Session 1
Disorders Of Ears, Nose, Throat
Bioscience Department
SESSION LEARNING OUTCOMES

At the end of this session, you should be able to

- Revise and review anatomy and physiology of Ear Nose and Throat.
- Define and identify the common conditions affecting the ears, upper respiratory tract and trachea.
- Analyse and identify the probable causes of these conditions, their clinical manifestations, pathophysiology and complications.
- Make a probable differential diagnosis on the basis of symptomatology and investigations.
- Plan the management of the case with the conditions affecting Ears, Nose and Throat considering prevention, active and supportive treatment of the patient.
SESSION PLAN

- Review Anatomy of the human ear and URT
- Diseases affecting Ears:
  - Otitis media, Meniere’s disease.
- Diseases affecting the nose and throat:
  - Acute Coryza, Allergic Rhinitis
  - Acute and chronic laryngitis
  - Acute epiglottitis
  - Acute bronchitis and tracheitis
  - Tracheal obstruction
- Acute infection of respiratory system: Influenza
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ANATOMY OF THE HUMAN EAR
ANATOMY OF THE HUMAN EAR

- External ear
  - Auricle
  - External auditory canal
  - Ear drum/Tympanic membrane
ANATOMY OF THE HUMAN EAR

- Middle ear
  - Eustachian tube opening
  - Auditory ossicles
  - Muscles and Ligaments

ANATOMY OF THE HUMAN EAR

- Internal ear
  - Bony labyrinth
    - The semicircular canals
    - Cochlea
    - Vestibule
  - Membranous labyrinth
  - Vestibulocochlear nerve

Tortora, GJ & Derrickson, B 2014, Principles of anatomy and physiology, 14th edn, John Wiley & Sons, Hoboken, NJ
MECHANISM OF HEARING

Sound waves travel through:
The external auditory canal → strike the tympanic membrane, causing it to vibrate → the vibration of malleus, incus and stapes → movement of perilymph and endolymph in the inner ear → produces action potential → travels through the Vestibulocochlear nerve to the temporal lobe of the brain where it is interpreted.

Tortora, GJ & Derrickson, B 2014, Principles of anatomy and physiology, 14th edn, John Wiley & Sons, Hoboken, NJ
DISEASES AFFECTING EARS
# COMMON SYMPTOMS IN DISEASES AFFECTING THE EARS

<table>
<thead>
<tr>
<th>Signs/Symptoms</th>
<th>Common causes/conditions</th>
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</thead>
<tbody>
<tr>
<td>Tinnitus</td>
<td>Over exposure to loud noise, wax on ear drum, tumours, Meniere’s disease, Osteosclerotic change in ear ossicles, head injury, metabolic diseases such as hyperthyroidism,</td>
</tr>
<tr>
<td>Hearing loss</td>
<td>Congenital, conductive deafness, sensorineural deafness</td>
</tr>
<tr>
<td>Earache</td>
<td>Otitis externa or otitis media, Upper respiratory tract infection, TMJ disease, Cervical spondylosis, Trigeminal neuralgia, Tonsillitis, Bell’s palsy, Dental problems, Cancer</td>
</tr>
<tr>
<td>Ear discharge</td>
<td>Otitis Media, Head injury, Infection,</td>
</tr>
<tr>
<td>Vertigo</td>
<td>Vestibular neuralgia, Benign Paroxysmal Vertigo, Meniere’s disease</td>
</tr>
</tbody>
</table>
OTITIS MEDIA

Definition: Inflammation of the middle ear

- Types
  - Acute otitis media
  - Serous otitis media (otitis media with effusion-OME)
  - Chronic suppurative otitis media

- Aetiology:
  - Sequel to common cold and other Upper respiratory infections
  - Bacteria: *Streptococcus pneumoniae* & *Haemophilus influenzae*
  - Viruses: herpes, varicella, influenza, rhinovirus
OTITIS MEDIA

Pathophysiology: Inflammation usually due to infection.

Upper respiratory tract infection
Causative pathogens:
• Bacteria
• Viruses

Triggers inflammation
• Release of chemical mediators
• Activation of cellular mediators

• Vasodilation
• Increase capillary permeability
• Phagocytosis

• Impaired hearing
• Fullness in ears
• Exudation (ottorrhoea)

• Swelling
• Redness
• Heat (fever)
• Pain

• Increased blood flow
Collection of fluid and proteins
• Action of WBCs
OTITIS MEDIA

○ Clinical features of Acute Otitis Media:
  • Acute onset of otalgia (or pulling of the ears in an infant)
  • Fever (>39°C)
  • Hearing loss
  • Evidence of middle ear inflammation
  • Middle ear effusion (MEE)

○ Diagnosis:
  • Otoscopic examination of Tympanic membrane
  • Tympanometry
  • Acoustic reflectometry
  • Microbiologic studies
OTITIS MEDIA

Tympanic membrane appearance on otoscopic examination:

Normal ear drum (blood vessels only at the margins, i.e. not injected)

Otitis media (injected blood vessels)

OTITIS MEDIA

Tympanic membrane appearance on otoscopic examination:

- **Serous otitis media:** air/ fluid level/ air bubbles behind drum, yellow amber drum
- **Chronic suppurative otitis media:** mucopus
- **Chronic suppurative otitis media:** perforated ear drum

OTITIS MEDIA

Complications:
- Perforation of the tympanic membrane
- Hearing loss
- Cholesteatoma
- Mastoiditis
- Otologic meningitis

Management: Control symptom and underlying pathologic process
- Pain killers
- Myringotomy
- Antibiotics
- Surgical treatment:
  - Tympanostomy tubes (Grommets)
  - Adenoidectomy
OTITIS MEDIA

A tympanostomy tube (Grommet) in place in an ear drum

Otitis media: Middle (Media) Ear (Ot) Inflammation (itis)

Common cold/ other upper respiratory infections:
- **Bacterial**: Haemophilus influenzae, Streptococcus pneumoniae.
- **Viral**: Herpes, Influenza, Varicella, Rhino

Triggers inflammatory response

- Release of inflammatory mediators
- Fever
- Vasodilation of tympanic membrane blood vessels
- Increase pressure in middle ear
- WBC activation and phagocytosis
- Collection of inflammatory fluid (effusion) behind tympanic membrane

Otoscopic examination of Tympanic membrane:
- Red injected: AOM
- Yellow, amber (or occasionally blue) discoloration: OME
- Muco-pus: Chronic OM
- Opacification other than scarring: Chronic OM
- Decreased or absent motility: Chronic OM
- Perforated drum: Chronic OM with perforation

Tympanometry & Acoustic reflectometry detects effusion

Management:
- Pain killers
- Myringotomy
- Antibiotics
- Tympanostomy tubes (Grommets)
- Adenoidectomy

Complications:
- Perforation of the tympanic membrane
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Tympanometry & Acoustic reflectometry detects effusion
MENIERE’S DISEASE

- **Definition**
  - A disorder of the inner ear due to distention of the endolymphatic compartment of the inner ear.

- **Aetiology:**
  - Idiopathic
  - Trauma
  - Infection
  - Specific drugs (such as antibiotics)
  - Toxins
  - Autoimmune reaction
MENIERE’S DISEASE

- **Pathophysiology:**
  - An increase in volume and pressure of the endolymph of the inner ear - endolymphatic hydrops
  - Dilation of membranous labyrinth
  - Altered function of hair cells in cochlea and vestibular apparatus

- **Clinical features:**
  - The classic triad: hearing loss, vertigo, and tinnitus.
  - A sensation of fullness or pressure in one or both ears
  - Pallor, sweating, nausea, and vomiting.
  - Nystagmus
MENIERE’S DISEASE

Normal Membranous Labyrinth

Dilated labyrinth – endolymph Hydrops

MENIERE’S DISEASE

- Diagnosis:
  - Otoneurological assessment
  - MRI to rule out other causes of vertigo

- Differential diagnosis
  - Vestibular neuronitis
  - Tumour of vestibulocochlear nerve
  - Benign paroxysmal positional vertigo
MENIERE’S DISEASE

Management: aimed to reduce the distention of the endolymphatic space

○ Pharmacologic management:
  • Suppressant drugs
  • Diuretics
  • The steroid hormone, prednisone
  • A low-sodium diet

○ Surgical management:
  • Endolymphatic sac surgery
  • Vestibular nerve section
Meniere’s Disease: An inner ear disease due to distention of the endolymphatic compartment

Trauma, Infection, Specific drugs (such as antibiotics), Toxins, Autoimmune reaction, Idiopathic mechanism

Damage to endolymphatic structure

An increase in volume and pressure of the endolymph of the inner ear-endolymphatic hydrops

Dilation of membranous labyrinth

Altered function of hair cells in cochlea and vestibular apparatus

Pressure stress on vestibule-cochlear nerve

Oto-neurological assessment:
• Audiograms
• Vestibular testing by Electronystagmography (ENG)
• Petrous pyramid radiographs
• MRI scans

A sensation of fullness or pressure in one or both ears

Altered Hearing and balance:
Tinnitus, Hearing loss, and Vertigo
Nystagmus caused by an imbalance in vestibular control of eye movements.

Altered stimulation of autonomic nervous system:
Pallor, Sweating, Nausea, and Vomiting,

Pharmacologic management:
Suppressant drugs
Diuretics
The steroid hormone, prednisone
A low-sodium diet

Surgical management:
Endolymphatic sac surgery
Vestibular nerve section

Complications:
Permanent hearing loss
Progressive tinnitus and imbalance

Colour Key: Definition Aetiology Pathophysiology
Clinical features Diagnosis Management Complications
DISEASES AFFECTING THE NOSE AND THROAT
ANATOMY OF NOSE AND THROAT

- **Nose**
  - Conchae
  - External nares
  - Internal nares

- **Throat**
  - Pharynx
  - Epiglottis
  - Tonsils
  - Larynx

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## COMMON SYMPTOMS IN DISEASES AFFECTING NOSE AND THROAT

<table>
<thead>
<tr>
<th>Symptom</th>
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<tbody>
<tr>
<td>Sneezing</td>
</tr>
<tr>
<td>Nasal discharge/ runny nose</td>
</tr>
<tr>
<td>Headache</td>
</tr>
<tr>
<td>Acute Cough- usually dry</td>
</tr>
<tr>
<td>Change of voice – hoarseness</td>
</tr>
<tr>
<td>Sore throat</td>
</tr>
</tbody>
</table>
ACUTE CORYZA

- **Definition**
  - Common cold is a contagious infection of the upper respiratory tract, involving the nasal mucosa.

- **Aetiology**
  - Viral and Bacterial infections. Mainly rhinoviruses

- **Clinical Features:**
  - Sudden onset, rapid progress
  - Burning and tickling sensation in nose
  - Sneezing
  - Sore throat
  - Blocked nose with watery discharge
ACUTE CORYZA

Pathophysiology:

- Exposure to Infectious agents like rhinoviruses, bacteria
- Triggers inflammation of nasal and pharyngeal mucosa
  - Release of chemical mediators
  - Activation of cellular mediators
- Vasodilation
- Increase capillary permeability
- Phagocytosis

- Sneezing
- Fever
- Fullness and heaviness of head due to sinusitis
- Nasal discharge
- Sore throat
- Swelling
- Redness
- Heat (fever)
- Pain
- Increased blood flow
- Collection of fluid and proteins
- Action of WBCs

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ACUTE CORYZA

- Complications
  - Sinusitis
  - Lower respiratory tract infection
  - Otitis media
  - Impaired hearing

- Management
  - Acute and self-limiting illness
  - Symptomatic treatment: Rest and antipyretics
  - Nasal decongestants
  - Antibiotics are ineffective against viral infections and are not recommended
ALLERGIC RHINITIS

○ Definition
  • Inflammation of the lining of the nose, caused by allergens.

○ Aetiology
  • Seasonal allergic rhinitis:
    – Grass, flowers, weed and tree pollens
  • Perennial allergic rhinitis:
    – House dust (‘dust mite allergen’)
    – Fungal spores
    – Animal dander (hair and skin flakes)
    – Physical or chemical irritants
ALLERGIC RHINITIS

- Pathophysiology: Type 1 hypersensitivity reaction in the nasal mucosa
ALLERGIC RHINITIS

- Clinical Features
  - Sneezing, with profuse watery nasal discharge and nasal obstruction
  - Smarting and watering of the eyes and conjunctival irritation
  - In perennial rhinitis, the symptoms are more continuous and usually less severe
  - Skin hypersensitivity tests with the relevant antigen are usually positive in seasonal allergic rhinitis, but are less useful in perennial rhinitis.
ALLERGIC RHINITIS

- Complications
  - Sinusitis
  - Lower respiratory tract infection
  - Otitis media
  - Impaired hearing

- Management
  - Antihistaminic drugs
  - Nasal spray
  - Systemic corticosteroids in severe cases

- Prevention
  - Avoid contact with allergens
ACUTE LARYNGITIS

- **Definition:**
  - Acute inflammation of the vocal cord often a complication of acute coryza

- **Aetiology:** exposure to noxious agents, or infectious agents leading to upper respiratory tract infections

- **Clinical features:**
  - Dry sore throat, hoarseness of voice, loss of voice
  - Pain on speaking
  - Painful, unproductive cough
  - Stridor in children
ACUTE LARYNGITIS

- Complications:
  - Chronic laryngitis
  - Tracheitis
  - Bronchitis
  - Pneumonia

- Management:
  - Rest of voice
  - Steam inhalation
  - Paracetamol
  - Antibiotics

The image shows thick mucous on the vocal folds and generalized mucosal inflammation involving all regions of the larynx.

http://www.drrahmatorlummc.com/infectiveconditions.htm
CHRONIC LARYNGITIS

○ Aetiology:
  • Repeated attacks of acute laryngitis
  • Excessive use of the voice, especially in dusty atmospheres
  • Heavy tobacco smoking
  • Mouth-breathing from nasal obstruction
  • Chronic infection of nasal sinuses

○ Clinical features:
  • Hoarseness or loss of voice
  • Irritation of the throat
  • Spasmodic cough
CHRONIC LARYNGITIS

- Differential diagnosis
  - Bronchial Carcinoma
  - Pulmonary TB
  - Laryngeal paralysis or tumour

- Management
  - Rest the voice
  - Inhalation of medicated steam
  - Avoid smoking around the patient

http://www.ghorayeb.com/LaryngitisChronic.html

This patient smoked 80 cigarettes daily. The vocal cords are swollen and covered with plaques of whitish keratinized mucosa (leukoplakia). Leukoplakia is related to smoking and is precancerous.
ACUTE EPIGLOTTITIS

○ Definition:
  • Inflammation of epiglottis, the cartilage that covers the trachea

○ Aetiology:
  • Bacterial infection, mostly H. influenzae type b (Hib)

○ Clinical features:
  • Fever and sore throat rapidly leading to stridor
  • Stridor and cough without hoarseness of voice
ACUTE EPIGLOTTITIS

- Complications
  - Death from asphyxia due to spasm (hence a medical emergency)

- Management
  - Intravenous antibiotic therapy
  - Avoid using spatula or tongue depressor while examining the throat (avoids the spasm and thus the asphyxia)

Laryngoscopic view of oedematous and red epiglottis, with generalised oedema of supraglottic.
http://www.enetmd.com/content/epiglottitis
ACUTE BRONCHITIS AND TRACHEITIS

- **Definition:**
  - Acute inflammation of the trachea and the bronchial tree

- **Aetiology:**
  - Infection usually bacterial or viral

- **Clinical features:**
  - Follows acute coryza
  - Chest tightness, wheezing, breathlessness
  - Coughing & sputum
ACUTE BRONCHITIS AND TRACHEITIS

- **Diagnosis:**
  - X ray throat and chest for trachea and lungs
  - Tracheal / nasopharyngeal swab culture
  - Blood oxygen levels
  - Blood test to determine the cause of infection

- **Complications**
  - Bronchopneumonia
  - Respiratory failure
  - Bronchial asthma

- **Management**
  - Antibiotics
  - Endotracheal intubation
  - Analgesics and paracetamol
TRACHEAL OBSTRUCTION

- **Aetiology:**
  - Allergic reactions
  - Foreign bodies
  - Throat cancers
  - External tumours pressing on trachea
  - Inflammation of trachea or bronchial tree

- **Clinical feature:**
  - Stridor

- **Complications:**
  - Asphyxia

- **Management:**
  - Systematic and depending upon the cause
INFLUENZA
INFLUENZA

- **Definition**
  - An acute systemic viral infection that primarily affects the respiratory tract and carries a significant mortality.

- **Aetiology**
  - Orthomyxoviridae family: Mainly Influenza types A, B, and C

Influenza A virus Image from: Bauman, RW, 2010, Microbiology with Diseases by Taxonomy, 3rd edn, Pearson Higher Ed, USA. Neuraminidase and hemagglutinin are proteins found on the envelope, or coat, of the virus that help the virus to lock on to and invade its target cells.
INFLUENZA

Pathophysiology:

• The virus first targets and kills mucous-secreting, ciliated, and other epithelial cells of upper respiratory airway, leaving gaping holes between the underlying basal cells and allowing extracellular fluid to escape. This leads to the “runny nose”.

• Viral proteins are released into the blood leading to release of various cytokines and chemical mediators - Inflammatory response (fever, headache, fatigue etc).

• Spread of infection to lower respiratory tract may cause severe shedding of bronchial and alveolar cells down to a single-cell–thick basal layer

• Pneumonia may result from a viral or a secondary bacterial infection.
INFLUENZA

Clinical features

- Incubation period: About one day; remain infective for up to 8 hours on objects outside the body.
- Sudden fever between 39°C and 41°C (102–106°F)
- Pharyngitis, congestion, dry cough
- Malaise, headache, and myalgia
- Most people recover in one to two weeks.
- Associated symptoms:
  - Body aches, Nausea, Vomiting
  - Loss of appetite
  - Sweating, Chills, Dizziness, Flushed face
  - Worsening of underlying illness, such as asthma or heart failure
INFLUENZA

Complications:

- Viral or bacterial Pneumonia
- Bronchitis
- Sinusitis
- Otitis media
- Myositis
- Myocarditis
- Pericarditis
- Reye syndrome (fatty liver with encephalitis)
INFLUENZA

- Management
  - Most people recover without needing medical care.
  - Rest and medicines to relieve symptoms
  - Drink plenty of liquids
  - Avoid aspirin (especially teens and children)
  - Avoid alcohol and tobacco
  - Avoid antibiotics (unless necessary for another illness)
  - Antiviral drugs to treat people who become very sick with the flu or who are at high risk for flu complications.
Influenza: An acute systemic viral infection that primarily affects the respiratory tract and carries a significant mortality.

Orthomyxoviridae family: Influenza types A, B, and C

- Mucous-secreting, ciliated, and other epithelial of upper respiratory airway cells are attacked.
- Gaping holes between the underlying basal cells and allowing extracellular fluid to escape.
- Viral proteins are released into the blood leading to release of various cytokines and chemical mediators - Inflammatory response.
- Spread of infection to lower respiratory tract, sinuses, middle ear, heart, liver, muscles.

**Runny nose**
- Sudden high-grade fever
- Pharyngitis, congestion, dry cough
- Malaise, headache, and myalgia
- Body aches, Nausea, Vomiting
- Loss of appetite
- Sweating, Chills, Dizziness, Flushed face

**Management:**
- No medical care required.
- Rest and medicines to relieve symptoms
- Drink plenty of liquids
- Avoid aspirin
- Avoid alcohol and tobacco
- Avoid antibiotics
- Antiviral drugs

**Complications:**
- Viral or bacterial Pneumonia
- Bronchitis
- Sinusitis
- Otitis media
- Myositis
- Myocarditis
- Pericarditis
- Reye syndrome

**Colour Key:**
- Definition
- Aetiology
- Pathophysiology
- Clinical features
- Diagnosis
- Management
- Complications

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Reading and Resources

- Crowley LV, 2012, *An Introduction to Human Diseases – Pathology and Pathophysiology Correlations*, 9th edn, Jones and Bartlett Learning
Reading and Resources

- Mosby’s dictionary of medicine, nursing and health professions 2013, 9th edn, Elsevier, St. Louis, MO.
- VanMeter, KC & Hubert, RJ 2014, *Gould's pathophysiology for the health professions*, 5th edn, Elsevier, St Louis, MO.
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