



LECTURE: Microbiology of Middle Ear Infections

Editing File

- Important
- Doctor's notes
- Extra explanation
- **Only F** or **only M**

"لا حول ولا قوة إلا بالله العلي العظيم" وتقال هذه الجملة إذا
داهم الإنسان أمر عظيم لا يستطيعه ، أو يصعب عليه القيام به .

OBJECTIVES:

Upon completion of the lecture , students should be able to:

- Define middle ear infection
 - Know the classification of otitis media (OM).
 - Know the epidemiology of OM
 - Know the pathogenesis & risk factors of OM.
 - List the clinical features of OM.
 - Know the diagnostic approaches of OM.
 - Know the management of OM.
 - Recall common complications of OM.
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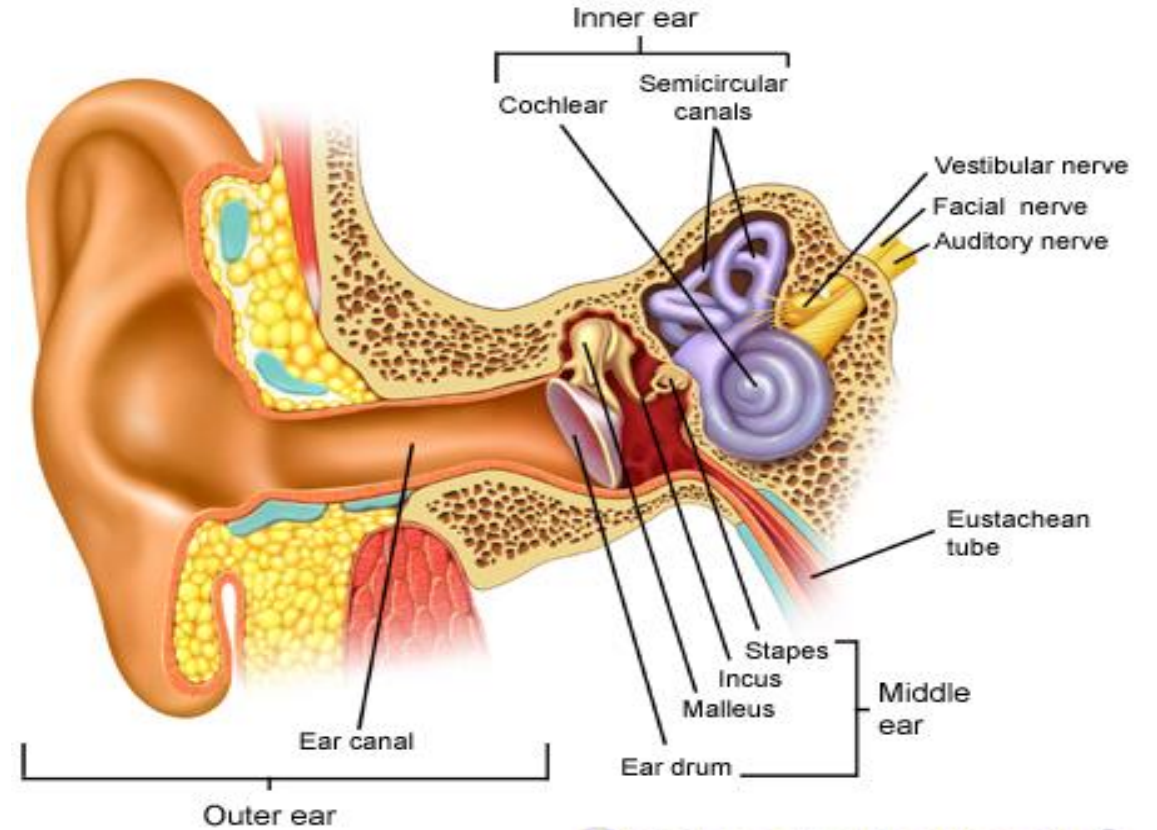
- **Definitions:**

- Middle ear is the area between the tympanic membrane and the inner ear including the Eustachian tube.
- Otitis media (OM): is inflammation of the middle ear.

- **Anatomy of the Middle Ear:**

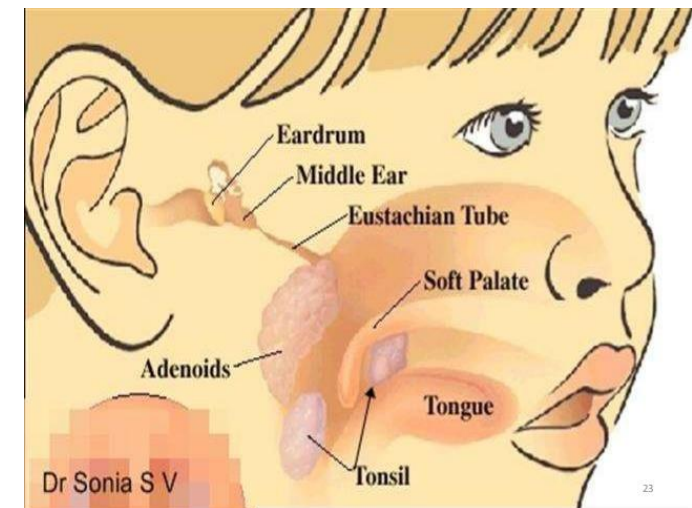
- **OM-Classification:**

- **Acute OM**
- **Chronic OM**
- **Secretory (Serous) OM**



- OM - Epidemiology

- **Most common in infants 6 to 18 months of age (2/3 of cases)*** . Improves with age, why ?
- The Eustachian Tube which vents the middle ear to the nasopharynx is horizontal in infants, difficult to drain naturally, its surface is cartilage ,and the lymphatic tissue lining is an extension of adenoidal tissue from the back of the nose. **
- **Often preceded by viral upper respiratory infection (URTI).**
- **Accompanied by viral upper respiratory infection (URTI).**



Extra picture

*The baby is protected on his first 6 months because of the IgG he got from his mother

**connected to the back of the nose including tonsils

- **OM-Pathogenesis and Risk Factors:**

How the otitis media is developed ?

- **URTI** or allergic condition cause edema or inflammation of the tube.
- In normal situation the Functions of the tube *eustachain tube* (ventilation, protection and clearance) when they are disturbed they may lead to OM.
- During this process the Oxygen lost leading to negative pressure
- Pathogens enter from nasopharynx into the middle ear.
- Colonization and infection result.

- **OM- Other risk factors**

- Anatomic abnormalities
- **Medical conditions such as Cleft palate ,obstruction due to adenoid or nasogastric tube* or malignancy, immune dysfunction.**
- Exposure to pathogens from day care.
- **Exposure to smoking.** Some studies relieve that the smoker mothers or fathers they may cause OM to their child, the smoking may initiate allergic and inflammatory prosseces



*nasogastric tube: a tube passed into the stomach via the nose for nutritional support or aspiration of stomach contents

EXTRA SLIDE

FOR THE NEXT SLIDE - هذي بعض الخصائص المهمة للبكتيريا المذكورة فيه هذه المحاضرة

Garm +ve	Gram -ve
Streptococcus pneumonia : <ul style="list-style-type: none">• Cocci in chains• Alpha hemolytic• Catalase -ve	Haemophilus influenzae : <ul style="list-style-type: none">• Cocci• Requires X and V factors for growth
Group B streptococcus (strepto agalactiae): <ul style="list-style-type: none">• Cocci in chains• beta hemolytic• Catalase -ve	Moraxella catarrhalis : <ul style="list-style-type: none">• Diplococcus• Oxidase +ve
Streptococcus pyogenes (group A): <ul style="list-style-type: none">• Cocci in chains• Alpha hemolytic• Catalase -ve	Proteus: <ul style="list-style-type: none">• Bacilli• Oxidase –ve• Urase +ve
Staph aureus : <ul style="list-style-type: none">• Cocci in clusters• Catalase +ve• Coagulase +ve	Pseudomonas aeruginosa: <ul style="list-style-type: none">• Bacilli• Oxidase +ve

• **OM-Microbiology-Bacterial Causes:** The majority of OM is bacterial causes and it's more serious

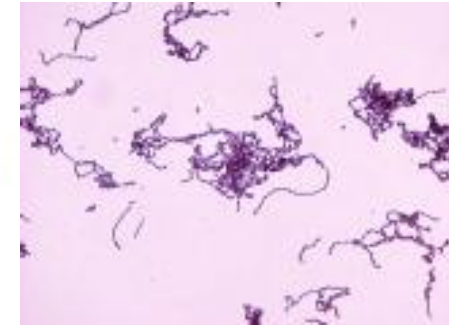
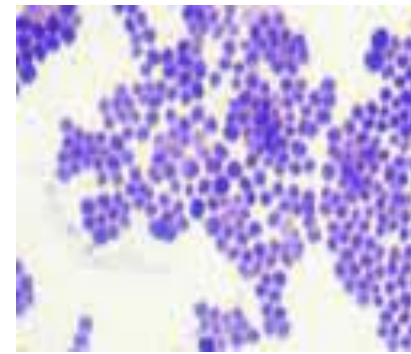
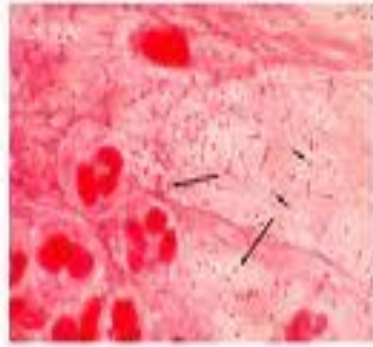
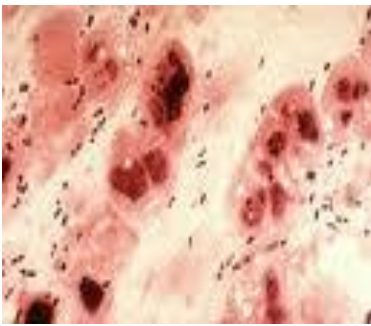
Acute OM	< 3 months of age	<p><i>-S.pneumoniae, (40%)</i> The most common</p> <p><i>-group B Streptococcus maternal colonization during labor`</i></p> <p><i>-H.influenzae (non tyable)**</i> most common</p> <p><i>-Gram negative bacteria including P.aeruginosa</i> And E.coli</p>
	> 3 months of age	<p><i>-S.Pneumoniae</i> The most common</p> <p><i>-H.influenzae</i></p> <p><i>-others eg. S.pyogenes, Moraxella catarrhalis, S.aureus</i></p>
Chronic OM	<ul style="list-style-type: none"> Mixed flora in 40% of cases, Usually is mixed infection with more than one type of organism <i>P.aeruginosa</i> (Most common in children less than and older than 3 months), <i>H.influenzae, S.aureus, Proteus species, K.pneumoniae, Moraxella catarrhalis, anaerobic bacteria.</i> <p>If you could not find Pseudomonas Aeruginosa, then Anaerobes would probably be the cause.</p>	
Serous OM	<ul style="list-style-type: none"> Same as chronic OM, but most of the effusions are sterile (no bacteria culture) Few acute inflammatory cells 	

• **OM-Viral causes:**

- **RSV(Respiratory Synsechial Virus) -74%**
- Rhinovirus
- Parainfluenza virus
- Influenza virus

**H.Influenzae have different types which are tyable and non tyable.The tyable are (type A,B,C,D and E) which cause serious infection, the type B is the most pathogenic type which cause a serious infection such as mengineitis, septicemia and pneumoniae. But the most cases of OM in children is non tyable which mean they don not belong to these types A,B,C,D and E

Microbiology of OM

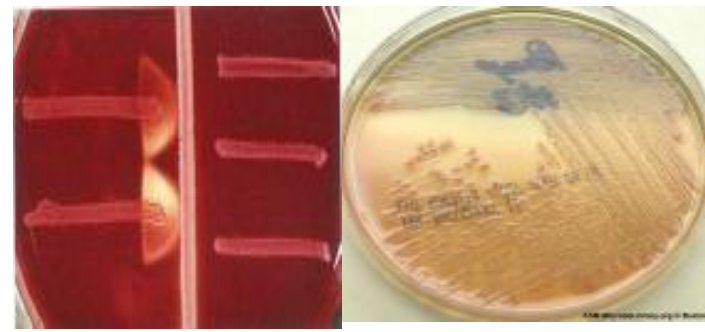
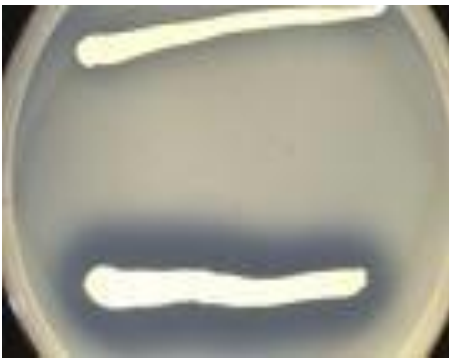


Gram positive diplococci and pus cell
Streptococcus pneumonia

Gram negative diplococci and pus cell
Moraxella catarrhalis

Gram positive staphylococcus

Gram negative bacilli
H./Influenzae non-typable



This a plate with optochin disc, which the resistance for viridance

This test is to confirm H.influenzae which requires X and V factors.

• **Clinical presentation:** For :Acute, chronic and serous

1- Acute OM	
	<ul style="list-style-type: none"> • Mostly Bacterial ,often a complication of viral URTI. • Pain often severe and continuous in bacteria causes.
First 1-2 days:	<p>-Fever (39 C), irritability, earache , muffled nose which Filled with secretion.</p> <p>-Bulging tympanic membrane ,poor mobility and obstruction by fluid or inflammatory cells on otoscopic examination.</p> <p>Irritability which mean he is crying all the time and sleepless.</p>
3-8 days:	<p>Pus and ear exudative discharge released spontaneously then pain and fever begin to decrease.</p> <p>تخف حرارة الطفل والأعراض الثانية والأم تعتقد إن طفلها صار أحسن، بس لما يصحى الصباح تلقى مخدة طفلها كلها مويه وخراجات من الأذن</p>
2-4 weeks :	<p>Healing phase, discharge dies up and hearing becomes normal.</p>

Images of acute OM:



We can see bulging tympanic membrane and exudative discharge

- **Clinical presentation:** For :Acute, chronic and serous

2- Serous OM (OM with effusion):

- 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.
- **Over weeks to months, middle ear fluid become very thick and glue like(glue ear)**
- Tends to be chronic , with non –purulent secretions.
- **Cause conductive hearing impairment.**
- **Cause hearing deficit.**

Images of serous OM:



Pediatric doctors when they examine the child they use a small tube to help them to decrease the ear secretions

- **Clinical presentation:** For :Acute, chronic and serous

3- Chronic OM*

- Usually result from unresolved acute infection due to inadequate treatment or host factors that perpetuate the inflammatory process. Risk factors such as obstruction, malignancy or cleft plate
- **Involves perforation of tympanic membrane and active bacterial infection for long period.**
- **Pus may drain to the outside (otorrhea).**
- Result in destruction of middle ear structures and significant risk of permanent hearing loss.

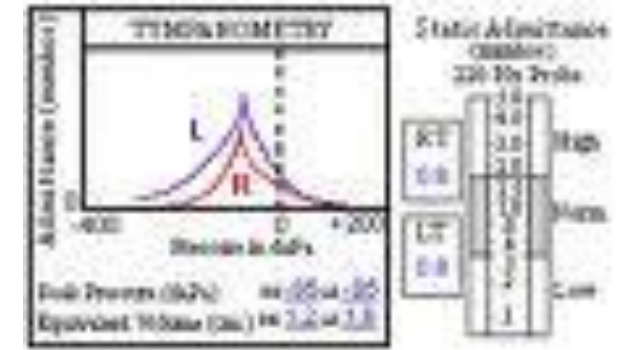
Images of chronic OM:



*If they will not complete the course of antibiotic, that's may lead to chronic OM.

- Diagnostic approaches of OM

- Clinical examination
- Tympanometry (detect the presence of fluid)
- Gram stain and culture of aspirated fluid to determine the etiologic agents.
If there is discharge we have to do the culture of the fluid



- Management of OM

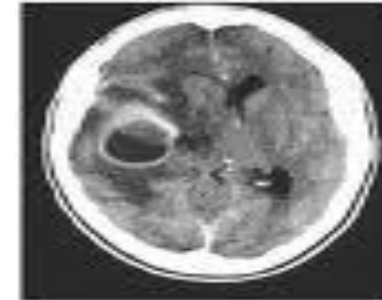
- Acute OM requires antimicrobial therapy & careful follow up.
- Antimicrobial* usually empirical depending on the most likely bacterial pathogens, usually to cover S.pneumonia and H.influenzae.
- Drainage of exudate may be required.
- Chronic or serous OM need complex management, possibly surgical.

*Such as 3rd generation of cephalosporin such as Ceftriaxone for S.pneumonia Or 2nd generation of cephalosporin such as Cefuroxime which cover both S.pneumonia and H.influenzae

- Amoxicillin and clavulanic acid combination in resistant infection. (Augmentin)
-

- **Complications:**

Extracranial	Intracranial
<ul style="list-style-type: none"> • Hearing loss • Tympanic membrane perforation • Mastoiditis * • Cholestatoma ** • Labyrinthitis • others 	<ul style="list-style-type: none"> • Meningitis (most dangerous complication) • Extradural abscess • Subdural empyema *** • Brain abscess • others

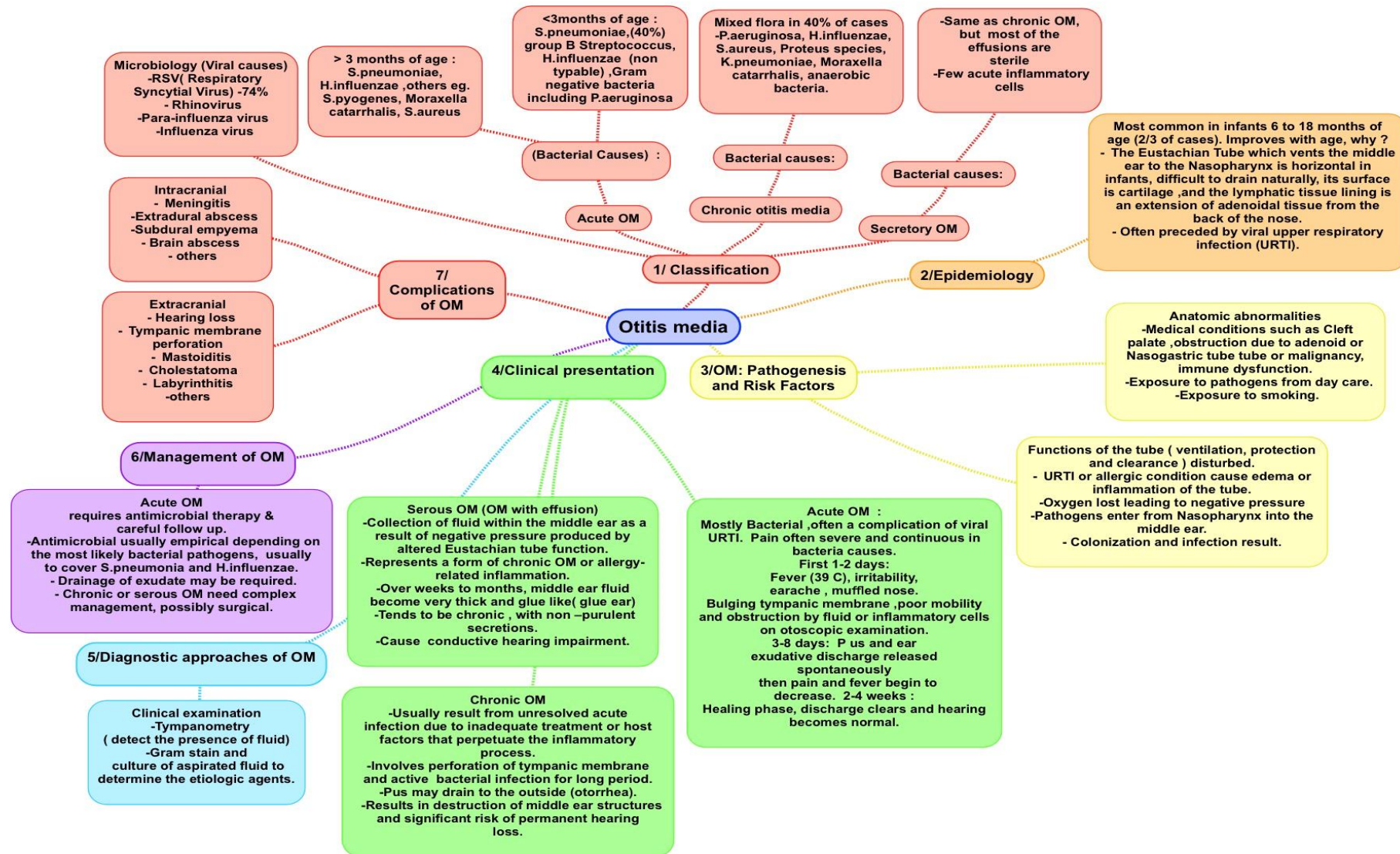


*Mastoiditis : Inflammation of the mastoid process.

**Cholestatoma : An abnormal skin growth in the middle ear behind the eardrum.

***Subdural empyema: Collection of pus between the dura mater and the underlying arachnoid mater.

SUMMARY:



QUIZ:

1/ function of eustachian tube is :

- A. Ventilation.
- B. Protection.
- C. Clearance.
- D. All of the above

Answer: D

2/ the most common infection for acute OM less than three months organism is:

- A. Streptococcus pneumonia.
- B. Group B streptococcus
- C. H. Influenza
- D. Gram negative bacteria

Answer: A

3/ the most common infection for chronic for OM is :

- A. S. Aureus .
- B. Proteus species
- C. Moraxella catarrhalis
- D. P.aeruginosa

Answer: D

• 7/management of OM:

- A. Antimicrobial therapy.
- B. Drainage of exudate.
- C. Surgery.
- D. All of the above .

Answer: D

4/ collection of fluid within the middle ear as a result of negative pressure produced by altered eustachian tube function is :

- A. Acute OM
- B. Chronic OM
- C. Serous OM
- D. None of the above

Answer: C

5/A result from unresolved acute infection due to inadequate treatment or host factors that perpetuate the inflammatory process:

- A. Acute OM .
- B. Serous OM
- C. Chronic OM
- D. Non of the above

Answer: C

6/The diagnostic approach of OM :

- A. Tympanometry
- B. Gram stain
- C. Culture of aspirated fluid
- D. All of the above

Answer: D

THANK YOU FOR CHECKING OUR WORK, BEST OF LUCK!



Doctors slides



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