



# *Acute Otitis Media*

---



M.R. Kadivar , M.D  
Professor of Pediatric Infectious Diseases  
Shiraz University of Medical Science





# *Otitis Media*

---



- ★ Second only to the common cold for visit to pediatrician
- ★ AOM is extremely common in children – in fact, 75% of children have at least one episode by one year of age
- ★ Tympanostomy tube placement is 2nd most common surgical procedure in children



## *What is Acute Otitis Media(AOM)?*

---

- ★ Otitis media has 2 main components:
  - 1- acute infection ,suppurative or acute otitis media (AOM)
  - 2- inflammation accompanied by effusion, nonsuppurative or secretory otitis media, or otitis media with effusion (OME).
- ★ Middle-ear effusion (MEE) is a feature of both AOM and OME



- 
- A diagnosis of AOM requires
    - (1) a **history** of acute onset of signs and symptoms
    - (2) signs and symptoms **middle-ear inflammation**  
(Distinct erythema of the TM ,Distinct otalgia)
    - (3) the presence of MEE,

# *Acute Otitis Media*







*tympanic membrane is slightly  
convex, translucent, mobile, and  
intact*





# *Normal Tympanic Membrane*





---

– The presence of MEE is indicated by any of the following:

- **Bulging** tympanic membrane
- Limited or **absent mobility** of the TM
- **Air-fluid level** behind TM
- Otorrhea



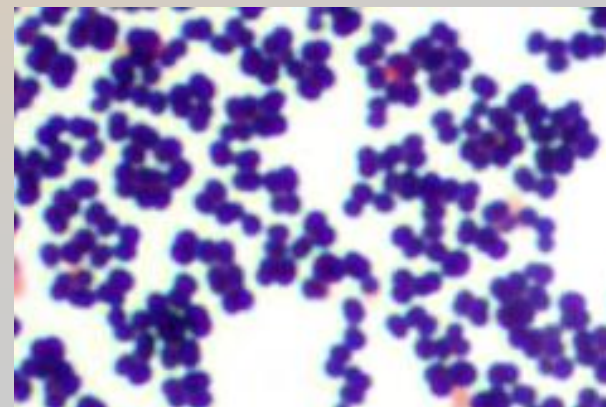
# *Microbiology*

---

- ★ *S. pneumoniae* - 40%
- ★ nontypable *H. influenzae* 25-30%
- ★ *M. catarrhalis* - 10-15%
- ★ Group A strep - 2-4%
- ★ Infants have higher incidence of gram negative bacilli and staphylococcus aureus
- ★ The incidence of these organisms has changed with the widespread use of the conjugate pneumococcal vaccine



- 
- ★ *Alloiococcus otitidis* (Alloiococcus Otitis) was recently discovered as a pathogen in 1992.
  - ★ Alloiococcus are Gram-positive. They are aerobic cells that are arranged in clusters
  - ★ *Alloiococcus otitidis* is difficult to detect in middle ear effusions by conventional culture





# *Virology*

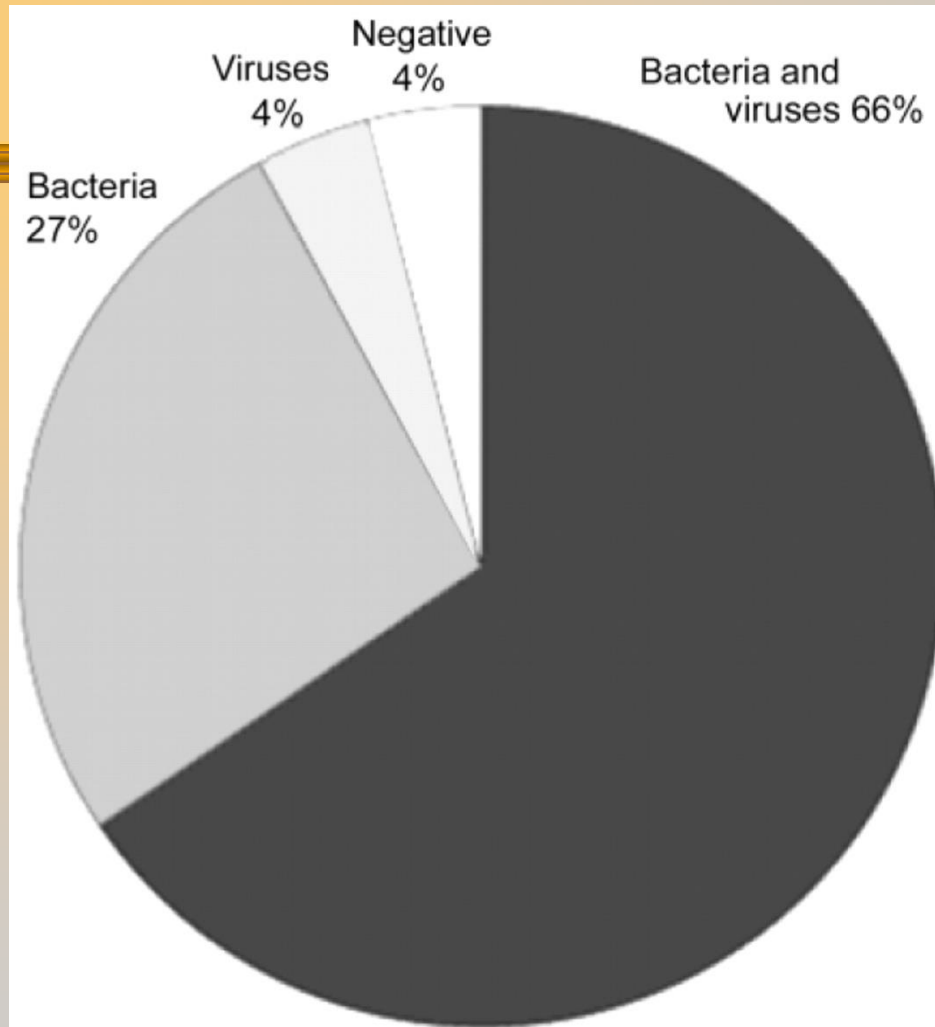
---



- ★ Evidence of **respiratory viruses** also may be found in middle-ear exudates of children with AOM, either alone or, more commonly, in association with pathogenic bacteria.
- ★ RSV - 74% of middle ear isolates
- ★ Rhinovirus
- ★ Parainfluenza virus
- ★ Influenza virus (**influenza virus vaccines** showed 30-36% efficacy against the development of AOM)



**Proportions of microbial findings in children with acute middle ear infection (because of rounding, the total is 101%).**



**Ruohola A et al. Clin Infect Dis. 2006;43:1417-1422**



## CLINICAL MANIFESTATIONS

---

- ▶ Symptoms of AOM are **variable**, especially in infants and young children.
- ▶ In young children, evidence of ear pain may be manifested by **irritability** or a **change** in sleeping or eating habits and occasionally, **holding** or **tugging** at the ear. *Pulling at the ear alone has a low sensitivity and specificity.*





- 
- ▶ Fever may also be present and may occasionally be the only sign.
  - ▶ Rupture of the TM with purulent otorrhea is uncommon.
  - ▶ Symptoms associated with upper respiratory tract infections also occur; occasionally there may be no symptoms, the disease having been discovered at a routine health examination.



- 
- ★ It is usually asymptomatic.
  - ★ Hearing loss
    - Kid can not concentrate himself
    - Turn on TV in loudness
    - If one ear is normal, the above symptoms will be ignored
  - ★ Fullness
  - ★ Otalgia
  - ★ Tinnitus





## EXAMINATION OF THE TYMPANIC MEMBRANE ,Otoscopy

- ▶ Two types of otoscope heads are available: **surgical**, and **diagnostic** or **pneumatic**.
- ▶ Examination of the ear in young children is a **relatively** invasive procedure that is often met with lack of cooperation by the patient.
- ▶ A speculum pushed too far forward and placed in this area often causes **skin abrasion and pain**.
- ▶ Learning to perform **pneumatic otoscopy** is a critical skill in being able to assess a child's ear and in making an accurate diagnosis of AOM.
- ▶ Parental cleaning of cerumen with cotton-tipped swabs often **worsens** cerumen impaction by pushing cerumen deeper into the canal, compacting it.
- ▶ If the TM is obscured by cerumen, the cerumen should be removed.

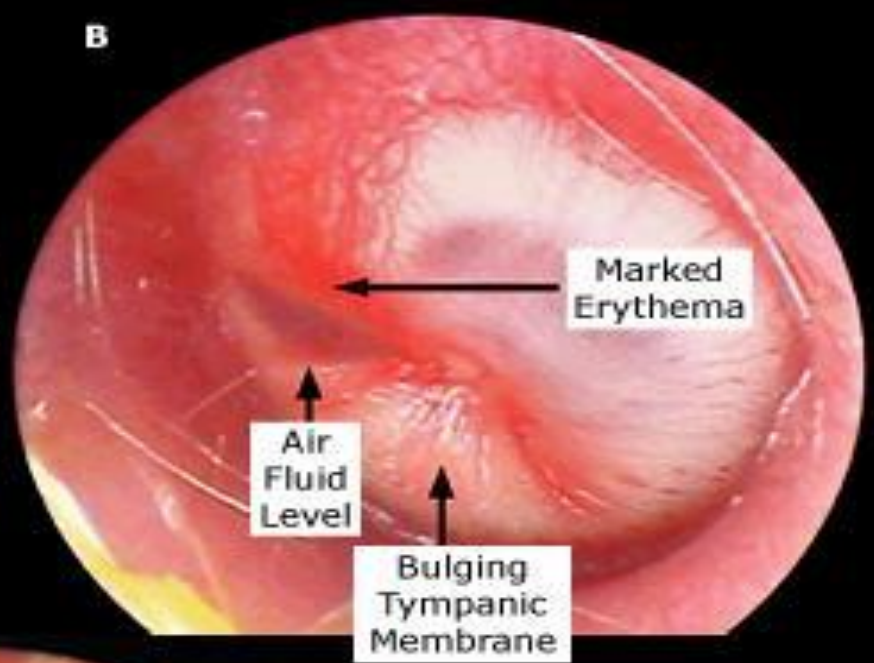
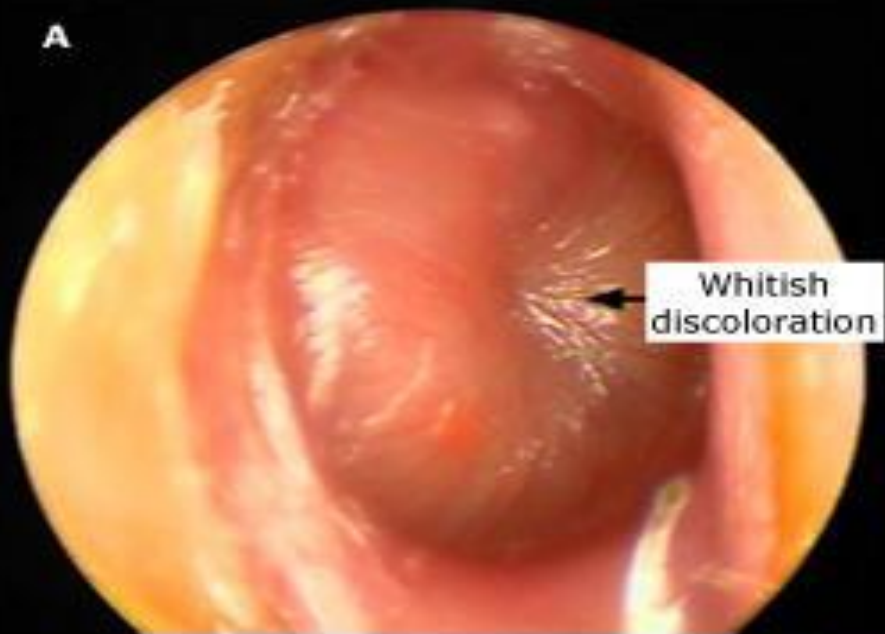


# *Diagnosis*

---

- ★ **Pneumatic otoscopy** is gold standard
  - Color - opaque, yellow, blue, red, pink
  - Position - bulging, retracted
  - Mobility - normal, hypomobile, neg pressure
  - **Assoc pathology** - perfs, cholesteatoma, retraction pockets









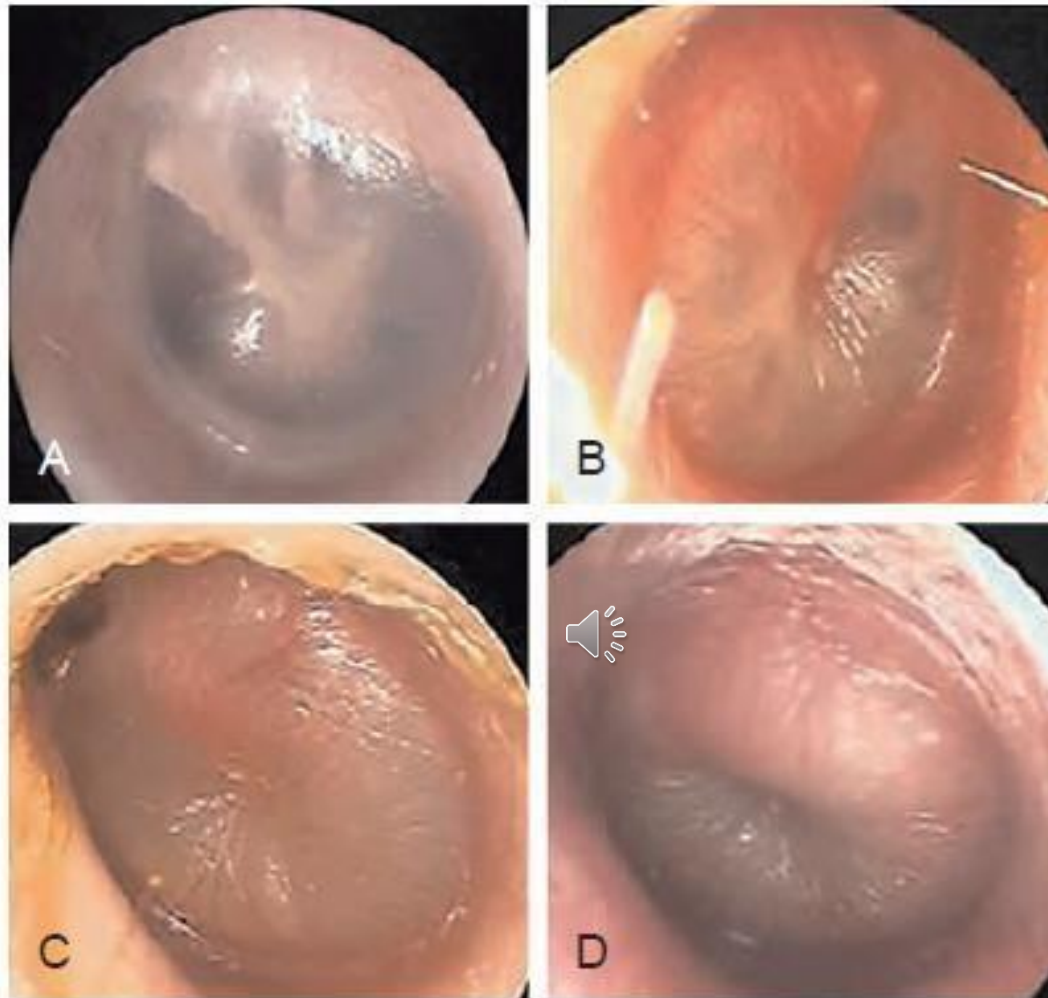
# *Tympanic Membrane Perforation*

## *Partial*

---







**Fig. 658.2** Examples of normal tympanic membrane (A) and of mild bulging (B), moderate bulging (C), and severe bulging (D) of the tympanic membrane from middle-ear effusion. (Courtesy of Alejandro Hoberman, MD.)



- ▶ To support a diagnosis of AOM instead of OME in a child with MEE, distinct fullness or bulging of the TM may be present, with **or without** accompanying erythema, or by **ear pain**.
- ▶ Unless intense, erythema **alone** is insufficient because erythema, without other abnormalities, may result from **crying or vascular flushing**.
- ▶ In AOM, **the malleus may be obscured** and the TM may resemble a **bagel without a hole** but with a central depression.



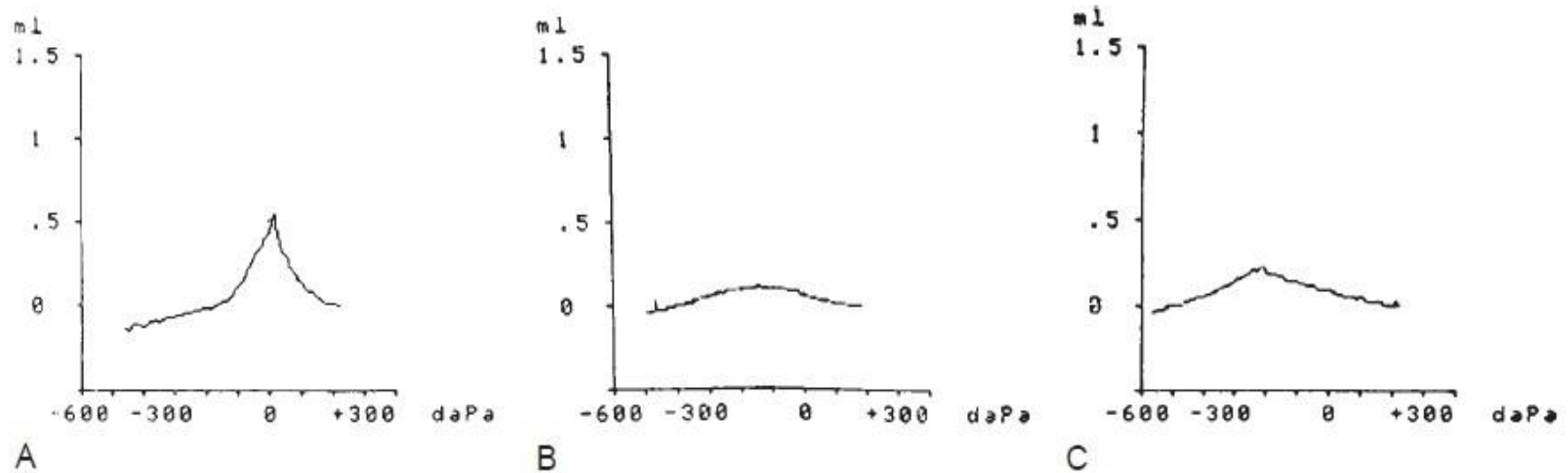
Fig. 658.3 Tympanic membrane in acute otitis media



**Tympanometry** is a simple, rapid, atraumatic test that, when performed correctly, offers objective **evidence of the presence or absence of MEE**.

Anything tending to stiffen the TM, such as **TM scarring or middle-ear fluid**, reduces the TM compliance, which is recorded as a flattening of the curve of the tympanogram.

**Tympanograms** may be grouped into 1 of 3 categories



**Fig. 658.5** Tympanograms obtained with a Grason-Stadler GSI 33 Middle Ear Analyzer, exhibiting (A) high admittance, steep gradient (i.e., sharp-angled peak), and middle-ear air pressure approximating atmospheric pressure (0 decaPascals [daPa]); (B) low admittance and indeterminate middle-ear air pressure; and (C) somewhat low admittance, gradual gradient, and markedly negative middle-ear air pressure.



# *Chronic MEE*

---

- ★ Chronic OME is defined as an effusion persisting for more than **3 months** duration.
- ★ A dense effusion typically may confer **up to a 30 dB** hearing loss.
- ★ Chronic OME may have a role in development of retraction pockets, ossicular chain erosion, and cholesteatoma formation.





# *Chronic suppurative otitis media (CSOM)*

---

- ★ Chronic suppurative otitis media (CSOM) is the most common cause of childhood hearing impairment in the developing countries and atticoantral type is associated with increased incidence of intracranial and extracranial complications





- 
- ★ *P aeruginosa* is the most commonly recovered organism from the chronically draining ear.
  - ★ *S aureus* is the second most common organism isolated from chronically diseased middle ears.
  - ★ *Klebsiella* (10-21%) and *Proteus* (10-15%) species .
  - ★ The anaerobes (*Bacteroides*, *Peptostreptococcus*, *Peptococcus*) and fungi (*Aspergillus*, *Candida*)



# *Treatment?*

---

- ★ Observation vs. Treatment
  - Deferring antibacterial treatment
- ★ Assess pain
  - Treat to reduce



## *Criteria for Initial Antibacterial-Agent Treatment or Observation in Children with AOM*

---

### ★ Age Less than 6 months

- Uncertain Diagnosis
  - Antibacterial therapy
- Certain Diagnosis
  - Antibacterial therapy





## *Criteria for Initial Antibacterial-Agent Treatment or Observation in Children with AOM (cont.)*

---

### ★ Age 6 months to 2 years

#### – Uncertain Diagnosis

- Antibacterial therapy if severe illness
- Observation option if nonsevere illness

#### – Certain Diagnosis

- Antibacterial therapy



## *Criteria for Initial Antibacterial-Agent Treatment or Observation in Children with AOM (cont.)*

---

### ★ Over 2 years

- Uncertain Diagnosis

- Observation option

- Certain Diagnosis

- Antibacterial therapy if severe illness
- Observation option if nonsevere illness



★ Age

<6 mo

6 mo-2y

>2y

## **CERTAIN DIGNOSIS**

**Antibacterial therapy**

**Antibacterial therapy**

**Antibacterial therapy if severe illness;  
observation option\* if nonsevere illness**



★ Age

★ <6 mo

★ 6 mo-2y

★ >2y

## UNCERTAIN DIAGNOSIS

**Antibacterial therapy**

**Antibacterial therapy if severe illness;**

**observation option\***



---

## ★ Middle-ear effusion (MEE)



## Acute Inflammation

At least one of:

- 1-Substantial ear pain, including unaccustomed tugging or rubbing of the ear
- 2- Marked redness of the TM
- 3- Distinct fullness or bulging of the TM

yes

Acute Otitis Media  
(AOM)



★ Acute purulent otorrhea not due to  
otitis externa

Yes

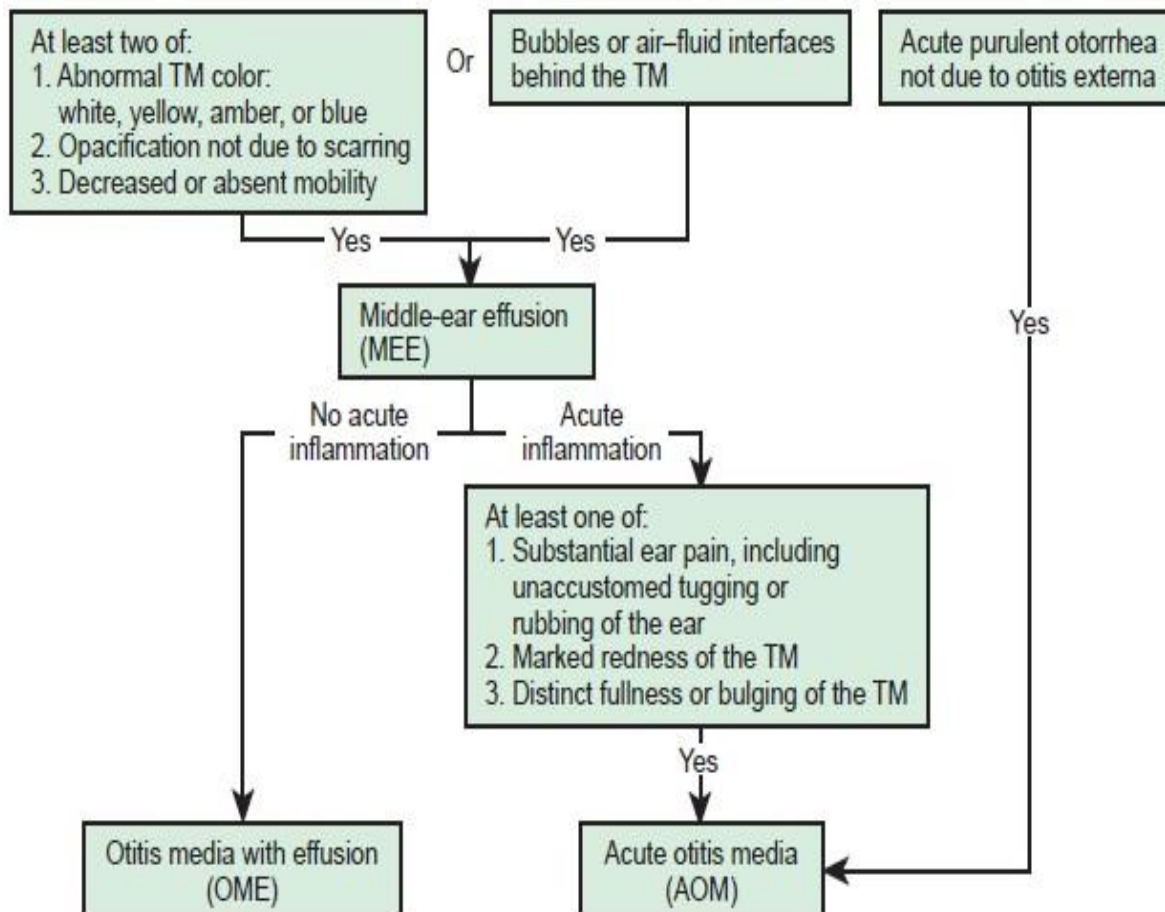
Acute otitis media  
(AOM)



★ No Acute Inflammation



Otitis media with effusion  
(OME)



**Fig. 658.1** Algorithm for distinguishing between acute otitis media and otitis media with effusion. TM, tympanic membrane.



## *Antibiotic Treatment:*

---

- ★ Which Antibiotic?
- ★ RECOMMENDED
- ★ Amoxicillin, 80-90 mg/kg per day





---

★ Amoxicillin, clavulanate, 90 mg/kg per day of amoxicillin, with 6.4 mg/kg per day of clavulanate (14/1)



---

★ Ceftriaxone , 1 or 3 days



## *ALTERNATIVE FOR PENICILLIN ALLERGY*

---

- ★ Non –type 1: cefdinir, cefuroxime (30 mg/kg per day, bid )
- ★ type 1: Azithromycin (10 mg/kg day 1, then 5 mg/kg per day x 4 days)
  - Adult 500mg first day, 250 mg QD for more 4 days
- ★ Clarithromycin 15 mg/kg per day, bid



- 
- ▶ Clarithromycin and azithromycin have only **limited** activity.
  - ▶ Clindamycin is active against most strains of *S. pneumoniae*, but is **not** active against nontypeable *H. influenzae* or *M. catarrhalis*.
  - ▶ Cefixime, trimethoprim-sulfamethoxazole, and erythromycin-sulfisoxazole have significant **lack of effectiveness** .
  - ▶ Antimicrobial prophylaxis clearly **outweigh** potential benefits.



**Table 658.3** Suggested Antibiotics for Treatment of Otitis Media and for Patients Who Have Failed First-Line Antibiotic Treatment

Initial Immediate or Delayed Antibiotic Treatment

Antibiotic Treatment After 48-72 hr of Failure of Initial Antibiotic Treatment

RECOMMENDED FIRST-LINE TREATMENT	ALTERNATIVE TREATMENT (IF PENICILLIN ALLERGY OR SUSPICION OF BETA LACTAMASE-PRODUCING ORGANISMS)	RECOMMENDED TREATMENT	ALTERNATIVE TREATMENT
Amoxicillin (Pathogens include <i>Pneumococcus</i> , <i>H. influenzae</i> non-type B, <i>Moraxella</i> )	Cefdinir	Amoxicillin-clavulanate	Ceftriaxone
or	or	or	Failure of second antibiotic
Amoxicillin-clavulanate Ceftriaxone IM/IV for 1-3 days	Cefpodoxime Ceftriaxone Levofloxacin	Ceftriaxone	Azithromycin Tympanocentesis*

**ANTIBIOTIC DOSAGE**

- Amoxicillin 90 mg/kg/day bid for 10 days
- Amoxicillin-clavulanate (ratio 14:1) 90 mg/kg/day of amoxicillin component bid for 10 days
- Ceftriaxone 50 mg/kg/day qd IM, IV for 1-3 days
- Cefdinir 14 mg/kg/day qd for 10 days
- Cefpodoxime 10 mg/kg/day bid for 10 days
- Levofloxacin 20 mg/kg/day bid if  $\leq 5$  yr for 10 days; 10 mg/kg/day bid if  $> 5$  yr for 10 days
- Azithromycin 10 mg/kg/day on day 1 QD then 5 mg/kg/day days 2-5 qd or 10 mg/kg/day for 3 days QD or 20 mg/kg once

IM, intramuscular; IV intravenous; bid, twice daily; qd, once daily.

\*Tympanocentesis for those who fail second-line therapy.





---

## ★ Analgesics/Antipyretics

- Acetaminophen
- Ibuprofen

▶ Corticosteroids, antihistamine-decongestant, topical intranasal steroid sprays and mucolytic agents **no longer recommended** for treatment of OME and are **contraindicated** for OME treatment.



## *Follow-Up*

- ▶ Follow-up within days is advisable in the young infant with a severe episode or in a child of any age with continuing pain.
- ▶ Follow-up within 2 wk is appropriate for the infant or young child who has been having frequent recurrences. At that point, the TM is **not likely to have returned to normal**, but substantial improvement in its appearance should be evident.
- ▶ In the child with only a **sporadic episode** of AOM and prompt symptomatic improvement, follow-up **1 mo** after initial examination is early enough, or in older children, **no follow-up** may be necessary.



# *Treatment Failure*

---

- ★ Initial failure to antibiotics within 48-72 hours.
  - Reassess to confirm AOM
  - Exclude other cases of illness
  - Change antibiotic agent



## *PREVENTION*

---



- ▶ Avoiding exposure to individuals with respiratory infection;
- ▶ Appropriate vaccination strategies against pneumococci and influenzae;
- ▶ Avoiding environmental tobacco smoke;
- ▶ Breast milk feeding.



# *OM - Medical Conditions*

---

- ★ Cleft palate
  - decreases after repair
- ★ Craniofacial disorders
  - Treacher-Collins
- ★ Down's syndrome
- ★ Ciliary dysfunction
- ★ Immune dysfunction
  - AIDS
  - steroids, chemo
  - IgG deficiency
- ★ Obstruction
  - NG tubes
  - NT intubation
  - adenoids
  - malignancy



# *Myringotomy and Insertion of Tympanostomy Tubes*

- ▶ When AOM is **recurrent, despite appropriate medical therapy**, consideration of surgical management of AOM with **tympanostomy tube** insertion is warranted, it in reduce the rate of AOM .
- ▶ When a patient experiences **three episodes of AOM in a 6-mo period, or four episodes in a 12-mo period** with one episode in the preceding 6 mo, potential surgical management of the child's AOM should be discussed with the parents.

