Examination of the Ear

Anatomy

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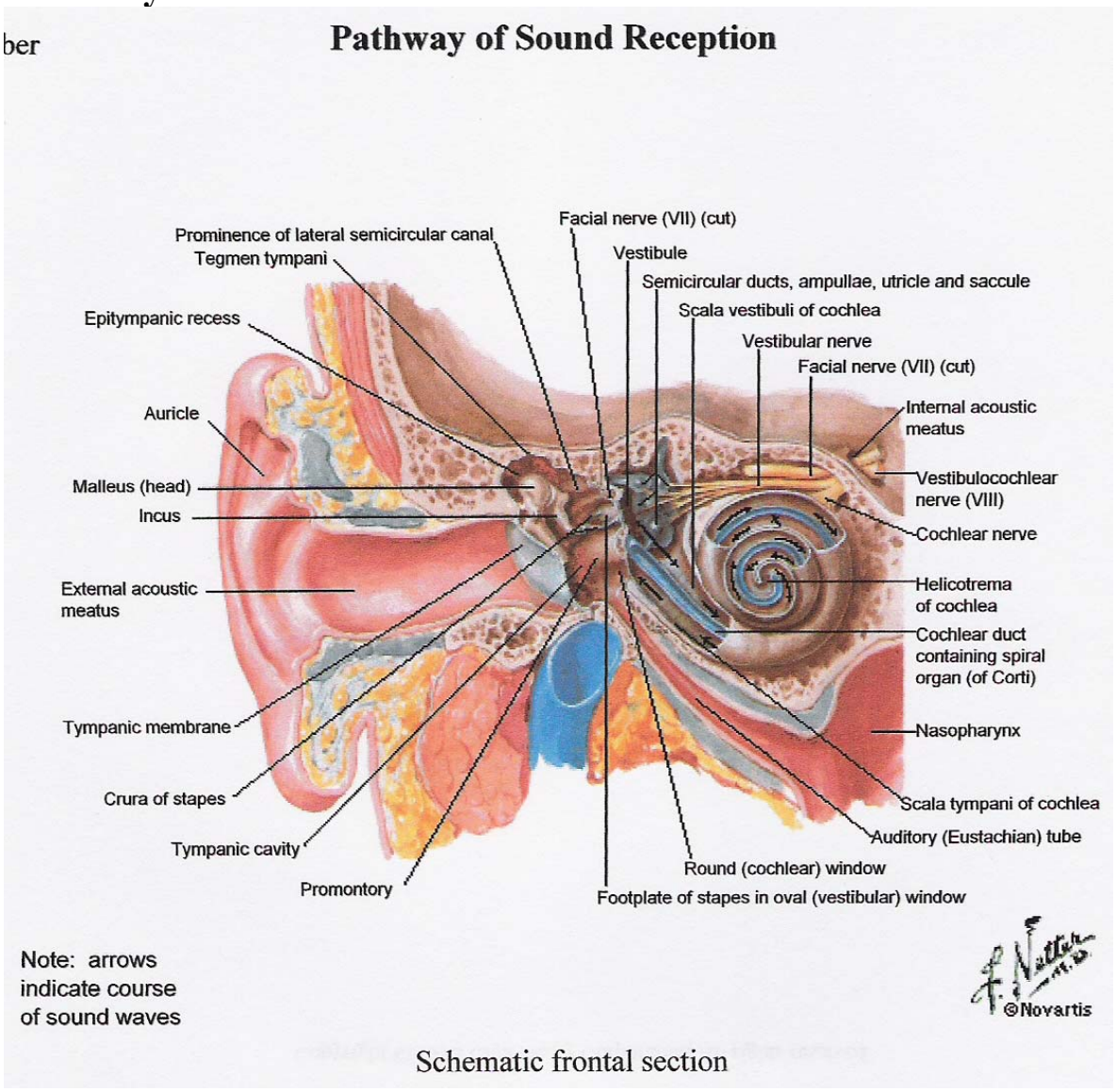
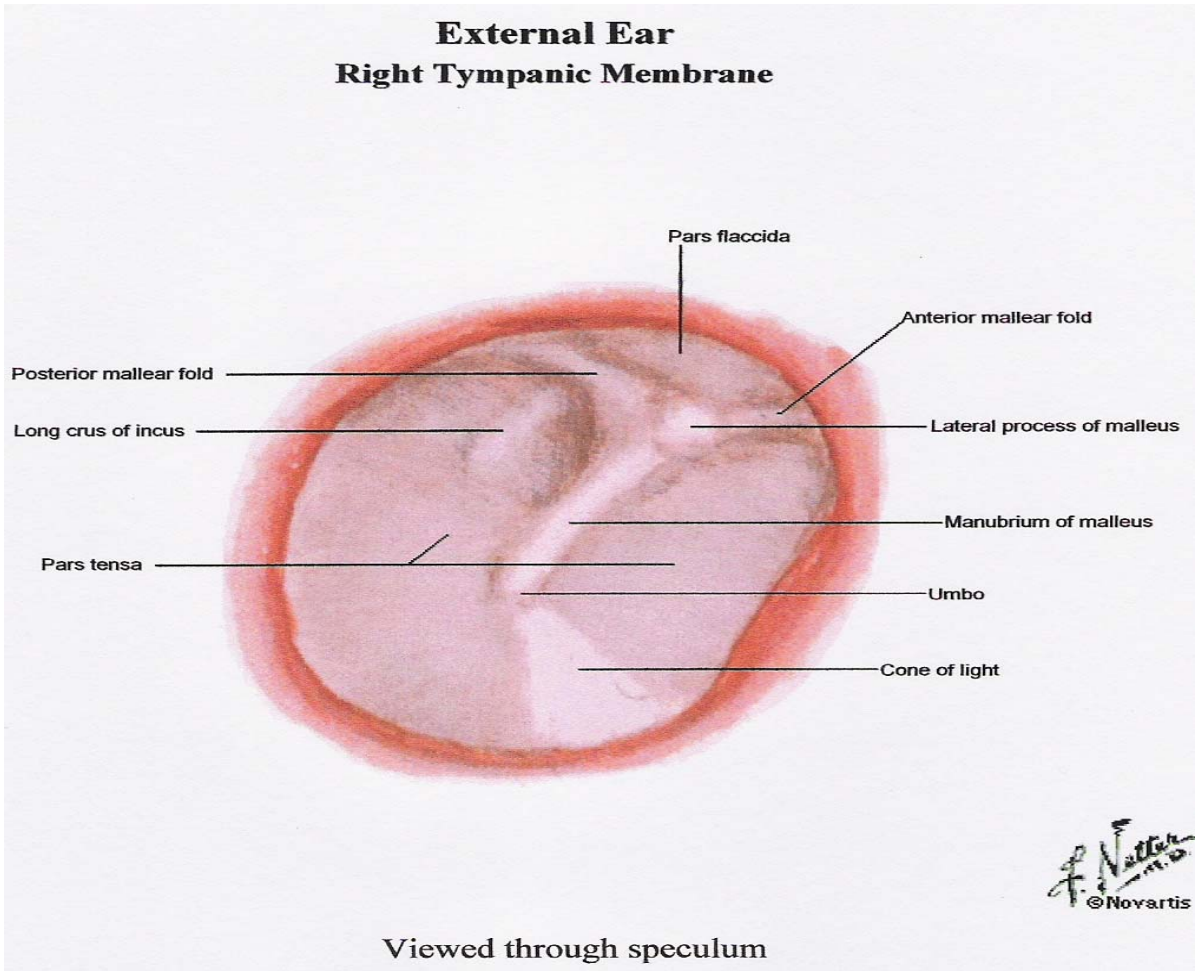
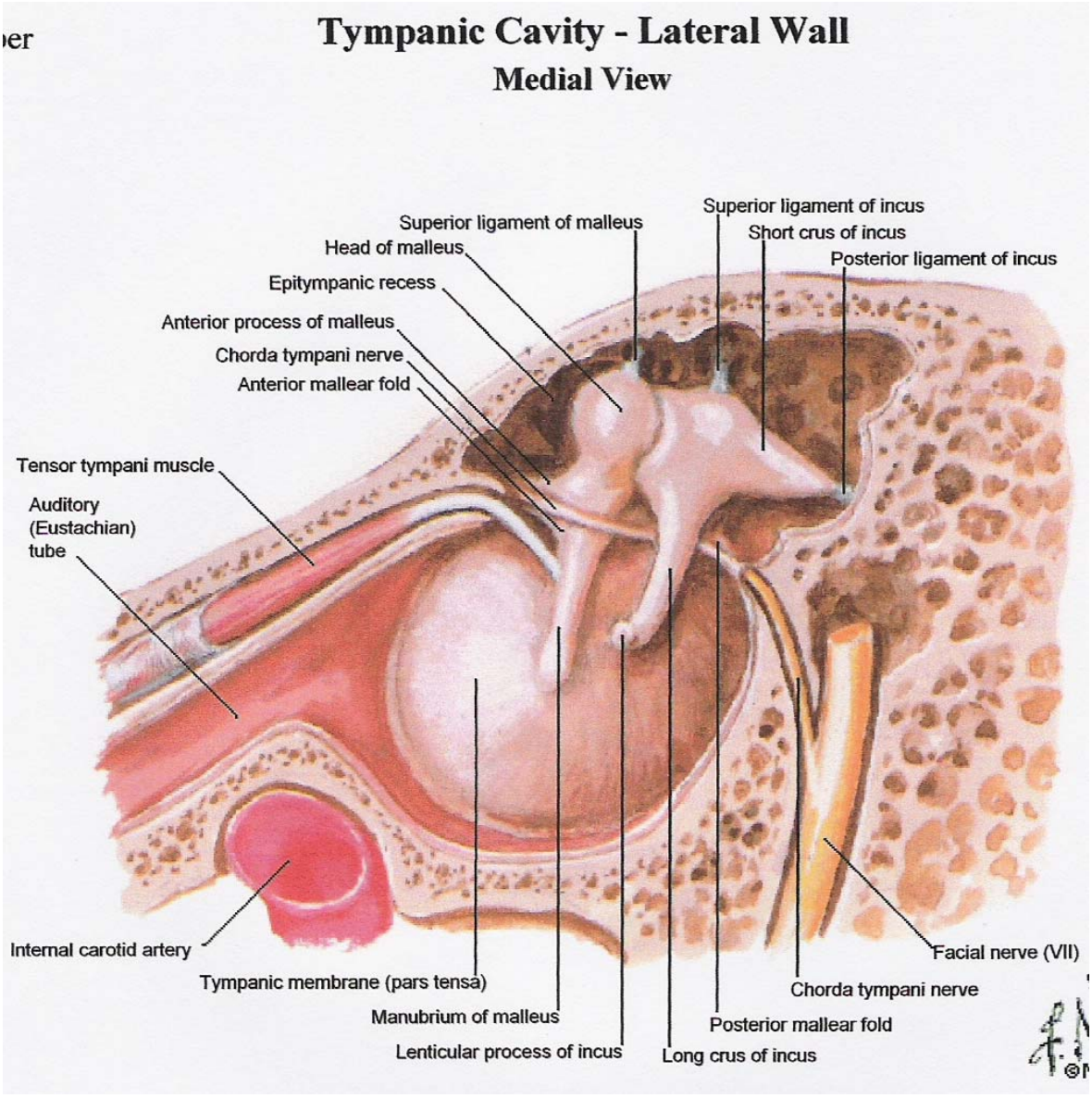


Schematic frontal section


External Ear
Right Tympanic Membrane
Pars flaccida
Anterior mallear fold
Posterior mallear fold
Long crus of incus
Lateral process of malleus
Manubrium of malleus
Pars tensa
Umbo
Cone of light
©Novartis
Viewed through speculum



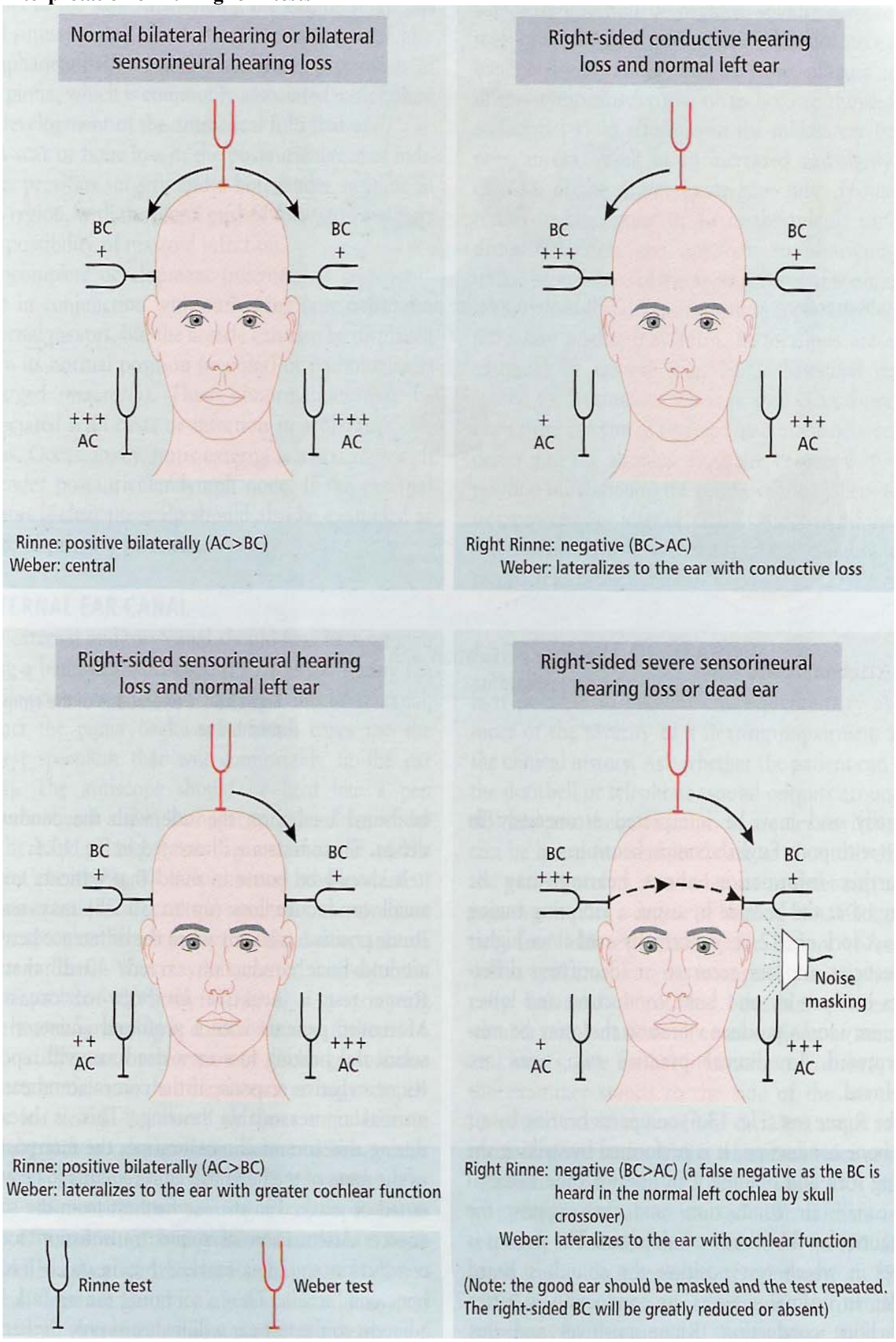
Hx;

- Discharge
- Hearing loss
- Otalgia
- Tinitus
- Dizziness

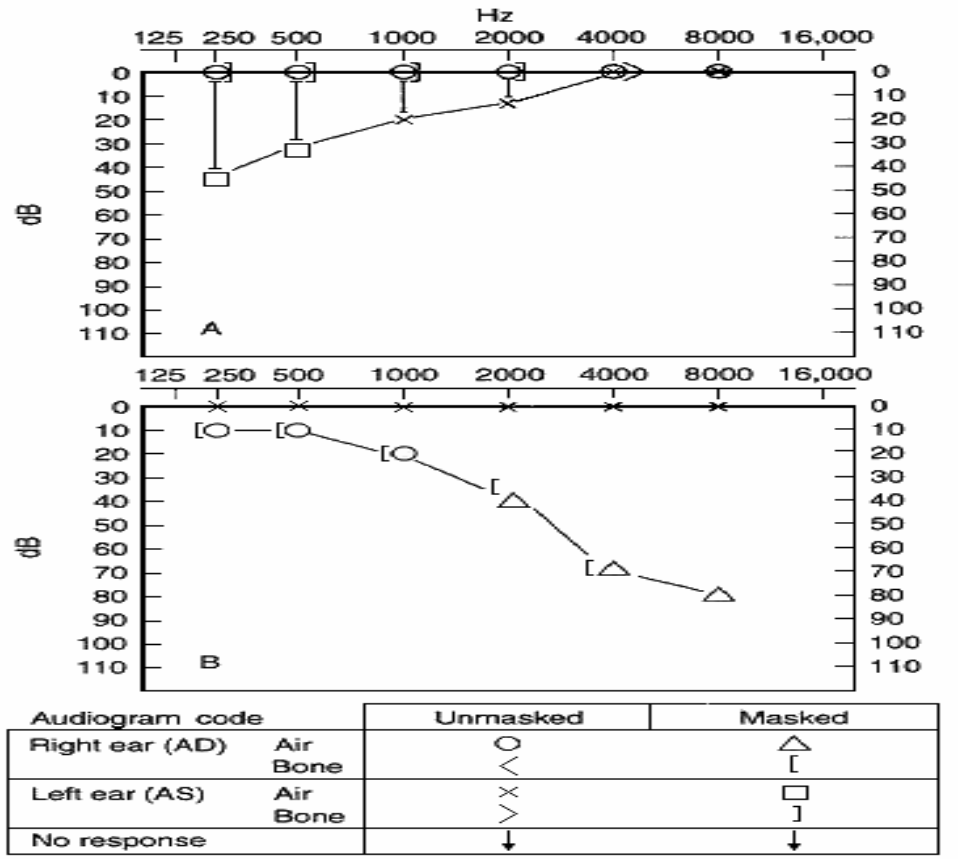
O/E;

- Inspection of the external ear
- Hearing tests;
    * Rinne's & Weber's with a **512Hz** tuning fork
    * Pure tone audiometry
- Inspection of the Tympanic Membrane - ***Otoscopy***;
    * Anterior Inferior Cone of light
    * Manubrium of malleus pointing posteriorly
    * Colour - **Normal** is **Pearly Gray or White**
        - Too many blood vessels or **Red** - ***Inflammation***
        - **Bluish** - ***Fluid*** *or bulb of Jugular Vein behind*
    * Mobility;
        * ***Pneumatic otoscopy***
        * ***Tympanometry***

i) Interpretation of Tuning fork tests



ii) Pure tone Audiometry

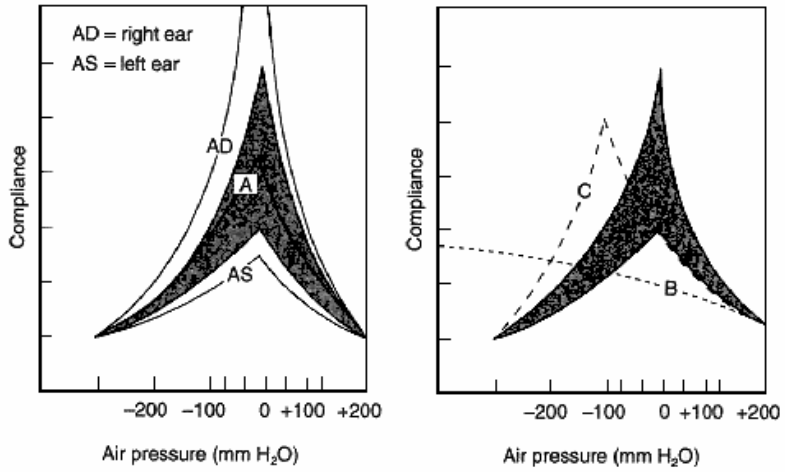


Audiograms in patients with hearing loss.

A. A left, low-frequency, conductive hearing loss; the right ear has normal hearing. The air-bone gap between the air curve (□ and ×) and the bone curve (]) is indicated by (|−|), demonstrating that the problem is conductive.

B. The left ear is normal, but the right ear has a downward-sloping, sensorineural hearing loss. The loss of both air and bone hearing indicates that the problem is sensorineural.

iii) Tympanometry



Tympanogram tracings.

- Left, with normal middle ear pressure.
  - **AS** is a **stiffened curve**, indicating **reduced** tympanic compliance e.g. ***Otosclerosis***.
  - **AD** is a **deep curve**, seen with either a ***flaccid*** or ***perforated tympanic membrane*** or ***ossicular discontinuity.***
- Right,
  - **Curve C** is seen with ***negative middle ear pressure***
  - **Curve B** is a **nonpeaking curve**, suggesting ***middle ear fluid.***

Otitis

Otitis media - *Inflammation of the **middle ear***

Classification;

a) **Acute otitis media (AOM)**: Usually a **bacterial infection** accompanied by **viral URTI**; rapid onset of signs and symptoms
b) **Recurrent AOM: *≥3 AOM** in **6 months***, or ***≥4 AOM** in **1 year***
c) **Otitis media with effusion (OME): *Painless* hearing loss** and intermittent ***purulent* ear drainage** that follows AOM or arises without prior AOM
d) **Chronic OME (CSOM) -** Persistent **otorrhoea** present **> 6 weeks**

Predominant age: Peak incidence age **6-18 months**; declines after **age 7 years** (*the eustachian tube is **more horizontal & shorter** in children **up to 7yrs***); rare in adults

Predominant sex: *Male > Female* *(for AOM and recurrent AOM)*

Risk factors:

- Male gender
- Family history of middle ear disease
- Sibling history of otitis media
- Smoking in household
- Formula feeding
- Day care
- AOM in 1st year of life is a risk factor for recurrent AOM

Associated conditions

· URTI
· Bacteraemia
· Meningitis
· Allergies

Causes:

A preceding **viral URTI** produces ***eustachian tube dysfunction*** that is thought to promote **bacterial infection** via eustachian tube - *Pneumococci, Haemophilus influenzae, Moraxella (Branhamella) catarrhalis, Group A streptococci, Staphylococcus aureus, Sterile/non-pathogens.*

Pathogenesis:

a) **Eustacian tube dysfunction**
The physiologic role of the auditory tube is to;
i) **Ventilate the middle ear space** - Normally, the middle ear is ventilated **3-4 times/min** as the eustachian tube opens during **swallowing**, and O_2 is absorbed by the blood in the vessels of the middle ear mucous membrane. If the patency of the eustachian tube is impaired, a relative **negative pressure** develops within the middle ear with **hypoxia** of the cells leading to **transudation from the mucosa** & **accumulation of serous fluid.**
ii) Clear middle ear secretions into the nasopharynx
iii) Protect the middle ear from nasopharyngeal secretions
It is ***more horizontal & shorter** in children **up to 7yrs*** thus *prone to obstruction.*
Eustachian tube obstruction may be due to;
- Inflammatory processes in the nasopharynx
- Allergic manifestations
- Hypertrophic adenoids
- Benign or malignant neoplasms.

b) **Altered Mucocilliary system**
* 1° - Kartagener's Syndrome
* 2° - Tissue *Hypoxia, Inflammation, Mucosal oedema*

c) **Nasopharyngeal dysfunction**
Cranio-pharyngeal disproportion e.g. ***Down's Syndrome*** - There is ***increased basal angle of skull** in relation to cranial capacity ± **adenoid tissue hypertrophy*** - Adenoid growth in the nasopharynx outstrips skull growth in the first ***3-5yrs.***

skull growth in the first ***3-5yrs.***

d) HIV;

* The infection itself
* Recurrent URTIs
* Localised lymphoid hyperplasia
* Nasopharyngeal carcinoma

S/S

· **AOM:**
- ***Earache***
- Fever, although *more often afebrile*
- Accompanying URTI symptoms
- **Decreased hearing**
- Otorrhoea *if eardrum perforated*
- Eardrum *mobility decreased* (as observed by pneumatic otoscopy)
- Eardrum ***bulging*****, opaque,** often **yellowish or inflamed.** *Redness alone is* ***not*** *a reliable sign.*

· **AOM in infants:**
- May cause no symptoms in the first few months of life
- Irritability is sometimes the only indication of ***earache***
- *Eardrum bulging, opaque, often yellowish or inflamed. Redness alone* ***not*** *a reliable sign.*

· **OME:**
- Usually ***asymptomatic***
- Associated with a 25-dB **hearing loss** in the affected ear probably universal, but not always measurable, and rarely appreciated by parents
- Eardrum often ***dull,*** *but* ***not bulging***
- Eardrum *mobility decreased* (as observed by pneumatic otoscopy)
- In an adult with **persistent unilateral *serous* OME**, ***nasopharyngeal carcinoma*** *must be excluded.*

DDx:

· Tympanosclerosis

· Redness due to crying

· Earache with a normal ear exam may be caused by *referred pain from the* ***jaw or teeth***

Ix:
- Otoscopy;
  - *Pneumatic otoscopy* demonstrates decreased Eardrum mobility
  - ***Negative middle ear pressure*** is suggested by;
    * Distorted cone of light
    * Prominence of the lateral process
    * *Shortening* of the manubrium of the malleus with a more *horizontal* orientation
    * *Better mobility with negative* compared with positive pressure.
- Effusion m/c/s
- Tympanometry - To document the presence of middle ear fluid - *Flat tympanogram*
- Hearing testing helpful to assess the need for *early surgical intervention in OME*

Mx:

General measures;
- **AOM:** Outpatient except for ***febrile*** *infants* ***< 2 months***
- May use **watchful waiting** approach, treating symptoms *without antibiotics* for first **2-3 days**. If symptoms persist, then **amoxicillin** is first line treatment.

Medication;
- **AOM: Amoxicillin *5-7 day*** course with no complications; Also, *Cephalosporins, Augmentin, Septrin*
- **Recurrent AOM**: **Amoxicillin** for ***3-6 months*** or until summer; Also *Sulfisoxazole*
- **Analgesics** and **antipyretics** as needed

Alternative drugs are indicated for the following AOM patients:
- AOM due to **Chlamydia trachomatis** will respond to ***macrolides and sulfonamides***
- AOM due to **Mycoplasma pneumoniae** will respond to ***macrolides***

Surgery - ***Myringotomy*** *(Tympanostomy)* ***tubes*** *and* ***Adenoidectomy***
- **≥3 AOM** *while on chemoprophylaxis.*
- **OME;**
  * **> 6 months *unilateral***
  * **> 4-6 months *bilateral***
  * **Hearing loss > 25db**

Follow up:

· AOM: *Otoscopic* examination **4 weeks** after diagnosis

· OME: **Monthly** *otoscopic or tympanometric* exams as long as OME persists

Possible Complications:

- Extra-cranial
  - Extra-temporal
    * Hearing loss
    * Perforation/otorrhoea
    * Atrophy and scarring of eardrum - *Tympanosclerosis*
    * Adhesions
  - Intra-temporal
    * Labyrinthitis and resulting vertigo
    * Facial nerve palsy
    * Ossicular erosion
    * Retraction pockets
    * ***Cholesteatoma*** - A mass of **keratinizing squamous epithelium and cholesterol** in the middle ear, usually resulting from chronic otitis media, with squamous metaplasia or extension of squamous epithelium inward to line an expanding cystic cavity that may involve the mastoid and erode surrounding bone. Usually present in the **anterior superior** aspect through the tympanic membrane.
    * ***Mastoiditis*** - develop when infection tracks under the periosteum of the temporal bone to cause a subperiosteal abscess or breaks through the mastoid tip to cause a neck abscess deep to the sternocleidomastoid muscle (***Bezold's abscess***).
    * Venous sinus thrombosis
- Intra-cranial
  - Otitic Meningitis
  - Epidural abscess
  - Brain abscess and other intracranial suppurative complications
  - Otitic hydrocephalus
  - Dural venous thrombophlebitis (*usually sigmoid sinus*)

Otitis Externa - *Inflammation of the **external auditory canal***

Classification

a) **Acute OE;**
   i) **Acute *diffuse* OE** - the *most common* form, an infectious process usually **bacterial**, occasionally fungal
   ii) **Acute *circumscribed* OE** - synonymous with **furuncle**. Associated with **infection of the hair follicle.**

Acute Circumscribed Otitis Externa	Acute Diffuse Otitis Externa
Externally (outer) seated pain	Deep seated pain
Patient is in good general condition	Patient is sick looking
Adults	Children
No fever	Fever
Pain worse on jaw movements	**Not** worsened by jaw movements
Tenderness increases on pressing the **tragus**	Tenderness increases on pressing the **mastoid**
Pinna is pushed forward	Pinna is pushed forwards & downwards
Localised lymphadenopathy	**No** lymphadenopathy
X-Ray – **No** clouding of muscle ear cells	X-Ray – Clouding of muscle ear cells

b) **Chronic OE** - same as **acute diffuse**, but of longer duration (>**6 weeks**)
c) **Eczematous OE** - may accompany typical atopic eczema or other primary skin conditions
d) **Necrotizing "malignant" OE** - an infection which extends into the **deeper tissues adjacent to the canal.** May include ***osteomyelitis and cellulitis***. Rare in children.
e) **OE Haemorrhagica** - Inflammation of the **ectodermal layer of the tympanic membrane** by **influenza virus** forming blisters with blood inside - **Rx** - Analgesics.

Causes:

· Diffuse/Necrotizing OE
- Traumatized external canal
- Bacterial infection - **pseudomonas,** (**67%** cases); staphylococcus; streptococcus; gram negative rods
- Fungal infection - **aspergillus** (**90%** cases); Phycomycetes; Rhizopus; actinomyces; Penicillium; yeast

· Eczematous OE (associated with primary skin disorder):
- Eczema
- Seborrhoea
- Neurodermatitis
- Contact dermatitis
- OME
- Sensitivity to topical medications

Risk factors:

· Acute and chronic otitis externa
- Ear scratching
- Traumatization of external canal
- Swimming
- Hot humid weather
- Use of a hearing aid
- Chronic OME

· Eczematous
- Primary skin disorder

· Necrotizing OE in adults
- Elderly
- Diabetes
- Debilitating disease

· Necrotizing otitis OE in children (rare)
- Leucopoenia
- Malnutrition
- Diabetes

Pathological findings:

· Acute and chronic OE - desquamation of *superficial epithelium of external canal* with infection
· Eczematous OE - pathologic findings consistent with primary skin disorder, secondary infection on occasion
· Necrotizing OE - *vasculitis, thrombosis and necrosis* of involved tissues; *osteomyelitis*

S/S:

· Itching
· Plugging of the ear with a pimple like swelling leading to mild hearing loss
· Otalgia worsened by movement of jaw or pressing on the tragus/mastoid
· Periauricular adenitis (Acute circumscribed otitis externa)
· Erythematous canal
· Purulent discharge
· Eczema of pinna
· Cranial nerve involvement (**VII, IX-XII**)

DDx:

· Ear pain
· Purulent ear discharge
· Hearing loss
· Cranial nerve palsy (VII, IX-XII) with *necrotizing otitis externa*
· Wisdom teeth eruption

Ix:

- Otoscopy - 'Cotton wool fibre' in *Otomycosis*
- Radiological evaluation of deep tissues in *necrotizing otitis externa*

Mx:

General measures;

· Thorough cleansing of external canal
· Pain medications
· Antipruritic and antihistamines (eczematous form)

Medications;

· Acute bacterial and chronic otitis externa
  * Topical therapy for approximately **10 days**
  * 2% acetic acid
  * Antibiotics
  * Corticosteroids
· Fungal otitis externa
  * Topical therapy anti-yeast for candida or yeast - **nystatin**
  * Parenteral antifungal therapy - **amphotericin B**
· Eczematous otitis externa - topical therapy
  * **Aluminium acetate**
  * Steroid cream, lotion, ointment
  * Antibacterial, if super-infected
· Necrotizing otitis externa
  * **Parenteral antibiotics** - ***antistaphylococcus and antipseudomonal***
  * ***4-6 weeks*** of therapy

Possible complications:

· Mainly a problem with *necrotizing otitis externa.* May spread to infect contiguous bone and CNS structures.
· Acute otitis externa may spread to pinna causing a ***chondritis***

Herpes Zoster Oticus (Ramsay Hunt's Syndrome)

Invasion of the **geniculate ganglion** of **CN VIIth** *and the* **CN VIIIth nerve ganglia** by the herpes zoster virus, producing;

* ***Severe ear pain***
* ***Hearing loss -*** may be *lost permanently or recovered partially or completely*.
* ***Vertigo -*** lasts for days to several weeks.
* ***Facial nerve palsy -*** *transient or permanent; taste may be lost in the* ***anterior ⅔^{rds} of the tongue****.*

Vesicles can be seen on the pinna and in the ear canal (external auditory canal) along the distribution of the sensory branch of the facial nerve and other cranial nerves are often involved, and some degree of *meningeal inflammation* is common. Evidence of a *mild generalized encephalitis* can be found in many patients.

Ix

CSF;

- **Lymphocytes ++**
- **↑ protein content**

Mx

- **Corticosteroid** therapy is the treatment of choice and should be started promptly
- **Acyclovir** for **10 days** may shorten the clinical course
- Pain is relieved with **codeine**
- The vertigo is effectively suppressed with **diazepam**

Hearing Loss

Deficiency of hearing capacity from the normal (0-20db)

Classification;

- Types;
  - **Conductive -** *External auditory meatus* to *oval window* (**<*60db***)
  - **Sensorineural -** *Oval window* to *inferior temporal gyrus*
- Grades (as measured by **Pure Tone Audiometry**);
  - **I -** Mild - **0-40db**
  - **II -** Moderate - **40-60db**
  - **III -** Severe - **60-80db**
  - **IV -** Profound/Total - **>80db**

Terminology;

- **Deficit -** Deviation of hearing ***in the pure tone audiometry from normal (0-20db)***
- **Handicap -** Failure to communicate in ***spoken speech***
- **Disability -** Total *impact/effect* of hearing loss.

Causes;

Congenital;

- Infections in pregnancy especially ***Rubella & Syphilis***; ***Congenital 3° syphilis*** manifests at **20-30yrs old**.
- Drugs e.g. ***aminoglycosides***
- Irradiation

Acquired;

i) Conductive hearing loss;
- External ear;
  - Wax - ***commonest cause***
  - Acquired atresia of the external auditory canal 2° *trauma, infection etc*
- Middle ear;
  - Trauma
  - Otitis barotrauma - 2° to rapid descent in pressure e.g. plane descent
- Inner ear;
  - Infection - CSOM (***2nd most commonest cause*** *after wax*)
  - Tumours of the middle ear

ii) Sensorineural hearing loss;
- Infections of the ***inner ear;***
  - Meningitis
  - Labyrinthitis;
    - Viral - may recover
    - Bacterial - ***No*** recovery
- Meniere's disease - a disorder of the *membranous labyrinth of the inner ear* that is marked by recurrent attacks of *dizziness, tinnitus & deafness.*
- Drugs - *Quinine, furosemide, aminoglycosides, chemotherapy*
- Acoustic trauma - *Sudden exposure to high intense sound e.g. bomb blast*
- Long exposure to loud sound
- Cerebelopontine angle tumours
- CVAs
- Metabolic disorders
- Presbycussis - *Ageing ear*

Ix

- **BERA** - Brainstem Evoked Response Audiometry
- **PTAT** - Pure Tone Average Threshold

Allergic Rhinitis

Immediate and delayed reactions to airborne allergens, beginning with the generation and presence of **specific antigen-responsive IgE antibody receptors** on **mast cells** of the nasal mucosa

- An antigen-antibody chemical union initiates a cascade of events in the **mast cell** culminating in its **degranulation** and **production of** a melange of **inflammatory mediators** including ***histamine, heparin, leukotrienes, prostaglandins, proteases and platelet activating factor***
- An **immediate symptomatic response** occurs followed by a more prolonged, persistent **late phase reaction.** This involves the **infiltration** into the reactive region of ***eosinophils, neutrophils, basophils and mononuclear cells***
- May be **seasonal or perennial** depending on climate and individual response and the offending antigens
    * **Seasonal** responses usually to *grasses, trees and weeds*
    * **Perennial** responses exampled by *house dust mites, mould antigens and animal body products*

System(s) affected: Pulmonary, Skin/Exocrine, Hemic/Lymphatic/Immunologic

Epidemiology

Genetics: Complex, but strong genetic determination present
Predominant Age:

· Onset usually **before the age of 30** with tendency to **diminish with time**
· **Mean age** onset approximately **10 years**

Predominant sex: **Male = Female**

Causes

· Animal and plant proteins: *Pollens, moulds, mite dust, animal danders, dried saliva and urine*
· Insect debris: Cockroach, locusts, fish food (thirps)

Risk Factors

· Family history
· Repeated exposure to offending antigen
· Exposure to multiple offending allergens
· Presence of other allergies, e.g., *atopic dermatitis, asthma, urticaria*
· Non-compliance to appropriate therapeutic measures

S/S

· Nasal stuffiness and congestion
· Pale, boggy mucous membranes
· Nasal polyps
· Sneezing, often paroxysmal
· Loss or alteration of smell
· Postnasal drip
· Itchy nose, eyes, ears and palate
· Watery eyes
· Dark circles under eyes, "allergic shiners"
· Long eye lashes often associated
· Sensation of plugged ears
· Mouth breathing
· Scratchy throat
· Voice change
· Irritating cough
· Dull facies
· Transverse nasal crease from rubbing nose upwards
· Symptom associated sleeping difficulties
· Fatigue

DDx

· Nasal polyps and tumour
· Chronic sinusitis
· Foreign body
· Medications
    * Rebound effect associated with continued use of *topical decongestant drops and sprays*
    * *ACE-i*
    * Chronic *aspirin* use
· Cribriform plate defect with CSF leakage (*rule out by testing watery discharge for sugar*)

Ix

· **Coronal CT scan for sinuses** - Check for ***complete opacity***, ***fluid level*** *and* ***mucosal thickening.***
· May have slight increase in eosinophils but often normal with uncomplicated rhinitis.
· Nasal probe smear with cytologic exam for eosinophils
· Increase IgE level.
· Skin tests using suspected antigens
· Radioallergosorbent test (RAST) - More expensive and used especially in cases where skin testing not practical, e.g., in atopic dermatitis and dermatographia

Mx

· Limit exposure to offending allergen
· Medication;
  * Antihistamines:
  * Decongestants e.g. Oral, e.g., *pseudoephedrine*; Topical drops or sprays, e.g., *phenylephrine*; Topical ophthalmic vasoconstrictors for annoying conjunctival itching
  * Nasal sprays e.g. *Physiologic saline solution, Cromolyn, Beclomethasone, flunisolide, triamcinolone, budesonide.*
  * Systemic steroids - ***Only in urgent,*** *selected cases and* ***only for short-term*** *use.*

Contraindications:

· Antihistamines *may precipitate urinary retention* in males with prostatism and/or hypertrophy
· Decongestants if congestion is a *"rebound" phenomenon* or if *hypertension a problem*
· Non-sedating antihistamines (Seldane and Hismanal) should **not** be used in patients with *liver disease* or in situations in which potassium channelling is a problem

Complications

· Secondary infection
· Otitis media
· Sinusitis
· Epistaxis
· Nasopharyngeal lymphoid hyperplasia
· Decreased pulmonary function
· Continue to suspect effects of medications
· Facial changes (see Signs and Symptoms)

Nasal Polyps

Polyps are protrusions of **oedematous lamina propria** of the *mucous membrane of the nose* surrounded by **hyperplastic secreting mucosa** 2° to *frequent trauma from blowing of the nose.*
They usually originate from the **middle turbinate** *and* **ethmoid sinus.**
A **developing** polyp is **teardrop-shaped**; when mature, it resembles a **peeled seedless grape.**

Epidemiology

- **5%** incidence
- Usually seen in adults & children **>10yrs**; *Rarely seen in **children** unless due to **cystic fibrosis***
- M:F - **2:1**

Causes

- Allergic rhinitis
- Acute and chronic infections
- Cystic fibrosis - cause *persistent pansinusitis* in children & nasal polyps may be found in as many as **25%** of these patients and may cause recurrent nasal obstruction.
- **Bleeding polyps** occur in **rhinosporidiosis.**
- **Unilateral polyps** occasionally occur in association with or represent ***benign or malignant neoplasms of the nose or paranasal sinuses.***

Theories of Pathogenesis

i) **Allergic reaction** - *Most plausible* as evidenced by;
   * Common in *atopic individuals*
   * Polyps are associated with ***asthma** (20-40%) **& allergic rhinitis***
   * Persons with nasal polyps are more likely to be *allergic to aspirin.*
   * Nasal findings mimic allergic symptoms *(allergic rhinitis)*
   * Presence of *mast cell degranulation*
   * **90%** of patient's with polyps have *eosinophilia*
   * ↑ *IgE & IgA* in the *nasal polyp fluid* > in the serum

ii) Infection
iii) Bernouli's Phenomenon - *air turbulence causes hypertrophy*
iv) *Polysacharide changes* in the *ground substance* of the *ethmoid mucosa*
v) Vasomotor imbalance

Types

- **Ethmoidal -** *In **adolescents & young persons** & usually **multiple & bilateral***
- **Maxillary/Antral** - *in **adults & elderly**, **single, unilateral** & may grow back into the turbinates*

C/P

- **Nasal fetor**
- **Post nasal drip**
- Rhinorrhoea - *watery or yellowish 2° to eosinophilia*
- Itching
- Sneezing
- Nasal obstruction
- Reduced sense of smell
- Eustachian tube obstruction

O/E

- Hyponasal voice (*2° to ↓ flow of air in the nose*)
- **Pale bags of water** in the nose - ***commonly bilateral***
- Dry oral mucous membranes 2° to mouth breathing
- Flattening of the nasal bridge

DDx

Nasal Polyps	Turbinates
Anaesthetic	Sensitive
Pale in colour (whitish)	Normal mucosal colour (Pinkish)
Can go around it with a probe	**Cannot** go around it as it is attached to the wall
Shrunk by **intranasal steroids only**	Shrunk by **steroids & nasal decongestants**

Ix

- **CT scan** of paranasal sinuses - **coronal cut**
- Allergic skin tests
- Immunological studies
- Histology

Mx

- **Medical** - ***Steroid sprays*** e.g. ***beclomethasone dipropionate*** *or* ***flunisolide aerosols,*** - 1/2 sprays in each nasal cavity BD for **2wks**, sometimes reduce or eliminate polyps, although surgical removal is often still required.
- **Surgical**
  Indications;
  - Polyps that **obstruct the airway**
  - Polyps that **promote sinusitis**
  - **Unilateral polyps** that *may be obscuring benign or malignant neoplasms*

  Procedures;
  a) Simple polypectomy by forceps
  b) Functional Endoscopic Sinus Surgery (**FESS**)
  c) In severe, recurrent cases, **maxillary sinusotomy** or **ethmoidectomy** may be indicated.

Complications

Anaesthetic

Intra-op

- Haemorrhage
- Damage to surrounding structures
  * CSF Rhinorrhoea
  * Damage to the olfactory nerve
  * Penetration to the orbital cavity

Post-op

- Polyps tend to **recur** due to;
  * Less removal
  * Presence of the underlying allergy or infection - After removal of nasal polyps, ***topical steroid or cromolyn therapy*** tends to retard recurrence.
  * Aspirin sensitivity
  * Development at a young age (*R/O - Cystic fibrosis*)
- Formation of synechiae obstructing nasal passages

Sinusitis

Symptomatic inflammation of the paranasal sinuses occurring as a result of ***impaired drainage*** and ***retained secretions***

- Acute Sinusitis - **<8 weeks** duration
- Chronic sinusitis - ***3-4 annual episodes*** or ***failure to respond to medical therapy***

Causes

a) Infectious
   - Bacteria;
     * **Acute sinusitis** is caused by *S pneumoniae, H influenzae (nontypable), M catarrhalis, and β-hemolytic streptococci* and is usually *precipitated by an* ***acute viral URTI***
     * **Chronic sinusitis** may be exacerbated by a ***gram-negative bacilli or anaerobic microorganisms.***
   - Viral
   - Fungal (***Aspirgillus*** most common)

b) Allergic Reactions

Risk Factors

- Viral URTI
- Age **<10** or **>50**
- Anatomical abnormalities
  - Tonsillar and adenoid hypertrophy
  - Deviated septum
  - Nasal polyps
  - Cleft palate
- Nasotracheal intubation
- Barotrauma
- Dental infections and procedures
- Trauma
- Immunodeficiency & HIV disease

Associated conditions

- Allergic Rhinitis
- Asthma
- Bronchitis
- Otitis Media
- Pharyngitis

Pathological Findings

- Inflammation
- Oedema
- Thickened mucosa
- Impaired ciliary function
- Inflammatory metaplasia to *ciliated columnar cells*
- Relative *acidosis and hypoxia within sinuses*

S/S

- Symptoms predictive of acute infection:
  - Preceding URTI symptoms, particularly if seemed to be spontaneously resolving with acute return of symptoms (***"double-sickening"***)
  - History of coloured nasal discharge
  - Unilateral facial pain which is *worse with bending forward or with cough or sneezing*
  - Maxillary toothache
  - Poor response to antibiotics
  - In young children, *URTI symptoms, clear or purulent nasal discharge and persistent cough* **>10-days**
- Other Associated Symptoms:
  - Headache
  - Retroorbital pain

    - Otalgia
    - Hyposomia
    - Halitosis
    - Chronic cough
- Other associated signs
    - Oedematous nasal mucosa
    - Nasal obstruction/polyps
- ***S/S indicating urgency or complications;***
    - Orbital pain
    - Periorbital *oedema or erythema*
    - Visual changes;
        * Visual disturbances, especially *diplopia*
        * Abnormal extraocular movements
    - Facial *swelling or erythema*

O/E

- Purulent rhinorrhea
- Abnormal transillumination
- Seropurulent or mucopurulent exudate may be seen in the;
    * **Middle meatus** *with frontal, anterior ethmoidal & maxillary sinusitis*
    * **Superior meatus** *with posterior ethmoidal or sphenoidal sinusitis*

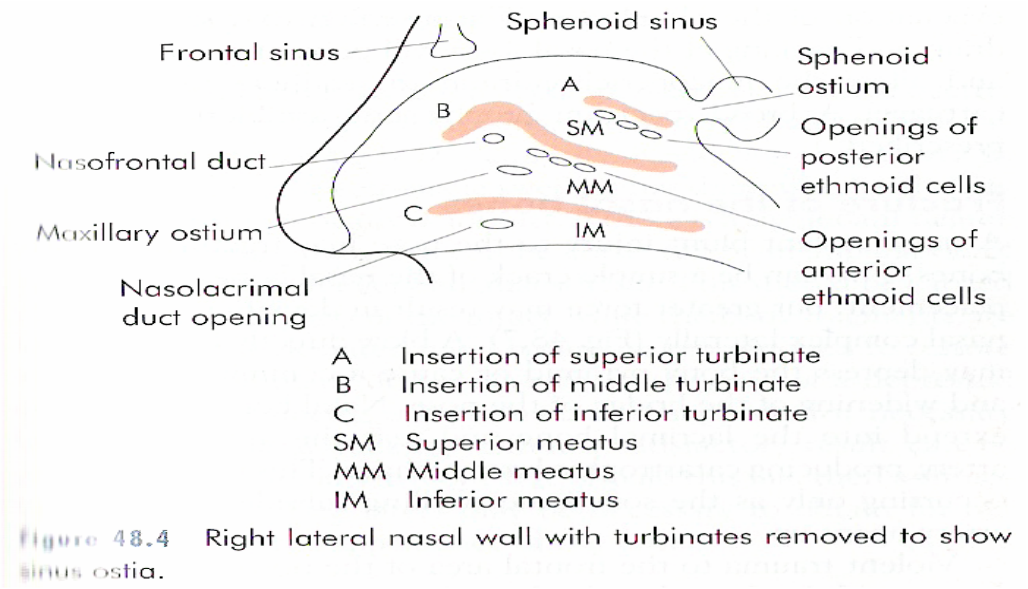


Figure 48.4 Right lateral nasal wall with turbinates removed to show sinus ostia.

DDx

- Viral URTI
- Nasal foreign body
- Dental disease
- Temporomandibular joint disorders
- Migraine, cluster or tension headache
- Temporal arteritis
- Wegener's granulomatosis

Ix

- Nasolaryngoscopy
- Maxillary sinuscopy
- Plain sinus radiographs (*single Waters view may be sufficient*)
    * May be helpful when only 2-3 associated signs and symptoms are present
    * Look for ***air-fluid levels, sinus opacity, mucosal thickening*** (**>6mm** in **children** or **>8mm** in **adults**)
- Limited **coronal CT of sinuses** - Most useful in evaluation of **chronic sinusitis**

Mx

Palliative care;

· Adequate hydration (**8-10 glasses water daily**)

· **Steam inhalation 20-30 minutes TDS** or use of **Facial steamer** - *effectively produces nasal vasoconstriction and promotes drainage.*

· **Saline irrigation or saline nose drops** - *may promote drainage.*

· Sleep with *head of bed elevated*

· Avoid exposure to *tobacco smoke, fumes*

Definitive Mx;

a) Medical;

- **Antibiotics - *Amoxicillin or Septrin*** for **10-14days;** In **chronic sinusitis**, prolonged antibiotic therapy for **4-6 wks** often results in complete resolution.
- **Decongestants -** Useful for ***first 3-5 days***
- **Analgesics -** *acetaminophen, aspirin, NSAIDS, acetaminophen-codeine*

b) Surgery;

If **3 weeks** of medical therapy fails, **irrigation of sinuses** can be performed to wash out the *inspissated mucopurulent material, epithelial debris,* and *hypertrophic mucous membrane* to improve *ventilation and drainage*

Absolute surgical indications:

- Massive nasal polyposis
- Acute complications: *subperiosteal or orbital abscess, frontal soft tissue spread of infection*
- Mucocele or mycopyocele
- Invasive or allergic ***fungal sinusitis***
- Suspected obstructing tumour
- CSF rhinorrhoea

Functional endoscopic sinus surgery (FESS) less invasive and associated with fewer adverse effects

Complications

Local complications;

- Ethmoiditis;
  * Preseptal & Postseptal cellulitis
  * Subperiosteal abscess
  * Orbital cellulitis and abscess formation
  * Cavernous sinus thrombosis.
- Frontal sinusitis;
  * **Osteitis** of the frontal bone (***Pott's puffy tumour***)
- Maxillary sinusitis
  * Cellulitis of the cheek
- Osteomyelitis
- Mucocele

Intracranial complications of sinusitis occur either through;

- Direct extension, as in ***epidural, subdural, and brain abscesses***
- Haematogenous spread, as in ***cavernous sinus thrombosis*** and ***meningitis***

Epistaxis

Aetiology

- **Local**
  - Nasal trauma - *Nose Picking* ***(most common)***
  - Infection
  - Granulomatous disorders
  - Nasal foreign body
  - Tumours
  - Deviation of the nasal septum
  - Juvenile angiofibroma - *Epistaxis + unilateral nasal obstruction*
- **Systemic**
  - Uraemia
  - Hypertension
  - Warfarin therapy
  - Aspirin therapy
  - Arteriosclerosis
  - VWD
  - Leukaemia
  - Hereditary Haemorrhagic telangiectasia (Osler's disease)

Pathogenesis

The most common site of bleeding is from ***Kiesselbach's plexus in Little's area*** *of the* ***anterior*** *portion of the nasal septum*; less often from the lateral nasal wall.

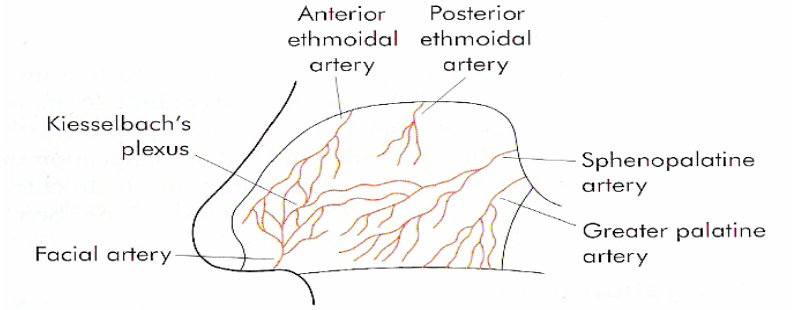


Figure 48.6 Arterial blood supply to the left side of the nasal septum.

In the **elderly**, **arteriosclerosis & hypertension** are the underlying causes of arterial bleeding from the **posterior part of the nose**. The *degeneration of the muscle layer* of small arteries with age & the *gradual replacement with collagen & calcification* hinders post-traumatic vasoconstriction & *prolongs bleeding*

Management

- Treat underlying condition
- Bleeding from **Kiesselbach's plexus** may be controlled by ***$AgNO_3$ cautery*** or ***Electrocautery*** under LA.
- **Posterior bleeding** may require ***Anterior*** **nasal packing** either with ***Vaseline-impregnated ribbon gauze*** or ***Absorbable sponge.***

  KNH;
  - Foley's Catheter
  - Liquid paraffin
  - Bismuth Iodoform Paraffin Paste Packs (BIPPPs)
  - Zinc Iodoform Packs (ZIPs)

  The packing is usually kept in place for **48hrs** & the patient is commenced on a **broad-spectrum antibiotic.**

  Alternatives to **anterior packing;**
  - Use of an **inflatable epistaxis balloon catheter** passed into the nose & the distal balloon inflated in the nasopharynx to secure it & the proximal balloon, which is sausage shaped, is then inflated within the nasal fossa to compress the bleeding point.
  - **Posterior nasal packing** may be required which involves inserting a gauze pack into the **nasopharynx under GA**.
  - Endoscope-assisted ***electrocautery*** *or* ***clipping*** *of a posterior bleeding point.*
- In those with **chronic epistaxis**, ***vasoconstrictor nasal sprays***
- In uncontrolled, life threatening epistaxis, when the above methods have proved ineffective, haemostasis is secured by ***vascular ligation*** at;
  - **Anterior & Posterior ethmoidal** arteries
  - **Sphenopalatine** artery under endoscopic control
  - ***Internal maxillary*** *artery* in the *pterygopalatine fossa* (**Greater Palatine** artery)
  - ***External carotid*** *artery above the origin of the lingual artery* (**Facial** artery)

Complications

- Sometimes **hypoxia** can be induced by nasal packing & may be exacerbated in patients with *obstructive airway disease.*

Tracheostomy

Emergency Airway Procedures

i) Tracheostomy
ii) Cricothyroidotomy
iii) Endotracheal Intubation - *Fiberoptic or Laryngoscopic*
iv) Laryngeal Mask Airway
v) Percutaneous Dilator Tracheostomy - *Use of bronchoscopic control (to prevent going into the oesophagus), trochar, cannula & dilators to insert tube.*
vi) Transtracheal Ventilation

Tracheostomy

Indications

- *Acute* upper airway obstruction (*from nose to vocal cords*);
  - Inhaled foreign body
  - Acute pharyngolaryngeal infections in children e.g. *epiglottitis, croup*
  - Malignancies e.g. *Nasopharyngeal, Larynx Ca*
  - Neurological lesions - *Injuries to the recurrent laryngeal nerve*
  - Neuromuscular disease - *Polio, GBS*
- *Potential* upper airway obstruction;
  - After major surgery involving the *oral cavity, pharynx, larynx or neck*
- Protection of the *lower* airway;
  - *Protection against aspiration of saliva* by separation of the larynx from the pharynx with a cuffed tracheostomy tube in *unconscious patients*, *faciomaxillary injuries, bulbar poliomyelitis or tetanus*
  - Facilitate *tracheobronchial toilet & prevent aspiration* in *patients with a depressed cough reflex*;
    * GBS, Polio
    * Chest Injuries, Flail chest
    * Stroke
- Patients requiring *prolonged artificial respiration* (**>3wks**);
  - "Prolonged" mechanical ventilation is an indication for **elective tracheostomy** - A reasonable approach is to continue endotracheal intubation in most mechanically ventilated patients for **7-10 days** and consider tracheostomy if weaning and extubation are *not likely within the* ***next week.***
  - Trauma
  - Neurosurgery
  - Drug overdose

Types

** The time to do a tracheostomy is when you first think it may be necessary*

a) **Emergency** - LA, GA or None
b) **Elective** - LA or GA

Procedure

i) Place patient in the supine position, with padding placed under the shoulders & the neck is extended & kept as steady as possible in the midline - ***children's*** *heads should* ***not be overextended*** as it is possible to enter the trachea in the *5th & 6th* rings under these circumstances.

ii) Inspect & palpate the neck to assess the laryngotracheal anatomy

iii) Optional;
- Laryngoscopy
- Tomography of the larynx & upper trachea

iv) Inject local anaesthetic;
a) *Below* the thyroid cartilage
b) Cricoid cartilage
c) Midline to suprasternal notch

v) Divide the trachea into 3;
- Upper ⅓ - Injury to the *cricoid cartilage* leads to *subglottic stenosis*
* **Middle ⅓ -** ***Most appropriate***
- Lower ⅓ - Presence of **major vessels** leaving the chest & the **Apices of the lungs**

vi) Incise;
a) *Transverse;*
- *Elective* tracheostomy
- Cosmetically desirable

b) *Vertical;*
- *Emergency* tracheostomy
- Children

vii) Do blunt dissection to expose the trachea - *Layers of the neck;*
a) Skin
b) Subcutaneous fat
c) Platysma
d) Superficial fascia
e) Strap muscles of the neck
* Sternocledomastoid
* Sternothyroid
* Sternohyoids
* Omohyoids

f) If there is a thyroid ishthmus, **displace** it up or **transect** it.
g) Pre-tracheal fascia
h) Trachea

viii) Inject local anaesthetic into the lumen of the trachea *to reduce the cough reflex*

ix) Incise the **2nd - 4th tracheal ring**; *Avoid the 1st ring* to reduce risk of injury to the cricoid cartilage & in *babies,* palpate for the tracheal rings *to rule out the common carotid;*

a) **Vertical incision**;
- Emergency tracheostomy
- Children

b) **Cruciate incision** - Remove corners to have an oval opening

c) **Björk flap** - The inferiorly based flap is begun at its apex with an incision on the superior aspects of the 2nd ring & extends down either side through the 2nd & 3rd rings. The tip of the flap should be stitched to the inferior edge of the transverse skin incision. *Advantage* is that it allows reintroduction of a displaced tube with the minimum of difficulty.

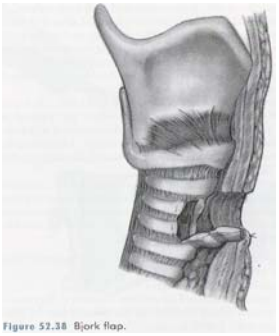


Figure 52.38 Bjork flap.

x) Insert tracheostomy tube;
* Basically made of 2 materials - ***Plastic or Silver***
* A **cuffed tube** is used initially to prevent blood from trickling into the lungs, which may be *changed after* ***at least 48hrs*** to a **non-cuffed** plastic or silver tube to allow tract formation.
* **DO NOT** use a cuffed tube *in children* because they have a lot of connective tissue that leads to a lot of oedema if used; instead, *put a throat peg* around the tube inlet. Size - (**Age/4)+4mm**

oedema if used; instead, *put a throat peg* around the tube inlet. Size - (**Age/4)+4mm**

* **Females - 7 - 8.5mm** (internal diameter)
* **Males - 7.5 - 10mm**
* Always have **2 tubes**, *an **Estimate** & a **size smaller***

xi) Inflate cuff & monitor pressure carefully so as not to occlude circulation in the mucosal capillaries

xii) When in position, the tube should be retained by **double tapes** passed around the patient's neck, with a reef knot on either side. It is important that the patient's head be **flexed** when the tapes are tied, otherwise they may become slack when the patient is moved from the position of extension, thereby resulting in a possible displacement of the tube if the patient coughs. Alternatively, the flanges of the plastic tube may be **stitched** directly to the underlying neck skin.

Post-op Management

- A warm well ventilated room
- Position of the tube & patient - *Propped-up*
- Humidification (± oxygen) - *Thermovents; Moist cloth over tracheostomy*
- Suction - *as often as required*
- Cover with antibiotics
- Spare tube, introducer, tapes & tracheal dilator at bedside
- For cuffed tubes, **deflate** *for **15mins every 2hrs***; Keep **inflated** during ***feeding & suctioning***
- Change of tube, inner tube, possible speaking valve - *Done after at least **48hrs** post-op to allow for **tract formation.***
- Physiotherapy
- Provide paper & pen for communication

Complications

Intra-op;

- Anaesthetic complications
- Haemorrhage
- Injury to paratracheal structures, particularly the ***carotid artery & recurrent laryngeal nerve & oesophagus***
- Damage to the trachea

Early Post-op;

- Infection
- Haemorrhage - **Reactionary (2°) haemorrhage** if **>24hrs** Post-op
- **Apnoea** caused by a **fall in PCO_2**; Patients are dependant on the hypoxic drive thus if Oxygen tension rises, respiration falls thus *avoid* giving 100% O_2; *Recommended - **95% O_2 : 5% CO_2.***
- *Subcutaneous emphysema, pneumomediastinum & pneumothorax*
- Obstruction of the tube;
    * Accidental extubation
    * Anterior displacement of the tube
    * Obstruction of the tube lumen
    * Tip occlusion against the tracheal wall.
- Swallowing dysfunction

Late Post-op;

- Difficult decannulation
- Fistulae;
    * Tracheocutaneous
    * Tracheo-oesophageal
    * Tracheoinnominate artery fistula *with severe haemorrhage*
- Sepsis
- Tracheostomy dependence ***especially in children***
- Kelloid formation
- Subglottic stenosis ***especially in babies*** with small tracheas & movement of tube induces an inflammatory reaction
- Narrowing
- Permanent stoma

Death may be due to;

- Accidental decannulation
- Obstruction
- 1° disease

Indication for Permanent Tracheostomies;

- Advanced carcinoma of the larynx
- Obstructive sleep apnoea syndrome
- Severe stricture of the trachea/larynx ***not*** surgically amenable
- Bilateral vocal cord paralysis
- Myasthenia gravis
- Severe emphysema

Cricothyroidotomy

Indications

- Suspected unstable cervical spine fracture
- When endotracheal intubation is not possible

Procedure

i) The patient's neck is extended & the area between the prominence of the thyroid cartilage & the cricoid cartilage below is palpated.

ii) In the emergency situation, a **vertical** skin incision is recommended, with dissection rapidly carried down to the cricothyroid membrane.

iii) A **1cm transverse** incision is made through the membrane immediately above the cricoid cartilage & the scalpel is twisted through a right angle to gain access to the airway.

iv) It should be **converted** to a tracheostomy **within 4hrs**

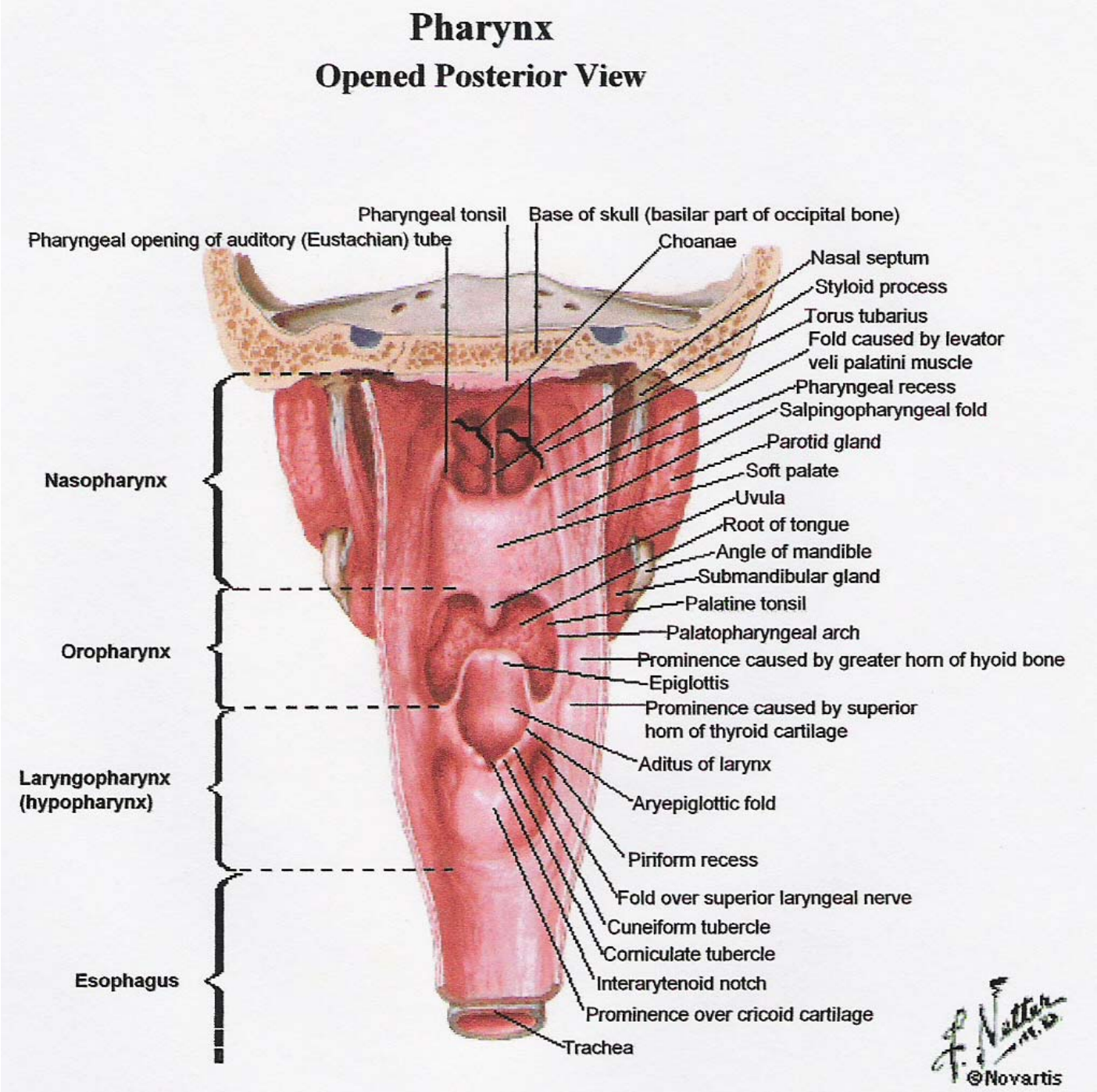
Complications

- Subglottic stenosis
- Long-term voice changes

Advantages of tracheostomy & cricothyroidotomy

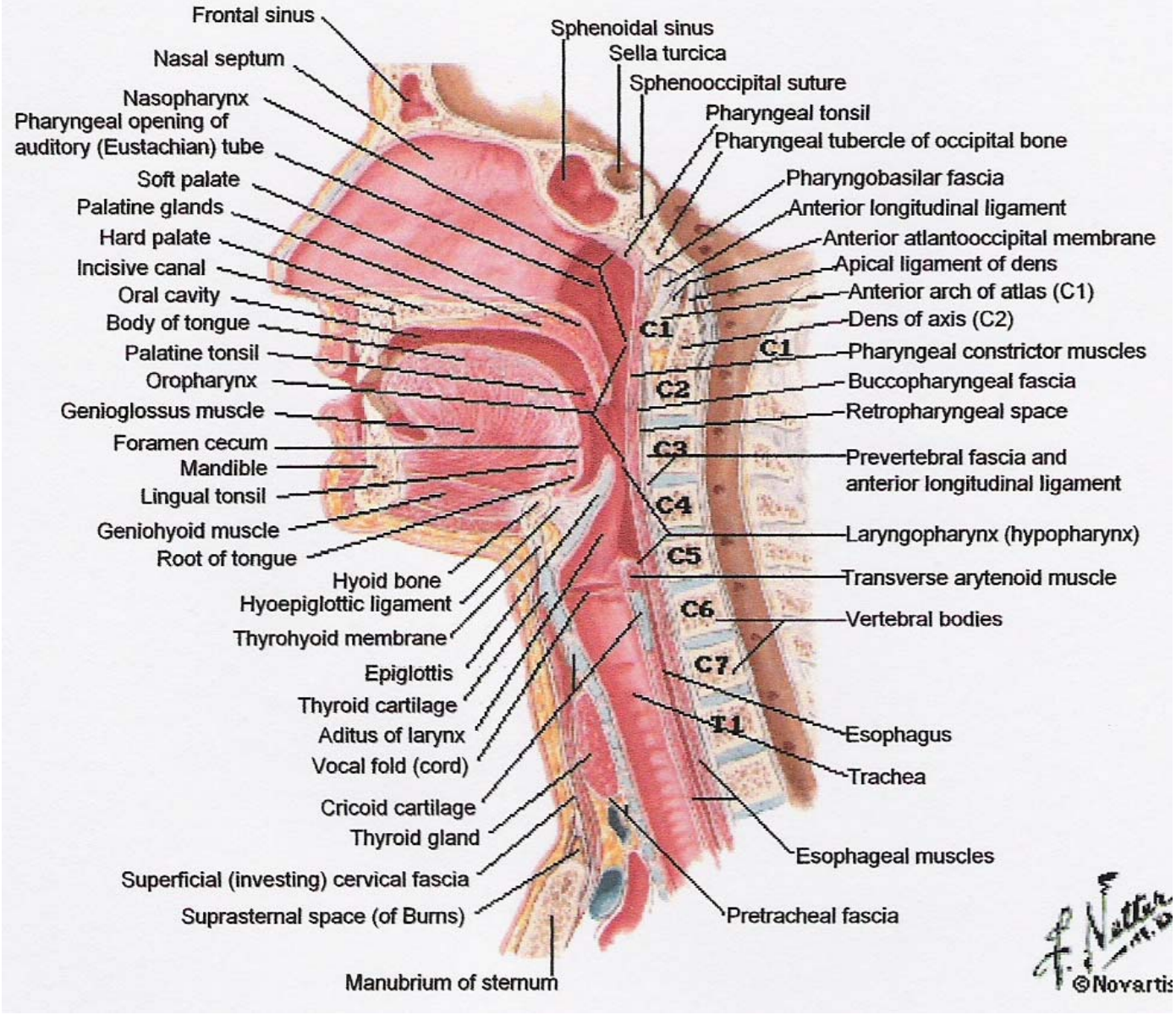
- The **anatomical dead space** (*Mouth to trachea*) is ***reduced*** by approximately **50%**
- Have **less resistance to air flow** as compared with endotracheal tubes
- The **work of breathing** is ***reduced***
- **Alveolar ventilation** is ***increased***
- The *level of sedation* needed for patient comfort is ***decreased*** &, unlike endotracheal intubation, the patient may be able to ***talk & eat with the tube in place.***
- *Tracheostomy tubes* also are ***more easily changed*** when necessary

Nasopharyngeal Carcinoma



Pharynx

Sagittal Section



Malignant tumours of the nasopharynx

- SCC - **71%**
- Lymphomas (NHL - 95%)- **18%**
- Others - 11%
    - Adenocarcinomas
    - Plasma cell myeloma
    - Melanoma
    - Rhabdomyosarcoma
    - Fibrosarcoma

Squamous Cell Carcinoma

3rd commonest in Kenya
M:F - **3:1**
Race - Common in the Chinese
Predominant age

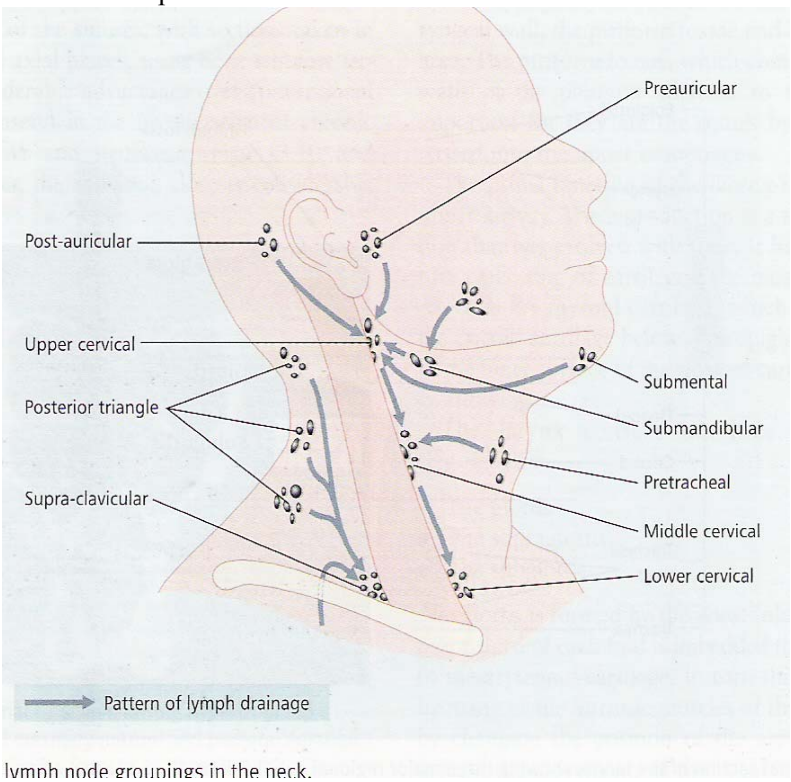
- **10-15yrs** - EBV type 2 & 3 (Especially ***Anaplastic** SCC*)
  - HLA A2
- **50yrs** - ***Environmental factors;***
    * Nitrosamines from dried fish
    * Household smoke - *Contains polycyclic hydrocarbons*
    * Vitamin C deficiency - *Vitamin C prevents nitrosification of amines.*
    * Chronic nasal sinus infection
    * Poor hygiene
    * Tobacco consumption

Histopathology

- **Keratinizing** SCC - Well differentiated
- **Non-Keratinizing** SCC - Moderately differentiated/*Transitional cell*
- **Anaplastic** - Poorly differentiated - *Lymphoepithelioma*

Tumour Spread

- **Direct - 70%** arise from the **Fossa of Rossenmuller**; Also ***Posterior(25%) & Superior wall***
- **Lymphatic** - 1st area of spread is to the ***node of ranvier*** in the retropharyngeal space
    - Level I - Submental & Submandibular
    - **Level II - Upper ⅓ Jugular (**cervical**) nodes**
    - Level III - Middle ⅓ " " "
    - Level IV - Lower ⅓ " " "
    - Level V - Posterior triangle
    - Level VI - Suprasternal notch



lymph node groupings in the neck.

- **Haematogenous** - To the ***retropharyngeal & prevertebral areas (*lumbar *vertebrae)***; Also; *Lungs, Liver,*

Brain, Skeletal structures & Kidneys.

- **? Neuronal spread** - ***Adenocarcinoma***

S/S

- Nasal S/S
  - Rhinorrhoea
  - Epistaxis
  - Nasal Blockage
  - Nasal mass/Neck Mass
- Eustachian tube malfunction;
  - Otalgia
  - Otorrhoea
  - **Persistent unilateral serous otitis media/CSOM**
  - Vertigo
  - Hearing loss
- CNS;
  - Headache
  - Cavernous sinus thrombosis -(CN III, IV, VI) II laterally & Ophthalmic branch of V
  - SOL
- Orbital spread - *Proptosis & CN II compression*
- Parapharyngeal space spread;
  - Sympathetic ganglion - *Horner's syndrome*
  - CN X - Vagus nerve - *Dysphagia*
  - CN XI - Hypoglossal Nerve
  - CN XII - Accessory nerve - *Winging of scapula*

Ix

- Direct Laryngoscopy
- Rigid Nasopharyngoscopy + Biopsy Fossa of Rossenmullaer (*If cancerous this makes it worse thus **FNAC first***)
- EUA + Biopsy
- X-Ray;
  - Skull base to view foramen ovale
  - PNS fullness
  - Structure deviation
  - Bone erosion
- CT Scan
- MRI
- EBV Immunology - *IgA for viral capsid - Can be used for screening.*

TNM Staging

T_0 - No evidence of primary tumour
T_{is} - Pre-invasive carcinoma or carcinoma in situ
T_1 - Tumour in *PNS*
T_2 - Tumour in *Nose &/or Oropharynx*
T_3 - Tumour spread to the *bony structures of the nose*
T_4 - Tumour *outside the nasopharynx or CN involvement*

N_0 - No evidence of regional LN involvement
N_1 - Unilateral LN **<6cm**
N_2 - Bilateral LN **<6cm**
N_3 - LN **>6cm** or in the **Supraclavicular** space

M_0 - No ,evidence of distant metastasis
M_X - Minimal requirements to asses distant metastasis cannot be met
M_1 - Evidence of distant metastasis

Mx

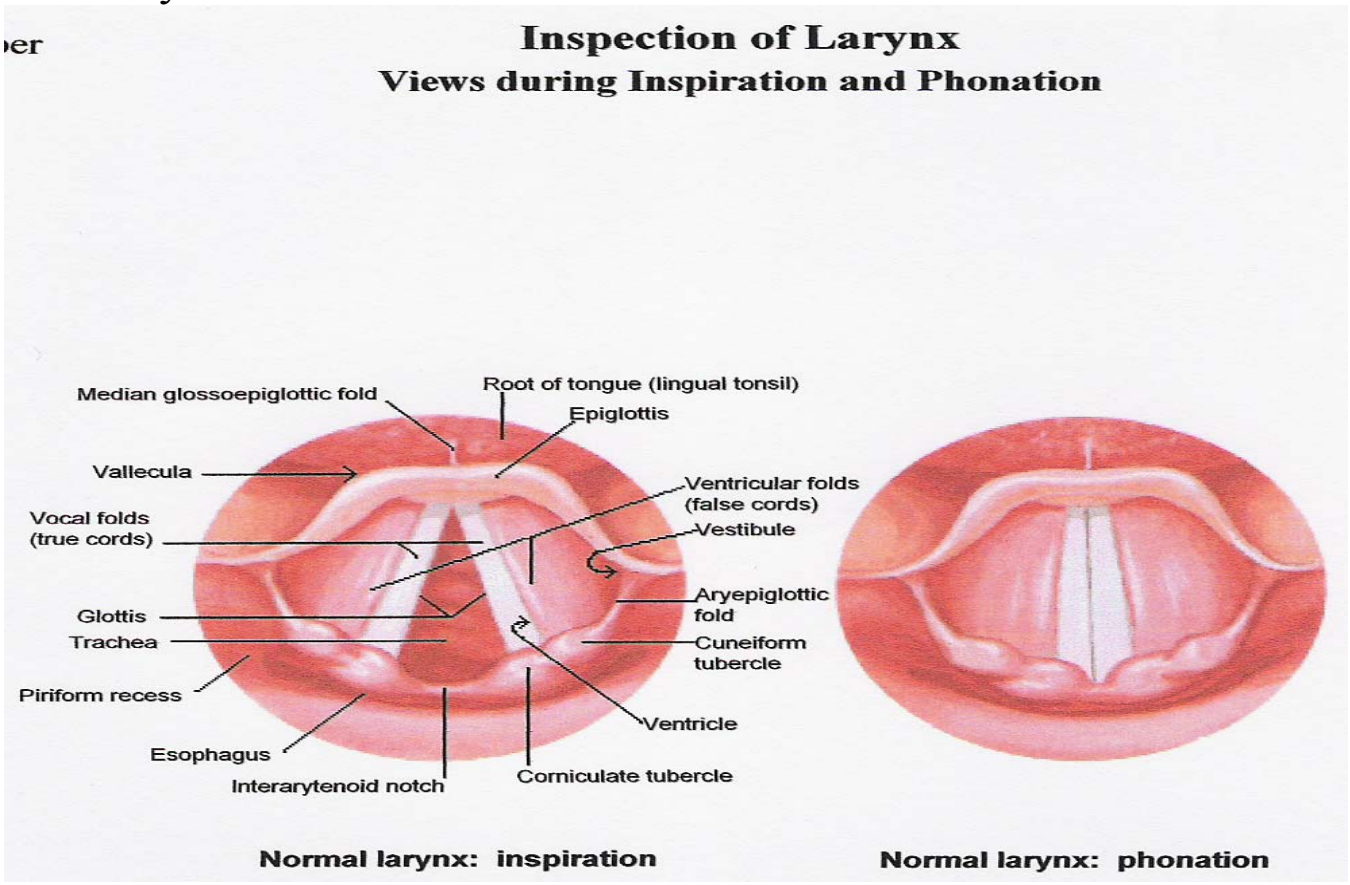
- **$T_{1,2}$ N-** ***Radio****therapy*
- **$T_{3,4}$ -** ***Chemoradio****therapy* (**Cisplatin + 5FU**)
    * Cisplatin - *Neurotoxic*
    * 5FU - *Myelosuppresion*
- ***Surgery;***
    - *Residual nodes* when 1° tumour has been controlled - ***Neck dissection***
    - *Residual small tumours* or Resistant tumours - ***Nasopharyngeal or Cranial Approach***
- Brachytherapy - Use of small radioactive implants
- ? Immunotherapy - *Plasmapheresis, High IgG titres* against EBV
- ? Vaccination against EBV

Prognosis

- Depends on;
    - Age
    - Response to therapy
    - Stage
- Death is due to;
    - Nutritional loss
    - Cachexia
    - Carotid blow out during radical neck dissection.

CA Larynx

Anatomy



Supraglottis;

- Epiglottis (tip & Laryngeal surface)
- Aryepiglottic folds
- Arytenoids cartilages
- False vocal cords (ventricular bands)
- Laryngeal ventricles

Glottis;

- Free margins & upper surface of both vocal cords
- Anterior commissures
- Posterior commissures

Subglottis;

- From *under surface of the vocal cords* to the *inferior border of the cricoid cartilage*

Malignant tumours of the larynx;

- **SCC - 90%**
- Verrucous carcinoma - 5-10%
- Adenocarcinoma
- Basal Cell carcinoma

Squamous Cell Carcinoma

2% of all neoplasms
Incidence - 3-10/100,000
M:F - **6-32:1**
Age - **>45yrs**

Aetiology;

Unknown but associated with;

- Smoking
- Alcohol
- Environmental pollutants e.g. *asbestos*
- Radiation
- GERD
- ? Racial predilection

C/P

- ***Progressive*** & unremitting dysphonia for **>2wks**
- ***Stridor*** *if tumour is* ***above*** *cords* or ***Wheezing*** *if* ***below*** *cords*
- **Dysphagia**
- Pain
- Dyspnoea
- Cough & irritation
- Haemoptysis
- Anorexia, cachexia & fetor oris
- Neck swelling

O/E

Examination of the neck;

- Laryngeal swelling, widening, & crepitus
- Thyroid gland - *exclude invasion*
- Cervical LNopathy

Laryngoscopy - *Growth, thickening of the vocal cords, ulceration, inflammation, vocal cord mobility;*

- Indirect (mirror)
- Direct (Laryngoscope)
- Rigid (stroboscopy)
- Flexible fibre optic

Ix

- EUA + Biopsy
- CXR - *Metastases*
- CT scan of larynx & neck
- U/S/MRI - *neck nodes*

Sites & Spread;

- *Supra*glottis - **25%**
  - Direct - to the ***pre-epiglottic space*** because the epiglottic cartilage is like a sieve with small channels
  - Lymphatic - Level ***II*** ± ***III*** cervical nodes
- ***Glottis - 70%***
  - Direct - *Anterior commisure to thyroid cartilage*
    Lateral muscle infiltration leading to *vocal cord paralysis*
  - Lymphatic - In advanced stages
- *Sub*glottis - **5%**
  - Lymphatic - *Tracheal nodes* distally to the *upper mediastinal nodes*

Distant metastases;

- **Lungs - *commonest***
- Skeletal system - *lumbosacral spine & ribs*
- Heart

TNM Staging

T_0 - No evidence of primary tumour
T_x - Minimal requirements to asses the tumour cannot be met
T_{is} - Pre-invasive carcinoma or carcinoma in situ
T_1 - Tumour **confined to region (**Glottis, Supraglottis, Subglottis**)** with **normal vocal cord mobility**
T_2 - Tumour **extension to adjacent regions** &/or **evidence of deep infiltration** with **normal or impaired vocal cord mobility**

* *Supraglottis → glottis*
* *Glottis → supraglottis or subglottis*
* *Subglottis → glottis*

T_3 - Tumour confined to the larynx with **fixation of one or both vocal cords**
T_4 - Tumour **outside the larynx**

N_0 - No evidence of regional LN involvement
N_x - Minimal requirements to asses the regional LN cannot be met
N_1 - Single Ipsilateral LN **<3cm**
N_2;
A - Single Ipsilateral LN **3-6cm**
B - Multiple Ipsilateral LN **<6cm**
C - Bilateral or Contralateral LN **<6cm**
N_3 - LN **>6cm**

M_0 - No evidence of distant metastasis
M_X - Minimal requirements to asses distant metastasis cannot be met
M_1 - Evidence of distant metastasis

Mx

No treatment;

- Retrospectively - Patients with Ca larynx but who die of other disorders
- In whom the disseminated tumours cause death without the 1° or regional disease causing symptoms
- With other debilitating or lethal disorders
- Presenting in extremis

T_1 & T_2 - *Radiotherapy* (30 courses**)**

T_3 & Early T_4 - *Surgery* + *Radiotherapy;*

- Sx - ***Total laryngectomy*** *(up to **2-3** tracheal rings)* **+ *Neck dissection*** - Heals in **6wks**

Late T_4 - Palliation;

- Pain relief employing ***radiation, surgery &/or chemotherapy***
- *Tracheostomy* to relieve airway obstruction

Rehabilitation;

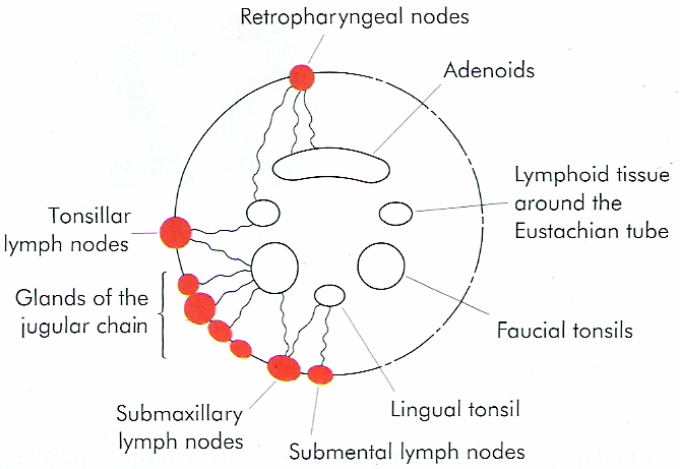
- Voice training
- Swallowing
- Avoid swimming & dry dusty environments

Tonsils & Adenoids

Anatomy

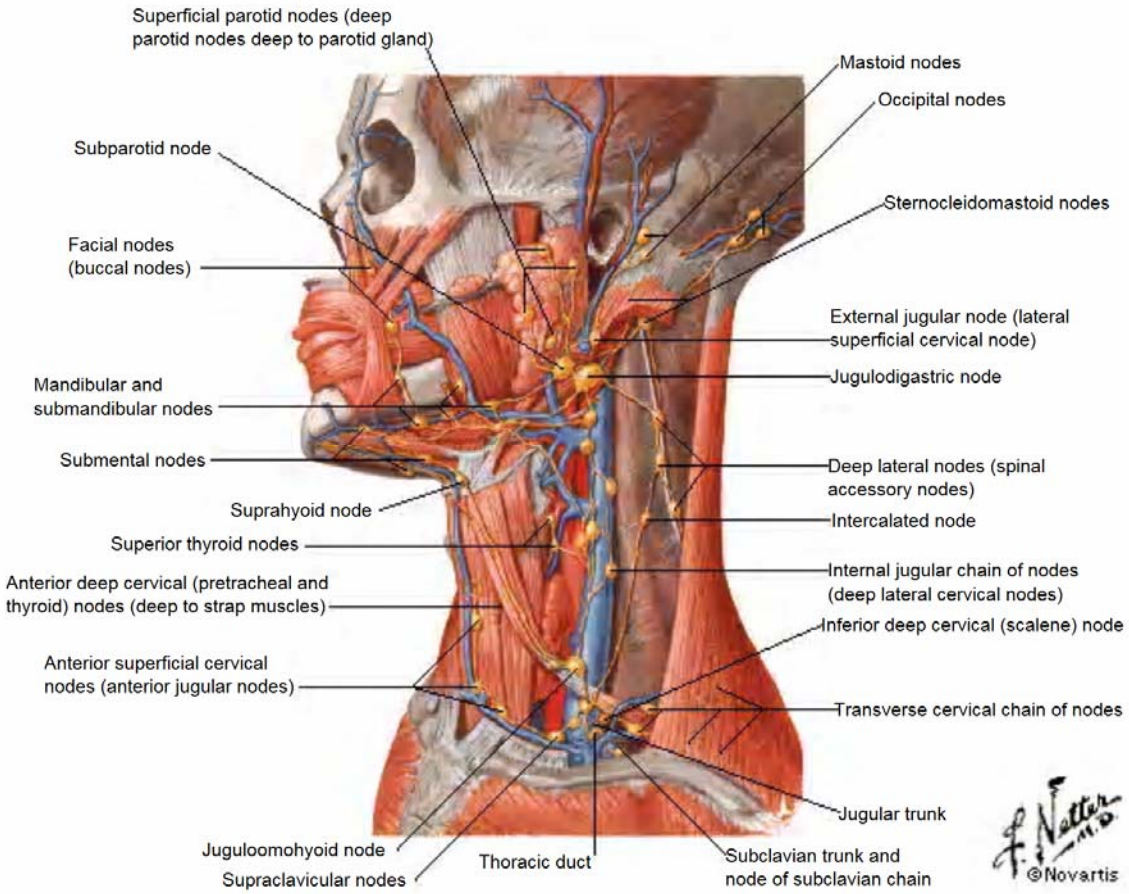
A tonsil is any collection of lymphoid tissue with **no afferent** vessels but **has efferents** (cf Lymph node - has both)
There are **three** main groups of lymphatic tissue in the head and neck;

i) **Waldeyer's ring**



a) **Lingual tonsils** - Lie at the base of the tongue just anterior to the epiglottis
b) **Palatine tonsils** - embedded in the lateral wall of the oral pharynx on either side between the pillars of the fauces.
c) **Tubal tonsils** (eustachian tonsils) - At the pharyngeal opening of the eustachian tube
d) **Pharyngeal tonsils** - on the posterior wall and roof of the nasopharynx, the **hypertrophy** of which constitutes the morbid condition called **adenoids**

ii) **Transitional lymphatics** (*submental, submandibular, parotid, retroauricular, and occipital nodes*)



iii) **Cervical lymph nodes** (*internal jugular chain, spinal accessory chain, supraclavicular area*).

Tonsillitis

Acute inflammation of the ***Palatine tonsils***, usually due to **streptococcal** or, less commonly, to *viral infection.*

C/P

- Sore throat and pain, most *marked when swallowing* and often *referred to the ears*
- High fever, malaise, headache, and vomiting are common.

O/E

- The tonsils are ***oedematous and hyperaemic***. There may be a ***purulent exudate*** from the crypts and a ***white membrane*** - *thin, nonconfluent, and confined to the tonsil - that peels away* ***without*** *bleeding.*

DDx

- **Diphtheria** - the *membrane is* ***dirty grey***, ***thick***, and tough; it ***bleeds*** if peeled away, and smear and culture show Corynebacterium diphtheriae.
- **Vincent's angina** (trench mouth) - characterized by superficial, painful ulcers with erythematous borders, is caused by a *fusiform bacillus* and a *spirochete* that are demonstrable on smear.
- **Infectious mononucleosis** - associated with ***micropetechiae*** of the ***soft palate***; atypical lymphocytes on smear and a positive ***monospot test*** confirm the diagnosis of mononucleosis.

DDx for enlarged tonsils;

* Infection
* Swelling in the *tail of the parotid*
* Swellings in the *parapharyngeal space*

Ix

- A **lateral neck XR** - Useful in assessing the size of adenoids and tonsils and also in differentiating *croup from* ***epiglottitis,*** the latter being associated with the **"thumbprint"** sign.
- **Fiberoptic nasopharyngoscopy**
- When episodes of ***hypopnoea or obstructive apnoea, poor weight gain, or clinical signs of cardiac disease*** are present, a **CXR & ECG** should be obtained.

Mx

Medical;

- For **viral** tonsillitis, ***symptomatic*** therapy
- **Streptococcal** tonsillitis - ***Penicillin V for 10days***

Surgical;

Tonsillectomy - Removal of the **Palatine tonsils -** Indications (± adenoidectomy);

i) Persistent or recurrent infections;
   - **≥ 4** documented **S pyogenes** infections **per year**
   - A documented ***S pyogenes carrier state resistant to medical therapy***
   - **≥ 6** tonsillitis episodes **per year** or **≥ 5** per year for **2 years**.

ii) Pulmonary conditions;
   - Chronic hypoxia related to upper airway obstruction
   - Hypopnoea-obstructive sleep apnoea

iii) Orofacial conditions;
   - Swallowing disorders
   - Speech abnormalities
   - Mandibular growth abnormalities
   - Dental malocclusion
   - For access to posterior structures in surgery e.g. *of an elongated styloid process or CN IX*

iv) Growth on tonsil

v) Impairment of normal functioning

Complications

- Chronic hypoxia related to upper airway obstruction can result in signs of right heart failure (**cor pulmonale**) or **pulmonary hypertension.**
- **Obstructive sleep apnoea syndrome**

Adenoids

The **Pharyngeal tonsils** are normally small at **birth** (***2-3 cm***), ***grows until*** child reaches ***adolescence***, and ***then*** begins to ***atrophy*** slowly.

C/P

- Purulent rhinorrhea.
- Impaired taste or smell
- Hyponasal voice
- Cough
- Mouth breathing
- Snoring
- Sleep apnoea
- Earache
- Otitis media
- Chronic sinusitis
- Headache
- Restlessness

Complications of Adenoids;

- Obstruct the upper airway
- Alter normal orofacial growth - **Adenoidal facies;**
    * Dull stupid expression - The *face is pinched* and the *maxilla narrowed* because the moulding pressures of the *orbicularis oris and buccinator muscles* are *unopposed by the tongue*
    * Periorbital oedema
    * High arched palate
    * Dental malocclusion
    * Mouth breathing
- Interfere with *speech, swallowing, or auditory tube function*

Indications for adenoidectomy ± tonsillectomy include;

- *Eustachian tube obstruction*
- *Recurrent suppurative otitis media*
- *Orofacial conditions* such as mandibular growth abnormalities, dental malocclusion, and swallowing disorders; speech abnormalities;
- *Pulmonary conditions* such as chronic hypoxia related to upper airway obstruction, hypopnoea, or obstructive sleep apnoea;

Complications of Tonsillectomy & Adenoidectomy

- Haemorrhage
- Hypernasal speech

Contraindications to Tonsillectomy & Adenoidectomy

- **Acute Tonsillitis:** An elective T&A should be postponed until acute tonsillitis is resolved. This guideline may prevent super infection of the wound.
- **Short Palate:** Adenoids should **not** be removed in a child with a *cleft palate or submucous cleft palate* because of the risk of aggravating the **velopharyngeal incompetence** and causing *hypernasal speech and nasal regurgitation.* Occasionally, a "modified" adenoidectomy is performed in a child with marked obstructive sleep apnoea who has a submucous cleft palate.
- **Bleeding Disorder**

DDx for Persistent mouth breathing

- Allergic rhinitis
- Nasal polyps
- Nasopharyngeal tumours
- Meningocele or encephalocele herniated into the nasal cavity
- If **unilateral nasal obstruction and epistaxis** occur frequently, ***juvenile angiofibroma*** should be suspected.