INTRODUCTION TO SKILLS LABORATORY
OTORHINOLARYNGOLOGY

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EAR ANATOMY
EAR ANATOMY

- Pinna
- External auditory canal
- Temporal bone
- Semicircular canals
- Incus
- Auditory nerve
- Malleus
- Cochlea
- Ear lobe
- Cartilage
- Ear drum (tympanic membrane)
- Stapes (stirrup)
- Eustachian tube
- Round window (fenestra cochleae)
EAR DRUM ANATOMY

- Long crus of incus
- Posterior malleolar fold and chorda tympani nerve
- Posterior crus of stapes
- Promontary
- Fibrocartilaginous ring
- Tympanic sulcus (of temporal bone)
- Anterior malleolar fold
- Lateral malleolar process
- Manubrium of malleus
- Umbo (tip of manubrium of malleus)
- Pars tensa of tympanic membrane
- Reflected cone of light
EAR DRUM

NORMAL EAR

ACUTE OTITIS MEDIA
History

The classic symptoms of ear disease are:

- deafness
- tinnitus
- discharge (otorrhoea)
- pain (otalgia)
- vertigo
Other relevant features in the history:
- previous ear surgery
- head injury
- systemic disease (e.g. SM, CVD)
- ototoxic drugs (antibiotics, diuretics, cytotoxics)
- exposure to noise at work or recreation (shooting)
- family history of deafness
- history of atopy and allergy (in children)
Otoscoppy is an examination that involves looking into the ear with an instrument called an otoscope (or auriscope).

This is performed in order to examine the 'external auditory canal' and the 'tympanic membrane' (ear drum).
Inspection of the eardrum can also provide a lot of information about what is happening within the middle ear - the space within the skull where the hearing and balance mechanisms are situated.
An otoscope consists of three parts:

- the handle, which contains the power for the light source
- the head, which contains the light bulb and magnifying lens
- the cone, which is inserted into the ear canal.
INSPECTION OF THE OUTER EAR

Before inserting the otoscope cone into the ear canal, the outer ear is inspected for any signs of disease that may relate to the patient's symptoms.

For example, if the complaint is of ear pain, there may be evidence of an infection of the outer ear in the form of redness or slight swelling.
EXAMINATION OF THE EXTERNAL AUDITORY CANAL

The examination is performed by gently pulling the outer part of the ear upwards and backwards! This action straightens the external auditory canal, which has a natural curve, and makes it easier to see the eardrum.
EXAMINATION OF THE EXTERNAL AUDITORY CANAL

The normal external auditory canal has some hair, often lined with yellow to brown wax. The total length of the ear canal in adults is approximately 2cm, which gives it a resonance frequency of approximately 3400 Hz, which is an important frequency region for understanding speech.
Abnormal findings may include:

- an inflamed and swollen, narrowed canal, possibly with a discharge indicating infection (otitis externa). The usual symptoms include itch, local discomfort, a discharge and often an unpleasant smell from the ear.
- a dry, flaky lining suggestive of eczema (usual symptom- itch).
EXAMINATION OF THE EXTERNAL AUDITORY CANAL

Abnormal findings may include:

- wax obscuring the eardrum.
- a foreign body in the ear, e.g. cotton, organic materials, toys, stones.
EXAMINATION OF THE EAR DRUM

The normal eardrum appears semitransparent, pinkish-grey in colour and is approximately circular in shape.

The first of the three small bones which transmit sound vibrations to the hearing mechanism (the cochlea) lies against the far side of the drum and can be seen through it in the upper part, like the clock handles in approx. the 12 -1 o'clock position.
Examination of the Ear Drum

Most otoscopes have a small air vent connection which allows the doctor to puff air into the canal - pneumatic speculum. Observing how much the eardrum moves with air pressure assesses its mobility, which varies depending on the pressure within the middle ear. This technique is called **Insufflation**.

Normally the air pressure within the middle ear is the same as that in the outer ear. This allows the eardrum to lie in its middle position and respond to sound vibration most efficiently.
EXAMINATION OF THE EAR DRUM

If Eustachian tube is blocked, air cannot get to the middle ear to equalise the pressure on the eardrum. This can impair hearing or, if the pressure difference is enough to stretch the eardrum, cause pain.

You can get some idea of whether the Eustachian tube is blocked by asking the patient to gently blow out while pinching the nose and closing lips. This is called Valsalva's manoeuvre, and the normal finding is that the eardrum moves slightly during it. When the Eustachian tube is blocked, the eardrum doesn't move.
EXAMINATION OF THE EAR DRUM

Other abnormal findings seen with the otoscope include:

- a hole (perforation) in the eardrum (depending on the cause, eardrum perforations can heal remarkably well).

- acute infection of the middle ear (acute otitis media).
You should identify some of the common pathological conditions related to the eardrum:

- perforations
- tympanosclerosis
- glue ear / middle ear effusion.
- retractions of the drum
- haemotympanum (blood in the middle ear, it gives a blue or brown colour)
EXAMINATION OF THE EAR DRUM

The normal drum is quite translucent and does not really appear to be any colour except grey.

The colour of the drum can be changed by thickening of the drum itself, injection of blood vessels, or the presence of something behind it such as glue, pus or blood.
EXAMINATION OF THE EAR DRUM

Bubbles
You may see bubbles behind the drum. This represents a resolving middle ear effusion, as air gradually re-enters the middle ear.

White patches
White patches actually on the drum or within the drum itself are usually *TYMPANOSCLEROSIS*, which is deposition of calcium into the drum itself in response to trauma or infection. This is not normally of any consequence unless it is severe, which can lead to a mild conductive hearing loss.
Earwax is rarely pathological. A lot of patients get quite obsessed with earwax and its removal. A considerable amount of pathology is generated by misguided attempts to remove wax at home with a variety of objects.

WAX is produced by the ceruminous glands in the outer part of the canal. It contains the oily secretion of the ceruminous glands and dead skin from the drum and canal.
It is normally transported outwards by the desquamation and migration of the epithelium. **Therefore wax more deeply in the canal is abnormal.**

Often this will be because **a patient has attempted to remove wax using a cotton swabs and forced some of it medially; exacerbated by swimming and showering (water moistens and expands cerumen)**.
Otalgia
Cerumen impaction is painless, unless:
- Cerumen touches tympanic membrane
- Cerumen injures external canal

Hearing Loss
Requires completely obscured canal
- Even a tiny hole of ear drum will maintain hearing

Vertigo or disequilibrium
- Associated with cerumen touching tympanic membrane
INDICATIONS FOR REMOVAL OF CERUMEN =

SYMPTOMS

- Otalgia
- Hearing loss
- Vertigo, buzzing
- Cerumen obscures examination
CERUMEN IMPACTION MANAGEMENT

- Warm Water Ear Lavage (Irrigation)
- Manual Cerumen Removal
- Cerumen removal by Ear Canal Suction
- Cerumen Softening Agents; REMOVAX, A-CERUMEN, SODIUM BICARBONATE etc.)
CERUMEN IMPACTION
EAR LAVAGE

Technique
✓ Retract pinna posteriorly
✓ Use moderate pressure (AVOID forceful irrigation)
✓ Direct fluid to superior canal or other opening in wax

Efficacy
✓ Effective in 70% of cases
CERUMEN IMPACTION
EAR LAVAGE

Contraindications
✓ Inflammation
✓ Tympanic membrane perforation
✓ Tympanostomy tubes
  (ventilation tubes, grommets tubes)

Complications
✓ Tympanic membrane perforation
✓ External ear canal injury
✓ Inflammation (external canal, AOM)
When cotton tipped applicators are used to clean out ear wax, there is a risk of breaking the ear drum (perforation).

Although we realize that this is commonly done, we recommend against using cotton tipped applicators, hair pins, and similar devices to clean the ear.
Foreign bodies of the ear are relatively common in emergency medicine. They are seen most often but not exclusively in children.

Various objects may be found, including toys, beads, cotton, stones, folded paper, and biologic materials such as insects or seeds.
Patients may be in significant discomfort and complain of nausea or vomiting if a live insect is in the ear canal (they may crawl or fly into the ear).

Insects may injure the canal or tympanic membrane by scratching or stinging.

Patients may present with hearing loss, or pain, or sense of fullness.
Pain or bleeding may occur with objects that hurt the ear canal or rupture the tympanic membrane or from the patient's attempts to remove the object.

With delayed presentation, erythema and swelling of the canal and a foul-smelling discharge may be present.
EAR FOREIGN BODIES

THE PHYSICAL EXAMINATION IS THE MAIN DIAGNOSTIC TOOL.
Differential diagnosis
- Abrasions to ear canal
- Cerumen impaction
- Hematoma
- Otitis externa
- Tumor
- Tympanic membrane perforation
Methods of removal: irrigation

- Irrigation is the simplest method of foreign body removal, provided the tympanic membrane is not perforated.
- Irrigation with water is contraindicated for soft objects, organic matter, or seeds, which may swell if exposed to water.
Methods of removal: suction

Suction is sometimes a useful means of foreign body removal. Suction the ear with a small catheter held in contact with the object.
EAR FOREIGN BODIES MANAGEMENT

Methods of removal: manual

- Grasp the object with alligator forceps.
- Place a right-angled hook behind the object and pull it out.
- Avoid any interventions that push the object in deeper.
EAR FOREIGN BODIES MANAGEMENT

Special instances:

➢ The physician may need to sedate the patient to attempt removal of the object. Use mild sedation following a procedural sedation protocol.

➢ Remove batteries immediately to prevent corrosion or burns. Do not crush battery during removal.
Consult an ENT specialist if the object cannot be removed or if tympanic membrane perforation is suspected.
EAR FOREIGN BODIES MANAGEMENT

After the foreign body is removed, inspect the external canal. For most foreign bodies, no medications are needed. However, if infection or abrasion is evident, fill the ear canal 5 times/day for 5-7 days with a combination antibiotic and steroid otic suspension. (eg, Atecortin, Cortisporin).
Examination of the nose also involves assessment of function: airway resistance and occasionally sense of smell.

Examination of the nose is incomplete without looking into the mouth and pharynx.
NOSE EXAMINATION

History
The main symptoms of nasal disease are:
- airway obstruction
- runny nose (rhinorrhoea)
- sneezing
- loss of smell (anosmia)
- facial pain due to sinusitis
- snoring associated with nasal obstruction
NOSE INSPECTION

☑ Look at the external nose and face before you look into it.
☑ Ask the patient to take off any glasses they may be wearing.
☑ Look at the nose from the side as well as in front.
☑ A deviated nose is often best looked at by looking from above.
NOSE INSPECTION

Look for any of the following:

- Obviously bend, deformity or swelling
- Scars across the nose
- Redness or evidence of skin disease
- Discharge or crusting
- Offensive smell
NOSE INSPECTION

To inspect the nose, first look into the very front of the nose (anterior nares) by tipping the tip of the nose up with a finger and looking inside without a speculum. After this you may choose to use a speculum with a torch or head mirror (rhinoscopy).
NOSE INSPECTION

Very useful way of examining the nose for general practitioners is to use an otoscope with a very wide end on it. Otolaryngologists use either a head mirror or illuminated spectacles.
Inside the nose you should be able to identify the nasal septum medially and the turbinates laterally.

It should nearly always be possible to see the inferior turbinate, the middle turbinate may be more difficult.

The superior turbinate is of little importance in examination and is very small.
NOSE INSPECTION

Try to assess if there is any inflammation (rhinitis) and if the septum is straight or deviated to one side.

If you see what you think is a polyp, it is useful to see if it is sensitive. Swollen turbinates are often mistaken for polyps: a polyp is insensitive whereas a turbinate is quite tender to touch.
NOSE INSPECTION

In children, a foreign body may occasionally be seen inside the nose, this is usually accompanied by an offensive, unilateral nasal discharge.

Look inside the mouth as well, occasionally large nasal polyps and tumours may be visible arising from behind the soft palate.
To assess the nasal airway, occlude one nostril with a thumb and ask the patient to sniff. This gives a reasonable idea of the patency of the airway.
NOSE EXAMINATION

The smell is not routinely assessed in nasal examination as this can be very subjective.

On occasions where there is a need to assess smell, this is done using a series of bottles containing specific odours.

Usually asking specifically about sense of smell in the history is enough.
Epistaxis is defined as acute hemorrhage from the nostril, nasal cavity, or nasopharynx. It is a frequent complaint and often causes significant anxiety in patients and clinicians. However, more than 90% of patients who present with epistaxis may be successfully treated by an GP, emergency phys.
EPISTAXIS

Pathophysiology:

Epistaxis is classified on the basis of the primary bleeding site as anterior or posterior. Hemorrhage is most commonly anterior, originating from the nasal septum.
EPISTAXIS

Pathophysiology:

A common source of anterior epistaxis is the Kiesselbach plexus, an anastomotic network of vessels on the anterior portion of the nasal septum. Anterior bleeding may also originate anterior to the inferior turbinate. Posterior hemorrhage originates from branches of the sphenopalatine artery in the posterior nasal cavity or nasopharynx.
## NASAL BLEEDING CAUSES

<table>
<thead>
<tr>
<th>Local causes</th>
<th>General causes</th>
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<tbody>
<tr>
<td>No identifiable cause</td>
<td>Cardiovascular diseases</td>
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<tr>
<td>Trauma, barotrauma</td>
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<tr>
<td>Rhinitis, allergic, atrophic</td>
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<td>Coagulation disturbances</td>
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<td>Nasal polyp</td>
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<td>Chemicals irritants</td>
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<tr>
<td>Hereditary hemorrhagic</td>
<td>Anticoagulant treatment</td>
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<tr>
<td>teleangiectasia</td>
<td>Antiplatelet treatment (e.g. ticlopidin, aspirin)</td>
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<td></td>
<td>NSAID treatment</td>
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<td>Infections( influenza, eruptive diseases)</td>
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<td>Awitaminosis</td>
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<td>Hepatic failure</td>
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<td></td>
<td>Renal failure</td>
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<td>Endometriosis, phaeochromocytoma</td>
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</table>
EPISTAXIS

- Approximately 90% of nosebleeds can be visualized in the anterior portion of the nasal cavity.
- Massive epistaxis may be confused with hemoptysis or hematemesis.
- Perform a thorough and methodical examination of the nasal cavity!
EPISTAXIS MANAGEMENT

- **Blowing the nose** decreases the effects of local fibrinolysis and removes clots, permitting a better examination.

- **Application of a vasoconstrictor** (hypertension contraindicated) prior to the examination may reduce hemorrhage and help to localize the precise bleeding site.
EPISTAXIS MANAGEMENT

- Gently insert a nasal speculum and spread the naris vertically. This permits visualization of most anterior bleeding sources.

- A posterior source is suggested by failure to visualize an anterior source, by hemorrhage from both nares, and by visualization of blood draining in the posterior pharynx.
EPISTAXIS MANAGEMENT

➢ TAKE CAREFULLY THE MEDICAL HISTORY (taken drugs!)

➢ CHECK THE BLOOD PRESSURE!

➢ PERFORM BASIC LABORATORY TESTS (blood cell count, coagulation tests, bleeding time etc.)
EPISTAXIS MANAGEMENT

- Upon initial arrival to the family practice, patients should be instructed to grasp and pinch their entire nose, maintaining continuous pressure for at least 10 minutes.

- Patients should be positioned comfortably in a seated position, holding a basin under their chin.
Patients with significant hemorrhage should receive an intravenous line and crystalloid infusion, as well as continuous cardiac monitoring and pulse oximetry.
EPISTAXIS MANAGEMENT

- Insert pledgets soaked with an anesthetic-vasoconstrictor solution into the nasal cavity to anesthetize and shrink nasal mucosa (epinephrine :1:10.000, 4% lidocaine)
- Allow them to remain in place for 10-15 minutes.
If a bleeding point is easily identified, gentle chemical (or electric) cautery may be performed after the application of adequate topical anesthesia. To avoid septal necrosis or perforation, only one side of the septum should be cauterized at a time. To be effective, cautery should be performed after bleeding is controlled.
EPISTAXIS MANAGEMENT

Anterior nasal packing

The proper technique for placement of a gauze pack is as follows:

1. Grasp the gauze ribbon with forceps.
2. Place it in the nasal cavity as far back as possible, ensuring that the free end protrudes from the nose.
EPISTAXIS MANAGEMENT

Anterior nasal packing

The proper technique for placement of a gauze pack is as follows:

3. Continue this process, layering the gauze from inferior to superior until the naris is completely packed. Both ends of ribbon must protrude from the naris and should be secured with tape.

4. If this does not stop the bleeding, consider bilateral nasal packing.
EPISTAXIS MANAGEMENT
Anterior nasal packing

Anterior epistaxis balloons:

Anterior epistaxis balloons may come in different lengths but have only one chamber. Cover the balloon with antibiotic ointment or lubricate it with water, insert it along the floor of the nasal cavity, and inflate it slowly with air or sterile water until the bleeding stops.
EPISTAXIS MANAGEMENT

Anterior nasal packing

Compressed sponged (MEROCEL)

Once wet with blood or a small amount of saline, the sponge expands to fill the nasal cavity and tamponade bleeding.
Emergency posterior nasal packing

If a Foley catheter is used, place a 12-16 F catheter with a 30-cc balloon into the nose along the floor of the nasopharynx, until the tip is visible in the posterior pharynx.
Emergency posterior nasal packing

Slowly inflate the balloon with air or sterile water, pull it anteriorly until it firmly sets against the posterior choanae, and secure it in place with an umbilical clamp. Finally, an anterior nasal pack should be placed.
Posterior nasal packing

Epistaxis that requires posterior packing should be managed in cooperation with an ear, nose, and throat (ENT) specialist.

Because of multiple possible complications, hospital admission is required, usually in a monitored setting.
Further Outpatient Care:

Patients discharged with anterior packing should receive follow-up care with an ENT specialist within 48-72 hours.

Nasal packing increases the risk of sinusitis or toxic shock syndrome.
Nose and Nasal Cavities

- Frontal sinus
- Nasal concha
- Sphenoid sinus
- Middle nasal concha
- Internal naris
- Inferior nasal concha
- Nasopharynx
- External naris

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Ear Canal

Eustachian Tube

Tympanic Membrane

Insertion

Removal