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Ear, Nose and Throat

The Official Handbook for Medical Students and Junior Doctors

Students and Foundation Trainees in Otolaryngology (SFO UK)
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Ear, Nose and Throat: The Official Handbook for Medical Students and Junior Doctors

By the Students and Foundation Doctors in Otolaryngology (SFO UK)
Part of ENT UK

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Parotidectomy
Thyroidectomy
Neck Dissection
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Introduction

Preface

ENT makes up a significant part of the clinical practice of general practitioners, paediatricians and emergency doctors although exposure to the specialty is often limited during undergraduate training.

This “E-book” has been written to provide a practical guide to the day-to-day management of common ENT conditions and will be helpful to medical students and junior doctors as well as other clinicians that have exposure to ENT as part of their practice. It has been developed by the Students and Foundation Doctors in Otolaryngology group (SFO UK), which is part of ENTUK. The group aims to provide support for undergraduates in medicine and junior doctors with an interest in ENT. The content is based on a Delphi study that set out what the most important topics should be in an undergraduate ENT curriculum taking in to consideration guidance published in Tomorrow’s Doctors by the General Medical Council guidance.

Congratulations to the authors and to my colleagues on the SFO UK committee for delivering an excellent and novel educational resource. A number of individuals have been instrumental in producing this E-book from conception to production.
These include Alex Yao, Michaella Cameron, Charlotte McIntyre, John Lee Allen and Mamoona Khalid-Raja. I also wish to particularly thank the section editors Andrew Robson, Dheeraj Karamchandani, Roland Hettige, Eamon Shamil, Nimesh Patel & Irfan Syed as well as James Tysome & Victoria Ward (Elf-ENT) for allowing us to use many of their images.

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Foreword

Ear, Nose, and Throat (ENT), or otorhinolaryngology, is an important, interesting and diverse specialty. It covers a wide range of areas from the common, such as tonsillitis, to the highly specialised, including cochlea implantation, congenital airway disease, voice disorders, skull base and facial plastic surgery.

Whether you become a GP or an A&E doctor, you will encounter ENT pathologies in abundance, some of which can be life threatening. Yet, students have limited exposure to the specialty within most undergraduate curricula.

This book complements the national ENT curriculum written by ENTUK. Although not designed to be a comprehensive text, this book aims to provide you with the most important topics that you should know by the time you finish medical school and qualify as a foundation doctor. The book will also prove useful for foundation doctors wishing to refresh and review their ENT knowledge.

Topics are presented systematically in an easy-to-read format suitable for short attachments. Students may also find it useful to use as reference material chapters explaining common medicines, investigations, procedures, and operations specific to ENT.

ENT is a very hands-on specialty and ENT doctors are generally very approachable! So make the most of every opportunity to exude enthusiasm, watch and participate during your attachment!

Professor Anthony Narula
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MA MB BChir FRCS FRCS (Ed)
President of ENTUK (2016)

A Career in Ear, Nose and Throat Surgery

Ear Nose and Throat (ENT) surgery or Otorhinolaryngology offers an exciting and varied surgical career option. It has been described as a ‘cradle to grave’ specialty with a caseload ranging from a baby with hearing loss, teenager with allergic rhinitis to an elderly man with throat cancer. As there is no separate medical companion, ENT surgeons also manage the non-surgical care of their patients. Furthermore, once at registrar level, on calls can be done from home, which can be considered as particularly attractive.

Subspecialties

Head and Neck Surgery
Otology
Skull Base Surgery/Neuro-Otology
Thyroid and Parathyroid Surgery
Rhinology
Facial Plastic Surgery
Paediatrics
Laryngology

Typical working week

4 clinics a week
2 surgical sessions a week
Light emergency work
Multidisciplinary work with other specialties (audiology, speech and language therapist, endocrinologist, oncologists, plastic surgeons, maxillofacial surgeons and dermatologists)

Further Information

- Approach your local ENT team!
- ENT UK: www.entuk.org
- Student and Foundation Trainees in Otolaryngology (SFO UK): http://sfo.entuk.org
- Association of Otolaryngologist in Training (AOT) : www.aot.ac.uk
- Royal College of Surgeons of England: www.rcseng.ac.uk
- British Association of Paediatric Otolaryngology (BAPO): www.bapo.org.uk
- British Rhinological Society (BRS) : www.britishrhinologicalsociety.org.uk
- British Otolaryngology & Allied Sciences Research Society (BOARS) https://www.entuk.org/boars-section
- Intercollegiate MRCS exams: http://www.intercollegiatemrcsexams.org.uk/new

Generic Skills in ENT

General ENT History

Principles of history taking in ENT

Good history taking is an essential skill to be maintained throughout your training. By building a good rapport, you will help the patient feel more comfortable about discussing his/her symptoms. It provides the opportunity to explore a patient's concerns and expectations. After completing a thorough history, you should have a good idea of what the top differential diagnoses could be.

Before starting

- Wash your hands
- Introduce yourself and ensure the patient is comfortable
- Maintain good eye contact and remember the importance of developing good rapport with the patient (and the parents if present)

Structure of history taking

- Presenting complaint (PC) 'How may I help you today?'
- History of presenting complaint (HPC) ' When did this problem begin'
- Enquire about the relevant risk factors and other specific questions relating to the presenting complaint. Do have a targeted list of questions for PCs related to "Ear", "Nose", and "Throat/Head Neck" (For targeted histories, go to the relevant sub sections of this booklet)
- Previous episodes - Severity, response to previous treatment and hospitalisation
- Past medical history (PMH)
- Birth History – Particularly important for ear conditions in children
- Drug history (DH) - Including over the counter medication and vaccinations
- Allergies
- Family History

- Social history (SH) - Do not forget to enquire about the impact that the presenting complaint has had on quality of life
- Systems review - Also enquire on any tendency to bruise or bleed easily

At the end of the history

- Summarise the patient's history to them. Clarify that you understood them correctly and whether there is anything else that they would like to mention.

Ear examination

Before starting

- Gel/wash your hands
- Introduce yourself and ensure the patient is comfortable
- Ask about any pain or tenderness
- The patient should be positioned on the chair and you should place yourself to the side of the patient. In children, positioning is even more important. Children should be sat across the parent/nurses lap, with the side of the head held to the chest by the carer's hand (See Figure 1) Flailing arms can be secured with the carer's other hand. Ideally, aim to examine children as opportunistically as possible and incorporate play as part of the examination.

Figure 1: Correct positioning of a child for ear exam

Inspection

- From the front: note the size, assess symmetry of the pinna. Are there differing degrees of protrusion? Is there an obviously abnormal pinna? For example, see Figure 2.

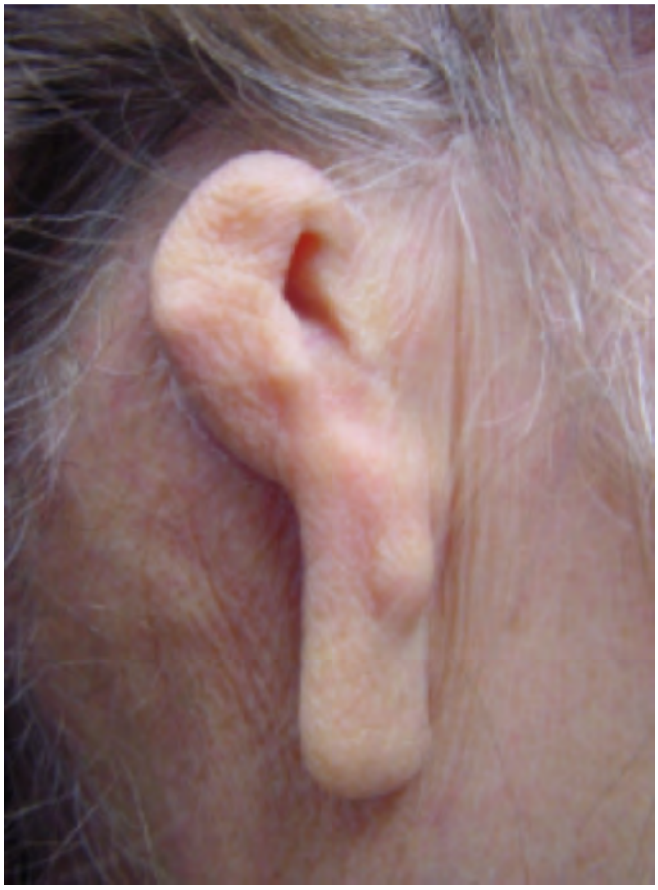


Figure 2: Congenital Microtia of the External Auditory Canal

- Inspect each ear individually - Start with the normal ear
- Pre-auricular - Inspect for scars (previous parotidectomy or middle ear surgery), swelling (infection, parotid tumour), erythema (infection/ inflammation), sinuses, pits, fistulae
- Pinna - Note any signs of erythema, swelling (infection, haematoma) or tenderness
- Post-auricular - Move pinna anteriorly to inspect behind the pinna. Note any post-auricular scars. Acute and/ or painful swelling here suggests infection (mastoiditis or lymphadenitis)
- Examine the other ear. Note any difference.

Otoscopy

- Ensure the otoscope has good magnification and illumination. Use the largest speculum that will fit comfortable in the external auditory canal (EAC)
- Start with the “normal” ear
- Gently pull the pinna upwards and backwards to straighten the ear canal to best visualise the tympanic membrane. In children, pulling the pinna downwards and backwards may provide better visualisation
- Hold the otoscope like a pencil and use your little finger as a fulcrum against the cheek to avoid injury should the patient move suddenly
- Inspect systematically

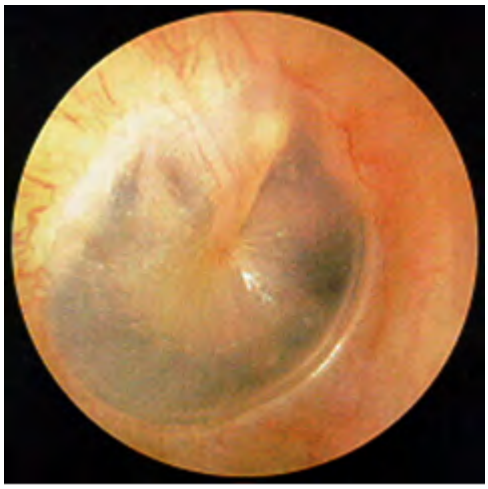


Figure 3: Normal right tympanic membrane

- External auditory canal: Wax or discharge, erythema, swelling (infection, trauma)

- Tympanic membrane (See Figure 3): Is there a normal light reflex in the anteroinferior quadrant? Colour of drum - Normal is greyish & translucent. Pink/red colouring can mean infection/inflammation and white plaques can indicate tympanosclerosis. Position of drum - Retracted (cholesteatoma, infection), bulging (infection), perforation

- Ossicles: The malleus, incus and stapes can be seen sometimes through the tympanic membrane especially if there is a perforation.
- Pneumatic otoscopy can also be used to assess tympanic membrane mobility – this modified otoscope has an air-tight seal when placed in the ear canal and a rubber bulb (similar to that of a sphygmomanometer) which the user can squeeze which alters the pressure within the ear canal

Hearing tests

- These tests include the Pure Tone Audiogram (see Chapter: ENT Investigations - Pure Tone Audiogram).
- Examine a patient's response grossly to your greeting. Can they hear you? Is there a hearing aid being used?

(i) Free field speech testing

- Free field testing is a good screening tool for hearing loss
- Use of masking improves the accuracy of testing: Rub the tragus of the contralateral ear whilst performing this to prevent sound being heard in the contralateral non-test ear
- Use polysyllabic phrase (number or letter) e.g. 'C5', '37' or motivational phrases in children e.g. ball, sweets, crisps
- Test normal ear first. Perform, in order of intensity at 60cm (arms length) and 15cm: whisper, conversational speech, loud voice. Patient should be able to repeat >50% of the letters/numbers correctly.

If he/she can repeat:
Whisper at 60cm – Hearing better than 30dB
Whisper at 15cm – Hearing better than 35dB
Conversational voice at 15cm - Hearing better than 55dB
Loud voice at 60cm – Hearing worse than 75-90dB

ii) Weber's and Rinne's tests

These tests assess air conduction (AC) and bone conduction (BC) and are used to help delineate whether hearing loss is sensorineural (SNHL)or conductive (CHL) in origin.

Weber's test

Figure 4: Weber's test

- Vibrating 512Hz tuning fork applied firmly to the midline of the forehead, apex of head (see Figure 4)
- Ask the patient if he/she can hear a tone in the right ear, left ear or centre of the head
- The "louder" ear may be due to conductive hearing loss in that ear (sound travels through the bone), or sensorineural hearing loss in the other ear
- You can work out which this is by performing Rinne's test.

Rinne's test

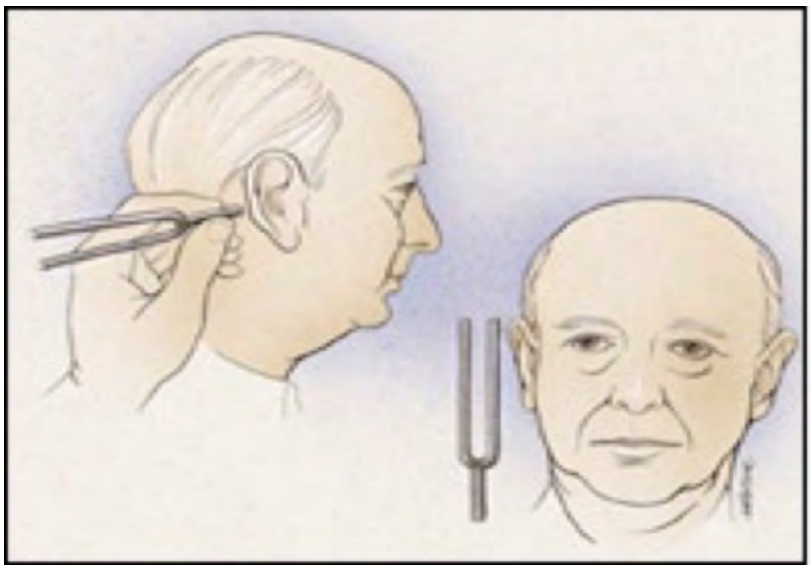


Figure 5: Rinne's test

- Place vibrating tuning fork with base on mastoid process (position 1, testing bone conduction). See Figure 5
- Then move the tuning fork so its prongs are adjacent to (but not touching) the external auditory meatus (position 2, testing air conduction).
- Ask patient to tell you which is louder, when the fork is placed behind the ear or in front of the ear
- Position 2 is louder than position 1 in the normal ear (Positive Rinne), as an intact hearing apparatus of the external and middle ear amplifies sound. When position 2 is quieter than position 1, (Negative Rinne), this indicates external or middle ear disease affecting the air conduction

Interpretation of Weber's and Rinne's test

Weber's	Rinne's	Interpretation
Central	Positive bilaterally. AC>BC	Normal or bilateral SNHL (presbyacusis)
Louder in right ear	Negative right, positive left	CHL right ear
Louder in right ear	Positive right, negative left	SNHL on the left

(AC= Air conduction, BC= Bone conduction, SNHL= Sensorineural hearing loss, CHL= Conductive hearing loss)

Facial Nerve Examination

See “Cranial Nerves Examination” section.

Concluding

- Thank patient
- Wash hands
- In an exam setting, summarise findings to the examiner and mention extra tests that you may wish to perform: Rigid nasendoscopy - Useful to identifying nasopharyngeal pathology e.g. adenoids, carcinoma, Pure tone audiometry and tympanometry.

Nasal Examination

Before Starting

- Gel/wash your hands
- Introduce yourself, ask for permission to examine the patient and ensure they are comfortable. Ensure the examination area is well lit.
- Ask about any pain or tenderness
- Ask if they have had any previous surgery

Inspection

- From the front: shape change, deviation from the midline, symmetry of one side to another, scars, skin changes
- It is often easier to split the nose into thirds when describing shape or deviations, (see Figure 6 and Figure 7).

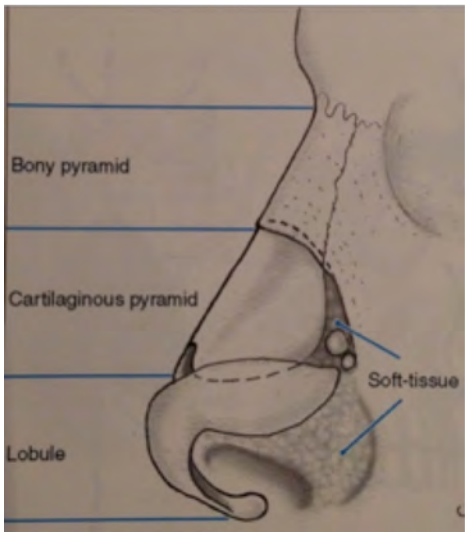


Figure 6: Separation of the nose into bony pyramid, cartilaginous pyramid and lobule. The upper third mostly composed of bony vault, middle third made up of dorsal septum and upper lateral cartilages,

and lower third or nasal tip composed primarily of lower lateral cartilages, septum and soft tissue)

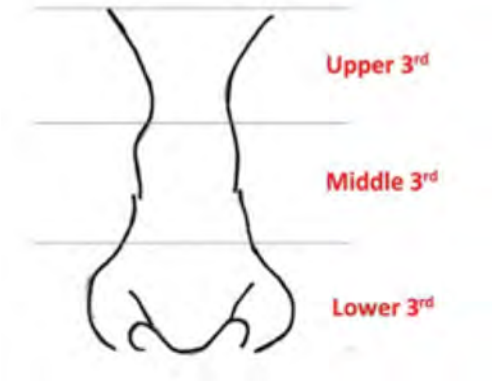


Figure 7: Upper, middle and lower thirds of the nose.

- From the side (the side or dorsal profile of the nose): can comment on shape, hump (protruding bump) or collapse (sunken in), projection (how far the nose sticks out from the face) and rotation of the tip (whether the tip of the nose is pointing up or drooping down). When performing advanced assessment of the nose, e.g for cosmetic analysis, then angles and measurements of the nose in relation to the surrounding face become more important.
- From below – look for symmetry, deviations and scars of previous surgery.

Palpation

- Skin envelope – feel the thickness of nasal skin (thinnest over bone, thicker sebaceous skin over lower nose)
- Tip Recoil – the tip of the nose is pushed in and the degree of resistance is assessed- lack of recoil may indicate lack of tip support

Anterior rhinoscopy

Examine the anterior internal nose with a Thudicum's speculum and headlight (see Figure 8).

How to hold a Thudicum's speculum

Figure 8: How to perform anterior rhinoscopy with a Thudicum's speculum.

The speculum is held from the tip of the index finger of the left hand with the tines facing the patient. The middle finger goes in the front and the ring finger behind, with the thumb pressed firmly on top to support the speculum. The hand is then twisted, and pressure is then used between the middle and ring fingers to open and close the speculum.

The speculum is held like this so the rest of your hand does not obscure your view into the nose. Your contralateral dominant hand is then free to use instruments in the nose should you need to. It is important to ensure your light source is lined up with the nasal cavity.

Look especially for these common pathological findings:

- Septal deviations (see Figure 9)
- Evidence of swelling (rhinitis causing enlarged inferior turbinates, oedema and clear rhinorrhoea- Figure 10)
- Septal perforations (holes in the cartilage – see Figure 11)
- Prominent blood vessels (see Figure 12)
- Polyps in middle meatus/nasal airway (see Figure 13)

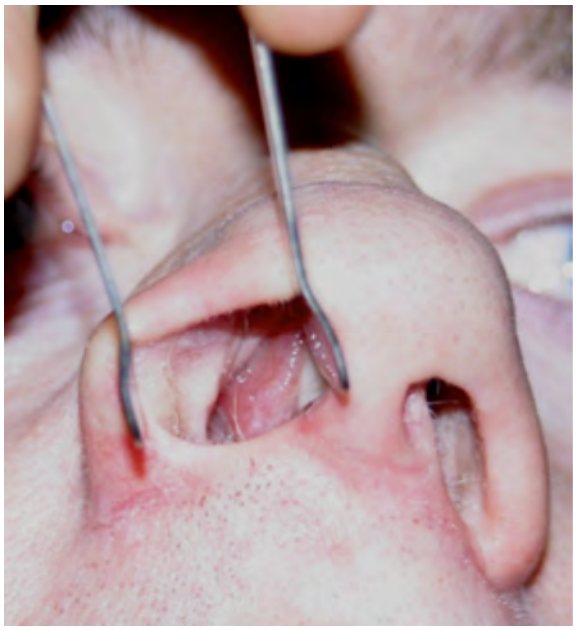


Figure 9: Septal deviation to the right

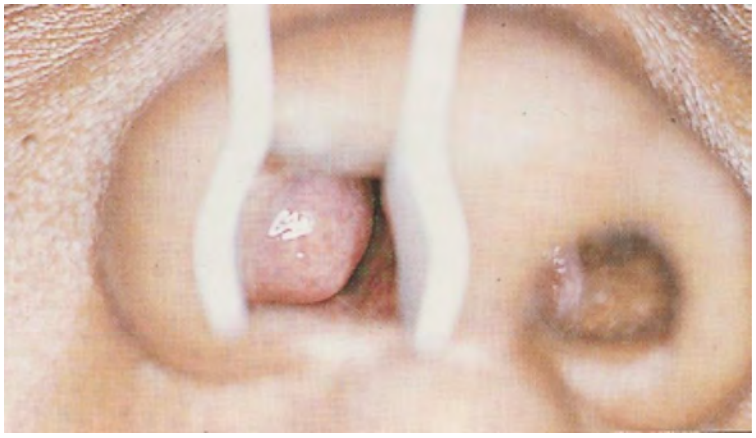


Figure 10: Right Inferior Turbinate swelling due to allergic rhinitis

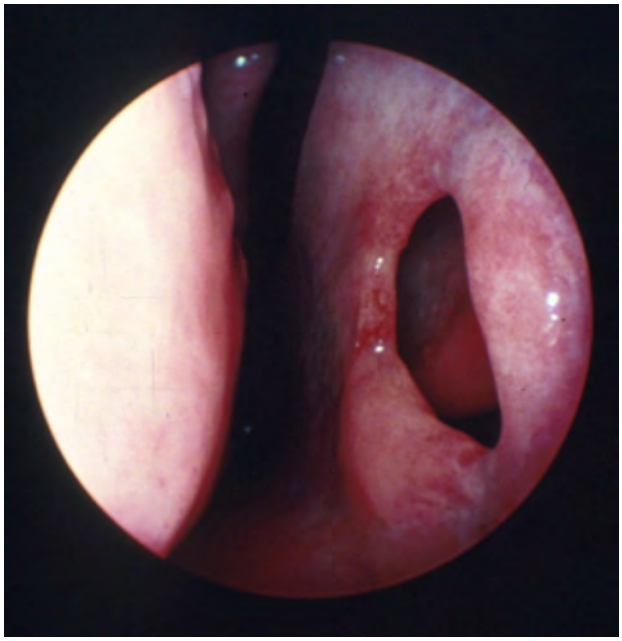


Figure 11: Septal perforation when viewed through the right nasal airway.

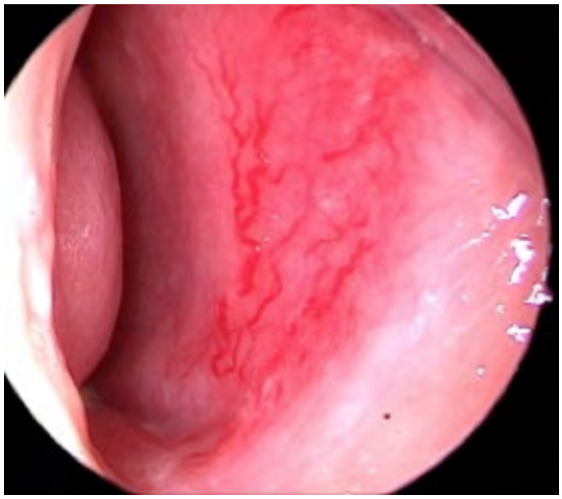


Figure 12: Prominent blood vessels overlying right Little's area (anterior septum)

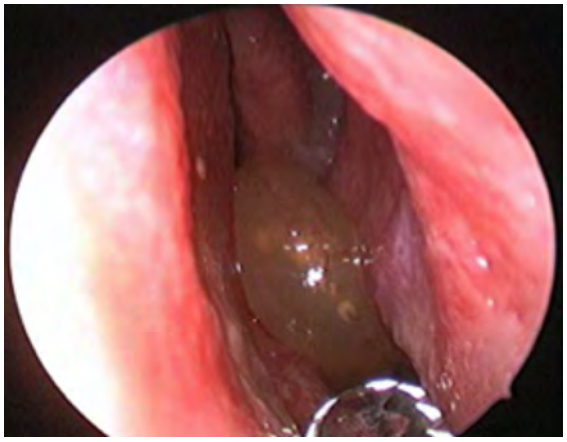


Figure 13: Left-sided inflammatory nasal polyp

Other nasal tests

Nasal misting

Perform nasal misting with a Lack's cold metal tongue depressor (see Figure 14)

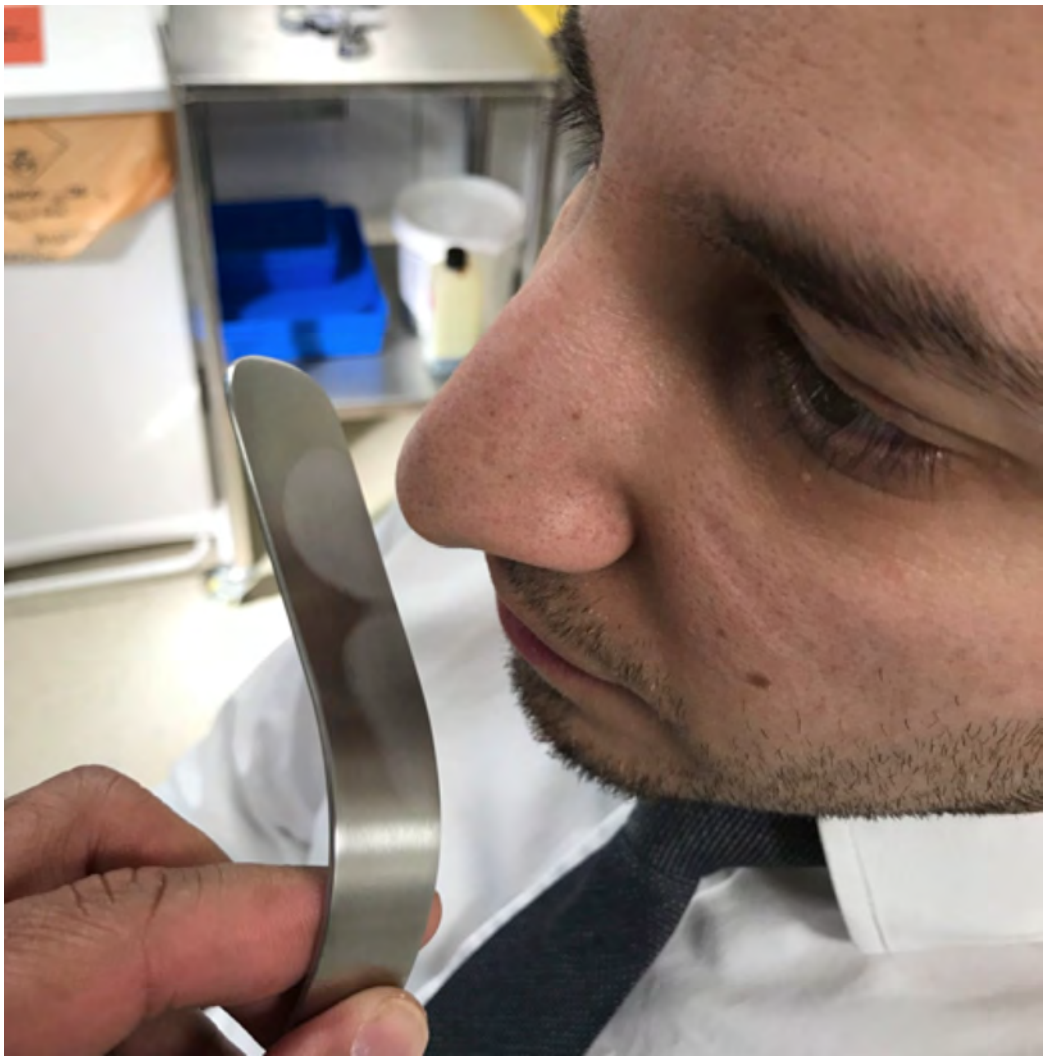


Figure 14: Cold spatula misting test. The humidified expired air creates a mist on the cold metal tongue depressor. Due to its simplicity and lack of invasiveness, it is especially useful to assess bilateral nasal patency in paediatric patients.

Cottles & Modified Cottles Test

Perform Cottle's & Modified Cottle's Test using a Jobson-Horne probe/ear curette for external/internal nasal valve patency +/- alar collapse (Figure 15).

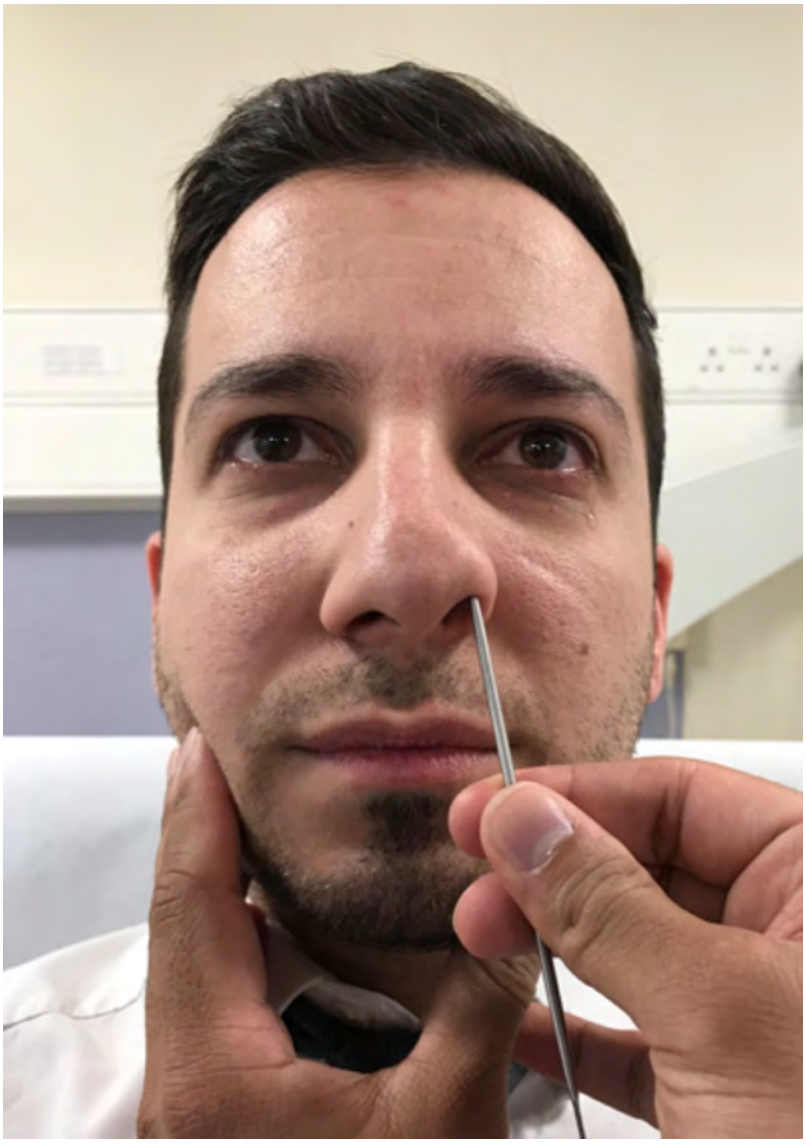


Figure 15: Modified Cottle’s test

Modified Cottle’s Test which involves placing a Jobson Horne probe under the lower end of the upper lateral cartilage and opening out the internal nasal valve (the narrowest point of the nasal airway) which can be narrowed by septal deviations, enlarged inferior turbinates or collapsed nasal cartilages. The original Cottle’s maneuver described pulling the side of the face outwards to try and relieve the nasal obstruction, but this was not always deemed a reliable method of assessment.

Examine the oropharynx

Examine oropharynx with a tongue depressor. Look for posterior cobble-stoning associated with chronic inflammation or infection/post nasal drip or large antro-choanal polyp.

Perform Flexible Nasendoscopy (FNE)
The use of modern flexible endoscopes allows a thorough assessment of the nasal cavity and drainage pathways of the paranasal sinuses. One can also pass the endoscope beyond the post nasal space to assess the oropharynx, larynx and hypopharynx. However, in this section, we will concentrate on the examination of the nasal cavity.

There main areas of examination are as follows:

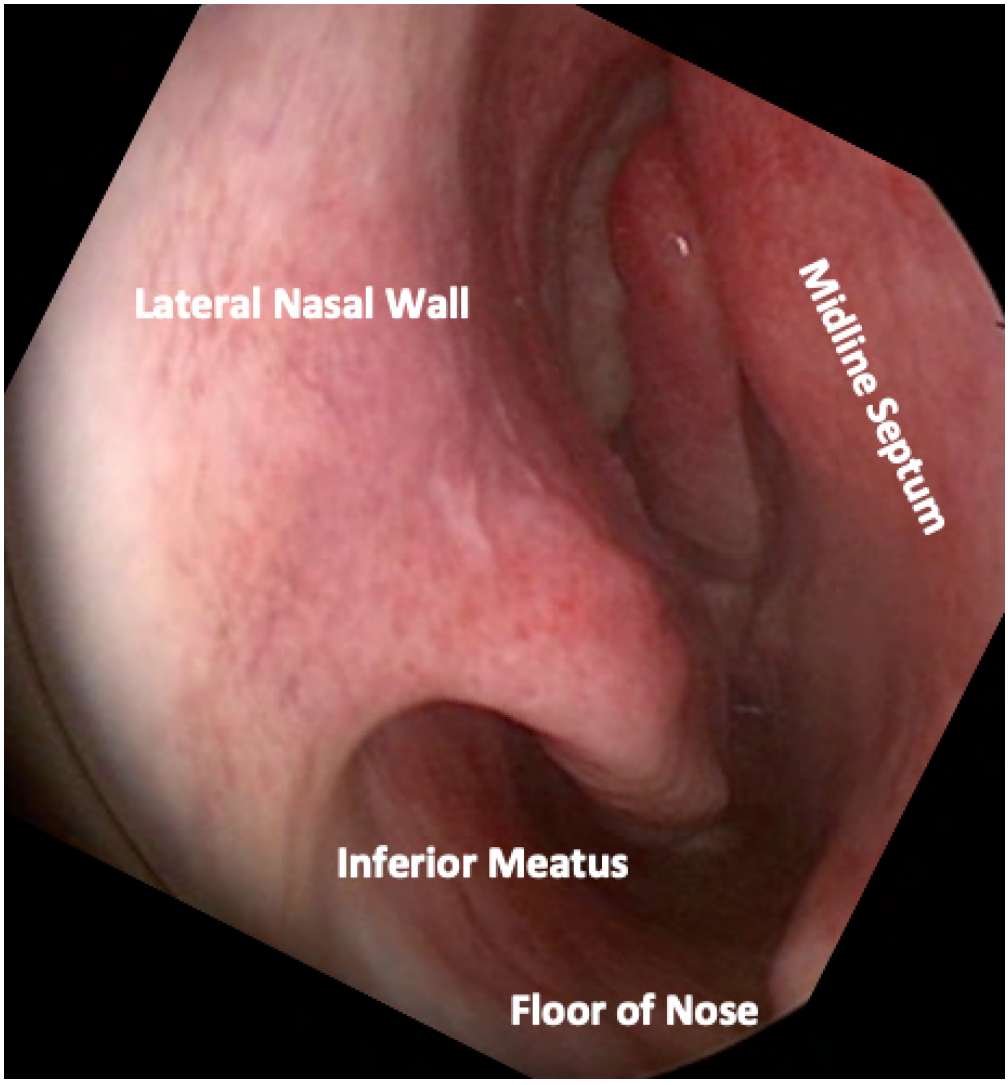


Figure 16: Endoscopic view of the right anterior nasal cavity.

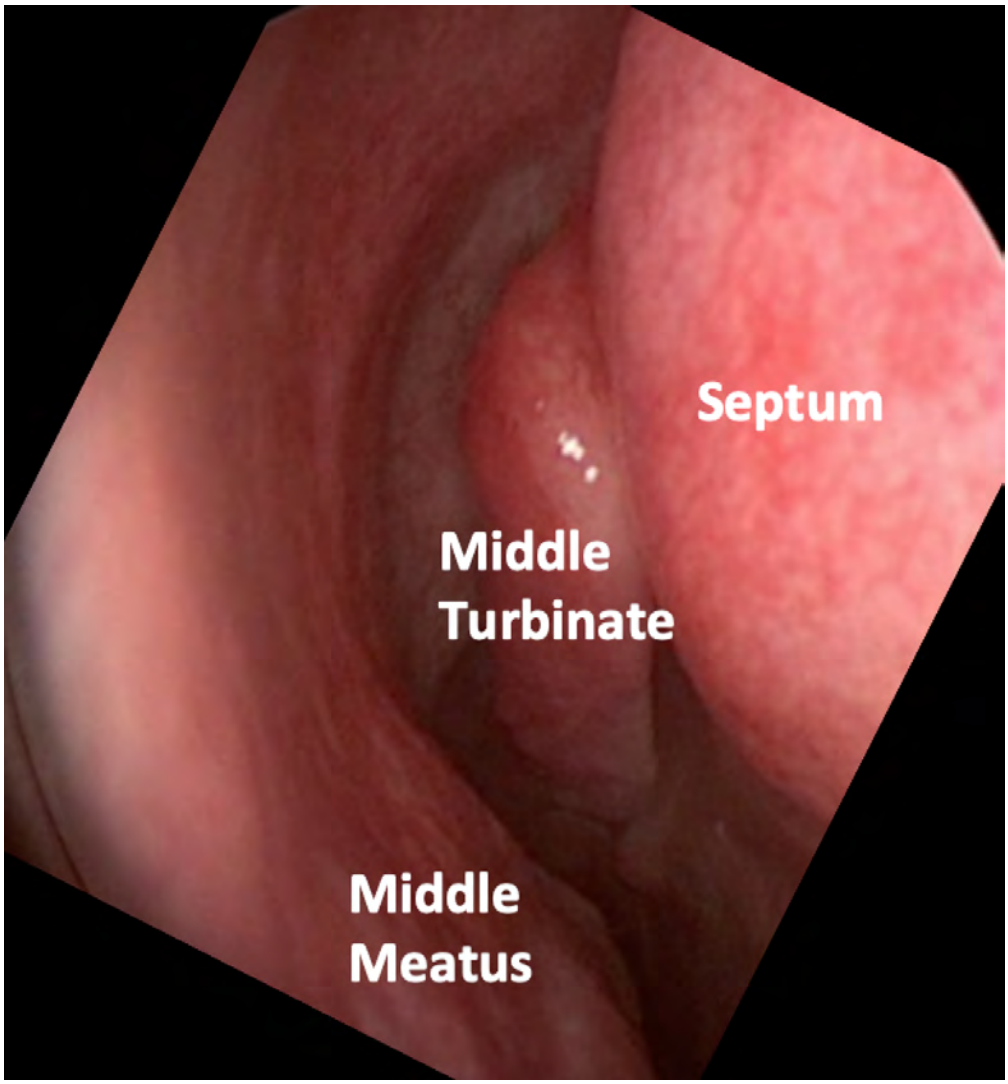


Figure 17: Endoscopic view of the right middle metal region

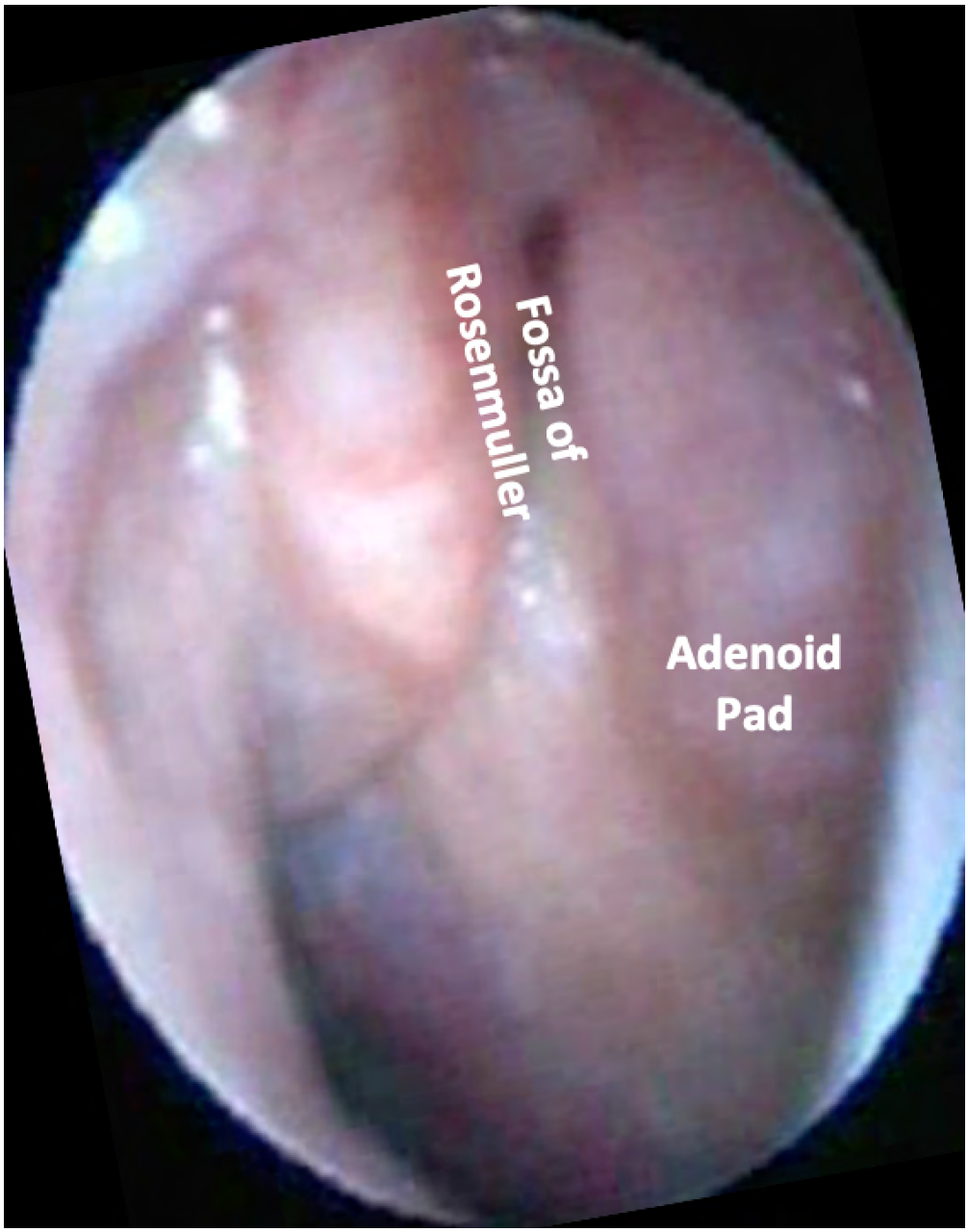


Figure 18: Endoscopic view of the right post-nasal space. The Eustachian tube orifice is where the middle ear drains down into the nasal cavity. The Fossa of Rosenmueller is an important place to check for pathology such as nasopharyngeal carcinoma.

Neck and thyroid status exam

Before Starting

- Wash your hands
- Introduce yourself and ensure the patient is comfortable
- Ask about any tenderness (does their voice sound normal?)
- Expose the neck adequately (ideally to the clavicles)
- Ensure that you are able to move around the patient. If not, the patient should be repositioned

Inspection

- Assess from the front and both sides of the patient
- Note any neck asymmetry or obvious masses. Be able to describe gross features of the mass (size, neck level, overlying skin involvement and obvious pulsatility)
- Scars from previous radiotherapy changes, thyroid surgery, parathyroid surgery, neck dissection, tracheostomy

Palpation

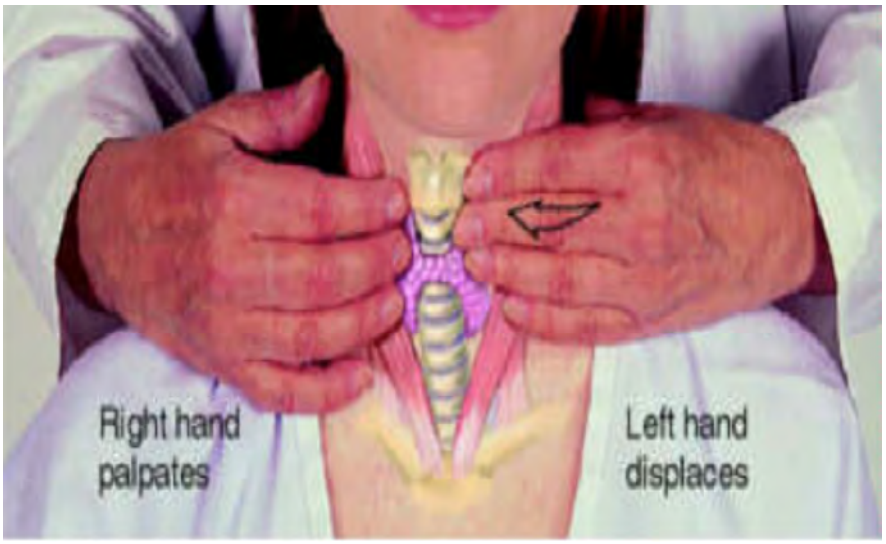


Figure 19: Correct hand position for thyroid examination

- You should examine the patient from behind. You may be able to note proptosis of the eyes (Graves' disease)
- Fingers are more sensitive than thumbs so use your fingertips to palpate neck, rolling tissues and compressing them gently (Figure 19)
- Ask the patient to swallow a sip of water. If the mass moves upwards with swallowing it suggests thyroid origin
- Ask the patient to stick out their tongue- a midline lump moving up suggests a thyroglossal cyst

When noting any lump during palpation, describe the presence of the following signs:

- Tender (infection, inflammation i.e. thyroiditis) /non-tender
- Temperature- heat may indicate inflammation or infection
- Firm/soft
- Smooth/craggy. Can you feel multiple nodules?
- Fixity to the overlying skin or underlying tissues.
- Site of lump. Is it in the anterior or posterior triangle?
- Size of lump; often comparing the size of a lump to common fruits (eg grape, plum, bean) is helpful

Examine the lymph nodes in the neck (anterior & posterior triangles)

- Begin in midline with submental lymph nodes. Progress on to submandibular nodes, pre/ post-auricular nodes, occipital nodes, anterior/posterior cervical chain
- Do not forget the supra- clavicular area

Auscultation

Auscultate the thyroid. A bruit is a sign of increased blood flow and may indicate hyperthyroidism

Percussion

Tap the superior part of the sternum for a large goitre extending retrosternally with percussions sounding stony dull.

Thyroid status examination

General

- Appropriately dressed
- Look sweaty?

Hands and arms

- Examine for tremor (hyperthyroidism) by asking patient to put arms outstretched
- Inspect the nails for thyroid acropachy (similar to clubbing, hyperthyroid- see Figure 20), and palmar erythema (hyperthyroid)
- Feel the temperature of hands and presence of sweating (hyperthyroid)
- Take the pulse. Atrial fibrillation, tachycardia (hyperthyroid), bradycardia (hypothyroid)

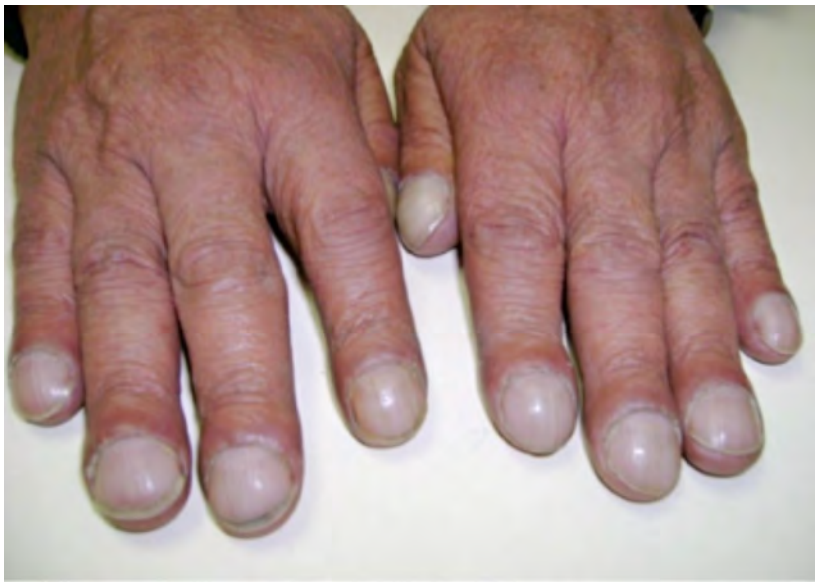


Figure 20: Thyroid acropachy.

Face

- “Peaches and cream” complexion of hypothyroidism.
- Loss of outer 1/3 of eye brows (hypothyroidism)
- Graves’ ophthalmopathy (see Figure 21), proptosis, chemosis, and injection of sclera in severe disease
- Examine the eye movements for dysconjugate gaze (indicator of severe disease)
- Examine for lid lag (sympathomimetic effect of thyrotoxicosis)

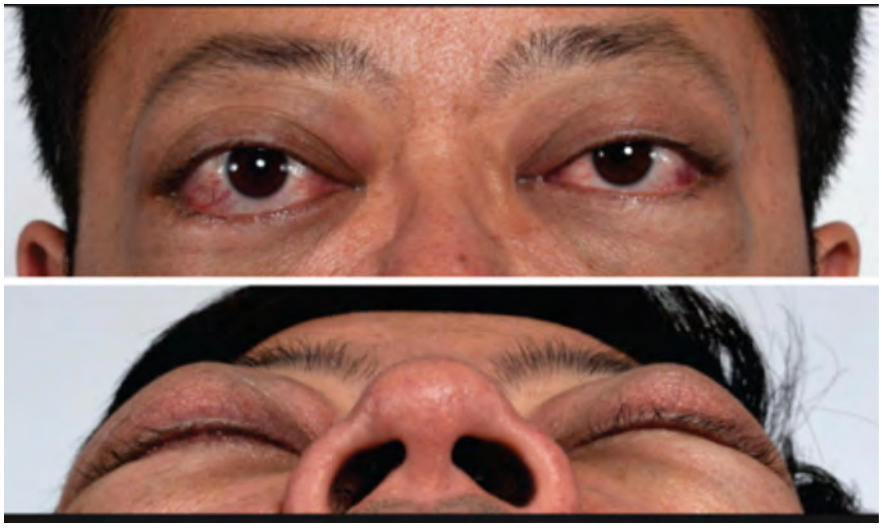


Figure 21: Proptosis secondary to thyroid eye disease

Legs

- Inspect for pre-tibial myxedema which is present in hypothyroidism
- Check the ankle reflexes- brisk in hyperthyroidism, and the opposite in hypothyroidism

Pemberton's test
Pemberton's test is a test for a retrosternal goitre that may obstruct the thoracic outlet and superior vena cava. A positive sign is congestion of facial/neck veins and hoarse voice upon raising the arms.

Concluding

- Thank the patient
- Wash your hands
- Summarise your findings to examiner

Cranial Nerves Examination

Before starting

- Introduce yourself and obtain consent
- Wash your hands
- Ask about tenderness

CN I: Olfactory nerve

- Informal: Ask about changes in smell sensation
- Formal smelling set test e.g. The University of Pennsylvania Smell Identification Test (UPSIT)

CN II, III, IV, VI: Optic nerve, Oculomotor, Trochlear, Abducens

- Inspect for normal colour vision and normal eye movements as these functions can be affected by skull base tumours and orbital infections. Gradenigo's syndrome is a complication of acute otitis media resulting in a triad of periorbital unilateral pain, diplopia secondary to VI nerve palsy, & petrositis.

CNV: Trigeminal nerve

- Motor component
- Patient to clench teeth whilst you palpate the tone of the masseter and temporalis muscles.
- Open mouth- look for deviation. Tests the pterygoids

- Sensory component
- Ask the patient to close their eyes, and say ‘yes’ when they feel you touching them with cotton wool
- Touch the patient’s face on the left then right of the forehead, cheeks and mandible in turn to test the 3 somatic sensory divisions of the trigeminal: ophthalmic, maxillary and mandibular divisions respectively. Rarely tested in practice are the temperature and pain sensations in these distributions

Both motor and sensory

- Corneal reflex. The afferent limb of this reflex is mediated by CNV. The efferent limb is mediated by CNVII
- Jaw jerk. Minimal or absent is normal. Brisk is pathological but may be present in younger patients

CNVII: Facial nerve

- Inspect for facial tone- asymmetry
- Motor. Testing the branches emanating from the parotid
    - Raise eyebrows. Note forehead wrinkles and whether this is forehead sparing or not. If there is no forehead sparing, this likely suggests a lower motor neuron palsy
    - Screw up eyes tight.
    - Puff out cheeks.
    - Smile.
    - Show teeth/grimace.
- Hyperacusis- due to loss of the dampening effect of nerve to stapedius.
- Loss of taste- due to loss of chorda tympani.
- Loss of these modalities depend of the location of facial nerve lesion.

CNVIII: Vestibulocochlear nerve

- See “ear examination” section for further details:
- Free field testing / whisper voice tests
- Weber’s and Rinne’s test
- Pure Tone Audiometry

CNIX, and CNX: Glossopharyngeal and Vagus nerve

- Open mouth, say “ahhhhh”. Uvula will deviate away from the side of the lesion.
- Assess voice (hoarseness) and quality of cough. Is there a bovine sounding coughing? Think recurrent laryngeal nerve palsy if abnormal (CNX)
- Swallowing.
- Gag reflex

CNXI: Accessory nerve

- Shrug against resistance- testing trapezius
- Turn head- tests the sternocleidomastoid of the contralateral side.

CNXII: Hypoglossal nerve

- Look for tongue atrophy
- Ask patient to move the tongue side to side.
- Protrude tongue- tongue tip deviates towards the side of the lesion

Conclusion

- Thank the patient
- Wash your hands
- Summarise your findings to the examiner

Otology

Ear Anatomy

The ear is subdivided into 3 main parts: 1) the external ear 2) the middle ear 3) the inner ear (Figure 22).

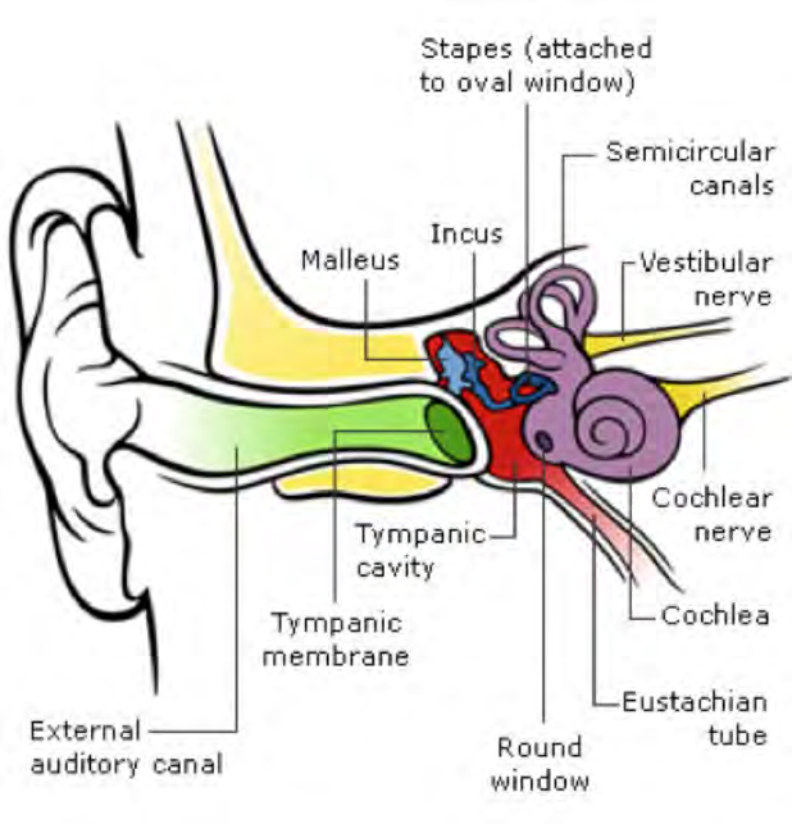


Figure 22: External auditory canal and middle ear (Elf-ENT)

The External Ear

The external ear canal consists of the pinna (auricle) and the external auditory canal.

Pinna (auricle)

- The pinna consists of elastic cartilage, thrown into folds (see Figure 23), and a fibrofatty lobule.
- It is supplied by the greater auricular nerve, lesser occipital and facial nerve.

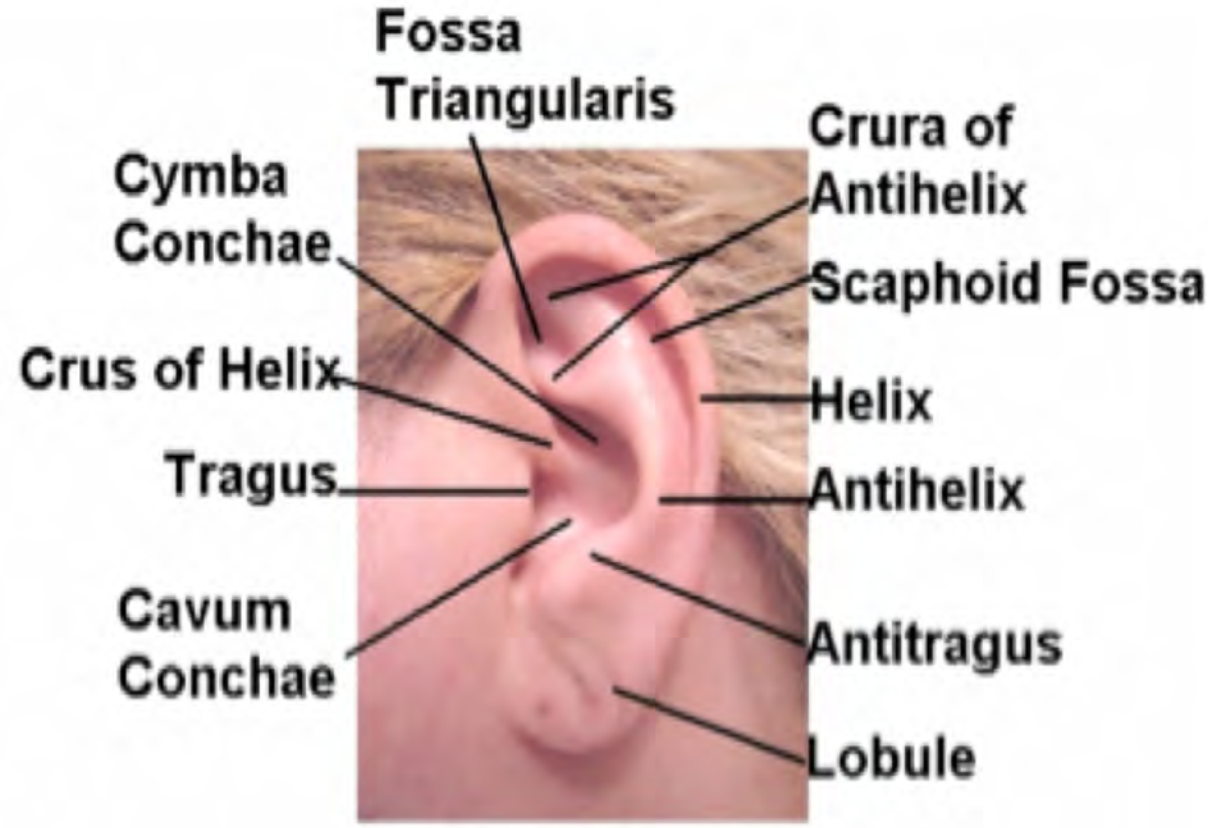


Figure 23: Anatomy of the pinna (reproduced with permission from Otolaryngology Houston, www.ghoryeb.com)

Nerve supply of the pinna
Lateral

- Anterosuperior – Auriculotemporal nerve (V3)
- Anteroinferior – Great auricular nerve (C2/3)
- Posterior – Lesser occipital nerve (C2)
- Conchal bowl and ear canal – Auricular branch of vagus nerve

Medial

- Greater auricular nerve (C2/3) and lesser occipital nerve (C2)

- **External Auditory Canal (EAC)**

- It is an oblique tube - 3 cm in length. The outer 1/3 is cartilage, and inner 2/3 is bony
- Ceruminous glands only exist in the outer 1/3. These glands secrete wax
- The tympanic membrane forms the medial boundary of the canal.

Clinical important point: Examining the EAC
In adults, the outer third of the canal is directed superiorly and posteriorly as it runs medially. The inner two thirds of the canal is directed inferiorly and anteriorly. When examining the ear canal, you must pull the auricle superiorly and posteriorly to align the two portions. (In infants, pull the pinna (gently!) posteriorly)

Blood supply of the external ear

- Auriculotemporal branch of superficial temporal artery
- Posterior auricular branch of the external carotid artery

Clinically important point: Cauliflower ear
The cartilage derives its nutritional support from the overlying perichondrium. Separation of the two layers (with blood, infection or inflammation often following trauma) may result in cartilage necrosis resulting in a cauliflower ear (see Figure 24)

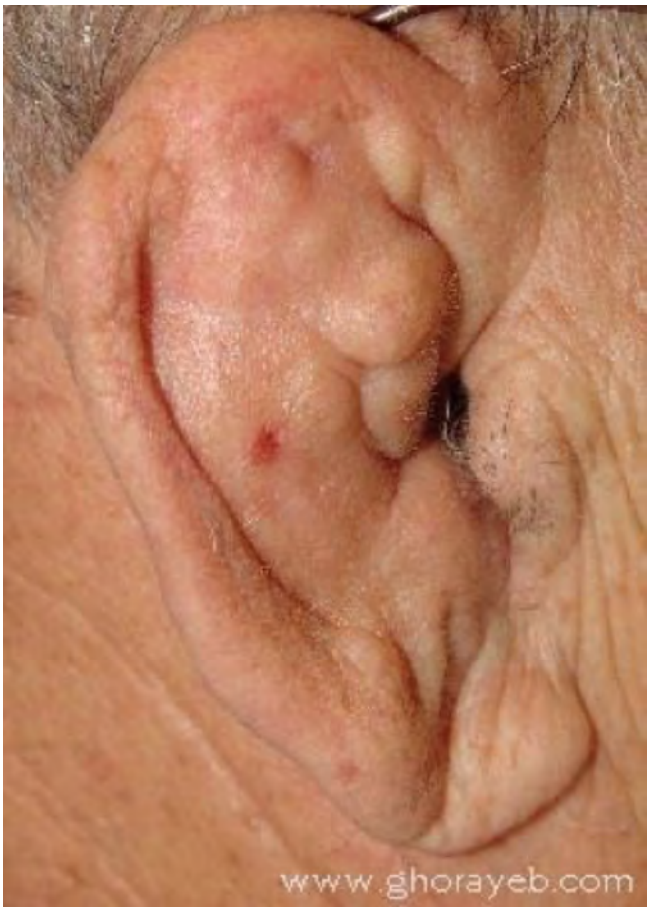


Figure 24: Cauliflower ear (reproduced with permission from Otolaryngology Houston, www.ghoryeb.com)

Nerve supply of the external ear canal
The auriculotemporal nerve and the auricular branch of the vagus nerve

The Middle Ear

- The middle ear is an air-containing cavity held within the temporal bone and it is lined with mucous membrane. It also communicates with the nasopharynx via the Eustachian tube. The function of the middle ear is mainly to amplify and transmit sound energy.
- The tympanic membrane forms the lateral boundary of the middle ear cavity. It is a circular shape and roughly 1cm in greatest diameter. It is innervated on the outer surface by the

auriculotemporal nerve and the auricular branch of the vagus. Figure 25 illustrates the component of the tympanic membrane. The membrane is normally greyish/ pinkish in colour. When the membrane is examined with an otoscope, the concavity of the structure produces a cone reflex in the anteroinferior quadrant.

- The tip of the handle of malleus forms the deepest concavity of the membrane called the umbo, which is where the cone of light radiates from. The pars flaccida is the weakest and most flaccid area of the tympanic membrane. It plays a vital role in the pathophysiology of cholesteatoma. The pars tensa forms the remainder of the tympanic membrane.

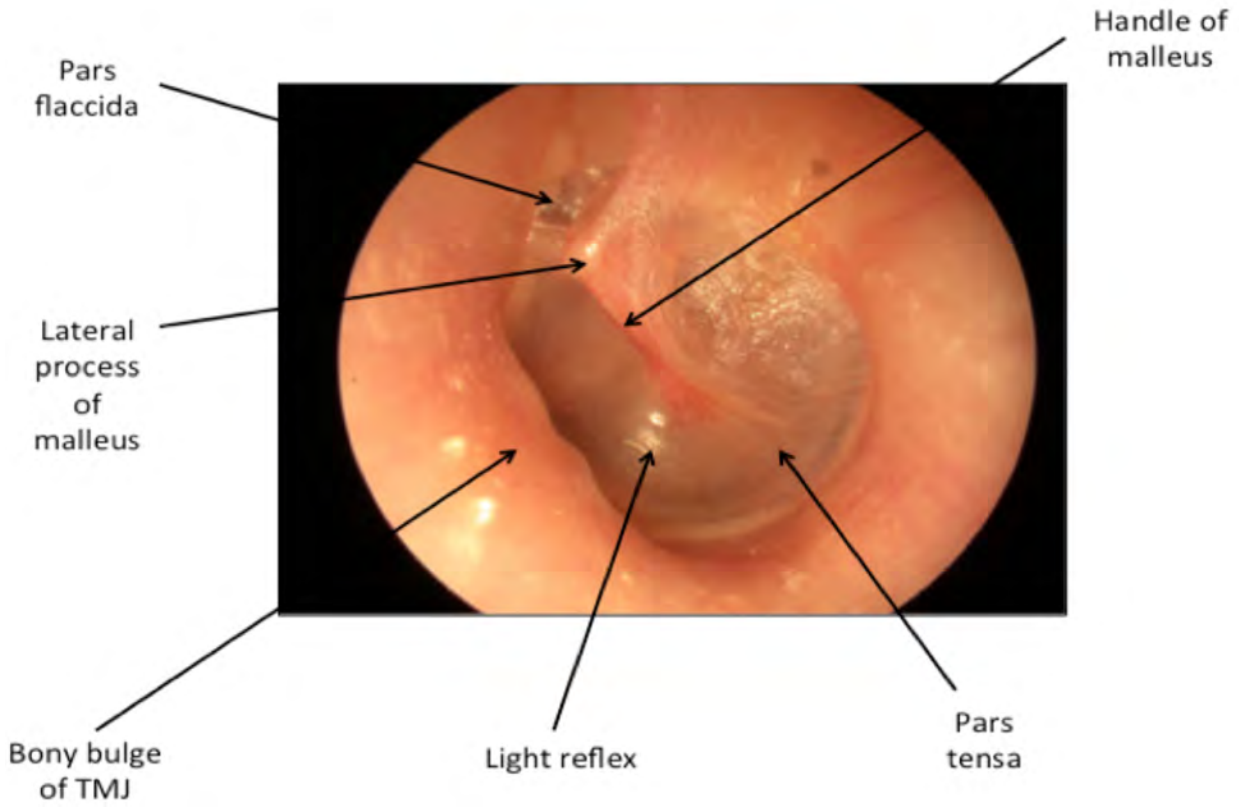


Figure 25: A labelled picture of the left tympanic membrane

The middle ear structures include:

- Ossicles – Malleus, incus and stapes (Figures 26, 27, 28). The malleus is the largest ossicle. The lateral process of the malleus is attached to the tympanic membrane. The head articulates with the body of the incus. The long process of the incus articulates with the head of the stapes. The stapes structure includes two limbs (anterior crus and posterior crus), which are attached to the oval window footplate
- The tensor tympanic and stapedius muscles: these are attached to the ossicles to regulate their movement
- Chorda tympani (provides taste to anterior two-thirds of the tongue)
- Facial nerve

Pictures of the three middle ear bones:

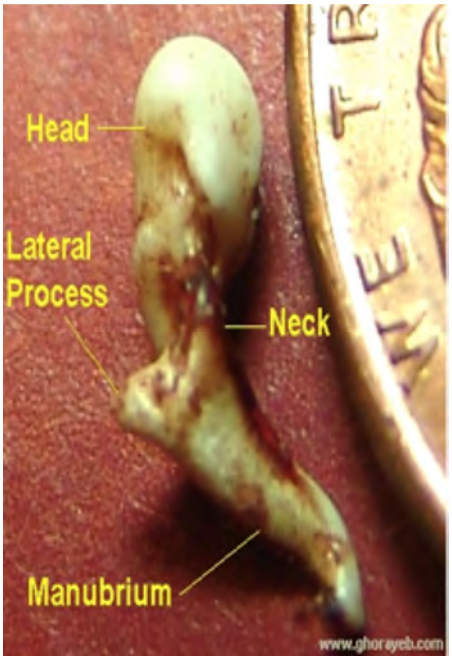


Figure 26: Malleus (reproduced with permission from Otolaryngology Houston, www.ghoryeb.com)

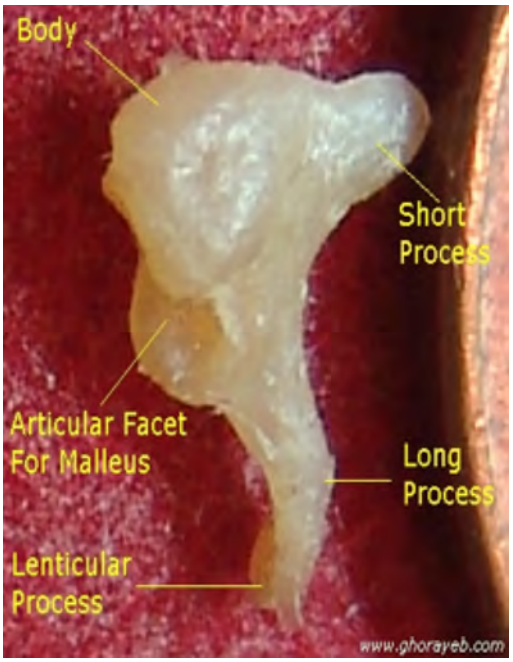


Figure 27: Incus (reproduced with permission from Otolaryngology Houston, www.ghoryeb.com)

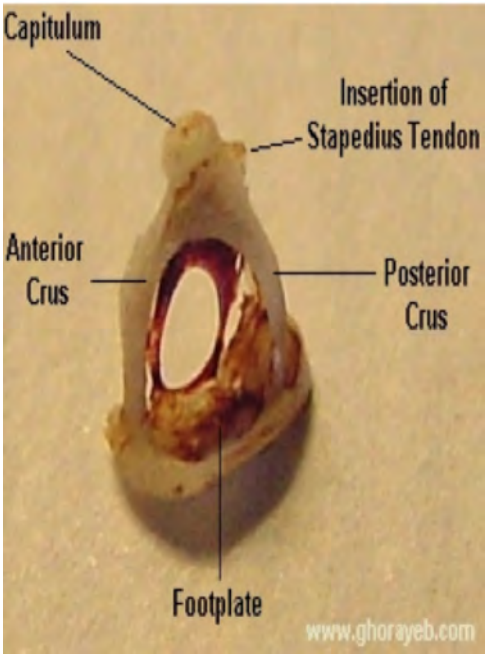


Figure 28: Stapes (reproduced with permission from Otolaryngology Houston, www.ghoryeb.com)

The Inner Ear

The inner ear is located within the petrous part of the temporal bone. It is medial to the middle ear.

Function of the inner ear:

- Cochlea - Transduction of energy from sound to electrical impulses, which are relayed and interpreted by the brain
- 3 Semicircular canals (superior, lateral and posterior) – Detect angular head acceleration
- Utricle and saccule – Detects linear acceleration forwards/backwards and up/down respectively

Clinically important points:

- The average human can detect sounds ranging between 20 and 20,000 Hz
- The cochlear is tonotopic with high frequency sounds detected at the basal turn of the cochlear and low frequency sounds detected at the apex. The ability to detect high pitch sounds decreases in older humans (presbycusis)

Dizziness and Vertigo

Description
True vertigo is most often associated with a sensation of ‘spinning’ and movement of the surrounding environment. It is important to distinguish this from the more generalised dizziness of disequilibrium.

Epidemiology
Male: Female ratio 1 : 3

Causes and Differential Diagnoses
Once you have established that the symptom is that of true vertigo, it is imperative to ascertain the duration and frequency of attacks, as this is the key to reaching the correct diagnosis and determining if the disorder is most likely peripheral (pertaining to the ear) or central (brain).

There are 3 common causes of vertigo originating from the labyrinth itself:

- Benign Paroxysmal Positional Vertigo (BPPV)- most common cause of true vertigo with typical age of onset 40-60 years
- Vestibular neuronitis
- Meniere’s Disease

These can generally be differentiated by the duration or onset of the vertigo and by the presence or absence of associated audiovestibular symptoms

Another common condition that is seen is vestibular migraine. Symptoms do not always include a headache and/or visual

symptoms and can sometimes overlap (e.g. hearing loss) making it difficult to differentiate between conditions such as Menieres.

	Onset	Hearing loss
BPPV	Sudden	No
Vestibular neuritis	Sudden or Gradual	No
Meniere's	Gradual	Yes-fluctuating
Vestibular migraine	Sudden or Gradual	Sometimes

Signs and Symptoms

- BPPV- Dix-Hallpike test positive. Rotatory vertigo on moving head
- Meniere's – Rotatory vertigo associated with fluctuating hearing loss often with low frequency thresholds affected. Tinnitus usually gets worse during an attack. Patients classically get an aural fullness before onset of vertigo.
- Vestibular neuritis – Rotatory vertigo that is continuous for over 24 hours often associated with nausea and vomiting. Classically they are confined to bed and it takes several days to weeks to recover.
- Vestibular migraine – Rotatory vertigo can last minutes to hours to days. Classically associated with headaches/photophobia/visual disturbance\phonophobia but these are not always present.

Investigations

- Full neurological examination
- Pure tone audiometry
- Dix-Hallpike test
- MRI of internal auditory meatus may be appropriate with asymmetrical sensorineural loss to exclude an acoustic neuroma
- Video head impulse testing (vHiT) – this is performed using specialist equipment and can be used to assess the function of

the semi-circular canals by measuring visual ocular reflex (VOR) function. It takes around 15minutes to perform and is a quick and sensitive measure of labrythine function

Treatment

- BPPV - Epley's manoeuvre can be curative in up to 90% by repositioning of the displaced otoconia crystals. In persistent cases, Brandt-Daroff exercises may be advised. Surgical management is rarely required but posterior semi-circular canal occlusion is useful in resistant cases.
- Vestibular neuronitis – Treatment is expectant with anti-emetics during the acute phase
- Meniere's Disease – There is a hierarchy of treatments depending on the severity of the disease and response to previous treatments. The underlying pathophysiology is thought to be endolymphatic hydrops. Therefore "pressure reducing" therapies include low salt diet, medications such as betahistine and diuretics although the evidence for these treatments is weak. Intratympanic injection of steroid or gentamicin is used for those that fail conservative management. Other treatment options include saccus decompression, labyrinthectomy and vestibular nerve section.
- Vestibular migraine – Common trigger factors include dehydration, foods (classically chocolate, cheese), anxiety and a poor sleep pattern. A symptom diary can help identify these. In those that do not respond to avoidance measures, there are a variety of migraine-preventative medications available.

Hearing Loss

Description

Hearing loss may be unilateral or bilateral.

Causes of Hearing Loss

Conductive Hearing Loss

	Additional Symptoms	Signs	Investigations
Excessive earwax (must occlude canal)	Blocked feeling	Wax on otoscopy	n/a
Otitis media with effusion (OME)	Popping, clicking/ pressure	Dull TM/ Fluid level/ bubbles on otoscopy	Tympanogram will show flat trace
TM perforation	May have middle ear discharge if active infection	TM perforation	n/a
Otosclerosis	Can be unilateral or bilateral	Usually none. Schwartz sign - red tinge to TM on otoscopy due to vessel injection on promontory (cochlear otosclerosis)	CT, PTA - 2kHz raised BC threshold (Carhart notch)
Cholesteatoma	Chronic smelly discharging ear	Deep retraction pocket with keratin collection	CT - assess extent of disease.

Sensorineural Hearing Loss

	Symptoms	Signs	Investigations
Presbyaucusis	Bilateral gradual onset	Normal otoscopy	PTA
Noise induced (NIHL)	Often tinnitus	Normal otoscopy	PTA- raised thresholds at 4kHz
Vestibular schwannoma (acoustic neuroma)	Asymmetrical hearing loss	Normal otoscopy	MRI
Complication of meningitis	Important to exclude in children who have had meningitis	Normal otoscopy	MRI may identify labyrinthine obliteration
Acute sensorineural loss	May have tinnitus and vertigo	Normal otoscopy	MRI, autoimmune screen

History

- Sudden vs gradual onset. Unilateral or bilateral.
- Associated otological or neuro-otological symptoms

Investigations

Pure Tone Audiogram (PTA) & Tuning fork tests (Rinnes & Weber) are complimentary to each other – should always be used together.

Management of Hearing Loss

Audiological

- Hearing aids for mild-to-profound hearing loss

Surgical

- Tympanoplasty - Cartilage or temporalis fascia is used to repair a perforation in tympanic membrane. N.B. This surgery is normally done for recurrent ear infections or to waterproof the

ear; hearing improvement often occurs when a perforation is closed but cannot be guaranteed.

- Stapedectomy - Prosthesis used to bypass fixed stapes/footplate in otosclerosis and allow transmission of sound into inner ear
- Bone anchored hearing aid – a transcutaneous or percutaneous device can be surgically implanted under general or local anaesthesia for a conductive, mixed conductive /sensorineural hearing loss or unilateral dead ear
- Cochlear implantation- There are specific NICE criteria for cochlear implantation which includes profound sensorineural hearing loss. However it may be of benefit in other patients – they require a multidisciplinary team assessment.
- Middle ear implant – suitable for conductive and mixed hearing loss

Management of excessive ear wax

Method	Uses
Topical eardrops - Warm olive oil, sodium bicarbonate.	Soften impacted earwax allowing it to migrate naturally out of the canal
Microsuction	Evacuate softened wax and wax tightly adherent to the ear canal
Jobson Horne wax probe	Useful in slowly coaxing out wax that can be easily manipulated
Syringing	Sometimes performed in primary care setting

Tinnitus

Description

Tinnitus is a term used to describe the perception of sound when no external sound is present. It is sometimes described, as ‘the sound of silence’ because all people, if they are seated in a completely quiet soundproofed room, will hear tinnitus. This noise is usually masked by the environmental sounds. It is said to be objective when apparent to the examiner and subjective when apparent to the patient only (more common).

Epidemiology

No identifiable cause is found in most cases of tinnitus. It is often associated with hearing loss.

Types of Tinnitus

Non- pulsatile tinnitus is typically referred to as a false perception of sound that is heard by the affected individual only (subjective). It is often described as a buzzing, high-pitched tone or a clicking or popping.It can be associated with noise induced hearing loss, presbycusis, Meniere’s disease, head injury, otitis media and drug related causes (e.g. salicylates, nonsteroidal anti-inflammatory drugs, loop diuretics)

Pulsatile Tinnitus (4%) is defined by a sound heard by an individual that is synchronous with their heartbeat and is usually caused by turbulent blood flow that reaches the cochlear. It may be associated with a treatable cause. It can be classified according to the underlying causes which is usually vascular or non vascular.

Causes of Pulsatile Tinnitus

Vascular causes

- Atherosclerosis on the internal carotid artery. The eventual stenosis of the artery may predispose the individual to pulsatile tinnitus due to turbulent blood flow.
- Vascular malformations. Arterio- venous malformations/fistulas are abnormal communications between the arterial and venous system. It may be congenital or acquired- the latter being secondary to trauma or a result of venous sinus obstruction.
- Glomus tumours are rare hypervascular tumours arising from paraganglia cells. Glomus tympanicum are associated with Jacobson's nerve around the promontory in the middle ear. Glomus jugulare are found along the jugular bulb and they involve the skull base and may extend in the middle ear.
- Non-vascular causes

- Paget's Disease
- Otosclerosis
- Myoclonus. Myoclonus of the middle ear muscles or palatal muscles may cause objective tinnitus, which classically presents with a clicking noise rather than a vascular thrill.

Investigations

- If unilateral and associated with hearing loss, MRI should be performed to exclude an acoustic neuroma.
- Pulsatile tinnitus may be investigated using MR or CT angiography. Carotid duplex scanning may also be helpful if carotid artery stenosis is suspected. Arteriography is also helpful in a limited number of cases but is associated with a small risk of CVA.

Treatment

- The vast majority of time, the patient just needs reassurance that tinnitus is very common and that they will adapt to it. It

tends to be worse at quiet times (e.g. at night when trying to sleep) and worrying about it generally makes the tinnitus worse.

- Address any underlying cause of the tinnitus in appropriate cases e.g. hypertension, carotid stenosis, side effect of medications
- For selected patients, behavioural therapy can be provided by audiologist/hearing therapist who introduce coping strategies and tinnitus retraining therapy (TRT) . A noise generator can mask tinnitus if interfering with sleep
- A hearing aid may improve tinnitus if hearing loss is present through a masking effect

Facial Nerve Palsy

Description
Temporary or permanent paralysis of the facial nerve (CN VII)

Epidemiology

- Bell's palsy (idiopathic in origin) is most common but is a diagnosis of exclusion (15-40 cases/100,000)
- M: F, 1:1

Causes and Differential Diagnoses of Facial Nerve Palsy

Idiopathic	Bell's palsy
Trauma	Iatrogenic injury following surgery, temporal bone fracture
Infectious	Bacterial vs viral (Ramsay-Hunt syndrome – Varicella reactivation). Secondary to acute or chronic otitis media, malignant otitis externa
Neoplastic	Malignant parotid or temporal bone tumour, paraganglioma
Congenital	CHARGE syndrome (Coloboma of eye, Heart defects,Atresia of choana, Retardation of growth, Genital and/or urinary abnormalities, Ear abnormalities & deafness)
Systemic/ inflammatory	Sarcoidosis, Gullain-Barre Syndrome, Multiple sclerosis
Other	Cerebrovascular Accident

Symptoms

- Dry painful eye, especially, if eye closure is impaired
- Drooling from side of mouth and difficulties with eating
- Psychological disturbance

Signs

- Differentiate between upper and lower motor neurone (upper motor neuron has sparing of forehead)
- Test strength of each branch of the facial nerve using House-Brackmann classification of nerve palsy - Raise eyebrows, tightly close eyes, wriggle nose, puff out cheeks, show teeth.

House-Brackmann Grade	Observation (simplified)
I	Normal
II	Slight weakness
III	Complete eye closure. Obvious weakness but not disfiguring
IV	Incomplete eye closure. Obvious weakness and disfiguring asymmetry
V	Flicker of motion
VI	No movement

- Bell's phenomenon - White sclera visible as eyeball rolls upwards to protect cornea when eyelid does not close
- Otoscopy – cholesteatoma, Acute Otitis Media
- Head and neck examination - parotid tumour

Complications of Facial Nerve Palsy

- Corneal scarring - Blindness if eye care advice not given
- Wasting of facial muscles, synkinesis
- Psychological

Investigations

- Pure Tone Audiogram – Look for conductive hearing loss (cholesteatoma) or asymmetrical sensorineural hearing loss (cerebellopontine lesion e.g. acoustic neuroma)
- MRI scan if suspecting central cause

Treatment

- General: Eye care, Artificial tears/tape eyelid shut. Referral to ophthalmology.
- Medical: Bell’s palsy/Ramsay Hunt syndrome - Oral steroids and oral antivirals although the evidence for oral antivirals in Bell’s palsy is lacking. Treatment needs to be started within forty eight hours to be effective.
- Surgical (rarely indicated): Depends on cause but options include facial nerve grafting, facial re-animation if the function does not recover.

Otalgia

Description

Otalgia is ear pain that can originate from the ear itself or can also be referred from elsewhere in the head or neck (see referred otalgia below)

Epidemiology

This is a very common presentation to primary care especially in young children.

History

Symptoms	Signs	Diagnosis
Child with severe ear pain and preceding URTI	Erythema, bulging drum, febrile	Acute otitis media (AOM)
Severe pain. Often with preceding itch and contact with water (swimming)	Tender, narrow external auditory meatus and mucopus	Otitis externa
Elderly with severe pain and often known diabetes or other causes of immunocompromise	Floor of ear canal showing granulation, +/- cranial nerve palsies	Necrotising otitis externa (malignant otitis externa, skull base osteomyelitis)
Pain anterior to tragus and worse when eating	Normal eardrum, tender over Temperomandibular joint(TMJ) and misaligned/ clicking bite	TMJ dysfunction
Moderate/ severe intermittent pain	Normal eardrum and palpable mass in the head and neck	Referred pain - Look out for red flags

Referred Otolagia

Always ask about other general symptoms – There are several other causes of otalgia, not directly related to the ear (referred pain). It is important to enquire about dental, nasal and throat symptoms in order to identify these. It is particularly important to identify potential indicators of malignancy.

Pain referred to the ear is a well-documented phenomenon. Any pathology involving the cranial nerves V, VII, IX, and X and the upper cervical nerves C2 and C3 can cause the sensation of referred otalgia.

Trigeminal neuralgia is the most common cranial neuralgia linked to referred otalgia. Other causes of referred cranial neuralgia are described below.

Nerve	Possible causes of pain
Cranial Nerve V3 (most common) i.e. mandibular branch of Trigeminal nerve	TMJ Dysfunction Pathology involving the 3 major salivary glands Dental Abscess
Cranial Nerve V (maxillary branch of trigeminal nerve)	Mucosal inflammation involving the sinuses
Cranial Nerve IX (includes the Jacobson nerve branch)	Oropharyngeal pathology e.g. peritonsillar abscess, tonsillitis, oropharyngeal carcinoma
Cranial Nerve X (includes the Arnold nerve branch)	Laryngeal cancer
Cervical Nerve (C2 and C3)	Cervical spine disease e.g. cervical spondylosis

Otorrhoea

Description

The ear can discharge wax, pus, blood, mucus and even cerebrospinal fluid. Remember discharging wax should be reassured as normal.

The common bacterial pathogens in a discharging ear that can cause an infection include:

- Pseudomonas aeruginosa
- Staphylococcus aureus
- Proteus spp.
- Streptococcus pneumonia
- Haemophilus influenza
- Moraxella catarrhalis

In most patients with a discharging ear, the diagnosis can be made based on good history and examination. We will recap on a focused history taking for otorrhoea and then revise the possible differentials of this symptom in more detail.

History

- Duration of discharge – If chronic, think chronic otitis media including cholesteatoma especially if unilateral
- Is there associated otalgia (ear pain)?
- Associated fever or systemic symptoms indicates an infective aetiology
- Is there associated hearing loss or dizziness?
- Do not miss a history of putting foreign bodies in the ear especially in children

- Facial nerve palsy - May occur with acute or chronic otitis media especially if the facial nerve is dehiscent along its course in the middle ear (10% of the population)
- Check for history of trauma - CSF otorrhoea
- Has there been any recent history of topical antibiotics? This can in itself cause discharge or predispose to antifungal ear infections if there is prolonged usage

Differential diagnosis

Symptoms	Signs	Diagnosis
Itchy ear canal	Fluffy whitish yellow or green black coating of the canal	Fungal otitis externa
Recent URTI infection Deep severe ear pain which precedes discharge and improves after discharge appears	Mucoid ear discharge	Acute otitis media (AOM) +/- perforation
Itchy ear canal	Scanty, thin watery discharge External ear canal can be completed occluded with discharged and swelling	Otitis externa

Unilateral Severe ear pain	Foul smelling discharge Cranial nerve palsies	Necrotising otitis externa (malignant otitis externa)
Unilateral Chronic offensive smelling ear discharge & hearing loss	Ear drum retraction/ perforation with keratin accumulation	Cholesteatoma
History of trauma or skull base surgery	Clear, watery discharge	CSF otorrhoea

Otitis Externa

Description
Inflammation of the external auditory canal that can be acute or chronic

Epidemiology
An estimated 10% of people develop otitis externa in their lifetime and there is an increased risk after first episode. Hence, otitis externa is an extremely common presentation when on call for ENT or at the emergency ENT clinic.

Risk Factors

- Swimming
- Warm/humid climates
- Underlying skin conditions e.g. eczema
- Immunosuppression e.g. diabetes
- Trauma e.g. excessive cleaning or scratching
- Hearing aids that reduce ventilation or introduce infection into the canal

Causes

- Mostly bacterial: Pseudomonas aeruginosa, S. Epidermidis and S. Aureus.
- Otitis externa can be fungal. There is an increased risk after prolonged antibiotic courses.

Symptoms

- Otalgia (ear pain) - especially on movement of the pinna or jaw. Can be severe.
- Pruritus (itching)
- Discharge
- Hearing loss

Signs

- Pain on moving the pinna and/ or tragus. Pinna may be very tender indeed.
- If pain is out of proportion with examination findings, there is a history of diabetes or failure to respond to antibiotics, consider necrotising otitis externa which is a severe, potentially fatal progressive form of otitis externa. It is a non-neoplastic infection, which spreads to the bone and results in osteomyelitis of the lateral skull base. It can cause multiple lower cranial nerve palsies. It is almost exclusively unilateral.
- External auditory meatus swelling, erythema with purulent discharge (Figure 29)
- Tympanic membrane not always visible because of swelling
- Complete external auditory meatus obstruction possible
- If possible, examine the tympanic membrane for a perforation. It is possible to have a secondary otitis externa associated with otitis media

Complications

- Peri-auricular cellulitis
- Necrotising otitis externa

Investigations

- Swab the external ear canal for MC&S

- Urgent CT scan is required if necrotising otitis externa is suspected (Unilateral, severe ear pain, elderly and/or immunocompromised)

Treatment

- Aural toilet (microsuction)
- Topical antibiotic and steroid ear drops e.g. ciprofloxacin (provides anti-pseudomonal cover)
- Insertion of a Pope wick helps the antibiotic come into contact with the canal wall and stents open a severely oedematous ear canal. The Pope wick looks like a small thin sponge and expands in the ear canal when wet.
- Admit for diabetic control, IV antibiotics and regular aural toilet if suspecting necrotising otitis externa

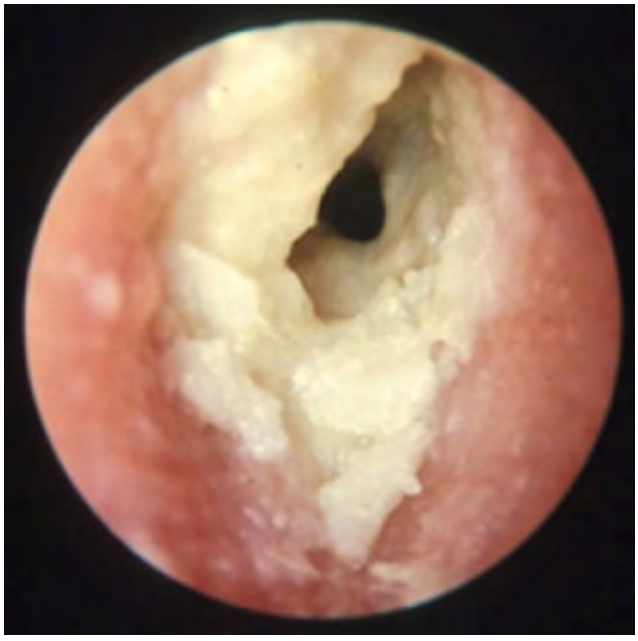


Figure 29: Otitis Externa (Courtesy of Elef-ENT)

Acute Otitis Media

Description
Acute otitis media is acute onset inflammation of the middle ear, usually of an infective origin. Otitis Media with Effusion (OME) may be a sequelea of acute otitis media but is regarded as a different, non-infective condition.

Epidemiology
Occurs at all ages, but much more common in infancy

Risk Factors

- Lack of breastfeeding as a baby
- Attending nursery/day care
- Positive family history
- Age between 6-18 months
- Exposure to smoking

Causes

- An upper respiratory tract infection (URTI) results in inflammation of the upper airways and swelling causes obstruction of the Eustachian tube. Ascending infection results in hyperaemia of the middle ear mucosa with production of a purulent exudate. This is called acute otitis media (AOM)
- Viral infections account for two thirds of cases of AOM. Respiratory syncytial virus, rhinovirus and enterovirus are the most common.
- Bacterial organisms include Streptococcus pneumoniae, Haemophilus influenza, and Moraxella catarrhalis.

Symptoms

- Infants: fever, ear pulling, irritability, vomiting
- Children and adults: otalgia (ear pain), fever, generally unwell, hearing loss. If the tympanic membrane bursts the pain may suddenly improve, but a purulent discharge develops from that ear

Signs

- Bulging tympanic membrane (Figure 30)
- Injected tympanic membrane
- If there is a perforation, there may be purulent discharge coming through. There may also be secondary otitis externa

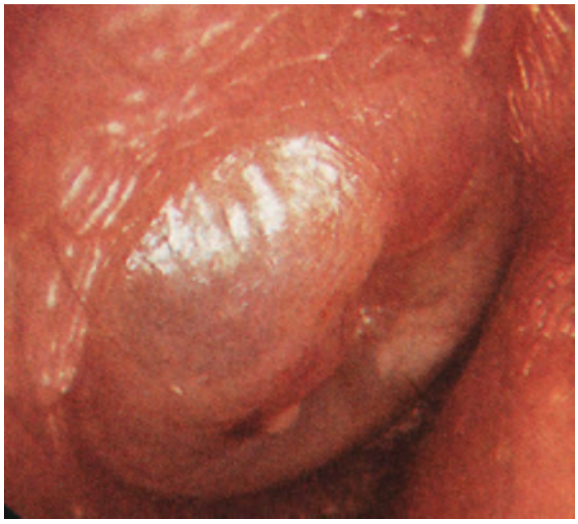


Figure 30: Bulging tympanic membrane in AOM (Courtesy of Elef-ENT)

Complications

- Intratemporal: tympanosclerosis (white patch on the ear drum due scarring), hearing loss, tympanic membrane perforation, mastoiditis, labyrinthitis, facial nerve palsy
- Intracranial: meningitis, intracranial abscess, lateral sinus thrombosis, cavernous sinus thrombosis, subdural empyema.

Investigations

- Consider swab for M, C &S if ear discharging
- Imaging (CT and/or MRI) if complications are suspected

Treatment

- Analgesia (e.g. Ibuprofen) and anti-pyretics (e.g. Paracetamol)
- If failure to improve within 24-48 hours, consider prescribing oral antibiotics. A 10 day course of Amoxicillin is first line. If no improvement, switch to Co-amoxiclav.

Otitis Media with Effusion (OME)

Description

This is a middle ear effusion (fluid) without the signs of infection. Also known as ‘glue ear’.

Epidemiology

- Bimodal distribution at a peak at 2 years and 5 years of age. Prevelance is 20% and 15% respectively.
- 50% of OME resolves spontaneously within 3 months

Causes

- Eustachian tube dysfunction. In children, the Eusatachian tube is smaller and more horizontal than in adults therefore middle ear ventilation is impaired. Thus commoner in cleft palate and other syndromic diseases affecting the face and skull base.
- Beware of the adult with a unilateral middle ear effusion. Nasopharyngeal tumours can block the drainage of the Eustachian tube and result in a middle ear effusion

Symptoms

May be asymptomatic in an infant. Parent may notice the child has hearing loss or behavioural problems.

Signs

- Poor speech development
- Otoscopy: tympanic membrane will appear dull +/- a visible fluid level. If pneumatic otoscopy is performed the tympanic membrane will have poor compliance (Figure 31)

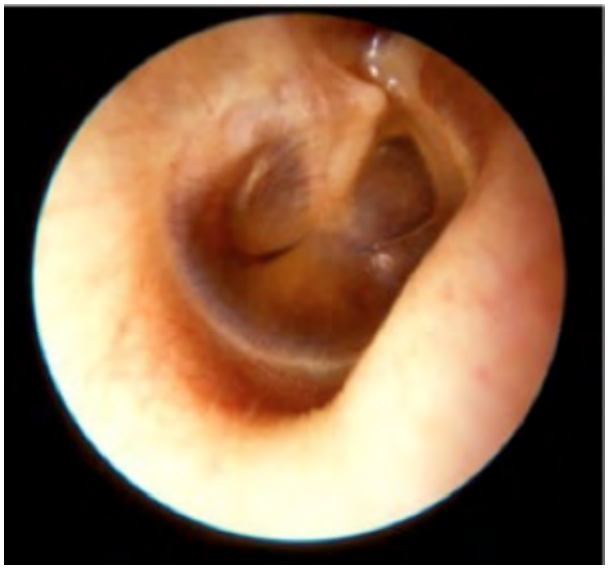


Figure 31: Dull right tympanic membrane with visible fluid level (Courtesy of Elef-ENT)

Investigations

- Pure tone audiogram – this will reveal a conductive hearing loss (i.e. air bone gap on PTA)
- Tympanometry will show a flat trace due to the reduced compliance of the tympanic membrane (i.e. ‘type b’ curve)
- In an adult with a unilateral middle ear effusion ensure that flexible nasoendoscopy (FNE) is performed to rule out a nasopharyngeal tumour

Treatment

- Antibiotics are not advised as they have no benefit in OME

- Watch and wait – 50% of OME will resolve spontaneously within 3 months
- Hearing aid may be useful whilst waiting for the OME to spontaneously resolve
- Myringotomy and ventilation tube insertion. This is a small incision in the tympanic membrane with the insertion of a small ventilation tube. Once inserted, the grommet will usually self extrude after around 9 months. Grommet insertion can lead to tympanosclerosis (scarring of the tympanic membrane) and tympanic membrane perforation (if the TM fails to heal after the grommet extrudes N.B. more common if history of multiple grommet insertion)
- Adenoidectomy may reduce the recurrence rate of OME

Chronic Otitis Media

Description

There are two types of chronic otitis media:

- Mucosal: A tympanic membrane perforation in the presence of recurrent or persistent ear infection.
- Squamous: Gross retraction of the tympanic membrane with formation of a keratin collection. (cholesteatoma)

The disease may be active (infection present) or inactive (no infection present):

- Inactive mucosal: Dry perforation
- Inactive squamous: Retraction pocket, which has the potential to become active with retained debris (keratin)
- Active mucosal: Wet perforation with inflamed middle ear mucosa and discharge
- Active squamous: Cholesteatoma

Mucosal Chronic Otitis Media

Epidemiology

- May occur in children and adults
- Causes
- Chronic infection following development of a post-infective, traumatic or iatrogenic perforation
- Pathogens: most commonly Pseudomonas aeruginosa, Staphylococcus Aureus

Symptoms

- Hearing loss
- Otorrhoea

Signs

- Mucosal inactive: Dry perforation (Figure 32)
- Mucosal active: Wet perforation with middle ear inflammation
- Otorrhoea: May be present in active disease
- May develop secondary otitis externa due to the discharge

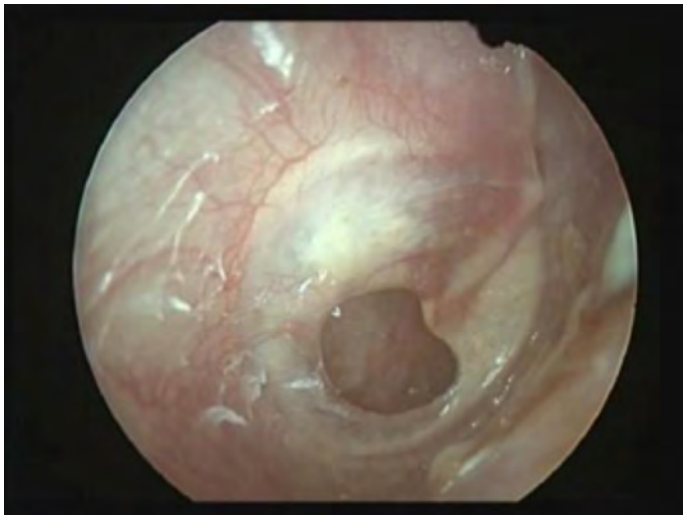


Figure 32: Right TM perforation (Courtesy of Elef-ENT)

Complications

As for acute otitis media.

Investigations

- Pure tone audiometry
- Ear swab for MC&S

Treatment

- Aural toilet with microsuction ensuring that the whole tympanic membrane is visualised

- Antibiotic and steroid combination ear drops if infection is present
- Myringoplasty (also known as Type 1 tympanoplasty). This is the surgical repair of the tympanic membrane perforation using cartilage or fascia. It is indicated to prevent recurrent otitis media.

Cholesteatoma

Description

Despite the name, a cholesteatoma is neither a tumour nor does it consist of cholesterol. Instead, it is an accumulation of benign keratinizing squamous cells which most commonly involves the middle ear. The squamous cells are hyperproliferating and secrete enzymes, which can be locally destructive (with potentially serious complications). It is commonly described as ‘skin in the wrong place’.

Epidemiology

Can occur in both children and adults but it usually has it’s origins in childhood chronic Eustachian tube dysfunction although congenital cholesteatoma accounts for around 5% of cases (see below). It is more common in males.

Causes

Congenital cholesteatoma results from persistent epithelial cell rests left within the middle ear during growth of the embryo and is diagnosed in children who have an intact tympanic membrane and no history of ear surgery

Acquired cholesteatoma develops after birth. Eustachian tube dysfunction results in tympanic membrane retraction and once the retraction is deep enough keratin migration from the tympanic membrane to the external auditory canal can no longer occur and the trapped keratin develops into a cholesteatoma. Keratin debris can become infected and leads to a chronic ear discharge

Symptoms

- Persistent/recurrent ear discharge despite topical antibiotics

- Unilateral hearing loss

Signs

- Otoscopy should be performed and micro suction should be used to clear any wax to ensure that the whole TM is visualised paying particular attention to the superior part of the TM (attic area)
- There is a deep retraction pocket in the TM with keratinous debris within it. There may be granulations around the margins of the retraction pocket and it is very common for adjacent bony erosion to occur
- If there is secondary infection there will be discharge in the ear canal
- In congenital cholesteatoma, the tympanic membrane is usually intact but it may be bulging and a white pearly mass will be visible through the tympanic membrane

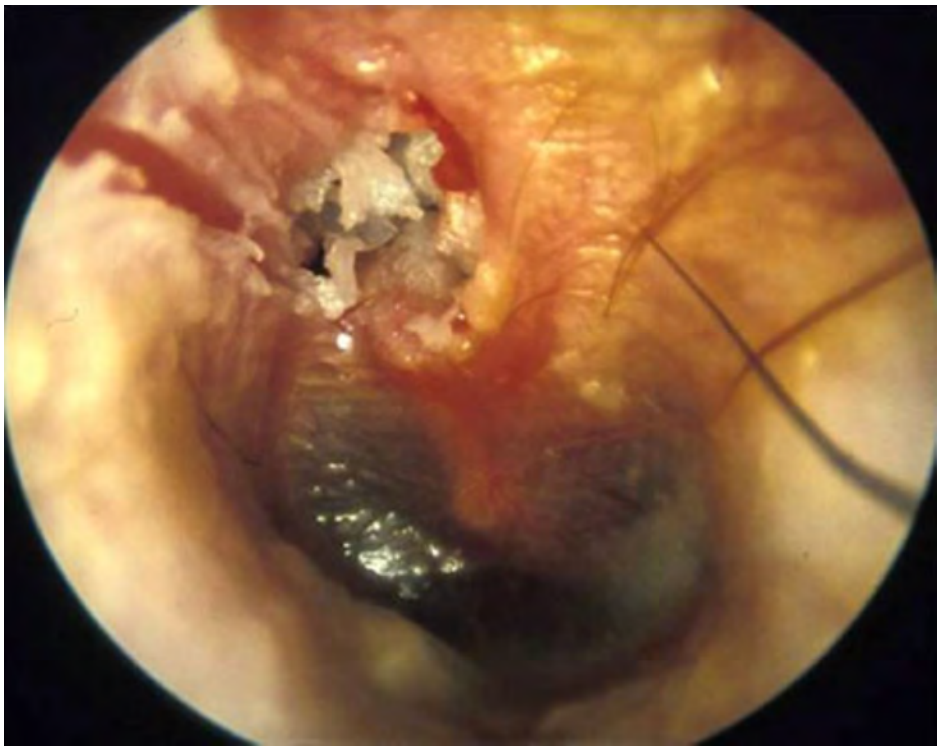


Figure 33: Active squamous chronic otitis media in left ear: attic retraction with retained squamous epithelial debris (cholesteatoma) (Courtesy of Elef-ENT)

Complications

As per acute otitis media (see above)

Investigations

- Pure tone audiometry
- CT scan of the temporal bone

Treatment

- Surgical management unless the patient is not fit for surgery
- The aim of surgery is to remove the cholesteatoma sac and repair the tympanic membrane and any adjacent bony defect, to prevent recurrent discharge. The mastoid cavity is drilled to allow access to the middle ear and all of the cholesteatoma is removed. If there has been destruction of the ossicles, hearing can be reconstructed (ossiculoplasty) using a variety of techniques and the tympanic membrane is replaced with a graft

Rhinology

Nasal Function and Anatomy

Nasal Function

The primary function of the nose is ventilation.

Other functions include:

- Humidification of inspired air and dehumidification of expired air
- Heating or cooling of inspired and expired air
- Filtering of large matter by vibrissae (small hairs) in the nasal vestibule
- Olfaction and pheromone detection
- Mucus production (mucociliary escalator: mucus traps particulate matter and carries it as far as the pharynx, where it is swallowed and then eliminated by the digestive system)
- Immune protection – lysosomes, immunoglobulin A (IgA), IgG and nitric oxide
- Ventilation of middle ear cleft via Eustachian tube
- Drainage of nasolacrimal duct
- Voice tract resonance

Nasal Anatomy

The anatomy of the nose can be subdivided into the external nose and the internal nasal cavity and paranasal sinuses.

The external nose is attached to the forehead by the nasal bridge and extends towards a free tip. The anterior openings are called the nares or nostrils. The nares are bounded medially by the nasal septum. The skeleton of the external nose consists of bone in the upper third (nasal bones) and cartilages (upper and lower laterals and septum) in the lower two thirds.

Clinically Important Point

The skin overlying the cartilaginous portion of the external nose contains multiple pilosebaceous glands. Rhinophyma (see Figure 34) is a pathological hypertrophy of the glands, which results in an enlarged, red bulbous nose. It begins with rosacea, which worsens to acne rosacea. It is more common in white men between the age of 40 and 60 years of age.

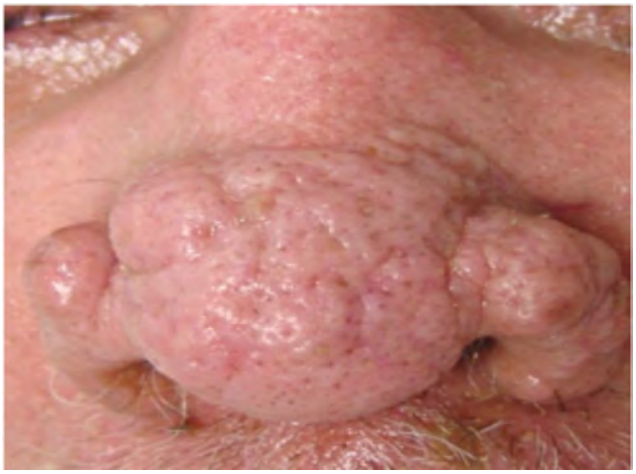


Figure 34: Rhinophyma in an elderly man (reproduced with permission from Otolaryngology Houston, www.ghoryeb.com)

The Nasal Cavity

The nasal cavity extends from the nares anteriorly, to the choanae posteriorly. The midline is partitioned by the nasal septum (see Figure 35), which itself consists of structures including the maxillary crest inferiorly and perpendicular plate of the ethmoid bone superiorly and vomer posteriorly. The nasal septum is rarely in the midline, but when significantly deviated, it can contribute to nasal obstruction, particularly if the deviation is anterior.

Each half of the nasal cavity has a roof, floor, lateral and medial wall. The roof is formed by the body of the sphenoid, cribriform plate of the ethmoid, frontal bone, the nasal bone and the nasal cartilages. The floor is formed by the maxilla, palatine bone and upper surface of the hard palate. The medial wall is illustrated opposite.

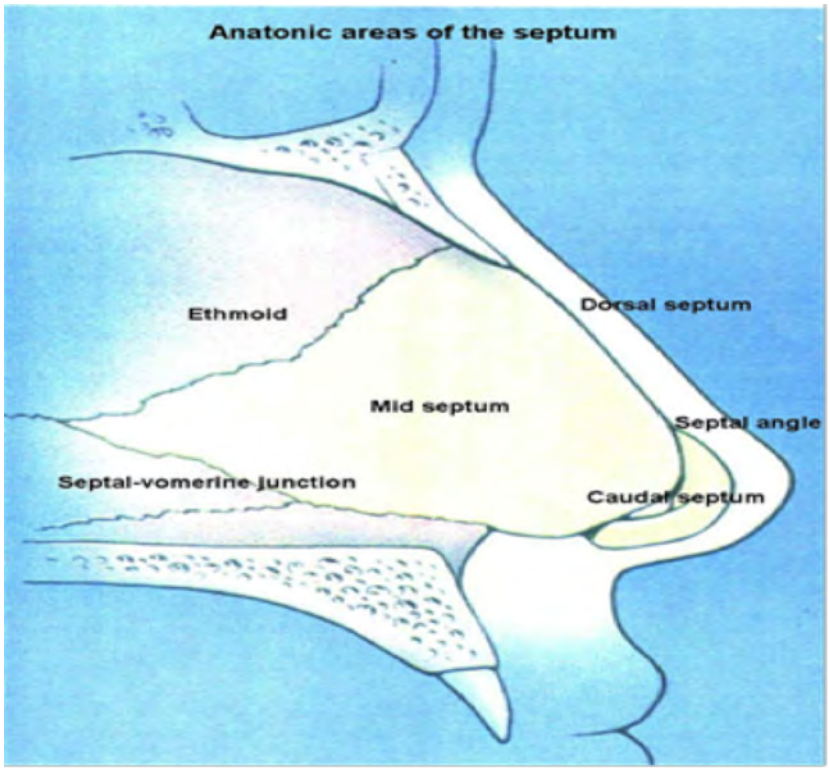


Figure 35: Bony and cartilaginous septum. (reproduced with permission from Otolaryngology Houston, www.ghoryeb.com)

The lateral wall of the nasal cavity consists of a series of bony projections called turbinates (See Figure 36 below). The turbinates are covered by pseudostratified ciliated columnar epithelium and contain venous plexuses, which can engorge in response to external stimuli, neural and hormonal control. They have a role in humidifying and filtering inspired air.

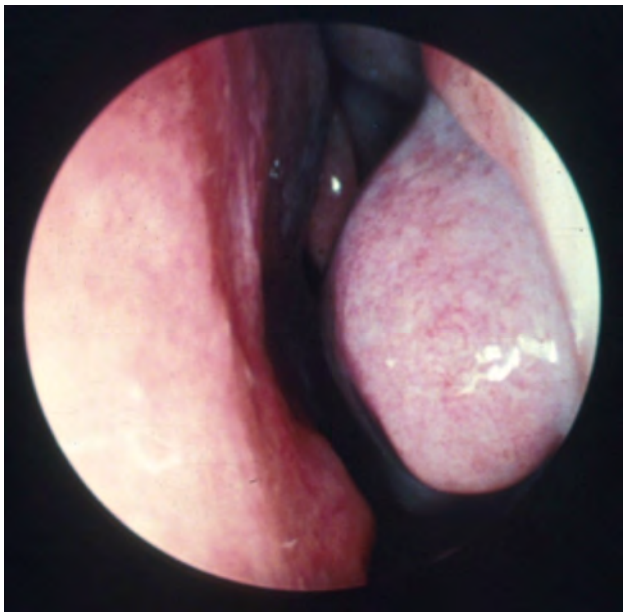


Figure 36: Left Inferior turbinate as viewed with the rigid endoscope.

There are four major openings into the internal nasal cavity:

- Sphenoidal air cells drain into the spheno-ethmoidal recess.
- The posterior ethmoid sinuses drain into the superior meatus.
- The anterior ethmoid sinuses, fontal sinus, and maxillary sinuses drain into the middle meatus.
- The nasolacrimal duct drains into the inferior meatus.

The olfactory nerve arises in the olfactory mucous membrane adjacent to the cribriform plate. The trigeminal nerve provides general sensation through the ophthalmic and maxillary divisions with nerve endings distributed throughout the mucosa.

The arterial supply to the nasal cavity is derived from branches of the internal carotid artery (anterior and posterior ethmoidal arteries) and external carotid artery (facial artery, sphenopalatine artery).

The arteries involved in the Little’s area (which lies in the antero-inferior part of the nasal septum) are the following:

- Anterior ethmoidal artery (from the ophthalmic artery)

- Sphenopalatine artery (from the maxillary artery)
- Greater palatine artery (from the maxillary artery)
- Superior labial artery (from the facial artery)

Epistaxis

It is not a trivial condition and can potentially be life threatening. If the patient is actively bleeding, see them in A&E Resus, not in an isolated treatment room without resuscitation facilities/help.

History

You may have to take a focused history whilst simultaneously resuscitating and stabilising the patient (establishing intravenous access, sending off the pertinent bloods and setting up IV fluids).

Important points to remember are:

- Unilateral Predominance- which side did it start or more commonly comes from, which can then focus your assessment for the likely source.
- Anterior/Posterior – often patients can tell initially if it runs out the front first or down the back of the throat, which may guide further management
- Frequency – how often is it troubling them?
- How much blood loss has occurred – estimating blood loss can be notoriously difficult and bleeding from the nose can be very distressing. By focusing on common measures such as a teaspoon, a cupful, or a kidney dish full of blood can help prioritise your patient's resuscitation requirements.
- Co-morbidities such as hypertension, cardiac history, anti-coagulant use and previous nasal surgical history can all have an effect on patient management.
- Antecedents – traumatic bleeding can have a different anatomical source to other forms of bleeding
- Management techniques, risk factors, smoker, occupation, allergy to nuts

Examination

Most epistaxis occur in Little's Area (otherwise known as Kisselbach's plexus), located in the anterior part of the septum where an anastomosis occurs between the branches of the internal and external carotid arteries.

Initial management options for epistaxis include leaning forwards and pinching the soft part of the nose to apply pressure to the septum (not the bony part of the nasal bridge - Figure 37 and Figure 38). Sucking on ice cubes or applied to the forehead may help slow bleeding by causing vasoconstriction of the feeding vessels. The next step should ideally be identification of the bleeding point for cautery (see Cautery in Practical Procedures Chapter)

Figure 37: Incorrect method of pinching the nose.

Figure 38: Correct method of pinching the nose

Surgical Management of Epistaxis

If these measures fail to control the bleeding (or bleeding from more posteriorly in the nasal cavity is responsible), an endoscopic sphenopalatine artery ligation under general anaesthesia is undertaken (see Figure 39).
Traumatic epistaxis (for example from a sports injury) is usually anterior and related to the anterior ethmoidal artery. Ligation of this is often performed through an external incision at the medial aspect of the orbit.

When dealing with acute traumatic injuries of the nose, it is important to rule out a septal haematoma (Figure 40), which can starve the underlying septal cartilage of oxygen and cause ischaemic necrosis and cartilage loss, resulting in a saddle nose. It is therefore important to drain these at an early opportunity.

Trauma to the front of the nose may cause one or both nasal bones to be displaced. Assessment of any nasal vault deformity should be

made after 5 days once the swelling has subsided. There is a window of opportunity in the weeks after the injury for the nasal fracture to be reduced under local or general anaesthetic.

When the cartilaginous septum is fractured, deformed or displaced it may be corrected with a septoplasty (cartilage remodelling) procedure.

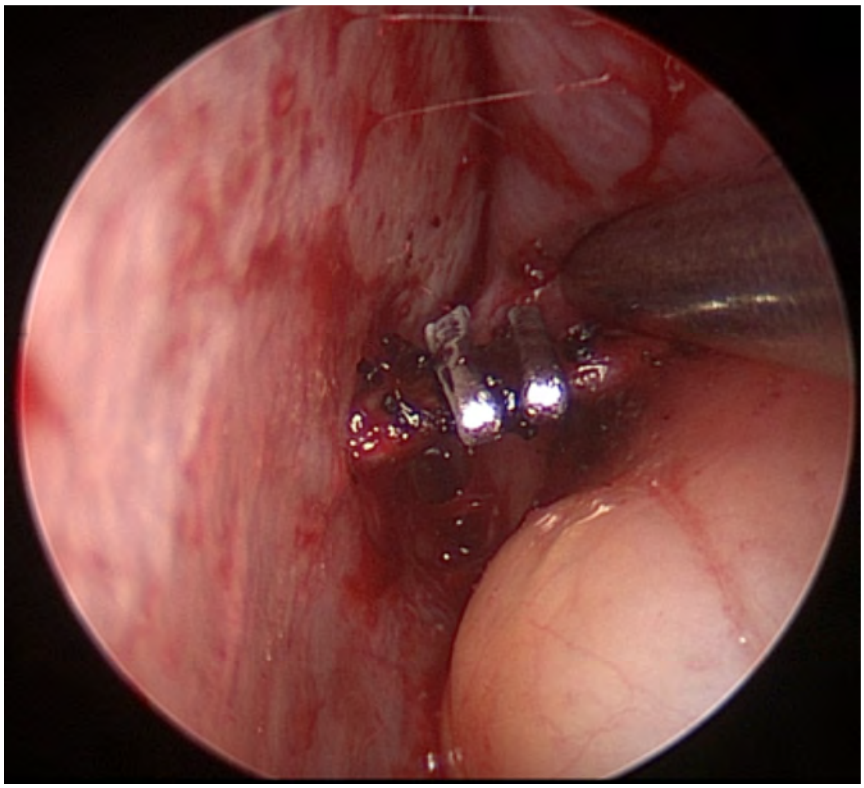


Figure 39: An endoscopic clinical photograph of the right Sphenopalatine artery being clipped in the back of the nose under general anaesthetic for epistaxis. 2 clips have been applied to the main branch.

Nasal obstruction

Causes of Nasal Obstruction

There are a number of causes for nasal obstruction, many of which are beyond the scope of this chapter. More common, acquired causes of nasal obstruction can be classified as seen below. A thorough history, good clinical examination and tailored investigations will often reveal the underlying aetiology:

Infectious – viral; bacterial or fungal infections causing rhinitis/rhinosinusitis
Allergy – inflammation with or without nasal polyps
Developmental - resulting in septal deviation, bony deviation or both; cleft lip
Traumatic – same as above (+/- septal haematomas, perforations, etc)
Iatrogenic – previous surgery (eg septoplasty) causing scar tissue (adhesions); residual septal deformities; mucocoeles
Drugs – chronic use of decongestants (rhinitis medicamentosa); side effects of medication (eg. Beta-Blockers, oral contraceptive pill); cocaine abuse resulting in vasculitis or septal perforation
Neoplastic – benign or malignant masses
Inflammatory/Systemic Diseases – eg. Granulomatosis with Polyangiitis (GPA); Eosinophilic Polyangiitis (EPA/Churg-Strauss); Sarcoidosis; Cystic Fibrosis; Kartaganer’s Disease

Fractured Nose

Nasal fractures do not need to be X-rayed.

If the patient is well and there is no epistaxis and no septal haematoma (a boggy swelling of the septum which is usually seen bilaterally and insensate when probed with a jobson-horn- see Figure 40) they can be sent home.

If there has been no change in shape and no new nasal obstruction since the injury the patient does not need to be seen by ENT and can be discharged with advice.

However, if the swelling and bruising are such that any deformity is obscured, then they should be reviewed in 5-7 days (once the swelling has subsided) in the ENT emergency clinic for assessment of the injury and discussion as to whether the patient wants to proceed to manipulation under anaesthetic.

The patients will need to be consented and listed for an MUA (manipulation under anaesthesia- Figure 41) after seeing them in the SHO emergency clinic. The common risks for the procedure include pain, bleeding, the need to pack the nose, the need to wear a splint, bruising and failure to get the nose back to its original shape.

If the clinician is confident, however, and the patient will tolerate it, a manipulation under local anaesthetic can be undertaken. Using a dental syringe infiltrate over the nasion down to bone and then either side of the nasal bones. Then firm pressure over the deformity will usually result in the bones being realigned into the midline. Patient selection is key to a successful procedure. They will need to wear a splint for 1 week which can be removed by the patient themselves or their GP practice nurse.

If a septal haematoma is present, the patient must have this drained (in theatre) as soon as possible to prevent infection and subsequent

destruction of the septal cartilage. This will lead to saddle deformity of the nose. They will need to be started on antibiotics to prevent secondary infection of the haematoma causing a septal abscess.

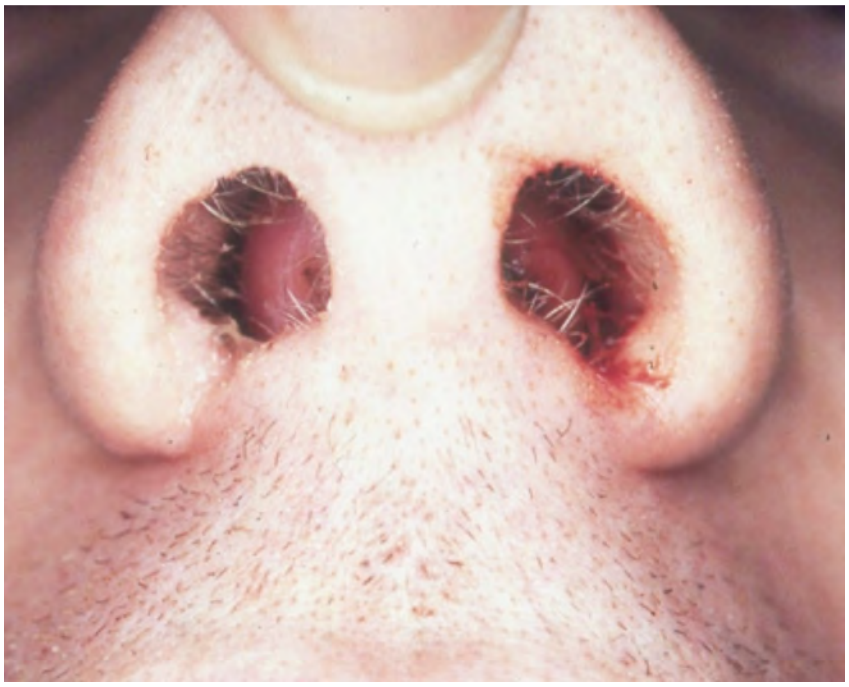


Figure 40: Septal Haematoma after nasal trauma. This requires urgent drainage to avoid complications such as abscess and septal cartilage necrosis.

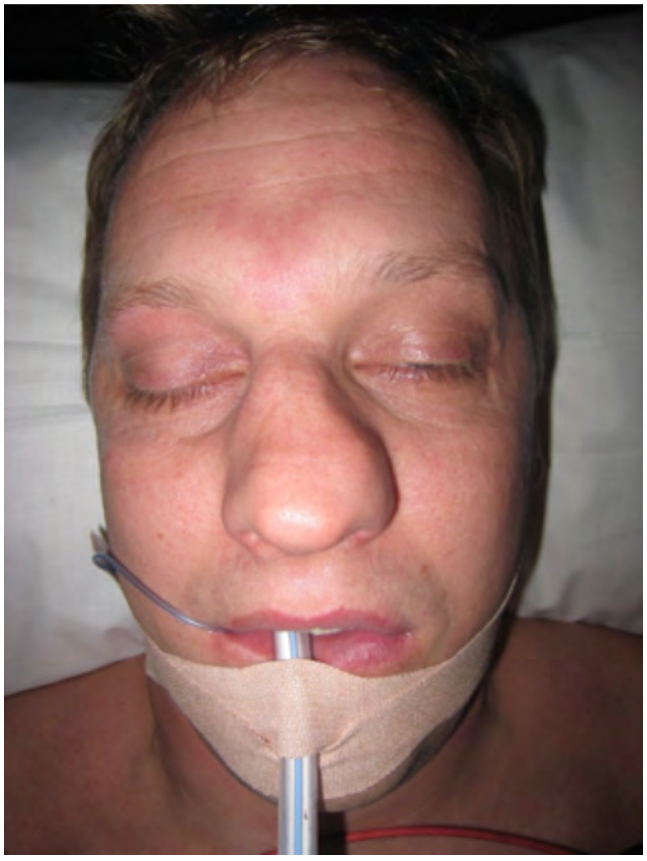


Figure 41: Pre-operative image of trauma resulting in significant nasal deformity.

Septoplasty/Septorhinoplasty

When the underlying midline cartilaginous or bony septum is deviated, a septoplasty can be undertaken to remodel and improve the functional nasal airway. It is often performed under general anaesthesia, as a day-case procedure. It can also be performed to gain better access to the nose for other endoscopic procedures e.g. limited access for epistaxis surgery or for septal cartilage harvest for graft harvesting.

A septorhinoplasty may be indicated if the septum and bony vault are deviated. This operation can be carried out via an external approach (via an incision in the columella) or endonasally. It can be performed for functional and cosmetic indications, and has important implications for both, so patients require appropriate pre-operative counselling.

Both of these procedures, if indicated, are not done acutely after the nasal injury and would be done on an elective list often 6 -12 months after the initial injury.

Rhinitis and Rhinosinusitis

Description

The term ‘rhinitis’ describes inflammation of the lining (mucous membranes) of the nose, characterized by nasal congestion, a runny nose, sneezing, itching and post-nasal drip. It can be usually divided into allergic and non-allergic causes.

The term ‘rhinosinusitis’ describes inflammation of the lining of the nose and paranasal sinuses. It has a number of manifestations, the commonest symptoms being anterior or posterior rhinorrhea (runny nose or post-nasal drip), nasal blockage/congestion or obstruction, and facial headache or reduction in sense of smell.

Allergic Rhinitis

Description

IgE-mediated Type 1- hypersensitivity reaction of the nasal mucosa. This condition can significantly affect quality of life with negative impacts on activities of daily living, school and work attendance.

Epidemiology

Allergic rhinitis (AR) is common and increasing in western populations. It can be associated with atopic disease such as eczema and asthma (1 in 3 patients with AR have asthma). There can be a family history noted.

Causes

- Intermittent (previously known as seasonal)- e.g. grass/tree pollen (hay fever) – late Spring/Summer.
- Persistent (previously known as perennial)- e.g. house dust mite, moulds, dogs, cats
- Food allergens causing rhinitis – this is a controversial area and not fully proven but may be a contributory factor

Symptoms

- Rhinorrhoea (seasonal)
- Nasal irritation /itching (seasonal)
- Sneezing (seasonal)
- Nasal obstruction (seasonal and perennial)
- Ocular symptoms e.g. itchy/watery eyes

Signs

Inflamed nasal turbinates and mucosa- bluish and pale hue to turbinate mucosa, watery nasal discharge and gross turbinate hypertrophy

Investigations

- Clinical diagnosis can be made with a combination of history & examination
- The mainstay of investigation is the skin-prick allergy test (SPT), which can be done cheaply and quickly in clinic. Positive (histamine) and negative (saline) controls are inserted into the skin (dermis), along with solutions of the various common inhaled aero-allergens (Figure 42), eg grass and tree pollen, dog and cat dander. A positive result is a wheal response after 20 minutes (Figure 43). Resuscitation equipment should be ready in case of anaphylaxis. Contra-indications include severe eczema/dermatographism or anaphylaxis. Patients should avoid taking anti-histamine tablets for 72 hours prior to the test in case they mask a response.
- Serum RAST (Radio-allergosorbent test) is a blood test to find specific IgE to an allergen. There is no risk of anaphylaxis, but this is more expensive and takes time for the results. This may be also useful in children who may not tolerate SPT.

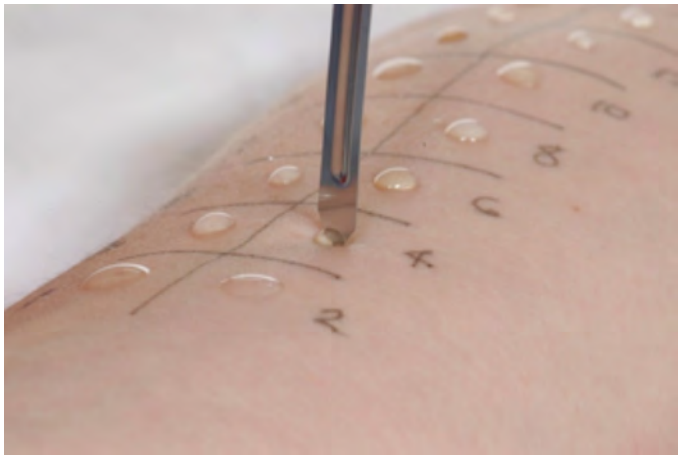


Figure 42: Skin Prick Allergy Testing (SPT) Droplets of various allergen solutions are placed onto the forearm and the skin is punctured

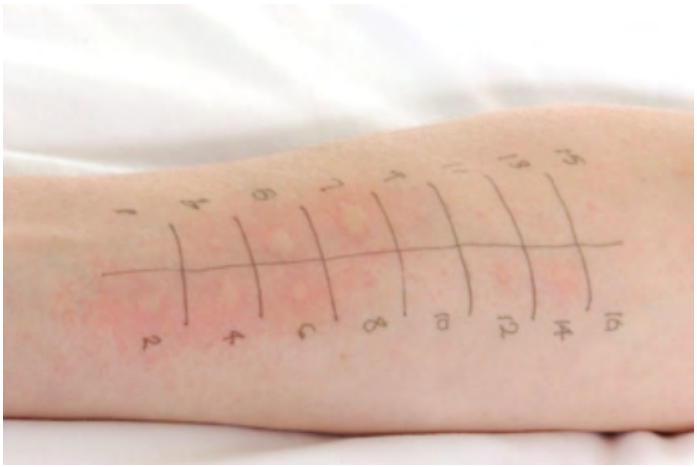


Figure 43: After 15-20 minutes the results can be shown by the positive wheal reaction

Treatment

- General advice- avoiding allergen exposure. E.g. washing bed linen at high temperature to reduce house dust mite allergen burden
- Nasal douching and barrier ointments/creams
- Oral non-sedating antihistamine, eg. Loratidine, Cetirizine, Fexofenadine
- Intra-nasal steroids e.g. Fluticasone (Flixonase or Avamys nasal spray), Beclomethasone (Beconase Nasal spray), or Mometasone (Nasonex Nasal spray) - 1 – 2 sprays, once or twice a day titrated to the patient’s symptoms for a minimum of 4-6 weeks. Check formulary for appropriate prescribing ages. Intra-nasal steroid sprays are suitable for long-term use if tolerated. Escalation to steroid drops or oral steroids can be considered on rare occasions for severe symptoms, but caution must be taken over longer courses due to the numerous systemic side-effects.

- Combination steroid and anti-histamine nasal sprays (eg. Dymista manufactured and distributed by Mylan®) – prescribed by specialists as 2nd line topical management for more effective relief in allergic rhinitis due to the synergistic combination of medications.
- Leukotriene antagonists e.g. montelukast, (orally) useful if patients also have asthma
- Immunotherapy- Desensitisation therapy works by gradually increasing the exposure to an antigen. It can be given sublingual or via subcutaneous injection. Immunotherapy to grass pollens and house dust mite is available in a few specialist centres.

Non-Allergic Rhinitis

Description
Inflammation of the nasal mucosa.

Epidemiology
Very common. Up to 50% of all cases of rhinitis in adults

Causes

- Irritants: tobacco, pollution, cleaning products (occupational)
- Vasomotor: temperature changes- especially cold, dry air
- Gustatory: Spicy food
- Pharmacological: rhinitis medicamentosa (rebound nasal congestion following prolonged use of topical decongestants), substance abuse- cocaine
- Infection
- Systemic- Granulomatosis with polyangitis (GPA), sarcoidosis.
- Physiological- exercise, positional, hormonal
- Atrophic rhinitis

Symptoms
Nasal congestion, rhinorrhea, post-nasal drip, hyposmia

Signs
Nasal congestion and hypertrophic turbinates

Investigations
Allergy testing to exclude allergic cause

Treatment

Non-surgical treatment. Non-surgical treatment should always be tried and is the mainstay of treatment.

- General advice- avoidance of trigger, eg smoking cessation.
- Nasal douches and intranasal steroids
- Other: Ipratropium. Decongestants (short-term only)
- Surgical treatment

- Surgery is not a permanent, curative procedure as the underlying pathology is to do with the lining of the nose. However, surgery may help improve the nasal airway and allow better delivery of topical nasal steroids, which the patient will need to continue postoperatively.
- Turbinate reduction surgery for obstructing inferior turbinates.
- Vidian Neurectomy – cutting the parasympathetic nerve supply to the nose (rarely indicated).

Acute Rhinosinusitis (ARS)

Description

Acute rhinosinusitis (ARS) is caused by symptomatic inflammation of the mucosal lining of the nasal cavity and paranasal sinuses.

There is sudden onset of two or more symptoms, one of which should be either nasal blockage/obstruction/congestion or nasal discharge (anterior/posterior nasal drip):
± facial pain/pressure
± reduction or loss of smell; for <12 weeks

Epidemiology

An average child is likely to have 6-8 colds (ie, upper respiratory tract infections) per year, but only approximately 0.5-2% of upper respiratory tract infections in adults and 6-13% of viral upper respiratory tract infections in children are complicated by the development of acute bacterial sinusitis. Therefore, antibiotics should be prescribed sparingly (see below for indications).

Causes

- Most commonly ARS is viral i.e. a common cold caused by Rhinovirus, Coronavirus, Parainfluenza virus or Respiratory Syncytial Virus (RSV).
- Streptococcus pneumonia, Haemophilus influenzae and Moraxella Catarrhalis account for the majority of bacterial causes.

Symptoms

- Main symptoms are nasal obstruction and coloured discharge

- Facial pain occurs more commonly in the acute presentation of rhinosinusistis
- Hyposmia/ anosmia (reduced/absent smell)
- Ask about pain elsewhere. e.g. dental infections can spread into the sinus
- Systemic features of fever and malaise
- Double sickening (deterioration after an initial milder phase of illness), which may indicate acute post-viral rhinosinusitis or bacterial rhinosinusitis.

Signs

- Facial tenderness can occur but is uncommon
- Anterior rhinoscopy- inflammation, discharge
- Nasendoscopy - pus discharging from sinus openings e.g. middle meatus (Figure 44)

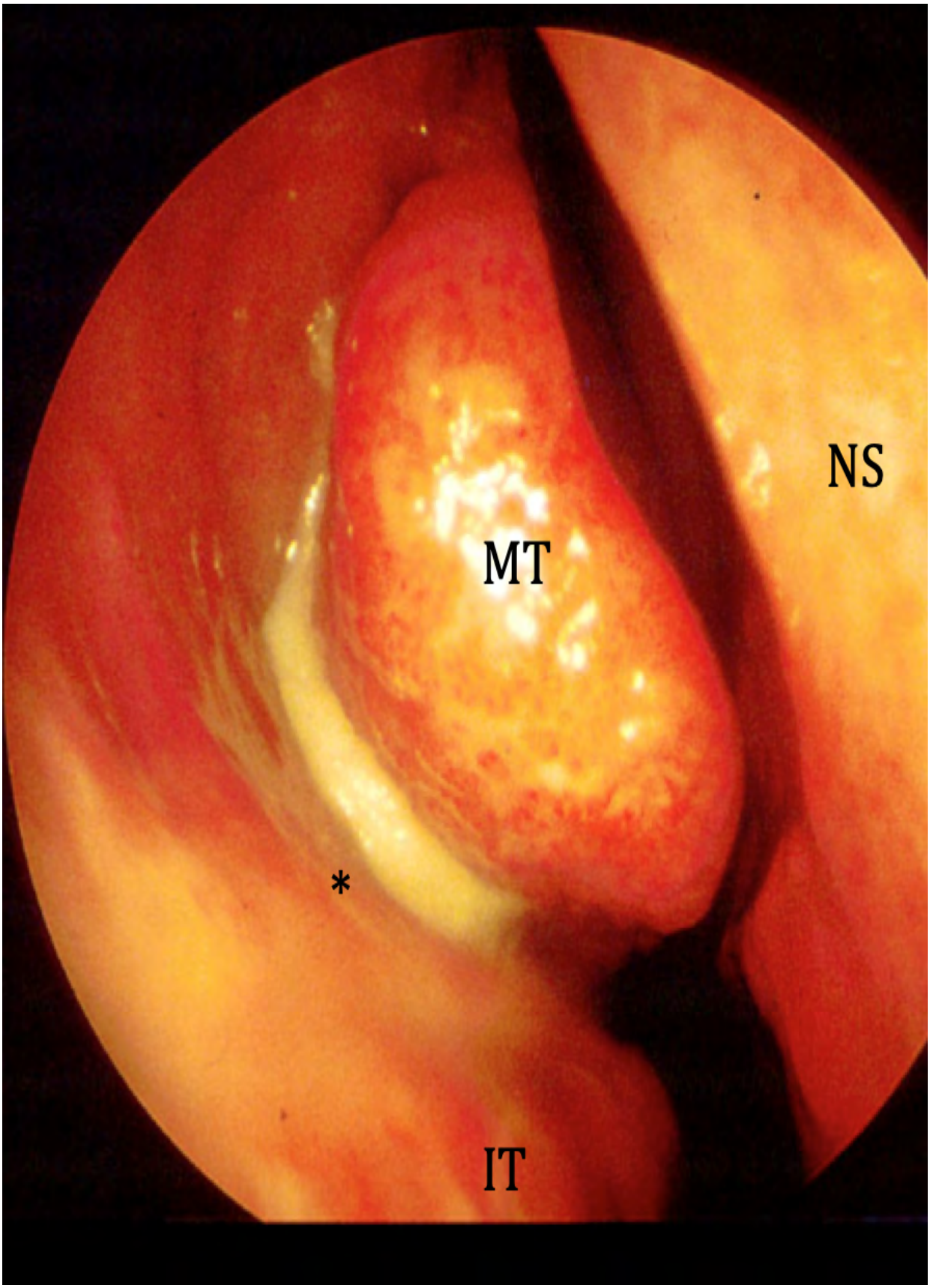

NS
MT
*
IT

Figure 44: Mucopurulent discharge from the Right Middle Meatus (Sinus Drainage pathway) may be indicative of bacterial infection. (NS) Nasal septum, (MT)Middle Turbinate, (IT) Inferior Turbinate.

Complications

- Intracranial: meningitis, cavernous sinus thrombosis, intracranial abscess (rare)
- Associated with severe, sudden onset headache, vomiting & photophobia
- Extracranial: Osteomyelitis, orbital or pre-septal cellulitis, orbital abscess

Investigations

- Bloods: FBC for WBC, CRP,blood culture only if very ill or other comorbidity
- If complicated/not responding…
- Swab for microscopy, culture and sensitivity
- High definition CT scan with contrast, of sinuses and brain if above complications occur. Intra orbital complications are a surgical emergency as vision can be threatened in the presence of intra orbital sepsis (see Figure 45)

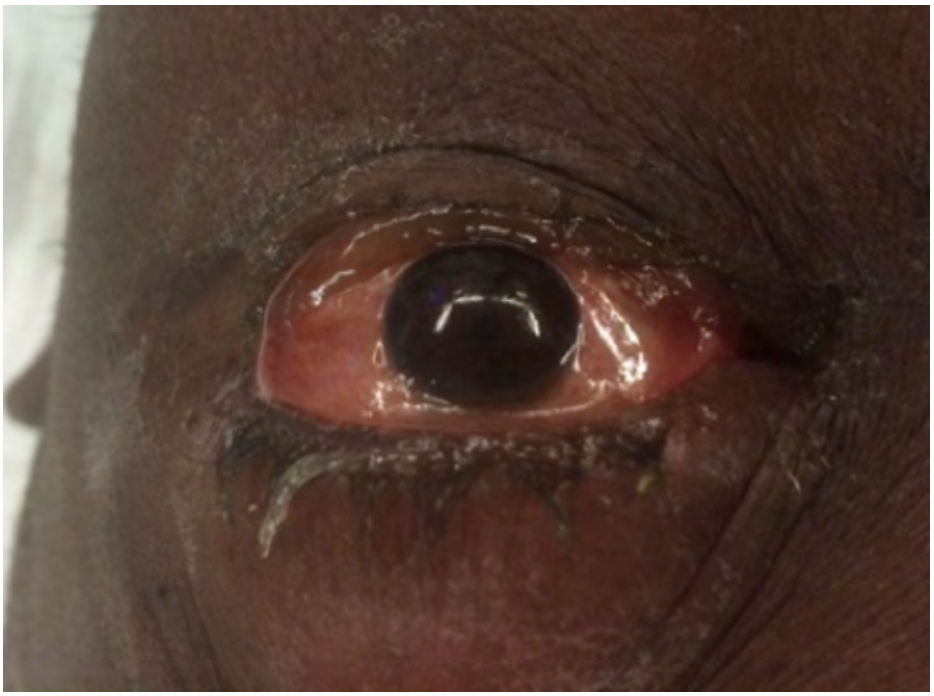


Figure 45: Evidence of a sub-periosteal abscess secondary to sinusitis causing right eye proptosis, peri-orbital swelling, chemosis and loss of the pupillary reflexes. Urgent surgery is required to reduce pressure on the optic nerve.

Treatment

If symptoms less than 5 days and mild:

- Analgesia and nasal saline irrigation
- Fluid rehydration
- Nasal decongestant e.g. xylometazoline or Pseudo-ephidrine for period of 1 week only.

If symptoms are persistent after 10 days or worsening after 5 days;

- As above
- Topical intranasal steroids

If severe (at least 3 of: discoloured discharge, severe local pain, fever, elevated ESR/CRP, double sickening)

- Broad-spectrum antibiotics for 7days. e.g. amoxicillin

- Topical intranasal steroids

If recurrent or chronic symptoms, refer to an ENT specialist for further management, and possible endoscopic sinus surgery.

Chronic Rhinosinusitis (CRS)

Description

- Inflammation of the nasal mucosa and paranasal sinuses for >12 weeks.
- Can be divided into CRS with polyps or CRS without polyps.

Epidemiology

- Common. CRS accounts for 85% of outpatient visits for rhinosinusitis in adults.
- Can follow ARS.

Causes

- Multifactorial and still not fully understood:
- Allergic: Intermittent or Persistent.
- Other non-allergic causes – Occupational, Hormonal, Granulomatous/ Inflammatory, Infective (Viral, Bacterial, Fungal), Anatomical, Iatrogenic, secondary to medication (eg. Rhinitis Medicamentosa/Cocaine abuse)

Symptoms and Signs

The European Position Paper on Rhinosinusitis and Nasal Polyps (EPOS 2012) defines the diagnostic criteria for CRS below:

- Inflammation of the nose & sinuses causing 2 or more symptoms
- Nasal blockage/obstruction/congestion

- Nasal discharge (ant/post nasal drip)

+/- facial pain/pressure
+/- reduction/loss smell

And either:

- Endoscopic signs of polyps, middle meatal oedema or mucopurulent discharge
- CT mucosal changes of the ostiomeatal complex/sinuses

Investigations

CT Sinuses. Can assess the extent of disease and provide anatomical detail for pre-operative planning (see Figure 46).

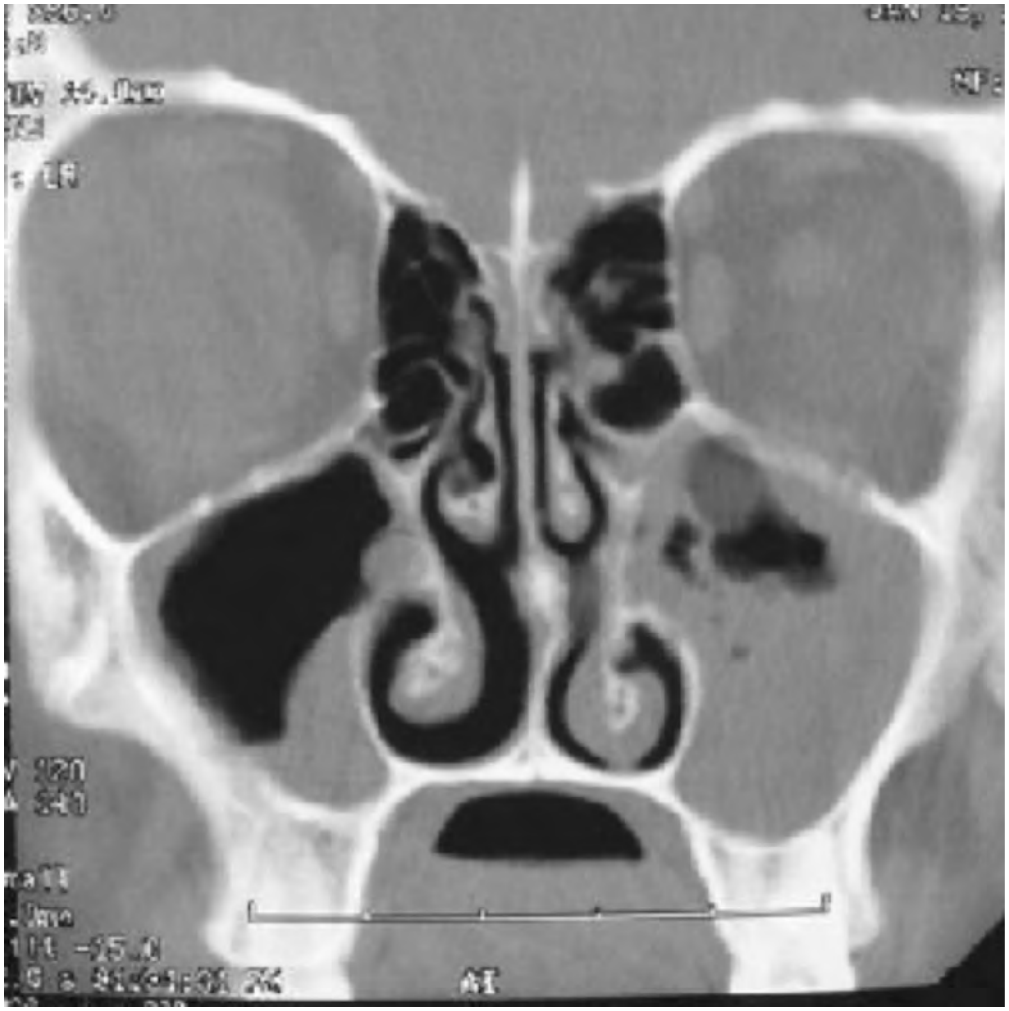


Figure 46: CT Scan in coronal section showing bilateral maxillary sinusitis. R = Right side. Disease is worse on the left hand side mostly in the maxillary sinus and there is hypertrophy of the left inferior turbinate (reproduced with permission from Otolaryngology Houston, www.ghoryeb.com)

Treatment

Non-operative. Appropriate medical management should be attempted primarily, including:

- Saline Nasal Irrigation
- Nasal decongestants (short course only)
- Anti-histamines (if there is an underlying allergic component)
- Oral steroids with CRS with polyps – (caution with side effects), followed by topical therapy

- Topical Steroids with CRS without polyps-
    - Drops include: betamethasone or fluticasone (A typical regime might be for a period of 4-6 weeks)
    - Then switch onto maintenance intra-nasal cortico-steroid spray (INCS) such as fluticasone or mometasone for 3 months until review.
- Antibiotics – Certain antibiotics may help by their anti-bacterial and anti-inflammatory mechanisms. The true benefit of antibiotics in CRS is undergoing evaluation by ongoing trials.
    - The EPOS guidance suggests macrolides are useful in non-polyp CRS when the IgE levels are not raised and the cardiac history has been taken into account due to possible effects on prolongation of the QT interval (e.g. Clarithromycin 500mg OD PO for 3 weeks).
    - In polyp patients, the antibiotic of choice is Doxycycline (50-100mg OD PO for 3 weeks) if tolerated.
    - Local formulary guidance should be sought if patients are allergic to first line options.

Operative: Functional endoscopic sinus surgery (FESS).

- The principles of FESS are to remove diseased tissue, relieve obstructions and to restore the normal function and anatomy of the paranasal sinuses. Often it can involve removing the bony septae obstructing the sinus outflows whilst preserving mucosa, to widen the sinus drainage pathways and increase access for subsequent topical medical therapies.
- Sinus surgery should be seen as an adjunct in the management of CRS where medical treatment alone has failed, rather than stand alone definitive treatment.
- Patient selection is key, and quality of life screening tools such as the SNOT-22 (Sino-Nasal Outcome Test of 22 questions) can help identify appropriately symptomatic patients who may gain benefit from surgery.

Nasal Polyps

Description

Nasal polyps are very common and are typically bilateral. They typically present with symptoms of nasal blockage with or without a change in smell perception. They are benign. They include:

- Inflammatory/Allergic Polyps – sino-nasal polyposis, often multiple grey, oedematous polyps associated with CRS (see Figure 47)
- Antro-choanal polyp – single polyp arising from maxillary sinus extending out towards nasopharynx causing unilateral nasal obstruction.

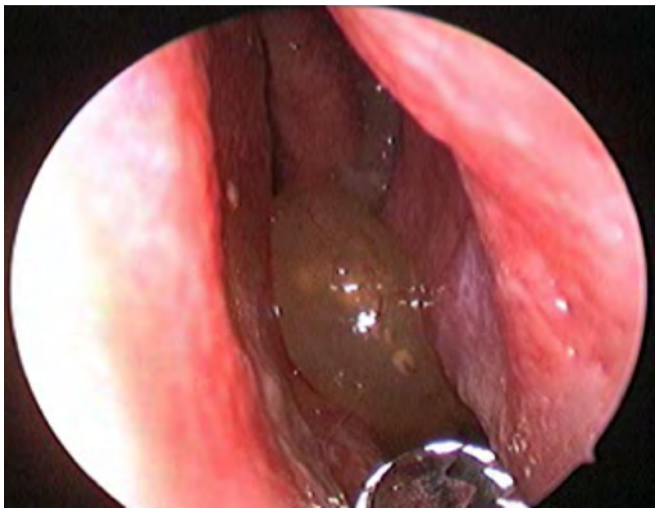


Figure 47: Clinical photograph of left nasal cavity showing inflammatory nasal polyps arising from the sinus drainage pathway (Middle Meatus) blocking nasal airway

Treatment

Medical

Medical treatment involves some form of steroid-based treatment combined with nasal saline rinses. If there are no contra-indications, a typical regime might consist of a short course of oral steroids (Prednisolone 0.5mg per kg PO for 7 days with PPI cover), followed by intra-nasal steroid drops for 4-6 weeks, and subsequently a maintenance intra-nasal corticosteroid spray (INCS) such as Mometasone until further review.

There is some evidence from the EPOS guidance that certain antibiotics are of added benefit if the levels of IgE in the serum are not raised (eg. Doxycycline).

Surgical

The principles of surgery for CRS with polyps are to establish good access for further medical treatment, when medical therapy alone has failed. Simple endoscopic nasal polypectomy or Functional Endoscopic Sinus Surgery (FESS) is usually performed under general anaesthesia and aims to remove the polyps and re-establish the natural drainage pathways of the paranasal sinuses. The extent of surgery will be governed by disease factors, patient factors and the experience of the operating surgeon.

When consenting patients for surgery, certain risks should be included such as pain, infection, bleeding, the need to pack the nose, intra-cranial complications (CSF leak and meningitis), intra-orbital complications (double vision/blindness) and possible recurrence of polyps/sinus disease.

Other Sinonasal Lesions

Benign lesions

- Papilloma/Wart – verrucous lesion, commonly in nasal vestibule, often multiple and painless, presents with bleeding. Local excision is mainstay of treatment
- Pyogenic Granuloma – friable lesion that bleeds, usually from trauma often arising on septum. Commoner in pregnancy
- Other rarer pathology can have the appearance of a “unilateral nasal polyp” during nasal examination. Examples include
- Inverted Papilloma – benign but locally aggressive polyp that has a predisposition for recurrence if not completely cleared including its site of origin. Can rarely transform into malignancy over time (see Figure 48)
- Juvenile Nasopharyngeal Angiofibroma (JNA) – vascular benign tumour exclusively present in adolescent males (may have hormonal element). These are extremely rare but classically present with nose-bleeds and nasal obstruction in teenage boys. Embolisation and subsequent surgical removal (endoscopic or open depending on extent) is the mainstay of treatment.
- Meningoencephalocoele/glioma – herniation of intracranial contents through a weakness in skull-base containing meninges, brain (rarely functioning) or support tissue. Imaging with MRI needed before biopsy.

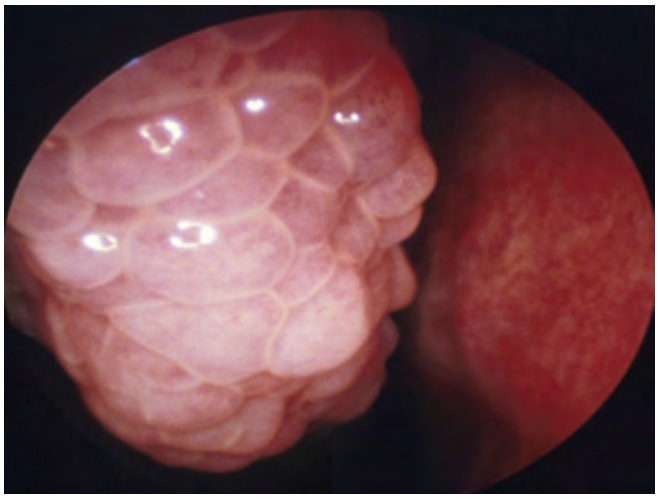


Figure 48: Inverted papilloma right nasal cavity arising from lateral wall of nose

Malignant

Sino-nasal malignancies are rare but present late, resulting in a poor prognosis. Presenting symptoms include unilateral nasal obstruction, unilateral glue ear, bleeding, pain, neck lumps, unexplained weight loss, eye symptoms, headaches or cranial nerve deficits. The commonest are squamous cell carcinomas (see Figure 49 and Figure 50), adenocarcinomas (associated with wood-working) and nasopharyngeal carcinomas (arising from the nasopharynx)

Imaging and histology are essential and the results are discussed in a multi-disciplinary team meeting, where recommendations for which treatment is best suited for the patient can be made.

Treatment can be curative or palliative and may include surgery, chemotherapy (drugs), radiotherapy (ionizing radiation) or a combination of these. Nasopharyngeal cancers are commonly treated with radiotherapy or chemoradiotherapy.

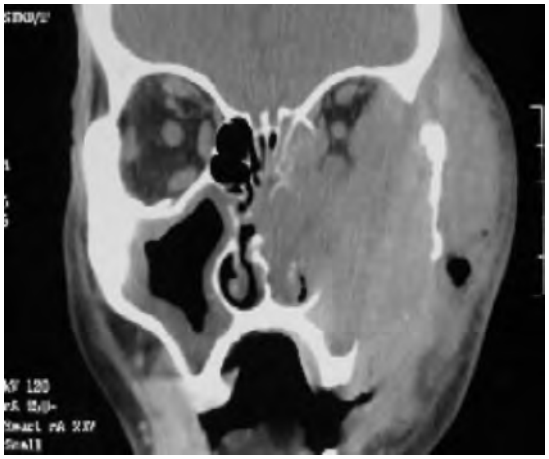


Figure 49: SCC of the Left Maxillary Sinus

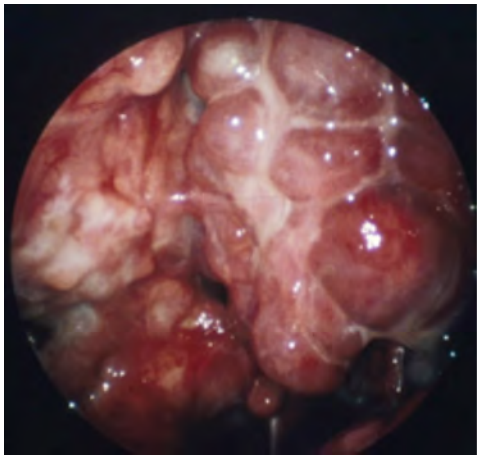


Figure 50: Endoscopic image of SCC Left Maxillary Sinus

Cleft Lip and Palate

Description

A cleft is a gap or split in the upper lip and/or roof of the mouth (palate) resulting in an abnormal connection between the oral and nasal cavity. A cleft lip and palate is the most common facial birth defect in the UK, affecting around one in every 700 babies.

It can range in severity from a submucous cleft (the muscles of the soft palate not fully joining) which may be relatively asymptomatic to a bilateral cleft lip and palate with immediate concerns at birth regarding airway and feeding.

It can be an isolated occurrence or associated with other genetic and developmental abnormalities.

Important Considerations

- Feeding – poor suction, lengthy feeds, nasal regurgitation, excessive air intake, poor airway protection and expending too much energy can cause failure to thrive. Bottles with special nipples can help improve this.
- Otologic – high incidence of glue ear and delayed resolution (poor Eustachian tube function secondary to abnormally developed palate muscles predisposes to middle ear effusions) means hearing assessment early on is a priority with onward referral for grommets or hearing aids.
- Speech/Swallow – speech and language therapy to combat problems with palate dysfunction and reflux
- Cosmetic – lip and nasal deformities will require addressing within 1st year of life and revision often required later as patient grows
- Dental – restoration / prosthesis may be required for normal function and cosmesis

- Psychology, Social Work & MDT – parental counselling and assistance is important starting pre-natally and ongoing throughout childhood. Paediatricians are often well placed to help co-ordinate global development.

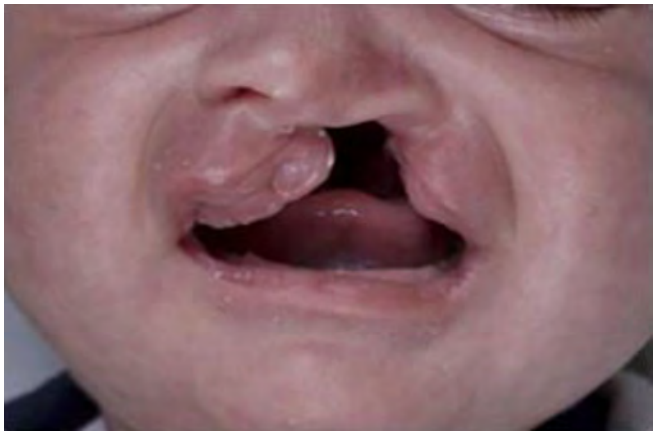


Figure 51: Unilateral left cleft lip and palate (Courtesy of Elf-ENT)

Head and Neck

Head and Neck Anatomy

As medical students and junior doctors, being able to apply anatomy in a clinical context is important. You do not need to have an in depth knowledge of complex head and neck anatomy. Instead, being able to grasp the basic anatomy to inform your examination skills and interpretation of findings is more advisable.

Facial Muscles

Muscles develop from the second arch mesoderm and are attached to the dermis and arranged into sphincters, dilators and muscles of facial expression. The groups can be subdivided into muscles of mastication (nervous supply: trigeminal nerve) and muscles of expression (nervous supply: facial nerve).

Orbicularis Oris

- A complex muscle which encircles the mouth
- Contraction of this muscle narrows the mouth and closes the lips
- It is most evident when performing the act of whistling

Buccinator

- This quadrilateral muscle forms the muscular component of the cheek. It lies between the mandible and the maxilla
- It is the deepest muscle of the face
- It acts to prevent accumulation of food between the teeth and cheek

Clinically important points:

- The temporalis muscle is covered by tough fascia. This fascia can be used to repair a perforated tympanic membrane (myringoplasty)
- The masseter is the most powerful muscle of mastication owing to the multipennate arrangement of its fibres
- The lateral pterygoid muscle is the only muscle of mastication which is attached to the temporomandibular joint
- The facial nerve has a long course from the brainstem to innervate the muscles of facial expression. Damage of this nerve results in facial weakness. Supranuclear lesions (e.g. stroke) spare the forehead, usually due to bilateral innervation.

Infranuclear lesions produce a lower motor neuron paralysis with both upper and lower facial muscles- there is typically unilateral weakness.

- Paralysis to the orbital muscles occurs when there is damage to the facial nerve. Ptosis results with secondary consequences of exposure keratitis and corneal surface ulceration
- Inability to form facial expression on one side of the face can be the first sign of facial nerve damage

Blood Supply to the Face and Neck

External Carotid is a branch of the common carotid artery, which gives off several branches in the neck

Mnemonic: “Some Anatomists Like Freaking Out Poor Medical Students!” describes the branches of the external carotid from most inferior to superior aspect:

- Superior thyroid artery (Anterior branch)
- Ascending pharyngeal artery (Ascending branch)
- Lingual artery (Anterior branch)
- Facial artery (Anterior branch)
- Occipital artery (Posterior branch)
- Posterior auricular artery (Posterior branch)
- Maxillary artery (Terminal branches)
- Superficial temporal artery (Terminal branches)

Clinically Important Points

- The common carotid bifurcates at the level of the superior border of the thyroid cartilage
- The carotid sinus (baroreceptor) and carotid body (chemoreceptor) are located at the bifurcation
- The internal carotid artery has no branches. In surgery, at least 2 or more branches from the external carotid artery should be identified to distinguish it from the internal carotid artery when considering ligating the external carotid artery

The Major Salivary Glands

Parotid Gland
Large serous salivary gland anterior and inferior to the ear. Saliva is drained via the Stenson duct which lies superficial to the masseter. After piercing through the buccinators, it enters the oral cavity opposite the 2nd upper molar tooth

Submandibular Gland
Mixed serous and mucous salivary gland. Closely related to and indenting the mandible
Forms majority of saliva when not eating. The gland drains into the floor of oral cavity via Wharton's duct, one to either side of the frenulum

Sublingual Gland
Mucous gland. It drains via multiple openings into the submandibular duct and sublingual fold in the floor of the oral cavity.

Oral Cavity

The main function of the oral cavity is to provide the ability for satisfactory mastication, including formation of a food bolus, drinking and breathing. Speech is also an important function.

Dentition
Adults have 32 teeth and children 20 (milk teeth). Teeth are important for mastication. They require saliva to ensure they remain healthy. Dental health can be affected by a variety of problems, not least a poor diet, smoking and alcohol. Poor oral health can have adverse consequences on general health. Complications of dental disease include submandibular abscesses, deep neck space abscesses and are part of the differential diagnosis of acute tonsillitis and peritonsillar abscesses.

The oral cavity is bounded by (Figure 52):

- Anteriorly by the lips
- Posteriorly by the palatoglossal arches (anterior pillars of the fauces)
- Laterally by the teeth and cheeks.
- Inferiorly by the floor of mouth and mylohyoid
- Superiorly by the hard palate

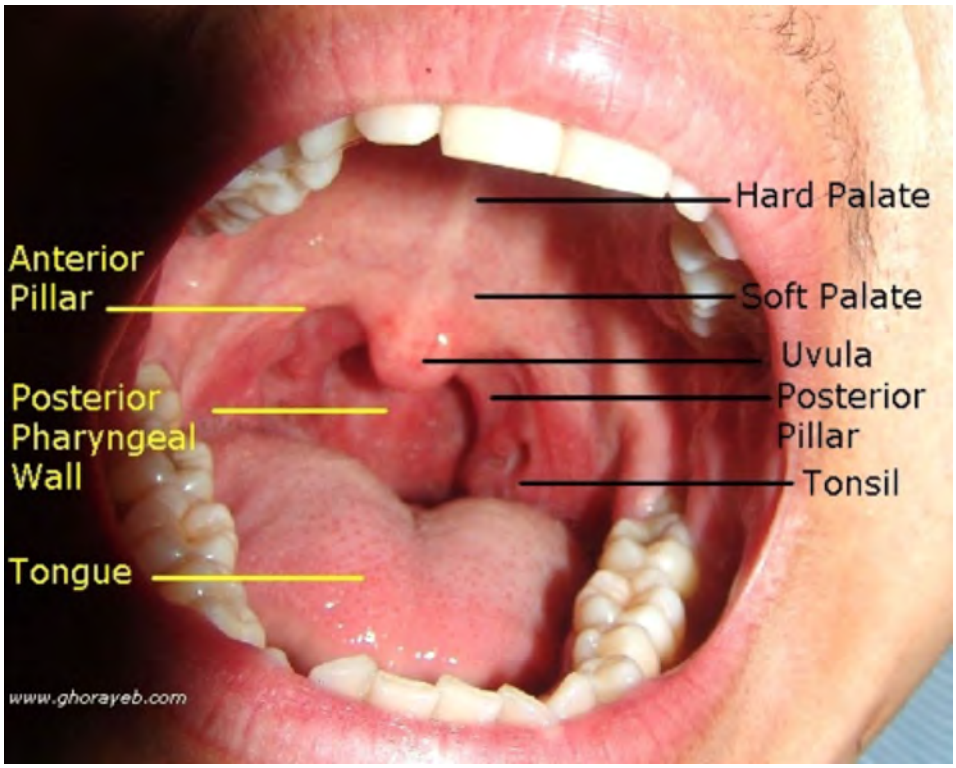


Figure 52: Oral cavity (reproduced with permission from Otolaryngology Houston, www.ghoryeb.com)

Nerve Supply of the Tongue

Tongue Area	Innervation
Somatic sensation from anterior two thirds of tongue	Lingual nerve (V3 branch of Trigeminal nerve)
Taste sensation from anterior two thirds of tongue	Chorda tympani nerve (hitchhikes with Lingual nerve)
Somatic and taste sensation from posterior one third of tongue	Glossopharyngeal nerve and a small part- internal branch of the superior laryngeal nerve
Intrinsic muscles of the tongue	Hypoglossal nerve
Extrinsic muscles of the tongue	Hypoglossal nerve (except palatoglossus which is supplied by the pharyngeal plexus)

Clinically Important Points

- The surface of the tongue is covered with 3 types of coarse papillae called filiform, fungiform (which contain taste buds) and

circumvallate papillae (which are aligned in V shaped formation dividing the anterior 2/3rds of the tongue from the posterior 1/3 of the tongue)

- The apex of the circumvallate papillae (foramen caecum) represents the embryological site of the thyroid gland. A lingual thyroid may present as a mass in this area if there is failure of migration
- Unilateral hypoglossal nerve palsy will result in deviation of the tongue towards the affected side with associated muscle atrophy.
- Ludwig's angina is a necrotising cellulitis+/- abscess formation of the floor of mouth, which can extend into the neck and can be caused by dental root abscesses. It's most dangerous complication is a potentially life threatening airway obstruction due to the swelling within the mouth/neck.

Topography of the Neck

The regions are described as levels and assigned a roman numeral. It is particularly useful when describing the location of a neck lump. These levels can be divided into subdivisions but for the purposes of this handbook we have not discussed this.

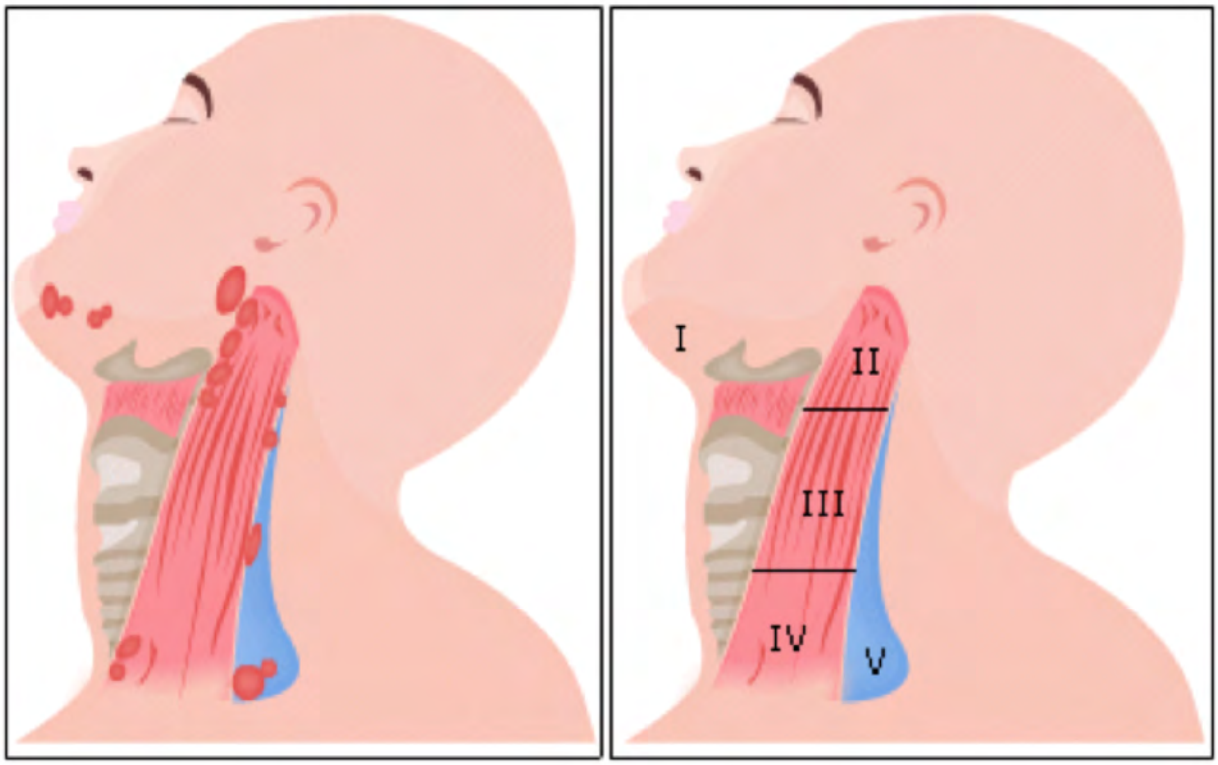


Figure 53: Levels of the neck (courtesy of Elf-ENT)

The neck can also be divided into anterior and posterior triangles. The anterior triangle is bounded superiorly by the mandible, laterally by the sternocleidomastoid muscle and medially by the midline. The posterior triangle is bounded anteromedially by the sternocleidomastoid, inferiorly by the clavicle and posteriorly by trapezius muscle

Neck Level	Content Definition
Level one	Bound by the body of the mandible superiorly, the midline anteriorly and the inferior edge of the posterior belly of digastric infero-posteriorly
Level Two	Region related to the upper third of the jugular vein, extended from the skull base to the inferior border of the hyoid bone. The anterior border is the lateral edge of sternohyoid and the posterior border is the posterior border of sternocleidomastoid muscle
Level Three	Region between the hyoid superiorly and the inferior border of the cricoid cartilage. The anterior border is the sternohyoid muscle and the posterior border of the sternoicleidomastoid muscle is the posterior border
Level Four	Region between the inferior border of the cricoid cartilage and the clavicle. The anterior and posterior border is identical to that of level three. The omohyoid muscle is a surgical landmark that divides level III from level IV
Level Five	Posterior triangle of the neck- bounded by the posterior border of the sternocleidomastoid muscle anteriorly and posteriorly by the anterior border of the trapezius muscle. The contents include the spinal accessory, transverse cervical and supraclavicular group of the nodes.
Level Six	Region defined by the carotid arteries laterally, hyoid bone superiorly and suprasternal notch inferiorly

Fascial Layers of the Neck

Superficial layer- This layer forms a thin sheet of fascia that encircles the platysma muscle.

Deep Layer consists of 3 separate layers:

- Investing layer (external) (Figure 54)- It splits to invest the trapezius, sternomastoid and parotid, and its deeper layer invests the great vessels to form the carotid sheath.
- Pretracheal layer (visceral) (Figure 55)- covers the salivary glands, muscles, thyroid gland and other structures located in front of the trachea
- Prevertebral layer (internal) (Figure 56)- covers the prevertebral muscles. The interval between the pharynx and the prevertebral fascia is called the retropharyngeal space

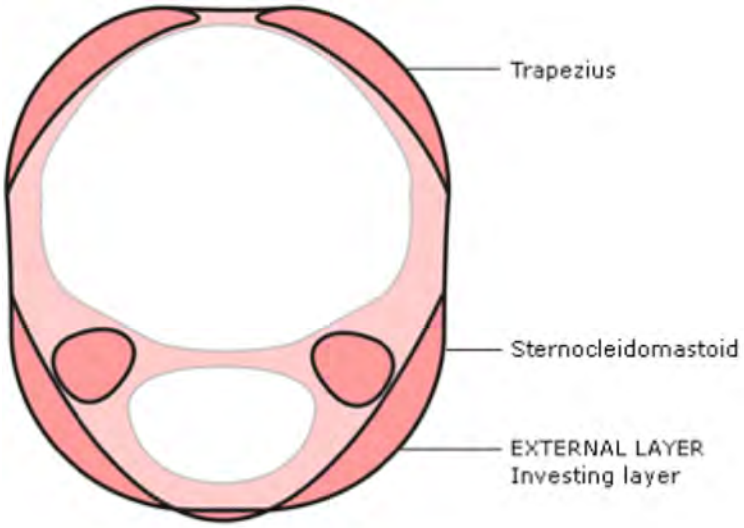


Figure 54: Investing layer of fascia (Image courtesy of Elef-ENT)

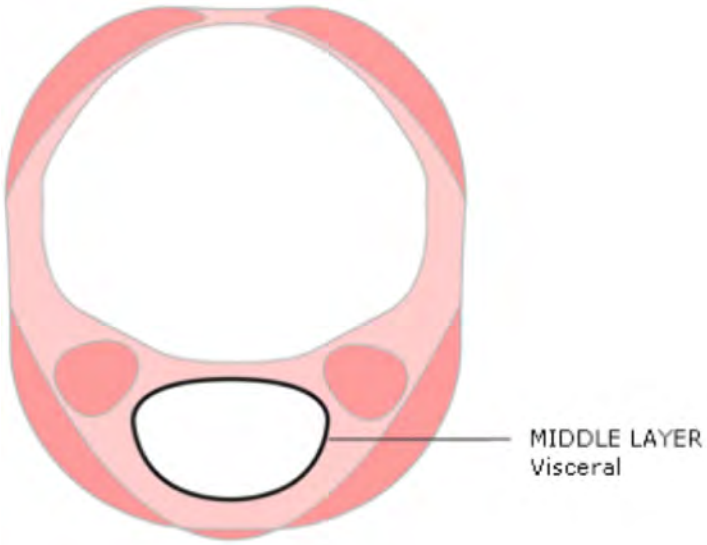


Figure 55: Visceral layer of fascia (Image courtesy of Elef-ENT)

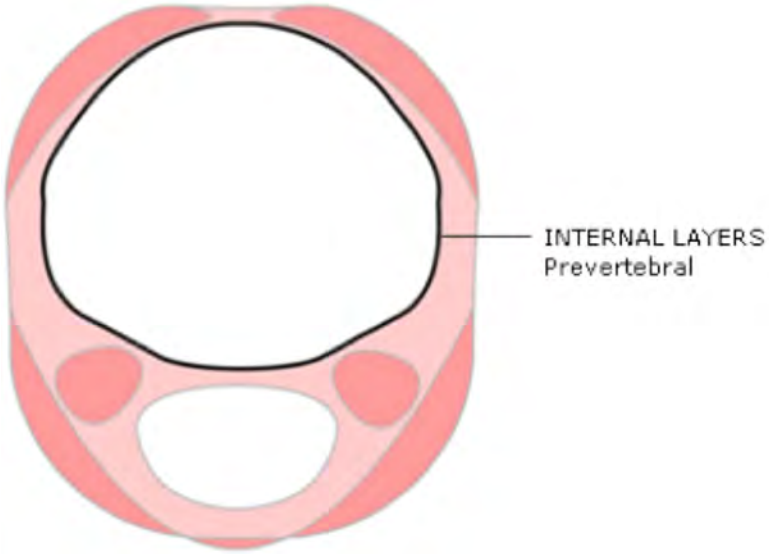


Figure 56: Prevertebral layer of fascia (Image courtesy of Elef-ENT)

Nervous Supply of the Head and Neck

Nerve	Parent Nerve	Innervation	Clinical Note
Ansa Cervicalis	Cervical plexus (anterior rami of the first four cervical nerves) C1 nerve initially joins the hypoglossal nerve, then leaves to unite with the descending cervical nerve (C2 , C3) to form the ansa cervicalis.	Ansa cervicalisàthe omohyoid, sternohyoid and sternothyroid muscles. Other C1 fibres- nerve to thyrohyoid and genihyoid.	Stylohyoid is innervated by the facial nerve- not the ansa cervicalis
Auriculotemporal	Trigeminal n. -> Mandibular n. -> Auriculotemporal n.	Outer ear and temporal region. Parasympathetic secretomotor to the parotid gland via lesser petrosal	Frey's Syndrome – after a parotidectomy, the nerves from auriculotemporal that previously innervated the gland can reattach to the sweat glands in the same region. The result is sweating along the cheek with the consumption of food

Buccal	Trigeminal n. -> Mandibular n. -> Buccal n.	Cheek and oral mucosa	Runs parallel with parotid duct
Chorda Tympani	Facial n. -> Chorda Tympani	Parasympathetic secretomotor innervation to submandibular and sublingual gland	Taste to anterior 2/3 of tongue

Facial		Muscles of facial expression, Stapedius muscle, Secretomotor to all glands in head except parotid.	Bells Palsy= LMN loss of facial expression of unknown cause (a diagnosis of exclusion). Risk of damage during parotidectomy.
Glossopharyngeal		Parasympathetic secretomotor to parotid gland, Stylopharyngeus muscle motor supply, Taste to posterior 1/3 of tongue, Somatic sensation to posterior tongue, pharynx, inner part of ear, Somatic sensation to tympanic membrane, Visceral sensation to baroreceptors in the carotid sinus	Risk of damage during tonsillectomy

Great Auricular	Cervical plexus (C2, C3)	External ear, region inferior to ear	Risk of damage during parotidectomy, with sensory defcit of the ear lobe
Greater Occipital	C1	Back of the neck	
Hypoglossal		All intrinsic and extrinsic muscles of the tongue, except palatoglossus	Injury of this nerve is a risk during Neck Dissection surgery (See Chapter on Operations)

Lesser Occipital	C2, C3	Posterior to ear and back of neck	
Internal Laryngeal		Visceral sensory from the larynx and mucosa in the supraglottis	Passes between the middle and inferior pharyngeal constrictors. It pierces the thyrohyoid membrane
Lingual		Somatic Sensation to the anterior 2/3 of the tongue, Taste to the anterior 2/3 via the chorda tympanic	It wraps around the submandibular duct in the floor of the mouth
Mandibular (V3)		Muscles of mastication, tensor tympani, tensor veli palatini, mylohyoid and anterior belly of digastric. Somatic sensation to anterior 2/3 of tongue. Sensory to chin, lower lip and mandibular teeth.	
Maxillary (V2)		Sensory to upper lip, nose, infraoribtal region, maxillary teeth, nasopharynx and soft palate	
Recurrent Laryngeal	Vagus (X)	All intrinsic muscles of the larynx except the cricothyroid muscle	Damage to the nerve causes vocal cord paralysis
Spinal Accessory		Sternocleidomastoid muscles and trapezius	Risk of injury during Neck Dissection operation and lymph node biopsy
Superior Laryngeal	Vagus (X)	Inferior Pharyngeal muscle and cricothyroid, Sensory to supraglottis	Loss of sensation to supraglottis may lead to aspiration
Vestibulocochlear	Auditory innervates the cochlea and Vestibular innervates the		

Physiology of Swallowing

1. Oral Stage (voluntary)

Oral preparatory - Food bolus is formed and held in the anterior part of the oropharyngeal cavity. The oral cavity is closed posteriorly by the soft palate and tongue to prevent leakage into the pharynx

Oral Propulsive - The dorsum of the tongue gradually propels the food bolus to the back of the oral cavity

2. Pharyngeal Stage (involuntary- CNIX)

The soft palate elevates and closes the nasopharynx at the same time as the bolus comes into the pharynx- this prevents bolus regurgitation into the nasal cavity
The larynx is closed, elevated and tucked under the base of the tongue to prevent aspiration.
The pharyngeal constrictor muscles contracts from top to the bottom, squeezing the bolus inferiorly

3. Oesophageal Stage

The food bolus enters the upper oesophageal sphincter, which includes the cricopharyngeus muscle. This muscle relaxes at the arrival of the food bolus
Peristalsis propels the food bolus at a rate of 4cm/s towards the lower oesophageal sphincter which also relaxes
Gravity aids peristalsis in the upright position

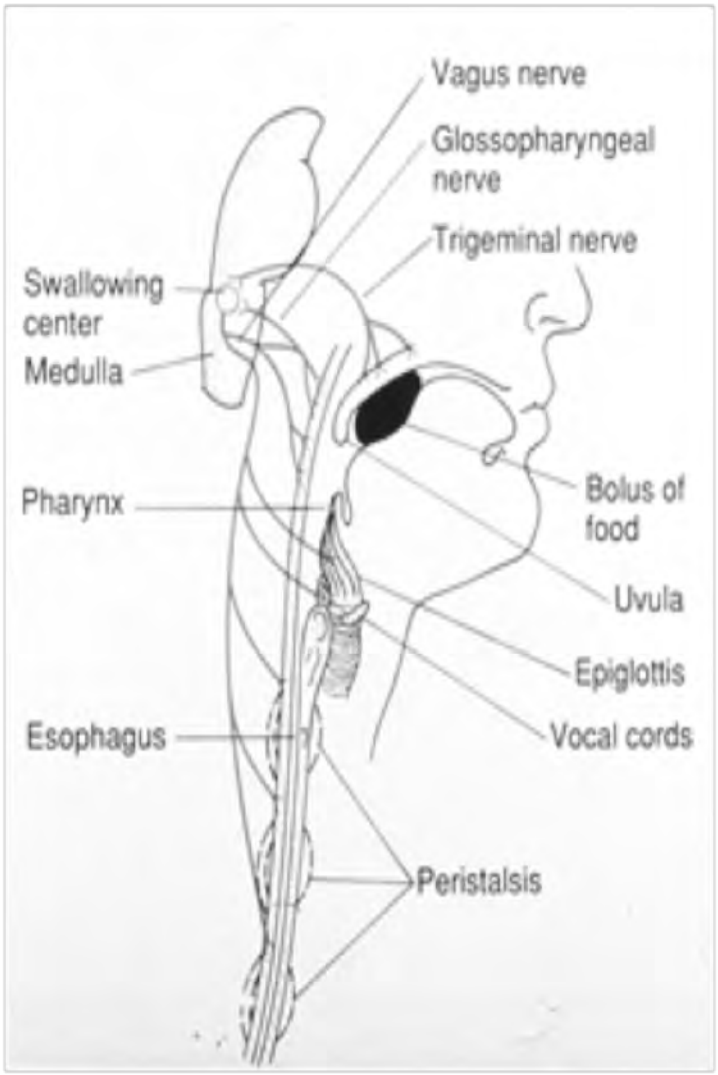


Figure 57: Swallowing Physiology

Taking History of a Neck Lump

Opening

- How old are you?
- What do you do for a living?
- Why have you come to see me today?

History of Presenting Complaint

- What made you notice the lump?
- How many lumps have you noticed?
- Where do you notice the lump?
- Has the lump changed in size?
- Is the lump always there or does the lump come and go?
- How long have you had the lump?

Associated symptoms

- Has the lump been painful at all?
- Any sore throat?
- Have you had any difficulties swallowing?
- Have you had painful swallowing?
- Have you had any problems with breathing?
- Any coughs or colds?
- Have you noticed any blood?
- Have you noticed any weight change?
- Have you had any ear pain?
- Have you noticed any sweating at night/ temperatures?
- Has your voice changed?

Past Medical and Surgical History - to include:

- Have you had any previous investigations for this neck lump
- Have you received any treatments for this lump

Medication and Allergies

- Do you take any regular medications?
- Are you allergic to anything?

Social History

- Ask about smoking & quantify
- Ask about drinking alcohol and quantify

Red Flag Symptoms for urgent referrals (with or without a neck lump)

- Unexplained neck lump that has changed over a period of 3- 6 weeks
- Hoarse voice > 3weeks
- New onset dysphagia
- Unexplained persistent swelling in the salivary glands
- Otalgia > 4 weeks and normal otoscopy
- Unexplained persistent sore or painful throat
- Non healing ulcers
- White or red lesion in the mouth or oropharynx

Causes of Neck Lump

Level	Pathology to be considered
I	Submandibular gland pathology, tooth abscess
II	Parotid pathology, branchial cyst , lymphadenopathy (benign/ malignant)
III	Branchial cyst, paragangliomas e.g. carotid body tumour, lymphadenopathy (benign/ malignant),
IV	Lymphadenopathy (benign/ malignant),
V	Cystic Hygroma, lymphadenopathy (benign/ malignant)
VI	Thyroid goitre/nodule, thyroglossal duct cyst, dermoid (thyroglossal and dermoid cysts are strictly midline) and epidermoid cysts, thymic cyst

Commonest aetiology of lymphadenopathy relative to age

Child / young adult: inflammatory > congenital > neoplastic
Adult: inflammatory > neoplastic > congenital
Older adult: neoplastic > inflammatory

Branchial Cysts

Description
These present as upper neck masses in young adults, often in the third decade of life. They represent epithelial inclusions within lymph nodes.. They sometimes become infected. In middle aged and older adults consider cystic masses to be oropharyngeal or thyroid cancer metastasis until proved otherwise

Investigations
Neck ultrasound and fine needle aspiration cytology (FNAC). Cross sectional imaging is usually performed as well.

Treatment
Surgical excision.

Dysphagia

Description
Dysphagia is difficulty in swallowing

History

- Establish the level of dysphagia (pharynx, upper, mid or lower oesophagus
- Is it dysphagia mainly to solids, liquids, saliva?
- Ask about associated symptoms such as
    - Hoarseness
    - Odynophagia (painful swallowing)
    - Otalgia
    - Regurgitation
    - Gastrointestinal bleeding
    - Weight loss
- Are the symptoms progressing?
- Ask about risk factors for cancer of oesophagus & pharynx e.g. smoking and alcohol excess
- Refer to General Skills in ENT for notes on neck and thyroid examinations and oral examination.

Causes of dysphagia
Extraluminal (external pressure on the pharynx and oesophagus)

- Neck mass (e.g. retrosternal goitre)
- Vascular abnormalities (e.g thoracic aortic aneuryism, double aortic arch)
- Any type of mediastinal mass eg secondary cancer
- Lung cancer

Intramural Causes (pharyngeal/ oesophageal)

- Motility problems
- Motor neuron disease/ Multiple sclerosis
- CVA
- Achalasia
- Oesophageal spasm
- Pharyngeal pouch
- Benign/malignant stricture
- Candidiasis

Intraluminal Obstruction (oesophageal)

- Foreign body
- Oesophageal or pharyngeal cancer
- Candidiasis
- Oesophageal web/Plummer-Vinson syndrome

Investigations

- FBC- may show iron deficiency anaemia
- Chest radiograph
- CT or MRI Scan of the neck (mainly if suspecting malignancy)
- Barium swallow
- Panendoscopy which includes laryngoscopy and upper oesophagosopy
- Dynamic investigations (e.g. video fluoroscopy if investigating motility disorders)

Dysphonia

Description
Dysphonia means hoarseness. It is disorder characterised by altered vocal quality, pitch, loudness or vocal effort that impairs communication.

Causes
Malignant e.g. squamous cell carcinoma
Benign e.g. vocal cord nodules, papillomas, or cysts
Neuromuscular e.g. Vocal cord palsy
Trauma e.g. surgery, intubation, excess use
Endocrine e.g hypothyroidism
Infective e.g. laryngitis, candida (inhaled corticosteroids may predispose to this)
Iatrogenic e.g. recurrent laryngeal nerve palsy secondary to thyroid surgery
Functional e.g. muscle tension dysphonia

Investigations

- Flexible nasendoscopic examination of the larynx is an essential investigation that can be done in clinic
- Blood tests as appropriate e.g. thyroid function tests

Treatment

- Treatment depends on the underlying cause.
- Patients with dysphonia and red flag symptoms should be considered for urgent referral to ENT.

Red flags in patients with dysphonia

- History of smoking and alcohol use
- Concomitant neck mass
- Unexplained weight loss
- Accompanying neurological symptoms
- Accompanying haemoptysis, dysphagia, odynophagia, otalgia.
- Hoarseness that is persistent and worsening (rather than intermittent)
- Hoarseness in an immunocompromised patient

Tonsillitis

Description

Tonsillitis is an infection of the palatine tonsils. It may be bacterial or viral.

Epidemiology

- Acute tonsillitis is most common in children and young adults. The causative agents are mostly viral (70%) and to a lesser extent bacterial (30%). As a result, antibiotics are typically not efficacious in the majority of cases.
- Group A beta hemolytic streptococci is the most common cause of bacterial tonsillitis. Other bacterial examples include Haemophilus influenza, Streptococcus pneumonia and Staphylococci- the latter being more associated with dehydration and previous antibiotic use.

Symptoms

- Sore throat
- Odynophagia (painful swallowing) and dysphagia
- Earache
- Systemic upset: Malaise and headache
- Viral tonsillitis may present with milder symptoms

Signs

- Pyrexia
- Swollen tonsils +/- exudate
- Thick or ‘hot potato’ voice with enlarged tonsils

- Presence of trismus indicates a peritonsillar abscess (quinsy)
- Bilateral cervical lymphadenopathy

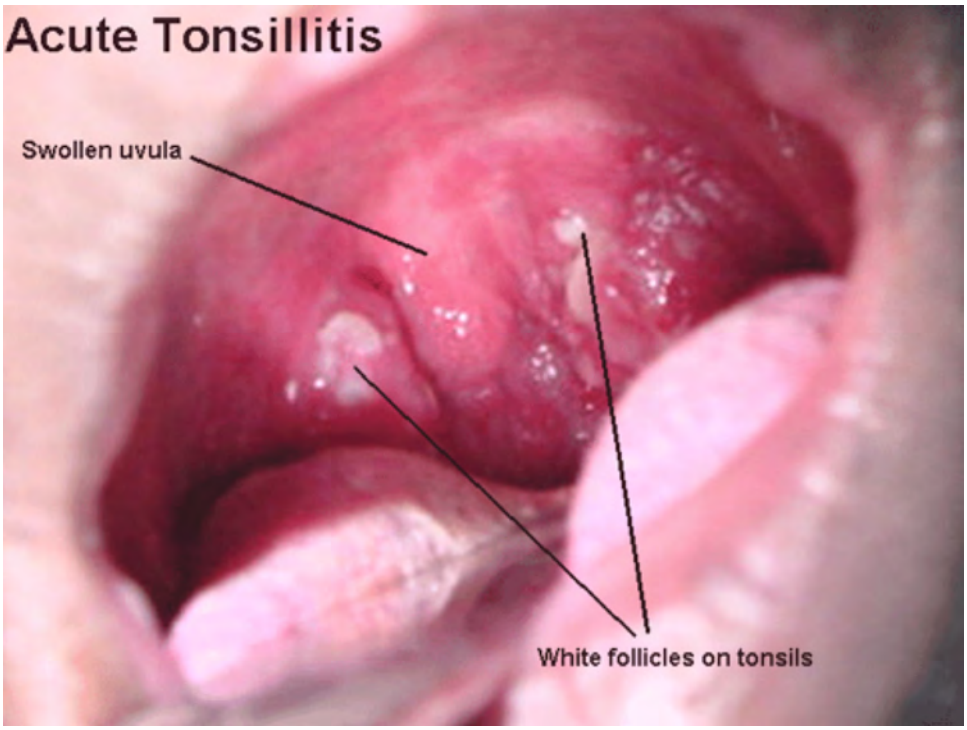


Figure 58: Acute Tonsillitis illustrating white follicles on the tonsils (reproduced with permission from Otolaryngology Houston, www.ghoryeb.com)

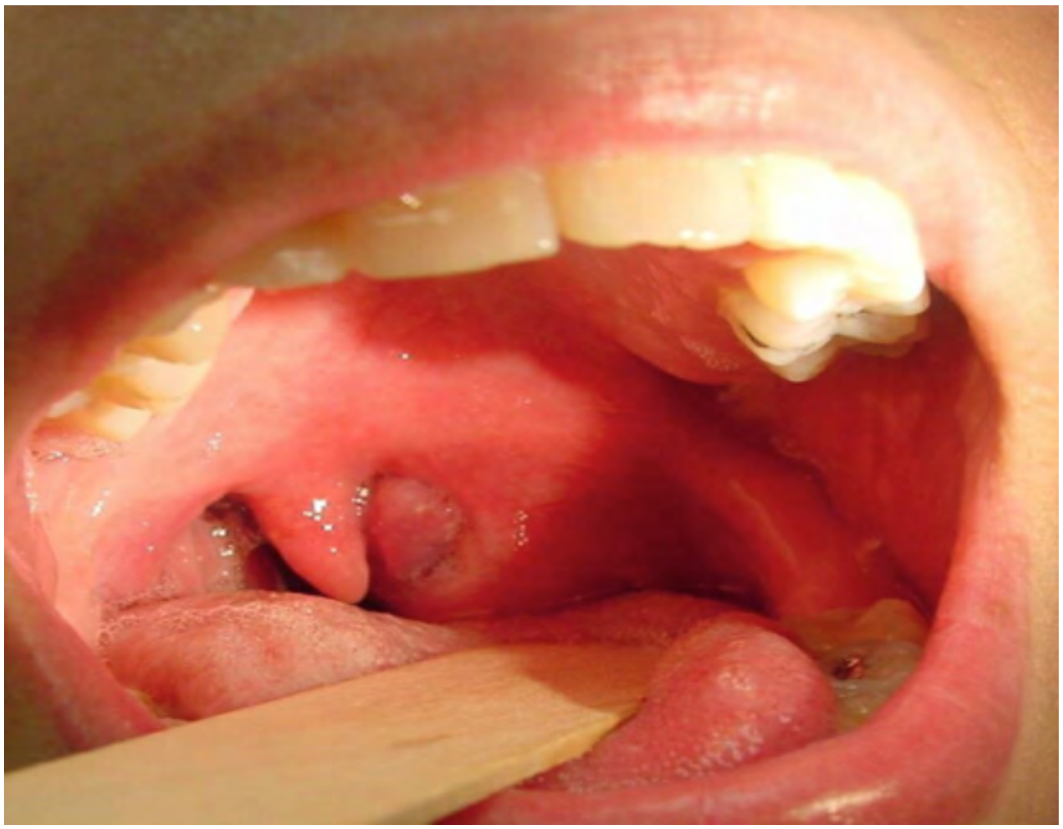


Figure 59: Left Sided Peritonsillar Abscess (Quinsy) (reproduced with permission from Otolaryngology Houston, www.ghoryeb.com).

Natural history

- Resolves after 5-7 days, may recur after symptom free interval

Complications

- Peritonsillar abscess (quinsy)- severe, usually unilateral pain, “hot potato” voice, trismus, and uvula pushed to opposite side by peritonsillar swelling (see figure 53)
- Parapharyngeal and retropharyngeal abscesses- potentially life threatening complications of tonsillitis. They may present with non-resolving sore throat, systemic upset, neck stiffness and neck tenderness

Investigations

- FBC, U&Es, glandular fever screen, CRP, Blood cultures (if pyrexial)

Treatment of acute tonsillitis

- Regular IV/PO analgesia e.g. paracetamol and ibuprofen
- Topical Analgesia e.g. Benzdyamine (Difflam)
- Fluid resuscitation (important, these patients are often dehydrated from not drinking adequate fluid)

Antibiotics
Use the Centor Criteria to guide this decision. There is a 50% chance of the tonsillitis being bacterial if:

- Pus on tonsils (tonsillar exudate)
- Pyrexia
- No cough
- Tender cervical lymph nodes

Antibiotics should be given to those who meet 3 or 4 criteria.

Penicillin V (phenoxymethypenicllin), 500mg QDS for 10 days. Erythromycin is an alternative in penicillin allergic patients. Avoid amoxicillin- this causes a rash if the patient has glandular fever due to type IV hypersensitivity.

Tonsillectomy
The following are recommended as an indication for tonsillectomy for recurrent acute sore throat (SIGN 2010):

- Sore throats are due to acute tonsillitis

- Episodes of sore throat are disabling and prevent normal functioning
- 7 or more well documented episodes of significant sore throats in the preceding year or
- 5 or more such episodes in each of the preceding 2 years or
- 3 or more such episodes in each of the preceding 3 years

Postoperative care and complications of a tonsillectomy are discussed in further detail in the “ENT Operation” chapter of this handbook.

Pharyngeal Pouch

Description

Also known as Zenker's diverticulum, this is an out-pouching of the mucosa and submucosa in the pharynx. It occurs between 2 muscles (cricopharyngeus and thyropharyngeus) of the upper oesophageal sphincter on the posterior pharyngeal wall in an area of weakness termed Killian's dehiscence.

Epidemiology

- More common in elderly men.
- Uncommon- incidence is approximately 2/100,000 per year in the UK.

Cause

- Aetiology is unknown
- However, one theory of pathogenesis describes incoordination between opening of cricopharygneus and peristaltic contractions propagating the bolus through the hypopharynx

Symptoms

- May be asymptomatic if small
- Progressive dysphagia
- Sensation of lump in throat
- Regurgitation of undigested food
- Halitosis (bad breath due to stasis of undigested food in pouch)
- Recurrent chest infections due to aspiration

Signs

- Gurgling
- Halitosis
- Usually no signs, with normal ENT examination

Investigations

- Barium swallow is the definitive investigation.
- Rigid oesophagoscopy may be useful to exclude carcinoma of the pouch wall.

Management

- If asymptomatic- conservative management.
- If symptomatic, particularly if risk of aspiration and recurrent pneumonia- endoscopic stapling is the first line. If not appropriate for endoscopic management, open approaches may be used. Division of the cricopharyngeus is important in resolving the pathological abnormality causing the pouch.

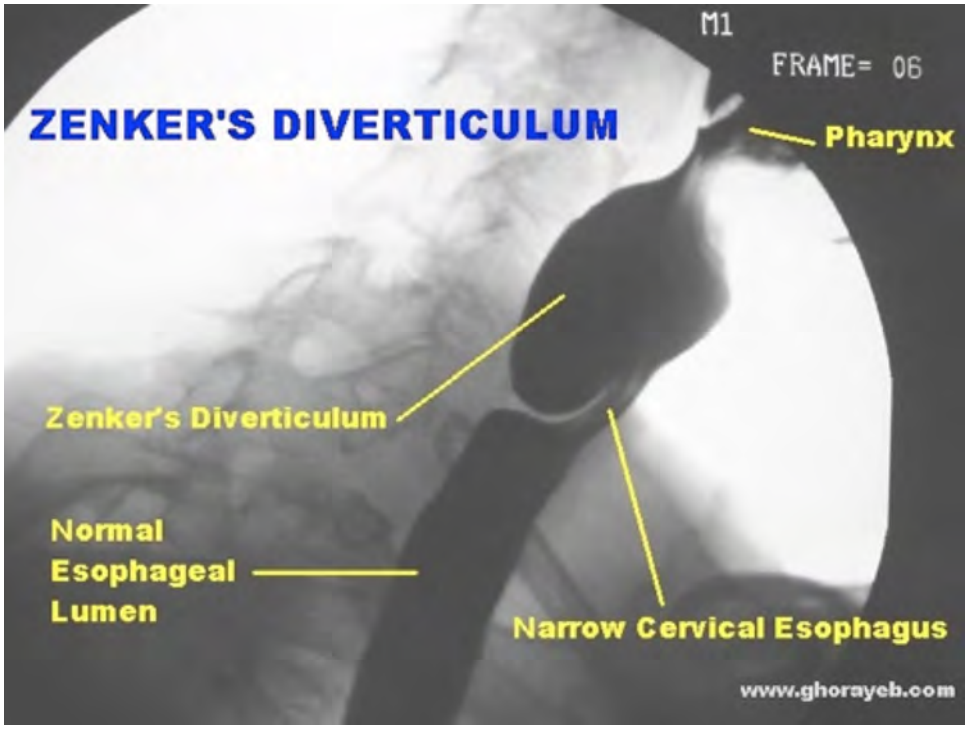


Figure 60: Zenker's Diverticulum(reproduced with permission from Otolaryngology Houston, www.ghoryeb.com)

Globus Pharyngeus

Description

This is the sensation of a lump, discomfort or foreign body in the throat without an obvious cause. It is a diagnosis of exclusion, linked to stress or anxiety and a form of somatization. It is associated with laryngopharyngeal reflux (30%), cricopharngeal spasm and oesophagitis. It is a very common presenting symptom to an ENT clinic.

Investigations

Thorough ENT examination including flexible nasopharyngolaryngoscopy to rule out other causes. If there is a history of smoking or excess alcohol consumption, consider a barium swallow, CT scan or upper GI endoscopy to exclude oesophageal pathology (as the post-cricoid region can be difficult to examine on clinical examination)

Treatment

Reassurance, lifestyle advice, and optimal anti-reflux therapy

Thyroid Masses

The commonest presentation of thyroid disease is the presence of a thyroid mass. These can also cause compressive symptoms such as dyspnoea or dysphagia.

Investigations of thyroid masses

- First line imaging is ultrasound of the neck to risk stratify thyroid lesions and look for malignant cervical lymphadenopathy.
- This can distinguish whether a patient has a solitary thyroid nodule or a suspicious nodule within a multinodular goitre.
- Suspicious features on ultrasound include solid hypoechogenic nodules with microcalcifications, irregular margins, taller than wider, and lymphadenopathy. Ultrasound scans are graded U2 (benign) to U5 (malignant); U3 and U4 are equivocal and need further investigation (see below)
- Suspicious nodules should undergo ultrasound guided FNAC (fine needle aspiration cytology). This can diagnose papillary carcinoma but cannot distinguish follicular adenoma (benign) from follicular carcinoma therefore the entire nodule must be assessed (by performing a diagnostic hemithyroidectomy). Follicular carcinoma has perivascular or pericapsular invasion which can only be detected by histology rather than cytology (which is what FNAC is).
- Thyroid function tests

Thyroglossal cyst or sinus

Description
Cyst of epithelial remnants of the thyroglossal tract

Epidemiology

- Most commonly in children. But 1/3 present in over-20s.
- Most common congenital cyst in neck.
- Associated with ectopic thyroid. May also contain ectopic (and very rarely the only) thyroid tissue

Cause

- Embryological remnant of thyroglossal tract during descent of the thyroid from the foramen caecum at the tongue base
- Thyroid descends with intimate contact to central portion of hyoid bone to end as a bilobed structure connected by an isthmus at the level of the second and third tracheal cartilages. The tract is normally resorbed in utero

Symptoms

- Often asymptomatic.
- May enlarge/become tender in upper respiratory tract infections
- May become infected, form an abscess or discharging sinus

Signs

- Palpable neck lump, small, midline. Can occur anywhere between base of tongue and trachea
- Usually in proximity to the hyoid bone
- Moves up on tongue protrusion and swallowing

Complications

If infected and ruptures, there is a risk of discharging sinus formation

Investigations

USS +/- Fine needle aspiration cytology. Delineates anatomy and demonstrates normal thyroid gland. Must ensure that thyroid gland is present. Removal of the only thyroid tissue in thyroglossal cysts renders patient hypothyroid.

Treatment

Most require no treatment unless there are complications e.g recurrent infections. Surgical treatment (Sistrunk's procedure) entails excision of cyst, thyroglossal tract and central portion of hyoid bone.

Multinodular goitre

Epidemiology
Commonest cause of goitre in the western world

Cause
Unknown aetiology. Occurs as a result of continuous change in thyroid activity as part of its role in homeostasis. Patients are almost always euthyroid. Pathologically can be hyperactive or atrophic

Symptoms

- Neck lump which can be asymptomatic
- Cosmetic deformity
- If very large- pressure symptoms. e.g. breathlessness, orthopnoea, dysphagia
- If cyst ruptures/haemorrhage into cyst- pain and acute swelling

Signs

- Palpable/visible neck lump- neck lump moves on swallowing
- Multiple nodules, irregular. May be one dominant nodule
- Dullness on percussion of manubrium in retrosternal goitre

Complications

- Mass effect/compression, cosmetic appearance
- Nodule haemorrhage. Presents with acute pain and neck swelling
- Thyrotoxicosis-related complications

Investigations

- Blood tests- TSH. Consider free T4 and FBC
- Thyroid US +/- Fine needle aspiration cytology
- CT scan neck and chest if concerns of retrosternal extension. Pulmonary function tests can show obstructive pattern.

Treatment

- Depends on the cause.
- Non-operative
- Watch and wait
- Anti-thyroid drugs +/- beta-blockers if hyperthyroid (usually under the care of the endocrinologist)
- Operative
- If mass effect or suspicion of cancer. Replacement thyroxine required afterwards if total thyroidectomy performed plus/minus calcium (parathyroid gland function may be impaired temporarily or permanently)

Thyroid cancer

The incidence of thyroid cancer in the UK has increased with time (approximately 3.4 cases per 100,000) but the mortality has remained consistently low (0.4 per 100,000). It is more common in women and risk factors include radiation exposure and family history. The order of prevalence is papillary, follicular, medullary, anaplastic thyroid cancer, as well lymphoma of the thyroid gland.

Thyroid cancers are staged using ultrasound of the neck to look at the size, lymph nodes, and the presence of metastasis. Non-contrast CT/MRI may be used in selected cases.

Thy Classification of Thyroid Nodules

Thyroid nodules undergo further cytological classification, which is called THY, which is related to risk of malignancy. All patients should be discussed at a thyroid multi-disciplinary meeting which includes an ENT surgeon, oncologist, radiologist and histopathologist.

THY1: non diagnostic due to lack of cellularity.
THY2: non-neoplastic.
THY3: follicular lesion. Patient should undergo surgical resection of the nodule (lobectomy) to distinguish between a follicular adenoma and carcinoma (as cytology insufficient to assess perivascular or pericapsular invasion). If histology confirms carcinoma, patient should undergo completion thyroidectomy.
THY4: Suspicious but non-diagnostic of malignancy. Surgery is indicated as there is a 60-75% risk of malignancy. If the results are non-diagnostic and medullary carcinoma or lymphoma are suspected, then the FNAC should be repeated.
THY5: Diagnostic of malignancy
MDT will recommend appropriate combination of surgery +/- radiotherapy +/- chemotherapy if indicated

Papillary and Follicular Thyroid Cancer

	Papillary thyroid cancer	Follicular thyroid cancer
Epidemiology	Most common thyroid cancer. 85% thyroid cancer.	Second most common. 5-15% thyroid cancer.
Age	Adolescents, young adults, Mean age 34-40 years	Middle aged adults. Older.
Risk factors	Radiation	Iodine deficiency/ endemic goitre.
Genetics	RET-PTC rearrangement	Ras proto-oncogene point mutation
Pathology	Multifocal, papillary structures with a fibrovascular stalk, Orphan-Annie nuclei, Psammoma bodies, lymphatic invasion.	Unifocal, encapsulated, haemorrhagic, invasive. Hurtle cells.
Spread	Lymphatics. Cervical lymph nodes.	Haematogenous- brain, bone, lung, liver.
Presentation	Solitary or multiple, painless thyroid nodule(s). Usually cold (patient is euthyroid). Cervical nodes.	Slowly enlarging painless solitary nodule. Patient is euthyroid. Evidence of metastases.
Ix	USS and FNAC Non contrast CT scan neck and chest (if neck nodes or extrathryoid spread) Cold nodules on scintography (rarely indicated)	
Prognosis	Excellent. 98% 10 year survival.	Good. 92% 10 year survival.

Summary of Papillary & follicular thyroid cancers management

- Thyroid MDT to recommend treatment in the form of a thyroid lobectomy (<1cm diameter papillary or low-risk follicular) or total thyroidectomy (>1cm papillary or high risk follicular carcinoma)
- A neck dissection is considered if pre-operative imaging has established metastatic cervical lymphadenopathy. Papillary

thyroid cancer is known to metastasise to the cervical lymph nodes early, so if neck nodes are negative on preoperative imaging, a selective level 6 / 7 neck dissection may be therapeutic in around 20% of patients, and may reduce the need for postoperative radio-iodine therapy

- The MDT recommendation for postoperative radioiodine (iodine-131) ablation is individualized, but generally it has proven survival benefit in patients with differentiated thyroid cancer > 1.5cm. Ablation eradicates all thyroid cells including residual microscopic disease. Its risks include a small risk of second malignancy as well as dry mouth or sialadenitis.
- Levothyroxine (T4) will both replace thyroid function, and suppress TSH which reduces the chance of recurrence
- Follow up required with measurement of thyroglobulin (acts a tumour marker) at least 6 weeks postoperatively and ultrasound/FNAC if indicated

Medullary thyroid carcinoma

Medullary thyroid cancers originate from the parafollicular cells (C cells) of the thyroid. Middle-aged patients are most commonly affected. It is the 3rd most common thyroid cancer and it represents 5% of all thyroid cancers. 80% are sporadic. Hence, 20% are inherited- there are 3 inherited syndromes:

- FMTC: familial medullary thyroid cancer
- MEN 2A: MTC, phaechromocytoma, hyperparathyroidism
- MEN 2B: MTC, phaechromocytoma, Marfanoid habitus, mucosal neuromas

Investigations

- USS neck & FNA
- Tumour markers (calcitonin and carcinoembyronic antigen) as well as genetic screening (RET proto-oncogene in both MEN 2A

and 2B). A urine sample (24 hours urine metanephrine) study can be used to assess for phaeochromocytoma (which is important to assess prior to potential surgical intervention)

Treatment
Treatment is surgical (total thyroidectomy and neck dissection) in confirmed cases of medullary thyroid cancer. Prophylactic surgery can be considered in children with MEN syndromes.. Radioiodine cannot be used as there is no iodine uptake (since the cancer is of neuroendocrine cells and not follicular cells).

Anaplastic thyroid cancer

Anaplastic thyroid carcinoma is a rare and aggressive undifferentiated thyroid cancer. It represents 1% thyroid cancer and has a tendency to affect the elderly.

It presents as a rapidly enlarging bulky, hard, neck mass. Appears over 2-3 months. Diagnosis often requires an ultrasound guided core biopsy or open biopsy rather than FNA. Prognosis is extremely poor and treatment is mostly palliative.

Thyroid lymphoma

This is a rare cancer and mostly consists of diffuse large B cell lymphomas (DLBCL). The only known risk factor is Hashimoto's thyroiditis. It presents as a rapidly enlarging goitre with compressive symptoms. Diagnosis is confirmed on core biopsy or open biopsy (FNA unreliable). Treatment is chemotherapy +/- radiotherapy as per lymphoma regimens guided by oncology team.

Benign and Malignant Neoplasms of the Salivary Glands

Description

- Neoplasms of salivary glands represent 3-6 % of all head and neck neoplasms.
- The parotid gland accounts for about 80% of salivary gland tumors and the majority (80%) are benign.
- The submandibular and sublingual glands account for about 20% of salivary gland tumors and the incidence of malignancy is higher.
- The commonest ‘benign’ tumours are pleomorphic adenomas.
- Malignant transformation is seen in 2-5 % of cases.
- The commonest malignant tumours are mucoepidermoid carcinoma or metastases from skin primaries in some populations e.g. in Australia.

Epidemiology

Pleomorphic adenomas are more common in women. Malignant neoplasms have an equal sex distribution.

Symptoms

- Slowly growing painless mass
- Facial palsies suggest malignancy.

Red Flags

- Hardness
- Rapid growth
- Tenderness
- Infiltration of surrounding structures
- Overlying skin ulceration
- Facial weakness

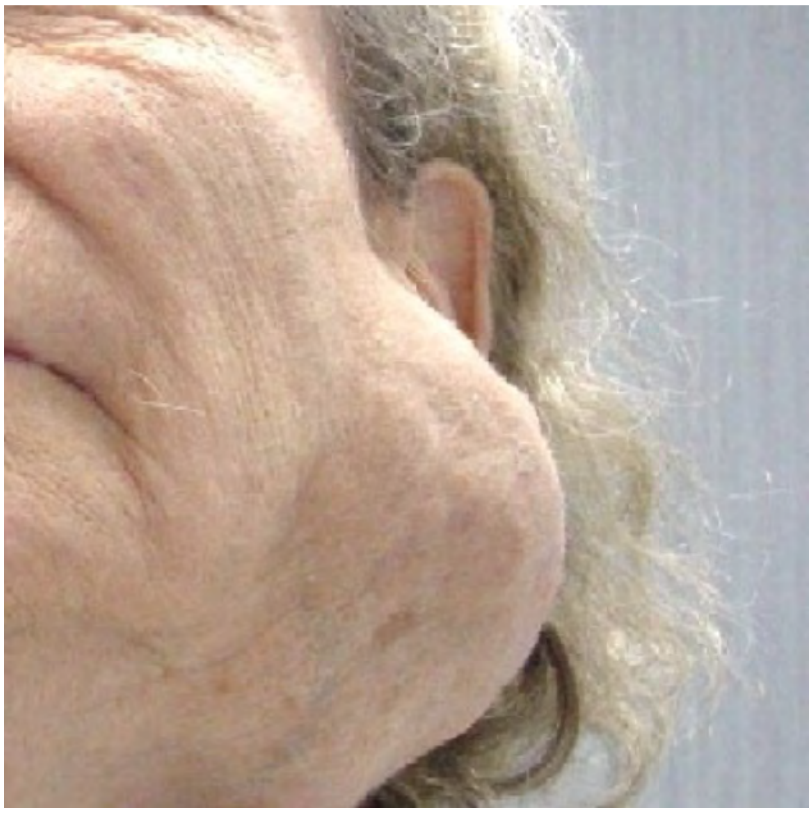


Figure 61: Pleomorphic adenoma of the parotid gland (reproduced with permission from Otolaryngology Houston, www.ghoryeb.com)

Summary of the Commonest Benign Salivary Tumours

	Benign Pleomorphic Adenoma	Warthin's Tumour (Adenolymphoma)
Location	The majority arises from the parotid (80%) Can arise from the submandibular gland (10%)	May be bilateral Classically tail of parotid
Risk factors		Disease of elderly men Smokers
Symptoms	Painless, slowly enlarging lump in the retromandibular region. 10% have a malignant transformation potential	Ovoid, mobile and fluctuant mass in the tail of the gland, can become infected
Treatment	Surgical excision due to malignant transformation potential.	Surgical excision or conservative management.

Summary of Malignant Salivary Tumours

Mucoepidemoid tumour	Most common salivary gland cancer (commonest in parotid) Tx: Parotidectomy
Acinic cell tumour	Parotid gland 10% give rise to metastases Tx: Parotidectomy
Adenoid cystic carcinoma	Characteristically, spreads along nerves with potential skip lesions Facial nerve often involved Tx: Parotidectomy- facial nerve sacrificed if involved
Lymphoma	Non Hodgkin's is the commonest Increase risk in pre existing Sjogren's syndrome

Carcinoma of the Oral Cavity

Description

Carcinomas of the oral cavity can affect the lips, tongue, floor of the mouth, alveolar ridge, hard palate or buccal lining
90% of these carcinomas are squamous carcinomas (SCC).

Epidemiology

- Typically seen in the middle age or older male patient
- Increasingly seen in women (due to increased smoking in this demographic group)

Risk Factors

- Multifactorial
- Smoking
- Alcohol
- Betel Nut (particularly in the Indian subcontinent population)
- Chronic dental infection
- Immunosuppression

Symptoms

- Painless ulcer or lump. Pain is a late symptom
- Increasing size of the tumour can affect speech and swallowing.

Signs

- Painless swelling.

- Discoloration
- Red, erythematous, velvety mucous membrane (erythroplakia) which is strongly associated with malignancy
- White (leukoplakia) or mixed red/white lesions (speckled leukoplakia)
- Lichen planus
- Non healing ulcer
- Neck swelling if metastases are present

Carcinoma of Lip

- Remains one of the most curable carcinomas in the head and neck
- Sun exposure is a well-established link
- Lower lip is hence most affected – 89%
- Risk factors: male, fairer skinned patient and older patient

Treatment

- Smaller tumours- excision and primary closure
- Larger tumours- local skin flaps for reconstruction

Carcinoma of the Oral Tongue

- Incidence rate is increasing in younger adults
- Lateral border of tongue is most commonly affected, and most commonly in anterior 2/3 tongue.
- Often presents with a persisting ulcer

Treatment

- Smaller tumours. Surgical excision.
- Advanced cancer- resection of primary lesions, neck dissection and post-operative radiotherapy. Sometimes reconstruction with flaps is needed with larger tongue resections Chemotherapy (for e.g. cisplatin) may be used in conjunction with surgery and radiotherapy
-

Treatment goals in carcinoma of the oral cavity

- Multidisciplinary team management approach
- Long term control of the cancer with preservation of cosmesis and function of the oral cavity

Factors affecting choice of treatment

- Staging of tumour (TNM classification most commonly used)
- Extent of resection necessary
- Method of reconstruction

Carcinoma of the Pharynx

Carcinoma of the pharynx can be subdivided into the following regions:

- Nasopharynx
- Oropharynx
- Hypopharynx

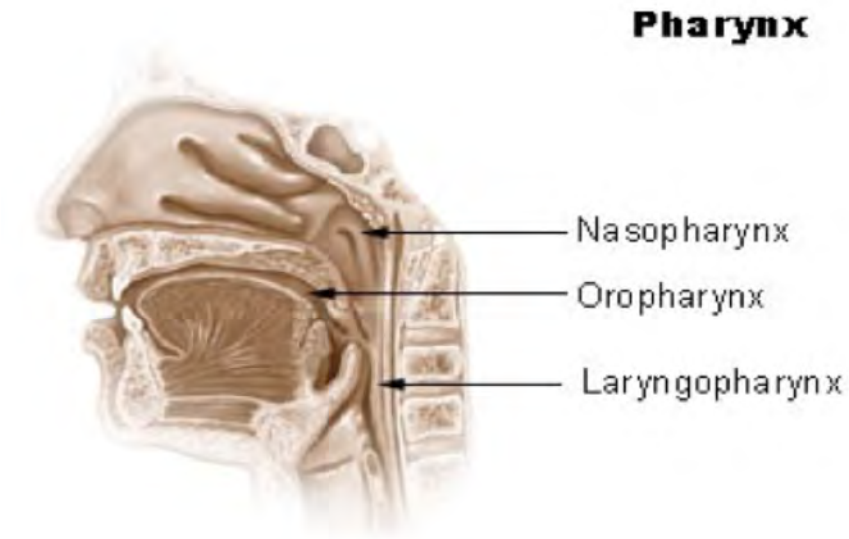


Figure 62: Divisions of the pharynx

Risk factors

- Multifactorial
- Smoking
- Alcohol
- Virus- Human Papilloma Virus (oropharynx), Ebstein Barr Virus (EBV, Nasopharynx)
- Radiation

Carcinoma of the Nasopharynx

Description

This is a rare tumour of the postnasal space. Highest incidence in the South Asian and North Asian population. EBV is believed to have a major causative role in this carcinoma.

Symptoms/Signs

- Cervical lymphadenopathy.
- Ear pain, secretory otitis media, hearing loss and cranial nerve palsies.
- The nasal involvement can present with epistaxis*, discharge, changes in smell and nasal obstruction
- Persistent unilateral otitis media with effusion and no preceding URTI

Epistaxis in a young adult may be secondary to “juvenile nasopharyngeal” angiofibroma. The majority arises in the lateral wall of the nose of young males. This is a benign but locally invasive and highly vascular rare tumour. If suspected a biopsy should not be carried out. Diagnosis is by imaging. Management of choice is surgical resection – if the lesion is unresectable then radiotherapy may be used.

Investigation

- Detailed Head and Neck exam
- Nasendoscopy
- Formal biopsy
- FNA of any neck nodes
- Imaging
- MRI (better to assess soft tissue involvement)

- CT (better to assess bony involvement)

Management

Combined chemotherapy and radiotherapy.

Carcinoma of the Oropharynx

Tumours of the tongue base (posterior third of the tongue) and the tonsils (or tonsillar fossae if the tonsils have been previously removed). 70% of tonsillar carcinomas are SCC and minority are lymphomas.

Risk factors

- Smoking
- Alcohol
- Strong association with HPV 16 and HPV 18
- Incidence rate is increasing in younger adults , particularly in non smokers due to the increasing incidence of HPV related carcinomas

Symptoms

- Painless tonsillar swelling (unilateral)
- History of throat discomfort with worsening dysphagia
- Referred otalgia (involvement of Arnold's nerve- branch of vagus)
- A 'lump in the throat sensation' or evidence of metastatic cervical lymphadenopathy; jugulodigastric lymphadenopathy is often present
- Trismus is a red flag for surrounding structure infiltration

Investigation

- A detailed Head and Neck Exam.
- Panendoscopy + Biopsy
- FNA of any neck nodes

- Imaging: MRI to delineate the margins of tumour. Staging CT neck and chest/ abdomen.

Treatment

- Surgery +/- radiotherapy or chemotherapy
- Chemoradiotherapy

Carcinoma of the Hypopharynx

Hypopharyngeal cancers are named for their location. Most cancers arise in the pyriform sinus. Virtually all malignant tumours are of SCC origin. Metastases are very common from the primary site. Patients are typically men aged 55-70 years old with a history of tobacco use and/or alcohol use.

Symptoms

- Cervical lymphadenopathy, pain that radiates from the throat to ear, sore throat, progressive difficulty with or painful swallowing, voice changes
- Paterson- Brown- Kelly syndrome: dysphagia , hypochromic microcytic anaemia, oesophageal webs and potential development of postcricoid carcinoma

Investigation

- Endoscopy
- Biopsy
- Pharyngo- oesophagoscopy
- Imaging
- Barium swallow
- MRI
- Staging CT neck and chest/abdomen

Management

- Early cancers (rare)- surgery + radiotherapy.
- Advanced cancers- surgery + radiotherapy +/- neoadjuvant chemotherapy

- Many hypopharyngeal cancers are incurable at presentation and best supportive care may be the most appropriate option for management

Carcinoma of the Larynx

The larynx is subdivided into 3 components.
Supraglottis: from tip of epiglottis to laryngeal ventricle
Glottis: true vocal folds and 1cm inferiorly
Subglottis: down to lower border of cricoid cartilage

Laryngeal carcinoma can be subdivided into supraglottic (27%), glottic (69%) and subglottic (4%). Glottic cancer is the most common. Histology is squamous cell origin in 90% .

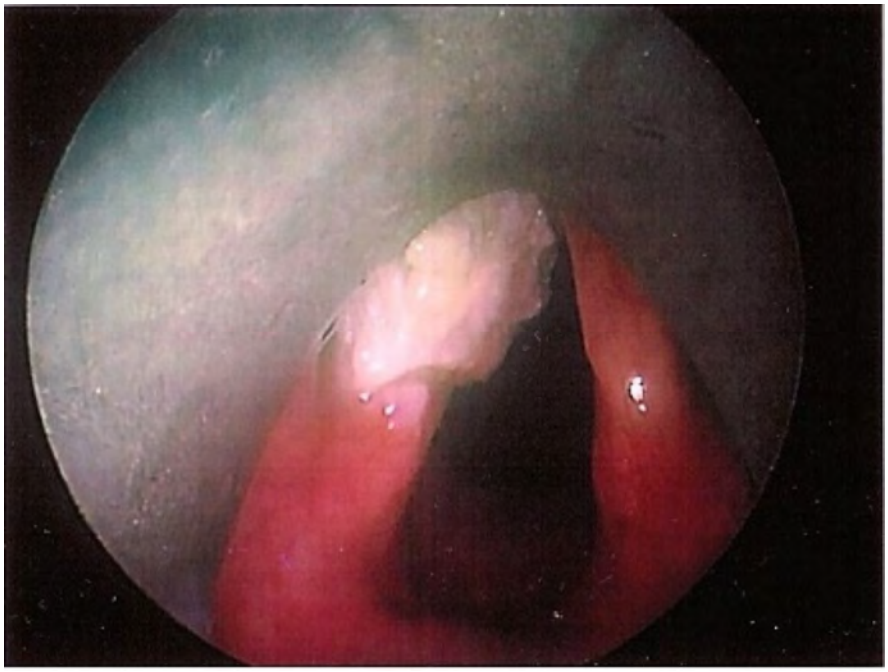


Figure 63. Left glottic squamous cell carcinoma- encroaching on the anterior commissure (reproduced with permission from Otolaryngology Houston, www.ghoryeb.com)

Epidemiology

- More common in males and elderly
- In younger population male: female ratio closer to 1:1.

Risk factors

- Smoking (most important)
- Alcohol consumption (cumulative risk increases with smoking)

Symptoms

- Hoarseness is the most common presentation overall, and commonest in glottic cancer. Progressively worsening over 6- 12 weeks
- Noisy breathing/stridor. Late presentation in supraglottic cancer
- Cough. Haemoptysis.
- Odynophagia
- Dysphagia (commonest in supraglottic carcinoma)
- Neck lymphadenopathy (commonest in supraglottic carcinoma)

Investigations

- Oral cavity, ENT and neck examination
- Flexible nasoendoscopy
- Microlaryngoscopy for biopsy
- CT neck and chest for staging
- MRI neck and PET CT occasionally indicated
- TNM classification to stage disease

Treatment

- Depends of the TNM staging of the tumour. Decisions made in multidisciplinary (MDT) team meeting
- For smaller tumours (T1 and T2) treatment is single modality with options being radiotherapy or endoscopic laser excision.
- Larger tumours (T3 and T4);

- Multimodality which may be either larynx sparing (Chemoradiotherapy) or larynegectomy with postoperative radiotherapy

Laryngopharygeal reflux (LPR)

Description
LPR describes a group of upper respiratory tract symptoms secondary to irritation from gastric contents.

Symptoms
The commonest symptoms are hoarseness, throat clearing, chronic cough, globus pharygeus and dysphagia. Symptoms of indigestion and heartburn are poorly correlated with LPR.

Diagnosis

The Reflux Symptom Index (RSI) is a commonly used self-report patient questionnaire. A score of >13 signifies LPR.

Visualisation of the larynx using a fibreoptic laryngoscopy or video laryngostroboscopy may demonstrate laryngeal (or specifically vocal cord) oedema or erythema, posterior commissure hypertrophy or thick endolaryngeal mucus. Laryngeal granulomas or pseudosulci are commonly linked to LPR but the evidence to support this is weak.

The Reflux Finding Score (RFS) is an objective measure that takes into account the above physical findings, with good sensitivity but low specificity. A score of >7 indicates LPR

The gold standard for diagnosing LPR is 24 hour dual probe pH manometry combined with intraluminal impedance studies.

Transnasal oesophagoscopy (TNO is an investigation increasingly used to exclude other causes for these symptoms by inspecting the

entire oesophagus. This can be performed readily in the outpatient setting.

Treatment

- Conservative measures include lifestyle modification. This includes
- Avoiding eating three hours prior to going to sleep
- Stopping smoking and reducing alcohol intake
- Addressing obesity
- Avoid fizzy drinks
- Avoiding throat clearing

Speech therapy can help as well as acid suppression using alginates or proton pump inhibitors. Alginates are seaweed compounds that has been proven to reduce reflux. Proton pump inhibitors are widely prescribed although there is little high quality or statistically significant evidence to support their use. Failure of medical therapy warrants referral to a gastroenterologist or upper GI surgeon for further investigations and management.

Snoring and Obstructive Sleep Apnoea (OSA)

Snoring implies upper airway resistance that causes an undesirable sound during sleep that affects up to 50% of the population. However, OSA is associated with apnoea (breath-holding for >10 sec leading to arousal from sleep) or hypopnea (reduced airflow with oxygen desaturation). Not all snorers have OSA but most patients with OSA snore.

It affects 1-4% of adults, more commonly men, and is classified using the apnoea-hypopnea index (AHI) as mild (5-15), moderate (16-30) or severe (>30)

The consequences of untreated OSA include neurocognitive impairment, type 2 diabetes, cardiovascular disease (hypertension, coronary artery disease / infarction, heart failure, stroke, pulmonary hypertension) and increased mortality.

Cause

In children, the most common cause are large tonsils and adenoids. However other causes affecting airway anatomy/physiology should be looked for (e.g. large tongue, muscle hypotonia in Downs syndrome)

In adults it is predominately multifactorial. A raised body mass index is not uncommon but consider each potential anatomical level that may obstruct airflow

- Nasal obstruction – e.g. obstructive nasal polyps
- Oropharynx – large tonsils
- Pharyngeal airway collapse: obesity

Symptoms

OSA can manifest with different symptoms but the diagnosis should be considered with witnessed breath-holding / gasping / choking, restlessness, daytime sleepiness and irritability. Take a history from the patient and their partner if applicable. It is not uncommon nowadays for parents/partners to use a mobile phone to film the patient's pattern of sleep.

Diagnosis

A detailed history is required.

ENT examination including:

- Measuring BMI
- Neck circumference
- Maxillofacial structures (including pro/retrognathia and oropharyngeal crowding from a large tongue / uvula / tonsils or elongated palate)
- Flexible nasopharyngolaryngoscopy to assess anything that may obstruct the passage of airflow from the nasal cavity to the level of the vocal cords.

The Epworth Sleepiness Score (a self-reported patient questionnaire) is often used to screen for excessive daytime sleepiness (abnormal score is >10)

The gold standard for diagnosis of OSA is nocturnal polysomnography which can record upper airway airflow oxygen saturation monitoring, ECG, EMG, EEG, and body position.

Treatment

Conservative measures include lifestyle modification. This includes

- Weight loss

- Avoiding excessive alcohol
- Adapt sleeping position for adults (supine causes the tongue to fall back)
- Nasal Dilators or Oral appliances such as a mandibular advancement device that pushes the mandible and tongue forwards
- Noninvasive ventilation such as CPAP that prevents airway collapse by splinting

Medications for nasal obstruction due to rhinitis or sinus disease include intranasal corticosteroids, decongestants (short term use) and saline douches.

Surgical measures address the underlying anatomical level of obstruction, which may be multi-level and thus require a thorough work-up and planning.

In children this commonly includes adenotonsillectomy, which is highly effective.

In adults, surgery may be considered if the patient fails conservative measures or as an adjunct to conservative measures in the setting of moderate to severe OSA. Patient selection for surgical intervention is crucial and obese patients tend to be poor candidates for surgery.

Operations for adult OSA include palatal surgery, tonsillectomy, septoplasty or endoscopic sinus surgery. However none have a good evidence base for effectiveness and surgical intervention, particularly nasal surgery should be undertaken with caution and careful preoperative counselling.

ENT Emergencies

Acute Airway Obstruction

Description
Acute airway obstruction is an emergency.

Causes

- In adults, this can be classified into Infectious and Neoplastic.
- The common infectious causes include supraglotitis and deep neck space infections. Neoplastic conditions are most commonly head and neck cancers e.g. tongue base, orophaygenal or laryngeal tumours
- In children, infection (e.g. croup, epiglottitis) or foreign bodies are more common. Congential causes should also be considered e.g. laryngomalacia, subglottic stenosis etc.

Symptoms

- Shortness of breath/noisy breathing particularly on inspiration (stridor)
- Stridor can be classified into inspiratory, expiratory or biphasic. Inspiratory suggests obstruction is between glottis and supraglottis, expiratory suggests the obstruction is below the carina and biphasic suggests the obstruction is between the glottis/subglottic. This is only a guide, not diagnostic!
- Change in voice
- Cough

Signs

- Tachypnoea

- Agitation/cyanosis
- Respiratory distress. There will be use of accessory muscles
- Facial/airway trauma
- Listen for type of breathing sounds
- Snuffle- nasal obstruction; important in children
- Stertor- “sounds like snoring” which suggests pharyngeal obstruction
- Stridor (as described above)
- Wheeze- level of obstruction is intra-thoracic trachea or small airways. May occur in anaphylaxis
- Decreased breath sounds- indicates acute decompensation/fatigue

Complications

- Respiratory arrest
- Airway compromise must be recognised early. Children may decompensate rapidly

Investigations

- Investigations are secondary to immediate management. Imaging should not be performed in unstable patients. Nasendoscopy, if safe to perform, can help identify the cause
- Investigations which agitate patients may risk precipitating total loss of airway e.g. epiglottitis in children

Treatment

- Initial airway management is similar for all patients. Specific management depends on the aetiology.
- Senior help early- ENT, anaesthetics, paediatrics (if child).

- Oxygen, or Heliox if available (79% helium and 21% oxygen). Lower density of heliox improves airflow
- Nebulised adrenaline. 1mL of 1:1000 adrenaline in 4 mL saline.
- Steroids. Nebulised and IV. 0.1mg-0.2mg/kg dexamethasone. Effect is usually delayed.
- If condition fails to improve/worsens- consider further management (this will be orchestrated by seniors):
- Intubation. Secures airway. Awake fibreoptic intubation can be useful.
- Nasopharyngeal airway may bypass obstruction if obstruction is high (e.g. swollen tongue secondary to angio-oedema)
- Tracheostomy. Front of Neck Access to the airway to bypass the obstruction may be necessary either by cricothyroidotomy or tracheostomy.

Summary of the Important Airway Pathologies

Pathology	History	Examination	Management
Deep neck space infection	Sore throat	Septic	Secure airway if compromised
	Odynophagia	Trismus	Broad-spectrum antibiotics
	Voice change	Neck swelling	Drainage of any collection
	These are of short onset of duration	Possible stridor	

Laryngopharyngeal carcinoma	Sore throat	Cachetic	Secure airway if compromised
	Odynophagia	Neck lymphadenopathy	Will require imaging for staging and biopsy of primary site. Fine needle aspiration of any neck nodes. Long term plan to be discussed in Head & Neck MDT
	Voice change	Nasendoscopy may identify the primary site	
	Weight loss		
	Symptoms are typically of a longer duration		

Anaphylaxis	Bee/insect sting	Stridor, wheeze	Call anaesthetist
	Food trigger	Respiratory distress	Adrenaline 0.5 mL 1:1000 IM
	Known allergy	Cyanosis	Chlorphenamine 10mg IV
		Facial swelling	Hydrocortisone 200mg IV
			HDU/ Intensive care. Cardiovascular support.

Epiglottitis (paediatric)	Sore throat	Do not agitate or attempt to look in mouth.	ENT, anaesthetics, paediatrics help.
	Severe odynophagia	Drooling	Do not agitate, or attempt to cannulate.
	Dysphagia	Tripod position	Secure airway in theatre
	Fever	Pyrexia	IV antibiotics.
	Neck tenderness	Respiratory distress	Throat swabs for MC+S
		Tenderness over hyoid.	

Epistaxis (Nose Bleed)

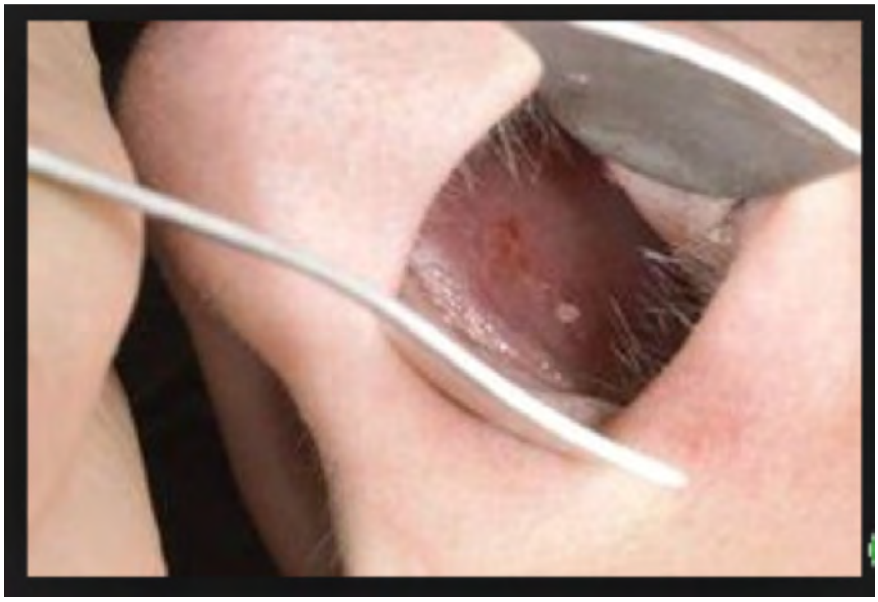


Figure 64: Little areas on the left nasal cavity (reproduced with permission from Otolaryngology Houston, www.ghoryeb.com)

History

- Epistaxis is a common ENT emergency. Unless urgent management is required, a good history is essential.
- When did it begin? Was trauma a trigger?
- How much blood? Try to quantify.
- Where?
- Which nostril? Does it change, or always that side?
- Blood coming out of nose only (Anterior epistaxis likely), or also trickling back and being swallowed (likely posterior bleeding)?

Risk factors/causes

- Local
- Trauma/foreign body/nasal sprays
- Infection

- Previous nasal surgery
- Systemic
- Drugs- warfarin, aspirin, NOAC (novel oral anticoagulants e.g. apixaban), Substance abuse e.g. cocaine.
- Coagulopathies. Bleeding elsewhere? Heavy periods? excessive bruising ?
- Pregnancy
- Hypertension.
- Liver/renal/EtOH
- Hereditary Haemorrhagic Telangiectasia (HHT)

Management

Management depends on the urgency of the situation. If active bleeding- is the patient haemodynamically stable or unstable?

Stable patients and those without active bleeding:

- Examine for bleeding source. Use headlight and Thudicum's speculum. Aid visualisation with: suction & adrenaline-soaked cotton wool
- Apply simple pressure for 10 minutes. Head should be tilted forward. Fingers pinching septum over Little's area bilaterally (not bony part of nasal bridge!)
- Next, try chemical cautery to bleeding point (usually Little's area) with silver nitrate sticks. Do not apply this bilaterally as this risks septal perforation from septal ischaemia

Unstable patients, or stable patients for whom above measures fail:

- Get senior help early and manage according to the ALS algorithm
- Give oxygen and suction of any obstructing clots as appropriate
- Obtain iv access, take bloods and fluid resuscitate. Patient needs to be admitted
- A high BP will require treating

- Perform anterior nasal packing (unilateral or bilateral - see Practical Procedures Chapter)
- Perform posterior nasal packing if bleeding persists. Examples include a Foley catheter being passed intranasally & then the balloon being inflated so it the inflated balloon lies against the back of the septum in the postnasal space. The patient will also require an anterior pack at the same time.
- If bleeding continues, the patient will most likely need surgery. Examples include: Ligation of (in order of increasing severity): sphenopalatine artery, anterior ethmoid artery, maxillary artery, external carotid artery.
- In certain cases, it may be appropriate to consider interventional radiology embolization.

Foreign body in the nose

A foreign body in the nose is more common in children. Foreign body examples include beads, peas, nuts and sweets. This presentation can be dangerous if the foreign body is inhaled into the airway causing airway obstruction. In particular, if the foreign body is a battery (button battery) this can quickly erode nasal mucosa and cartilage leading to septal perforation.

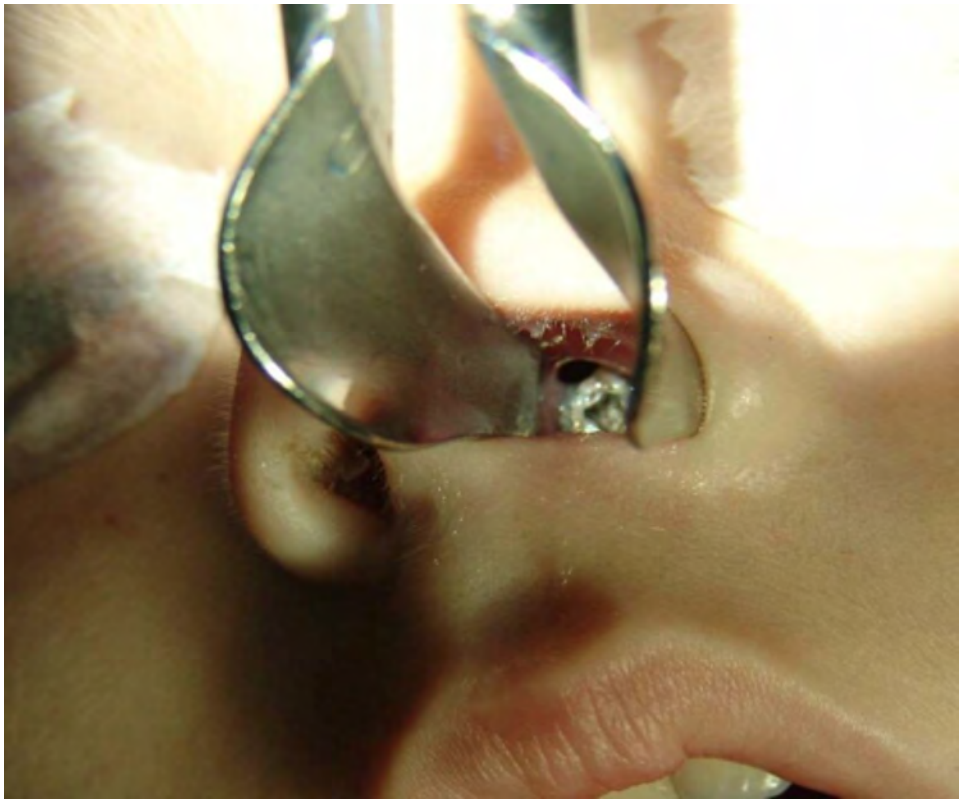


Figure 65: Foreign body (screw) in the nose of a child.

Symptoms

- Unilateral nasal discharge (often offensive if present for a while)
- Nasal obstruction
- Irritability in infants

Management

- Try positive pressure through mouth (can be done by the parents)
- Examine with the Thudichum’s speculum. Earwax hook or alligator forceps may be used to extract the foreign body. Avoid pushing the FB further back
- Removal under GA

Nasal septum haematoma

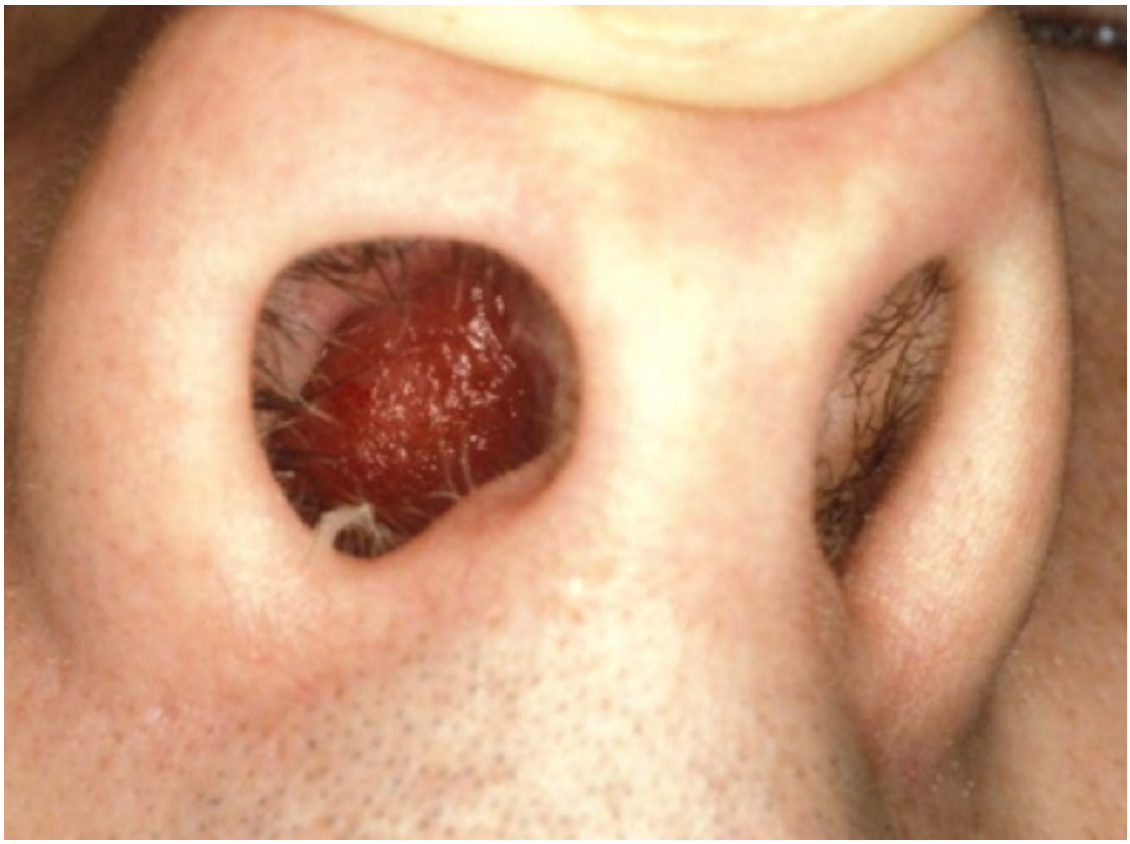


Figure 66: Right sided septal haematoma

Description

A septal haematoma is blood which collects between the perichondrium and septal cartilage. There is an increased risk of devascularisation of the septal cartilage and this can lead to necrosis, perforation and deformity.

Presentation

- Usually due to nasal trauma. Associated with nasal bone fracture.
- Can be unilateral or bilateral (usually bilateral).

Complications

- Abscess formation
- Septal perforation leading to saddle-nose deformity

Management

- Ensure the patient is stable and any head injury is managed appropriately.
- The patient needs an urgent incision and drainage under general anaesthetic . A delay in surgery risks permanent deformity
- Antibiotic cover

Foreign body in the ear

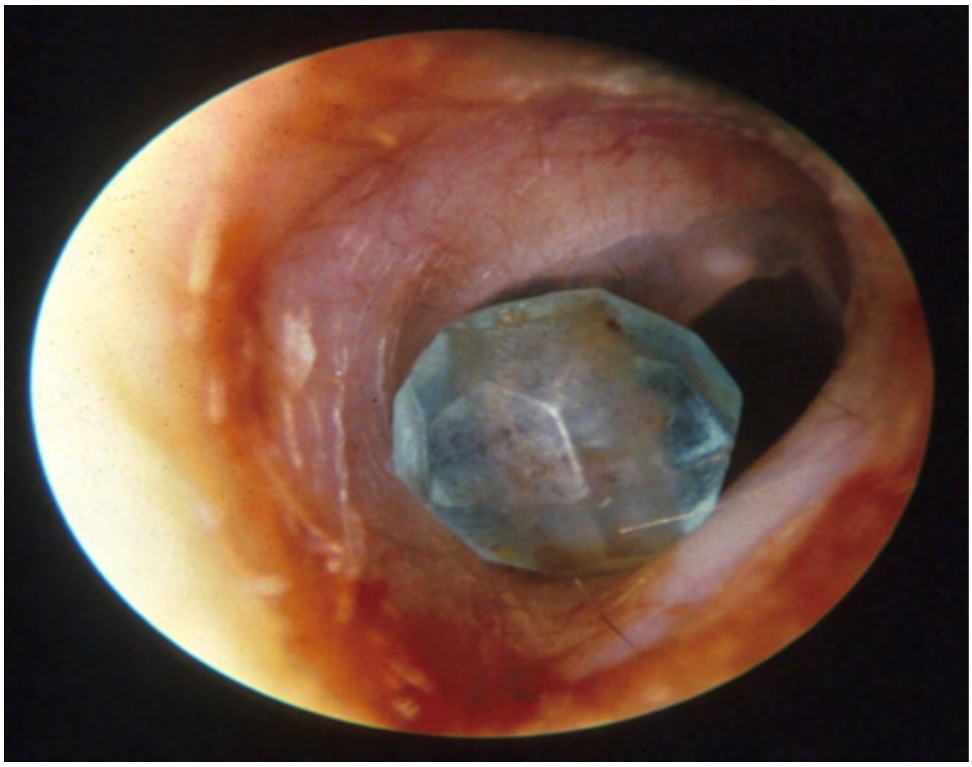


Figure 67: Foreign body in the ear (reproduced with permission from Otolaryngology Houston, www.ghoryeb.com)

A foreign body in the ear is more common in children. However, broken ends of cotton bud ends or pieces of tissue can be found in the embarrassed adult! It is particularly dangerous if the foreign body is a button battery as rapid erosion may occur.

Presentation

Hearing loss
Discharge- may be foul smelling or blood if FB is left long term.

Management

The foreign body needs to be removed using appropriate equipment – the method used depends upon what the object is and its shape.

Examples include using a wax hook (e.g. small hard, round objects), alligator forceps (paper) or microsuction.

Perforated Tympanic Membrane

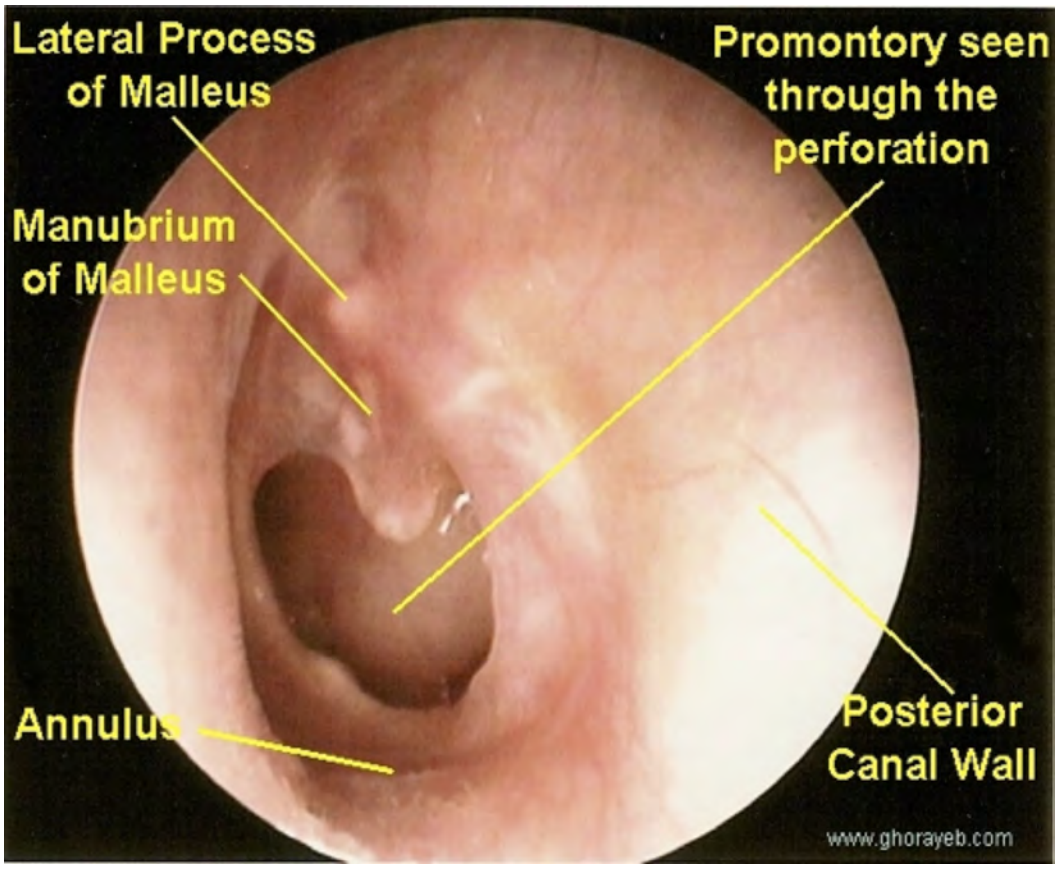


Figure 68: Central perforation of left tympanic membrane(reproduced with permission from Otolaryngology Houston, www.ghoryeb.com)

Causes

- Previous surgery e.g. grommets
- Infection (Acute otitis media with perforation)
- Trauma (blow to the ear or barotrauma)

Presentation

- Ear pain when perforation occurs. Blood may discharge at this time

- Hearing loss
- Recurrent discharge

Management

- Most cases can be managed conservatively by advising the patient to keep the ear free of water (e.g. use cotton wool smeared with Vaseline in the bath/shower, swimming cap/ear plugs for swimming). The perforation often heals within 6-8 weeks if traumatic in origin or secondary to an episode of otitis media with perforation.
- Infected perforations ears may require antibiotic ear drops.
- Reconstruction of eardrum (myringoplasty/tympanoplasty) may be required in appropriate cases e.g. recurrent ear infections, patients wanting to waterproof their ear

FB in the pharynx or oesophagus

Causes

- In children, this tends to be an inanimate object such as a coin . There should always be a high suspicion of battery as these can look very similar to a coin on a plain X-ray. A battery causes a chemical burn that can perforate the oesophagus within hours.
- In adults, it tends to be a food bolus. The most important question is whether there is any bone as this requires immediate removal because the oesophagus is at a higher risk of perforation.

Presentation

- Dysphagia, odynophagia, drooling
- In children, the presentation can be very non-specific. e.g. off their food, lethargic

Management

- Depends upon the nature of the foreign body, duration of the symptoms and the clinical status of the patient.
- Batteries – removal as soon as possible. This is a surgical emergency and should be treated with the same urgency as a significant bleed or an airway problem.
- Food bolus with bone – needs to be removed as soon as possible to minimize the possibility of perforation
- Food bolus without bone – this may spontaneously pass overnight (the oesophageal muscles & sphincters relax when a

patient sleeps) or muscle relaxants such as hyoscine butylbromide (Buscopan) can be given. If it does not pass, patient may need an upper rigid oesphagoscopy or an OGD (for a lower food bolus). Asking the patient to swallow a sip of water can be useful (immediate regurgitation implies a high obstruction whereas delayed regurgitation implies a low obstruction).

Deep neck space infections

Causes

The causative agent is normally bacterial & it often originates from poor dental hygiene particularly in the case of Ludwig's angina (Figure 69)

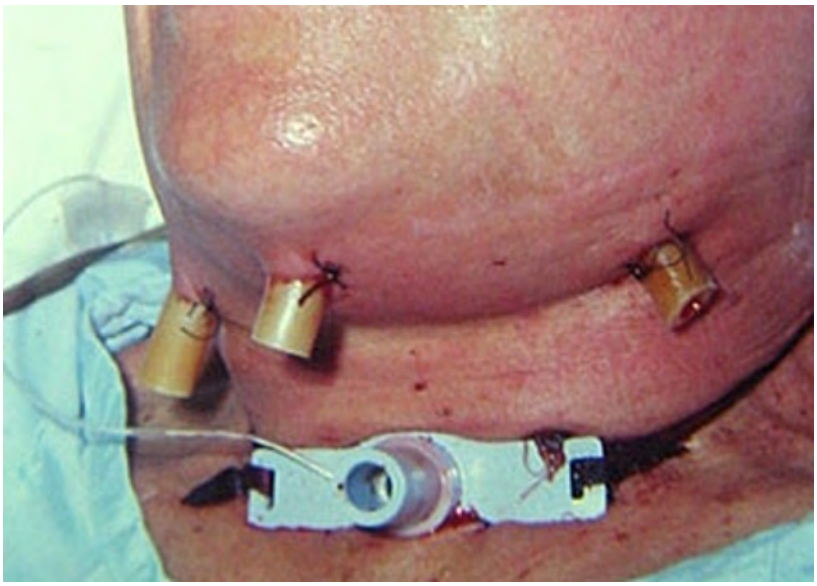


Figure 69: Ludwig's Angina (courtesy of E-lfENT)

Presentation

This depends upon which deep neck space is affected. Symptoms to watch out for include pain, trismus (unable to open mouth fully), dysphagia, dysphonia, stridor and drooling. Patients typically look very unwell with pyrexia and malaise.

Management

- The "ABC" approach should initially be used as these patients are often very ill. The airway is at risk so should be secured if compromised (this may require intubation or tracheostomy).

- Fluid administration and broad-spectrum antibiotics need to be administered (e.g. Co-amoxiclav).
- Imaging (CT scan with contrast) is normally performed to confirm the diagnosis and delineate which deep neck space compartments are affected.
- Definite treatment involves surgical drainage of the abscess (surgery may be per-oral/external or both). Small collections (< 1cm) may respond to intravenous antibitocs.
- Microbiology results from pus/blood cultures are very important to target the specific pathogen.

In children, retropharyngeal infections tend to be more common than in adults. They present with difficulty swallowing and trismus and when examined have limited neck movement or torticollis (hold their neck in a twisted position)

In adults, parapharyngeal infections are more common. Nasendoscopy may show a parapharyngeal bulge.

Quinsy (Figure 70)– this is a peri-tonsillar abscess. Patients present with pain, odynophagia and a “hot-potato” voice. Trismus is common. Treatment is per-oral aspiration and/or incision & drainage which can be done under local anaesthetic.

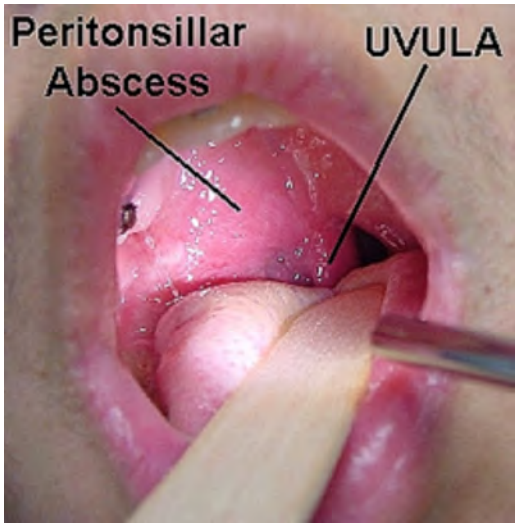


Figure 70: Right quinsy (courtesy of Elf-ENT)

Ludwig’s angina – this infection typically arises from poor dentition and spreads rapidly involving the floor of the mouth, submandibular space and into adjacent deep neck spaces. Treatment involves draining the collection and removing the source of infection (e.g. a rotten tooth)

Penetrating neck trauma

Causes

There are a large number of potential causes of penetrating neck injuries but most commonly these are due to a knife, broken glass (e.g. a bottle being used as a weapon) or gunshot wound.

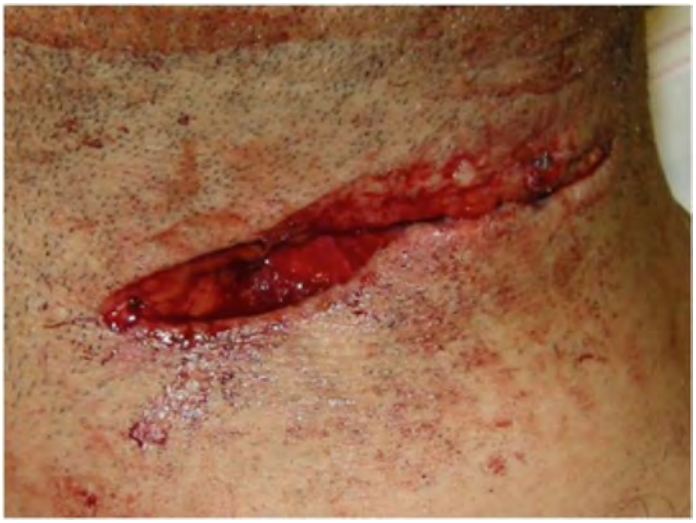


Figure 71: Knife laceration to neck (courtesy of Elf-ENT)

Presentation

It is important to obtain as much history as possible e.g. when and how it occurred, length of knife etc. Examination of the neck should include specific reference to the site of injury. This can help with identifying the most likely structure involved. The neck is divided into three zones

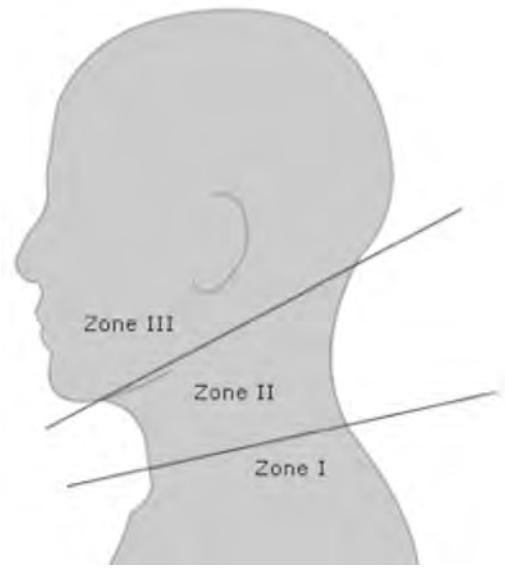


Figure 72: Zones of the Neck (courtesy of Elf-ENT)

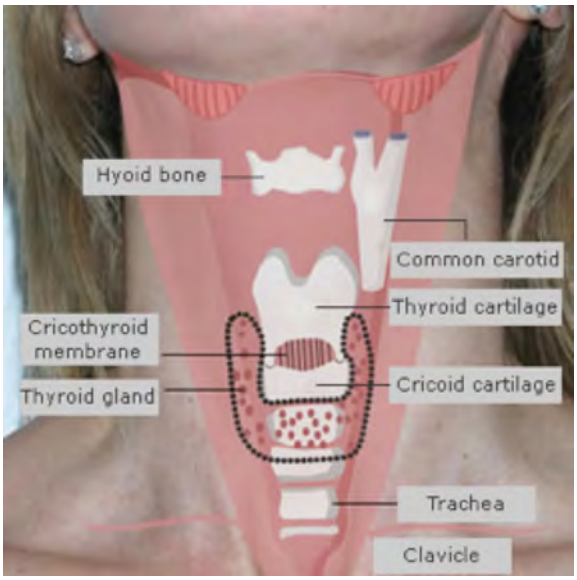


Figure 73: Important landmarks in the neck (courtesy of Elf-ENT)

Zone I extends from the clavicle to the cricoid. It contains a number of important vessels – the common carotid artery, internal jugular vein, the trachea and oesophagus.

Zone II extends from the cricoid to the angle of the mandible and is the most commonly affected zone of injury. This area contains the laryngeal structures and pharynx. It also contains the vascular structures including the common carotid artery, bifurcation into the

internal and external carotid, the internal jugular vein, the cranial nerves including the spinal accessory (XI), the vagus (X) and the hypoglossal nerves.

Zone III extends from the angle of the mandible to the skull base. It is associated with trauma to the internal carotid artery, trauma to the skull base and injury to the cranial nerves passing through.

Management

Patients are treated using the ATLS protocol (A-airway, B-breathing, C- circulation, D – disability & neurological status, E – exposure). Airway may need securing by intubation or a a surgical airway (criocthyroidotomy, tracheostomy). In a haemodynically stable patient, imaging may be performed (e.g.CT angiogram, CT head & neck) to look for vascular injury and/or intrancranial/C-spine/tracheal/oesophageal injury. Surgical exploration is normally performed if the platysma muscle has been breached. It is increasingly being recognised that surgical exploration is not mandatory in stable patients.

Medications in ENT

Antibiotics

Antibiotics can be administered topically (e.g. ear drops), orally or intravenously.
Common antibiotics used in ENT include:

Phenoxymethylpenicillin

Used to treat a sore throat caused by a bacteria e.g. tonsillitis.
Duration is typically a 10-day course.

Amoxicillin

Can also be used for sinusitis, otitis media, where bacteria are the likely cause, but NOT for sore throats due to possibility of Glandular Fever. It should be avoided if there is possible glandular fever due to inevitability of a systemic skin reaction and Stevens-Johnson syndrome.

Flucloxacillin

Used for staphylococcal infections including cellulitis
Macrolides e.g. erythromycin or clarithromycin
Used for the treatment of bacterial infections where the patient is allergic to penicillin
Often used for chronic rhinosinusitis without polyposis

Aminoglycosides e.g. Gentamicin/steroid eardrops

Used for otitis externa, (Pseudomonas is a commensal and an opportunistic pathogen)
Used with caution in a perforated ear drum and ears with grommets (due to risk of ototoxicity)

Quinolones

Ciprofloxacin drops are unlicenced for use in the ear in the UK but are frequently used in its eye drop form as it is not ototoxic. It is increasingly used in preference to aminoglyside antibiotics.
Used for pseudomonal otitis externa, chronic suppurative otitis media with perforated tympanic membrane

Antifungals

Clotrimazole is often used for fungal otitis externa (Candida infections)

Steroids

Topical nasal steroids

Topical nasal steroids are commonly used for the treatment of allergic rhinitis and chronic rhinosinusitis (with and without polyposis). They usually require a 2-3 week lead in period before the patient notices any effect. Alternative therapies should be considered if there is no improvement after 8 weeks of consistent use.

Common examples include:

- Fluticasone spray. They can also be given as nasal drops (nasules).
- Mometasone spray
- Beclomethasone spray or nasules

Practical points:

- These are steroids but there is minimal systemic absorption
- Common side-effects include dryness/crusting which can cause bleeding (which can be prevented by applying vaseline to the nose) and irritation within the nose

Oral steroids

These are typically used in adults (dose 1mg/kg for one week) in the following conditions.

Significant nasal polyposis – oral steroids are used in conjunction with topical nasal steroids. They are also sometimes prescribed in conjunction with antibiotics for the treatment of acute sinusitis.

Bell’s palsy - steroids should be prescribed (ideally within 24-48 hours of the onset of facial palsy). There is a good evidence base that this improves facial nerve recovery when prescribed early(versus low evidence for anti-virals which has been traditionally prescribed together with oral steroids)

Sudden onset sensorineural hearing loss - traditionally oral steroids were given although there is limited evidence for it. There is increasing evidence that intratympanic injections of steroids such as dexamethasone may be beneficial. They can be given under local anaesthetic in the ENT clinic.

Antihistamines

They are useful in rhinitis when the main symptoms include sneezing, rhinorrhoea and/or eye itching. (Note that intra-nasal steroids are aimed more specifically at the nasal obstruction) although topical nasal antihistamine preparations are available.

Antihistamines are used in a complementary fashion with or without topical corticosteroids.

Side effects if taken systemically include sedation, dry mouth, blurry vision, urinary retention and acute angle glaucoma

Vestibular sedatives and Meniere's disease

Prochlorperazine

This is a dopamine antagonist that is commonly prescribed for nausea and vertigo due to labrynthitis. It is not uncommon to find patients have been using this medication for a long period of time; it should not be given for over 2 weeks as this will prevent the brains "central compensation" which naturally occurs after an episode of labrinythitis.

Cinnarizine

It is an antihistamine and calcium antagonist used for nausea and vertigo.

Betahistine

Traditionally this is used in the treatment of Menieres disease although there is increasing evidence that it lacks efficacy. It is thought to improve blood flow to the inner ear which in turn reduces the endolymphatic pressure (a raised endolymphatic pressure is thought to be the cause of Menieres Disease)

Intratympanic dexamethasone or gentamicin

Intratympanic injections of dexamethasone and gentamicin are used to treat Menieres Disease. The medication is absorbed through the oval/round window membrane and "reduces" vestibular nerve function. Dexamethasone is preferred if the patient has good hearing (gentamicin is ototoxic whereas dexamethasone is not)

Practical Procedures in ENT

Nasal Cautery

Silver nitrate cautery of the anterior septum is a core skill for any ENT junior doctor. Universal precautions, a good headlight and suction (Zollner or Fraser) are useful.

First decongest and numb the nose with a combined lignocaine and phenylephrine spray either sprayed directly into the nose or applied on cotton wool pledgets. Close examination of the anterior septum can often reveal the likely point of bleeding e.g. right Littles area (Figure 74) The vasoconstrictive element helps reduce any active septal bleeding to a slow ooze which may be amenable to cautery.

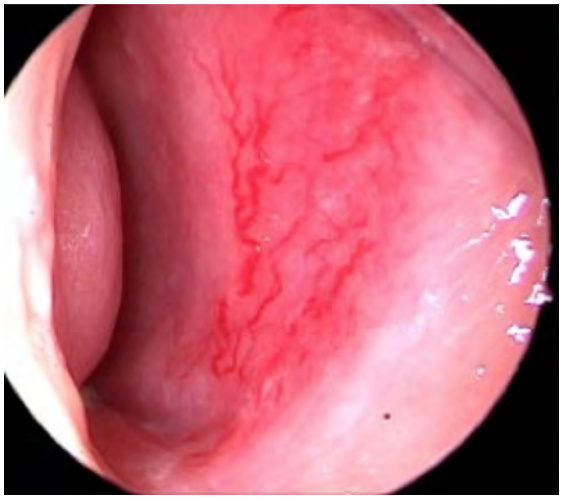


Figure 74: Prominent vessels over Little's area on the right.

Silver nitrate cautery (Figure 75) should be applied in a 'rose-petal' pattern (see Figure 76). Often Naseptin cream (a combination Chlorhexidine and Neomycin cream - caution with Nut allergy as it contains Arachis oil from peanuts) is applied topically post-cautery for 2 weeks which can aid healing. Caution should be taken not to cauterize both sides of the septum directly opposite each other for fear of creating a septal perforation. In some units bipolar cautery may be available, but the underlying principles of cautery remain the same.

Figure 75: Silver nitrate sticks.

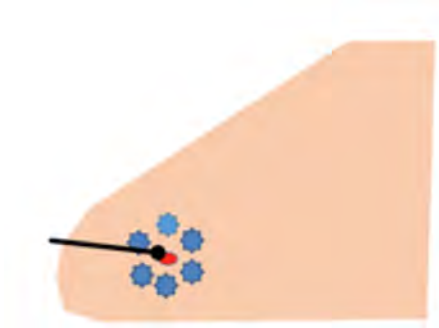


Figure 76. Cautery Applied in a ‘Rose Petal’ Pattern to
to fully deal with the efferent and afferent tributary vessels.

Anterior Nasal Packing

If a bleeding point has not been found, or cannot be controlled with cautery, then nasal packing may be the next option. Nasal packs can be classified as anterior or posterior.
Anterior packs commonly encountered include Merocel nasal tampons (which form a scaffold for clot stabilization) or Rapid Rhino nasal packs (which help clot formation but also contain an internal balloon to provide some pressure on bleeding vessels).

Again, as with cautery, a headlight, suction and universal precautions are useful when packing a nose. An assistant is also helpful. Anaesthetise the nose appropriately as described in previous sections.

Consent and counsel the patient of what you are going to do. Advise them that they may experience some discomfort on pack insertion.

Lift the tip of the nasal cavity and firmly insert the nasal pack along the floor of the nose (not up towards the skull-base), see Figure 77. Try and slide the pack between the septum and inferior turbinate. Deviations of the septum or other anatomical variations can make this difficult.

Try to only pack the side of active or recent bleeding. However, if a side cannot be identified from history or examination, or unilateral packing does not control the epistaxis, occasionally bilateral packing may be required. Be aware that this can exacerbate cardiopulmonary problems.

Ensure adequate analgesia has been prescribed for the patient to tolerate the nasal pack. Appropriate resuscitation should continue and the patient admitted to the ward as appropriate. Any clotting abnormalities should also be addressed with advice from the appropriate specialists (e.g. Haematology, Cardiology).

Return to examine the patient after 15 minutes to ensure the bleeding is controlled. Examination of the posterior pharyngeal wall can reveal if bleeding is continuing posteriorly despite an anterior pack being in place.

If anterior packing does not control the bleeding, or a posterior bleed is identified, a posterior nasal pack may be required. It is a good idea to get your seniors involved, and posterior packs should ideally be placed with senior supervision. A Foley urinary catheter using the balloon to occlude the post nasal space with anterior ribbon gauze is the convention, but there are a number of modern options for posterior packing now available (Antero-Posterior Rapid Rhino’s, Brighton Epistaxis Balloons, etc).

Figure 77. Nasal Packing with Rapid Rhino nasal pack. It should be inserted along the floor of the hard-palate (direction of arrow) and NOT upwards.

Nasendoscopy

Description

This uses a flexible fibreoptic endoscope or a rigid straight or angled scope to examine the nose, postnasal space, pharynx and larynx. It can be performed in the outpatients department and is commonly done without the need of any anaesthetic spray.

Figure 78: Flexible nasendoscopy

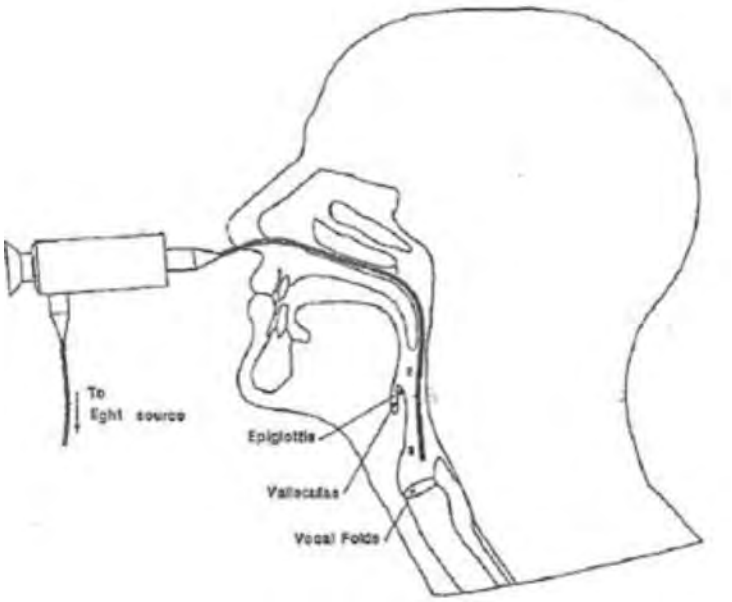


Figure 79: Flexible nasendoscopy schematic.

Indications

To examine the nose, the sinuses, pharynx and larynx for pathology
To assess the voice
To evaluate swallowing
To evaluate the airway and assist in intubation

Technique of flexible fibreoptic nasendoscopy

The endoscope should be accompanied with a high quality light source with a cable, and the image may be viewed through the eyepiece or on a screen which has the added benefits that it assists in teaching, allows the patient to appreciate the view and allows photographs and videos to be recorded. Some endoscopes can be battery operated which means they are portable and can be easily taken to wards and various departments.

Some patients require to be sprayed with local anaesthetic/ decongestant spray such as lidocaine/phenylephrine however most can tolerate this quick procedure without it.

The patient should be seated upright with their head in slight flexion position. The clinician should have the screen ideally situated and the endoscope should be focused to give a sharp image and a white balance should be performed if required. The endoscope should be lubricated, however the tip should be clean, if necessary using an alcohol wipe, to provide a clear image.

The patient should be given clear instructions and reassured throughout.

The examination requires inspection of the following structures:

- The nasal turbinates and their corresponding meati.
- Septum and Nasal mucosa.
- Presence of mucus, pus or polyps in the nasal cavity
- Nasopharynx including the Eustachian tube orifices and the fossa of Rosenmuller.
- Posterior pharyngeal wall
- Soft palate, uvula and tonsillar region
- Tongue base and vallecula
- Epiglottis
- Both pyriform fossae

- Vocal folds and their mobility by asking the patient to say ‘eeeeeeeee’

Do not force the endoscope into the nose, simply use the weight of the scope to gently pass the tip into the nasal cavity.

The patient may start to produce tears when the endoscope is passed. This is a normal reflex and does not necessarily indicate the patient is in discomfort. However, you should regularly check the patient’s face or ask if they are in any pain throughout the entire procedure.

The whole procedure takes less than 2 minutes and it is important to warn the patient to avoid any food and drink for 30 minutes if their nose and throat has been sprayed with local anaesthetic

Oto-Microscopy and Foreign Body Removal

Description

Examination of the ear under the microscope is a skill that can be acquired with the help of some basic principles and handy tips. Normally done by ENT team due to the need for specific equipment.

Indications

- To examine an ear
- Removal of impacted ear wax
- Treatment of ear infections
- Removal of a foreign body

Technique

- The patient should be lying on their back on a couch; the head end can be elevated for patients who may become dyspnoeic when lying flat. The clinician should sit on a chair and adjust the height of the chair to a comfortable level and ensure their back is straight.
- Familiarise yourself with the controls of the microscope before seeing a patient.
- Firstly adjust the inter-pupillary distance so that one image is seen and note this for future reference. Secondly set the focus of the lens by adjusting each lens to the zero position, then using some printing/writing on a piece of paper adjust the height of the microscope until the image can be seen clearly through the dominant eye (usually the right one). Then close that eye and check if the image is still clear. If not adjust eyepiece until the image is sharp. Again make a note of these settings.

- The focus should remain sharp even when the magnification is changed.
- Other equipment that may be required is suction, a wax hook, Jobson-Horne probe, crocodile forceps and an aural speculum.
- For foreign body retrieval, you need a cooperative patient and usually the first attempt is the best chance to remove it particularly in children. Otherwise a general anaesthetic may be required.
- Soft foreign bodies such as cotton wool can be grasped with crocodile forceps. Hard objects like a bead are best removed using a wax hook or Jobson-Horne probe.
- Insects (if alive) should be drowned in olive oil first.

ENT Investigations

Pure Tone Audiometry

Description

Pure tone audiometry is a subjective test that aims to evaluate the quietest sound that can be heard with each ear at various frequencies i.e. the hearing threshold. Hearing is usually reported on the decibel scale, which is a logarithmic scale. In general, a whisper from 1m has an intensity of 30dB, normal conversational voice is 60dB, shouting equates to about 90dB and discomfort can be felt at around 120dB.

Technique

The audiometer is a machine which provides pure tone sounds at varying frequencies

The test must be conducted in a soundproof room and the subject should not be able to see the machine or the tester adjusting the controls as this may influence the results.

Before conducting the test, the ears must be examined to exclude an active infection, foreign body or occluding wax. The patient then wears headphones to test air conduction followed by a bone vibrator placed on the mastoid process to test bone conduction

Air conduction is tested at 250, 500, 1000, 2000, 4000 and 8000 Hz while bone conduction is tested at 500-4000 Hz.

Masking helps to deal with cross hearing, which occurs from bone conduction to the contra-lateral cochlea. It involves presenting a sound to the non-test ear (masking noise) to prevent it from detecting the sound being presented to the test ear

Interpretation

Hearing Disability is defined as:

Normal hearing is defined to be 20dB or better.

Mild hearing loss is between 21-40dB.

Moderate hearing loss is between 41-70dB.

Severe hearing loss is considered to be 71-90dB.

Profound hearing loss is worse than 90dB.

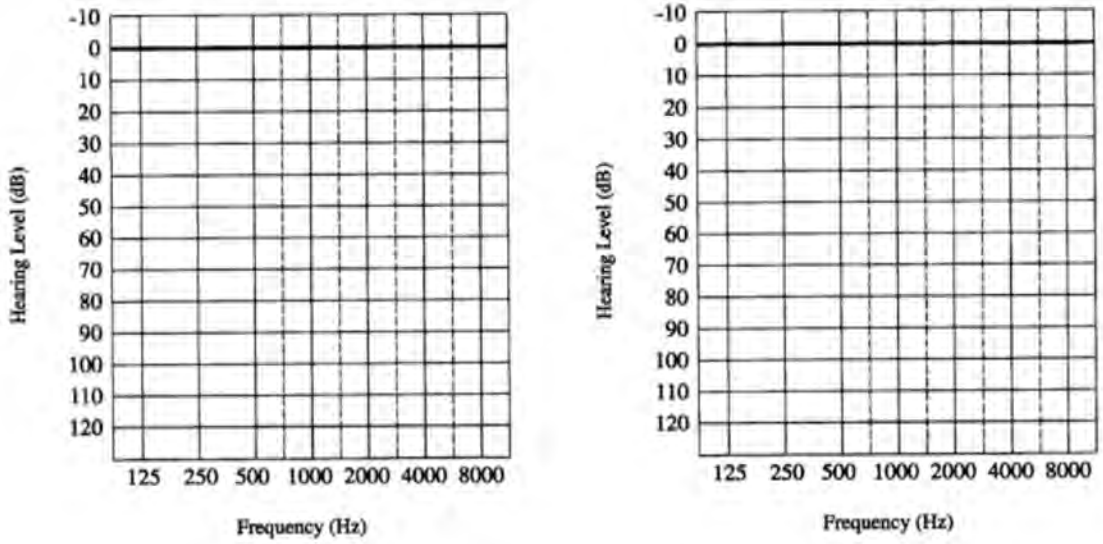
Recommended format for audiogram forms.

Pure tone audiogram

Name:

Age:

Date:



Case No:

Maximum level of masking noise used in non-test ear

	125	250	500	1000	2000	4000	8000
AC							
BC							

125	250	500	1000	2000	4000	80

	Right	Left
Air conduction, masked if necessary	O	X
Bone conduction, not masked	Δ	
Bone conduction, masked	[	]
Uncomfortable loudness level	L	⌟

Reference : British Society of Audiology Recommended procedure (March 2004). Pure tone air and bone conduction threshold audiometry with and without masking and determination of uncomfortable loudness levels.

Figure 80: An audiogram

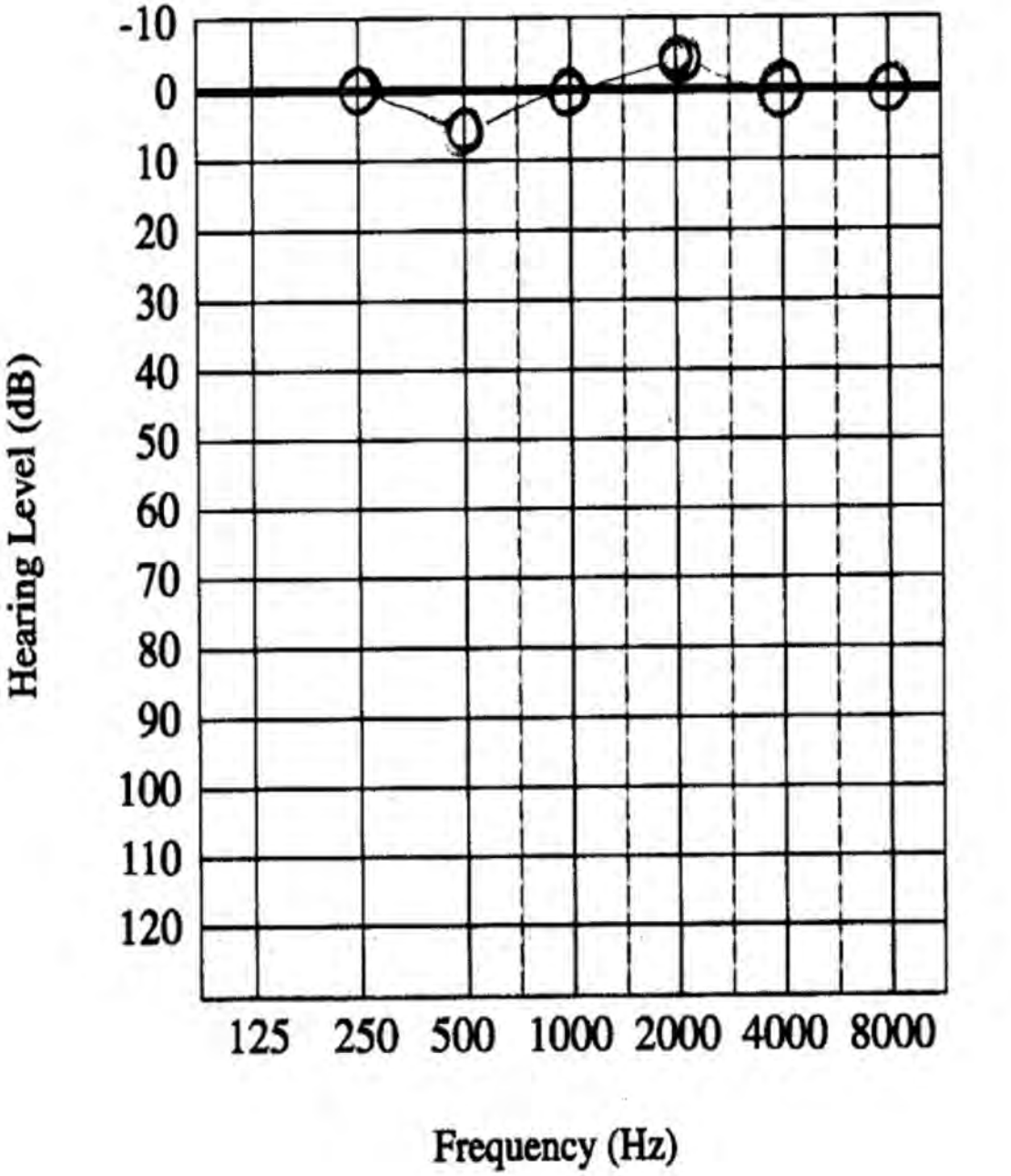


Figure 81: An audiogram showing normal hearing in the right ear

Audiogram Case Study 1

A 5 years old child is brought to see the GP by his mother who is concerned about his hearing. She feels he often mishears and can even ignore her at times. There have been similar concerns raised at his school including a slight speech delay and 2 failed hearing tests. The boy demands to have the television on loud and can often be loud and boisterous himself. In the past 6 months he has complained of earache several times which responds to paracetamol. He is referred to the community audiologist for a hearing test.

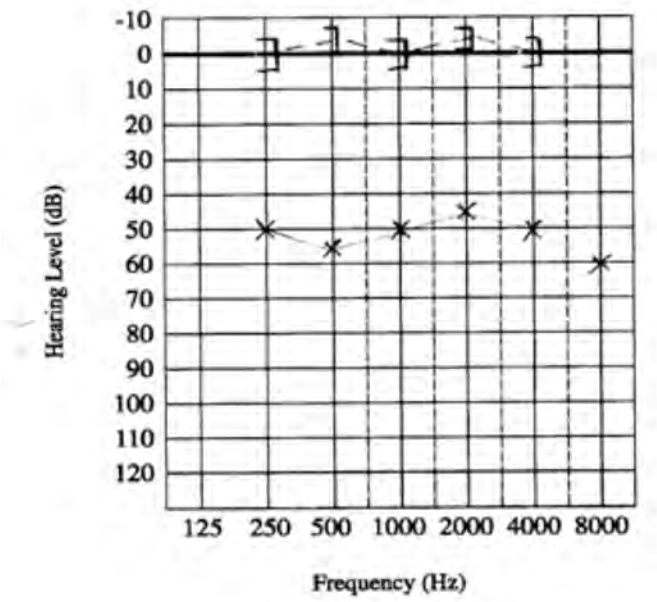


Figure 82: This audiogram shows left conductive hearing loss. The most common cause in a child would be otitis media with effusion commonly referred to as “glue ear”. This condition has a bimodal distribution peaking at 2years of age and then again at 5 years of age

Audiogram Case Study 2

A 72 years old lady presents to her GP rather upset that her family keep complaining about her hearing. She has no earache, no dizziness, no previous ear complaints and has never worked in a noisy environment. She has noticed some mild ringing in both ears for the past 6 months and does admit to lip reading at times. She is quite anxious that she will be given a bulky hearing aid and but agrees to have a hearing test.

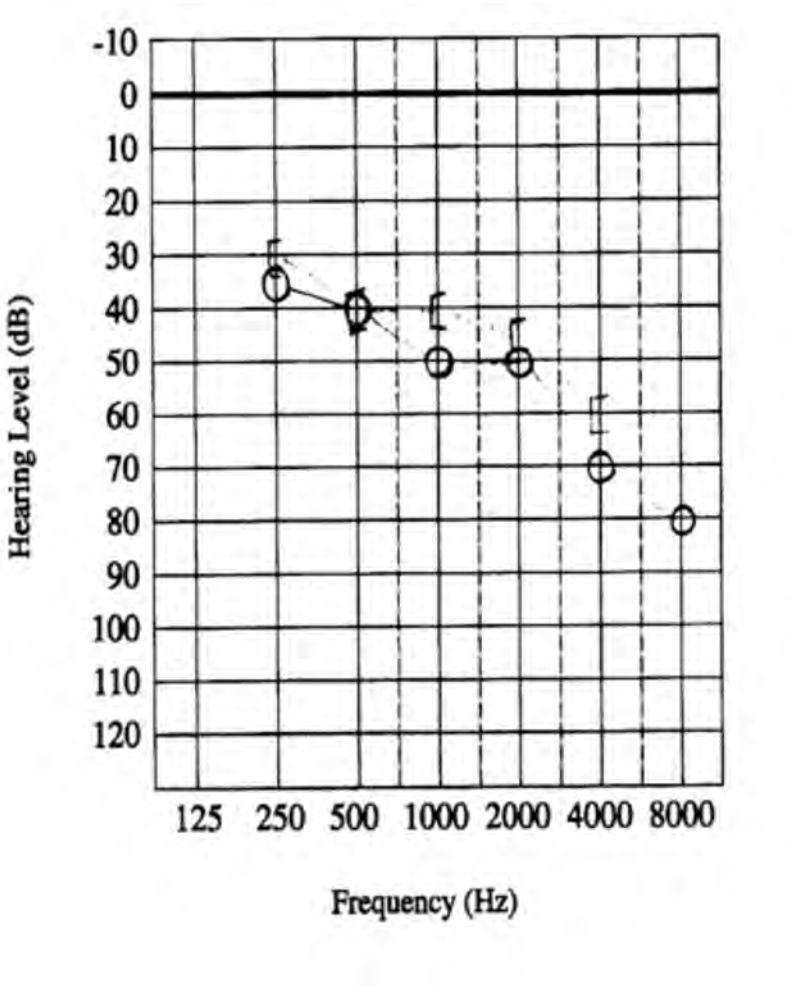


Figure 83: This audiogram shows right sensorineural hearing loss. Bilateral, progressive symmetrical sensorineural hearing loss with no history of noise exposure in a patient over 60 is typically due to presbyacusis, otherwise known as age-related hearing loss.

Tympanometry

Description

Impedance is the resistance to the passage of sound. Tympanometry indirectly measures the “compliance” or freedom of movement of the middle ear structures. Sound transmission from the outer to the middle ear is optimal when the pressure in the ear canal matches the middle ear pressure.

Technique

A test probe consisting of a sound producer, sound receiver and a component to alter the air pressure in the external auditory meatus is used. An air tight seal is required in the ear canal.
A test tone is transmitted to the middle ear system, some of which will be absorbed and some of which will be reflected. The air pressure in the ear canal is varied from 200mmH2O to -200mmH2O. This allows compliance to be measured.
Compliance should be maximum when there is no pressure difference across the ear drum.

Interpretation

Type A describes a Normal tympanogram. The peak occurs around 0 decaPascals or mmH2O. The peak may be shallow indicating stiffness of the drum (e.g ossicular fixation or tympanosclerosis) or may be high indicating a flaccid ear drum (e.g ossicular disarticulation)

Type B describes a flat or very low peak. This is typical of a middle ear effusion. It can also be seen if there is an ear drum perforation but the ear canal volume will be higher. Normal ear canal volume is less than 2 cubic centimetres.
Type C shows low pressure in the middle ear and is seen in Eustachian tube dysfunction.

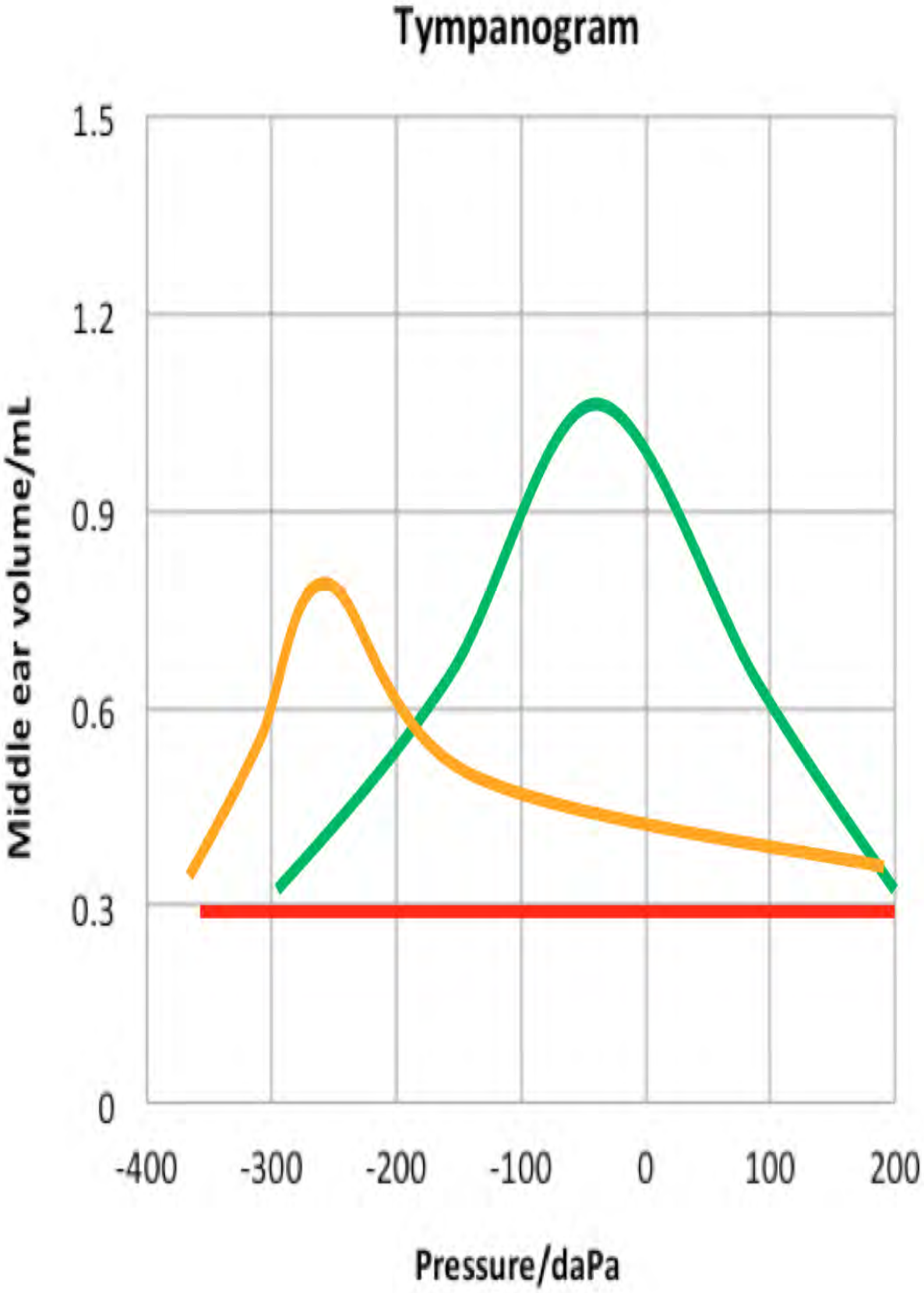

Tympanogram
1.5
1.2
0.9
0.6
0.3
0
Middle ear volume/mL
-400
-300
-200
-100
0
100
200
Pressure/daPa

Figure 84 Tympanogram describes Type A (green), Type B (red), Type C (orange) patterns (Courtesy of Elf-ENT)

Hearing Tests In Children

Otoacoustic Emissions

- Outer hair cell vibrations can be detected in the external auditory meatus as otoacoustic emissions and can be used as an objective measure of cochlear function.
- Transient evoked otoacoustic emissions occur in response to short stimulatory acoustic signals in the form of clicks or tone bursts.
- Their presence usually indicates that the hearing threshold is better than 40dB and they are used in the NHS Newborn Hearing Screening Programme. This screens for congenital hearing loss; if the test is failed then the baby is referred for a more detailed hearing assessment.

Behavioural Techniques

- Used in 0-6 months age
- Based on presenting a sound stimulus and observing the baby's response. A significant change in activity represents a positive response.

Distraction Techniques

- Used in 6-18 months
- In this test the parents are given the instructions and advised that they must not react to the sounds. An assistant distracts the baby with a toy, which is then phased out. The tester in the mean time presents a sound from behind the baby and from the right or left side. A positive response is if the baby turns in response to the sound

Visual Reinforcement Audiometry

- Appropriate for 9-36 months
- This test involves the child sitting and playing with toys. Sound stimuli are produced by one of two loud speakers positioned at either side of the child. On turning to the sound the child is rewarded by a visual stimulus such as a flashing light or toy bobbing above the speaker

Performance Testing

- Appropriate for 24-60 months
- The child is conditioned to participate in a certain task such as placing a toy in a box in response to a sound. The child is then rewarded. Once it is clear that the child understands, the hearing can be tested by using sounds of different frequencies at different intensities.

Pure tone audiograms

Generally used in children above the age of 5 years.

ENT Operations

Grommet Insertion

Description

A grommet is a ventilation tube which helps to ventilate the middle ear. The procedure can be performed under local or general anaesthetic.

Indications

- Otitis media with effusion persisting for more than 3months
- Recurrent acute otitis media
- Tympanic membrane retraction secondary to impaired Eustachian tube function

Technique

- The patient is positioned supine on an operating bed with their head resting on a head ring and turned to the side.
- The largest aural speculum that can be accommodated is used to visualize the tympanic membrane via an operating microscope.
- After de-waxing the ear if necessary, the tympanic membrane should be examined fully to assess for other pathologies (e.g. a cholesteatoma).
- A long enough radial incision (called a myringotomy) is made in the safe antero-inferior quadrant of the tympanic membrane and any glue is suctioned from the middle ear.
- The ventilation tube is grasped using a crocodile forceps in line with the forceps either from the top or the bottom flange (depending on the surgeon’s preference).
- The ventilation tube free flange is then inserted through the myringotomy and inserted into position using a Cawthrone hook or a straight needle.

Peri-Operative Care

- This is usually performed as a day case procedure. Ears should be kept dry for 2 weeks. An audiogram is usually performed in 6-12 weeks time.
- The grommet tends to self extrude after 6-12 months and the majority of eardrums will heal up.

Complications and consent

- Infection which most commonly manifests as otorrhoea.
- Tympanosclerosis (scarring of the eardrum)
- Tympanic membrane perforation (2-5%)

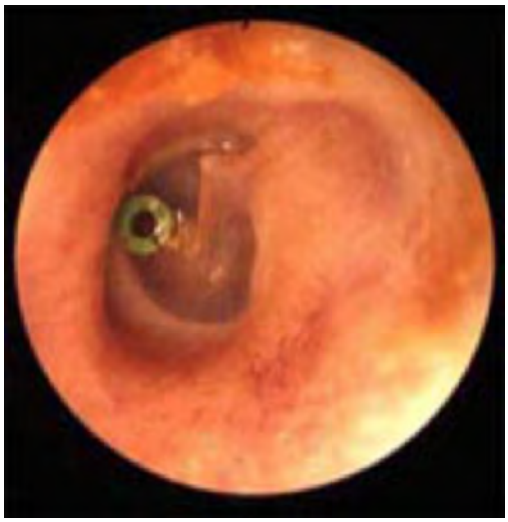


Figure 85: Grommet in situ

Middle ear and Mastoid surgery

Myringoplasty

A procedure to repair a perforation of the tympanic membrane. It can also be called a ‘Type I Tympanoplasty’

The following procedures aim to reconstruct the hearing mechanism and can be combined with a myringoplasty and /or mastoid surgery if there is co-existing middle ear disease.

Tympanoplasty

- Type II Tympanoplasty is when the malleus handle is absent and the tympanic membrane is reconstructed over the malleus remnant and long process of incus.
- Type III Tympanoplasty is when the malleus and incus are absent and the TM is reconstructed on the head of the stapes.
- Type IV Tympanoplasty is when only the stapes footplate remains.
- Type V Tympanoplasty occurs when the stapes footplate is fixed and a fenestration of the lateral semicircular canal is made.
- Type VI Tympanoplasty is when the TM reconstruction lies on the promontory.

Ossiculoplasty

This involves reconstruction of the middle ear ossicles –the method used depends upon which ossicles are missing/present.

Common examples are TORPs (total ossicular replacement prosthesis) and PORPs (partial ossicular replacement prosthesis).

The latter is used if the stapes head is present and the former is used if the stapes is absent.

Common prosthetic materials used are hydroxyapatite or titanium. Bone cement can also be used for small defects e.g. absent long process of incus.

Mastoidectomy

This can be classified as “Canal wall up or “Canal wall down” – this refers to the preservation/removal of the posterior external auditory canal wall respectively

Canal wall up

This is also known as Combined Approach Tympanoplasty (CAT) – this technique uses a cortical mastoidectomy and permeatal approach to eradicate disease (e.g. cholesteatoma) leaving the posterior canal wall intact.

A cortical mastoidectomy is a procedure to expose the mastoid air cells usually in acute mastoiditis. It is also performed as part of procedures for cochlear implantation and combined approach tympanoplasty,

Canal wall down

Also known as modified radical mastoidectomy - the posterior canal wall is removed as part of the procedure. Most commonly done for cholesteatoma.

Peri-operative care

- A recent pure tone audiogram (ideally within last 3 months)
- The ear should be dry ideally with no active underlying infection(in practice, this is not always possible)

Complications and consent

The risks attached are bleeding, infection, hearing loss, dizziness, tinnitus, disturbance of taste (secondary to injury/removalof the chorda tympani), facial nerve weakness and CSF leak and recurrence.

Tonsillectomy

Indications

- Recurrent tonsillitis
- Quinsy
- Obstructive sleep apnoea
- Suspected malignancy

Contraindications/Cautions

- Coagulopathy (haematological input may allow this)
- Acute infection (However, a tonsillectomy may be done in an acute setting for a quinsy that does not respond to aspiration)
- Cleft palate (risk of velopalatal insufficiency which can cause nasal regurgitation with eating/drinking)

Surgical Technique

- There are a number of surgical techniques. A common technique is described below
- The procedure is performed under general anaesthesia
- The surgeon wears a head light
- The patient is positioned with their neck extended using a shoulder bag. A metal gag (Boyle Davis) is used to hold the mouth open and allow access to the tonsils. Draffin rods are used to secure the Boyle Davis gag in position.
- The surgeon makes a mucosal incision with scissors and starts by freeing the superior pole of the tonsil
- The use of gentle retraction medially helps to identify the correct plan and dissection can be blunt using a Gwynne-Evans tonsil dissector or using bipolar diathermy to allow simultaneous haemostasis too

- The lower pole can then either be clamped and ligated with an appropriate tie (e.g. linen or silk) and the tonsil removed
- Haemostasis is achieved using ties +/- bipolar diathermy
- The gag is then released to check for tension related haemostasis and any bleeding points are controlled.
- The post nasal space and pyriform fossae are suctioned with a flexible nasal catheter to remove any “coroner’s clot”. This is a clot that if missed can suddenly obstruct the airway once the patient is extubated.
- The teeth and TMJ should be checked for any damage and documented in the operation notes.

Peri-operative Care

- The surgery can be performed as a daycase.
- Regular analgesia
- Encourage an early return to a normal diet
- 2 weeks recovery period.

Consent and complications

Need to warn patients about the risk of primary (within first 24 hours) and secondary haemorrhage (usually day 4-7), infection, dental injury, taste disturbance and 2 weeks off work/school.

Adenoidectomy

Indications

- Nasal obstruction +/- obstructive sleep apnoea
- Recurrent otitis media

Contraindications/Cautions

- Cleft palate/submucousal cleft
- Bleeding disorder or coagulopathy
- Velopharyngeal insufficiency (hypernasal speech and nasal regurgitation)

Surgical technique

- Performed under GA often in combination with a tonsillectomy and/or grommet insertion depending on the indications. A mouth gag is used to open the mouth and the postnasal space and adenoid tissue is palpated.
- Monopolar suction diathermy is used to remove the adenoid tissue to clear the choanaes without damaging the laterally positioned Eustachian tubes. This is done under direct vision using a postnasal space mirror/angled endoscope. An alternative technique is to use an appropriately sized curette to remove the adenoids followed by haemostasis with packs/bipolar.
- The post nasal space is suctioned with a flexible nasal catheter to remove any “coroner’s clot”

Consent and complications

Consent- Risk of postoperative haemorrhage, dental trauma, velopalatal insufficiency, transient hypernasal speech.

Peri-operative care

A period of observation is required to ensure no bleeding, but can be done as a daycase.

Functional Endoscopic Sinus Surgery (FESS)

Indications

- Acute or Chronic Sinusitis not relived by medical management
- Nasal Polyposis
- Orbital complication of Sinusitis
- Drainage of mucocoele/pyocoele or pneumatocele
- Endonasal tumour
- Access to skull base

Surgical Technique

- Pre-operative planning includes nasal endoscopy and imaging, usually CT +/- MRI paranasal sinuses.
- Performed under GA with the patient's head resting on a head ring for stability and with the head up and the eye exposed. Most surgeons will use a preoperative preparation to help decongest the nose and aid in haemostasis. This usually consists of a mixture of lignocaine, epinephrine, and cocaine (Moffat's solution).
- Most of the procedure is performed with a 0 degree endoscope; other viewing angles are also available for specific steps. The sequence of steps commonly performed are uncinectomy (removal of the uncinate bone), followed by enlargement of the maxillary ostium, anterior and posterior ethmoids air cells are then cleared, followed by clearance of the sphenoid and frontal recess if required. During this process microbiology swabs may be taken if pus is encountered or biopsies taken of polyps or abnormal tissue. Cysts may be drained and washouts of the sinuses performed. Overall the aim of this procedure is to

remove disease in the osteomeatal complex in order to allow the natural drainage pathways of the sinuses to function.

Consent and complications

The consent process needs to involve warning the patient about bleeding which may require the insertion of nasal packs, infection, injury to the nasolacrimal duct, numbness in the region of the canine and incisor teeth, orbital injury that rarely includes diplopia and blindness, CSF leak and anosmia. The patient needs to be aware that he or she is likely to require nasal sprays long term postop.

Peri-operative Care

This procedure can be performed as a day case however some centres prefer an overnight stay depending on the extent of disease and the comorbidities of the patient. Blood stained nasal secretions are common and tend to settle over the next few days. Regular analgesia is required and usually a period of 2 weeks recovery is advised. Patients may be instructed to use saline nasal douching +/- steroid nasal drops post operatively. If infection was found antibiotics may be prescribed.

Parotidectomy

Indications

Neoplasms (benign & malignant)
Rarely performed by may be part of a first-arch branchial abnormality excision

Types of parotidectomy

- Superficial conservative parotidectomy (excision of lesions affecting the superficial lobe of the parotid)
- Total conservative parotidectomy (excision of lesions affecting the superficial and deep lobe with preservation of the facial nerve)
- Total radical parotidectomy (involves sacrifice of the facial nerve and may be combined with a nerve graft)

Surgical Technique

Performed under GA without muscle relaxant. A facial nerve monitor is used and when draping the patient the ipsilateral eye and corner of the mouth should be exposed.

A cervico-mastoid-facial incision is created and skin flaps are elevated to allow adequate exposure. Greater auricular nerve may be sacrificed to allow adequate exposure. The facial nerve is located most commonly using the tympanomastoid suture as the nerve bisects the apex of this grove 5mm below the bony meatal edge. The nerve is also known to lie just superior to the posterior belly of digastric and 1cm deep and inferior to the tragal pointer. In particularly difficult cases, retrograde dissection of the peripheral branches is an option. The nerve stimulator can be used to verify the presence of the nerve and great care must be taken to avoid thermal

damage when using diathermy. Great care is taken to avoid tumour spillage as this increases the chance of tumour recurrence.

Consent and complications

During the consent process, patients must be warned about bleeding and the potential of a haematoma and the need of postoperative drains. There is a 10% risk of temporary facial weakness or 1% risk of permanent weakness. The lower half of the pinna may be numb postoperatively due to great auricular nerve sacrifice. Also there is a risk of a salivary fistula and Frey's syndrome, which is characterised by gustatory sweating due to cross over innervation between local parasympathetic secretomotor fibres with sympathetic sweat fibres after severing the parasympathetic fibres of the auriculotemporal nerve.

Peri-operative Care

Most patients will have a postoperative drain in place to avoid a wound haematoma and reduce the dead space. This means they are admitted into hospital until the drain is removed which is usually 24-48 hours later.

Thyroidectomy

Indications

- Suspicion of Malignancy
- Compression symptoms e.g dysphagia/difficulty in breathing in a large retrosternal goitre
- Cosmesis

Types of thyroidectomy

- Hemithyroidectomy
- Total thyroidectomy

Surgical Technique

- Performed under GA with the patient positioned with a head ring and shoulder bag to extend the neck.
- A collar incision is made 2 fingers' breadth above the suprasternal notch in a skin crease. Subplatysmal flaps are elevated superiorly and inferiorly.
- The strap muscles are then divided in the midline and retracted to expose the thyroid.
- The superior thyroid artery and vein are ligated and divided close to the gland to avoid injury to the external branch of the superior laryngeal nerve. The middle thyroid vein and inferior thyroid vessels are also ligated and divided close to the thyroid gland to avoid disrupting the blood supply to the parathyroids.
- The thyroid gland is mobilised and the recurrent laryngeal nerve is identified and preserved.
- The nerve is closely related to the inferior thyroid artery and after ascending from the mediastinum in the tracheoesophageal

grooves, enters the larynx behind the cricothyroid joint.
- Parathyroid glands must also be looked for and preserved.
- The thyroid is then freed from the ligament of Berry and removed followed by haemostasis and wound closure.

Consent and complications

- Patients should be warned of bleeding and the need for surgical drains. Bleeding can rarely result in a haematoma and airway obstruction.
- There is a risk of infection.
- The external laryngeal nerve may be affected causing difficulty with changing the pitch of the voice and voice fatigability. Unilateral recurrent laryngeal nerve palsy could give rise to hoarseness and dyspnoea on exertion. Bilateral vocal cord palsy can cause airway obstruction with the need for a tracheostomy.
- There is a risk of hypocalcaemia due to inadvertent direct injury to the parathyroid glands or their vascular supply.
- In patients with thyrotoxicosis, surgical manipulation of the gland can cause a ‘thyroid storm’ with sudden release of thyroid hormones into the circulation; therefore patients should ideally be euthyroid.

Postoperative Care

Most patients will be kept in hospital overnight for a period of observation to ensure no wound haematoma. Patients who have had a total thyroidectomy need postoperative calcium checks and appropriate management of any subsequent hypocalcaemia. A total thyroidectomy would require patients to take lifelong thyroxine.

Neck Dissection

Indications

Almost always for metastatic carcinoma

Types of Neck Dissection

- Selective neck dissection describes removal of one or more lymph node groups (but not all 5) and preservation of all 3 non-lymphatic structures (sternocleidomastoid (SCM), accessory nerve (AN) and internal jugular vein (IJV)
- Modified radical neck dissection is removal of levels 1-5 but with preservation of one or more of the non-lymphatic structures i.e. SCM, AN or IJV.
- Radical neck dissection involves removal of the lymph nodes from level 1-5 plus removal of the SCM, AN & IJV
- Extended radical neck dissection is a radical neck dissection but with removal of further lymph node groups and/or additional non-lymphatic structures such as the external carotid artery or posterior belly of digastric.

Consent and complications

Complications include bleeding and haematoma, infection, risk of chyle leak, nerve damage, facial lymphedema and disease recurrence.

Surgical Tracheostomy

Description

A tracheostomy is a surgically created opening in the front of the neck into the trachea. It can be performed electively or as an emergency depending on the indication and can be permanent or temporary.

Indications

- Airway obstruction (See Chapter on ENT Emergencies)
- Weaning. Tracheostomy reduces physiological dead space therefore helps with weaning patients from mechanical ventilation and allows trachea-bronchial suctioning.

Surgical Technique

- Ideally performed under general anaesthetic, however, if endotracheal intubation cannot be achieved, tracheostomy can be performed under local anaesthesia.
- The patient is positioned supine with a shoulder roll and a head ring to achieve neck extension.
- A horizontal neck incision is made midway between the cricoid and sternal notch.
- The strap muscles are divided in the midline and retracted.
- The thyroid isthmus is divided in the midline using diathermy or can be hemitransfixed.
- At this point the trachea should be visible and the anaesthetist should be alerted that you are close to making an incision into the trachea. Ensure the tracheostomy tube is ready along with a size smaller tube. Ensure the cuff of the tube has been tested and that your assistant has suction to hand.

- A window is created into tracheal rings 3 and 4 or alternatively a linear incision can be created.
- The anaesthetist at this point withdraws the endotracheal tube slowly to allow insertion of the tracheostomy tube. The cuff is inflated and connections are made to the anaesthetic circuit. The position is verified by looking for a CO2 trace, the anaesthetist checks for bilateral air entry into the lungs and then the tube is secured around the back of the neck with tape plus/minus sutures through the flange of the tracheostomy tube

Complications and consent

- Intraoperative or postoperative bleeding
- Dislodged tube or false passage
- Blocked tube
- Infection
- Subcutaneous emphysema, pneumothorax or pneumomediastinum

Peri-operative Care

- Humidification and regular suctioning is essential
- Care of the inner tube is required to avoid blockage
- Stoma wound care including dressing changes and skin protection if necessary.
- Decannulation (removal of the tracheostomy tube) if appropriate should be considered as soon as possible to avoid long-term complications. This should be preceded by down sizing of the tube plus/minus capping the tube off to ensure it is tolerated.

Tracheostomy tubes

- Several types of tracheostomy tube are available

- Most tracheostomy tubes have an inner and outer tube. The inner tube can be “unlocked” from the outer tube by twisting it and allows the inner tube to be cleaned/unblocked whilst keeping the airway patent with the outer tube in-situ.
- Inner and outer tubes can be fenestrated or non fenestrated. Fenestrated tubes allow for speech although speech can still be obtained with a non-fenestrated tube if there is a sufficient air leak around it.
- Tracheostomy tubes may be cuffed or uncuffed. A cuffed tube provides a closed circuit, which is required for mechanical ventilation through a tracheostomy. An inflated cuff also prevents aspiration of saliva.