
Opening for eustachian tube

The internal carotid passes very close to the anterior wall.

Inferior wall & roof

01:05:08

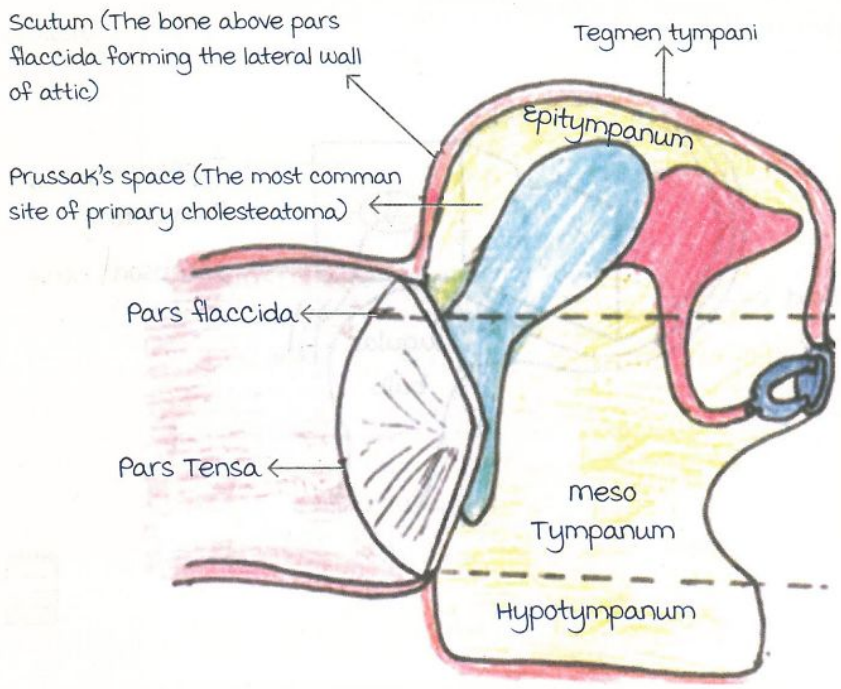




Active space

Middle ear cavity

01:27:17



Middle ear is divided into 3 parts by two lines.
Two lines drawn at the upper and lower border of pars tensa.

Epitympanum – 6mm
Mesotympanum – 2mm (narrowest)
Hypotympanum – 4mm

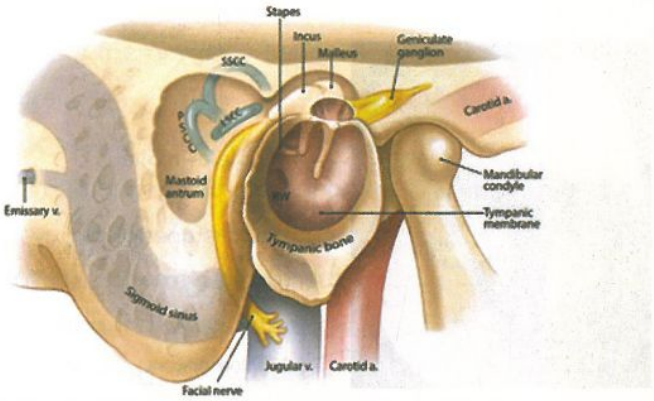
Scutum – Bone above pars flaccida forming lateral wall of attic.
Prussak's space – area medial to pars flaccida.
MC site of primary cholesteatoma.

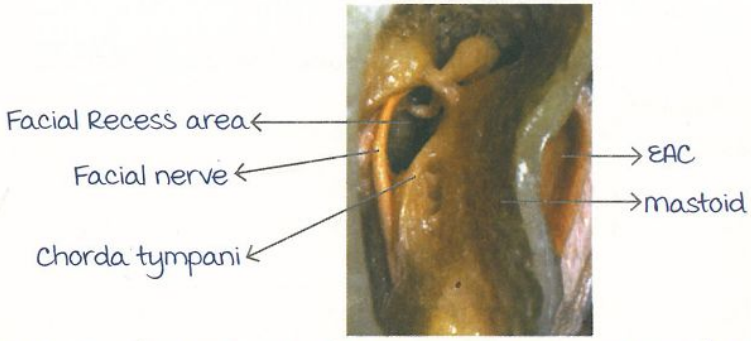
Active space

ANATOMY OF MIDDLE EAR - II

Middle ear anatomy 00:00:12

Medial most and largest air cell : mastoid antrum.
Anteriorly, EAC and middle ear are present.
Posterior wall of middle ear is the common wall between middle ear and mastoid.
The lining of EAC extends to form the outer layer of tympanic membrane.
Facial recess area : area between facial nerve and annulus that leads into the middle ear cavity. Gives surgical access into the middle ear.
The roof of middle ear and mastoid is same.
The floor (base of skull) is same for mastoid and middle ear.





Procedure for putting cochlear implant and removing disease from middle ear.

Active space

Electrodes from mastoid are passed to the inner ear through the round window in middle ear.

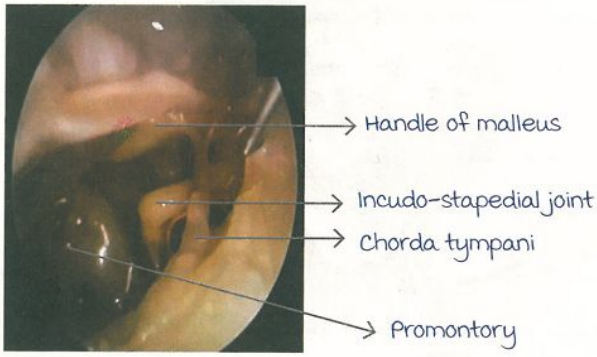
Endoscopic anatomy of middle ear

00:18:31

All the important structures lie in the posterior part of middle wall cavity :

- Oval window
- Round window
- Stapes
- Incudo-stapedial joint.

Chorda tympani enters middle ear through posterior wall and passes between malleus and incus and exits through anterior wall.



Tensor tympani arises from processus cochleariformis and attaches to handle of malleus

From promontary, two bony crest appear superiorly and inferiorly.

Superior – Ponticulus

Inferior – Subiculum

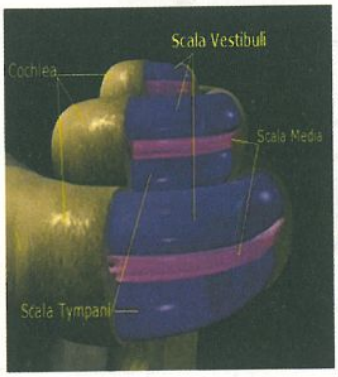
Below the floor, jugular bulb is present.

Active space

ANATOMY OF INNER EAR

Organ of Corti

00:01:12



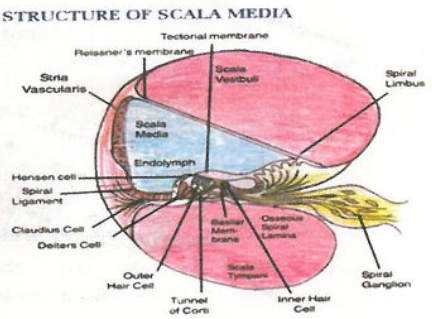
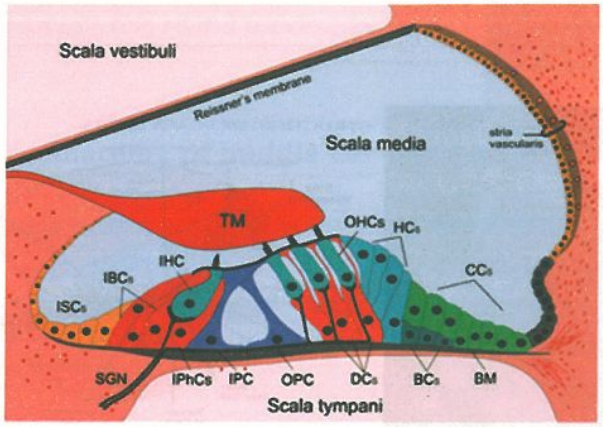


Fig. 22

- Organ of Corti present in scala media (divides bony labyrinth into upper scala vestibuli and lower scala tympani)
- Structures around scala media :
  - Reissner's membrane : separates scala media and scala vestibuli.
  - Basilar membrane (organ of corti present here) : separates scala media and scala tympani.
  - Stria vascularis (site of production of endolymph) : present on the lateral surface of scala media.
- Endolymph : fluid in the scala media.
  - Has electrochemical gradient of +85mV (maintained by the $Na^+/K^+/2\ Cl$ in the stria vascularis).
  - Furosemide (loop diuretic, acts on $Na^+/K^+/2\ Cl$) : ototoxic because acts on the stria vascularis (because of same channels).
  - Meniere's disease (overproduction of endolymph) : sodium restricted diet recommended.
  - Absorption of endolymph occurs from the endolymphatic sac.
- Perilymph : fluid present in the scala vestibuli and scala tympani.

Active space

Cut section :



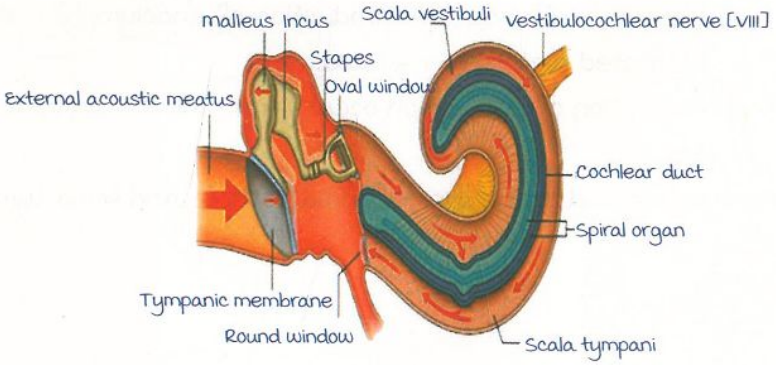
- Have hair cells (inner and outer) and supporting cells.
- Difference in inner hair cell and outer hair cell :

Inner hair cell	Outer hair cell
• Arranged in one row	• Arranged in 2-3 rows
• Less in number	• More in number
• Less prone to damage	• More prone to damage by drugs, noise
• Afferent nerves are present	• Efferent nerves are present
	• Produces OAE (oto acoustic emission)

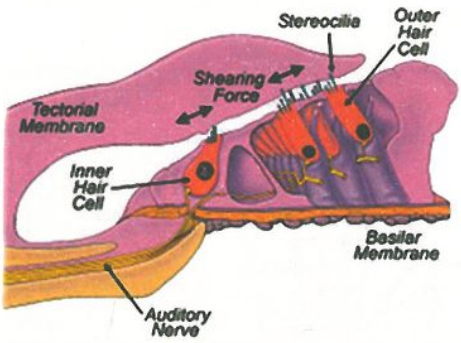
- Inner hair cell [IHC] transmits auditory stimuli whereas outer hair cell modulates IHC function.

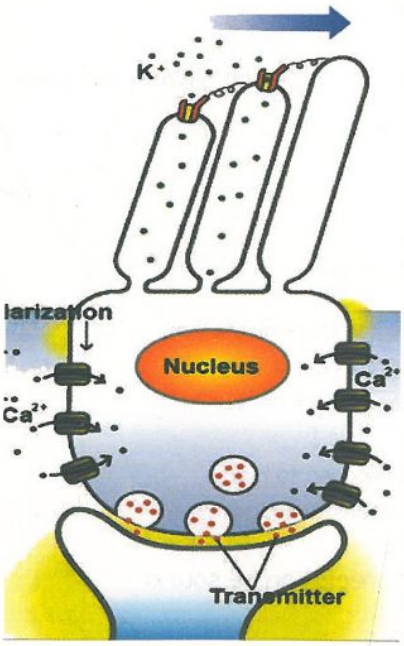
Transduction of sound :

- conversion of mechanical sound energy into electrical impulses.



Active space





The tips have K^+ channels and they open

↓

K^+ enters into hair cell from endolymph

↓

Voltage gated Ca^{2+} channels open – Ca^{2+} influx

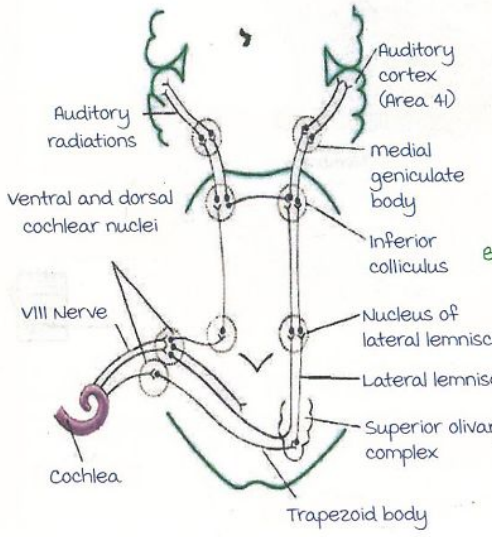
↓

Causes release of excitatory neurotransmitter glutamate

Active space

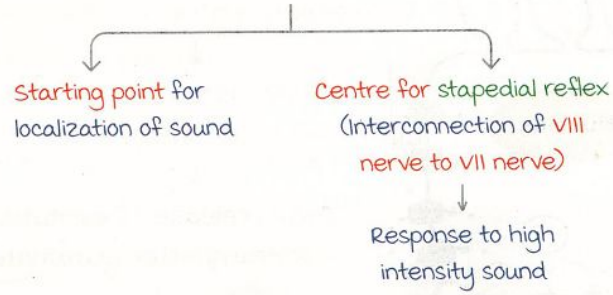
Auditory pathway

00:01:12



Inner hair cell
↓
Afferent nerve
↓
Cochlear nerve
↓
Spiral ganglion
(exits through internal acoustic meatus)
↓
Brain stem (ventral and dorsal cochlear nuclei)
S – Superior olivary complex
↓
L – Nucleus of Lateral lemniscus
↓
I – Inferior colliculus
↓
m – Medial geniculate body
↓
Auditory cortex (area-41) – Superior temporal gyrus

- It is tested using BERA.
- The nerves of auditory pathway cross to other side of brain and are interconnected
- The fibers cross at the level of the superior olivary complex (through the trapezoid body).
- Superior olivary nucleus :



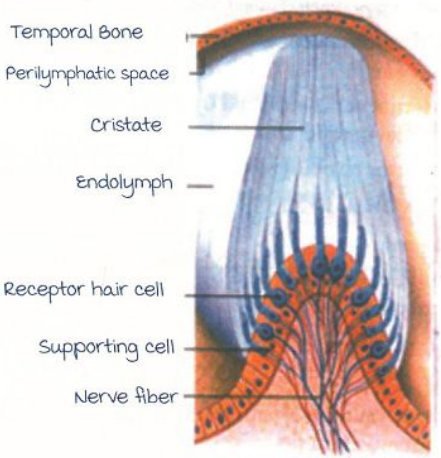
- Superior temporal gyrus ∨ : appreciation of sound

Dark Cells : maintain the electrochemical gradient of endolymph in utricle and saccule.

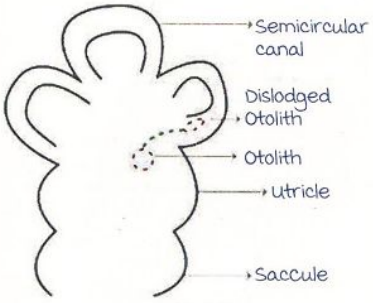
Active space

Structure of cristae and maculae

00:23:40



- Contain type 1 and type 2 hair cells.
- In cristae, hair cells project into gelatinous material called Cupula.
- In maculae, hair cells project into gelatinous material covered by calcium carbonate crystals, called Otolith.



- Following trauma / pathology : Otolith gets dislodged
  ↓
  Goes into semicircular canal (SCC) (m.c – Posterior semicircular canal)
  ↓
  Stimulates SCC and causes vertigo
  ↓
  After sometime, $CaCO_3$ crystals settle due to gravity decreases vertigo
  ↓
  head movement causes vertigo again (cycle repeats)
  ↓
  BPPV : Benign Paroxysmal Positional vertigo (m.c – vertigo)
  ↓
  C/F : vertigo on changing posture Lasting for few seconds

Active space

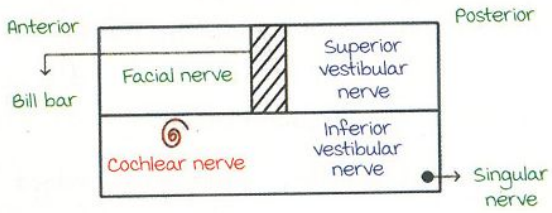
- Posterior semicircular canal is supplied by singular nerve (branch of inferior vestibular nerve)

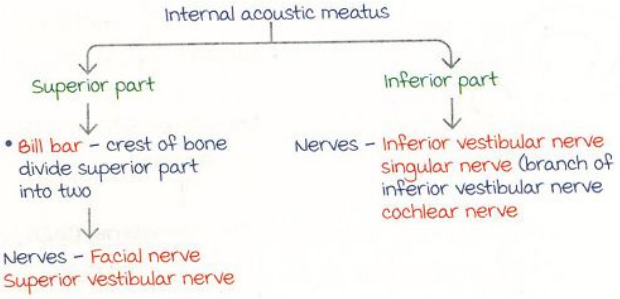
Vestibular nerve and internal acoustic meatus :

Cristae & maculae
↓
vestibular nerve arises
(superior & inferior vestibular nerve)
↓
Exits through Internal acoustic meatus

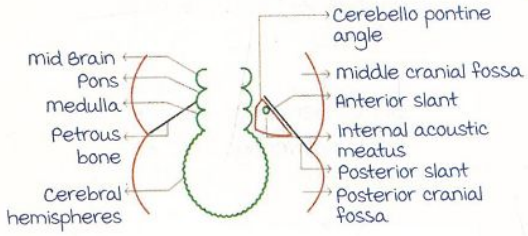
Internal acoustic meatus : An opening in the petrous bone (posterior slant)

Structures passing through internal acoustic meatus





Acoustic neuroma :



Acoustic neuroma – m.c benign tumor of cerebello pontine angle
↓
It Arises from inferior vestibular nerve in internal acoustic meatus
↓
The upper pole of the tumor involves – 5, 6 cranial nerves
↓
The lower pole of the tumor involves – 9, 10, 11 cranial nerves

Active space

NERVE SUPPLY OF THE EAR

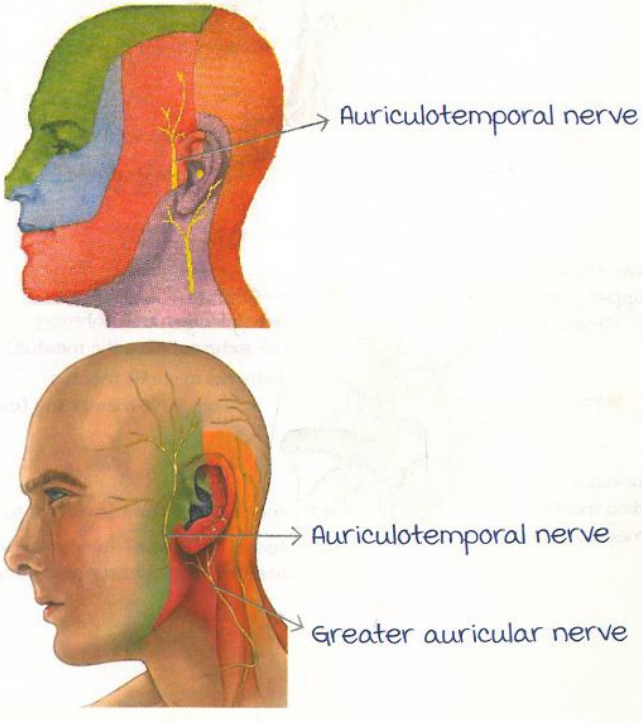
The inner ear has no sensory nerve supply.
The middle ear – sensory supply is glossopharyngeal nerve [Jacobson's nerve].

Nerve supply of the pinna - auriculotemporal nerve 00:03:11

The trigeminal nerve branches – ophthalmic
maxillary
mandibular

The mandibular branch of trigeminal → gives auriculotemporal nerve
↓
Supplies tragus, helix [anteriorly] auricle.

The pain can be referred from – temporomandibular joint, dental conditions, parotid, Anterior 2/3rd of tongue [ulcer, carcinoma].

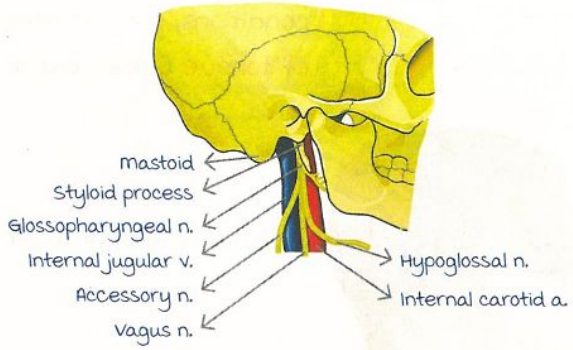


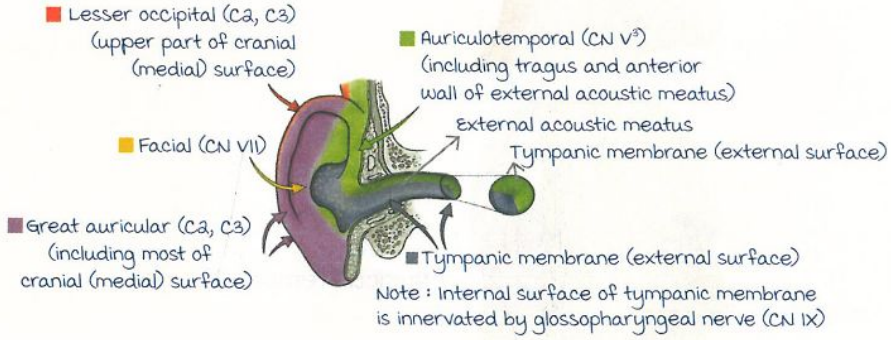
Active space

Nerve supply of the pinna - Greater auricular nerve 00:09:09

Nerve supply of the pinna – vagus 00:12:37

In the floor of middle ear
[jugular bulb is present], the vagus nerve comes out
↓
through the jugular foramen
↓
along with 9th and 11th cranial nerve.





Active space

The auricular branch of vagus :

It is A/K/A Arnold's/ Alderman's nerve.
It supplies – tympanic membrane [TM].
External auditory canal [EAC].
Concha.
The pain can be referred from – larynx [carcinoma of larynx].

The facial nerve supplies – posterosuperior part of external acoustic meatus.

Nerve supply of pinna :
G – Greater auricular nerve
O – lesser Occipital
A – Auriculotemporal nerve
A – Auricular branch of vagus

Nerve supply of the EAC, TM and middle ear 00:18:16

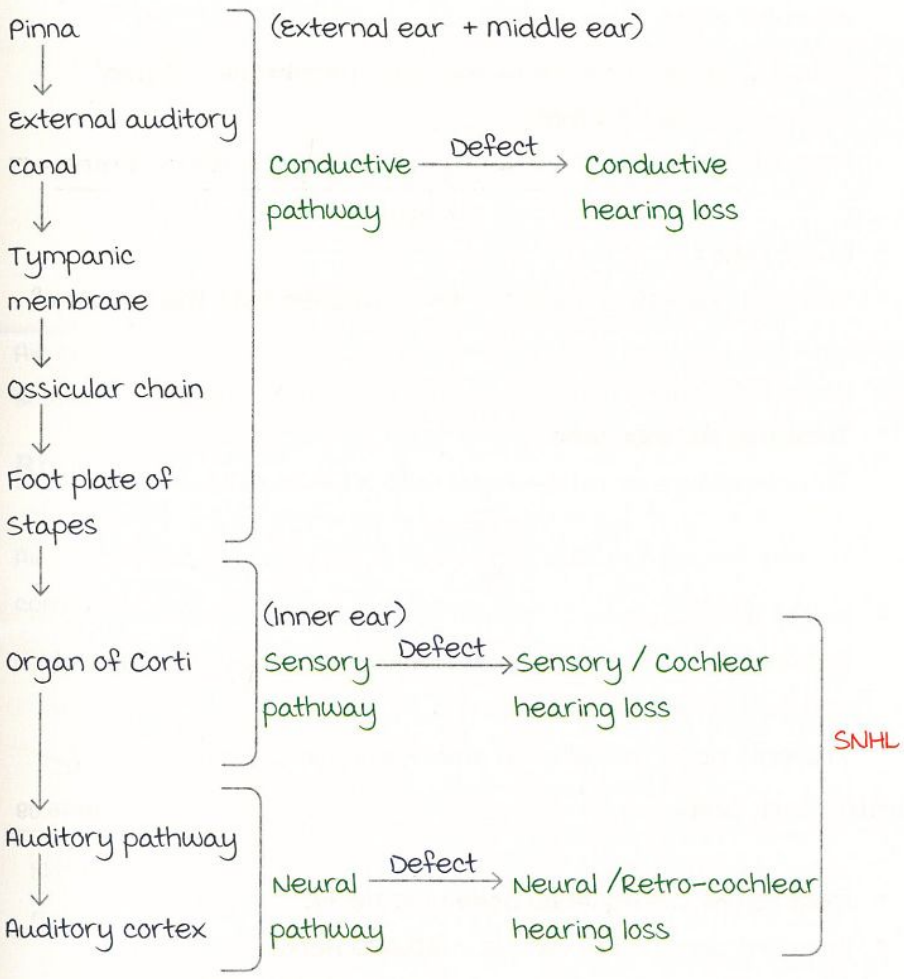
EAC :
The EAC and lateral surface of TM is supplied by :
A – Auriculotemporal nerve.
A – Arnold's nerve.

Nerve supply of middle ear :
The 9th nerve supplies – mucosa of middle ear.
medial surface of TM.
The pain can be referred from – tonsil, base of tongue, oropharynx.

Active space

AUDIOLOGY AND EVALUATION – TUNING FORK TESTS

Normal pathway :



Functions of the middle ear

00:05:00

1. Impedence matching :
   Also known as Transformer action.
   Amplification of sound to overcome reflection due to change in medium from air to fluid.
2. Dampening of sound by Stapedial reflex

Active space

Amplification of sound :

- Areal / Hydraulic ratio :
  Sound travels from the tympanic membrane (larger surface area) to footplate of stapes (small surface area) via the ossicular chain.
- Effective vibratory area of tympanic membrane : 55 mm^2
  Footplate area : 3.2 mm^2
  Areal ratio = $\frac{\text{Effective vibratory area of tympanic membrane}}{\text{Footplate area}}$ = 17
- Lever ratio :
  The long process of incus : 1.3 times smaller than the handle of malleus.
  Lever ratio = 1.3
- Total transformer ratio :
  Total transformer ratio = Areal ratio X Lever ratio
  = 17 X 1.3
  = 22
- Phase difference :
  Difference in phase between compression (oval window) and rarefaction (round window).
  Prevents noise cancellation and hearing loss.

Tuning fork tests 00:16:09

- Most common frequency used : 512 Hertz.
- Ears are sensitive to : 20 Hz – 20,000 Hertz.
- Speech frequencies : 500 Hz, 1000 Hz, 2000 Hertz.
- Tuning forks of frequencies less than 512 Hertz are used to assess vibration sense.

Air conduction and Bone conduction 00:21:08

Air conduction :

- measure of conductive, sensory and neural pathways.
- The most important part of conductive pathway : middle ear (amplification of sound).

Active space

Bone conduction :

- measure of sensory and neural pathways.
- Vibrating tuning fork is placed on mastoid.

↓

Cochlear fluids move.

↓

Basilar membrane and hair cells stimulated.

↓

Auditory pathway

↓

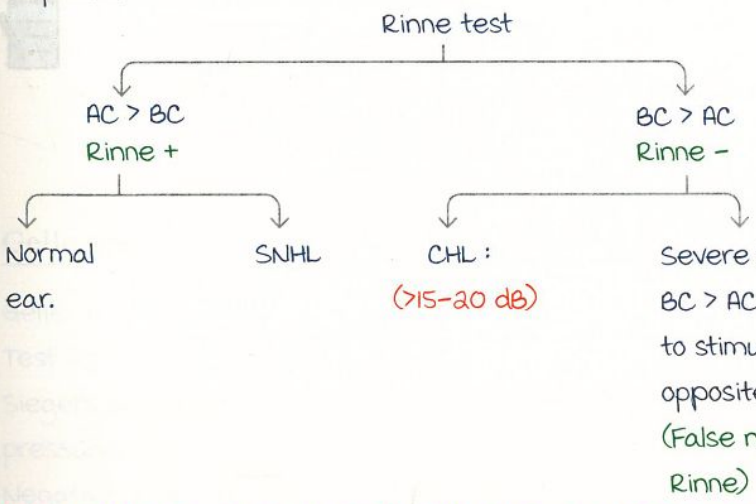
Auditory cortex

Air conduction is better than bone conduction, because the amplified sound reaches sensory neural pathways.

Rinne test

00.25.34

Air conduction (AC) and Bone conduction (BC) are tested and compared :



Rinne test becomes negative only if the hearing loss is more than 15 dB.

Sudden severe SNHL :

- Due to viral infection / idiopathic.
- Sudden edema, ischemia, compression of inner ear is seen.
- Reversible with immediate steroid administration.

Warning: Not all points are covered in the notes, especially conceptual explanations. Please use the notes in conjunction with Marrow masterclasses.

Active space

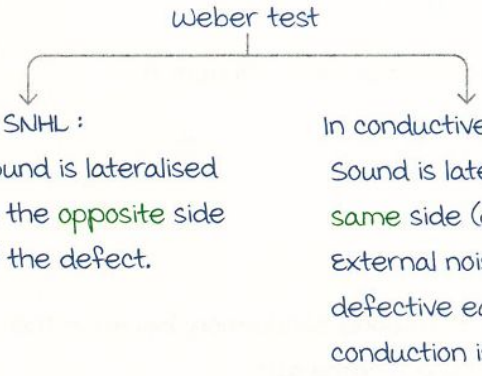
Weber test

00.41.55

The tuning fork is placed on the forehead, vertex or upper teeth.

Tests bone conduction.

To assess the lateralisation of sound.



Mnemonic : SO CS

- SNHL : Lateralised to opposite side
- Conductive : Lateralised to same side

Active space

Acoustic bone conduction test and Schwabach test 00:59:27

Acoustic bone conduction test (ABC) :

- To assess the bone conduction (SNHL assessment).
- The bone conduction of the patient is compared to that of the examiner's.

ABC

- Same as examiner
  - Normal
  - CHL not assessed
- Decreased / shortened
  - Bone conduction decreases
    - ↓
    - SNHL

Schwabach test :

- Similar to ABC test but tragus is not covered.
- To reconfirm CHL and SNHL.

Compare the bone conduction of the patient to the examiner's

- Decreased / shortened
  - ↓
  - BC decreased
    - ↓
    - SNHL
- Increased / lengthened
  - ↓
  - Patient BC > Examiner's
    - ↓
    - CHL

Gelle test and Bing test 01:10:46

Gelle test :

Test for otosclerosis.

Siegel's speculum is used to alter the external auditory canal pressure.

Negative Gelle : No change in hearing with pressure variation (ossicular chain fixation).

Bing tests :

No change in hearing on pressing and releasing tragus : CHL.

There is change in hearing on pressing and releasing tragus : Normal.

Active space

Q. In a patient of decreased hearing, Rinne test in Right ear is negative and in Left ear is positive. Which is true? (AIIMS)

A. 40 db CHL in Left ear

B. Bilateral 40 db CHL.

C. Left SSNHL, Right normal

D. Right SSNHL, Left normal

Q. A 38 year old gentleman reports of decreased hearing in the right ear for the last 2 years. On testing with a 512 Hz tuning fork, the Rinne test is negative on the right ear and positive on the left ear. With the Weber test the tone is perceived as louder in the left ear. Most likely the patient has :

A. Right conductive hearing loss

B. Right severe sensorineural hearing loss

C. Left sensorineural hearing loss

D. Left conductive hearing loss

Q. In a patient, Rinne test positive/ AC >BC, in both ears, Weber's lateralises to the right. Next step?

A. No intervention as both the ears normal

B. Remove wax from right ear

C. Repeat Rinne test

D. Do Shwabach test

Active space

AUDIOLOGY & EVALUATION – AUDIOGRAM (PTA)

Estimation of hearing loss 00:01:43

Negative tuning fork test frequency	Hearing loss
256 Hz	15 dB
512 Hz	30 dB
1024 Hz	45 dB

Condition	Hearing loss
Complete obstruction of external auditory canal (EAC).	30 – 40 dB
Tympanic membrane (TM) perforation. maximum hearing loss seen in : • Increasing size of perforation. • When phase difference is absent.	10 – 40 dB
TM perforation + ossicular discontinuity	40 dB
Ossicular discontinuity + intact TM	55 dB
Complete fixation of stapes foot plate (Otosclerosis).	60 dB

Introduction to pure tone audiometry 00:08:19

The ear is sensitive to frequencies from 20 – 20,000 Hz.

Speech frequencies : 500, 1000, 2000 Hz.

Indications of Pure tone audiometry (PTA) :

1. To determine type of hearing loss : Conductive, sensorineural or mixed hearing loss.
2. To determine the degree of hearing loss.

Active space

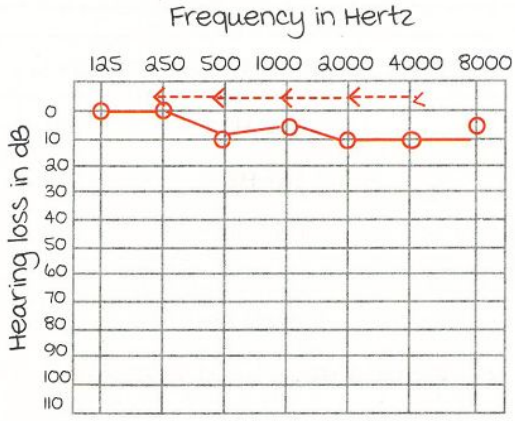
3. To determine the affected frequency.

PTA is a subjective test.

Normal range of hearing :

-10 to 25 dB

PTA results are plotted on a graph known as Audiogram.



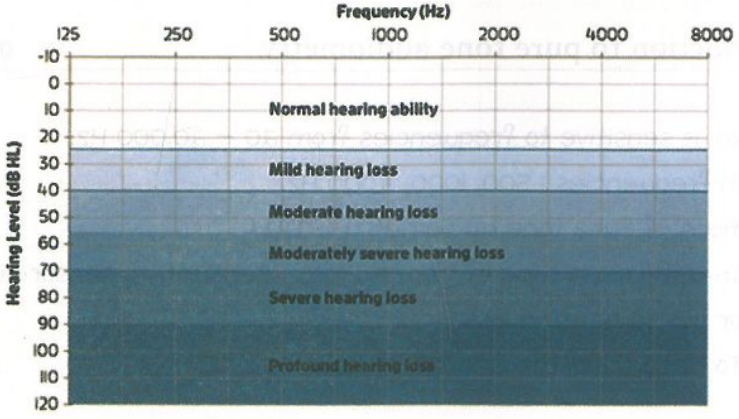
Grading of hearing loss

00:16:52

American speech and hearing association (ASHA) classification :

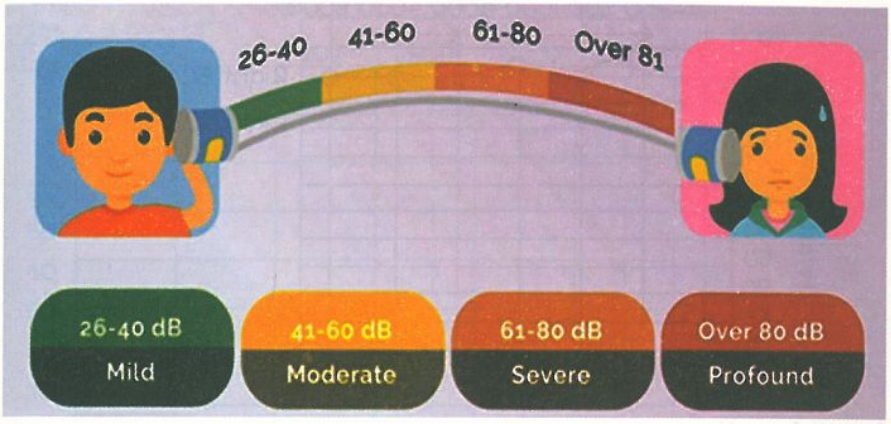
- commonly followed.
- Indication for cochlear implant : >70 dB hearing loss.

Pure Tone Average Range in dBHL	Degree of hearing loss
-10 to 25	Normal Hearing Sensitivity
26-40	Mild Hearing Loss
41 to 55	Moderate Hearing Loss
56-70	Moderately Severe Hearing Loss
71-90	Severe Hearing Loss
>91	Profound Hearing Loss



Active space

WHO classification :



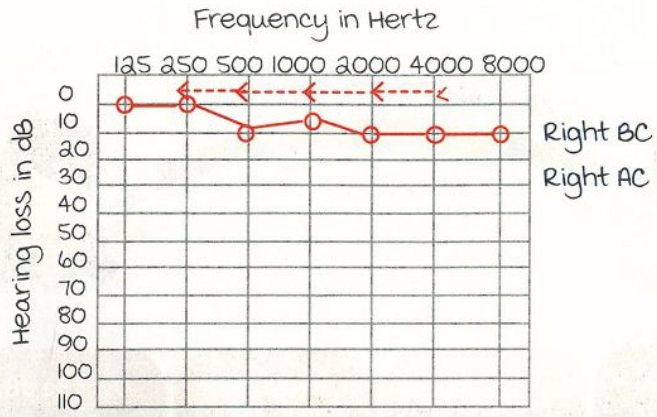
Interpretation of an audiogram

00:23:45

Symbols in an Audiogram :

	Right (Red)	Left (Blue)
Air conduction (AC) unmasked	○	×
Air conduction masked	Δ	□
Bone conduction (BC) unmasked	<	>
Bone conduction masked	[	]

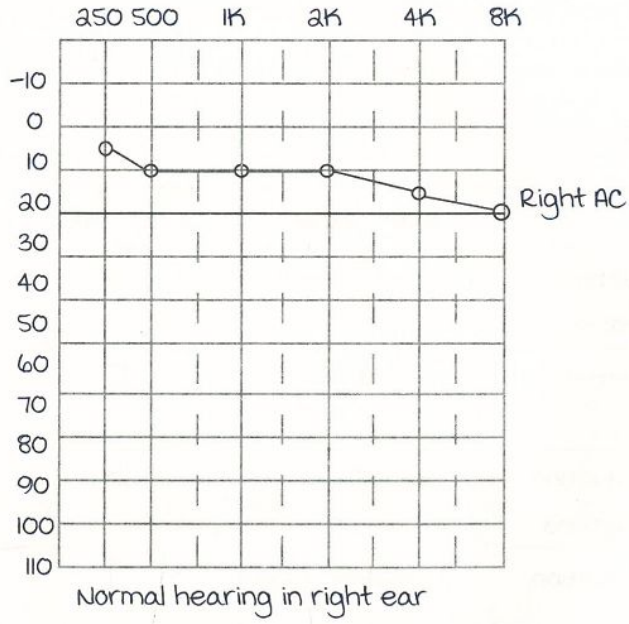
Active space



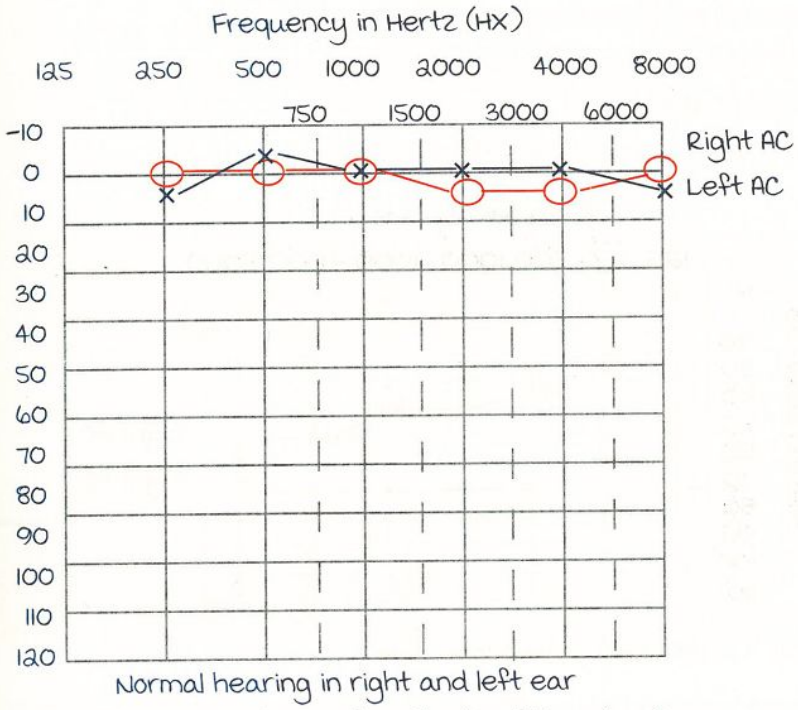
Normal audiogram

00:30:41

- AC and BC up to 25 dB.
- If AC is normal : Both sensorineural (SN) and conductive (C) hearing are normal.



Active space

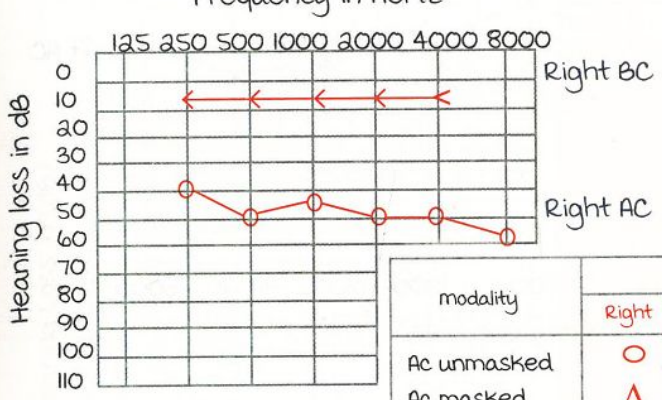


Conductive, sensorineural and mixed hearing loss audiogram

00:33:17

moderate right conductive hearing loss (CHL) :

- Right BC normal (Normal SN).
- Right AC defective
  (Normal SN + Defective C)
- In speech frequency : 50 dB loss.
- AB Gap > 15 dB : Defective C.

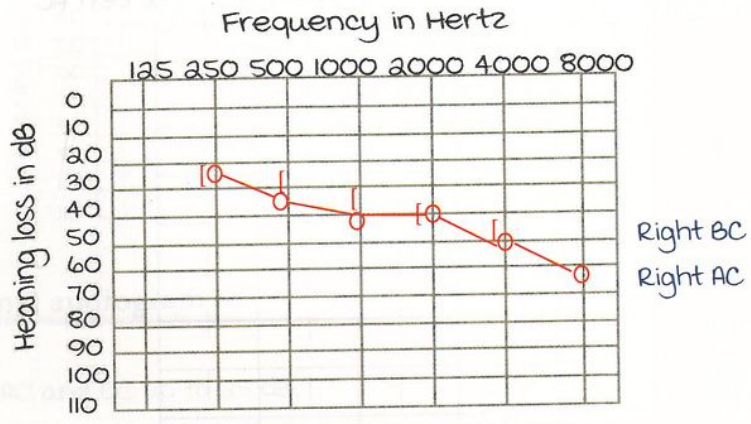


modality	Ear	
	Right	Left
Ac unmasked	O	X
Ac masked	Δ	□
Bc unmasked	<	>
Bc masked	[	]
No response	↙O	X↘

Active space

Right sensorineural hearing loss (SNHL) :

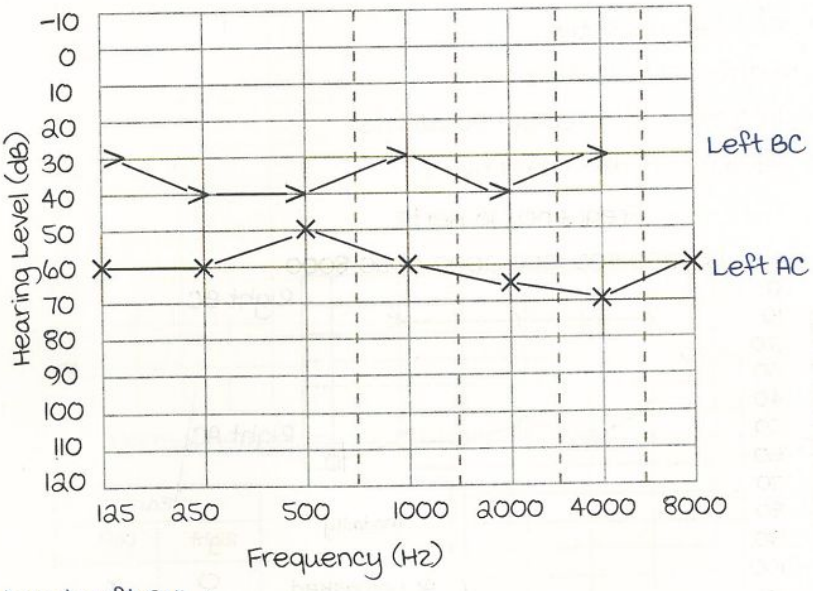
- Right BC defective (Defective SN).
- Right AC defective.
- AB gap < 15 dB : C is not affected.



If AB Gap > 15 dB : Defective conductive hearing.

Left mixed hearing loss :

- Left BC defective (Defective SN).
- Left AC defective.
- AB gap >15 dB : C is affected.



Right and Left CHL :

Right CHL :

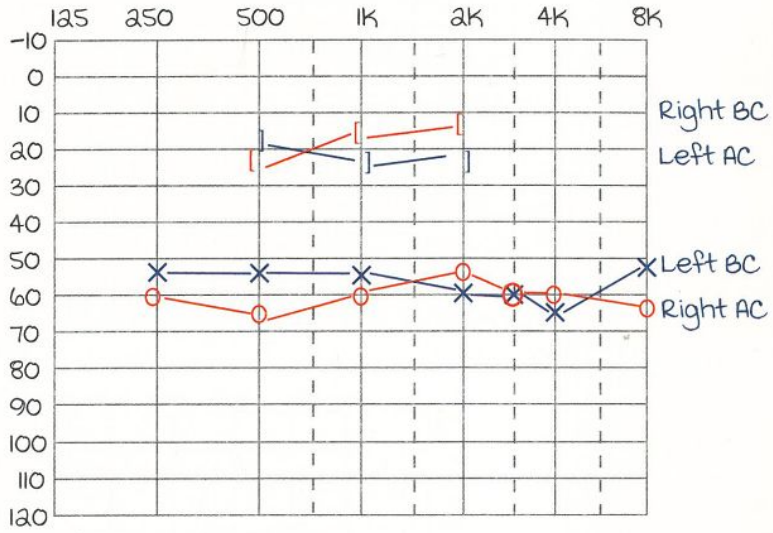
- Right BC normal (Normal SN).

Active space

- Right AC defective.
- AB gap > 15 dB : C is affected.

Left CHL :

- Left BC normal (Normal SN).
- Left AC defective.
- AB gap > 15 dB : C is affected



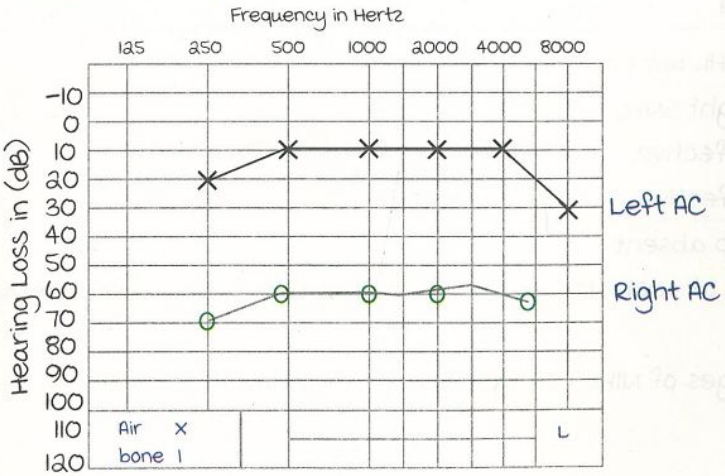
Right CHL :

Normal left ear

- Left AC : Normal (SN and C normal)

Right CHL

- Right AC defective.
- Right BC not given : Normal.



Active space

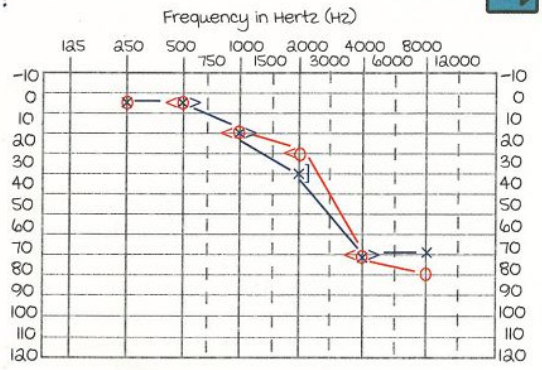
If BC is not given it is normal.

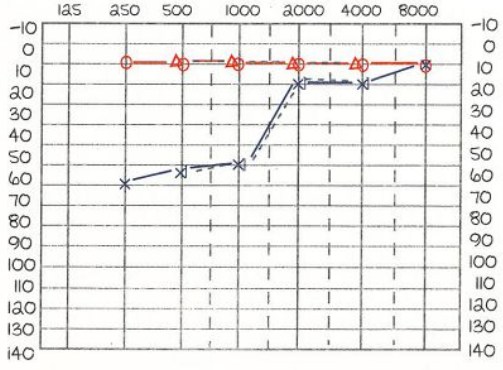
High and low frequency sensorineural hearing loss audiogram

00:52:55

Bilateral high frequency SNHL : Down-sloping audiogram.

Right high frequency SNHL :





Noise induced hearing loss and otosclerosis audiogram

00:52:55

Bilateral SNHL with acoustic dip.

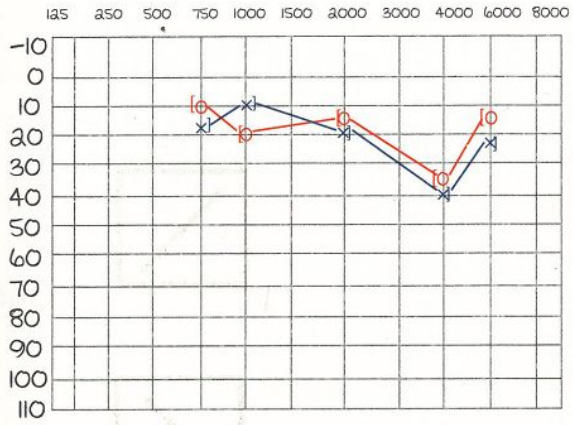
Left and right SNHL :

- BC defective.
- AC defective.
- AB gap absent

Acoustic dip at 4000 Hz : First change in noise induced hearing loss (NIHL)

In later stages of NIHL : Down-sloping audiogram.

Active space



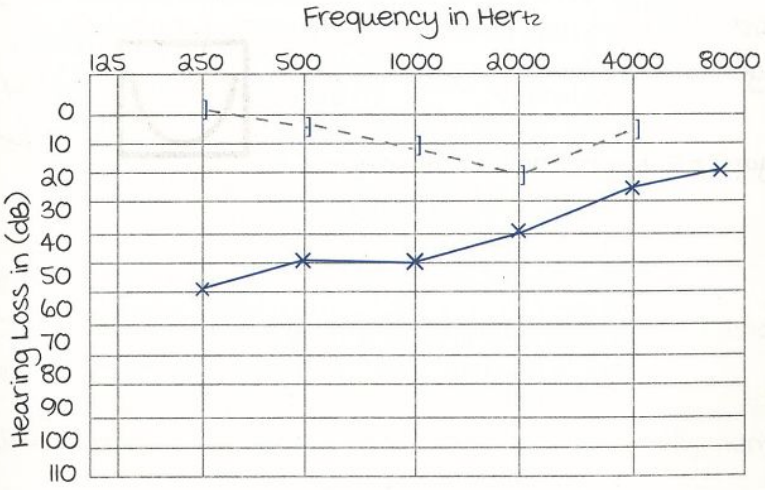
Left CHL with Carhart's notch : Otosclerosis.

Left CHL :

- Left BC normal.
- Left AC defective.
- AB gap present

Carhart's notch

- Dip in BC at 2000 Hz.



Steps for reading pure tone audiometry 01:01:29

1. Determine which ear : Left, right or both.
2. Determine if normal.
3. AB gap :
   - Absent : SNHL
   - >15 dB : CHL

Active space

- BC normal + AB gap : CHL
- BC defective + AB gap : Mixed hearing loss.

Characteristic audiograms :

Down-sloping : High frequency hearing loss

- Noise induced hearing loss
- Ototoxicity
- Presbycusis.

Up-sloping/ rising : Low frequency hearing loss

- Meniere's disease

Dip at 4000 Hz : Noise induced hearing loss.

U-shaped/ cookie bite/ Trough : Mid frequency (speech frequency) hearing loss

- Congenital SNHL

CHL (AB gap) + Carhart's notch : Otosclerosis.

Active space

AUDIOLOGY & EVALUATION- TYMPANOMETRY, BERA, OAE, & OTHERS

Defect in middle ear with normal tympanic membrane [TM]– can be :

- Ossicular discontinuity
- Ossicular fixation
- Serous otitis media

Impedance audiometry 00:04:35

Two parts : Tympanometry.
Stapedial reflex.

Tympanometry :

Indication : to assess middle ear condition with normal TM.
A probe is passed through external auditory canal [EAC].
The probe has three channels :
Probe A : passes sound across middle ear.
Probe B : changes the pressure of EAC
↓
To see movements of TM.

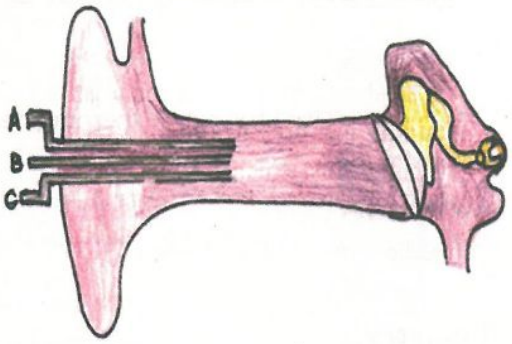
Probe C : picks up the reflected sound.

Excessive movement of TM : Ossicular discontinuity.
Decreased movement of TM : Ossicular fixation, fluid in middle ear.

If middle ear pressure is normal with decreased movement of TM
↓
It suggests normal Eustachian Tube (ET) : Ossicular fixation.

If middle ear pressure is negative with decreased movement of TM
↓
It suggests ET block : fluid in middle ear.

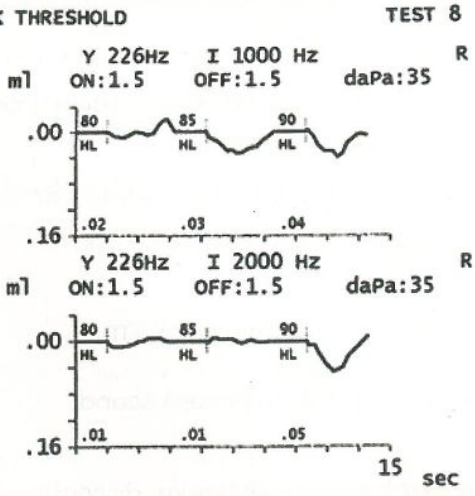
Active space



Stapedial reflex :

It is absent in all the three conditions:

- Ossicular discontinuity
- Ossicular fixation
- Serous otitis media



Tympanometry – graph

00:11:37

Tympanometry is most reliable test for ET function.

It is an objective test.

It measures two components : compliance [ease of mobility of TM].
[decreased resistance – increased compliance].
middle ear pressure : normal range = +100 to – 100.
[in ET block : negative pressure].

Active space

Graph : A : normal middle ear

A_D : Ossicular discontinuity

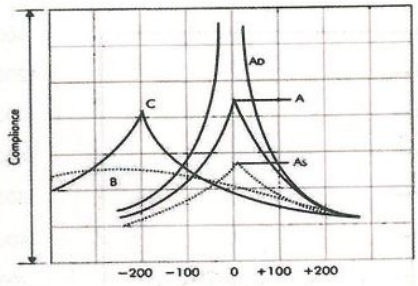
A_S : Ossicular fixation [stiffness/sclerosis of ossicular chain]

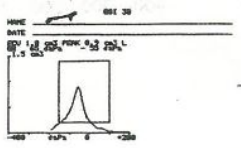
Seen in otosclerosis/tympanosclerosis

B : fluid in middle ear – serous otitis media [SOM]

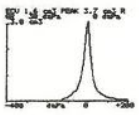
C : early stage of ET obstruction

Type of Curve	A	A_S	A_D	B	C	Flat
Compliance	Normal [N]	↓	↑	↓	[N]	negative
middle ear pressure	[N]	[N]	[N]	negative	negative	negative
Diagnosis	[N] middle ear	Oto / tympanosclerosis	Ossicular discontinuity	SOM	Early ET obstruction	TM perforation/ Extreme SOM



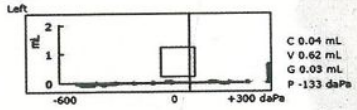


Normal middle ear



Ossicular Discontinuity

SOM



Warning: Not all points are covered in the notes, especially conceptual explanations. Please use the notes in conjunction with marrow masterclasses.

Active space

Graph : A : normal middle ear

A_D : Ossicular discontinuity

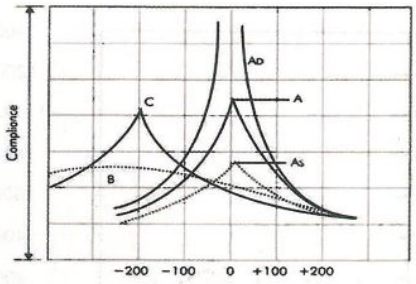
A_S : Ossicular fixation [stiffness/sclerosis of ossicular chain]

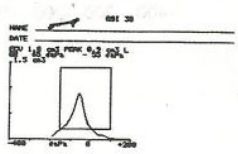
Seen in otosclerosis/tympanosclerosis

B : fluid in middle ear – serous otitis media [SOM]

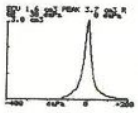
C : early stage of ET obstruction

Type of Curve	A	A_S	A_D	B	C	Flat
Compliance	Normal [N]	↓	↑	↓	[N]	negative
middle ear pressure	[N]	[N]	[N]	negative	negative	negative
Diagnosis	[N] middle ear	Oto / tympanosclerosis	Ossicular discontinuity	SOM	Early ET obstruction	TM perforation/ Extreme SOM

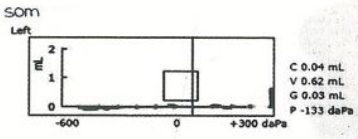




Normal middle ear



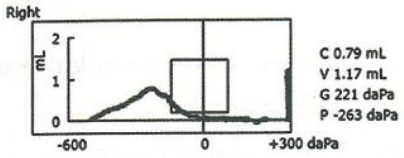
Ossicular Discontinuity



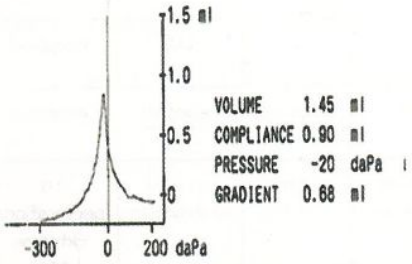
Active space

Warning: Not all points are covered in the notes, especially conceptual explanations. Please use the notes in conjunction with Marrow Masterclasses.

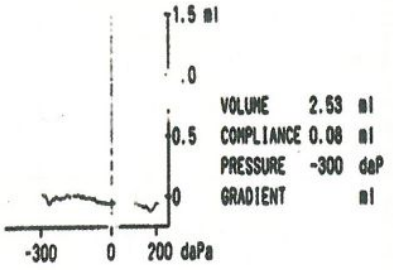
Early ET obstruction



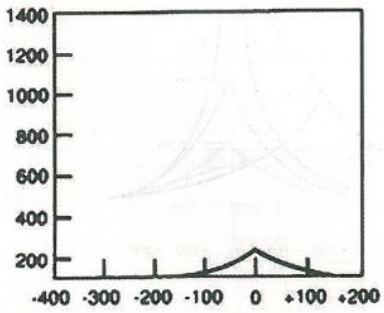
Ossicular fixation



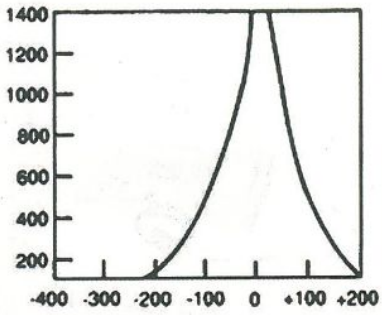
Ossicular discontinuity



Oto/tympanosclerosis



Ossicular discontinuity



Other tests for ET functioning

00:28:53

Valsalva maneuver :

Blow air into the mouth and exhale with closed nostril

↓

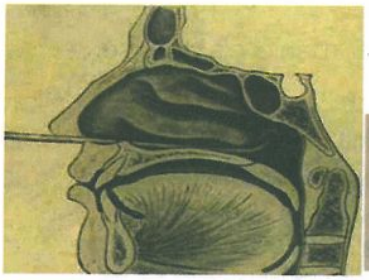
Normal – popping of eardrum

Active space

ET catherization :

It is used for nasal foreign body removal.

It is no longer used.



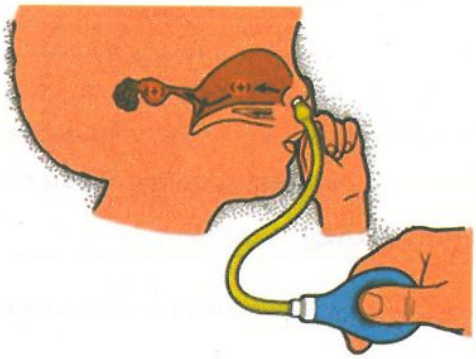
Politzerization :

It is used in children.

A politzer bag is passed via one nostril with other nostril closed.

↓

Increases pressure – popping of eardrum is seen/felt.



Test to differentiate – sensory and neural hearing loss 00:32:39

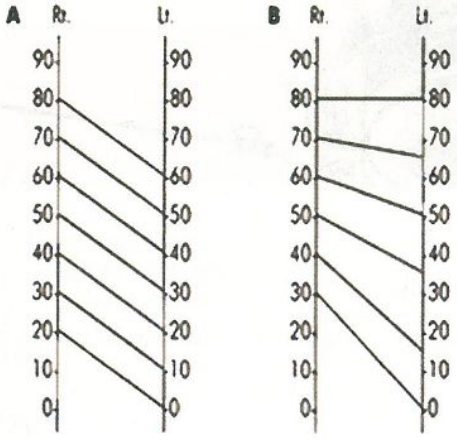
Active space

SISI – short increment sensitivity index :

In recruitment, an increase in Idb can be appreciated.

If 70 to 100% of Idb increments is identified correctly – abnormal ear.

It is seen in cochlear deafness, meniere's disease.



Stapedial reflex 00:40:57

In conductive hearing loss [CHL] : absent.

Sensory/cochlear hearing loss [HL] : threshold decreases.

Neural/ retro cochlear HL : Stapedial reflex decay occurs.

Oto-acoustic emission [OAE] 00:47:03

The activity of outer hair cells produces sound, which is recorded

↓

through the EAC by a probe.

If OAE is present [normal cochlea] : therefore, retro cochlear HL.

Types :

Spontaneous OAE

Evoked : used for testing.

Transient evoked : test is done with a click sound for whole of organ of corti.

It is used as a screening test in neonates.

[to provide early cochlear implants].

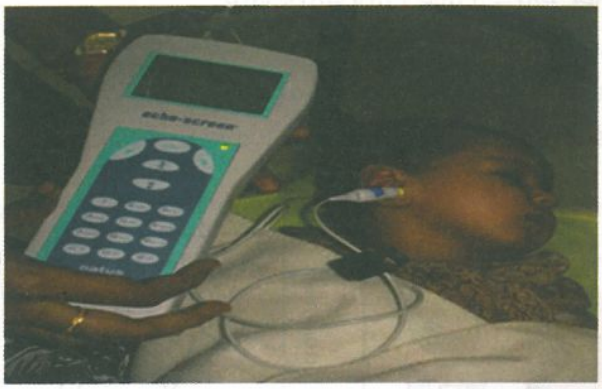
Active space

Distortion product : frequency specific.

Uses : To diagnose early noise induced HL.

To monitor ototoxicity.

If OAE is not recordable : refer to BERA/tympanometry.



BERA

01:06:11

Brain stem evoked response audiometry

It is an objective test.

It is the best investigation :

To differentiate cochlear and retro cochlear hearing loss.

To diagnose hearing loss in infants.

To screen neonates in ICU.

To find retro cochlear hearing loss : acoustic neuroma.

To find malingering [non-organic hearing loss].

A sound is given through EAC by a probe

↓

the response is recorded in the form of graph by electrodes.

Each part of the auditory pathway produces a wave.

Waves of BERA – 6 in number

- I : cochlear nerve [distal part]
- II : cochlear nerve [proximal part]
- III : cochlear nuclei
- IV : superior olivary nucleus

Active space

- V : lateral lemniscus – largest/most prominent wave. matches the threshold of the patient.
- VI : inferior colliculus.

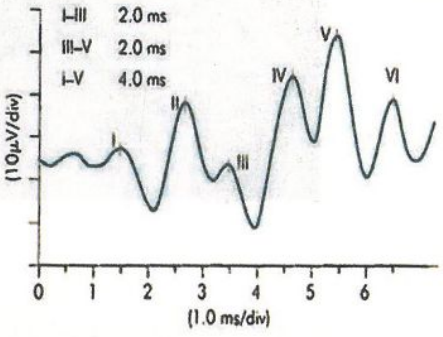
Latency : time at which each wave appears.

Defect in inner ear : wave I appears late.

Acoustic neuroma on BERA :

Increased latency between I and V.

Increased interaural latency of wave V : >0.2ms.



Electrocochleography [ECOG]

01:22:52

Electrocochleography is an invasive test.

It measures the electrical activity of cochlea.

It is the best test for cochlear disorders [Meniere's disease]

A probe is passed through tympanic membrane

↓

placed at promontory area.

↓

A click sound is given and response from organ of corti is recorded

↓

in the form of waves.

1st : activity of outer hair cell.

2nd : summating potential [SP] [sum of inner & outer hair cell activity].

3rd : action potential in the nerve [AP].

Active space

Normal SP : AP ratio <30%.

If SP : AP ratio >45% diagnostic of meniere

Speech audiometry 01:33:44

Speech audiometry is used in rehabilitation.

Speech reception threshold :

Loudness at which patient hears 50% of speech correctly.

It is 30db +/- 10db PTA threshold.

Discrimination score :

It is a function of the nerve to discriminate between words easily.

If poor : suggestive of neural deafness.

Roll over :

Speech audiometry is plotted in a graph.

On increasing sound above threshold :

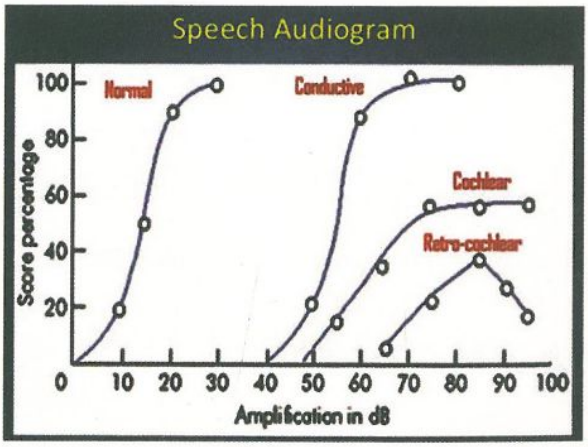
Normally : 100% words can be identified correctly.

In CHL : 100% words can be identified correctly.

In cochlear : not 100% words can be identified correctly

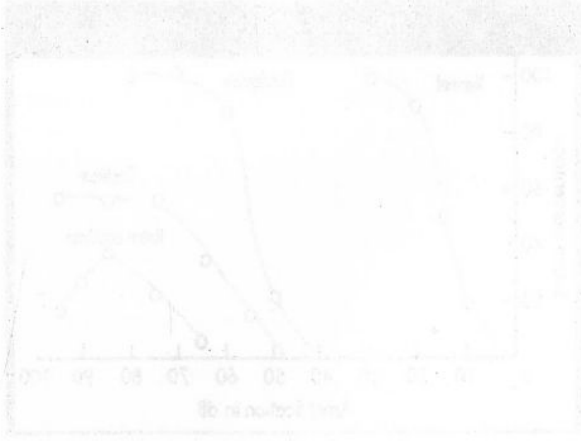
In retro cochlear : it improves till a level and falls.

Indicate nerve fatigue – neural deafness.



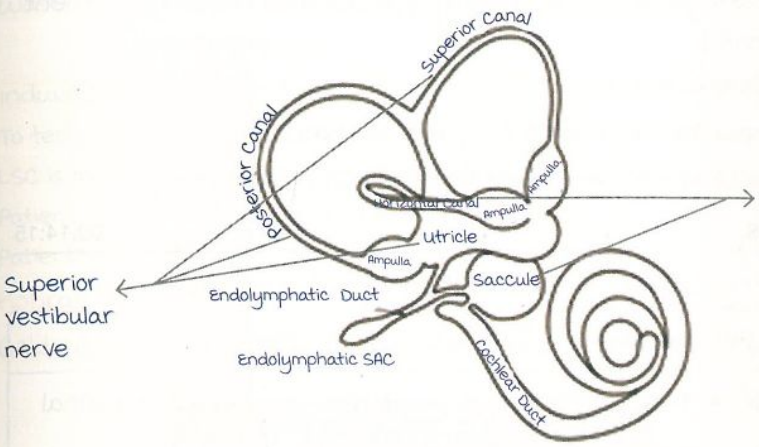
Active space

Active space



VESTIBULAR PHYSIOLOGY

Physiology of vestibular system 00:01:17



Cristae is present in the ampulla.
maculae present in utricle and saccule.

Inferior vestibular nerve(IVN) supplies inferior part of labyrinth - saccule and the posterior semicircular canal.
Superior vestibular nerve(SVN) supplies the superior & horizontal semicircular canal and the utricle.
IVN and SVN pass through the scarpa's ganglion and inferior acoustic meatus. as separate nerve and fuses to form the vestibular nerve.
Vestibular nerve goes to the vestibular nuclei in brainstem.

Impulse

Eye (Vestibulo ocular pathway) spinal cord (Vestibulo spinal pathway).

Vestibulo - ocular reflex : movement of eye in response to movement of position of body.

Active space

Vertigo 00:07:11

Peripheral	Central
Hearing loss	Cranial nerve involvement
Tinnitus	CNS symptoms
Fullness in ear	

Vestibular neuritis – Presents only with vertigo.

Defect in vestibulo-ocular reflex presents as nystagmus.

Nystagmus 00:14:15

Direction of nystagmus is the direction of fast component.

Peripheral	Central
Horizontal/ vertical + torsion	Pure vertical/ horizontal/ torsional
Disappears by optic fixation	Does not disappear
Direction fixed	Direction changing

Frenzel's glasses

Caloric test 00:27:03

Also called Fitzgerald Hallpike manoeuvre/ Bithermal caloric test.

Stimulation of inner ear with hot or cold water.

Temperature used is ±7° of body temperature (37°)

Hot water (44°C)	Cold water (30°C)
↓	↓
Nystagmus towards opposite side	Nystagmus towards same side

Active space

Latency : 10–20 secs

Duration : 1–1 mins

1/2

Water of different temperatures instilled inside the ear.

↓

Induces conventional currents in inner ear & stimulates it.

To test the lateral semicircular canal (LSC), supplied by SVN.

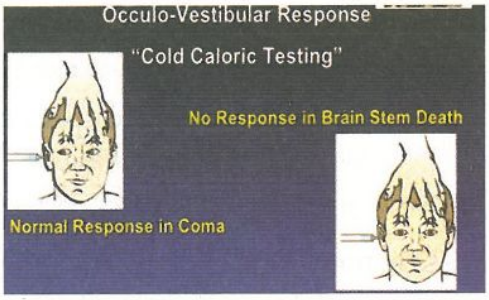
LSC is maximally responsive in vertical position.

Patient is put in supine and head elevated by 30° or

Patient in sitting position and head tilted by 60°

Kobrak test : testing with ice cold water.

Cold caloric test : to check response in brain stem dead patients.



Labyrinth hyperexcitability leading to vertigo 00:43:31

1. Posture change

Benign paroxysmal positional vertigo (BPPV): most common cause of vertigo.

Otoliths are set into motion during movement causing vertigo.

Posterior semicircular canal is commonly involved in BPPV.

Supplied by ↓ singular nerve

Diagnosis is by Dix hallpike manoeuvre.

Dix hallpike manoeuvre

In Peripheral nystagmus

- Latency : present
- Duration : limited
- Fatiguability : present
- Torsion : present
- Optic fixation : disappears
- Direction of nystagmus : fixed

Active space

2. During loud sounds : Tullio's phenomenon
   Causes : hypermobile footplate, fistula, superior semicircular canal dehiscence or Meniere's disease.
   Footplate movement during loud sound can stimulate inner ear.

Saccule	Utricle
IVN ↓	↓
Ipsilateral	Contralateral ocular
sternomastoid : relaxation	muscle

   Vestibular evoked myogenic potential (VEMP)
   Potentials are recorded using electrodes.
   Sternomastoid : cVEMP or cervical VEMP
   Eye : oVEMP or ocular VEMP
   If cVEMP normal : Utricle, SVN & Vestibuloocular reflex (VOR) are normal.
   If oVEMP normal : Saccule, IVN and vestibulospinal reflex (VSR) are normal.
3. Pressure changes
   Causes : Fistula, SSCD, Meniere's, hypermobile footplate.

Fistula test 1:08:46

False positive fistula test : Hennebert test
Pressure induced vertigo without fistula on medial wall.
Fistula can also be present in :
Lateral SSC, Oval window, round window, promontory.

Fenestration operation : Fenestra made over lateral SSC. Not done now.

False negative fistula :
Fistula covered by cholesteatoma
Dead labyrinth

Active space

Vestibular function tests 01:15:09

- Postural test
- VEMP test
- Electronystagmography (ENG) if spontaneous nystagmus present
- Head thrust test
- Caloric test

For VOR : oVEMP, ENG, Head thrust, caloric and fistula test
For VSR : cVEMP, Unterberger test (FUKUDA stepping test)

Unterberger test : patient is asked to close his eyes, arms extended and step in the same place at 90 steps / min.
Patient moves towards the side of lesion.

Nystagmus is always toward more active side.
In destructive lesion, normal side is more active .
Nystagmus towards normal side.
In hyperactive lesion, nystagmus is towards hyperactive side.

Active space

TEST OF VESTIBULAR SYSTEM

Dix Hallpike manoeuvre 00:00:21

Test for posterior semicircular canal Benign paroxysmal positional vertigo (BBPV).

Procedure : turn the patient's head to one side

↓

Lay the patient down with head overhanging at 45 degree

↓

this stimulates posterior semicircular canal.

Check for latency, character of nystagmus and side.

Example – In left ear BPPV :

Latency : present

Character : Torsional with vertical nystagmus towards active side [left ear].

Side : Active side [left ear] towards ground is called Geotropic nystagmus.

In vestibular neuritis.

Torsional with horizontal nystagmus is seen towards the hyperactive side.

Disappears on optic fixation.

Fast component is always towards the irritated labyrinth.

In complete destruction of labyrinth on one side – horizontal nystagmus.

Spontaneous nystagmus : Nystagmus in primary gaze.

Gaze evoked nystagmus : When eye is moving towards left or right.

Gaze paretic nystagmus : Small movements on fixation of extreme of gaze.

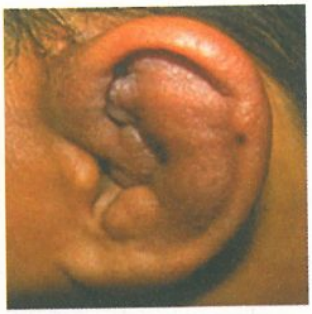
Vertigo on hearing loud sounds : Tullio's phenomenon.

Active space

DISEASES OF EXTERNAL EAR

Diseases of external ear

00:04:25



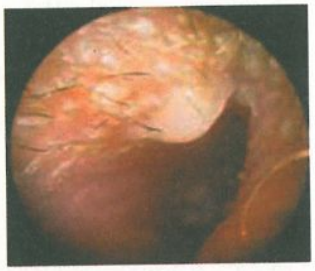
Cauliflower ear
A/K/A boxer's ear or wrestler's ear.
Hematoma of pinna.
Cause - Trauma (m.c. in boxers)
Treatment, if patient presents immediately -
Incision & drainage.

Perichondritis :
Inflammation of perichondrium in the cartilage of pinna except lobule.
Causes - infection of traumatic/ surgical wound by pseudomonas.
Clinically : Red, hot, painful pinna.
management :
Antibiotics against pseudomonas.
Ciprofloxacin, Ceftazidime, newer penicillins with analgesics.

Infections of EAC

00:11:18

1. Localised otitis externa (Furuncle) :
   Localised to outer 1/3rd part of EAC.
   Clinical features :
   - Pain increases on jaw & pinna movement.
   - Tragal sign - positive



Management -
Most common Organism : staphylococcus
Antibiotics against staph and analgesics

2. Diffuse Otitis externa :
   Painful movements of the

Active space

pinna & jaw.

O/E: edematous EAC

Infection caused by pseudomonas.

Management –

- Ear toileting
- Topical ear drops
- Antibiotics against pseudomonas.

Also known as Swimmer's ear/ Tropical ear.

3. Malignant otitis externa :

Infective condition caused by pseudomonas

Seen in elderly, immunocompromised (diabetics, on steroids, immunosuppressive drugs).

Clinically, severe pain and ear discharge.

On examination –

- Granulations
- Necrosis
- Cranial nerve involvement – 7,9,10,11.

Earliest to be involved – 7th cranial nerve.

Osteomyelitis of base of skull can occur through fissure of santorini.

So, it's known as skull base osteomyelitis.

Investigations :

For early diagnosis – bone scan (Technetium – 99m scan).

Shows increased uptake due to osteoclastic activity.

Biopsy – no mitotic activity seen

Management

Antibiotics against pseudomonas

- Ciprofloxacin (oral)
- 3rd generation cephalosporins Eg: Ceftazidime
- Newer penicillins

Course of antibiotics depends on the resolution.

Check for resolution of infection by gallium/ indium scan or by monitoring ESR.

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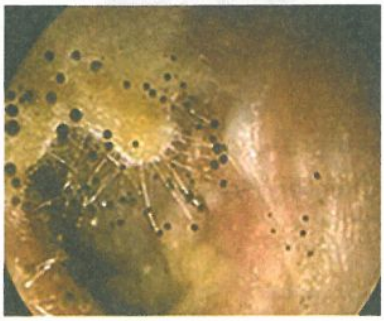
Fungal otitis externa - Otomycosis 00:35:46

Cause : fungus due to increased humidity in EAC

Aspergillusniger



Wet newspaper appearance
(when mixed with discharge)

Candida

cotton wool appearance

Clinical features :

Pain and itching.

Management :

Ear toileting with antifungal ear drops.

Herpes zoster oticus 00:39:14

Varicella zoster infection.

Clinical features :

Discharge

Vesicles in the distribution of nerve
(Auriculotemporal nerve)

If associated with facial nerve palsy –
Ramsay hunt syndrome

Ear wax 00:41:17

Ceruminous secretions + desquamated epithelium.

Clinical features:Blocked ear and pain.

Management :

Wax solvents followed by syringing.

Active space

Syringing :

- Water at body temperature
- Posterosuperior direction
- At moderate pressure

Complications :

Vertigo (if water is not at body temperature)

Perforation of tympanic membrane (if water injected with high pressure)

Contraindications of syringing :

- Tympanic membrane perforation.
- If FB is a battery – never put water inside the ear.
  Live insect – Kill the insect with oil and then syringing.
  Vegetative foreign body – it can swell up on syringing.
- Wax is removed by passing probe behind it.
- Foreign body is held with forceps & removed.

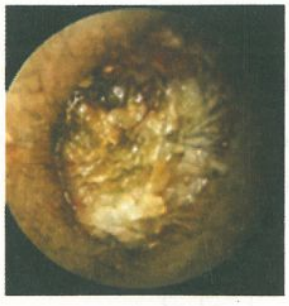
Keratosis obturans

00:49:52

Happens due to abnormal epithelial migration leading to the collection of keratin in the EAC.

Epithelium of EAC has a property of migrating the desquamated cells towards the outside.

Management : Surgical intervention.



Active space

CONDITIONS OF TYMPANIC MEMBRANE

Tympanic membrane is the window of the middle ear

Traumatic perforation 00:01:25

Tympanic membrane is the most susceptible part for traumatic injury when the injury occurs all of a sudden.

Tympanic membrane Perforation with blood clots around it.

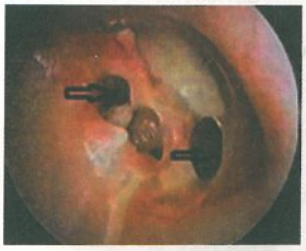
Management :

- Keep ear dry (while bathing).
- Keep the ear free from any kind of infection (from outside or from the Eustachian tube).
- The tympanic membrane heals by itself (in 3 months unless and until it gets infected).
- If it does not heal in 3 months, then myringoplasty has to be done.

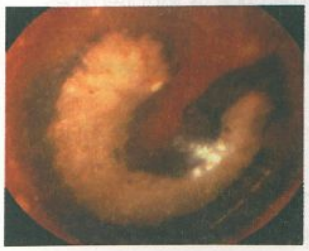
Only 2 layers heal. The fibrous layer will not heal.

TB of ear :

- Presents with discharge and multiple perforations.
- The discharge is very foul-smelling.
- Painless, Pale granulations, 50-55 dB hearing loss.
- Treatment : ATT



Tympanosclerosis 00:07:37



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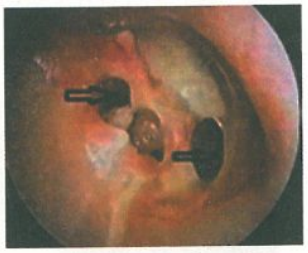
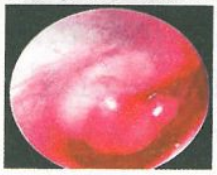


Tympanosclerosis 00:07:37

Active space

Myringitis

00:09:00

Acute	Chronic
Called as myringitis bullosa	Called as chronic myringitis
Bloodstained discharge on rupture	Multiple granulations on TM
Caused by Streptococcus pneumoniae (most common) and influenzavirus	Caused by Pseudomonas.
Treatment : antibiotics	Treatment : antibiotics
 	

Retraction of tympanic membrane

00:12:40

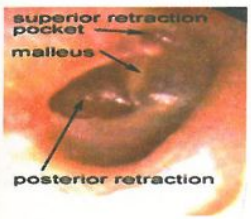
- Whenever the Eustachian tube gets obstructed, the pressure in the middle ear becomes negative, leading to retraction of TM.
- In acute conditions, Pars tensa gets retracted and in chronic conditions, pars flaccida gets retracted.

Sade Stage : for retraction of Pars tensa.

Sade stage 1	Sade stage 2	Sade stage 3	Sade stage 4
			
In retraction, due to pulling of handle of malleus : The cone of light becomes absent or distorted leading to a dull tympanic membrane. Sickling of malleolar folds. The prominence of the lateral process.	Retracted drum touches the incus or stapes.	The collapse of the middle ear space : Atelectasis. Tympanic membrane touches the promontory.	The tympanic membrane is adherent to the promontory : Adhesive otitis media.

Active space

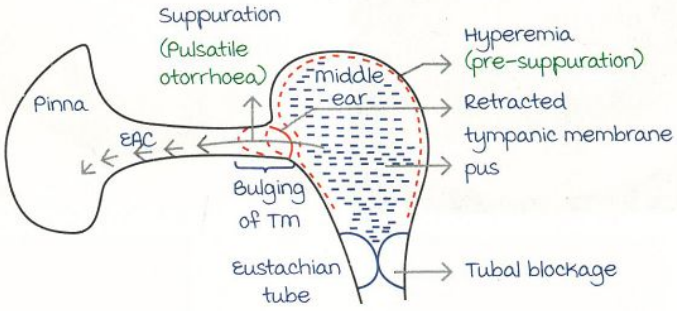
TOS Stage : for retraction of Pars flaccida.

TOS stage I	TOS stage 2	TOS stage 3	TOS stage 4
			
Pars flaccida is retracted than normal but not adherent to the malleus. Pars flaccida on retraction goes into the epitympanum (Prussak space : just medial to pars flaccida).	The retraction pocket is adherent to the head of the malleus. The full extent of the retraction pocket can be clearly seen.	Part of the retraction pocket may be hidden. They may also be associated with erosion of the outer attic wall (scutum).	Definite erosion of the outer attic wall. The full extent of the retraction pocket is not seen.

ACUTE OTITIS MEDIA

Etiology

00:01:07



MC causative organism : Streptococcus pneumoniae.

MC route of spread : Eustachian Tube.

Infection of pharynx affects the Eustachian tube.

↓

Tubal blockage (1st stage)

↓

middle ear pressure becomes negative & tympanic membrane gets retracted.

↓

Hyperemia of middle ear mucosa (2nd stage : pre-suppuration)

- Cart wheel appearance of tympanic membrane.
- Very red tympanic membrane.

↓

Exudation of fluid in middle ear.

↓

Pus is formed in middle ear.

↓

Tympanic membrane bulges out.

↓

Tympanic membrane ruptures (3rd stage : suppuration)

↓

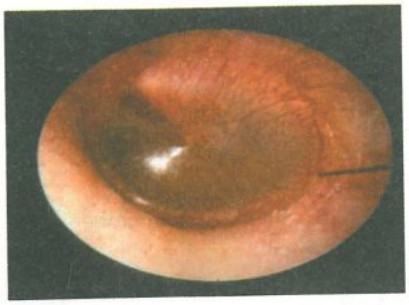
Pulsatile otorrhoea (Lighthouse sign)

Patient comes with C/O severe pain in ear & throat.

Suspect upper respiratory tract infection

Active space

Cart wheel appearance



Bulging tympanic membrane

management : Myringotomy

- Antibiotics against Pneumococcus
- Analgesics
- Decongestants

Myringotomy 00:11:11

Never given in postero-superior quadrant as many important structures (Incudo-Stapedial joint, Oval window) lie there.

Incision is given in Postero-inferior quadrant.

- Radial → Not preferred (Fibres of Tympanic membrane run radically, incision closes fast)
- J-shaped curvilinear incision → Preferred

Management of Acute suppurative otitis media-ASOM 00:13:27

Active space

Acute necrotizing otitis media

00:18:54

Causative organism : β Hemolytic streptococcus.

Perforation : marginal.

Types of TM perforation :

Small – perforation limited to one quadrant

Medium – perforation limited to 2 quadrants

Large – 3 quadrants

Subtotal – all 4 quadrants

These are central perforation with annulus intact.

If annulus is eroded – marginal perforation.

Active space

Active space

SEROUS OTITIS MEDIA

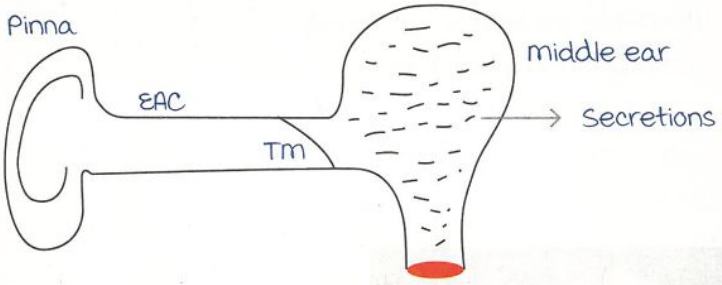
Causes of Serous otitis media 00:00:33

Serous otitis media is collection of sterile fluid in middle ear.

Due to :

- Decreased drainage :
  In children : Bilateral hypertrophy of adenoid (most common).
  In adults : Unilateral nasopharyngeal carcinoma.
- Increased production :
  In allergic conditions.

Adenoids start atrophy by puberty and disappear at 20 years of age.



Mass in pharynx

- Adults → Nasopharyngeal carcinoma → Unilateral obstruction → Unilateral painless hearing loss
- Children → Hypertrophy of adenoid → Bilateral obstruction → Bilateral painless hearing loss → Fluctuating due to change in size of the adenoids.

Fluid collection in middle ear is not under any pressure (Painless condition).

Active space

Tympanic membrane in SOM

00:10:16

1. Dull
2. Retracted TM (not bulging).

- Prominent lateral process.
- Handle of malleus is shortened.
- Sickling of malleolar folds.
- Complete cone of light not seen.

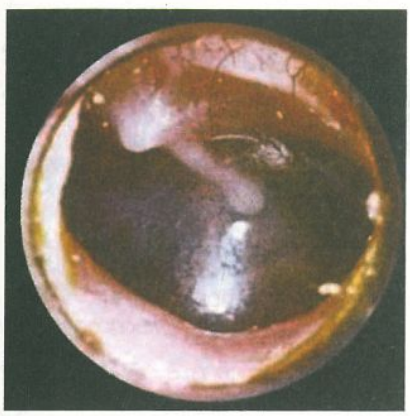
3. Fluid level seen
4. Air bubbles present

5. Glue ear

Due to precipitation of fluid inside tympanic membrane.

Active space

6. Bluish colour of tympanic membrane.



Audiological examination 00:14:03

Management of serous otitis media 00:17:07

Medical management : 3 months of treatment

- Anti-allergics
- Decongestants
- Steroid nasal spray
- Autoinflation

↓ No response

Surgical management : Adenoidectomy

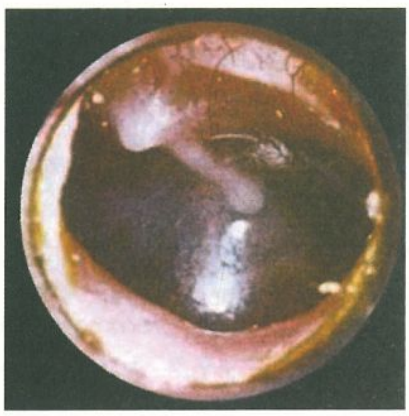
+

Myringotomy with grommet insertion.

Myringotomy : Incision over tympanic membrane to remove fluid from middle ear.

Active space

6. Bluish colour of tympanic membrane.



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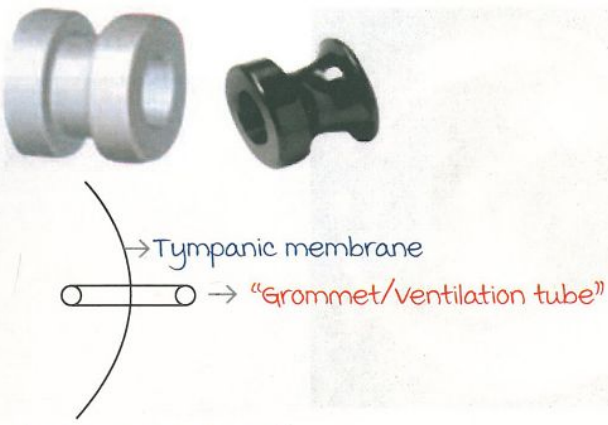
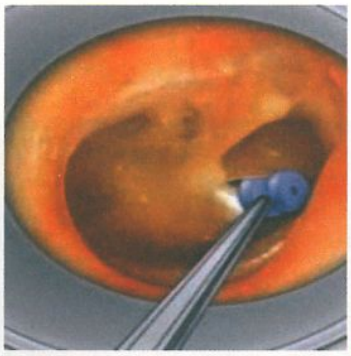
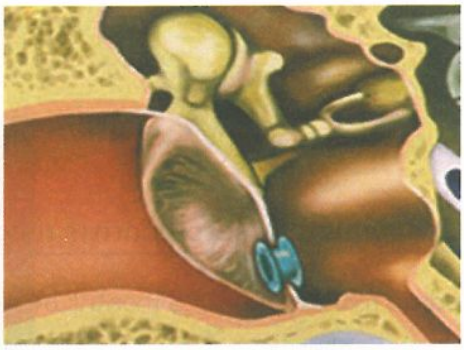
Active space

Grommet :



- Radial incision is preferred.
- It tightly holds the grommet.
- In anteroinferior quadrant of tympanic membrane (it replaces the eustachian tube).





- Incision in the posterosuperior quadrant is not preferred (to avoid injury to important structures).

Beer can technique :

- Done in cases of serous otitis media where it is difficult to remove fluid via radial anteroinferior incision.
- Incision at anterosuperior quadrant
- Air enters the middle ear, pushes the fluid out through the lower opening.

Warning: Not all points are covered in the notes, especially conceptual explanations. Please use the notes in conjunction with Marrow masterclasses.

Active space

Types of Grommet 00:29:16

Short term grommet :

- Stays for < 6 months.
- Shephard's grommet :

- Donaldson's grommet :

midterm grommet :

- Stays for 6-12 months.
- Shah's grommet :

- Armstrong's grommet :

Long term grommet :

- T-tube : > 2 years

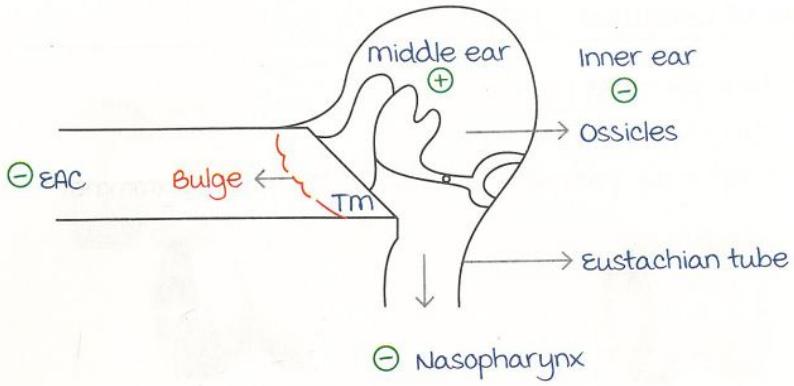
Barotrauma 00:35:55

The pressure in external auditory canal, nasopharynx and inner ear is automatically regulated, according to the change in external pressure. The failure of this regulation causes barotrauma.

Changes in ear due to barotrauma :

1. During ascent :
    - Decrease in pressure externally (negative pressure).

Active space



- If middle ear pressure > + 15 mm H_2O

↓

Passive opening of eustachian tube.

↓

Pressure relieved.

- In case of eustachian tube block

↓

Increased pressure in middle ear.

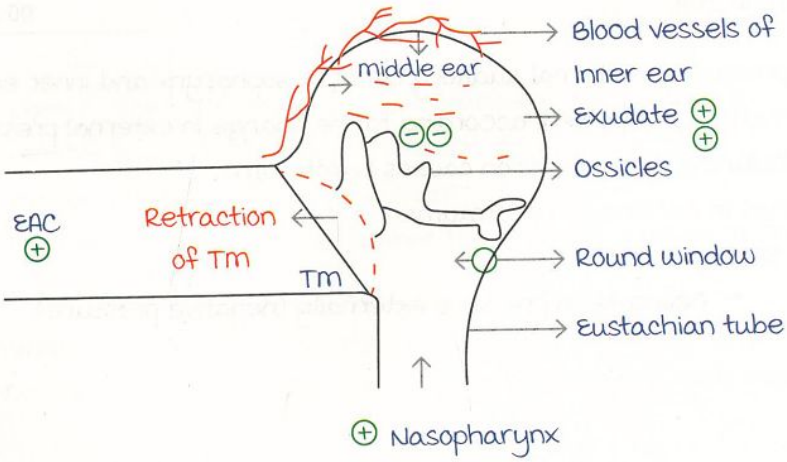
↓

Tympanic membrane is pushed outwards.

↓

Rupture of tympanic membrane.

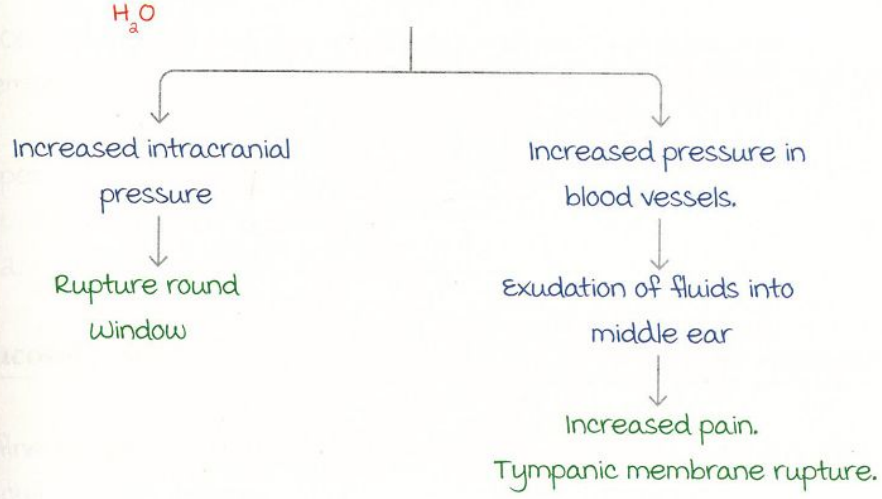
2. During descent :
   - Increased pressure in middle ear.



Active space

Pressure relieved on opening of eustachian tube actively (swallowing, chewing, Valsalva maneuver).

- If eustachian tube is blocked, pressure difference > 90 mm H_2O



Management : Mostly preventive

- Nasal decongestants

Active space

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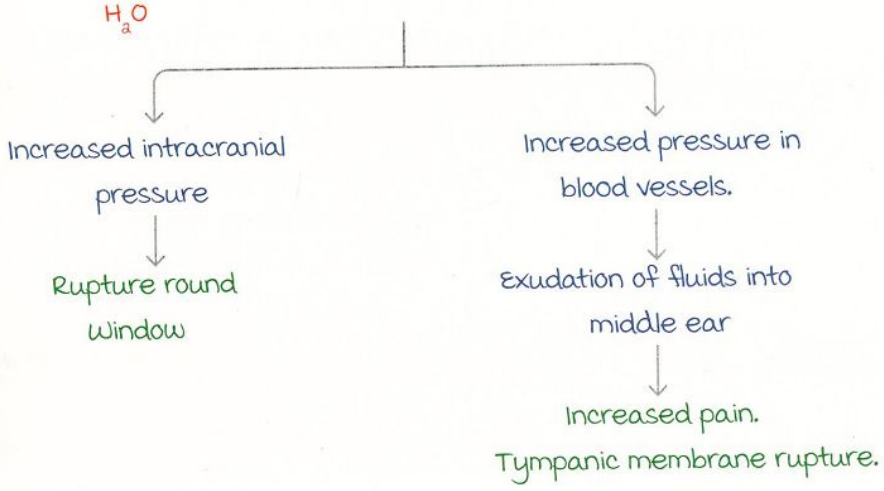


Management : Mostly preventive

- Nasal decongestants

Active space

MUCOSAL CSOM

Chronic otitis media (COM) / chronic suppurative otitis media (CSOM) 00:00:13

CSOM : Characterised by permanent abnormality of tympanic membrane (TM).

Types :

1. Mucosal COM : safe CSOM.
2. Squamosal COM : unsafe CSOM.

Mucosal CSOM 00:02:05

Defined as permanent central perforation of pars tensa for > 3months, following ASOM, trauma.

Also known as tubotympanic COM as infection from eustachian tube can lead to infection of middle ear.

Classified as :

- Active : if discharging.
- Inactive : if non-discharging.

Patient presents with complaints of :

- Ear discharge (>3months).
- Hearing loss (10-40db depending on site and size of perforation).

Myringoplasty 00:14:21

Active space

Ossicular necrosis

00:23:51

Lenticular/ long process of incus : most common ossicle to get necrosed/eroded.

Ossicular pathway is disrupted due to ossicular necrosis, leading to increased hearing loss (50db).

Treatment : Tympanoplasty (myringoplasty + ossiculoplasty).

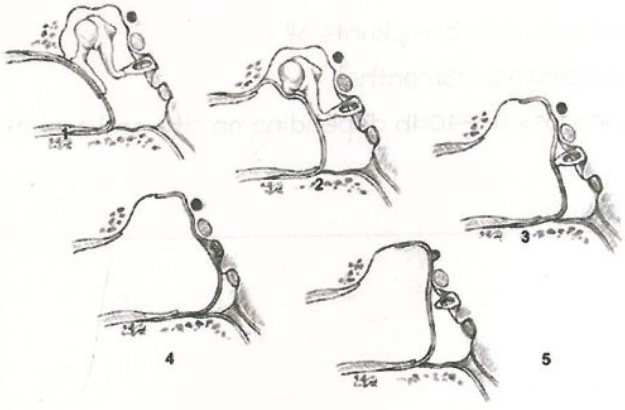
Tympanoplasty

00:26:01

Tympanoplasty is the repair of perforation (myringoplasty) along with reconstruction of ossicles (ossiculoplasty).

Wullstein classification of tympanoplasty :

- Type 1 : graft is placed over malleus; its same as myringoplasty.
- Type 2 : graft is placed over incus.
- Type 3 : graft is placed over stapes head; also known as myringostapediopexy/columella tympanoplasty.
- Type 4 : oval window is left open and rest of the middle ear mucosa is covered by graft.
- Type 5 : fenestration operation; done in cases where footplate is completely fixed (as in otosclerosis); not done anymore due to complication of vertigo.



Austine-Kartush classification of tympanoplasty :
(Based on presence of handle of malleus & stapes head)

- Type A : only incus is absent.

- Type B : incus & stapes are absent.
- Type C : only stapes present.
- Type D : none of the ossicles are present; treated by TORP (total ossicular replacement prosthesis).
- Type E : ossicular head fixation.
- Type F : stapes fixation.

Management of CSOM

00:41:10

1. Active CSOM :
   - medical management : local ear drops & oral antibiotics for 6 weeks (to reduce ear discharge and make the ear dry).
   - Surgical management (dry ear) : myringoplasty or tympanoplasty.
2. Inactive CSOM :
   - myringoplasty or tympanoplasty.

CSOM - SQUAMOSAL

Definition of CSOM- Squamosal 00:02:02

Any permanent abnormality on the tympanic membrane, which leads migration of squamosal epithelium from the EAC into the middle ear.

Cholesteatoma 00:05:12

Cholesteatoma - Presence of stratified squamous epithelium in the middle ear.

Cholesteatoma causes erosions that leads to complications.

Occurs in marginal perforation where annulus is eroded.

↓

Part of mucosa of middle ear will be absent favouring migration of epithelium to middle ear.

↓

Keratin accumulation occurs in the middle ear.

↓

Macrophages activated to remove epithelium and transform into osteoclast.

↓

Bone erosion.

Patient has foul smelling and scanty discharge.

Secondary cholesteatoma 00:13:35

Migration through marginal perforation.

(Acute necrotizingotitis media- ANOM)

↓

Haberman theory

Through retraction pocket.

↓

Wittmaack theory

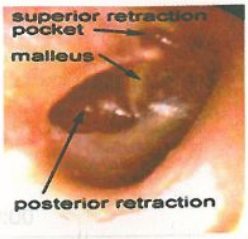
Primary cholesteatoma :

Migration of the squamous epithelium from EAC into middle ear without TM perforation.

Active space

TOS Classification :

Stage 1 : Pars flaccida is retracted but not adherent to malleus.



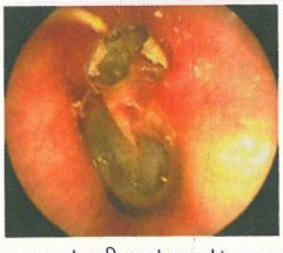
Stage 2 : Retraction pocket is adherent to the upper part of handle of malleus.

The full retraction pocket can be seen.

Stage 3 : A part of retraction pocket is hidden, it goes behind the scutum.

Stage 4 : Most of the retraction pocket is hidden.

Definite erosion of outer attic wall (scutum).



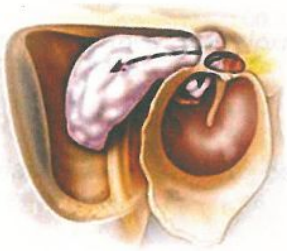
If any part of retraction pocket is not seen, suspect active cholesteatoma.

- MC site of retraction of TM : Pars flaccida or prussak's space or attic.
- MC route : via retraction pockets (A/K/A Primary cholesteatoma)

Active space

Atticoantral CSOM :

Since it goes from the attic through the aditus into the antrum, it's also known as attico antral CSOM



Congenital cholesteatoma 00:30:10

Management of squamosal CSOM 00:35:09

No medical line of management.

Surgeries

- Intact canal wall procedure
- Canal wall down procedure
  - Modified radicalc mastoidectomy(MRM)
  - Radical mastoidectomy(RM)

Incision - post aural incision (Wildes incision)

↓

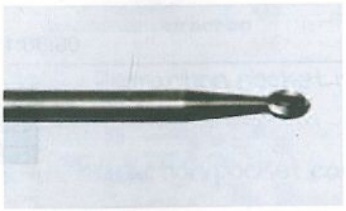
Pinna is retracted forward with self retaining mastoid retractor.
The retractor is self retaining.
Puts pressure on tissues and helps achieve hemostasis.

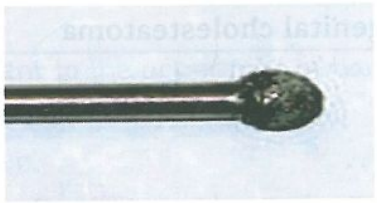
Active space

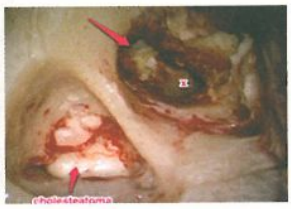
↓

Through mac evan's triangle, mastoid is drilled.

Cutting burr	Diamond burr
used to drill bones (mastoid)	Blunt burr used to prevent injuries to important structures.







Mastoid antrum filled with cholesteatoma flakes.

Cholesteatoma flakes are removed from middle ear cavity and attic area.

Through facial recess area - remove diseased part of middle ear.

Electrode of cochlear implant are introduced through the facial recess into the round window

The decision of Intact canal wall or canal wall down procedure is made on table.

If disease is limited - intact canal wall procedure.

If disease is extensive - canal wall down procedure.

Active space

Canal wall down procedure 00:52:27

Remove common wall between mastoid and middle ear.

↓

Remove diseased part and reconstruct posterior wall of EAC.

Aim of surgery :

- Safe and dry ear
- Restore hearing (if possible) – e.g. tympanoplasty.

Modified radical mastoidectomy	Radical mastoidectomy
1. Preserving healthy structures	1. Removing everything except footplate of stapes.
2. Reconstruction is done.	2. Eustachian tube closed
3. Management in all squamosal CSOM with or without complications.	3. No reconstruction
	4. Not done nowadays. Only indication is when inner ear is completely dead.

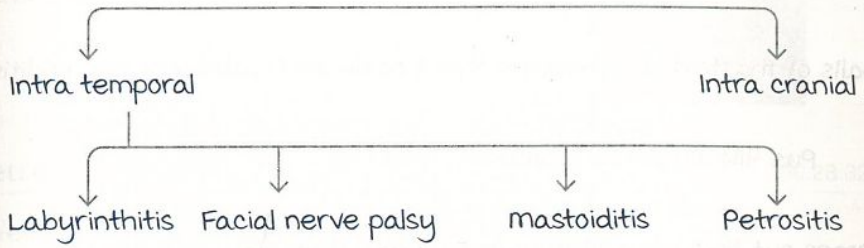
Warning: Not all points are covered in the notes, especially conceptual explanations. Please use the notes in conjunction with Marrow masterclasses.

Active space

Active space

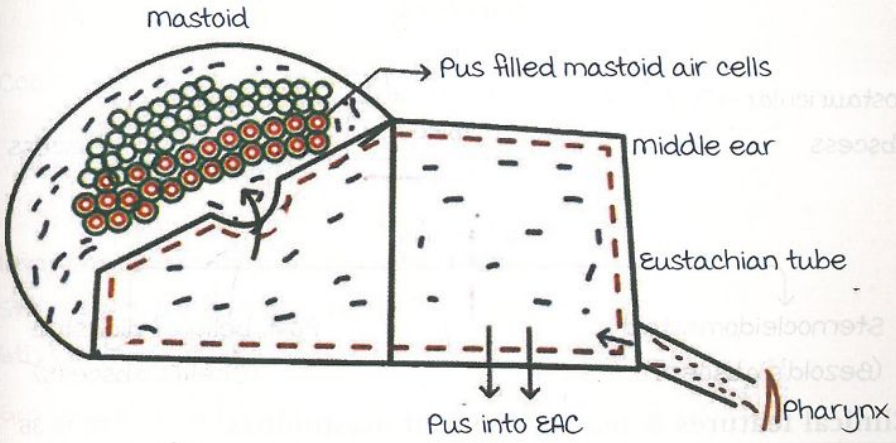
COMPLICATIONS OF CSOM

Classification of complications of CSOM/ASOM 00:02:40



MC complication in Acute Otitis media – TM perforation

Mastoiditis 00:07:55



Pharyngeal infections (mc : streptococcus pneumoniae)
Infection and edema of eustachian tube-blockage
↓
Hyperemia of middle ear (cartwheel appearance)
↓
Collection of fluid in middle ear – suppuration
↓
TM perforates under the pressure
↓
If patient's immunity is weak,
Spread of infection through aditus to mastoid air cells
↓

Active space

Hyperemia of mastoid air cells – suppuration

↓

Pus filled mastoid air cells

↓

Walls of mastoid cells become thin & coalesce (coalescent mastoiditis)

↓

Pus filled mastoid cavity

↓

Comes out through aditus to middle ear, then EAC.

Spread of pus from mastoid cavity :

Zygomatic abscess

↥

Superiorly

↥

Postauricular abscess ↤ Posteriorly ↤ **Pus in mastoid cavity** → Anteriorly → Luc's abscess

↓

Inferiorly

↓ ↓

Sternocleidomastoid (Bezold's abscess)

Post. belly of digastric (Citelli's abscess)

Clinical features & management of mastoiditis 00:15:36

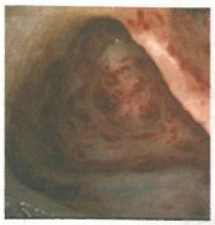
Active space

Management

First line – IV antibiotics against S.pneumoniae

↓ no response after 48 hrs

Simple mastoidectomy/
Cortical mastoidectomy/
Schwartze operation.



Petrositis 00:28:32

Infection spreads from mastoid to the petrous part of temporal bone.

↓

Spreads to petrosal air cells and causes hyperemia.

↓

Suppuration

↓

Coalesce and form a single pus-filled petrosal cavity.

↓

Petrous apex involvement

↓

Involvement of 5th and 6th cranial nerve.

5th nerve : Retro-orbital pain

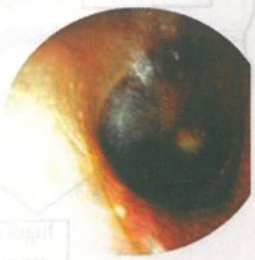
6th nerve : Diplopia

Gradenigo's triad :

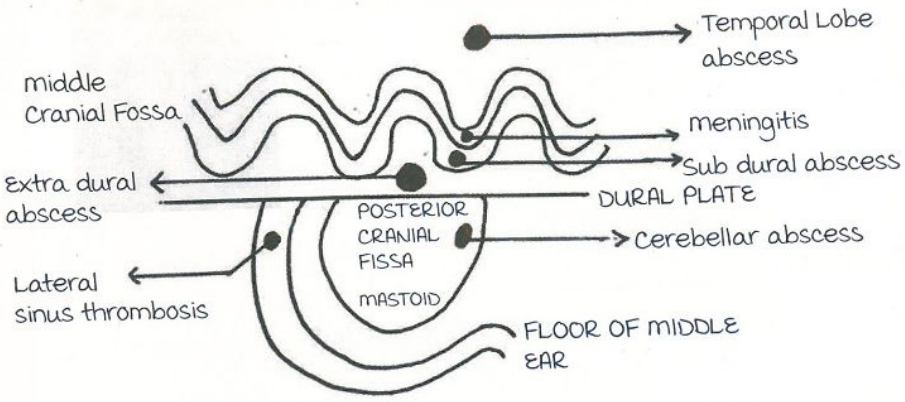
- Persistence of ear discharge after mastoid surgery.
- Involvement of 5th nerve
- 6th nerve palsy.

Battle sign

Hemotympanum



Active space



Intracranial complications

00:39:28

most common : meningitis.

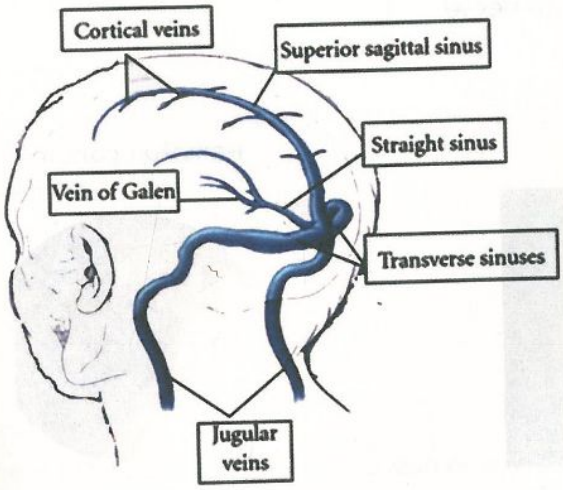
and most common : temporal abscess.

Temporal lobe abscess

- Convulsions
- Supraquadrantic homonymus hemianopia (Pie in the sky appearance)
- Nominal aphasia
- Contralateral motor palsy

Sigmoid sinus

00:51:17



Active space

Spread into sigmoid sinus forms a perisinus abscess

↓

Activation of coagulation cascade

↓

Sigmoid sinus thrombosis/ Lateral sinus thrombosis

↓

Everytime thrombus releases into blood, fever spikes

Picket fence fever/ Hectic fever

↓

Thrombus

↓ Mastoid emissary veins

↓

Slightly tender edema of mastoid

(Griesinger's sign)

↓ Internal jugular vein

↓

Other IJV takes up the function

↓

When the other IJV is compressed

↓

Increased ICT

Increased ICT

↓ Seen as papilledema

Crowe beck sign

↓

Due to compression of normal IJV

↓ Seen in lumbar puncture

Tobey Ayer test/Queckenstedt's test

↓

Increase in CSF pressure on lumbar puncture or pressing normal IJV

Management :

MRM + Evacuation of thrombus.

IV antibiotics

Thrombus in superior sagittal sinus causes Otitic hydrocephalus.

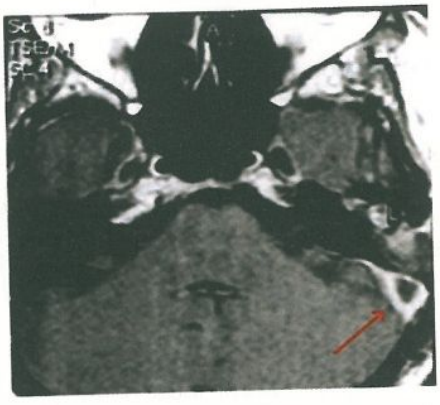
Clinically, headache & vomiting. (Signs of increased ICT).

Also known as Pseudotumour cerebri/ Benign intracranial hypertension.

In CECT/ MRI,

Empty triangle sign/ Delta sign

Active space



Active space

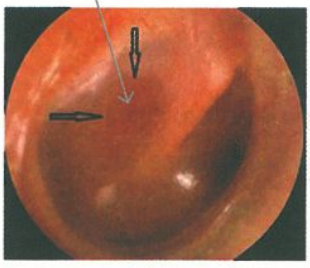
OTOSCLEROSIS

Features of otosclerosis 00:00:43

Inheritance – autosomal dominant.
Site of origin – fistula ante fenestrum (part of bony labyrinth; remains cartilaginous throughout life).
Hearing loss – conductive type.
Female : male → 2:1
Laterality – bilateral.
Progression – progressive conductive hearing loss.
Aggravating factors during pregnancy – hormonal changes, measles (infection).
Paracusis willisii – paradoxical hearing, better in noisy surrounding.

Tympanic membrane examination 00:11:10

mature cases – TM appears pearly white; 90%
Active cases – TM appears flamingo pink (also known as Schwartze sign); 10 %

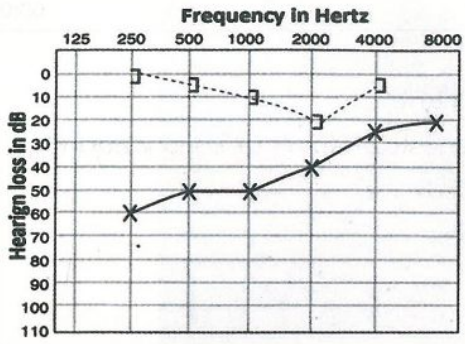


Tuning fork tests and PTA 00:15:06

Rinne's test → negative.
Weber's test → lateralised to worst ear.
Absolute bone conduction test → normal.
Schwabach test → lengthened.
Gelles test → negative (no change in hearing or, change in pressure of EAC).
PTA → AB gap present.

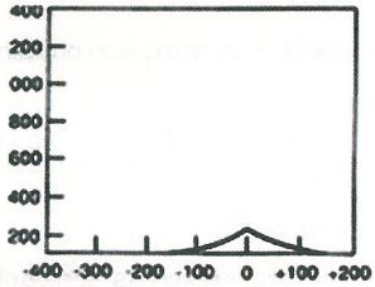
Active space

Carhartz notch → present.

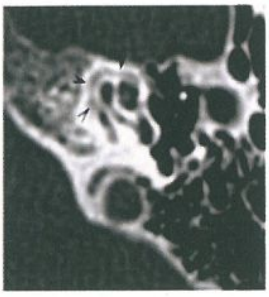


Impedance audiometry :

Tympanometry - best investigation; As-sclerosis type of curve.



Stapedial reflex – absent (due to fixed foot plate).



HRCT shows thickening and narrowing of foot plate; lucent and hypodense area of otic capsule in active cases.

Management of otosclerosis 00:30:10

Active space

- Contraindication for surgery – when the only hearing ear is infected.

Postoperative findings & causes of hearing loss 00:47:03

Post-operative findings :

- Carhartz notch – disappears.
- Tympanogram – Ad type of curve.

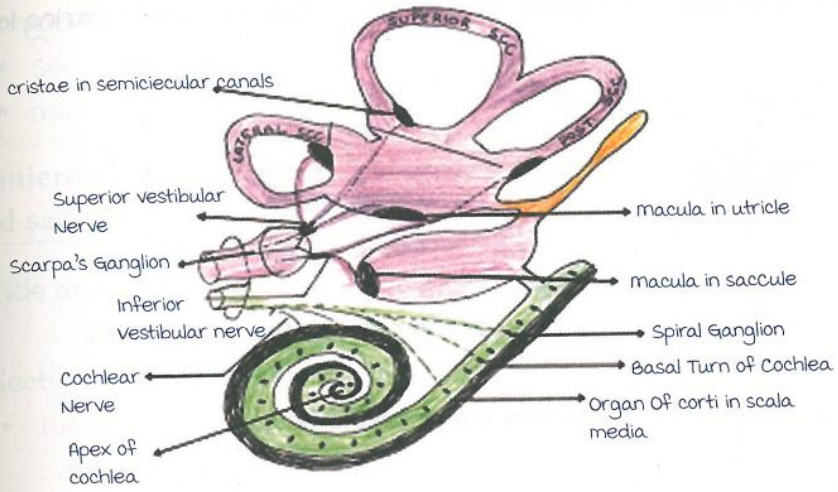
Post-operative complications :

- Dislodgement of prosthesis.
- Perilymph fistula leading to SNHL.
- Recurrence.

MENIERE'S DISEASE

Introduction to meniere's disease

00:01:10



meniere's disease is also known as endolymph hydrops.

Endolymph is present in the membranous labyrinth in inner ear.

- Endolymph production : From stria vascularis in scala media.
- Endolymph absorption : Endolymphatic sac.

Due to increased endolymph there is dilatation of :

Scala media apex.

↓

Scala media base.

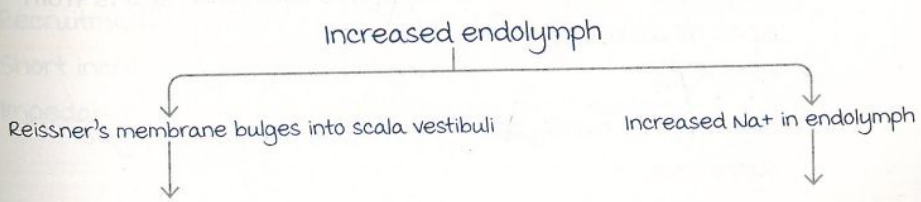
↓

Utricle and saccule.

Salt and water retention causes increased endolymph production.

Meniere's disease clinical features due to dilatation of scala media

00:04:00



Active space

Increased pressure → Rupture of Reissner's membrane → Sudden pressure change → Vertigo

Damage of hair cells → Sensorineural hearing loss

Pressure equalizes: Vertigo resolves within 24 hours.

↓

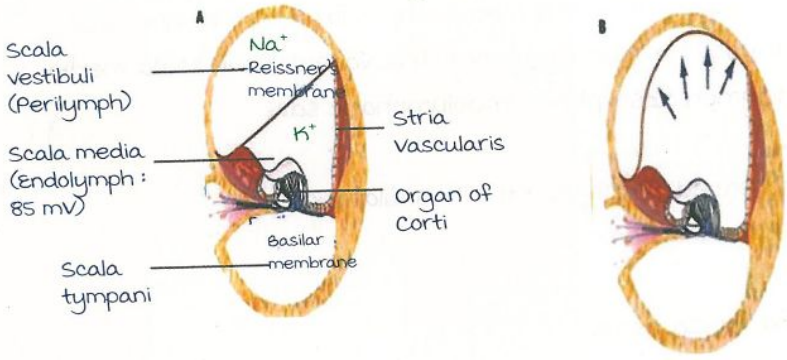
Reissner's membrane heals.

↓

Hair cells regenerate

↓

Hearing improves.



Clinical features :

1. Vertigo
   - Lasts between 20 minutes to 24 hours.
   - Associated with vagal symptoms.
2. Sensorineural hearing loss.
   - Fluctuating hearing loss : Occurs during vertigo episodes.
   - Initially low frequency hearing loss (Dilatation starts from apex of cochlea).
   - Diplacusis.
   - Hearing loss rarely occurs before vertigo : Lermoyez syndrome.

Active space

3. Tinnitus (subjective).
4. Fullness of ear.

Fluctuating hearing loss is seen in :

- Serous otitis media : Bilateral.
- Meniere's disease : Unilateral.

Meniere's disease clinical features due to dilatation of utricle and saccule 00:14:21

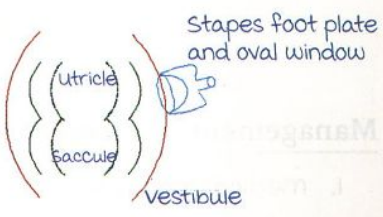
Utricle and saccule move closer to foot plate as they dilate.

Effects of dilatation inside utricle and saccule :

- Tumarkin Crisis or drop attacks : Distortion of affects acceleration.

Effects of dilatation outside utricle and saccule :

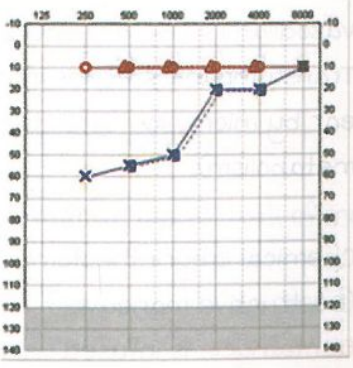
- Tullio's phenomenon : Vertigo due to excessive stimulation of utricle and saccule by loud sounds.
- Hennebert sign : Vertigo due to pressure changes without presence of fistula on medial wall.



Investigations in Meniere's disease 00:19:37

Rinne's test : Positive.
Weber's test: Towards normal side.
ABC test: Shortened.
Schwabach test: Shortened.
Pure tone audiometry (PTA) :

- AB gap : Absent.
- Slope : Up sloping audiogram.



Recruitment : Present.
Short increment sensitivity index : 70 – 80%.
Impedance – Stapedial reflex : Decreased threshold.

Active space

Electrocochleography : Summative potential/ Action potential (SP/AP) > 45%.
Glycerol test : Hygroscopic action decreases hydrops resulting inmdecreased SP/AP ratio.
Best investigations.
MRI with gadolinium enhancement : Enhancement of endolymph due to ruptured Reissner's membrane.

Prevention of meniere's disease

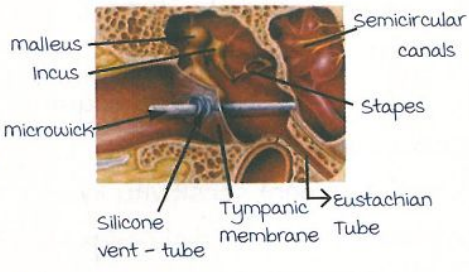
00:27:53

Management of meniere's disease

00:33:11

1. Medical management :
   Labyrinthine sedatives :
   - Promethazine.
   - Prochlorperazine.
   - Cinnarizine (calcium channel blocking property).

   Vasodilators : Betahistine.
2. Transtympanic steroids in inner ear by microwick (Alter the water metabolism).
3. Chemical labyrinthectomy (Destructive maneuver)
   - Gentamycin is infused using a microwick into inner ear through round window.
   - Gradual destruction of sensory mechanism results in central compensation.



Active space

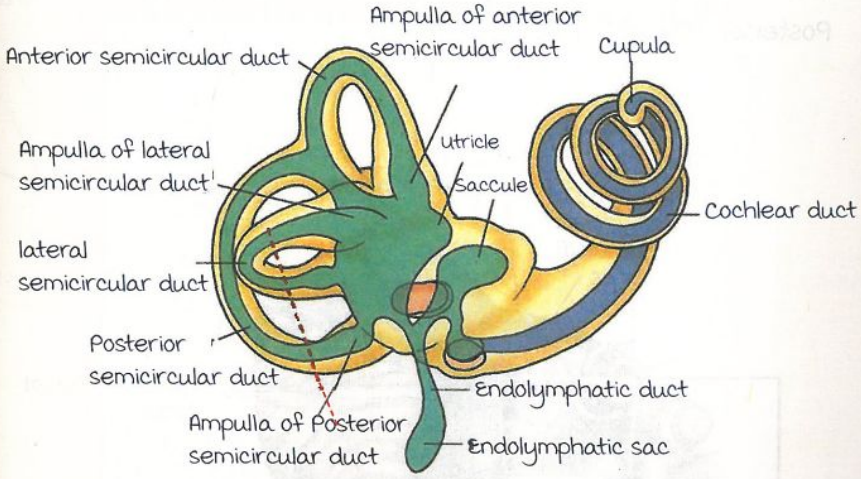
- Vestibulotoxic aminoglycosides (Damage type 1 and type 2 hair cells).
- Streptomycin
- Gentamycin

4. Vestibular neurectomy as a salvage procedure.
5. Total labyrinthectomy : If patient already has complete loss of hearing.
6. Endolymphatic sac decompression : Removal of bone overlying endolymphatic sac.

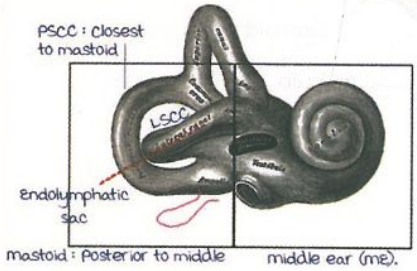
Endolymphatic sac 00:49:04

Location : On the dura of posterior cranial fossa, inferior to Donaldson's line.

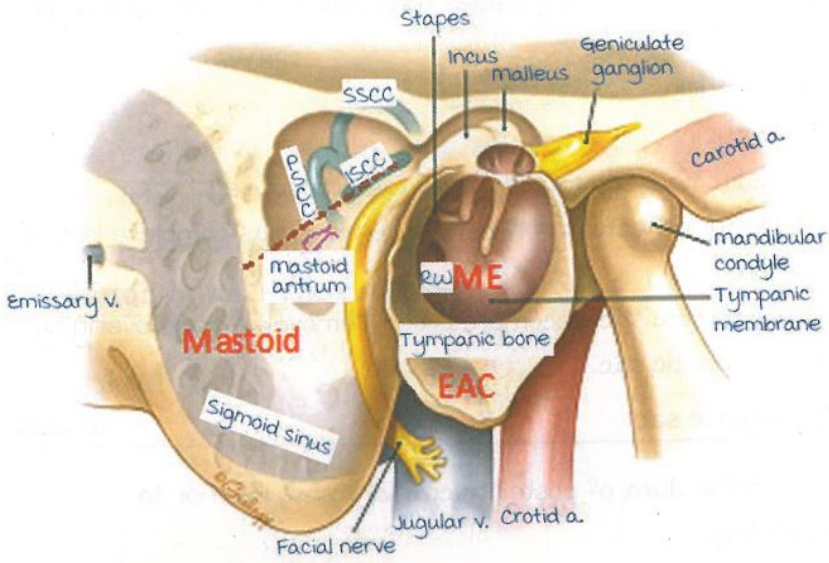
Donaldson's line : Imaginary line drawn from lateral semicircular canal (LSCC)to bisect posterior semicircular canal (PSCC).



The medial wall of middle ear extends to form medial wall of mastoid.

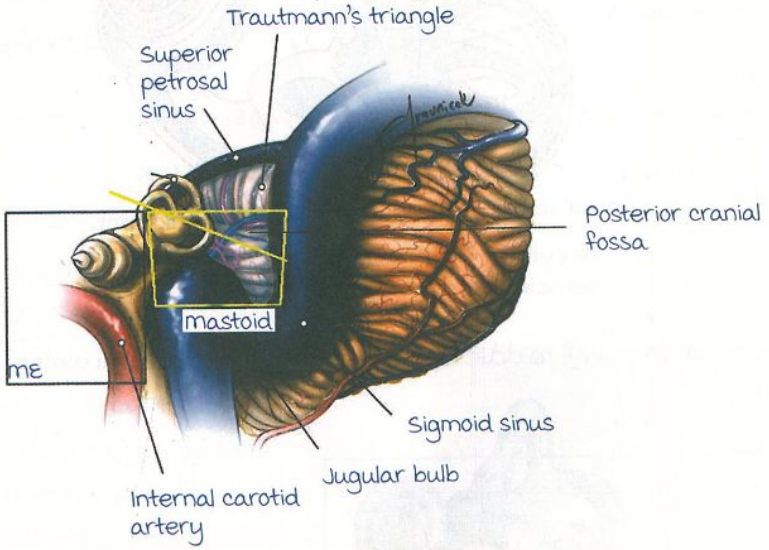


Active space

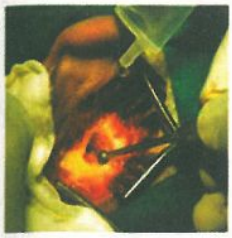


Approach from the mastoid :

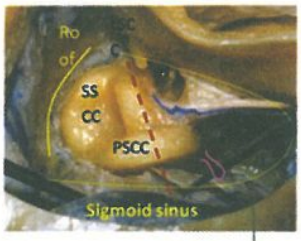
- Towards medial direction : Inner ear.
- Towards posterior direction –towards sigmoid sinus (SS) : Posterior cranial fossa.

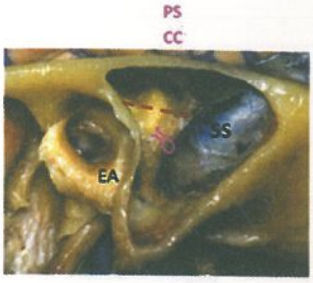


Active space



Drilling of mastoid





Mastoid antrum

Boundaries of Trautman's triangle :

- Posterior : Sigmoid sinus.
- Anterior : Inner ear.
- Superior : Superior petrosal sinus.

Route for operating posterior cranial fossa tumors : Transmastoid approach.

Citelli's angle : Sinodural angle between sigmoid sinus (sinus plate) and superior petrosal sinus (dural plate).

Active space

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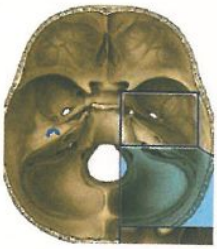
search
@Marrow_Edition5Notes in telegram
u will reach at latest Notes channel

Active space

SUPERIOR SEMICIRCULAR CANAL DEHISCENCE, BPPV AND VESTIBULAR NEURITIS

Superior semicircular dehiscence 00:00:45

Superior semicircular dehiscence syndrome is also known as Third window syndrome.



Arcuate eminence : Bulge of the superior semicircular canal (SSC) present on the anterior slant of petrous temporal bone.

Pathophysiology :

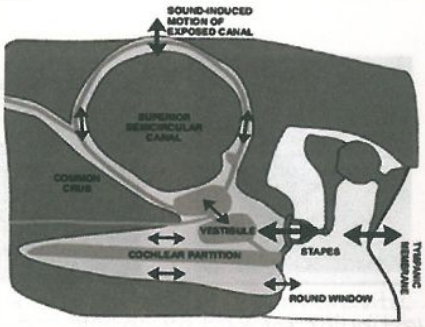
- Congenital weakness or trauma of arcuate eminence forms a dehiscence and exposure of SCC.
- Presence of abnormal window

  ↓

  Vestibular part (Utricle and saccule) stimulated by loud sounds and pressure changes.

  ↓

  Vertigo.



Clinical features of superior semicircular dehiscence 00:05:36

Vestibular symptoms :

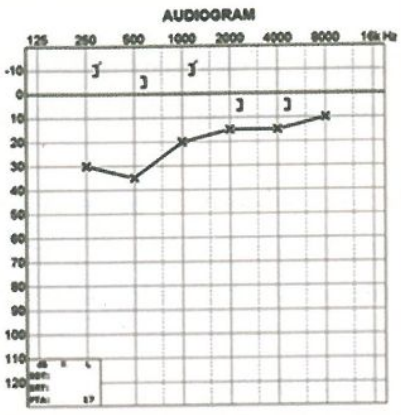
- Tullio's phenomenon : Vertigo on loud sounds.
- Hennebert sign : Vertigo on pressure changes.

Cochlear symptoms :

- Increased bone conduction (BC).
  Abnormal opening increases sound conduction by bony labyrinth into inner ear.
- Decreased air conduction (AC).
  Air conducted sound is lost at abnormal opening.

Active space

Investigations of superior semicircular dehiscence 00:09:43



Vestibular evoked myogenic potential (VEMP) :

- Increased amplitude of response.
- Decreased threshold.

Management of superior semicircular dehiscence syndrome 00:21:52

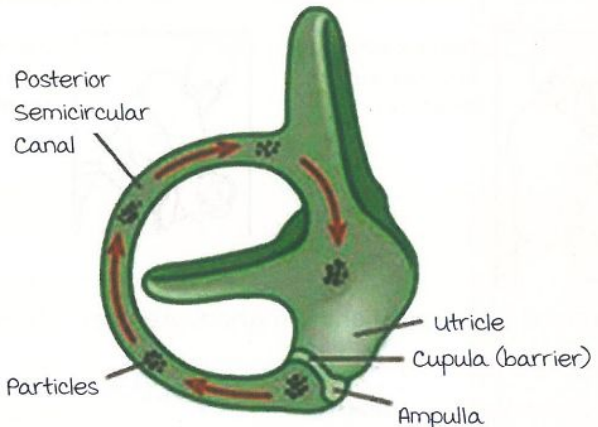
Avoid stimulating factors.

Repair of dehiscence if patient unable to tolerate the symptoms.

Meniere's disease	Superior semicircular canal dehiscence
Tullio's and Hennebert sign occur in later stage of disease	Tullio's and Hennebert sign occur in early stage of disease
Acute onset vertigo lasting for 20 minutes to 24 minutes.	Vertigo only during loud sounds or pressure changes.

Active space

Benign paroxysmal positional vertigo (BPPV) 00:27:50



C Principle of repositioning.

BPPV is paroxysmal episodes of vertigo occurring with change of position.

It is the most common cause of vertigo.

Pathophysiology :

Otoliths dislodge from utricle into the semicircular canals : Posterior semicircular canal > Horizontal SC > Superior SC.

↓

Otoliths irritate the endolymph.

↓

Otoliths (Calcium carbonate crystals) settle down with gravity.

↓

Relief of symptoms till the patient changes head posture again.

↓

Episodic vertigo on change of head position.

Dix Hallpike manoeuvre 00:31:54

Dix Hallpike manoeuvre is done for diagnosis of vertical canal BPPV (Posterior and superior SC).

Positive test : Nystagmus with :

- Latency.
- Vertical (PSC/ SSC)/ horizontal (Horizontal SC) nystagmus with torsional component.
- Direction : Fixed (peripheral pathology) and towards the affected side.
- Duration : Limited.

Active space

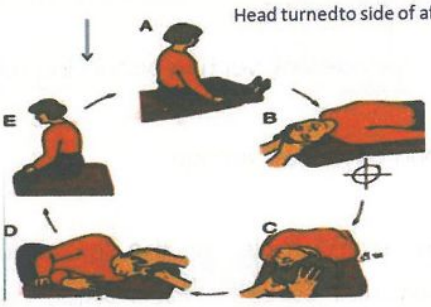
- Geotropic nystagmus.

Turn head 45° in direction of ear being tested.

Make the patient lie down with head extended by 30°

Epley manoeuvre is a repositioning manoeuvre used for treatment of posterior SC BPPV

It is done if Dix Hallpike is positive.



Horizontal semicircular canal benign paroxysmal positional vertigo

00:47:24

Investigation : Supine roll test for BPPV is done for testing horizontal SC.

Steps :

1. Patient is supine and head elevated by 30°
2. Head turned to the right side
3. Head turned straight.
4. Head turned to the left side.

Positive test : Horizontal nystagmus with torsion towards the affected side.

Geotropic nystagmus : Nystagmus direction is towards the ear facing the ground.

Management :

- Barbeque roll manoeuvre.
- Gufoni manoeuvre.

Warning: Not all points are covered in the notes, especially conceptual explanations. Please use the notes in conjunction with Marrow masterclasses.

Active space

Vestibular neuritis 00:57:24

Vestibular neuritis is the inflammation of the vestibular nerve :

- Superior vestibular nerve.
- Inferior vestibular nerve.
- Main trunk of vestibular nerve.

Clinical presentation : Vertigo alone without hearing loss.

- Acute onset vertigo.
- Duration : 3 – 7 days.
  6 – 12 weeks if extensive destruction of main trunk (Central compensation).

Vestibular neuritis	Cerebellar stroke
Fixed direction nystagmus towards normal side.	Direction changing nystagmus.
Horizontal nystagmus + torsional component.	Pure horizontal/ Pure vertical/ Pure torsional component.
Head thrust test : Abnormal	Head thrust test : Normal

Investigations for vestibular neuritis 01:03:34

VEMP :

- Ocular VEMP – oVEMP (Utricle) : Superior vestibular nerve.
- Cervical VEMP – cVEMP (Saccule) : Inferior vestibular nerve.

Caloric test (Horizontal SC) : Hypoactive/ canal paralysis if superior vestibular nerve is involved.

Active space

Active space

SUDDEN SNHL

Introduction 00:00:49

Definition – Sudden SNHL is defined as >30db hearing loss in 3 consecutive frequencies within 3 days.
most common cause – idiopathic (viral infection).
Rinne's test – positive (air conduction > bone conduction).
Weber's test – towards opposite ear.
Pure tone audiometry (PTA) – shows SNHL.

Management of SNHL 00:05:11

- Steroids (started immediately; on high doses).
- Transtympanic steroids (of no response is seen with steroids in 5days; introduced into inner ear by microwick).
- Antivirals.
- Carbogen (5% CO_2 + 95% O_2).
- Hyperbaric O_2.

Severe SNHL 00:06:50

Characterized by >70db hearing loss in 3 consecutive frequencies, occurring suddenly.
Rinne's test – negative (bone conduction > air conduction).

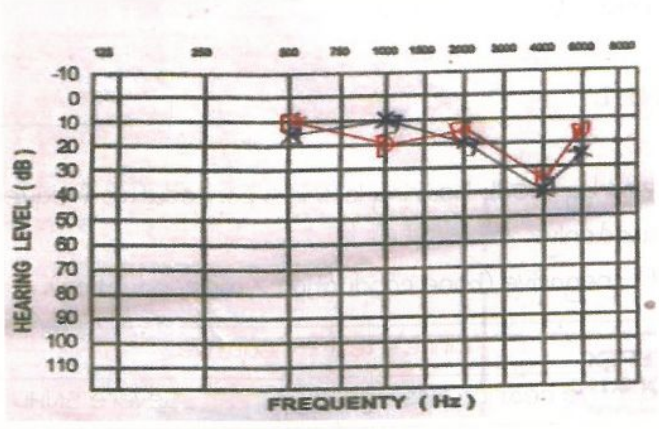
Rinne's test – negative	
Conductive hearing loss	Severe SNHL
Weber's – towards same ear	Weber's – towards opposite ear
Audiogram shows >30db hearing loss	Audiogram shows >70db hearing loss

Noise induced hearing loss 00:17:49

It was considered as an occupational hazard, but nowadays common problem due to earphones usage.

Active space

Recommended noise level → <85db for 8hours/day for 5days.



Prevention of noise induced hearing loss 00:31:21

Hearing aid & cochlear implant – if hearing loss has already occurred.

Ear muffs – gives protection of 40db.

Ear plugs – gives protection of 30db.

Presbycusis 00:33:59

Definition – age related hearing loss.

Active space

Types and its cause :

- Mechanical/cochlear conductive presbycusis – basilar membrane stiffening.
- Sensory presbycusis – hair cells atrophy/damage.
- Vascular/metabolic presbycusis – atrophy of stria vascularis.
- Neural presbycusis (most common) – atrophy of nerves.

Diagnosis & management of presbycusis 00:36:54

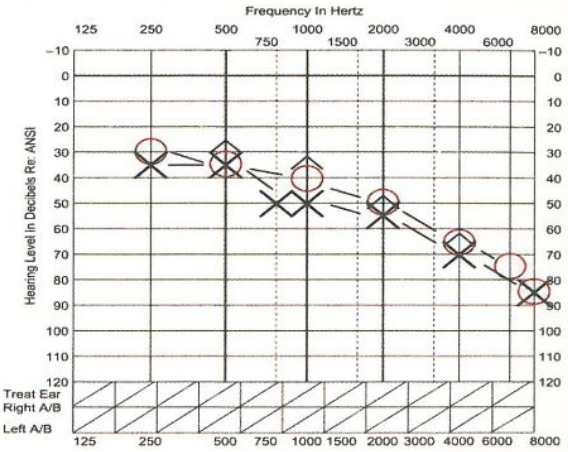
Diagnosis :

Audiogram (PTA)

shows – bilateral, progressive SNHL.

High frequency PTA

shows – downsloping audiogram.



Treatment :

- Hearing aids.
- Cochlear implants.

Ototoxicity 00:38:46

It is the drug induced toxicity to the ear.

Drugs causing ototoxicity :

- Aminoglycosides – cochleotoxic (kanamycin, amikacin, neomycin); vestibulotoxic (streptomycin, gentamycin).
- Analgesics.
- Vancomycin.
- Cytotoxic drugs.
- Diuretics.
- Antimalarial
- Macrolides

Aminoglycosides & cytotoxic drugs causes irreversible hearing loss.

Active space

Diagnosis :

OAE test – for monitoring toxicity; distortion product (high frequency specific).

Treatment – hearing aids & cochlear implants.

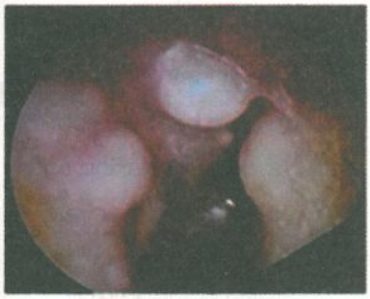
Active space

GLOMUS

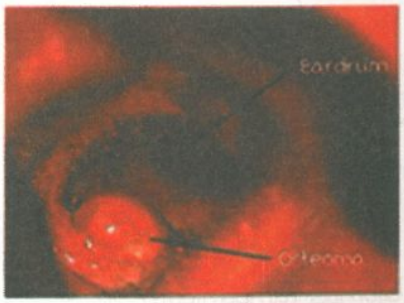
Tumors of External and Middle ear 00:00:31

Tumor of External Auditory Canal :

	Exostosis	Osteoma
Outgrowths	Mulitiple	Single
Location	Deep EAC ↓ a/k/a surfer's ear ↓ In surfer's – Exostosis is present normally ↓ To protect from cold exposure to tympanic membrane ↓ Which prevents vertigo M.C benign tumor of EAC	Superficial, lateral EAC
Management	Only if patient has hearing loss / wax impaction	



Exostosis



Osteoma

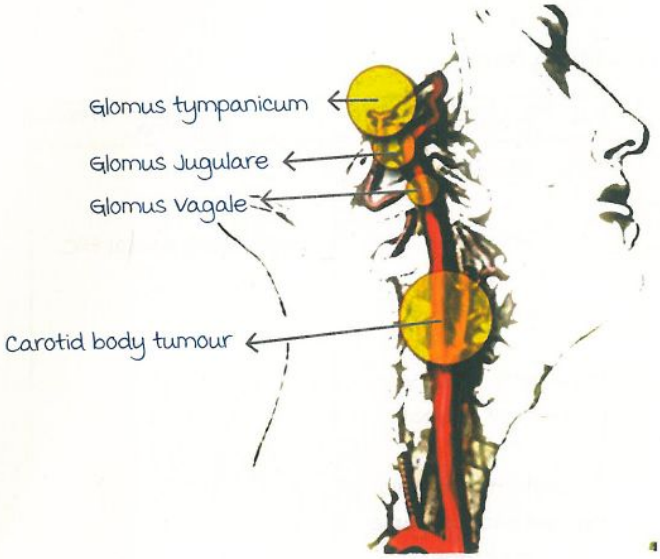
Tumor of middle ear :

- Benign tumor : Glomus tumor.

Active space

Glomus Tumor

00:04:48



Glomus tumor

↓

Arises from paraganglion cells

(Neural crest cell origin – Present in relation with cranial nerves)

↓

Paraganglioma

If arises from tympanic plexus in the promontory area

↓

Glomus tympanicum

↓

- M.C benign tumor of middle ear
- Encapsulated and locally invasive

If arises from jugular bulb area – floor of middle ear in relation with 9, 10, 11 cranial nerves

↓

Glomus jugulare

Active space

10% of Glomus tumors are multicentric

↓

So, should check urine VMA for two reasons

↓

i. If urine VMA is ↑ – paraganglion tumor is present else where

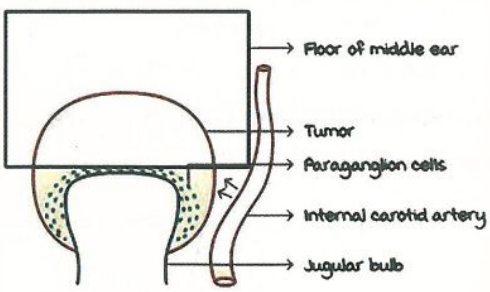
↓

ii. To prepare the patient before surgery (Treating hypertension)

- Benign but locally invasive.

Clinical Presentation

00:14:36



- Arises from the jugular bulb enters into hypotympanum and then middle ear.
- Conductive hearing loss : a tumor in the middle ear.

Active space

- main disturbing symptom : Pulsatile tinnitus.

Pulsations from internal carotid artery are transmitted

↓

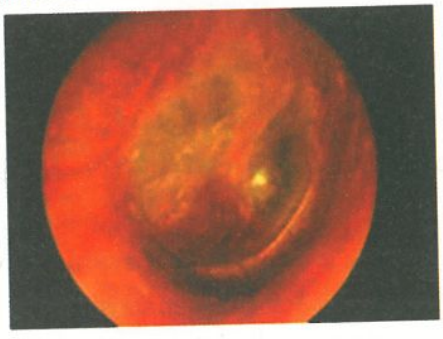
Perceived as tinnitus

↓

Compression of ICA – relieves tinnitus

Aquino Sign : on compression of carotid, pulsations cease.

- On examination : Rising sun/Setting sun/ Red reflex of the tympanic membrane.



Diagnosis

00:20:50

Diagnostic sign – Brown's sign/Pulsation sign

↓

Elicited with siegel's speculum

↓

Speculum is attached too otoscope

↓

On compressing the bulb, pressure ↑ sec in EAC and tumor blanches

↓

On compressing the bulb, pressure ↓ sec in EAC and tumor pulsates again.

Sometimes, tumor can protrude into EAC as polyp

↓

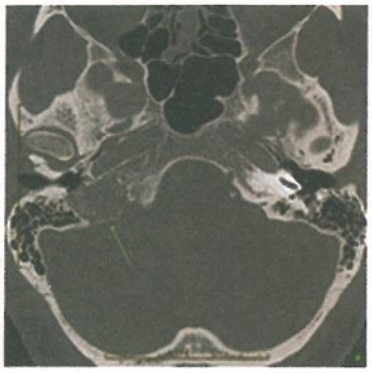
Should not be avulsed

↓

Because of relation with important structures (Cranial nerves, vessels)

Active space

- Best investigation : HRCT.



- On CECT : Phleps Sign (absence of crest of bone between jugular bulb and internal carotid artery)

Management 00:26:36

- Very slow - growing tumor and occur mostly in the elderly.
- If < 1.5 cm - wait and watch.
- If 1.5 cm - 3 cm : Gamma Knife (Stereotactic Radiosurgery), does not destroy the tumor completely but retards the growth.
- If > 3 cm : operate and remove it.

Staging 00:28:45

- Stages of glomus tumor divided according to the Fisch classification.
  - A - middle ear
  - B - middle ear + mastoid
  - C - inner ear & infralabyrinthine involving carotid canal
    - C_1 - Limited vertical carotid canal involvement
    - C_2 - Extensive vertical carotid canal involvement
    - C_3 - Horizontal carotid canal involvement
  - D - Intracranial extension

Pre-op :

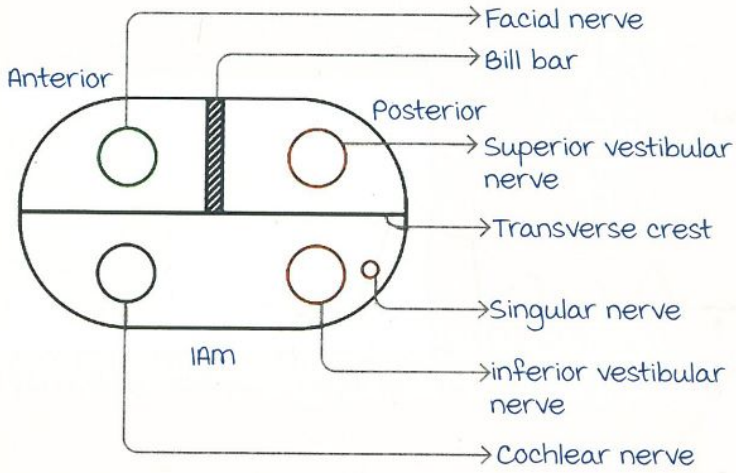
- Urinary VMA.
- Angiography : Embolization.

Active space

Active space

ACOUSTIC NEUROMA

- Most common benign tumor of the CP angle (cerebellopontine).
- Arises from the inferior vestibular nerve in internal acoustic meatus.
- It is a benign but locally invasive tumor.
- It is an unencapsulated, slow-growing tumor.



Clinical features

00:04:35

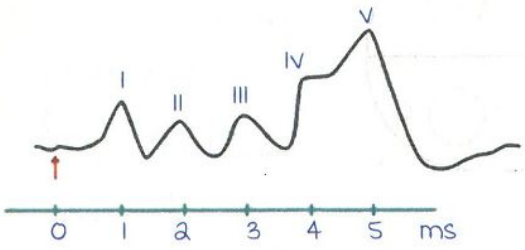
- The cochlear nerve is compressed: unilateral SNHL + Tinnitus.
- The superior vestibular nerve gets compressed : No vertigo.
- Facial nerve is compressed : Hypoesthesia of posterosuperior EAM [Hitzelberger Sign].
- Found mainly in the elderly.
- Also found in young patients :
  - with NF-2 : bilateral acoustic neuroma.
  - In NF-1 : 5% of patients have a unilateral acoustic neuroma.
- 1st nerve to be involved : 8th cranial nerve >>> 5th cranial nerve.
- If 5th cranial nerve involved : loss of a corneal reflex.
- If 6th cranial nerve involved : Diplopia.
- Earliest ocular sign : loss of a corneal reflex.
  - Upper pole involvement : 5th and 6th CN.
  - Lower pole involvement = 9th, 10th, 11th CN.
- Presenting feature : unilateral SNHL + Tinnitus.

Active space

Investigation

00:20:20

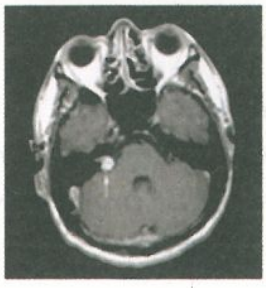
- BERA :



  - Increased latency between waves I and 5.
  - Increased latency between waves I and 3.
  - Interaural latency difference of wave 5 > 0.2 ms.

Best investigation : Gadolinium-enhanced MRI

- Ice cream cone appearance.
- Tells whether cystic or not.



VEMP Test :

- To find out whether the tumor is arising from superior vestibular nerve or inferior vestibular nerve before the operation.
- If arising from the superior vestibular nerve : oVemp (ocular vemp involved).

Active space

- If arising from the inferior vestibular nerve : cVemp (cervical vemp involved).

Management and Histopathology 00:28:02

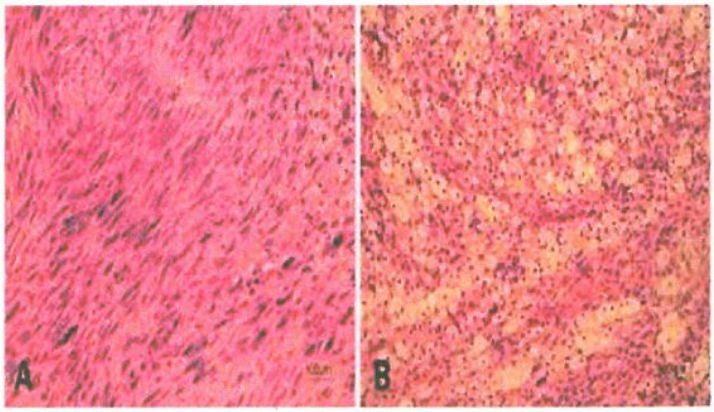
management :

- If < 1.5 cm : wait
- If 1.5 to 3 cm : Gamma Knife.
- If >3cm : surgery.
- All cystic tumors : Surgical excision.

Histopathology :

→ Compact
→ Antoni Type A

→ Loose arrengement
→ Cystic spaces
→ Antoni Type B

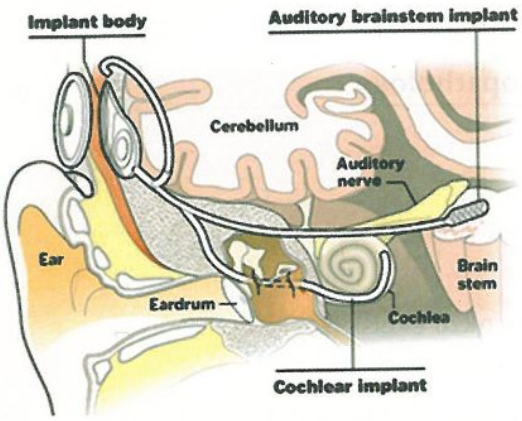


- Type B has a poor prognosis and excision usually done.

Post-surgery :

- If unilateral then : BAHA or Hearing aid (that picks up sound from one side and sends it to the other side)
- If bilateral (like in NF-2) then : Auditory brainstem implant.

Active space



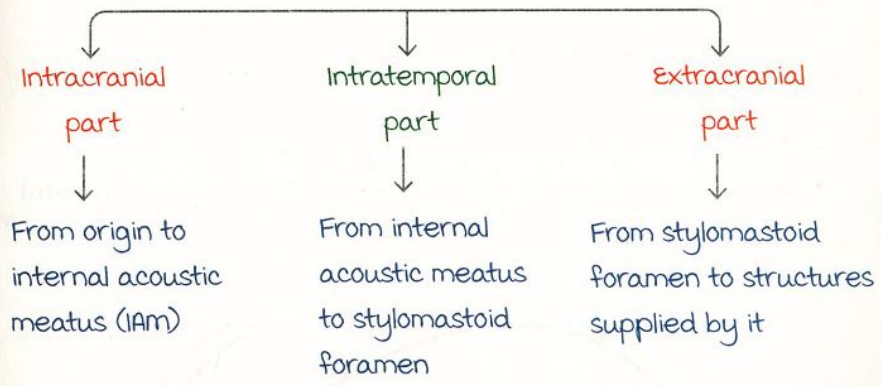
- Placed in lateral recess of 4th ventricle.
- Stimulates the cochlear nuclei.

Active space

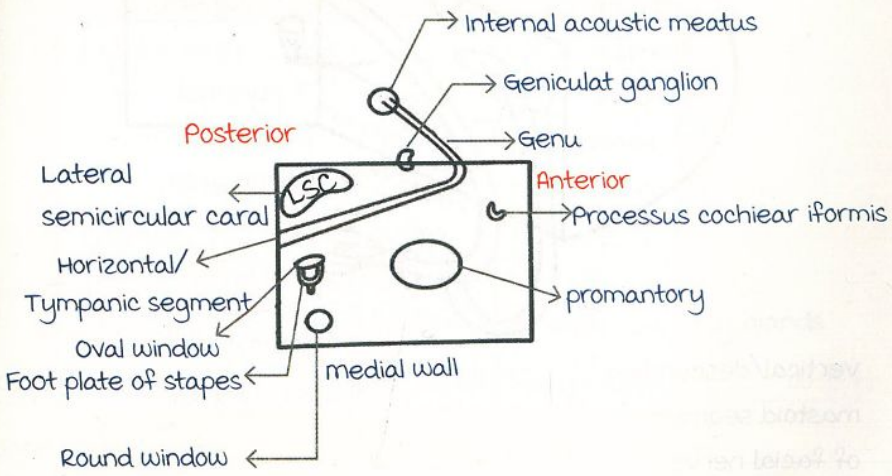
FACIAL NERVE

General Points 00:01:01

- It is a mixed nerve (mainly motor).
- Sensory part : Nerve of Wrisberg/Nerve of intermedius (because in the internal acoustic meatus, the sensory part of facial nerve lies between the 8th cranial nerve and the motor component of the facial nerve).
- sensory + parasympathetic.
- Parts :



Intratemporal Part 00:03:05



1. Meatal segment : in internal acoustic meatus.

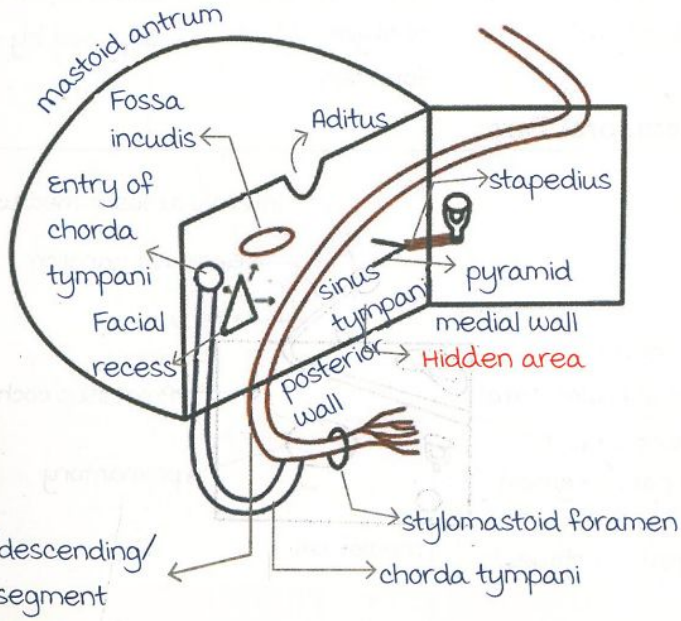
Active space

2. Labyrinthine segment :
   - In inner ear.
   - Covered by the shortest and narrowest part of the fallopian canal.
   - Most common involved in viral infections leading to compression and ischemia.

   Enters into the medial wall of the middle ear.

   Takes turn : 1st genu of the facial nerve.

3. Horizontal/Tympanic segment :
   - Runs horizontally on the medial wall.
   - Landmarks :
     - Processus cochleariformis.
     - Oval window.
     - Lateral semicircular canal.
   - Most common site of dehiscence : most common congenital abnormality of the temporal bone.



4. Mastoid segment :
   - Known as descending or vertical segment.
   - Landmarks :

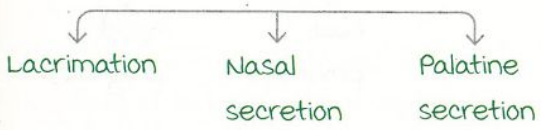
Active space

- Pyramid : the facial nerve is posterior and lateral.
- Aditus : the facial nerve is inferior to it.
- Chorda tympani : the facial nerve is medial to it.
- Fossa incudis : the facial nerve is medial and inferior to it.

Branches of Facial nerve 00:13:55

1st branch :

From the Ist genu – Greater superficial petrosal Nerve



If damaged → Dry eye

↓

"Schirmer's test"

2nd branch : Given off at the pyramid.

In the middle ear – Nerve to stapedius

↓ Injured

3rd branch : Absence of stapedial reflex – Hyperacusis

Just above stylomastoid foramen – Chorda tympani

↓

Enters middle ear through posterior wall → Exits middle ear through anterior wall

Supplies Anterior 2/3rd of tongue – Taste

Salivation from Sublingual and Submandibular Salivary glands

Topodiagnostic test and Electrodiagnostic test 00:21:55

Topodiagnostic test : will tell about the site of the lesion.

- Schirmer's test.
- Stapedial reflex.
- Taste.
- Salivation.

Active space

Electrodiagnostic test : will assess the prognosis.

Electrophysiological test

- Electroneuronography
  - Nerve injured → injury
  - Wait for 3 days (wallerian degeneration)
  - 2 sides of facial nerves are compared to identify the degree of dysfunction in injured nerve
- Electromyography
  - Fibrillation potential → Bad prognosis
  - Action potential → Good prognosis

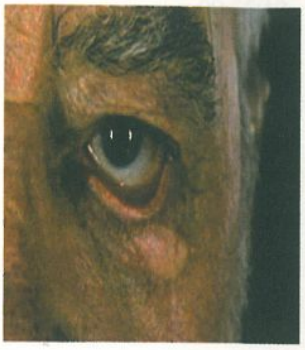
Bell's palsy

00:27:25

Active space

- Eye care : lubricants and keep eye padded.





- Recurrence : in less than 10%.
- Overflowing of tears occurs due to the collection of whatever lacrimation is taking place and not due to increased lacrimation.

Melkersson Rosenthal Syndrome 00:38:28


- Idiopathic facial nerve palsy.
- Swelling of lips and fissuring of the tongue.
- Recurrent and alternating.

Infections and injuries causing Facial nerve palsy 00:40:04

External auditory canal :

- Malignant otitis externa.
- Herpes zoster : Ramsay Hunt syndrome.
- Acute otitis media.
- Chronic otitis media.

Warning: Not all points are covered in the notes, especially conceptual explanations. Please use the notes in conjunction with marrow masterclasses.

Active space

Due to Trauma

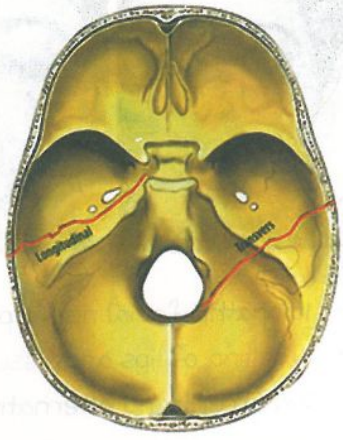
Surgical (Iatrogenic) m.c : parotid followed by mastoid
most common : vertical segment (2nd genu part)

Fracture of temporal bone

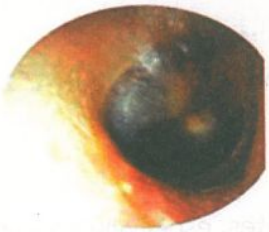
Longitudinal fracture (↑ common)
- Conductive hearing loss
- CSF Otorrhea
- Facial nerve palsy (Not common)
- No vertigo

Transverse fracture
- SNHL
- Vertigo
- Facial nerve palsy (Very common)
- CSF otorhinorrhea

- Best investigation : HRCT.
- Battle sign :



- Hematoma of the middle ear can occur in petrous temporal bone fracture.



Active space

Management of surgical complications and Complications following regeneration

00:51:10

management of Surgical complications :

- Sudden onset palsy

  ↓

  Immediate Exploration

- Late onset palsy

  ↓

  Steroids

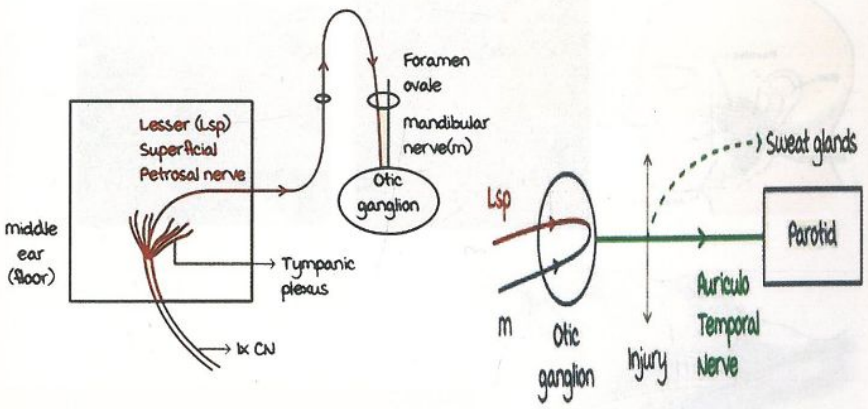
- The most common graft of the facial nerve : Greater auricular (C2, C3).
- Longer graft : Sural.

Complications following nerve regeneration :

- Occur when post-cut, the nerve regenerates and connects aberrantly.
- Aberrant regeneration :
  - Synkinesis.
  - Crocodile Tears :
    - Tearing with salivation.
    - Injury is before the origin of the greater superficial petrosal nerve.

Frey's Syndrome

00:59:16



Active space

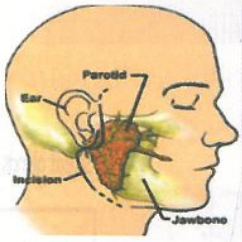
- Gustatory sweating.
- It does not occur due to facial nerve injury/regeneration.
  - Injury to auriculotemporal nerve in parotid sugery
    ↓
    Aberrant regeneration
    ↓
    Supplies sweat glands overlying parotid
- Management :
  - Injection of botulinum toxin : BOTOX.
  - Surgical :

    Implantation below the skin.

    Tympanic neurectomy.

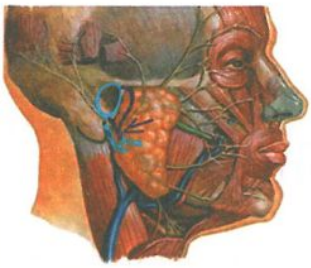
Landmark for identification of facial nerve during parotid surgery 01:06:39

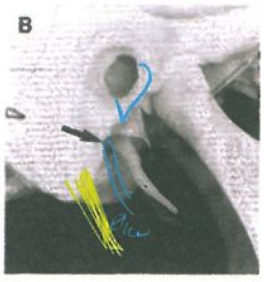
Procedure :

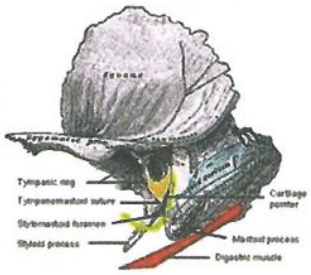


Active space

- Lazy S incision is given in parotid surgery.
- A skin flap is raised.







Active space

Active space

COCHLEAR AND BRAINSTEM IMPLANTS, BAHA COMPLETE

Cochlear implant 00:00:32

- 1st artificial sense organ invented by William F House (Father of Neuro-otology).
- Prerequisites/indications :
  - Bilateral severe to profound hearing loss > 70 dB.
  - No result from hearing aid trial of at least 3 months.
  - The nerve has to be functional.
  - The cochlea has to be present.
  - The central auditory pathway has to be functional.
  - The patient should be mentally and physically stable.
- Types of deafness :
  - Prelingual deafness :
    - Children who are born deaf.
    - Becomes deaf before development of speech because of meningitis like conditions (child has not learned to speak yet)
    - A cochlear implant has to be done as early as possible (earliest at 1 year and maximally at <7 years) because speech centers develop maximally at 3 years of age.
  - Postlingual deafness :
    - In people who have already developed speech (who can understand and speak).
    - A cochlear implant has no age criteria (earlier the better because auditory deprivation leads to nerve becoming dysfunctional).

Exernal device

Internal device

Active space

External Component :

- Microphone – picks up sound
- Speech processor

↓

Converts sound → Digital signals

- Transmitter coil

Internal Component :

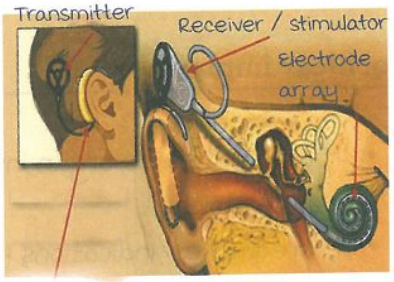
- Receiver stimulator

↓

- Recives signal from transmitter coil

↓

- Transmites signal to electrodes



Speech processor & microphone

- Electrodes

↓

Mastoid drilled to insert electrodes

↓

Pass through Facial recess into middle ear

↓

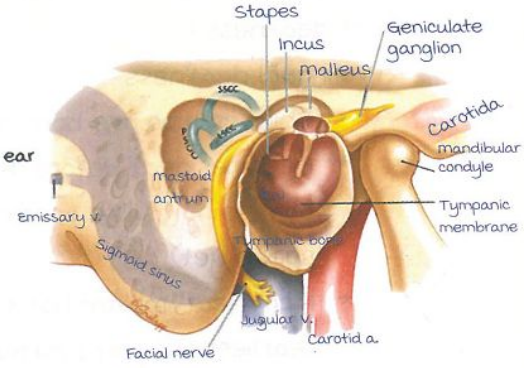
Via roundwindow

↓

Into inner ear (Scala tympani)

↓

Replace organ of corti (stimulate cochlear nerve)



Auditory brainstem implant [ABI] 00:16:28

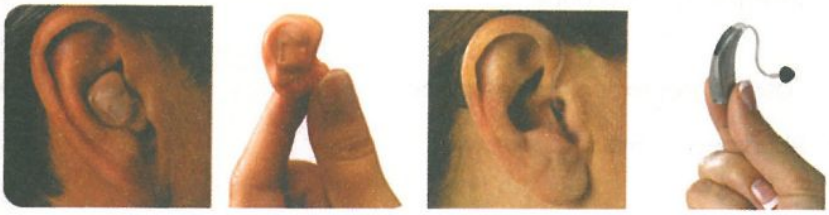
- Used in patients where the cochlear nerve is damaged :
  - Aplasia
  - Post-surgery of bilateral acoustic neuroma in NF2.
  - The cochlea is absent.
- Directly stimulates the cochlear nuclei.
- Looks the same as a cochlear implant on the outside but is different on the inside.

Active space

- Placed in the lateral recess of the 4th ventricle.

Hearing aid

00:20:06



- It can be just in the ear, go totally in the canal, or can be behind the ear hearing aid.
- Collect the sound and amplify it.
- Can be used in both CHL and SNHL.
- Generally, give benefit around 80–85 dB.

Bone anchored hearing aid [BAHA]

00:21:21

Active space

- Screw – send the vibrations to cochlea through skull (bone conduction)

  ↓

  Integrated with bone

  ↓

  "Osseointegration" takes place
- Abutment : Fits into screw

  ↓

  Holds speech processor in this place & passes
- Speech processor – capture sound via microphone

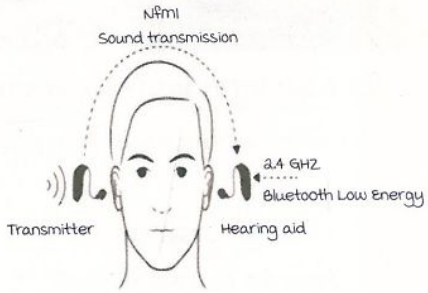
  ↓

  BAHA transducer passes the vibrations via abutment

Bone conduction hearing aid :

- For those who do not want to undergo surgery.
- Similar to BAHA.
- Puts a lot of pressure on the mastoid.
- 15–20 dB lost because of skin and subcutaneous tissue.

Contralateral routing of signals [CROS] :



- Looks exactly like a hearing aid.
- The transmitter in the damaged ear collects sound and transmits it to the hearing aid in the normal ear via Bluetooth.

Active space

- Better than a bone conduction hearing aid.

Profound unilateral deafness :

- CROS
- Bone conducting hearing aid.
- BAHA

Special type of bone conduction hearing aid :

- Used for rehabilitation in < 1 year olds, who are candidates for a cochlear implant.

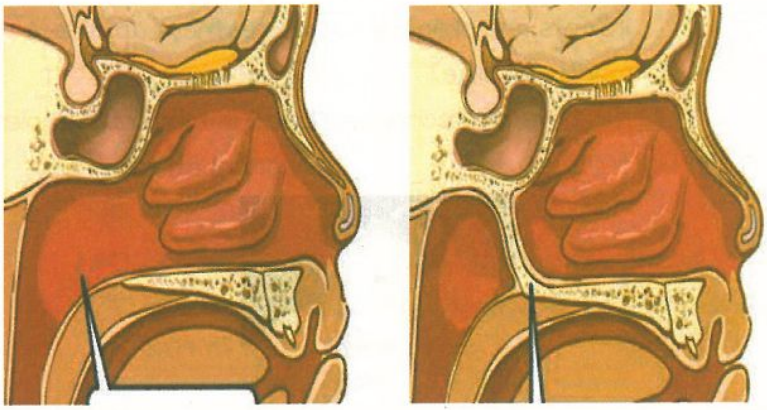
Active space

Active space

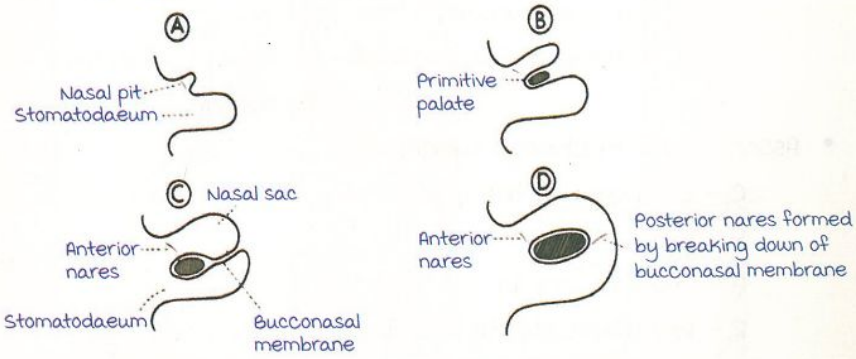
CHOANAL ATRESIA & ANATOMY OF EXTERNAL NOSE

Choanal Atresia

00:01:40



- "Choana" is a term for posterior nasal cavity.
- Embryology :



Nasal pit grows medially → Nasal cavity
Choana [posterior nares]
Nasopharynx

Stomatodaeum → Oral cavity
Oropharynx

Bucconasal membrane : Separates nasopharynx & oropharynx
↳ Disappears at birth
If bucconasal membrane is persistent "Choanal Atresia"

- 70 % mixed (membrane + bony) ; 30% bony.
- Clinical Features : Choanal atresia, Respiratory distress.

Active space

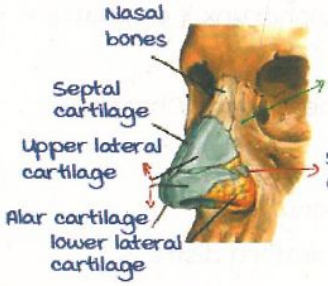
- It is confirmed when the nasogastric tube cannot be passed into the oropharynx.
- Immediate management :
  1. The mouth has to be kept open actively (because infants are obligate nasal breathers up to 3–4 months of age).
  2. Mc Govern's technique : used in bilateral complete choanal atresia.

- Late management :
  1. Surgical excision.
  2. Mitomycin C application : to prevent synechiae formation.
- Associated with Charge syndrome :
  - C – Coloboma of the eye.
  - H – Heart defects.
  - A – Choanal atresia.
  - R – Retarded growth and development.
  - G – Genitourinary defects.
  - E – Ear abnormalities.

Anatomy of nose

00:09:40

- Osteo – cartilaginous in nature.
- External nose = Bony (Upper 1/3rd) + Cartilaginous (Lower 2/3rd)



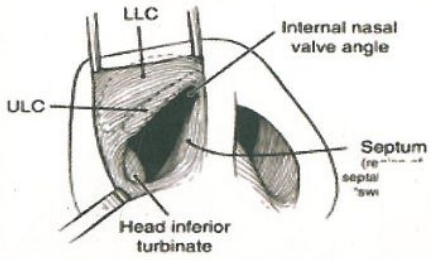
Bony : Nasal bones
Frontal process of maxilla
Cartilagenous :
upper lateral
lower lateral (alar)
Sesamoid (lesser alar)
} paired
Septal cartilage – Unpaired

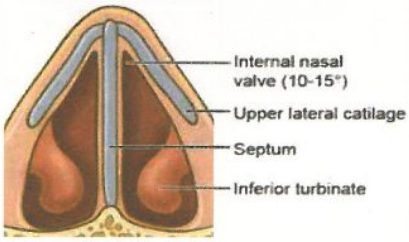
Active space

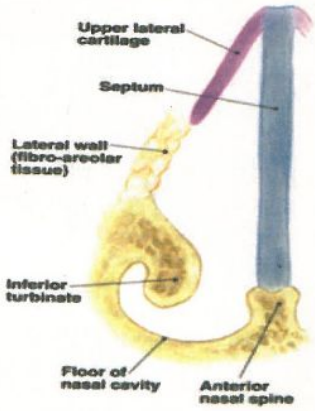
- Rhinoplasty : surgical correction of defects in the external framework of the nose.
- 3 Junctions :
  1. Nasion : between frontal and nasal bone (frontonasal suture).
  2. Rhinion : between bone and cartilage (osseocartilaginous junction).
  3. Limen nasi :
     - Also called as limen vestibuli.
     - Between upper and lower lateral cartilage.
     - Forms boundary of nasal valve area (the narrowest part of nasal cavity).

Nasal valve area

00:17:29







- Boundaries :
  Laterally - lower border of upper lateral cartilage + anterior end of the inferior turbinate.
  Medially - septum.
- Importance :
  On inspiration :
  Offers resistance to the inspired air - reduces velocity of airflow.

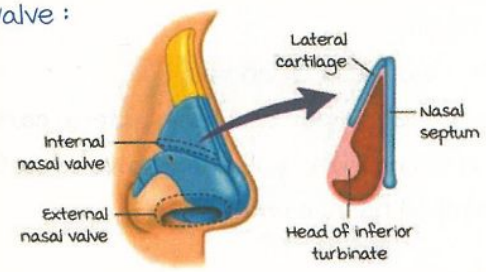
Active space

- Air has more contact with mucosa :
  Humidification and temperature regulation.

On expiration :

- Reverse currents are formed : Eddy currents.
- These currents ventilate the sinuses.

External nasal valve :



Lining of epithelium

00:24:50

ANATOMY OF LATERAL WALL OF NOSE

Lateral wall of the nose

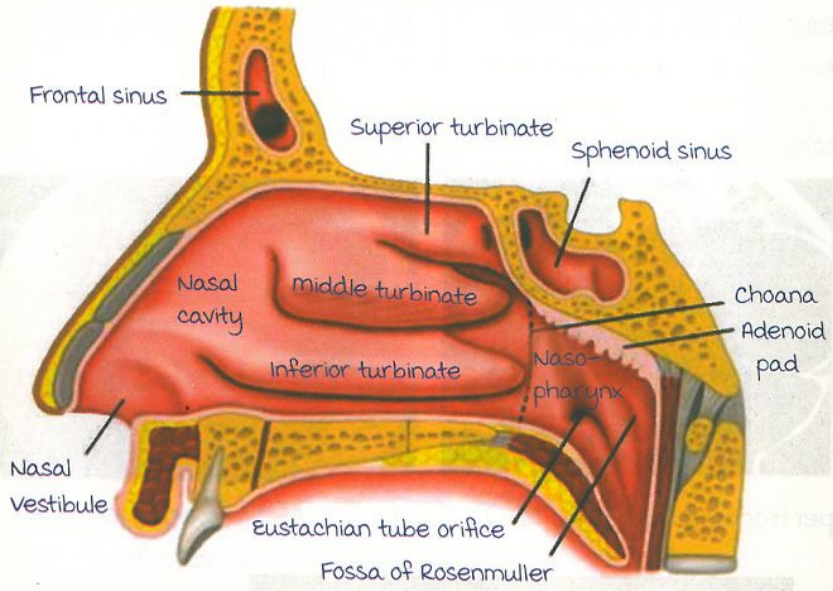
00:01:04

On lateral wall of nose, projection of 3 bones :

Turbinates

Also known as conchae.

1. Superior turbinate (Occupy posterior 1/3rd of lateral wall).
2. Middle turbinate (Occupy posterior half of lateral wall).
3. Inferior turbinate (Occupy whole of lateral wall).
   Largest turbinate.
   Independent separate bone.



Meatus : Space in between the lateral wall and turbinate.

Meatus is lateral to turbinate.

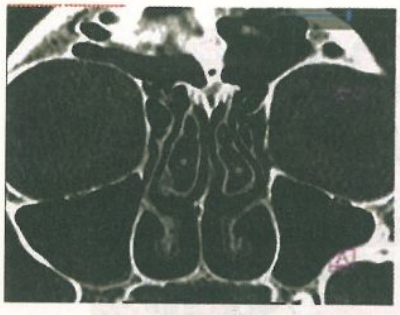
1. Superior meatus.
2. Middle meatus.
3. Inferior meatus : Largest.

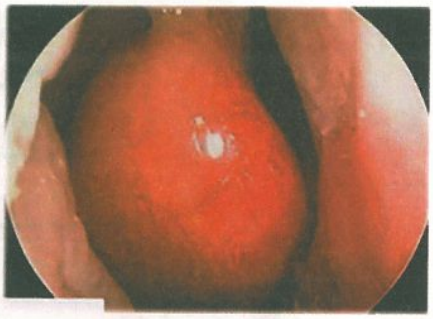
Active space

Concha Bullosa vs Hypertrophied turbinate 00:06:42

Concha Bullosa	Hypertrophied turbinate
Pneumatization of turbinate.	External hypertrophy.
Blocking drainage of the sinus. Results in sinusitis.	Nasal obstruction.
m/c site : middle turbinate. Confuses with polyp.	m/c site : Inferior turbinate. Mulberry appearance.
Management : Partial turbinectomy/ Turbinate reduction. (Removing of the lateral part of the turbinate)	Management : Partial turbinectomy/ Turbinate reduction.

Concha Bullosa (CT and endoscopic view)



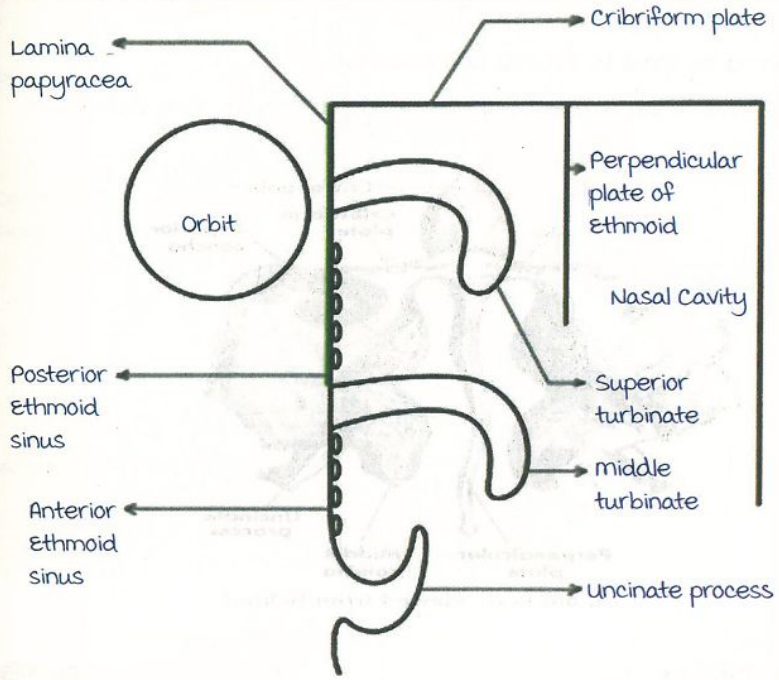


Hypertrophied turbinate (CT)

Active space

Ethmoid Bone

00:15:24



1. Lamina papyracea :
   Thin papery bone.
   Separates orbit from ethmoid.
   Form medial wall of orbit.
2. Superior turbinate
3. Middle turbinate
4. Uncinate process
5. Cribriform plate :
   Form roof of nose.
   Weakest part of base of skull.
6. Perpendicular plate of ethmoid

- Ethmoid bone articulates with inferior turbinate.

Ethmoid air sinuses :

1. Anterior ethmoid sinuses.
2. Posterior ethmoid sinuses.

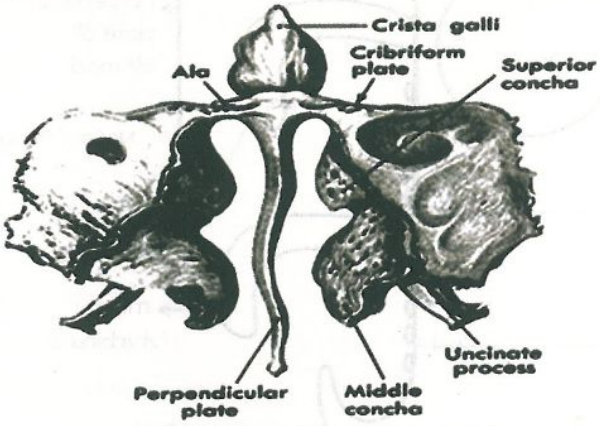
Active space

Ethmoid sinusitis :

Pain increases with movement of eye.

Most commonly lead to orbital complication.

(Ethmoid sinus is separated from orbit by a thin papery bone)



Ethmoid bone viewed from behind.

Inferior meatus

00:26:51

At junction of anterior 1/3rd and posterior 2/3rd of the turbinate

↓

Highest point of turbinate

↓ Below it

Nasolacrimal duct opens

Nasolacrimal duct :

Connects lacrimal sac to nasal cavity.

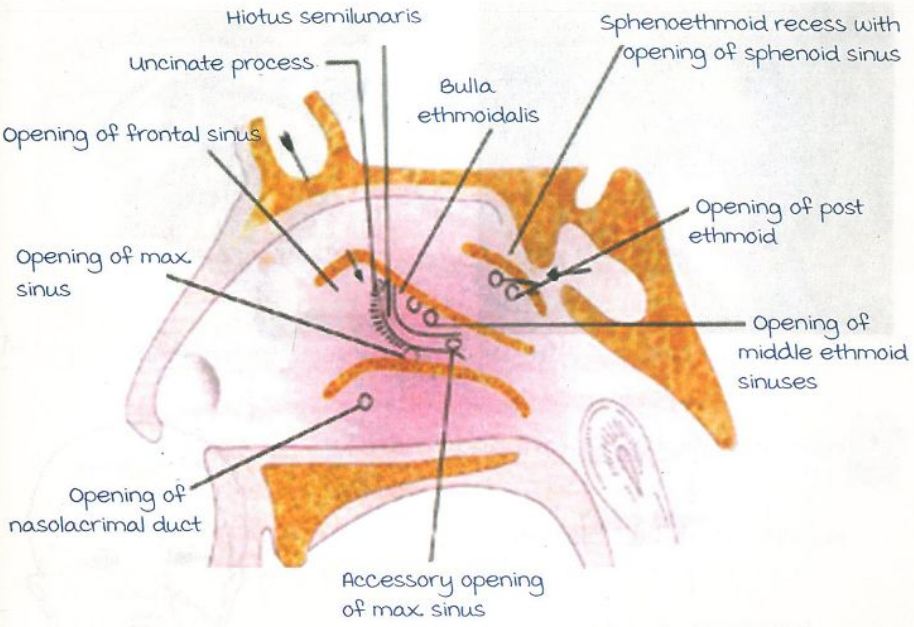
Direction : DBL (Downward, Backward, and Laterally)

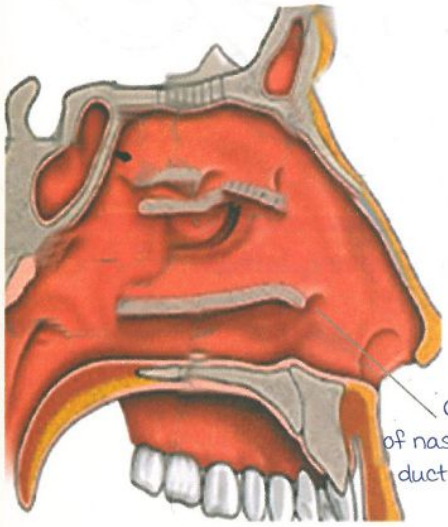
Bounded by valve of Hasner.

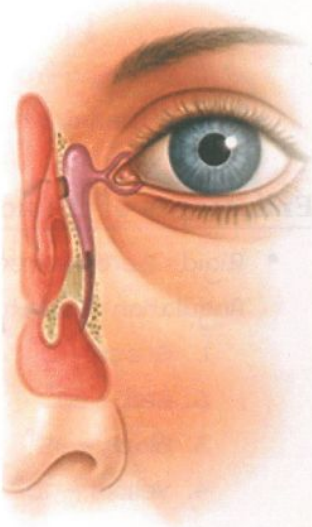
Function : Drains secretions of eye to nose.

Active space

Warning: Not all points are covered in the notes, especially conceptual explanations. Please use the notes in conjunction with Marrow masterclasses.

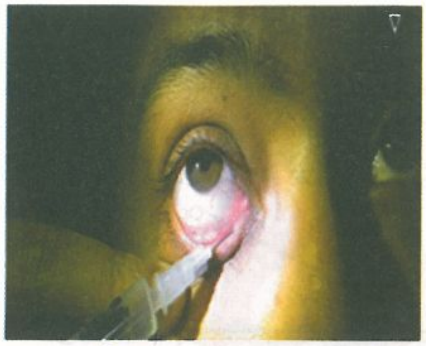




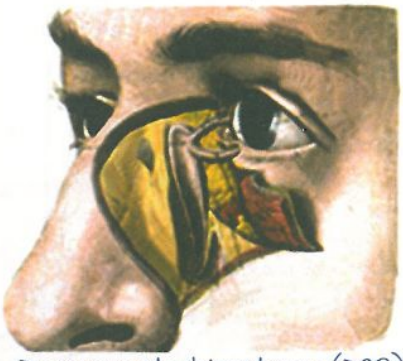


- Dacryocystorhinitis :
  Because of obstruction of nasolacrimal duct.
  Management
    Antibiotics.
    Syringing.
    Dacryocystorhinostomy (DCR).

Active space



Syringing.



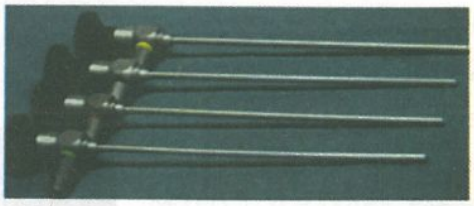
Dacryocystorhinostomy (DCR).

- Following rhinitis in infant and children
  ↓
  Nasolacrimal duct blocked
  ↓
  Watering of eyes
  ↓ managed by
  Massaging from eye medially and then downwards.

Endoscopes of the nose

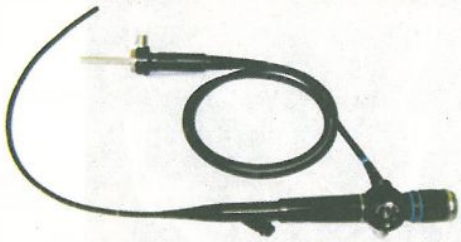
00:33:26

- Rigid : Zero degree or angulated (tip angulated).
  Angulation : Four types.
  1. Green – 0°
  2. Red – 30°
  3. Black – 45°
  4. Yellow – 70°



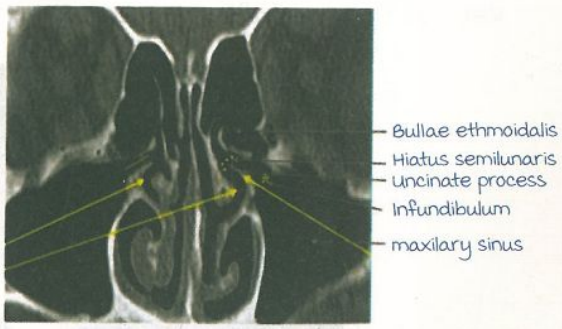
Active space

Flexible :



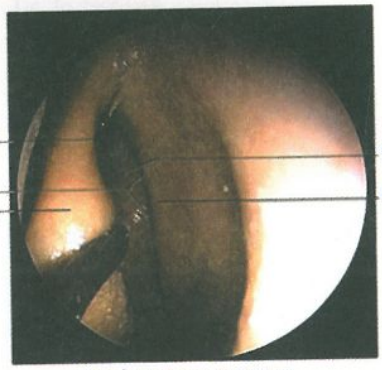
Middle meatus and osteomeatal complex 00:39:32

Osteomeatal complex.



Active space

Osteomeatal complex block.



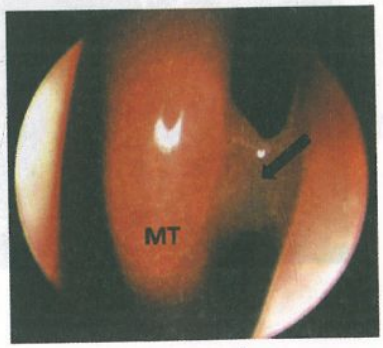
Endoscopic view.

FESS (Functional Endoscopic Sinus Surgery) 00: 46:27)

First step : Uncinectomy.
(Also first step for infundibulotomy)

Complication of sinus surgery

- Synechiae formation :
  Nasal pack is given to prevent this.
  The pack is impregnated with Mitomycin C.
  Remove the pack after 4-5days.

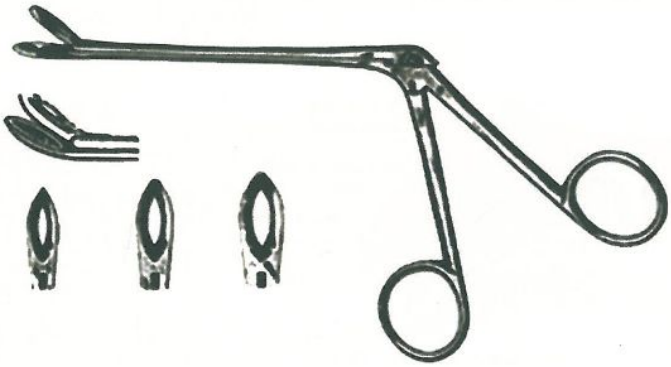


Synechiae formed following FESS.

Active space

Instrument used in FESS :

Blakesley forceps



Backbiting forceps

Superior meatus

01:04:29

Opening of posterior ethmoid sinuses.

Sphenoethmoidal recess :

Present over superior turbinate.

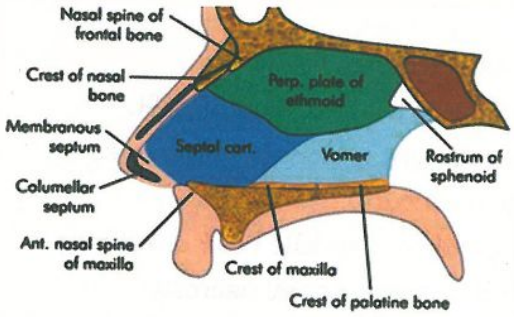
Sphenoid sinus opens here.

ANATOMY OF NASAL SEPTUM AND ITS DISEASES

Anatomy of nasal septum

00:01:13

Nasal septum is an osteo-cartilaginous structure (mainly – bony).



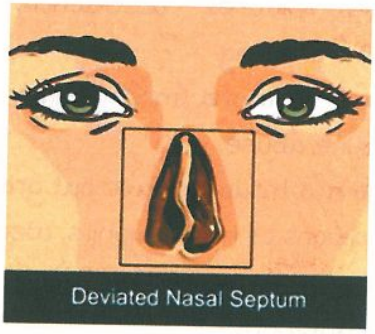
Divided into :

- Columellar septum.
- membranous septum.
- Septum proper/ septal cartilage/ quadrate.

Deviated nasal septum

00:06:09

Most common cause – birth trauma → 58%.


Deviated Nasal Septum

Clinical features :

- Nasal obstruction.
- Sinusitis.
- Nasal discharge (PND).
- Acute otitis media.
- Headache (Sludger's neuralgia).
- Hyposmia.
- Epistaxis
- quadrate.

Diagnosis :

- Cold spatula test.
- Cottle's test – patency test of nasal valve.
- CT scan.

Treatment :

- Surgery (SMR, i.e. submucosal resection of septum/ septoplasty).
- Surgery is not done until 17years of age (development of secondary ossifying centres of face complete by 17years).

Active space

- Septoplasty is preferred nowadays; SMR not done due to complication of saddle nose deformity.

Septal hematoma

00:25:50

Cause – trauma.
Features – bilateral, boggy, soft.
management – incision & drainage (within 48hours).
Complication – saddle nose deformity, septal abscess, septal necrosis.

Septal hematoma

00:27:53

Clinical features – obstruction, whistling sound, crusting.
Cause – trauma (most common), surgery, cocaine abuse.
If no h/o trauma – rule out granulomatous conditions of nose (syphilis, wegeners, i.e. Granulomatous polyangiitis).
management :

- Sialistic button – small perforation.
- Flap repair – large perforation.

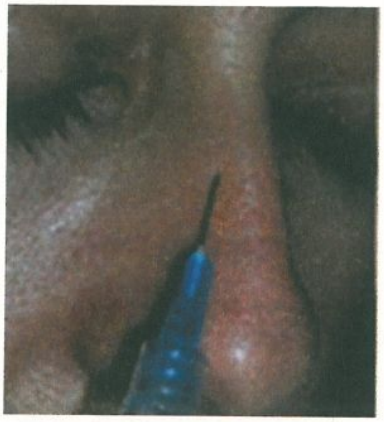
Active space

NERVE SUPPLY OF NOSE, ALLERGIC AND VASOMOTOR RHINITIS

Nerve supply of nose – olfactory nerve
Olfactory nerve supplies the upper 1/3rd of nose.
Sensory supply – ophthalmic nerve.
Tip of nose supplied by ophthalmic nerve.

Ophthalmic nerve

00:03:33



Anaesthetizing the external branch of anterior ethmoidal nerve.

Active space

Maxillary nerve

00:08:19

Ala of nose is supplied by the maxillary nerve.
Exits cranium through foramen rotendum.

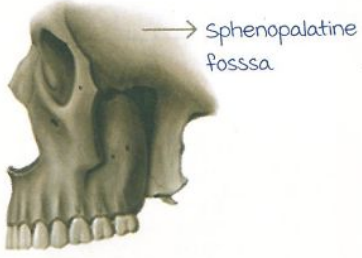
↓

Passes through sphenopalatine fossa.

↓

Enters nose through the sphenopalatine foramen,
lies 1cm behind middle turbinate.

Boundaries of sphenopalatine fossa :
Anteriorly - Posterior part of maxillary sinus.
Posteriorly - Anterior border of pterygoid plate.
Medially - lateral wall of nasopharynx.
Laterally - infratemporal fossa.



Contents of sphenopalatine fossa :

- maxillary artery
- maxillary nerve
- Sphenopalatine ganglion

Maxillary nerve gives many sensory branches and
continues as the infra-orbital nerve.

↓

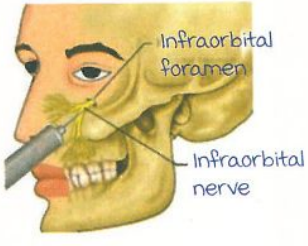
Exits via infraorbital foramen to supply
the skin of cheek and ala of nose.

Fracture of orbital floor/ zygomatic bone/ maxillary bone.

↓

Anaesthesia of cheek due to Infra orbital nerve injury.

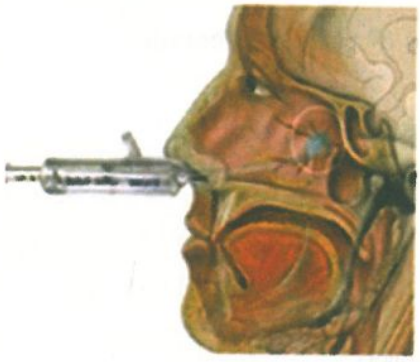
Anesthetizing the infra orbital nerve :

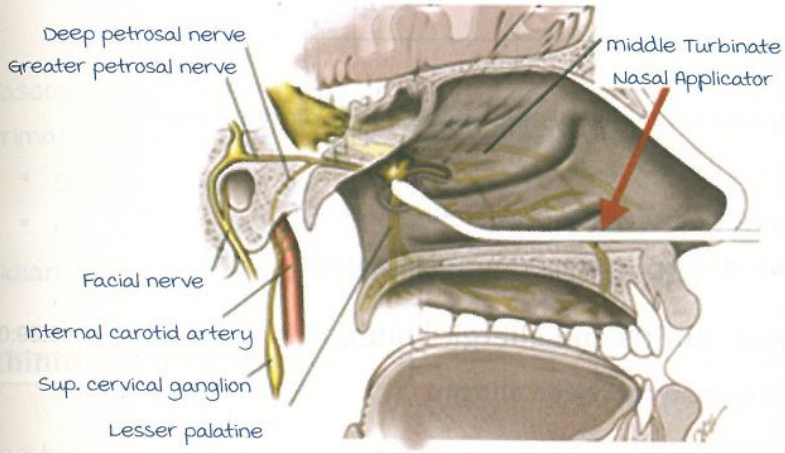


Sub-labial approach

Active space

To block the entire maxillary nerve at the sphenopalatine fossa.





In trigeminal neuralgia,
maxillary nerve anesthetized through foramen that lies behind and medial to the 3rd molar teeth.

Parasympathetic supply of nose

00:33:42

Greater petrosal + deep petrosal nerve = Vidian nerve.
Facial nerve in middle ear cavity.
↓
Greater petrosal nerve given off at first genu.
↓
Enters cranial fossa via roof of middle ear.
↓
Joins deep petrosal nerve

Active space

Joins deep petrosal nerve

↓

Forms vidian nerve (Nerve of pterygoid canal)

↓

Passes through the foramen at the root of pterygoid plate & pterygoid canal.

↓

Enters sphenopalatine fossa.

↓

Sphenopalatine ganglion.

↓ ↓ ↓

Lacrimation Nasal secretions Palatine secretions

Functions :

- Increases secretions by acting on the mucosal cells.
- Vasodilation – temperature regulation.

Vasomotor rhinitis and allergic rhinitis 00:39:09

Increased parasympathetic activity

↓

Vasodilation

↓

Increased nasal secretions

↓

Vasomotor rhinitis

(Paroxysmal sneeze, nasal secretions, post nasal secretions)

Idiopathic rhinitis : Lack of any predisposing cause.

Allergic rhinitis	Vasomotor rhinitis
Family/allergy history present.	Absent
Increased IgE levels (RAST)	Absent
Increased eosinophils (AEC)	Absent
Scratch/ Patch/ Prick test-Positive	Absent
O/E : Pale, edematous, boggy nasal mucosa	Congested mucosa

Active space

management of allergic rhinitis and vasomotor rhinitis.

Allergic rhinitis :

- Avoid allergens
- Anti-allergic medication :
  - Cetrizine, Levocetrizine
  - Fexofenadine
  - Leukotriene inhibitors
  - Mast cell stabilizers
  - Steroids (nasal spray)
  - Nasal decongestants

Vasomotor rhinitis :

Primary management – medical as in allergic rhinitis.

- Steroid nasal sprays
- Nasal decongestants

Vidian neurectomy (In failure of medical management)

Rhinitis medicamentosa 00:52:59

Due to over use of nasal decongestants.
(oxymetazoline, xylometazoline)

↓

Leads to rebound congestion.

↓

Nasal obstruction that can even produce ischaemia.

Nasal decongestants never to be used > 7 days.

Management :

Weaning of drug + Local steroid therapy.

If not benefitted, short course of systemic steroids.

Active space

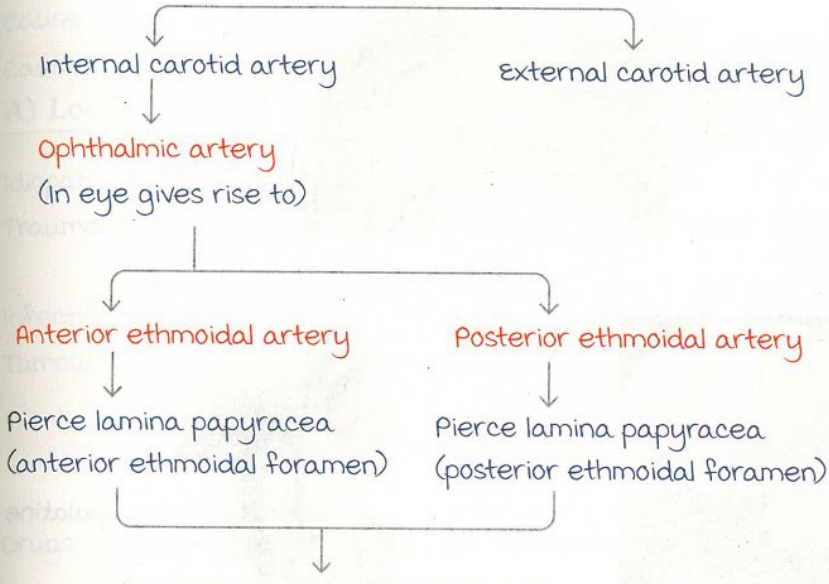
Active space

ARTERIAL SUPPLY OF NOSE AND EPISTAXIS

Arterial Supply of Nose

00:00:49

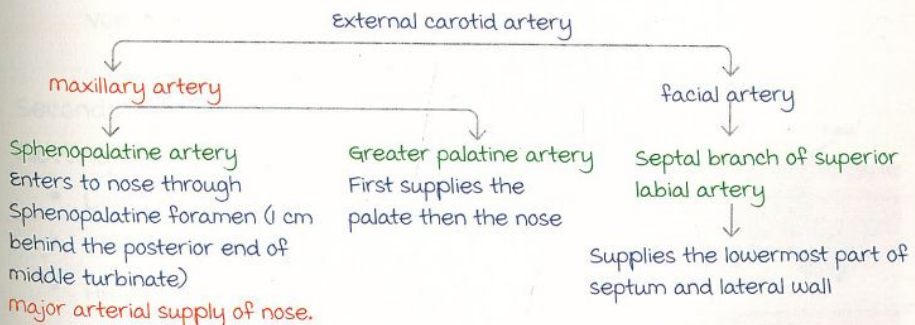
Supplied by both internal and external carotid arteries.



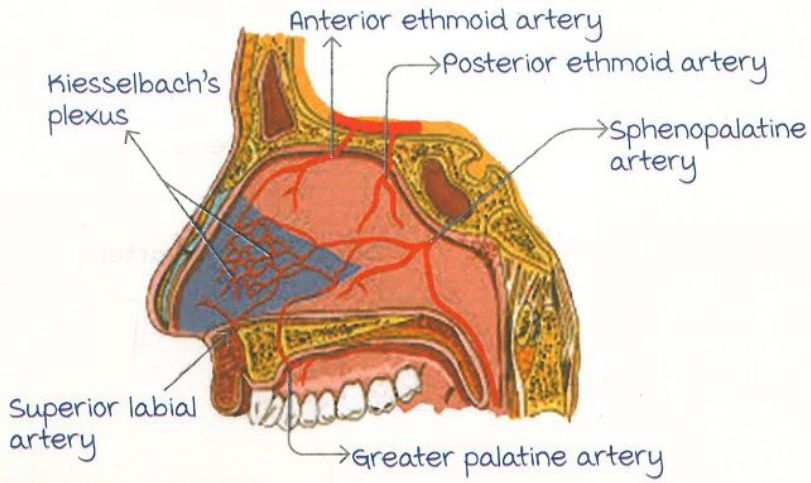
- Anterior ethmoidal artery :
  Supplies anterior part of lateral wall, anterior part of septum.
  Injury to this will result in orbital hematoma.
- Posterior ethmoidal artery :
  Supply very small part.
  Not a part of Kiesselbach's plexus.

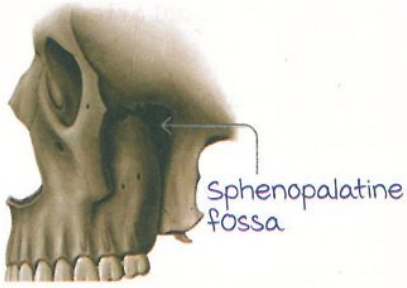
External carotid artery

00:02:48



Active space





(maxillary artery goes from infratemporal fossa to sphenopalatine fossa)

Little's area

00:06:50

for Marrow Edition 5 notes join telegram channel t.me/Marrow_edition5Notes
search
@Marrow_Edition5Notes in telegram
u will reach at latest Notes channel

Active space

Epistaxis

Epistaxis is mostly arterial.

Woodruff's plexus :

A venous plexus behind inferior turbinate on lateral wall.

Cause of venous epistaxis.

Causes :

A) Local causes 00:27:48

Idiopathic : M/C in adult.

Trauma : M/C in Children (nose picking) and young.
(DNS, iatrogenic)

Infection

Tumours : Young male with recurrent epistaxis should be investigated for angiofibroma
Elderly with recurrent epistaxis should be investigated for tumour.

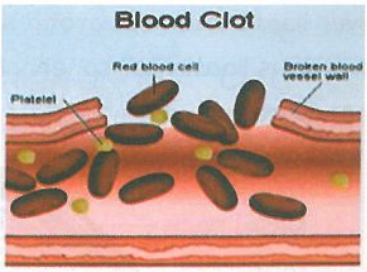
Drugs : Nasal decongestant, steroid nasal spray.

B) Systemic Causes 00:34:02

Primary Hemostasis defect :

Thrombocytopenia

- Decreased production : Leukemia, myelodysplastic syndrome.
- Increased destruction : Idiopathic thrombocytopenia purpura, splenomegaly.

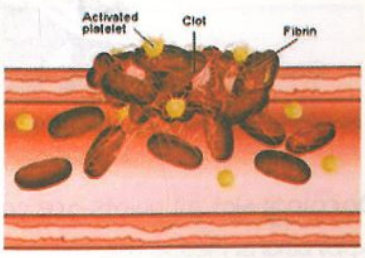


Drugs : Aspirin.
von Willebrand disease.

Secondary Hemostasis defect :

Clotting factor decreased.

- Liver disease.
- Chronic alcoholism.
- Hemophilia
- Drugs : Warfarin, Heparin



Active space

Management of Epistaxis

00:16:03

Pinch the nose and make the patient sit bending forward (Hippocratic/ Trotter's method).

Also get IV access

↓

Local cautery ($AgNO_3$)

↓

Anterior nasal packing (Gauge/ merocel pack)

↓

Posterior nasal pack (Foley's catheter inflated with air)

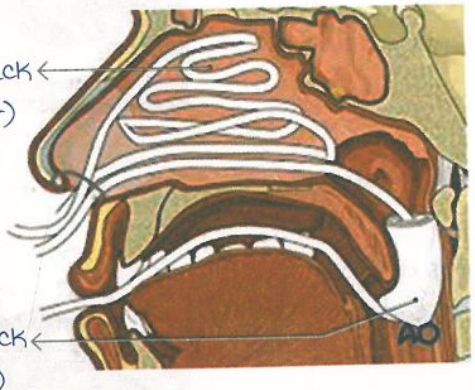
↓

Ligation

- Sphenopalatine artery at sphenopalatine foramen
- ↓
- Anterior ethmoidal artery
- ↓
- Maxillary artery – Caldwell luc approach
- ↓
- External carotid artery

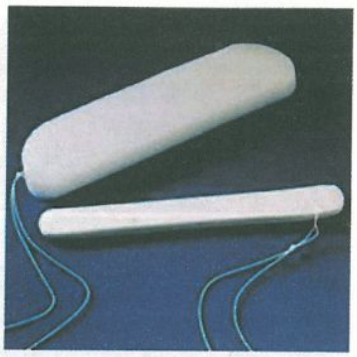
Never ligate internal carotid artery.

Nowadays ligation of sphenopalatine artery gives 100% result because of endoscopy.

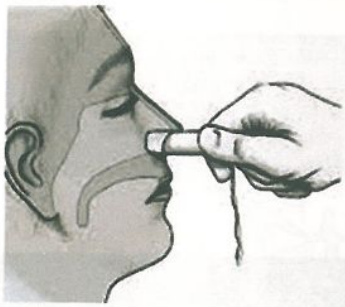


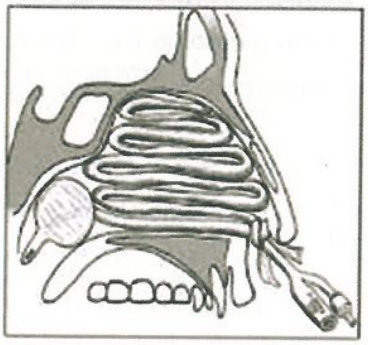
Warning: Not all points are covered in the notes, especially conceptual explanations. Please use the notes in conjunction with marrow masterclasses.

Active space



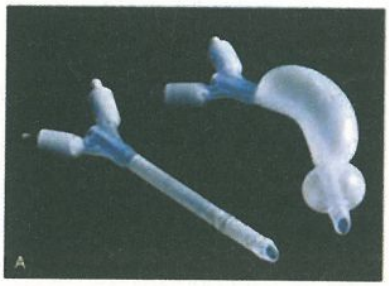
(merocel pack)

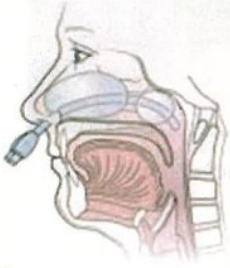




(Foley's catheter)

(Caldwell luc approach)





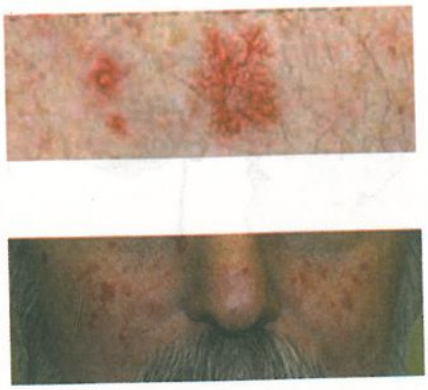
(Balloon packs used for both anterior and posterior nasal pack)

Hereditary haemorrhagic telangiectasia (Osler-Weber-Rendu syndrome)

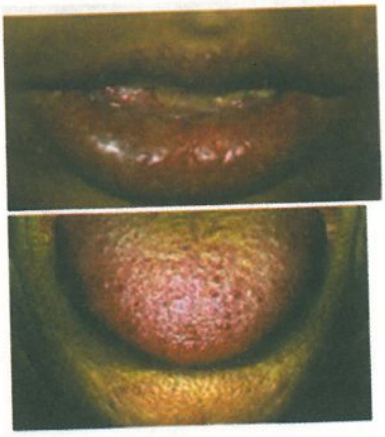
00:43:41

- Very rare and hereditary.
- Many episodes of epistaxis (18- 20 episodes per month).
- Telangiectasia over skin, mucocutaneous surface, viscera.
- Nasal packing not used.
- Bipolar cautery (localise case)
- Septal dermoplasty.

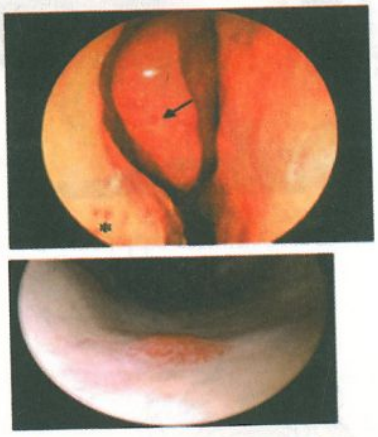
Active space



(Telangiectasia over face)



(Telangiectasia over lips and tongue)



(Telangiectasia in nose)

Active space

ANATOMY OF SINUSES, SINUSITIS & ITS COMPLICATIONS

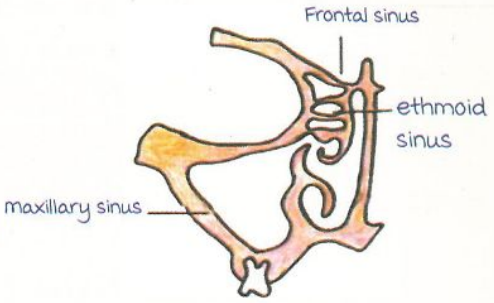
There are 4 paired paranasal sinuses.

Anterior group of sinuses :

- Frontal
- Anterior ethmoidal
- Maxillary

Posterior group of sinuses :

- Posterior ethmoidal
- Sphenoid



Maxillary sinus

00:02:12

Maxillary sinus is the first sinus to develop.

It is the largest sinus with around 15 ml capacity.

It is present at birth.

It is pyramidal in shape.

It is also known as Antrum of Highmore.

Boundaries :

- Roof – Floor of orbit.
- Medial wall – Lateral wall of nose.
- Opening – Middle meatus.

It has anti-gravity drainage.

It is the most common sinusitis in adults.

It is related to 2nd premolar and 1st molar :

- Tooth extraction can lead to oroantral fistula.
- Pain increases with movement of jaw.

Ethmoid sinus

00:05:19

Ethmoid sinus is the second sinus to develop.

It is present at birth.

It is maximally pneumatized at birth.

It is the most common sinusitis in infants and children.

Opening of ethmoid sinus :

- Anterior ethmoid – Middle meatus.
- Posterior ethmoid – Superior meatus.

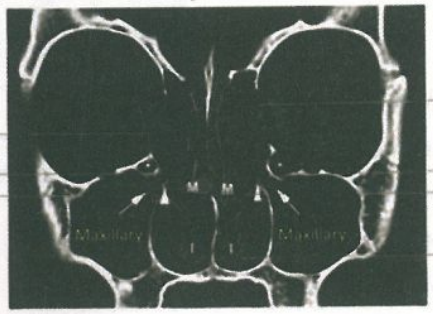
Active space

Bulla ethmoidalis is the largest anterior ethmoidal cell.

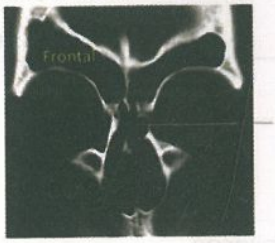
Pain increases with eye movement in ethmoid sinusitis.

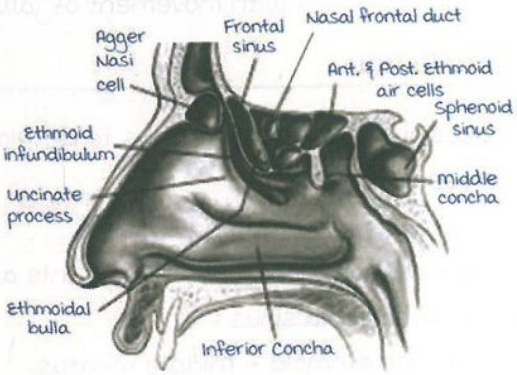
Named anterior ethmoidal cells

00:08:30



Non contrast CT coronal section :





Active space

Onodi cell

00:19:10

Onodi cell is a named posterior ethmoidal cell.

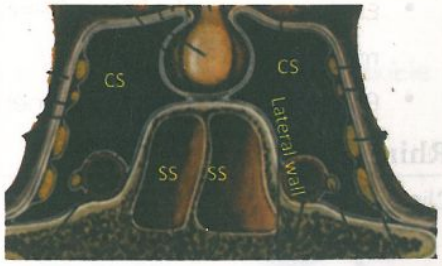
It lies in the lateral and superior wall of sphenoid sinus (SS).

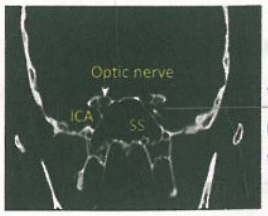
Structures related to cavernous sinus (CS) :

- Structures passing through superior orbital fissure :
  - 3rd, 4th, 6th cranial nerves
  - Ophthalmic branch of 5th cranial nerve.
- Maxillary branch of 5th cranial nerve passing through foramen rotundum.
- Structures passing through cavernous sinus :
  - 6th cranial nerve.
  - Internal carotid artery (lateral to lateral wall of sphenoid sinus).
- Optic nerve passes through roof of sphenoid sinus.

Following surgery around Onodi cell or sphenoid sinus there are chances of injury :

- Lateral – Internal carotid artery.
- Superior – Optic nerve.





Dehiscent lateral wall with ICA bulging inside

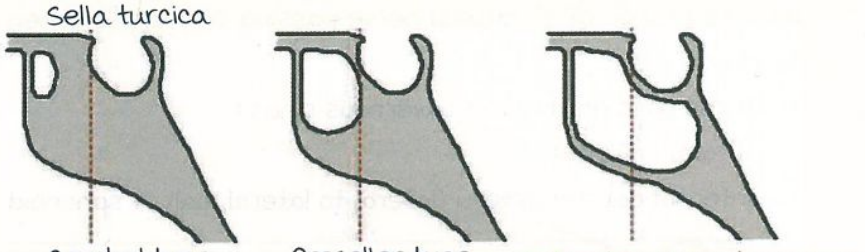
Active space

Sphenoid sinus and frontal sinu

00:33:45

Sphenoid sinus :

- Sphenoid sinus develops after the ethmoid sinus.
- It is present at birth.
- It is the least common sinusitis.
- Pituitary is removed through the trans-sphenoid approach : Trans-sphenoidal hypophysectomy.



Frontal sinus :

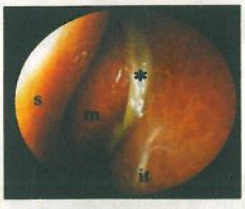
- Frontal sinus is the last to develop.
- It is not present at birth.
- Opening : middle meatus via frontal recess (Osteomeatal complex area).
- Frontal sinus drainage is aided by gravity.
- Early morning / Office / Periodic headache : Headache maximum in the morning.
- Pain increases with movement of eye.

Rhinosinusitis

00:40:42

Clinical features :

1. Nasal obstruction.
2. Nasal discharge.
3. Pain and pressure on face.
4. Hyposmia.



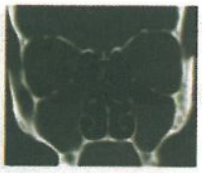
Endoscopy :

- Mucopurulent secretions in middle meatus.
- Edema + congestion of middle meatus.

NCCT :

- Best investigation for chronic rhinosinusitis (>12 weeks).
- Not preferred in acute sinusitis (< 12 weeks).

Active space



Air fluid level

Complete blockade of ostiomeatal complex area

Secretions in middle meatus

Management of rhinosinusitis

00:47:00

Acute rhinosinusitis :

- Most common cause – Viral.
- Most common causative bacteria – Streptococcus pneumoniae.
- Features suggestive of bacterial infection, indicating antibiotics :
  1. Unilateral predominance.
  2. Mucopurulent secretions.
  3. High fever.

Chronic Rhinosinusitis :

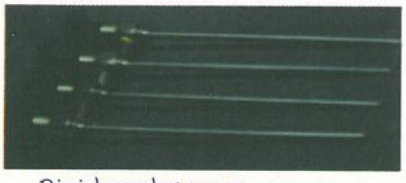
- Correction of anatomical abnormality if noted on NCCT.
- Medical management for at least 1 month :

  First line if no anatomical abnormality noted.
- If no benefit on medical management :

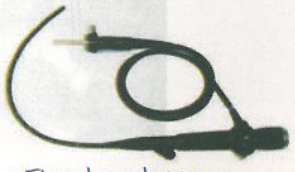
  Functional endoscopic sinus surgery (FESS).

Types of endoscopes :

- FESS : Rigid endoscopes.
- Diagnostic nasal endoscopy (DNE) : Rigid endoscopes or flexible endoscope.



Rigid endoscope



Fixed endoscope

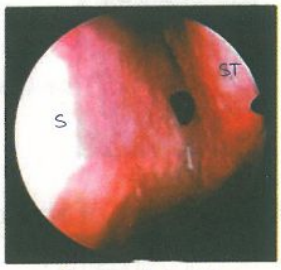
Structures visualized on nasal endoscopy – 3 Pass endoscopy :

1. First pass : Through the floor of the nostril up to choana.
2. Second pass : Through the middle meatus posteriorly.

   Structures of superior meatus and sphenoid sinus visualized.
3. Third pass : Structures of middle meatus visualized.

Active space

First pass



Second pass

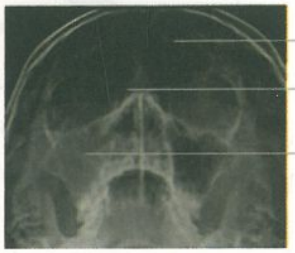
X-Rays for rhinosinusitis

00:55:56

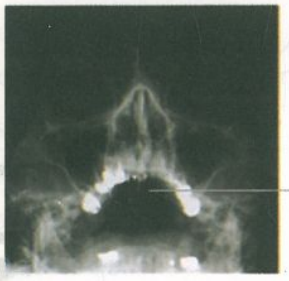
X-Rays are no more done for the diagnosis of sinusitis.

Types of X-Ray views :

1. Water's view : occipitomental view

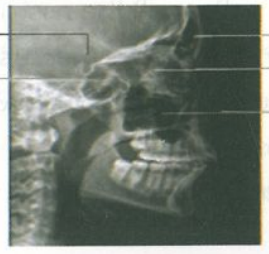


2. Pierre's view : Water's view with open mouth (posterior ethmoid is not seen).



3. Lateral view :

Highest sinus on lateral view – Frontal sinus.

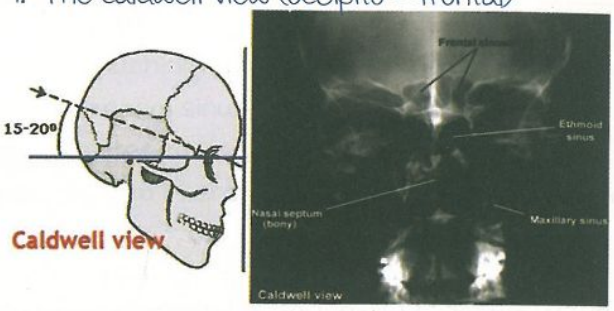


4. Caldwell view : Occipitomental view (Best for frontal sinus).

Active space

Standard Radiograph

1. The caldwell view (occipito – frontal)



Functional endoscopic sinus surgery (FESS) 01:00:17

The normal function of sinuses (Ventilation and drainage) is restored.

Indications : Chronic sinusitis, Nasal polyps, Mucocele, Pyocele.

Endoscopic surgery of nose :

Nasal conditions :

- Septoplasty
- Epistaxis : TESPAL (Transnasal endoscopic sphenopalatine artery ligation).
- Excision of choanal atresia.
- Excision of tumors

Non Nasal conditions :

- Endoscopic DCR
- Orbital decompression.
- CSF leak repair
- Trans – sphenoidal hypophysectomy.

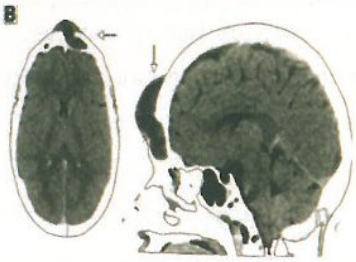
Complications :

- Hemorrhage is the most common complication.
- Lacrimal duct injury.
- Injury to orbit.
- Cribriform plate injury.
- Optic nerve injury.
- ICA injury is the most dreaded complication.

Complications of rhinosinusitis 01:07:32

Active space

- Pott's puffy tumor : Sub-periosteal abscess of frontal sinus.



- Treatment of Pott's puffy tumor : Frontal sinus trephination.
  Frontal sinus is opened, rubber tube is place and sinus is closed.
  Incision : Lynch Howarth incision.

Orbital cellulitis	Cavernous sinus thrombosis
Gradual progression.	Acute sudden progression.
3rd, 4th, 6th cranial nerves involved together.	6th nerve is involved first followed by 3rd and 4th nerves.
Unilateral	Bilateral

Chronic complications of rhinosinusitis :

- Mucocele : most commonly seen in frontal sinus.
- Pyocele.

Active space

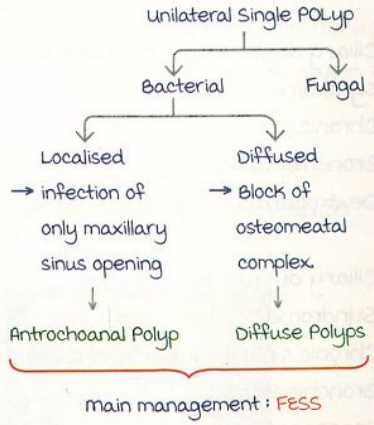
NASAL POLYPS AND FUNGAL SINUSITIS

Nasal Polyps 00:00:40

- mucosal outpouching (usually formed from middle meatus) involving paranasal sinuses.
- Formation relates to Bernoulli's Theorem.
- Can occur due to allergy or infection (due to underlying chronic disease).

Infection / Allergy
↓
Edema in middle meatal area
↓
Nasal narrowing
↓
↑Velocity
↓
Negative pressure
↓
Pulling of muscosa into pathway of air

Bilateral and Unilateral Polyp 00:03:58

Bilateral (think of systemic conditions)	Unilateral
In Adult age : 1. Allergy : • History of allergy, family history. • Test : IgE, Absolute eosinophil count. • Management : try medical first and then surgical. • medical management : anti-allergics, leukotriene inhibitors, mast cell stabilizers, and steroids. • Surgical management : FESS (Functional Endoscopic Sinus Surgery).	

Active space

Rule Out : generally present in middle age.

A. Churg Strauss Syndrome :

- Also known as Eosinophilic granulomatosis with polyangiitis.
- Autoimmune reaction to an unknown allergen.
- Leads to activation of eosinophils
- Adult-onset asthma with a nasal polyp and allergic rhinitis.
- Eosinophil count >10%.
- Biopsy : eosinophilic granulomas
- PANCA : positive.
- Management : Steroids

B. Samter's Triad : Aspirin sensitivity + Asthma + Nasal Polyp.

In young population :

A. Genetic disorder : Cystic fibrosis

- Also known as mucoviscidosis.
- young child.
- Chloride channel defect.
- Thick secretions leading to a bilateral polyp.
- Diagnosis : sweat chloride test.

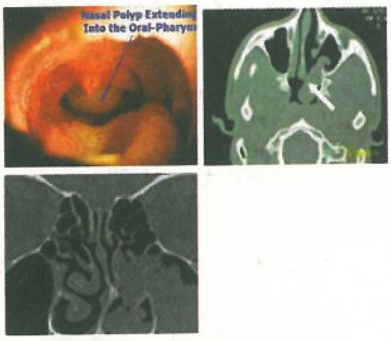
B. Ciliary dysfunction : Kartagener syndrome

- Chronic sinusitis.
- Bronchiectasis.
- Dextrocardia (Situs Inversus).

C. Ciliary dysfunction : Youngs Syndrome

- Chronic sinusitis leading to a polyp.
- Bronchiectasis.
- Azoospermia.

Antrochoanal Polyp :



Active space

Fungal sinusitis

00:28:50

- The fungus gets entrapped in the sinuses.
- Usually unilateral.

Fungal Sinusitis

Fungal Ball

1. Aspergillus Niger
2. Immunocompetent
3. Non- atopic
4. Chronic sinusitis
5. Cheesy secretion

Management :
- FESS
- No antifungal needed

CT : Heterogeneous appearance due to entrapment of metals
Double density sign

Allergic Fungal Sinusitis

1. Fungus entrapped in sinus
2. Aspergillus Niger
3. Immunocompetent
4. Atopic / Allergic to fungus

On Examination :
- Mucinous Secretion : (Peanut butter) (axle grease)
- Polyps usually unilateral
- Ig E ↑ , AEC ↑

CT : Entrapment of metals
↓
Heterogeneous, Appearance
Double Density Sign

Invasive Fungal Sinusitis

1. Mucor mycosis
2. Immuno suppressed (Diabetic, on steroids)

Mucor mycosis
↓
Angioinvasive
- Spreads rapidly → Life threatening
- Thrombosis → Ischemia → Necrosis → Black discolouration of the area involved

Management :
I.V Amphotericin B
+
Local Debridement

Management of all fungal sinusitis
FESS + Post-operative steroid nasal spray

- Antifungals have no role in the allergic fungal sinusitis (Only given when the response is not good; Antifungals that are given : Itraconazole, Voriconazole, Fluconazole).
- 1st step for FESS : Uncinectomy.
- 2nd step for FESS : put nasal pack (mitomycin) to reduce synechiae formation.
- Double Density Sign :

Active space

- Most common fungus in Fungal ball : Aspergillus.
- The most common fungus in Allergic fungal sinusitis was Aspergillus but now it is Dematiaceous (Bipolaris, Curvilaris, Alternaria).
- Most common fungus in Invasive Fungal sinusitis : Rhizopus, Aspergillus. If Rhizopus then the presentation is mucormycosis.
- Mucor mycosis : life-threatening condition.

Conditions that mimic Polyp

00:56:33

In infant : rule out Meningocele/ Meningoencephalocele :

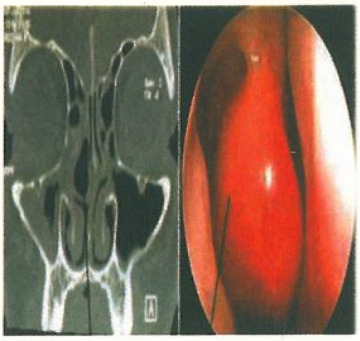
- Polyploid mass is seen in infants.
- Furstenberg sign : When the child cries, an increase in mass size due to an increase in ICT.
- Transillumination present.
- Confirmed by CT scan.

In elderly : rule out malignancy

In young :

- Epistaxis is not a feature of the polyp.
- Angiofibroma : presents with a nasal mass and recurrent epistaxis.
- Concha Bullosa : pneumatization of the middle turbinate. Not a Polyp.

Active space

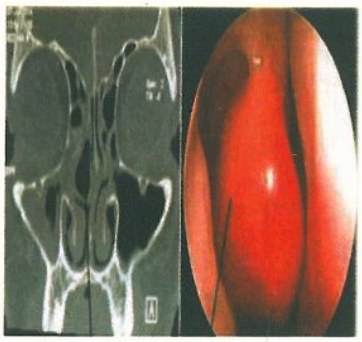


Concha bullosa	Polyp
Probe Test : Cannot pass probe all around the mass	Probe Test : can pass probe all around the mass
Bleed on probing	No bleeding
Pain present	Pain absent

Age-based classification of nasal mass 01:07:28

1. Infant : meningocele and meningoencephalocele.
2. Young :
   - Unilateral : Infection (Antrochoanal Polyp)
   - Bilateral : Systemic condition (cystic fibrosis, ciliary dysfunction)
3. Middle age :
   - Unilateral : Bacterial infection, Allergic fungal sinusitis.
   - Bilateral : Allergy, Churg Strauss syndrome, Samters triad.
4. Elderly : Malignancy.

Active space



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4. Elderly : Malignancy.

Active space

ATROPHIC RHINITIS & GRANULOMATOUS DISEASE OF NOSE

Atrophic rhinitis 00:01:12

Wide, roomy nasal cavities.
Also known as Ozaena.

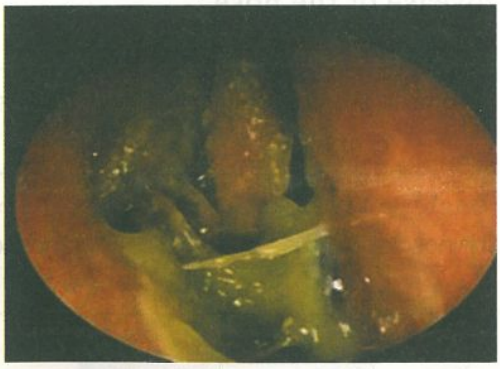
Etiology :

1. Secondary to the granulomatous condition of the nose.
2. Secondary to surgery : Empty nose syndrome (due to excessive removal of turbinates).
3. Primary atrophic rhinitis (Idiopathic) : Infection by Klebsiella ozaenae.

Clinical presentation :

1. Nasal obstruction (because of excessive crusting).
2. Merciful anosmia.
3. Foul smell from the nose (patient does not complain about foul smell due to anosmia).

On Examination :



Excessive crusting is seen on anterior rhinoscopy.

Medical management :

1. Removal of the nasal secretions : Alkaline nasal douching.

Active space

Procedure : Sodium chloride, Sodium bicarbonate & Sodium biborate are taken in a ratio of 2:1:1 & distilled water is added to it. It is filled in a 15–20 ml syringe and pushed into the nose. It helps to loosen the crust.

2. Treatment of local infection :
   - Kemicetine solution : Contains – Chloramphenicol, oestradiol, propylene glycol & vitamin D.
   - 25% glucose in glycerine solution :
     Glycerine : Hygroscopic.
     Glucose : Converts to lactic acid, which is proteolytic & it destroys bacterial proteins.

Surgical management :

3. Young's operation :
   Procedure : Flap of mucosa from the lateral wall and septum is raised, which is sutured in between to close the nasal cavity.
   Modified Young's operation : A 3 mm opening is left in the center.

Granulomatous disease of the nose

00:16:29

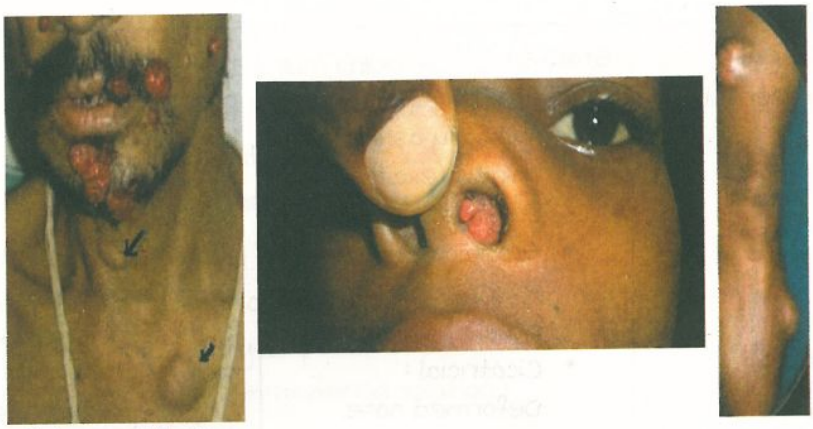
	Rhinoscleroma (Bacterial granuloma)	Rhinosporidiosis
Causative agent	Bacteria : Klebsiella rhinoscleromatis	Aquatic protozoa : Rhinosporidium seeberi

Active space

Clinical presentation :	Stages : • Atrophic : Presents typically as atrophic rhinitis (excessive crusting). • Granulomatous : Hard/Woody/Hebra nose. • Cicatricial : Deformed nose.	H/o taking bath in ponds, frequented by animals. MC seen in Tamil Nadu. Not confined to nose/nasopharynx, seen in the skin as well. C/F : Repeated nasal bleeding. O/E : Strawberry/ mulberry mass with white dots.
Diagnosis :	Biopsy : 1. Macrophages – Cytoplasm with phagocytosed bacteria. They are known as Miculicz cells. 2. Plasma cells contain inclusion bodies that are known as Russell bodies.	Biopsy/smear (multiple sporangia).
	Rifampicin, Tetracycline, Streptomycin, Ciprofloxacin for 6 weeks + Steroids to reduce fibrosis.	Wide excision with cauterization of base + Dapsone.

Rhinoscleroma – Hebra nose.

Active space



Rhinosporidiosis.

Granulomatosis with Polyangiitis

00:33:53

Diagnosis : Biopsy & cANCA is positive.
Management : Steroids, cyclophosphamide.

Active space

ENT manifestations of Sarcoidosis 00:38:22

1. Lupus pernio :

Strawberry nasal mucosa.

Management of Sarcoidosis : Steroids & Hydroxychloroquine.

2. Heerfordt syndrome/Uveoparotid fever : Facial palsy
   Parotitis
   Uveitis.

Right facial palsy with parotitis.

Warning: Not all points are covered in the notes, especially conceptual explanations. Please use the notes in conjunction with marrow masterclasses.

Active space

FRACTURES OF FACE & CSF RHINORRHOEA

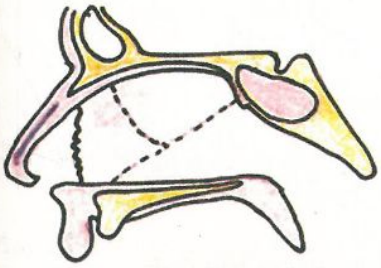
Fractures of face

00:00:36

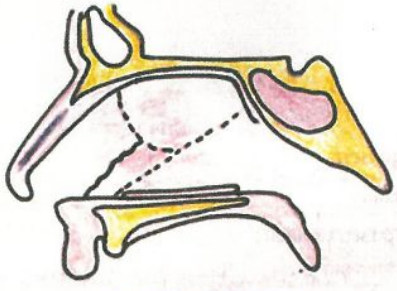
most common fracture of face – Nasal bone fracture.

Classification of fractures of nasal bone :

Class I	Class II	Class III
Chevallet fracture	Jarjaway fracture	Naso-orbito ethmoid fracture
Fracture of nasal bone + septum (septum not deviated)	Fracture of nasal bone + septum (septum deviated)	
Septum has vertical fracture	Septum has horizotal /C-shaped fracture	Pig nose deformity
Lateral blow	Lateral / Frontal blow	



Chevallet fracture



Jarjaway fracture

management – closed reduction, after 1 week /after edema subsides, using Asch's forceps (for nasal septum) or Walsham forceps (for bone wall).

Asch's forceps

Walsham forceps

Active space

Management after 3 weeks – Rhinoplasty (for > 17 yrs ; Surgery performed after 6 months).

CSF rhinorrhoea

00:15:26

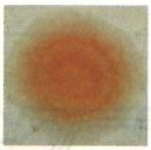
Cause :

Trauma (95%) – most common.

Spontaneous (5%) – infective erosion, tumor erosion, congenital dehiscence, empty sella syndrome.

Most common site – lateral lamella of cribriform plate.

Diagnosis :

Clinical examination	Biochemical examination	Radiological examination
1. Sniff test. 2. Handkerchief test. 3. Halo/ Target/ Double ring sign  4. Reservoir sign (gush of fluid from nose).	1. β_a transferrin. 2. β trace protein.	1. HRCT (best investigation). 2. CT cisternography (for active leak).

Management :

1. Conservative for 2weeks – aims at lowering the CSF pressure (using mannitol, glycerol, diuretics ; propped up position).
2. Endoscopic repair (preferably ; using fluorescein dye) or external repair – if no improvement is seen within 2 weeks.

Zygomatic bone fracture

00:37:15

Tripod fracture :

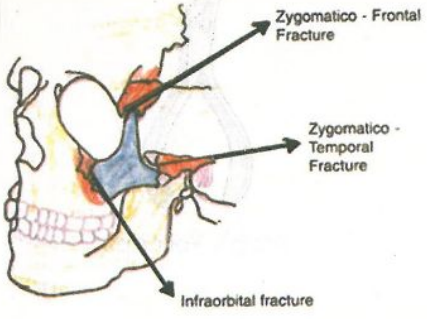
Infra orbital fracture

+

zygomatico temporal fracture

+

zygomaticofrontal fracture.



Active space

- Features of zygomaticomaxillary fracture :
  - Flattening of cheek.
  - Anaesthesia of cheek (due to infraorbital nerve injury).
  - Periorbital emphysema.
  - Step deformity.
  - Diplopia.
  - Enophthalmos.
- Feature of zygomaticotemporal fracture – trismus.
- Feature of zygomaticofrontal fracture – step deformity of lateral orbital rim.

management – reduced by open reduction.

Blowout fracture

00:42:56

It is the fracture of the floor of orbit.

most common site – inferior wall of orbit.

Tear drop sign

Features :

- Periorbital emphysema.
- Step deformity of infraorbital margin.
- Diplopia.
- Enophthalmos.

Maxillary bone fracture

00:45:29

Also known as Le Fort fracture.

Types :

Le Fort – I fracture :

- a/k/a Guerin fracture.
- Fracture is parallel to the palate.
- Hanging teeth.

Active space

Le Fort-II fracture :

- Pyramidal fracture.
- Hanging maxilla.

Le Fort-III fracture :

- Craniofacial disjunction.

TUMORS OF NOSE

Tumors of nose – benign

00:00:36

Benign tumor

- External nose
  - Rhinophyma
    - Hypertrophy of Sebaceous glands in the tip of nose
      - associated with Acne rosacea
        - Management : Excise skin with Knife/ laser.
- Nasal cavity
  - inverted papilloma [most Common]
    - a/k/a Ringertz tumor/ Schneiderian papilloma
      1. It arises from lateral wall of nose.
      2. locally invasive
      3. Pre-malignant
      4. Recurrent

      Management : surgical excision.
- Paranasal sinuses
  1. osteoma – MC
     MC in frontal sinus
  2. Fibrous dysplasia
     MC in maxillary sinus
     - Ground Glass appearance on CT

Rhinophyma :

Active space

Tumors of nose – malignant

00:08:32

Classification of maxillary sinus carcinoma based on Ohngren's line.

Ohngren's line

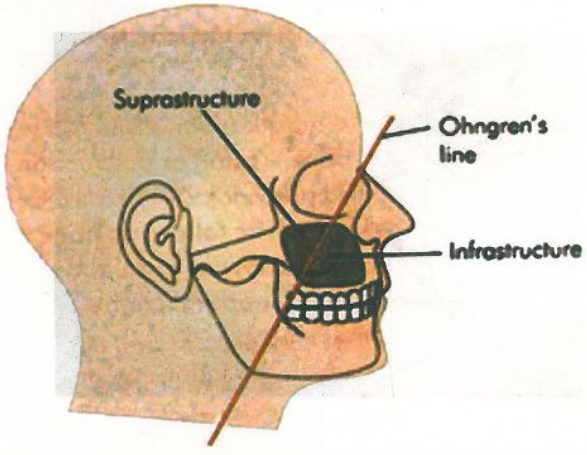
↓

Passes from the root of nose to the angle of mandible.

↓

dividing the maxillary sinus into

- Suprastructure → worst prognosis
- infrastructure → better prognosis



Active space

Tumor staging of carcinoma of maxillary sinus 00:12:02

T_1 – only mucosa is involved, no bone erosion.

T_2 [infrastructures] – bony erosion of hard palate, lateral wall of nose.

T_3 [suprastructures] – superiorly : floor and medial wall of Orbit.
Posteriorly : pterygoid fossa, pterygoid plate.
Laterally : infratemporal fossa, skin of cheek.

T_4 – Involves orbital contents :
Frontal /sphenoidal sinus.
Cribriform plate.
Nasopharynx.

Management of carcinoma of maxilla 00:16:58

Always combined – surgery and radiotherapy.
Surgery – partial or total maxillectomy
↓
With Weber Ferguson incision or Moure's incision
Or mid-facial degloving incision [most preferred] – minimal scarring.

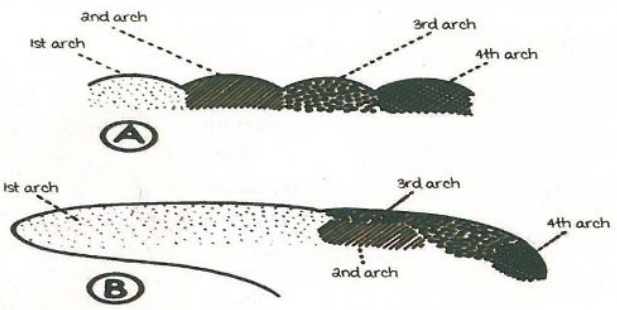
Non-Hodgkin lymphoma [NHL] 00:21:12

It is known as Extra nodal T cell lymphoma / natural killer lymphoma.
It is caused by EBV [Epstein-Barr virus].
Diagnosis – Biopsy.
Management – Radiotherapy.
[good prognosis if diagnosed early].

Active space

ANATOMY OF PHARYNX - OVERVIEW

Embryology of tongue 00:00:45



	Anterior 2/3rd	Posterior 1/3rd, Base	Posterior most & valeculla	Muscles of tongue
Nerve :	1st arch	3rd arch	4th arch	Occipital somites / myotomes
	Lingual branch of mandibular nerve	Glossopharyngeal nerve	Superior laryngeal nerve	Hypoglossal Nerve
Taste :	Chorda tympani	IX nerve	X nerve	

Chorda tympani is a pretrematic nerve of the second arch.
Sulcus terminalis divides the tongue into anterior 2/3rd and base.
Circumvallate papillae lies in anterior 2/3rd of tongue but supplied by glossopharyngeal nerve.
All muscles of tongue are supplied by hypoglossal nerve except palatoglossus (supplied by pharyngeal plexus i.e. vagus)

Referred pain to ear from tongue 00:08:40

Anterior 2/3rd	Base of tongue	Posterior most part of tongue
Auriculotemporal nerve through lingual branch of mandibular nerve.	IX nerve through Jacobson's nerve	Vagus / Arnold's nerve

Active space

In hypoglossal nerve palsy,

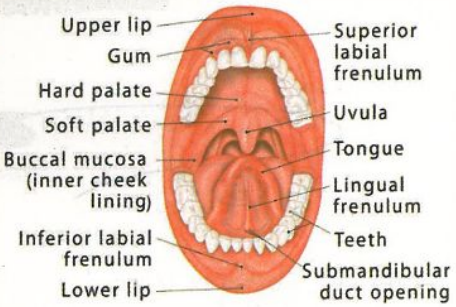
Tongue will move towards the weak side due to unopposed action of Genioglossus.

Anatomy of pharynx

00:17:47

Contents of oral cavity :

- Anterior 2/3rd of tongue
- Hard palate
- Floor of mouth
- Lip, gingiva,
- Retromolar trigone
- Buccal mucosa
- Vestibule

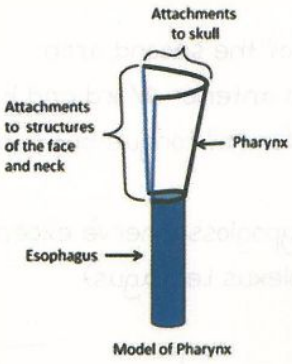


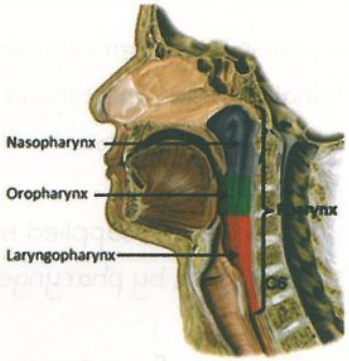
Soft palate and posterior 1/3rd of tongue are contents of the oropharynx.

Pharynx extends from base of skull to the lower border of cricoid.

Pharynx is divided into 3 parts :

- Nasopharynx / epipharynx
- Oropharynx
- Laryngopharynx / hypopharynx





Pharynx is a connecting tube for the aero-digestive tract.

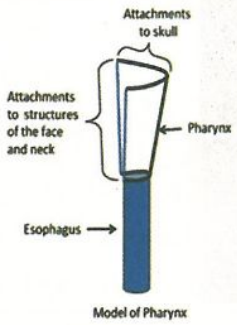
Communicates with the middle ear through Eustachian tube.

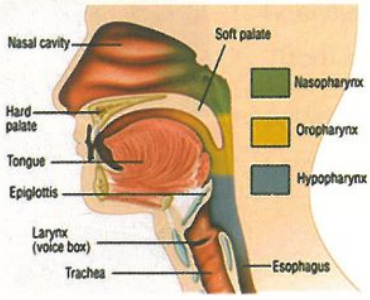
Parts	Extent	Vertebrae
Nasopharynx	Base of skull to hard palate	C 1
Oropharynx	Hard palate to hyoid bone	C 2, C 3 (upper part)
Laryngopharynx	Hyoid bone to lower border of cricoid	Lower part of C 3 to C 6

Active space

ANATOMY OF PHARYNX – II : PHARYNGEAL WALL

Pharynx 00:01:44

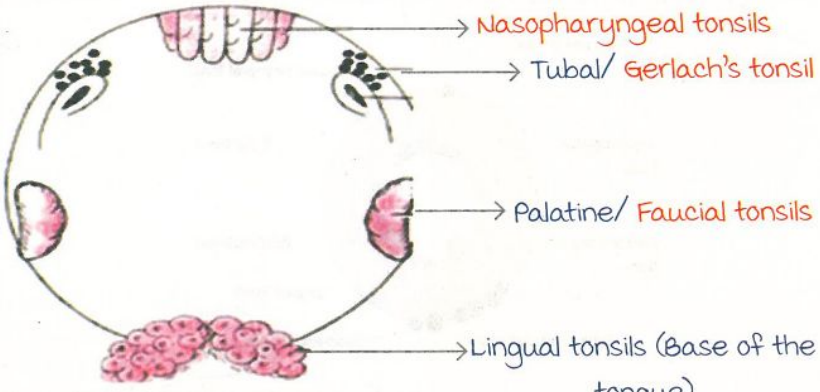


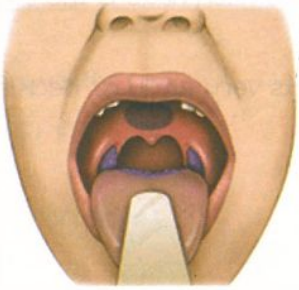


Extend of pharynx : Base of skull to lower border of cricoid.

Waldeyer's ring 00:06:00

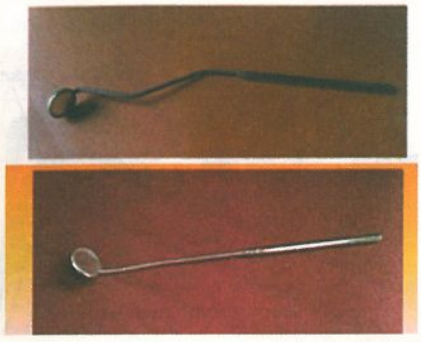
Collection of lymphoid tissue in form of a ring, below the lining epithelium of the pharyngeal wall.
Function : Provide local/ systemic immunity to children.
Gets atrophied in adults.



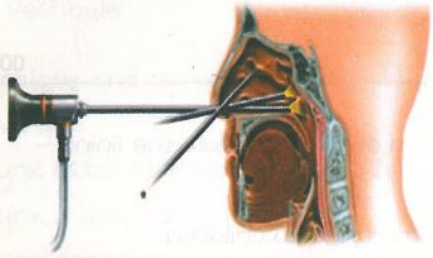


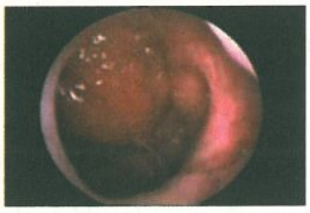
Active space

Examination of Adenoid tonsils was previously done using St. Clair Thompson post-nasal or posterior rhinoscopy mirror

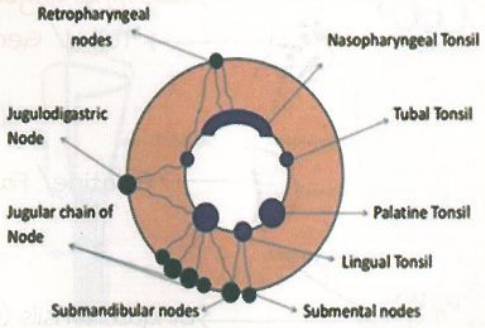


Structures of nasopharynx are visualized nowadays by Nasal endoscopy :





The external Waldeyer's ring is made up of the neck nodes. Diagram showing both external and internal Waldeyer's ring :



The most common cause of an infective neck node is the infection of lymphatic tissue in the pharynx.
Any carcinoma of the pharynx presents very early as neck nodes (rich lymphatic supply).

Active space

Walls of Pharynx and lining epithelium 00:18:59

Pharynx	Epithelium	Waldeyer's ring
Nasopharynx/ Epipharynx	Ciliated columnar	• Adenoids • Tubal tonsils
Oropharynx	Stratified squamous Non-Keratinised	• Palatine tonsils • Lingual tonsils
Laryngopharynx/ Hypopharynx	Stratified squamous Non-Keratinised	

Muscles of Pharynx 00:21:23

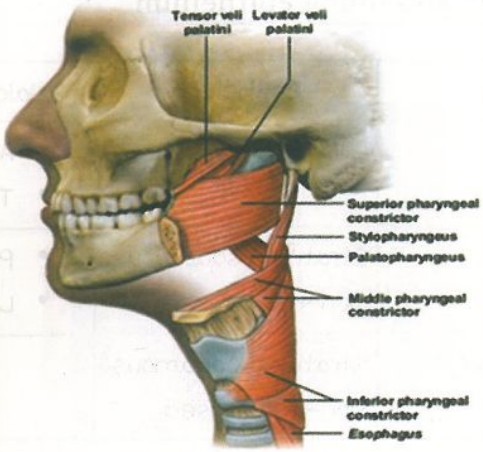
Superior and Inferior constrictors 00:29:29

Superior constrictor :

- Free upper border (not attached to the base of skull).

Foramen of morgagni :

Active space



- Gap between the base of skull and superior constrictor.
- Filled with pharyngobasilar fascia.
- Structures passing : Mnemonic- TALAA

  Tensor Palatini

  Auditory tube

  Levator Palatini

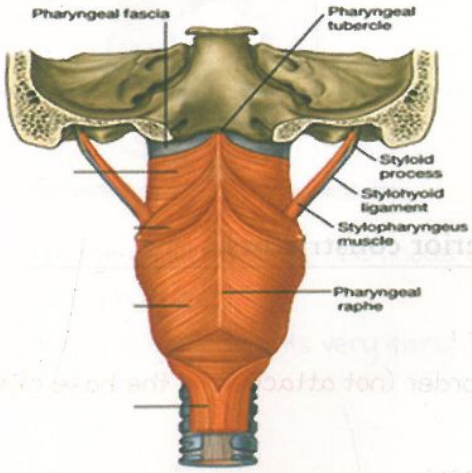
  Ascending Palatine artery

  Palatine branch of Ascending Pharyngeal artery

Inferior constrictor : Thyropharyngeus [Oblique fibers]

Cricopharyngeus [Horizontal fibers]

- The potential area of weakness between the 2 muscles : Killian's dehiscence/Gateway of tears (Posterior gap).

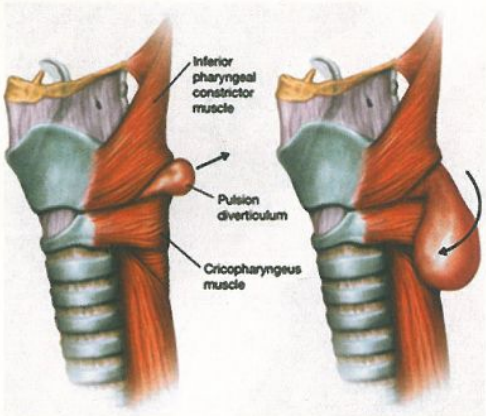


It can lead to development of Zenker's diverticulum.

Active space

Zenker's diverticulum

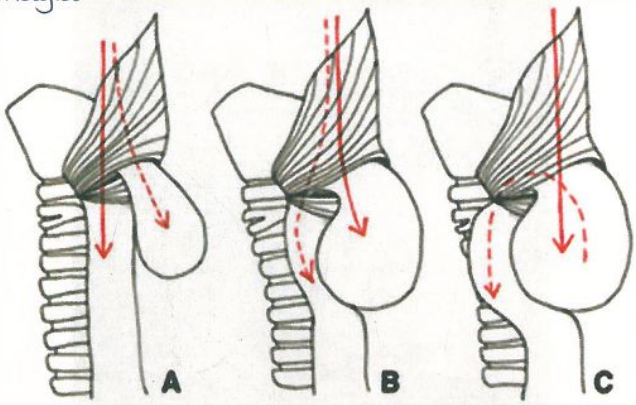
00:39:52



Occurs due to neuromuscular incoordination

Clinical presentation :

- Dysphagia



- Halitosis
- Regurgitation of undigested food
- Laryngitis
- Lung complications
- Cough

Neck swelling :

- Most common on left side
- On palpation: Gurgling sound heard (Boyce sign)

Seen in the elderly.

Characterised by a posterolateral pouch.

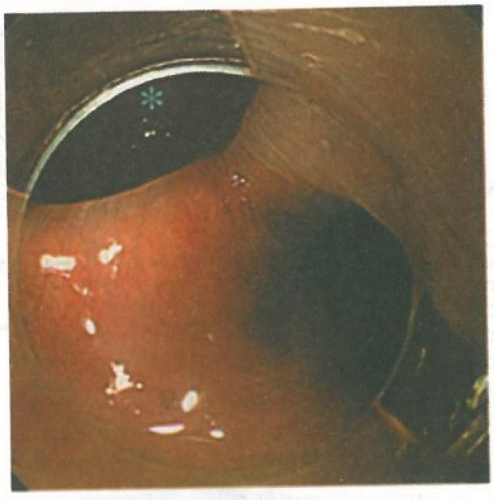
A pulsion diverticulum.

A false diverticulum (muscle layer not involved).

Active space

Investigation : Barium swallow – lateral view (best)

Endoscopy



Treatment of Zenker's diverticulum

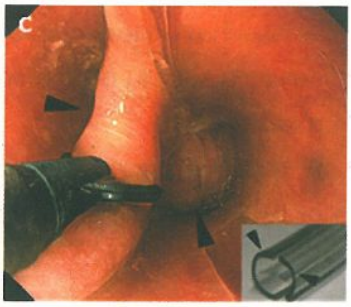
00:54:09

Cricopharyngeal myotomy (cutting of the common wall) :
Dohlman's procedure

- Laser technique
  (Pouches < 2cm)
- Endoscopic stapling
  (Pouches > 2cm)
  (Recommended)
  Cuts the wall and staples the edges simultaneously.

Active space

Dohlman's procedure



Endoscopic stapling

- Open neck surgery : If the pouch is very large (> 4 cm)

Excision

The constrictors and the nerve supply 01:01:49

Part	Constrictors
• Nasopharynx	Superior constrictor
• Hypopharynx	Inferior constrictor
• Oropharynx	Most of the lateral wall by Superior constrictor

The pharynx is supplied by the 9th and 10th nerve.

Nerves passing :

- Between superior and middle constrictor : 9th nerve.
- Between middle and inferior constrictor : Internal laryngeal nerve, branch of superior laryngeal nerve.
- Between inferior constrictor and esophagus : Recurrent laryngeal nerve

Active space

Glossopharyngeal nerve :

- sensory supply of the oropharynx, tonsils , base of tongue and middle ear.
- Enters the pharynx at the lower border of superior constrictor or at the lower pole of tonsil.

Active space

ANATOMY OF PHARYNX III - SPACES AND ITS ABSCESS

Spaces of pharynx

00:01:25

On transverse cut section at the level of tonsil,

Behind the pharyngeal muscles – three fascia :

B – Buccopharyngeal fascia

A – Alar fascia

P – Prevertebral fascia

Retropharyngeal space

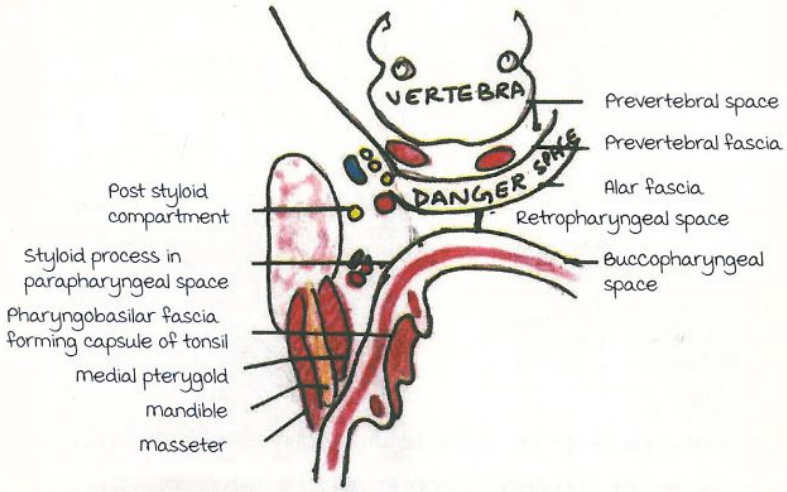
Space between buccopharyngeal fascia and alar fascia.

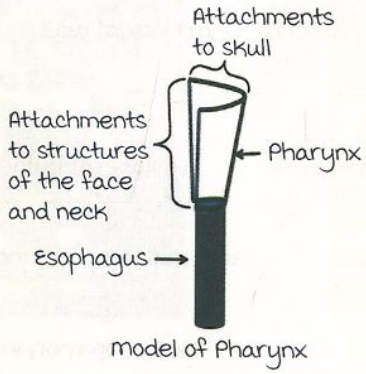
Dangerous space

Space between alar fascia and prevertebral fascia.

Prevertebral space

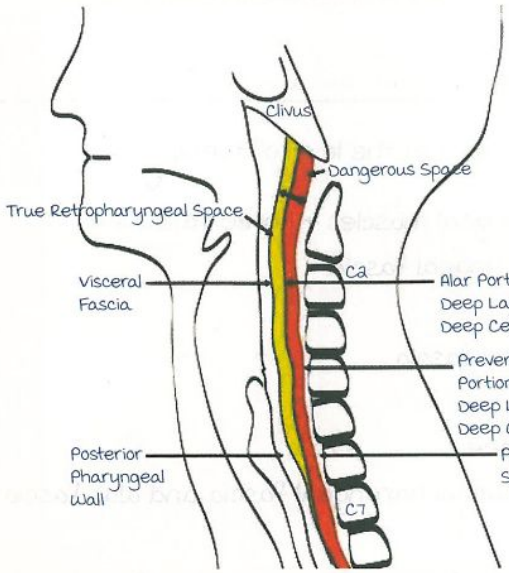
Space between prevertebral fascia and vertebra.





Model of Pharynx

Active space



Space of pharynx – boundaries and contents

00:07:10

The retropharyngeal space is divided in midline by fibrous raphe.
It contains nodes of Rouviere [lymph nodes] – drains naso, oropharynx.

Bulge in posterior pharyngeal wall

- midline bulge → Seen in prevertebral abscess → Cause – TB spine
- unilateral bulge → seen in retropharyngeal abscess → most common in children. In adults nodes of Rouviere disappear.

Active space

On x ray :

Normal prevertebral shadow – At C 1 : 7 mm.

At C 6 : 14 mm in children.

21 mm in adults.

In retropharyngeal and prevertebral abscess :

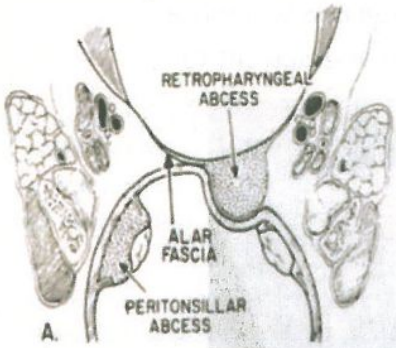
Increase in prevertebral shadow is seen.

Straightening of spine is seen.

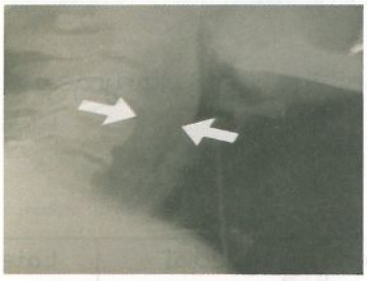
To differentiate retropharyngeal and prevertebral abscess :

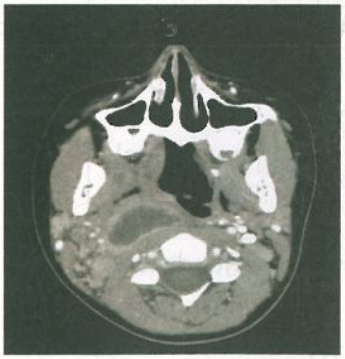
CT Clinical examination.

Normal X – ray :

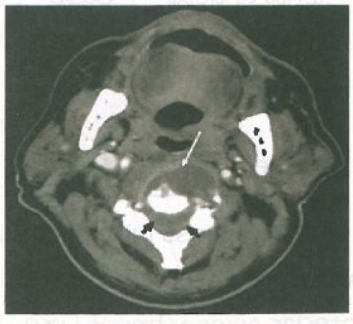


Increased prevertebral shadow and Straightening of spine





Retropharyngeal abscess



Prevertebral abscess

Active space

Retropharyngeal abscess 00:20:00

Bulge – unilateral paramedian bulge of posterior pharyngeal wall.

Acute abscess – causes :

In children – lymphadenitis of lymph nodes of Rouviere.

In adults – injury due to fish bone.

Chronic abscess – cause : tuberculosis [TB].

Diagnosis : clinical, CT

X ray doesn't differentiate prevertebral and retropharyngeal abscess.

Management :

Acute – incision & drainage and IV antibiotics.

Chronic – anti tubercular therapy [ATT]

Spaces of pharynx – Parapharyngeal space 00:25:00

Parapharyngeal space :

Between the mandible laterally and the lateral pharyngeal wall medially.

It is a pyramidal space.

Space	Upper	Lower	Medial	Lateral
Parapharyngeal/ Pharyngo maxillary / Lateral pharyngeal space	Base of skull	Hyoid	1. Lateral wall of pharynx 2. Bucco pharyngeal fascia	Mandible

The styloid process with its muscle attachments divides parapharyngeal space into :

Anterior compartment [pre – styloid]

Posterior compartment [post – styloid]

Active space

Structures passing through posterior compartment :

Internal carotid artery [ICA].

Internal jugular vein [IJV].

9th, 10th, 11th, 12th cranial nerves.

Cervical sympathetic chain.

Structures passing through anterior compartment :

Fat [majority].

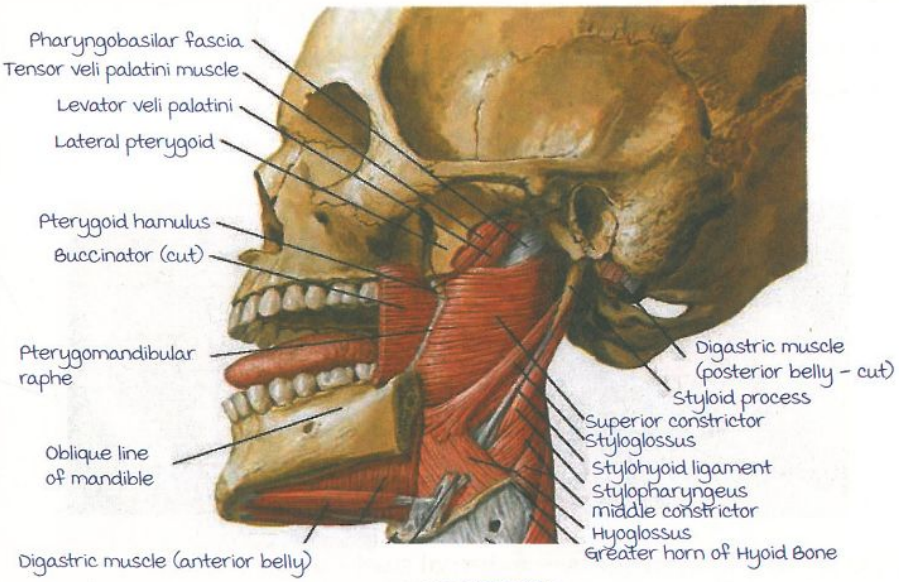
Mandibular nerve and its branches.

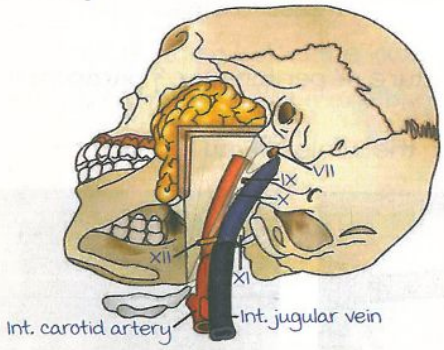
Maxillary artery branches.

Cancer of naso /oropharynx – if invades parapharyngeal space

↓

Causes Horner syndrome.





Spaces of pharynx – Peritonsillar space 00:42:40

Peritonsillar space :

Between the capsule of tonsil and superior constrictor muscle.

It is present lateral to tonsil.

Active space

Boundaries : laterally – superior constrictor muscle.
medially – capsule of tonsil and pharyngobasilar fascia.

Contents : Fat.
Paratonsillar vein.

Abscess of peritonsillar space – pushes tonsil medially.

On examination :

If tonsil is pushed medially – Peritonsillar abscess or Parapharyngeal abscess.

If lateral pharyngeal wall is pushed medially in – parapharyngeal abscess.

Clinical Features of peritonsillar and parapharyngeal abscess :

- Dysphagia
- Odynophagia
- Pain in ear
- Hot potato voice
- Trismus

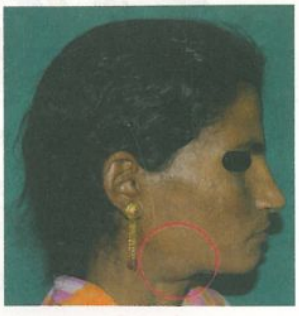
Tonsil is pushed medially,

In parapharyngeal abscess – external swelling over the angle of jaw

↓

differentiating feature of peritonsillar & parapharyngeal abscess.

External swelling over the angle of jaw



Active space

Peritonsillar abscess

00:57:20

Route – infection from pharynx through Crypta magna

↓

Reaches tonsil.

Age [most common] – In adults [due to atrophied Crypta magna]

Infection reaches tonsil easily.

Bacteria /anaerobes – β hemolytic streptococci.

management – IV antibiotic [against streptococci & anaerobes]

Aspiration of pus – done 1st

↓ If not resolved

Incision and drainage [I & D].

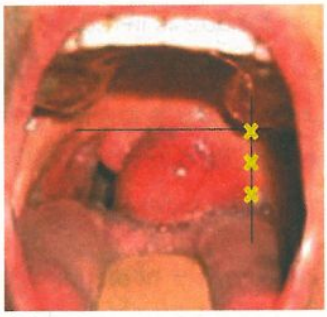
Tonsillectomy – done after 1 episode in children

After 2 episodes in adults

[after 6 weeks of last episode]

Aspiration of pus

Incision site of I & D in Peritonsillar abscess



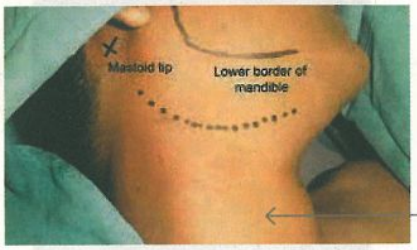
management of parapharyngeal abscess :

Incision given externally – 2 cm below the lower border of mandible.

If the incision is given right below the mandible

↓

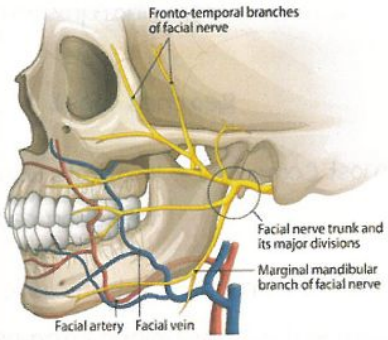
injury to marginal mandibular branch of facial nerve.



Incision site of I & D in parapharyngeal abscess

Active space

Injury to marginal mandibular branch of facial nerve



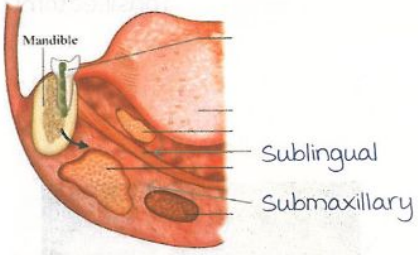
Submandibular space

01:04:11

It is present below the skin of floor of the mouth.

The mylohyoid divides it into two compartments – sublingual.
Submaxillary.

Infection of submandibular space :



It is known as Ludwig's angina.

MCC – dental carries

It is cellulitis [not an abscess]

If only sublingual space is involved :

tongue is lifted up

Difficulty in swallowing/talking

If submaxillary is involved : tense, brawny edema of skin below chin.

It spreads through tissues.

It is always bilateral.

Management – IV antibiotics

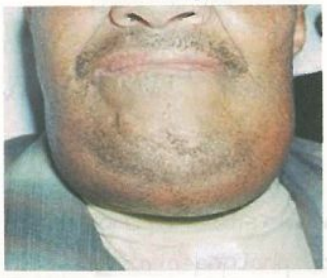
Incision & Drainage – to relieve the tissue pressure

↓

Bilateral incision given

[from one angle of mandible to other].

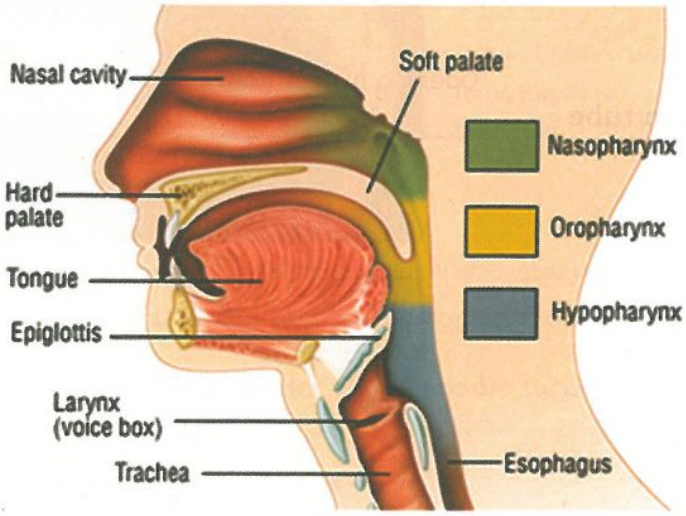
Tense, brawny edema



Swelling of the tongue

Active space

ANATOMY OF PHARYNX PART IV - CAVITY



Nasopharynx

00:01:03

Boundaries :

Superiorly - Base of skull.

Inferiorly - Hard palate.

At the junction of roof and posterior wall

↓

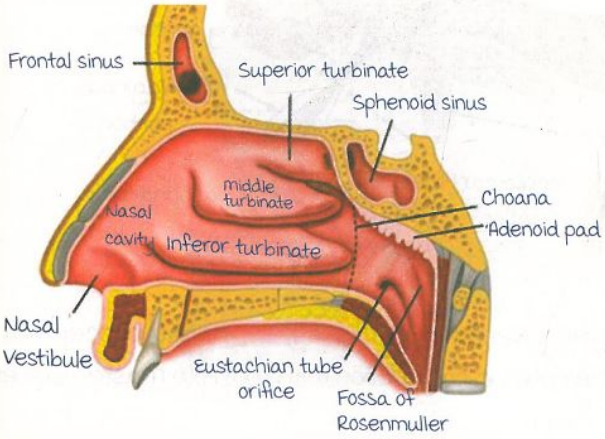
Collection of lymphoid tissue in nasopharynx

↓

Adenoids

Lined by ciliated columnar epithelium.

Seen by nasal endoscopy.



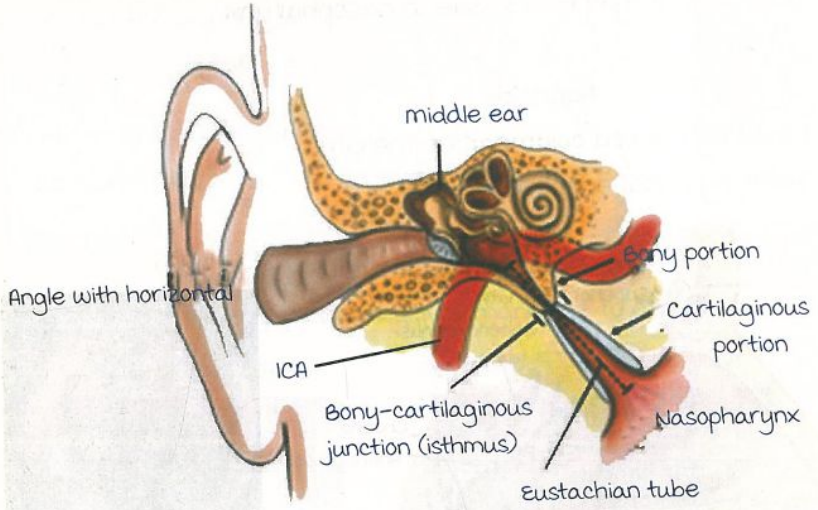
Adenoid

Active space

- Lateral wall of nasopharynx
  1.25 cm behind the posterior border of inferior turbinate
  ↓
  Opening of Eustachian tube

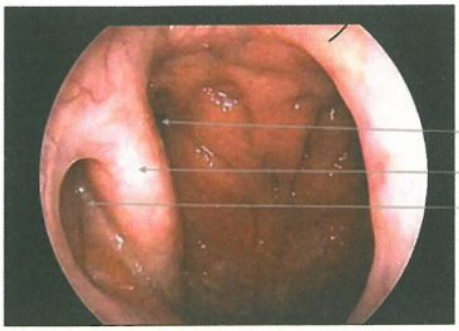
Eustachian tube

00:03:42



Warning: Not all points are covered in the notes, especially conceptual explanations. Please use the notes in conjunction with Marrow masterclasses.

Active space



Nasopharyngeal carcinoma blocks unilateral Eustachian tube.

Adenoid hypertrophy blocks bilateral Eustachian tubes.

1 cm behind the posterior border of the middle turbinate

↓

Sphenopalatine foramen

1. Maxillary artery and nerve.
2. Sphenopalatine ganglion.
3. Site of origin of Angiofibroma.

Sphenopalatine fossa 00:17:54

Boundaries :

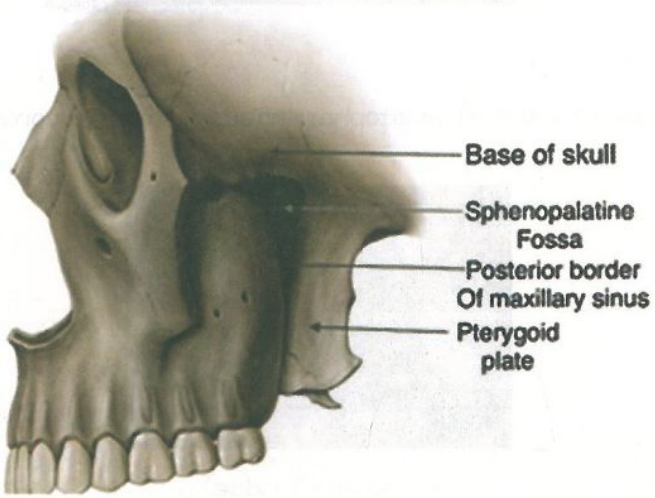
Anteriorly : Posterior border of maxillary sinus.

Posteriorly : Pterygoid plate.

Medially : Lateral wall of nose.

Laterally : Pterygomaxillary fissure.

Superiorly : Base of skull.



Active space

Oropharynx

00:22:56

Boundaries :

Superiorly : Hard palate.

Inferiorly : Hyoid.

Components :

Superiorly : Soft palate.

Inferiorly : Base of the tongue (posterior 1/3rd of tongue).

Vallecula.

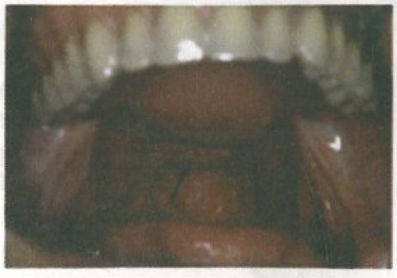
Laterally : Palatine tonsils.

Bounded by,

1. Anterior pillar : Extends from palate to the tongue.
   Muscle :
   Palatoglossus - only muscle of tongue not supplied by Hypoglossal nerve.
   Supplied by vagus nerve.
2. Posterior pillar : Extend from palate to pharynx.
   Muscle : Palatopharyngeus.

Passavant's ridge :

Circular muscle of palatopharyngeus + superior constrictor.



(Passavant's ridge)

Active space

Three longitudinal muscles of pharynx

1. Stylopharyngeus muscle
2. Palatopharyngeus muscle
3. Salpingopharyngeus muscle

During swallowing, the soft palate moves posteriorly and the passavant's ridge is formed, which moves anteriorly.

↓

The soft palate fuses with the passavant's ridge to close the nasopharyngeal opening.

↓

Preventing the entry of food into nasopharynx.

↓ Unable to close

Velopharyngeal insufficiency

1. Food regurgitated nasally.
2. Hypernasal voice.

Rhinolalia aperta and Rhinolalia clausa 00:29:51

Hypernasality (Rhinolalia aperta)	Hyponasality (Rhinolalia clausa)
Causes : Velopharyngeal insufficiency 1. Cleft palate 2. Palatal palsy 3. Submucosal cleft	Causes : Nasopharyngeal obstruction 1. Adenoid hypertrophy 2. Nasopharyngeal carcinoma 3. Nasal polyps

Hypopharynx 00.37.04

Also known as laryngopharynx.

Boundaries :

Superiorly : Hyoid.

Inferiorly : Lower border of cricoid.

Components :

1. Post cricoid.
2. Pyriform fossa : Site of lodgement of foreign body.
   Internal laryngeal nerve is superficial here.
   Therefore, biopsy can be taken under local anaesthesia.
3. Posterior pharyngeal wall.

Active space

(Endoscopic image of hypopharynx)

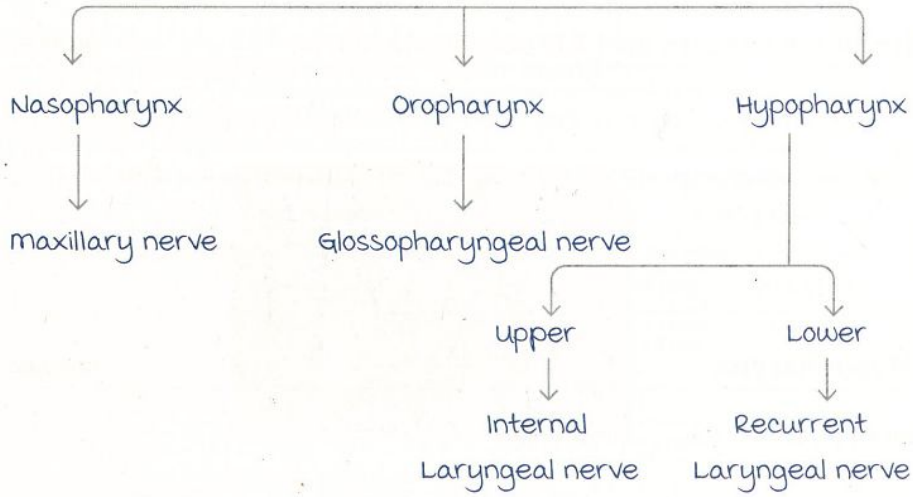
Nerve supply of pharynx

00:51:45

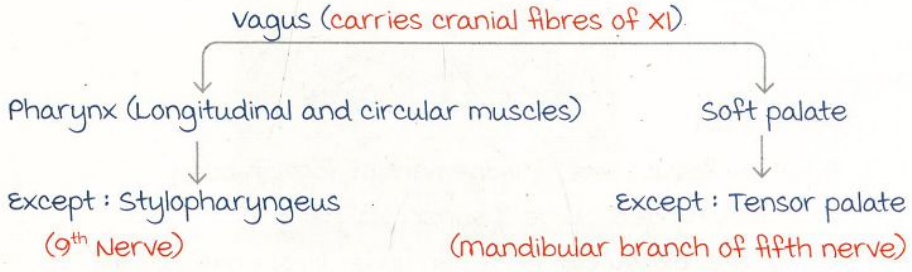
Pharyngeal plexus :

Pharyngeal branch of Vagus + 9th nerve + superior cervical ganglion.

Sensory :

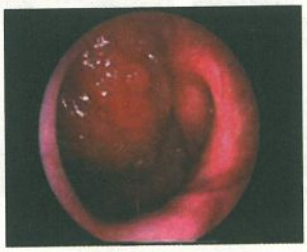


Muscles : Supplied by pharyngeal plexus.



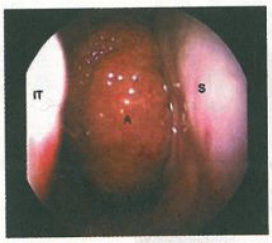
Active space

ADENOID HYPERTROPHY



- Lymphoid tissue present in the nasopharynx.
- Give embryological memory to the child.
- Gives local as well as systemic immunity to the child.

Adenoid hypertrophy 00:01:15



- Gets hypertrophied in response to allergens.
- It can obstruct the whole nasopharynx.

Presentation :

Nasal obstruction :

- Recurrent sinusitis.
- Sleep apnea (>30 apnea/7 hour of sleep or >5/hour).

Eustachian tube obstruction :

- Serous Otitis media.
- Recurrent Acute Otitis media.

Rhinolalia clausa.

Adenoid facies :

- Mouth breathing.
- Pinched nose.
- Open mouth.
- Dull Look.

Active space


Investigation :

- Endoscopic grading :
  - Grade I → 1/3 rd Obstruction
  - Grade II → 1/3 – 2/3rd Obstruction
  - Grade III → 2/3 complete Obstruction
  - Grade IV → complete Obstruction
- X-ray nasopharynx (lateral view) :

Treatment :

- If infection :give antibiotics (surgery is last preferred because adenoids have got immunological function).
- Surgery is only done when symptoms become chronic (medical management does not work for 3 months).
- If hypertrophy due to allergy: Nasal steroid spray and antiallergics to regress the size of adenoid.

Surgery

00:10:30

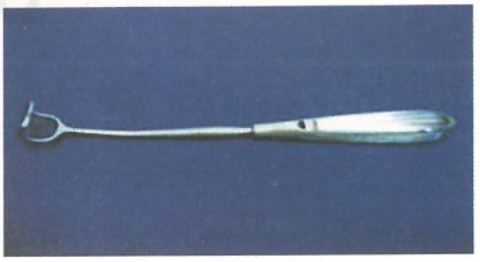
The larynx should be high (cervical joint extended).

- Rose Position : extension at the cervical joint and atlanto-occipital joint.

Active space

- The surgeon sits on the head end of the patient.

- Boyles's and Davis mouth gag is used.
  Connected using Draffin's Bipod stand.



- Adenoidectomy using microdebrider.
- Coblation band also used : to cut and coagulate (reduces bleeding).

Hot methods	Cold methods
• Heat produced • Laser, Coblation	• Heat not produced • Curettage, Microdebrider.

Contraindications and Complications 00:18:20

Contraindication : Velopharyngeal insufficiency (cleft palate).

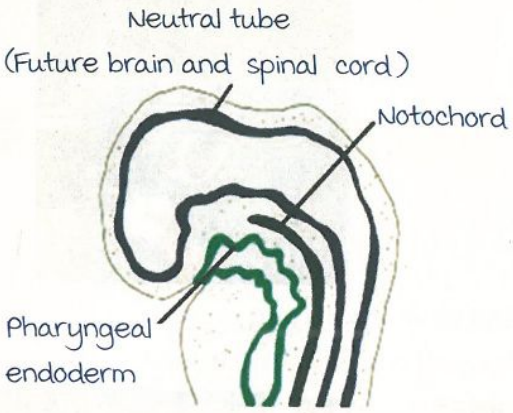
Complication :

- Hemorrhage (cold method).
- Coroner's clot.
- Grisel Syndrome (Atlanto-axial subluxation due to inflammation).

Active space

Thornwaldt's/Pharyngeal Bursa

00:23:02



ANGIOFIBROMA

Most Common benign tumour of nasopharynx.
Locally invasive.
Arises from sphenopalatine foramen.
In males – starts during puberty.

Etiology and spread 00:03:40

Incomplete regression of the first arch artery.
Hormonal causes.
Pubertal males.

Clinical features depend on the spread of the tumour.

Spread	Radkowski's staging
1. Medial spread	
• Nasopharynx and nose	I a
• Sinuses	I b
Patient complaints of recurrent epistaxis.	
2. Lateral spread	
• Sphenopalatine fossa	II a
• Completely fills the fossa	II b
• Posterior wall of maxillary sinus pushed anteriorly.	
• Proptosis.	
• Pterygoid plate pushed posteriorly.	
• Infratemporal fossa (swelling of cheek)	II c
3. Superior spread (Intracranially)	
• Limited	III a
• Extensive	III b

Frog facies :
Cheek swelling
Proptosis
Broadening of nose

Active space

Investigation

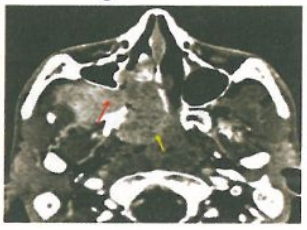
00:15:49

Investigation of choice : CECT

Main arterial supply is by maxillary artery.

Normal CECT

Antral sign/ Holman miller sign



Management

00:19:17

Surgical excision

Biopsy is contraindicated.

Angiography to be done to confirm the arterial supply

↓

Embolization followed by excision.

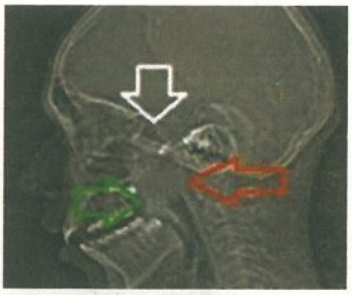
- Transpalatal approach (earlier days).
- Lateral rhinotomy + medial maxillectomy.
- Weber ferguson.
- Mid-facial degloving – Sublabial incision given and skin raised to reach the maxilla.
- Endoscopic approach – best method

Only indication of radiotherapy : stage III c – extensive intracranial spread.

On x-rays :

Crescent sign/ Dott sign

Crescent of air in between mass and pharyngeal wall.



Absence of crescent of air

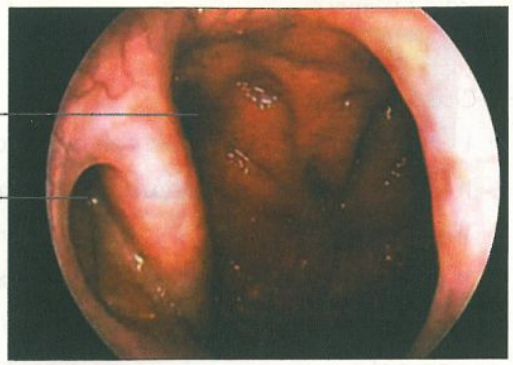
↓

Angiofibroma

Active space

NASOPHARYNGEAL CARCINOMA

Arises from Fossa of Rosenmuller.



Common in South-east Asia.

Etiology :

- Genetic: Most common in South China.
  Also known as Guangdong carcinoma.
- Nitrosamines used in food preservatives.
- Viral : Ebsteinbarr virus
  Antigen used for screening : Capsid antigen – IgA / VCA (Viralcapsid antigen)/EA
  Viral antigen – more sensitive, Early antigen – more specific.
  Age : Bimodal age occurence (15-25 years) and (55-65 years)

Symptoms :

- 1st symptom : Upper deep cervical lymph node swelling (70%)
- If the tumor grows :

Laterally
↓
Parapharyngeal space
↓
9, 10, 11, 12 cranial nerves
(Sympathetic chain involved)
↓
Horner's syndrome

Superiorly
↓
- Intracranial cavity
- Sinus of morgagni

↓
Sinus of morgagni syndrome / Trotter's triad :
- Neuralgia
- Palatal palsy
- Conductive hearing loss

Active space

Nasopharyngeal carcinoma – Management 00:11:41

Diagnosis : Biopsy

WHO Classification :

- I : Keratinising squamous cell carcinoma.
- II : Non-Keratinising squamous cell carcinoma.
  II a : Differentiated
  II b : Undifferentiated – Most common in endemic regions.

Management :

- Radiosensitive tumours
- Early stages : Radiotherapy
- Late stages : Concurrent chemoradiation (Radiotherapy and chemotherapy given in cycles)

Warning: Not all points are covered in the notes, especially conceptual explanations. Please use the notes in conjunction with Marrow masterclasses.

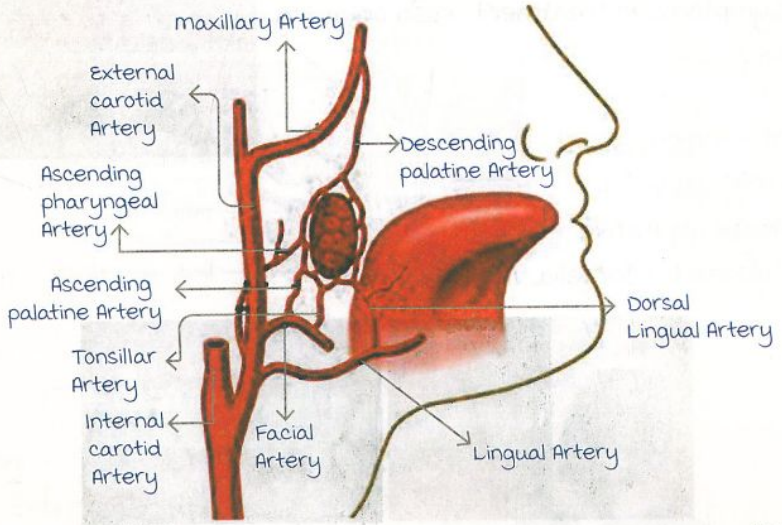
Active space

INFECTIONS OF TONSILS & TONSILLECTOMY

Tonsils

00:00:33

- Develops from 2nd pouch.
- Epithelium : stratified squamous epithelium.
- Capsule formed by the pharyngobasilar fascia.
- Nerve supply : 9th cranial nerve.
- Lymphatic drainage : Upper deep cervical lymph node (Tonsillar node).
- Arterial supply : mainly from the lower pole of the tonsil.
  1. Lingual artery.
  2. Facial artery : Tonsillar artery (main) and ascending palatine.
  3. Ascending pharyngeal.
  4. Descending palatine (branch of maxillary).



Acute Tonsillitis

00:06:08

- Most common organism : β hemolytic streptococci.
- Presentation : Sore throat, fever, difficulty in swallowing, pain in the ear (9th nerve), membrane over tonsil.

Active space

Differential diagnosis for membrane over tonsil 00:07:40

Diphtheria :


- The base starts bleeding if the membrane is removed.
- Toxic and dull appearance.
- Bull neck : edema of the neck.
- Swab test for diagnosis.
- Immediately give Antitoxin.

Infectious mononucleosis :

- Massive lymphadenopathy with fever
- and lethargy.
- Caused by the Epstein Barr virus.
- Symptomatic treatment (rash on giving Ampicillin).

Vincent's Angina :

- Dirty gingivitis.
- Acute ulcerative.
- Caused by Borrelia vincentii.


Differential diagnosis for ulcers /slough over Tonsils :

- Candidiasis., Malignancy, Aphthous Ulcer.

"ALL VITAMIN D"

A – Agranulocytosis
L – Leukemia
V Vincent's angina
I – Infectious mononucleosis

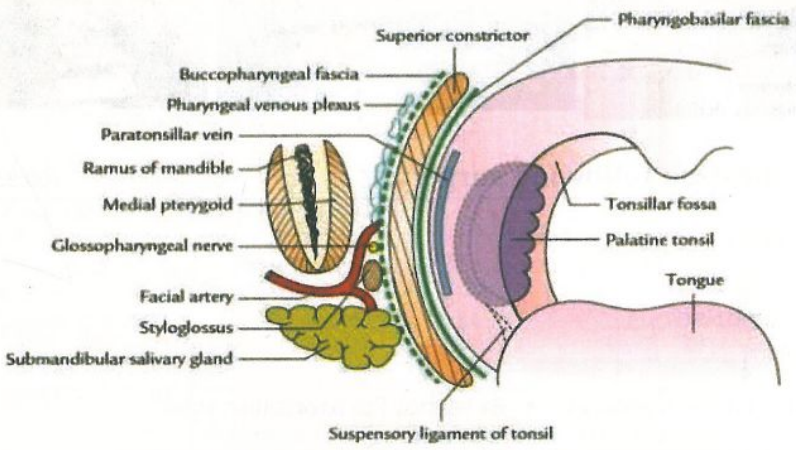
T – Trauma
A – Apthous ulcer
M – Moniliasis (Candidiasis)
IN – Infections of throat
N – Neoplasia
D – Diphtheria

Active space

Tonsillectomy

00:18:25

Indications for Tonsillectomy :



4. Approach to styloid process and 9th cranial nerve.

Position :

- Extension at the cervical and atlanto-occipital joint.
- Rose's Position.

Process :

- The mouth is kept open and the tongue is retracted.

Techniques :

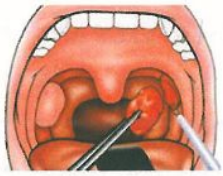
- Cold methods – Cold knife, Harmonic scalpel Microdebrider, Cryosurgery.

Active space

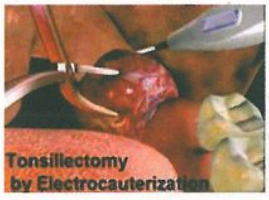
- Hot methods – Cautery
  Coblation
  Laser

Cold and Hot method 00:28:29

Cold method :

1. Dissection and snare	2. microdebrider	Harmonic scalpel (ultrasonic vibrations used)
To crush the pedicle and cut.	Remove tonsillar tissue	Cutting and Coagulation at same time
		 

Hot method :




Complication following surgery 00:33:17

Hemorrhage
↓
mc cause
↓
mc route : venous → "External Paratonsillar Vein"

- Primary → During surgery
- Reactionary → After surgery within 24hrs
- Secondary → >24hrs – 10 days → 2° to injection → mc : 5 – 6 days

- Removal of clots, then vasoconstriction pack, then Ligation/ cautery.

TUMOURS OF PHARYNX

Submucous fibrosis and sites of tumours in oral cavity and pharynx

00:00:26

Submucous fibrosis : Premalignant condition

- Submucous fibrosis is caused by betel nut chewing.
- Arecoline causes blistering and fibrosis of oral cavity and oropharynx.
- Patient presents with trismus and blanched appearance of oral cavity.
- Management :
  Local injection of steroids.
  Avoid betel nut chewing.

most common carcinoma in ENT : Squamous cell carcinoma – Except :

- most common carcinoma of external nose and upper lip : Basal cell carcinoma (BCC).

most common site of carcinoma :

Lip	Oral cavity	Oropharynx	Hypopharynx
Lower lip : 98% Upper lip : 2% (BCC)	Lateral border of tongue. Exception : In India : Vestibule (Buccoalveolar sulcus)	Tonsil Human papilloma virus is a very common cause	Pyriform fossa Exception : Plummer Vinson syndrome : Post cricoid.

Plummer Vinson syndrome :

- Iron deficiency anaemia.
- Mucosal atrophy in post cricoid area : Postcricoid webs.
- Hypopharyngeal dysphagia.

Active space

Staging of carcinoma of oral cavity and management 00:09:00

	Tumour length	Tumour depth
T1	≤ 2 cm	< 5 mm
T2	> 2 – 4 cm	> 5 – 10 mm
T3	> 4 cm	> 10 mm
T4a T4b	Locally advanced. Distant metastases.	

Neck node staging :

N0	No neck nodes
N1	< 3 cm
N2a N2b N2c	> 3 – 6 cm; Single and ipsilateral. < 6 cm; multiple. < 6 cm; Contralateral
N3a N3b	> 6cm Extra-nodal invasion

Management :

Oral cavity (most common : Tongue) :

- T1 or T2 : Excision + repair.
- T3 : Excisional surgery + Radio therapy +/- chemotherapy.
- T4 : Concurrent chemoradiation.

Oropharyngeal carcinomas : Concurrent chemoradiation.

ANATOMY OF LARYNX - I

Functions of the Larynx

00:01:08

1. It is a connecting tube for respiration.
2. It is used for speech [voice box].
3. On swallowing, food is prevented from going into the lungs (epiglottis closes the inlet of the larynx).
4. Protects the lower airways from foreign body entry by cough reflex.

Anatomy of the Larynx

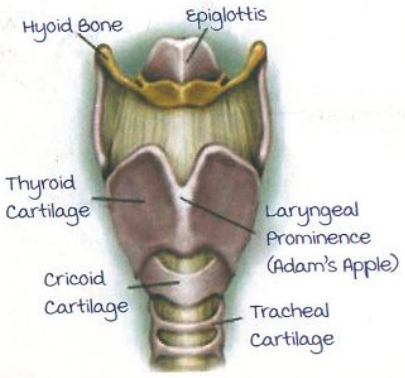
00:06:19

Consists of :

3 unpaired & 3 paired cartilages.

3 unpaired cartilages are : Thyroid
Cricoid
Epiglottis

- Thyroid cartilage : Largest cartilage of the larynx.



Thyroid cartilage

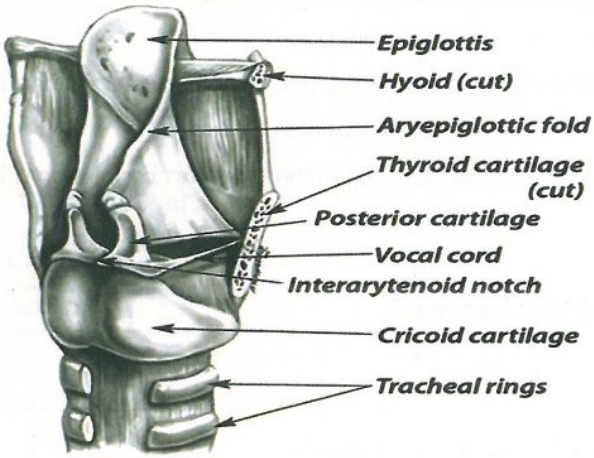
The two alae meet at an angle : In males - 90 degrees (Adam's apple).
In females - 120 degrees.

Thyroid cartilage has two projections above & below, known as superior & inferior cornu.

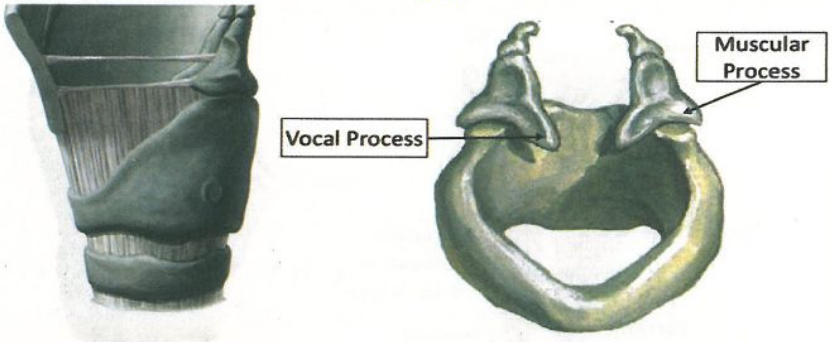
The inferior cornu articulates with the facet on the cricoid cartilage & it forms a hinge type of synovial joint.

Active space

- Epiglottis : Attached to the midpoint of the thyroid cartilage.
  Leaf-shaped & it is elastic.
  Rest all other cartilages of the larynx are hyaline.



- Cricoid cartilage : a/k/a signet ring cartilage.
  Only complete ring cartilage of the larynx.
  Injury leads to fibrosis.
  MC site of laryngeal stenosis.



Parts of cricoid cartilage :

- Anterior part is known as the cricoid arch.
- The posterior part is known as the lamina.
- Lamina has a facet on either side & it articulates with the Inferior cornu of the thyroid cartilage.

3 paired cartilages are : Arytenoids
Corniculate
Cuneiform

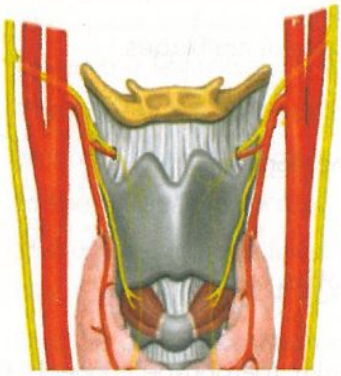
Active space

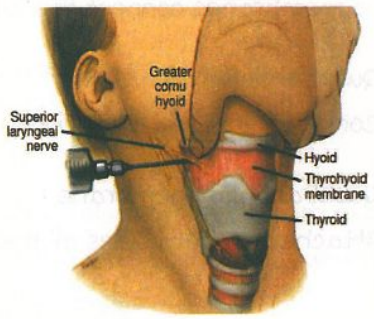
Extrinsic membranes

00:15:40

They connect the laryngeal framework to the outside.

- Thyrohyoid membrane : Connects hyoid bone to the thyroid cartilage.
  The internal branch of the superior laryngeal nerve pierces & enters the larynx.

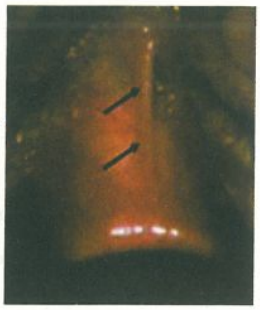




Anatomical landmark : Greater cornu of the hyoid.

Active space

It is used to anesthetize the internal branch of the superior laryngeal nerve to take biopsies & to operate in the supraglottic area.



- Cricotracheal membrane :
  Connects trachea to the cricoid cartilage.
- Hyoepiglottic ligament :
  Connects hyoid bone to the epiglottis.

Cricothyroid membrane : Intrinsic membrane, but lies outside.
Used for cricothyrotomy - emergency procedure for CICO (Can't Intubate, Can't Oxygenate).

CICO (Can't Intubate, Can't Oxygenate)

Intrinsic membranes

00:27:51

Intrinsic membranes connect the two laryngeal cartilages.

- Quadrangular membrane
- Conus elasticus (a/k/a Cricovocal membrane)

- Quadrangular membrane :
  Attached on both sides of the epiglottis.

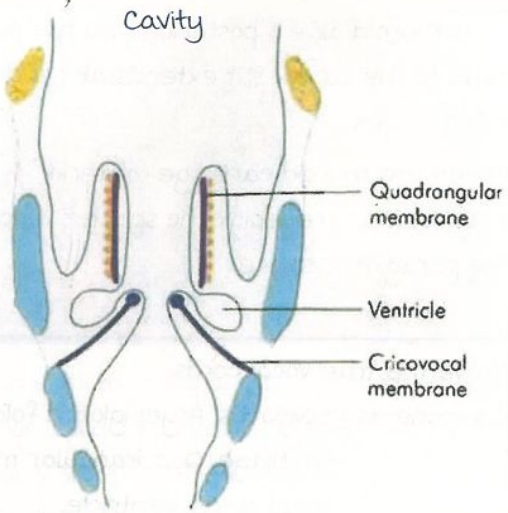
  The upper border of the quadrangular membrane connects the epiglottis to the arytenoids, therefore it is called the aryepiglottic fold.

  The lower border is known as false vocal cords.
  The inlet of the larynx is formed by the epiglottis, B/L quadrangular membranes, & the arytenoids. It is a/k/a epilarynx.

  The space between the quadrangular membranes in the laryngeal cavity is known as the vestibule.

Active space

The space between the two false vocal cords is known as rima vestibuli.



- Conus elasticus (Cricovocal membrane) :
  Arises from the upper border of the cricoid cartilage & attaches anteriorly to the thyroid cartilage & posteriorly to the vocal process of the arytenoid cartilage.
  The space between the false vocal cords & the true vocal cords is called the ventricle.
  The lateral extension of the ventricle is called the saccule. It contains the mucus glands. It is an oil sac that provides lubrication to the true vocal cords.
  The whole larynx is lined by ciliated columnar epithelium except the upper surface of epiglottis & the true vocal cords, which are lined by stratified squamous epithelium.

At the level of true vocal cords, it is known as glottis.

Above the true vocal cords, it is known as supraglottis.

Below the true vocal cords, it is known as subglottis.

The space between the true vocal cords is known as rima glottidis.

Active space

Paraglottic space : It is bounded medially by the quadrangular membrane, vestibule & ventricle, laterally by the thyroid alae & posteriorly by the pyriform fossa.

It is present lateral to the larynx & it extends above downwards in the whole length of the larynx.

The space between the thyroid cartilage (anterior) & the epiglottis (posterior) is known as the pre-epiglottic space & it communicates laterally with the paraglottic space.

Subsites

00:39:00

Supraglottis : Above the true vocal cords.

Components : Epiglottis, Aryepiglottic fold, Arytenoid cartilage, Quadrangular membrane. False vocal cords, Ventricle.

Glottis : At true vocal cords till 1 cm below it.

Subglottis : Below the true vocal cords (glottis).

Glottis

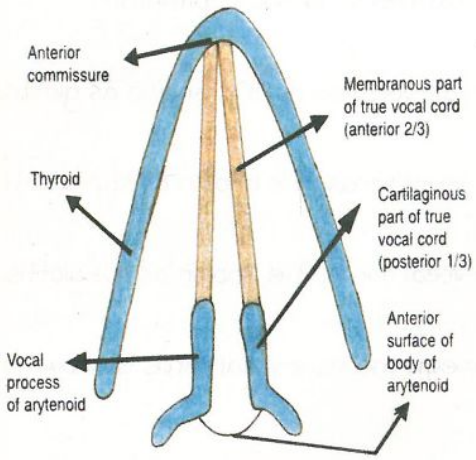
00:43:46

Components – Two true vocal cords.

When the two true vocal cords meet anteriorly & attach to the thyroid cartilage, it is called the anterior commissure.

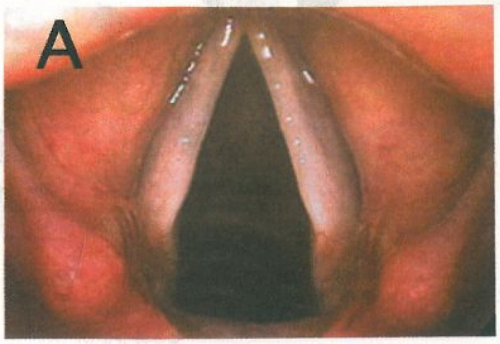
When the two true vocal cords attach posteriorly to the vocal process of the arytenoid, it is called the posterior commissure.

Glottis



Active space

Anterior 2/3rd part – membranous.
Posterior 1/3rd part – Cartilaginous.



Maximum vibration is at the midpoint of the membranous vocal cord (junction of anterior 1/3rd & posterior 2/3rd of the true vocal cords/ junction of anterior 1/3rd & middle 1/3rd.).
Therefore, it is the MC site of vocal nodule/vocal polyp.

Laryngocele

00:52:57

Enlargement of saccule is called laryngocele.

MC seen in carcinoma larynx (carcinoma obscuring the opening of the saccule), in individuals blowing against a closed glottis, for example, in trumpet players, weight – lifters.

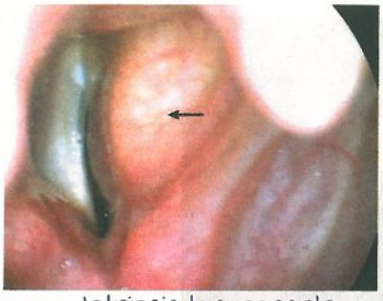
It can present as an

- Intrinsic laryngocele (does not pierce the thyrohyoid membrane to present externally).
- Extrinsic laryngocele (pierces the thyrohyoid membrane to present externally).
- Both.

On examination :
On the Valsalva maneuver, swelling enlarges.
On pressing the swelling, the sudden gush of air, due to the compression of laryngocele, into the larynx leads to a hissing sound, which is known as the Bryce sign.

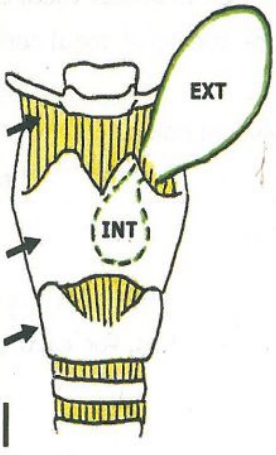
Management : Excision.

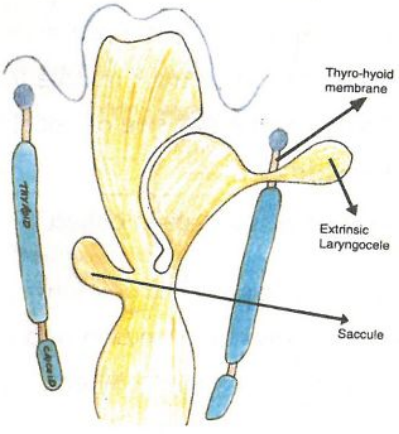
Active space



Intrinsic laryngocele

Extrinsic laryngocele.





Active space

ANATOMY OF LARYNX – II

Epithelium and lymphatics of larynx 00:00:20

Parts of larynx lined by stratified squamous epithelium :

1. True vocal cord.
2. Lingual surface of epiglottis.
   Upper part of epiglottis.
   Upper part of aryepiglottic fold.

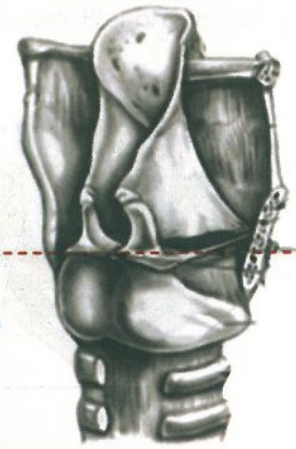
The rest of the larynx is lined by ciliated columnar epithelium.

The glottis acts as a watershed for lymphatics :

- Glottic cancer : Carcinoma of larynx with least lymphatic metastases and best prognosis.
- Supraglottic cancer : Maximum lymphatic metastases.

Supraglottis :
- Upper deep cervical lymph node
- Middle deep cervical lymph node

Subglottis : lower deep cervical lymph node



No lymphatics in the glottis.

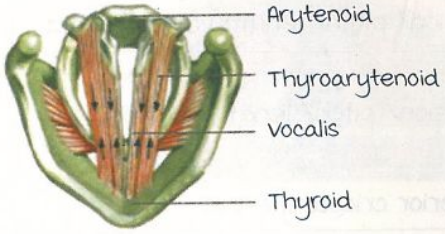
Intrinsic Muscles of larynx 00:03:31

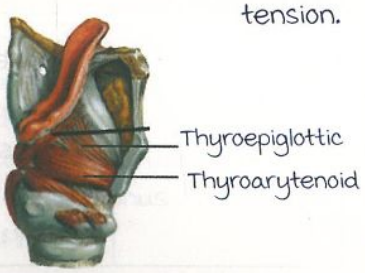
Thyroepiglottic muscle : Opener of inlet.

Thyroarytenoid muscle (lateral to true vocal cord) :

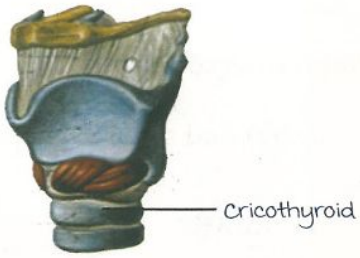
- Vocalis (Innermost part) : Tensor of vocal cord – Relaxes tension.
- Lateral part of Thyroarytenoid.

Cricothyroid muscle (lies outside) : Tensor of vocal cord – Increases tension.





Active space



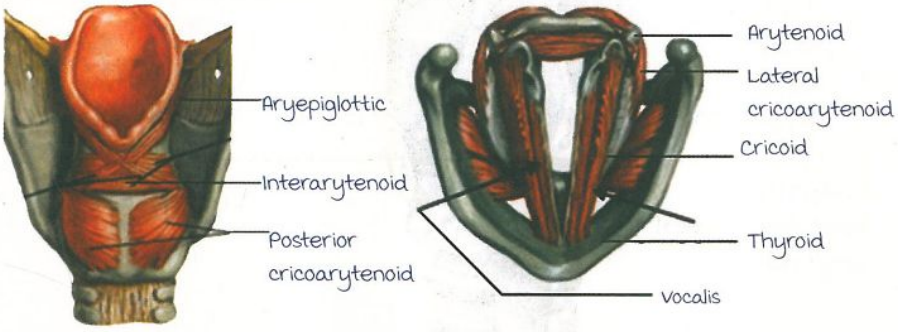
Cricoarytenoid muscle :

- Lateral cricoarytenoid
- Posterior cricoarytenoid : Only muscle of larynx which abducts the vocal cords.

Aryepiglottic muscle : Closes inlet

Interarytenoid muscle :

- The only unpaired muscle.
- It has dual nerve supply (Right and left recurrent laryngeal nerve)

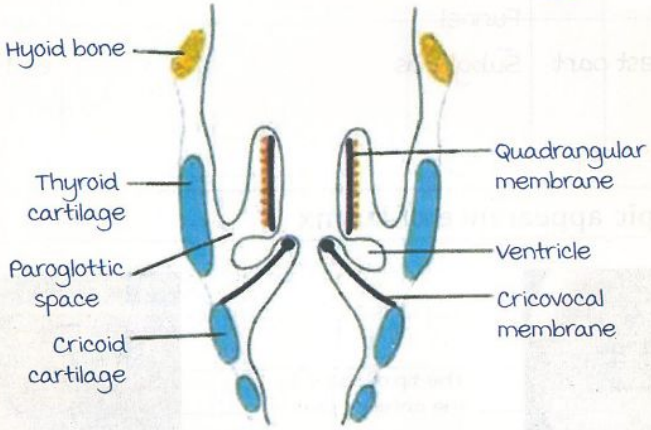


Inlet	True vocal cords
Open : Thyroepiglottic Close : Aryepiglottic	Adduct : All except Posterior cricoarytenoid Adduct + Tensor : • Vocalis • Cricothyroid Increase tension/ pitch/ length : Cricothyroid Decrease tension/ pitch/ length : Vocalis Abduct : Posterior cricoarytenoid

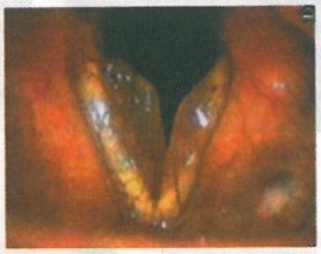
Active space

Spaces of Larynx

00:21:22



Reinke's space : Submucosal space of true vocal cord between epithelium and vocal ligament.



Reinke's Oedema

Epihelium of true vocal cord and underlying vocal ligment (upper border of conus elasticus)

Active space

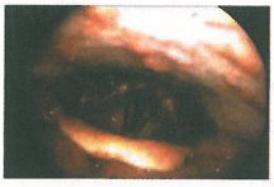
Differences in anatomy of larynx in adults and children 00:28:29

	Infant	Adult
Position	Upper end at C2 • Allows simultaneous passage of milk and air. • Epiglottis blocks the inlet • Milk passes from the sides into pyriform fossa and into oesophagus. • Air passes behind soft palate into trachea.	C3 – C6
Shape	Funnel	Cylindrical
Narrowest part	Subglottis	Glottis
Epiglottis shape	Omega	Leaf

Endoscopic appearance of larynx 00:34:07

The tip of the V is the anterior part

Laryngeal endoscopy :



Direct laryngoscopy :

Indirect laryngoscopy : Mirror image.

Active space

INFECTIONS OF LARYNX

Difference between supraglottic, glottic & subglottic 00:01:36

	Supraglottic	Glottic	Subglottic
Speech	Normal	Hoarseness/ dysphonia / aphonia	Normal
Stridor : Increase in supine Decrease in prone Preferred posture	Inspiratory + + Prone, tripod	Inspiratory/ biphasic – – –	Biphasic – –
Dysphagia/ Odynophagia/ drooling	+	–	–

Stertor : obstruction in nose, nasopharynx, oropharynx.

Stridor : obstruction in larynx up to secondary bronchi

- Inspiratory → Supraglottis, Glottis
- Biphasic → subglottis, cervical trachea, Sometimes in glottis
- Expiratory → intrathoracic [up to secondary bronchi]

Wheeze : obstruction beyond secondary bronchi.

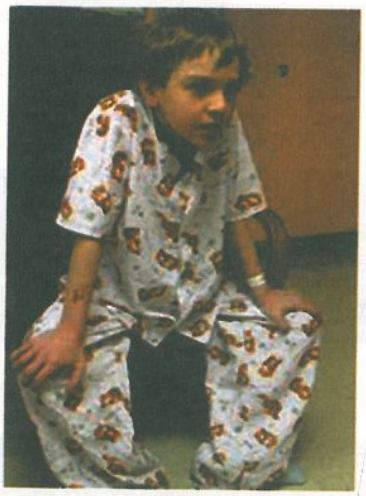
Active space

Acute epiglottitis and croup – cause & clinical presentation

00:07:35

	Epiglottitis	Croup
Fever	+	+
Stridor	Inspiratory	Starts with inspiratory and becomes biphasic
Posture	Tripod position	–
Cough	–	Barking/ seal like cough
Dysphagia/ drooling	+	–
Voice /cry	Normal	Hoarseness
Progression	Acute progression	Slow progression
Organism	Group A beta hemolytic streptococci	Parainfluenza virus

Tripod position



Warning: Not all points are covered in the notes, especially conceptual explanations. Please use the notes in conjunction with marrow masterclasses.

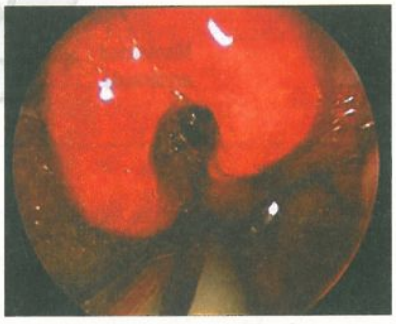
Active space

Acute epiglottitis and croup – diagnosis and management

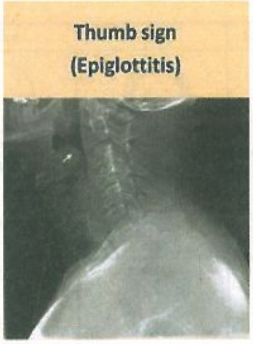
00:18:20

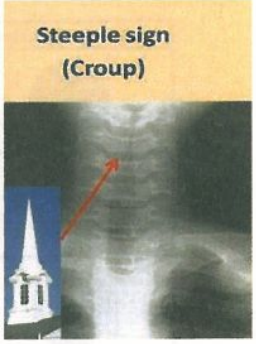
	Epiglottitis	Croup
Diagnosis : Endoscopy	Transnasal endoscopy can be done in children	
X ray [preferred]	Thumb sign [lateral view]	Steeple/ pencil tip sign [AP view]
Management	Antibiotics Steroids Adrenaline nebulization	Steroids Adrenaline nebulization Humidification

Endoscopy – swollen epiglottis



Normal x ray





Tuberculosis [TB] of the larynx

00:22:00

It occurs secondary to TB of the lung.

It affects : posterior part of larynx.

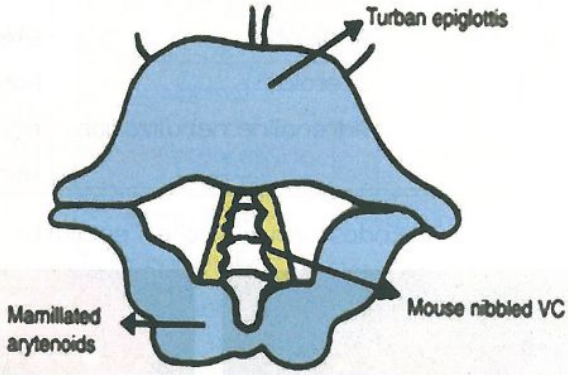
Active space

Other granulomatous conditions affect anterior of larynx.

TB larynx findings :

1. Mamillated arytenoids – 1st affected.
2. Mouse nibbled vocal cord
3. Turban epiglottis
4. Very painful condition

Management : anti tubercular therapy [ATT].

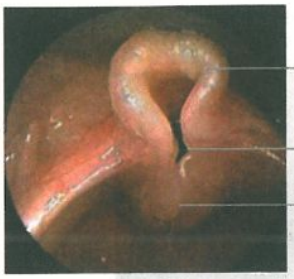


Active space

CONGENITAL CONDITIONS OF LARYNX

Laryngomalacia 00:01:55

most common congenital anomaly of larynx.



Features :

- Inspiratory stridor (relieves on prone position).
- Normal cry.

Diagnosis : fibreoptic laryngoscopy.

Treatment : reassurance; disappears by 2 years of age.

Sub-glottic stenosis 00:07:08

- 3rd most common congenital anomaly of larynx.
- Narrowest part → sub-glottis.
- Cause : prolonged intubation (most common), congenital.
- Meyer-Cotton classification :

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

Active space

Laryngeal web

00:12:07

Cause : occurs due to incomplete canalization of larynx.

Presentation : weak cry, inspiratory stridor.

Management : excision of web + Silastic keel.

Juvenile laryngeal papilloma

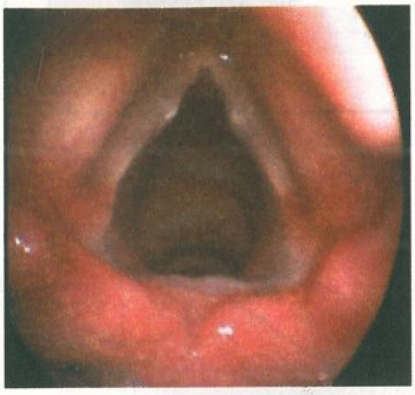
00:13:27

VOICE DISORDERS

Vocal nodule and Vocal polyp 00:02:15

Vocal nodule :

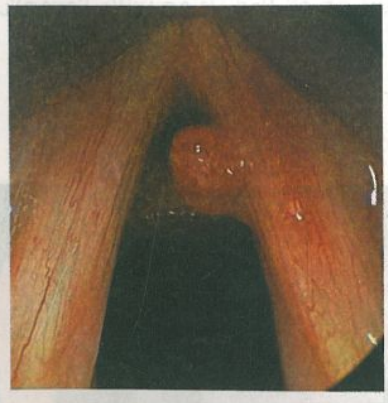
- The patient presents with hoarseness.
- On endoscopic examination,



- Bilateral, sessile.
- Site : Junction of anterior 1/3rd and posterior to 2/3rd of vocal cords.
- Also known as Screamer's/singer's/teacher's nodule due to prolonged voice abuse.
- Management : Voice rest and speech therapy.

Vocal polyp :

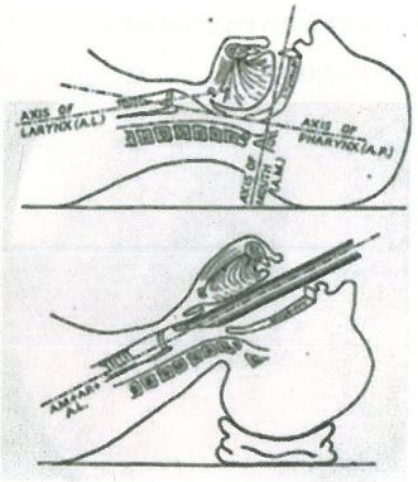
- Unilateral, pedunculated.



- Site : Junction of anterior 1/3rd and posterior to 2/3rd of vocal cords.

Active space

- Sudden episode of voice abuse.
- Management : Excision by microlaryngeal surgery (MLS)
- Position for MLS : Boyce/Chevalier Jackson/Barking dog/Sniffing the morning air



Conditions affecting posterior vocal cords

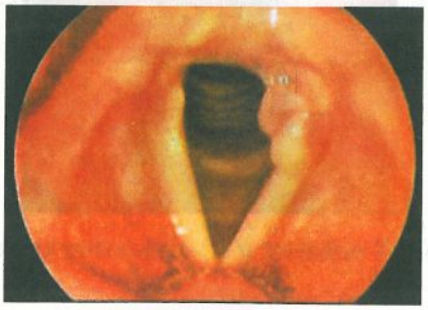
00:07:21

- Contact ulcer :

When there is abuse of the voice with forceful speech especially at the initiation of speech.

Not a true ulcer.

- Laryngopharyngeal reflux :



Active space

- Intubation granuloma :

management : Speech therapy
medications for reflux
Excision (if damage is significant): Botox in Thyroarytenoid.

Reinke's edema and Pseudosulcus 00:13:04

Reinke's edema :

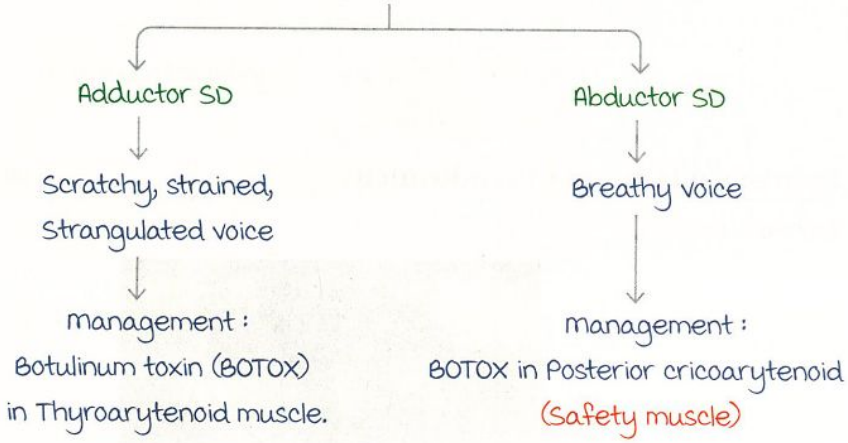
- Edema in Reinke's space (space between vocal ligament and mucosa).
- Bilateral.
- Most common in smokers. Also known as Smoker's larynx.
- Management : Stop smoking (early stage)
  Reduction glottoplasty (late stage)

Pseudosulcus :

- True vocal cord appears as it is two in number.
- Can be due to Laryngopharyngeal reflux.
- Reflux of the patient is managed.

Spasmodic dysphonia (SD) 00:16:18

- Associated with other distonias.
- Dystonia of larynx :



Functional aphonia 00:19:45

- Also known as Hysterical aphonia.
- The vocal cords adduct only on coughing, not on phonation.
- Management : Psychotherapy.

Stroboscopy is used to see the mucosal waves.

NERVE SUPPLY OF LARYNX & VOCAL CORD PALSY

Nerve supply of larynx

00:01:30

The larynx is supplied by the Vagus nerve
Vagus nerve emerges from jugular foramen along with 9th and 11th cranial nerves.

The Vagus nerve has 2 ganglions.

- Superior ganglion.
- Inferior ganglion.

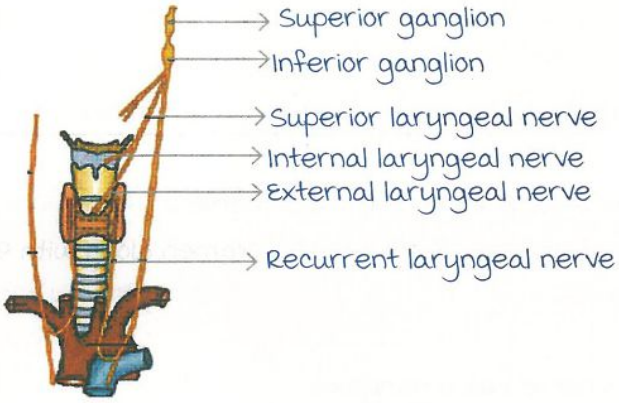
Superior ganglion gives rise to Arnold's nerve (Auricular branch).
Pharyngeal branch of Vagus nerve forms pharyngeal plexus along with 9th cranial nerve and sympathetic chain.
Inferior ganglion gives rise to superior laryngeal nerve (SLN).

SLN divides at the level of hyoid into :

1. Internal laryngeal nerve (ILN)
    - Pierces thyrohyoid membrane and enters larynx at upper border of inferior constrictor.
    - Sensory supply to supraglottis and upper part of hypopharynx.
    - ILN injury : Repeated aspiration.

2. External laryngeal nerve (ELN)
    - Supplies the only intrinsic muscle lying externally : Cricothyroid muscle (Tensor)
    - ELN accompanies Superior thyroid artery.

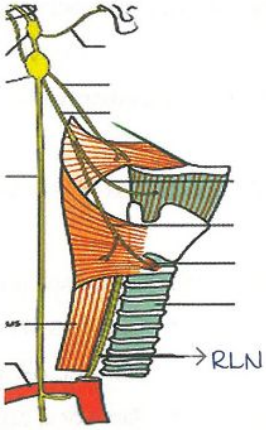
Active space



Recurrent laryngeal nerve (RLN) :

- Enters larynx between inferior constrictor and oesophagus : Lower border of inferior constrictor, behind cricothyroid joint.

- Left RLN :
  The branch is given at arch of aorta.
  It ascends in tracheoesophageal groove and enters larynx.
  It is prone to injury in the mediastinum.
  It has a longer course than right RLN hence more prone to injury.
  Cardiovagal syndrome : In Ortner's syndrome enlarged left atrium compresses left RLN.



- Right RLN :
  The branch is given at subclavian artery.
  It runs in the tracheoesophageal groove.
  It is more prone to be injured in the neck, compared to left RLN.
- RLN gives sensory supply to glottis and subglottis.
- It is the major motor supply of the larynx (All muscles except cricothyroid)
- RLN enters larynx with inferior thyroid artery.

Nerve injury associated with base of skull surgery :

- There may be complete palsy of the whole Vagus, including pharyngeal branch (Dysphagia, regurgitation).

Active space

- Other cranial nerves may be involved.

Nerve injury associated with carotid triangle surgery : ILN, ELN or SLN.

Nerve injury associated with cervical spine surgeries : Right and left RLN.

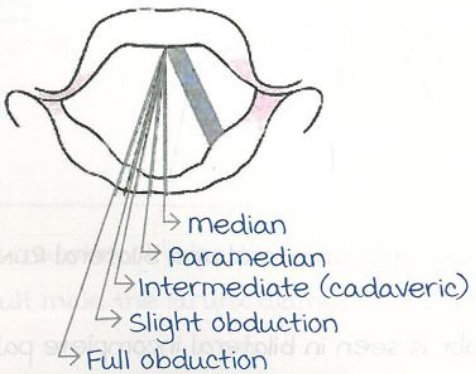
Nerve supply of larynx :

Sensory	motor
Supraglottis : ILN Glottis : RLN Subglottis : RLN	All muscles except cricothyroid : RLN Cricothyroid: ELN

Positions of the vocal cords

00:15:51

Position of vocal cords	Distance from midline	Action
Median	At midline	Phonation
Paramedian :	1.5 mm	Whispering
Intermediate/ cadaveric	3mm	Complete palsy
Abduction (slight)	7 mm	Normal respiration
Abduction (full)	9.5 mm	Forced respiration



Active space

Vocal cord palsy

00:22:25

Complete/ adductor/ SLN + RLN	Incomplete/ abductor/ RLN
Cadaveric position	median/ paramedian position Wagner and Grossman theory : In RLN palsy, all muscles are gone except cricothyroid keeping vocal cords in median position.

Clinical presentations of vocal cord palsy

00:28:00

Active space

most common cause of unilateral and bilateral RLN injury : Thyroid surgery.

maximum stridor is seen in bilateral incomplete palsy.

Medialisation and lateralisation of vocal cords 00:46:47

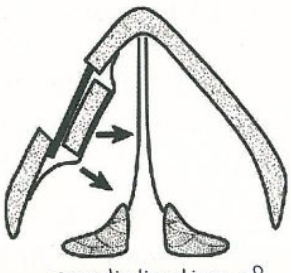
Medialisation : Inject laterally :

- Collagen
- Silicone
- Fat
- Calcium hydroxyapatite.
- Teflon (not preferred due to granulation).

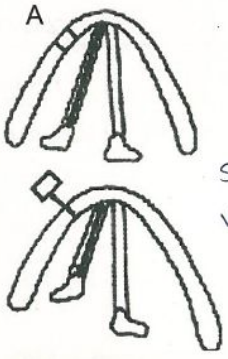
Lateralisation :

1. Cordectomy and arytenoidectomy.
   - Woodman's procedure
   - Kashima's procedure
2. Cordopexy : Burning a portion of vocal cord using laser.
   Thyroplasty : Thyroid framework surgery.
   Mnemonic : Thyro-PLASTY

i. Proximalisation/ medialisation: Unilateral complete.
ii. Lateralisation : Bilateral RLN.
iii. Shortening : Puberophonia.
iv. Tightening/ lengthening: Androphonia.



medialisation of vocal cord



Shortening of vocal cords

Puberophonia 00:53:21

It is also known as mutational falsetto.

Normally in an adult male the larynx diameter increases.

Active space

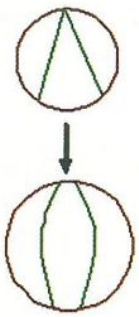
Vocal cord length increases more than the larynx diameter.

↓

Vocal cord becomes lax.

↓

Voice becomes low in pitch.



In puberophonia : Adult male voice remains high pitch.

Management : Type 3 thyroplasty (Shortening/ relaxation of vocal cord).

- Done if Gutzmann's pressure test is positive. (Posterior and downward compression of thyroid results in low pitched voice).

Q. 30 year old female following URTI presents with stridor. It can be managed by all the following except :

a. Tracheostomy
b. Cordectomy
c. Type I thyroplasty
d. Type II thyroplasty

Active space

CARCINOMA OF LARYNX & TRACHEOSTOMY

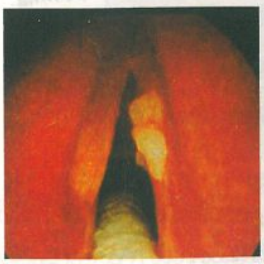
Carcinoma of larynx 00:02:36

Most common site – glottis.
Least lymphatic metastasis & best prognosis – glottis.
Maximum lymphatic metastasis – supraglottis.
Earliest presentation of glottic carcinoma – hoarseness of voice.
Presentation with dysphagia – supraglottis.
Pain in the ear – due to vagus nerve involvement.

Tumor staging :
T1 → one subsite involved.
T1a → only one vocal cord involved.
T1b → involvement of both vocal cords.
T2 → spread to adjacent subsites;
slight impairment in mobility of vocal cord.
T3 → involvement of pre-epiglottic space/para-epiglottic space/ post cricoid space/inner cortex of thyroid ; fixed vocal cord.
T4a → local invasion.
T4b → distant invasion.

Management of carcinoma of larynx 00:10:23

Management based on tumour staging :
T 1, T2 → radiotherapy, TLM (transoral laser microsurgery).
T 1a (mid-cord lesion) → TLM ; no radiotherapy.
T3 → concurrent chemo-radiation.
T4a → total laryngectomy.
T4b → palliative management.
Note : To assess cartilage invasion, MRI is done



Active space

Management of recurrence following radiotherapy 00:19:12

T1, T2 → conservative surgery / open partial laryngectomy.
horizontal (supraglottic carcinoma) and vertical (glottic carcinoma).

T3, T4 → Total laryngectomy.

Neck node staging & management 00:22:01

Node staging :

N0 → no neck node involvement.

N1 → single node involvement ; size < /= 3 cm.

N2a → single node involvement ; size >3cms to 6 cm.

N2b → multiple nodes involvement ; ipsilateral ; size <6 cm..

N2c → multiple nodes involvement ; contralateral / bilateral ; size < 6 cm.

N3a → single node involvement ; size >6 cm.

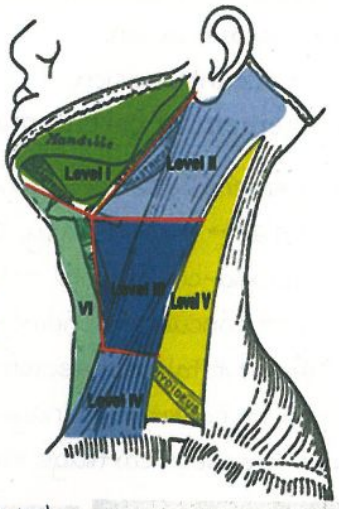
N3b → extra nodal extension.

Neck node management :

N0 → managed in supraglottic carcinoma; selective neck dissection. Only lateral and delphian lymph node groups are removed.

Radical neck dissection :

I-V group of lymph nodes removed, along with non-lymphatic structures (nerve, vein, muscle).



Modified radical neck dissection :

I - V group of lymph nodes removed and non-lymphatic structures are preserved.

- Type I : spinal accessory nerve preserved.
- Type II : spinal accessory nerve + internal jugular vein preserved.
- Type III (functional neck dissection) : spinal accessory nerve + internal jugular vein + SCM muscle preserved.

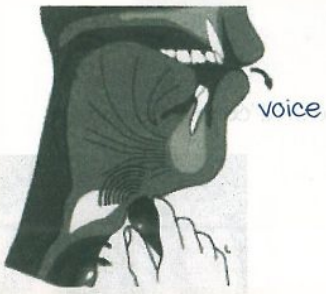
Warning: Not all points are covered in the notes, especially conceptual explanations. Please use the notes in conjunction with marrow masterclasses.

Active space

Speech following laryngectomy 00:32:40

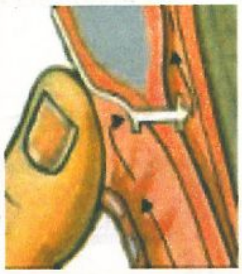
Following laryngectomy, permanent tracheostome is done.

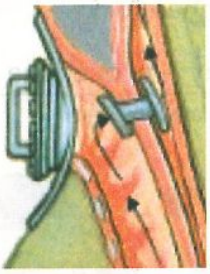
1. Oesophageal speech.
2. Electrolarynx (robotic voice).

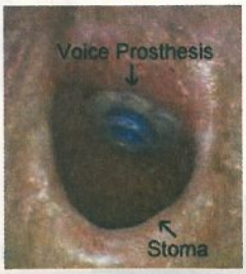


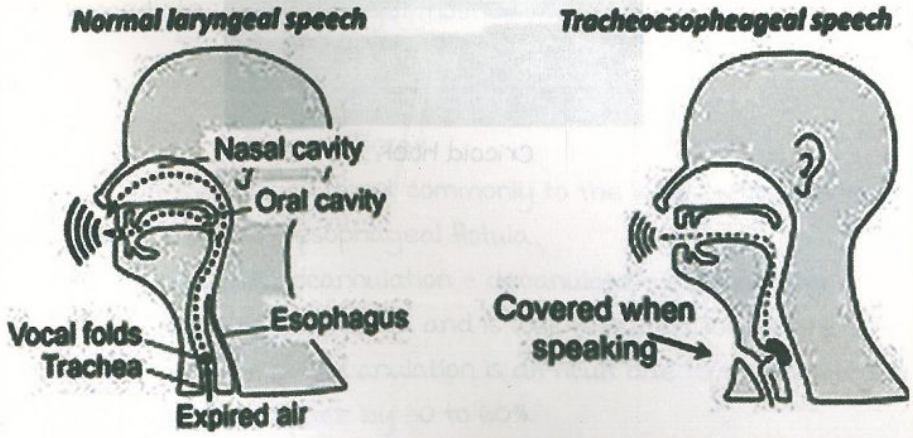
Vibrations are transmitted from electrolarynx through the tissues of neck.

3. Tracheo-oesophageal speech (best).









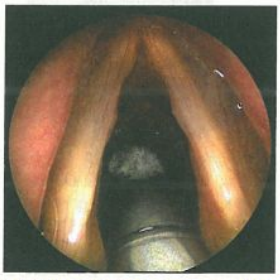
Active space

Indications for tracheostomy

00:38:29

- Obstruction – above tracheal rings 2, 3, 4.
- Prolonged mechanical ventilation.
- Suctioning of secretions.
- maxillofacial surgeries.
- Prevent aspiration (as in bilateral complete palsy).

tracheostomy



endotracheal tube within subglottis

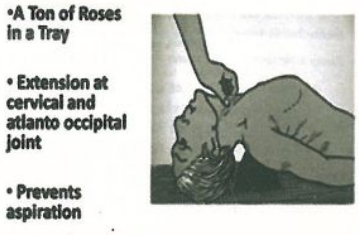
Tracheostomy – procedure

00:45:14

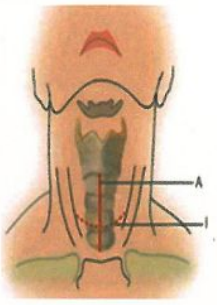
Cricoid hook

Active space

Fuller's bivalved metallic tube



Rose's position



Incision

Retraction of strap muscles

PVC High volume low pressure for air tight seal

Complications of tracheostomy 00:54:36

- Immediate : Hemorrhage (most common).
  Aspiration.
  Apnea.
  Pneumothorax.
  Injury (most commonly to the inferior thyroid vein).
- Late : Tracheo-oesophageal fistula
  Difficult decannulation – decanulation is done after creating a fenestra and is well tolerated for 24 hrs.
  In children decanulation is difficult due to the decrease in dead space by 30 to 60%.

Active space