

# Otitis media

- 2  $\frac{1}{2}$  year old girl
- Generally well. Attends nursery school
- Recent course of Augmentin (2 weeks prior)
- Mon 13 September 2010 - bilateral conjunctivitis; no fever, otherwise well; mild discharge; no preauricular lymph nodes
- After 3 days gave Tobrex eye drops

- Weekend - developed fever (not  $>38,5^{\circ}\text{C}$ ), loss of appetite, bad temper, rhinitis, cough (croupy), grade 1 stridor
- Prelone syrup, saline spray, suctioning, Paracetamol, Nurofen
- Within 48-72 hours fever settled, rest of symptoms unchanged
- Tympanic membranes looked dull bilaterally, tonsils enlarged but no follicles

- Loss of appetite, more irritable than usual, restless at night (relieved by clearing nose). No otalgia reported
- Sent to school
- Wednesday 22 September (9 days after initial symptoms) teacher called - felt hot, sleepy, miserable, coughing
- Afebrile, chest clear, no distress

## • Ears

- right - full TM, yellow (purulent) effusion, no erythema
  - left - poorly visualised (wax), TM looked red
  - ?tender when examined
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- Throat - tonsils large
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- Assessment: Otitis media. Effusion, but no fever, right ear not red. Assumed viral
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- Treatment: intranasal steroids, continued saline to nose, analgesia

- Uneventful night
- Noticed crusted discharge in right ear next morning. TM perforated, no fresh exudate. Left ear unchanged
- Continued steroids, sent to school
- ?antibiotics necessary, however since clinically improved, delayed.

- Paediatrician advised antibiotics, but also happy to watch and wait for 48 hours.
- Improved. No fever, sleeping better, appetite returned, no further discharge, still no pain reported.
- Right TM perforated now sealed. Looks dull but no pus behind TM. Left TM slowly improving
- Still coughing, but improving

- Left wondering about accuracy of diagnosis
  - ?viral/ bacterial
  - Acute otitis media/ otitis media with effusion
  - Was the other TM going to rupture?
- Uncertain about antibiotics
  - Was withholding treatment appropriate?

# Why discuss Otitis media?

- Extremely common disease of childhood
- General practitioners, POPD doctors, private paediatricians see otitis media on daily basis
- Wards
  - see complications of otitis media
  - little attention paid to ears otherwise - tend to focus on 'more serious' conditions
  - many HIV infected patients with chronic ear discharge
- Many doctors are also parents, may treat their own children

- Diagnostic difficulties
  - Many diagnoses of otitis media incorrect
  - Probably overdiagnosed, unnecessary antibiotics prescribed
  - Possibly often missed also
- Management controversial
  - Antibiotics vs watchful waiting
  - Which antibiotics?
  - Role of surgery
- Training deficient
  - Covered briefly in ENT block
  - Few (if any) bedside tutorials on the topic, rarely discussed on ward rounds

## Objectives

- Prevalence of OM
- Classify OM
- Pathogenesis
- Diagnosis and its difficulties
- Management guidelines and its controversies
- Prevention

## What is Otitis media?

- Generic term: inflammation of middle ear
- Variants, according to
  - Aetiology
  - Duration
  - Symptomatology
  - Physical findings

- **Acute otitis media (AOM)**
  - Viral/ bacterial infection of middle ear
  - Must fulfil 3 criteria:
    - **Rapid onset** of signs and symptoms
    - Signs and symptoms of middle ear **infection/ inflammation**
    - Presence of **middle ear effusion (MEE)**
- **Recurrent acute otitis media (RAOM)**

- **Otitis media with effusion (OME)**
  - Previously 'suppurative/ secretory' OM
  - 'Glue ear' if persists for >6 weeks
  - MEE of any duration, **lacks** associated signs and symptoms of **infection**
  
- **Chronic suppurative otitis media (CSOM)**
  - Chronic inflammation of middle ear
  - Persists > 6 weeks
  - Associated otorrhoea through perforated TM/ tympanostomy tube/ surgical myringotomy

# Otitis media with effusion



# Chronic suppurative otitis media with perforated tympanic membrane



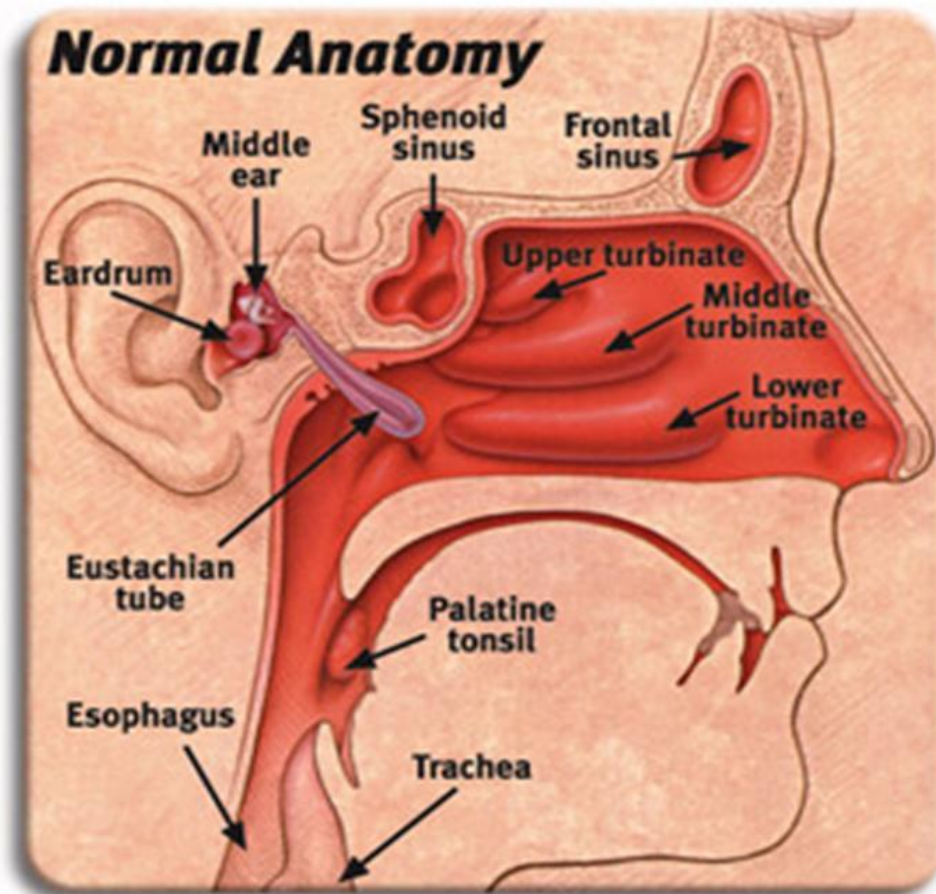
# Acute otitis media

## Prevalence

- 2<sup>nd</sup> most common disease of childhood
- Most common reason for antibiotics in childhood
- Prevalence rate 20% within first 2 years of life
- >80% children have had episode of AOM by age 3
- Recurrent episodes common
- Most common between ages of 6 - 24 months
  - 2<sup>nd</sup> peak at 4-5 years (school attendance)
- No gender predominance
- Equally common in black and white children

# Significance

- Significant costs
  - Treatment
  - Time lost from school and work
- Impact on overall use of antibiotics, development of drug resistance
- Developing countries
  - extremely common
  - major contributor to childhood mortality due to late presentation of intracranial complications
  - Significant morbidity due to chronic perforated TM



## Functions of Eustachian Tube

- Equilibration of pressure
- Drainage of secretions
- Protection of middle ear

# Pathophysiology


## 2 theories

- Eustachian tube (ET) dysfunction
  - Congestion, swelling of nasal mucosa, nasopharynx, ET due to URTI/ allergies
  - Shorter, narrower ET in children more prone to blockage
  - Obstruction => absorption of nitrogen, oxygen into surrounding capillaries => negative pressure => fluid 'pulled' into ET

- Fluid also accumulates due to exudate associated with viral infection
  - Essentially sterile effusion
  - Stasis => ideal environment for proliferation of bacteria
  - Secondary bacterial/ viral infection => suppuration => features of AOM
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- Not thought to be entirely accurate as same pathogenic bacteria in OME and AOM

## Newer theory

- Primary event = inflammation of middle ear mucosa in response to bacteria in middle ear
- Reflux up ET plays role
  - Children prone to OM have radiographic evidence of reflux
  - Documented presence of Pepsin in middle ear space in 60% of children with OME
  - [may also occur in otherwise healthy children]
- Inflammatory mediators released due to bacterial antigens => increased mucin production => bacterial proliferation

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- Whether cause or effect, Eustachian Tube Dysfunction universal in patients with middle ear effusions

# Causative organisms

- *Streptococcus pneumoniae* - 25 -50% AOM cases
- *Haemophilus influenzae* - 15 -30%
- *Moraxella catarrhalis* - 3 -20%
- *Alloiococcus otitidis* - new, gram positive, most frequent organism in AOM
- Remember TB
  - Microbiology may be changing since introduction of pneumococcal vaccine (Prevenar) - relative increase in *H influenzae*, decrease in *S pneumoniae*
- 50% of *H influenzae* isolates  $\beta$ -lactamase producers
- 100% of *M catarrhalis* isolates  $\beta$ -lactamase producers
- 15-50% *S pneumoniae* isolates *not* Penicillin sensitive
  - Of these, 50% *highly* Penicillin resistant

- Viruses

- RSV, Coronavirus, Rhinovirus, PIV, Adenovirus, Enteroviruses
- found in respiratory secretions, middle ear fluid in 40-75% AOM cases
- 5 - 22% of cases, purely viral (no bacteria found in middle ear fluid)
  - Could account for apparent antibiotic failure

# Predisposing factors

- **Host factors**

- Younger age - immunity, anatomy of ET
- Immunity - HIV, diabetes, congenital immune deficiencies
- Genetics - familial clustering; environment may also play a role
- Anatomic abnormalities - cleft palate, Down syndrome, Apert syndrome
- Physiologic dysfunction - ET mucosa, ciliary dysfunction. Cochlear implants, reflux
- Obesity

## • Environmental factors

- Breastfeeding exclusively for first 3-6 months of life **protective**. Protective effect persists beyond this also
- Prop-feeding
- Passive smoking
- Daycare attendance - increased colonisation, increased URTI's, antibiotic-resistant organisms

## • Socioeconomic factors

- Lower status = higher risk. Associated with higher risk for environmental exposure
- Use health resources less frequently, therefore not diagnosed

# Diagnosis

- **Symptoms on History**
  - Otolgia
    - Young children may pull ear (not specific sign)
  - Headache
  - Otorrhoea
  - Other URTI symptoms - rhinitis, cough
  - Fever (usually  $<40^{\circ}\text{C}$ ) in 2/3 of cases
  - Irritability - may be sole symptom in infant/toddler
  - Lethargy - implies sick child
  - Vomiting, diarrhoea, anorexia, nausea

# Examination

- Otoscopy
- Studies show most practitioners perform otoscopy incorrectly
  - otoscope
  - good light source
  - cooperative patient (and parent!)
  - wax should be cleared if possible
  - crying => red TM
  - fever => red TM
  - Trauma => red TM
  - know what **normal** TM looks like

# Healthy tympanic membrane.

TM pearly grey

Translucent

Unperforated

Light reflex not  
useful



## Healthy tympanic membrane



# Findings

- TM oedematous (cloudy, dull) and erythematous
- Bulging TM (laterally) - normal landmarks obscured
- Frankly purulent effusion seen through TM
- Possibly blistering of TM
  
- Pneumatic otoscopy
  - Standard examination technique
  - 90% sensitive, 80% specific for diagnosis of AOM if done correctly
  - Only 50% of practitioners use this

- Need direct visualisation
- Air seal against external auditory canal
- TM should respond briskly to positive and negative pressure
- **Adjunctive screening devices - detect MEE**
  - **Tympanometry** (impedance audiometry). Measures changes in acoustic impedance of the TM/middle ear system with air pressure changes in the external auditory canal
  - **Acoustic reflectometry**. Measures reflected sound from the TM

# Acute Otitis Media



Acute otitis media with purulent effusion behind a bulging tympanic membrane.



- “Although every effort must be made to differentiate AOM from OME from a normal ear, it must be acknowledged that, using all available tools, **uncertainty will remain in some cases**
- Efforts to **improve clinician education** must be increased to improve diagnostic skills and thereby decrease the frequency of an uncertain diagnosis
- Instruction in the proper examination of the child's ear should begin with the first paediatric rotation in medical school and continue throughout postgraduate training.”
- taken from the American Academy of Pediatrics Clinical Practice Guideline for the Diagnosis and Management of Acute Otitis Media

# Treatment of AOM

- Recently much debate as to necessity for antibacterial agents
  - USA - routine
  - Europe - treat symptoms and treat if no improvement
  - Rising rates of antibacterial resistance worrying
    - Broader spectrum drugs used, more costly
- Decision to treat vs wait based on age, severity of illness, diagnostic certainty
- Treat pain regardless
  - Paracetamol, Ibuprofen
  - Topical agents (additional benefit, brief, >5 years)

## • Observation

- Delay antibiotics 48-72hrs
- Symptom relief
- Parent - doctor contact NB
- Otherwise healthy
- 6-24 months + not severe illness + uncertain diagnosis
- > 24 months +not severe illness *or* uncertain diagnosis

- **Immediate antibacterial therapy**
- < 6 months
- 6-24 months + certain diagnosis *or* if severe illness
- >24 months +severe illness + certain diagnosis
- (non-severe = mild otalgia, fever <39°C)

- Rationale for observation
  - High rate of spontaneous resolution irrespective of treatment
  - Antibiotics may shorten illness duration by 1 day
- Likelihood of recovery without antibiotics depends on severity of illness at presentation
- Poorer outcomes in younger children
- Mastoiditis risk **not** increased when wait and watch approach used
  - But follow-up is NB
  - Antibiotics may mask signs and symptoms, delay diagnosis

- Need caregiver to watch child closely, recognise worsening of condition
- Contact doctor if child worsens
- Prompt access to medical care if worsens
- Be able to obtain antibiotics if no improvement
- Discuss options with parents
  - Weigh (small) benefit of using antibiotics, shortening illness against potential side effects

## Which antibiotic to use?

- 1<sup>st</sup> line most patients- Amoxicillin (90mg/kg/day)
  - Safe, narrow spectrum, low cost, tasty
- If **severe illness** and recommended in **daycare attendees** - Augmentin (90mg/kg/day Amoxil component)
- 75% AOM cases due to *M catarrhalis* resolve on treatment with Amoxil
- High dose Amoxil allows middle ear fluid levels of drug to exceed MIC of all pneumococci that have intermediate resistance to Penicillin, and many which are highly resistant

- Penicillin allergic patients
  - If not Type 1 hypersensitivity => 2<sup>nd</sup> generation cephalosporin (Cefpodoxime, Cefuroxime)
  - If Type 1 hypersensitivity => Azithromycin (5 days) or Clarithromycin
- Vomiting patients/ not taking orally
  - Single dose Ceftriaxone
- Duration uncertain
  - Severe disease, younger children - 10 days
  - >6 years old, mild-moderate disease - 5-7 days

- Time to response 48-72 hours
  - Fever should settle, clinical improvement
- May worsen in first 24 hours
- If no improvement after 72 hours
  - Wrong diagnosis
  - Inadequate therapy
- If observing - start antibiotics (Amoxil)
- If severe/ worsening on Amoxil - start Augmentin
  - Alternatives as mentioned can be used
  - At this point, if Ceftriaxone necessary, give for 3 days
- If fail to improve on Augmentin - give Ceftriaxone (3 days)

- If AOM persists
  - Tympanocentesis - therapeutic and diagnostic
  - If unavailable, try Clindamycin
  - Tympanocentesis essential if no response

# Complications

## • Intratemporal

- Hearing loss
- TM perforation (acute and chronic)
- CSOM
- Cholesteatoma
- Mastoiditis
- Labyrinthitis
- Facial paralysis

## • Intracranial

- Meningitis
- Subdural empyema
- Brain abscess
- Extradural abscess
- Lateral sinus thrombosis

# Prevention

- Remove from daycare if possible
- Breastfeed for 6 months where feasible
- Avoid prop-feeding
- Avoid pacifiers beyond 6 months of age
- Avoid secondary smoke exposure

# Vaccines

- Influenza vaccine decreases AOM episodes during flu season (>2 year olds)
- Prevenar decreases colonisation with vaccine-serotype strains
  - 6% decrease in incidence, fewer doctor visits, decreased antibiotic use

## Summary

- AOM very common childhood illness
- Diagnostic uncertainty common
- Must be differentiated from normal ear, equally common OME
- Avoid unnecessary antibiotic use
- Select patients can be observed initially as many cases resolve regardless of treatment
  - Follow up is essential
- Use appropriate antibiotics, upscale if necessary
- Treat pain