Lecture 1

Microbiology of Middle Ear Infections

- Additional Notes
- Important
- Explanation
- Examples

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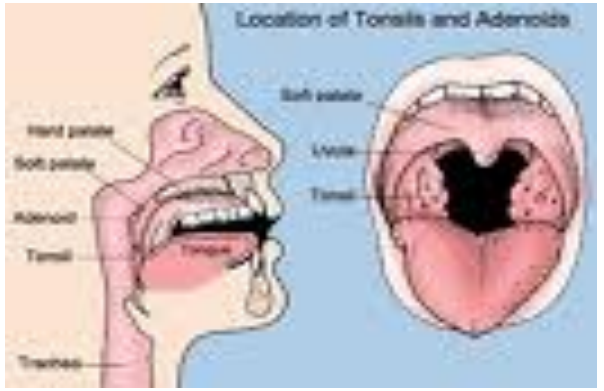
Introduction:

- Middle ear is the area between the tympanic membrane and the inner ear including the Eustachian tube.
- Otitis media (OM) is an inflammation of the middle ear.
- Most common in infants 6 to 18 months of age (2/3 of cases) and it improves by age. Because infants have horizontal and short Eustachian Tube: the tube is important for ventilation, protection and clearance.
- OM is accompanied with viral URTI
- OM-Classification:
  - ✓ Acute OM
  - ✓ Secretory (Serous) OM
  - ✓ Chronic OM

Pathogenesis and Risk Factors

- Pathogenesis:
  - ✓ URTI or allergic condition cause edema or inflammation of the tube.
  - ✓ Oxygen lost leading to negative pressure
  - ✓ Pathogens enter from nasopharynx into middle ear.
  - ✓ Colonization and infection result.
- Risk Factors:
  - ✓ Anatomic abnormalities
  - ✓ Medical conditions such as Cleft palate ,obstruction due to adenoid or NG tube or malignancy, immune dysfunction.
  - ✓ Exposure to pathogens from day care.
  - ✓ Exposure to smoking.



Bacterial Causes

Acute OM

- Less than 3 months of age:
  - ✓ S.pneumoniae
  - ✓ group B Streptococcus
  - ✓ H.influenzae[1]
- More than 3 months of age:
  - ✓ S.pneumoniae
  - ✓ H.influenzae
  - ✓ Moraxella catarrhalis

Chronic OM

- Mixed flora in 40% of cases.
  - ✓ P.aeruginosa
  - ✓ H.influenzae
  - ✓ S.aureus, Proteus species
  - ✓ K.pneumoniae, Moraxella catarrhalis
  - ✓ Anaerobic bacteria.

Serous OM

- Same as Chronic OM but most of the effusions are sterile.
- Few acute inflammatory cells

- It could be also duo to a viral causes:
  - ✓ RSV 74% of viral isolates
  - ✓ Rhinovirus
  - ✓ Parainfluenza virus
  - ✓ Influenza virus

[1] Most serious type of H.influenzae is type B

Clinical presentation

Acute OM

- **First 1-2 days**:
  - ✓ Fever (39 C), irritability, earache , muffled nose.
  - ✓ Bulging tympanic membrane.
- **3-8 days:**
  - ✓ Pus and ear exudate discharge spontaneously and pain and fever begin to decrease.
- **2-4 weeks :**
  - ✓ Healing phase, discharge dies up and hearing becomes normal.

Chronic OM

- Usually result from unresolved acute infection due to in adequate treatment or host factors that perpetuate the inflammatory process.
- Result in destruction of middle ear structures and significant risk of permanent hearing loss.

Serous OM

- Collection of fluid within the middle ear as a result of negative pressure produced by altered Eustachian tube function.
- Represent a form of chronic OM or allergy-related inflammation
- Tends to be chronic , with non –purulent secretions.
- Cause hearing deficit.

- Diagnostic approaches of OM:
  - ✓ Clinical examination
  - ✓ Tympanometry (detect presence of fluid)
  - ✓ Gram stain and culture of aspirated fluid to determine the etiologic agents.
- Management of OM:
  - ✓ Amoxicillin and Clavulanic Acid (Augmantin) is the antibiotic of choice.
  - ✓ Acute OM requires antimicrobial therapy & careful follow up.
  - ✓ Antimicrobial usually empirical depending on the most likely bacterial pathogens, usually to cover S.pneumonia and H.influenzae.
  - ✓ Drainage of exudate may be required.
  - ✓ Chronic or serous OM need complex management, possibly surgical.

Complications

- Meningitis
- Hearing loss
- Tympanic membrane perforation. "is a rupture or perforation (hole) of the eardrum"
- Mastoiditis. "infection of the mastoid bone of the skull. The mastoid is located just behind the ear"
- Extradural abscess "Pus may gather between a patient's skull and his dura"
- Sudural empyema "empyema means a collection of pus in the space"
- Brain abscess
- Cholestatoma "a type of skin cyst located in the middle ear and skull bone (mastoid)"
- Labyrinthitis "is an ear disorder that involves irritation and swelling (inflammation) of the inner ear"

Summary

Otitis media (infection of the middle ear)			
	Acute OM	Chronic OM (Usually follows un treated acute OM)	Serous
Etiology	S.pneumoniae, group B Streptococcus (infants) & H.influenzae (normal flora in pharynx)	P.aeruginosa & H.influenzae Anaerobes	Collection of fluid within the middle ear as a result of negative pressure (NOT INFECTIOUS).
Clinical finding	Bulging & inflammation of Tympanic membrane	It may perforate (destruct) the tympanic membrane	
Risk factors	1) Infants due to horizontal eustachian tube. 2) Anomalies (cleft palate & adenoid) 3) URTI 4) Allergy		
Complications	MENIGITIS, hearing loss, mastoidosis		
Diagnosis	Done by Tympanometry or otoscopy		

Quiz

ANSWERS: 1.D 2.C

1.OM is common in infants because of:

a. Eustachian tube is horizontal b. Tympanic membrane is weaker than adults

c. Viral infections are common in infants d. Both a&c

2.One of the main risk factors that may lead to OM:

a. UTI b. Diabetes mellitus c. Cleft palate

Quiz

ANSWERS: 3.A 4.C

3.Patient has presented with partial loss of hearing, fever & bulging of the tympanic membrane. A specimen has been taken from the middle ear indicates OM. The culture of aspirated fluid showed the following: gram negative coccobacillia, positive oxidase & catalase tests. The most likely organism:

a. H.inflenzae b. S.pneumoniae c. group B streptococcus d. P.auriginosa

4.Patient presented with hearing problem. Tympanometry detects presence of sterile fluid. Otoscope shows a form of chronic OM. The most likely diagnosis is:

a. Acute OM b. Chronic OM c. Serous OM