Otology seminar - Otitis media with effusion

INTRODUCTION

1. Otitis media with effusion (OME) is defined as the presence of middle ear effusion (MEE) in the absence of acute signs of infection.
2. OME most often arises following a recognized or unrecognized AOM; it may also occur in association with E-tube dysfunction or an inflammatory response of following AOM.

EPIDEMIOLOGY

1. Approximately 90% of children have OME at some time before school age, most often between ages 6 months ~ 4 years.
2. In the first year of life, >50% of children experience OME, increase to >60% by 2 years. Many episodes resolve spontaneously within 3 months, but 30%~40% of children have recurrent OME, and 5~10% of episodes last 1 year or longer.
3. In one study of children attending a daycare center, the incidence of effusion peaked during the 2nd year of life and was more prevalent in the winter than in the summer.

PATHOGENESIS

1. The factors promote persistence of MEE: incompletely defined
2. Risk factor: Family history, bottle as opposed to breast feeding, daycare center attendance, and exposure to tobacco smoke
3. Classic theory: OME result from chronic inflammation in response to residual bacterial components, and that the effusions frequently are sterile.

4. The new pathogenesis of OME include:
   a) Bio-film formation by bacterial resulting in persistence of bacteria even when cultures of middle ear fluid are sterile
   b) Altered ciliary function
   c) Allergy
   d) GE reflux

Histopathologically → proliferation of mucous secreting goblet cells

5. Bacterial DNA, mRNA, and newly synthesized protein have been detected in effusions, and viable bacteria were demonstrated within a biofilm in a chinchilla model of otitis media

6. A study in which mucosal biofilms were visualized in 46 of 50 (92%) middle-ear mucosal biopsy specimens from children undergoing tympanostomy tube placement for the treatment of OME and/or recurrent otitis media but from none of 8 biopsy specimens from controls undergoing CI.

7. The contribution of allergy to OME remains controversial.

   One study of 209 children in the United Kingdom found a history of allergic rhinitis, asthma, and eczema in 89, 36, and 24%, respectively.

8. GE reflux also has been hypothesized to be a cause of OME. However, investigators measuring the concentration of pepsin and pepsinogen in middle ear fluid have reported conflicting results and the association between GER and OME remains speculative.
**Microbiology**

The pathogens:

1. Majority: *S. pneumoniae*, *H. influenzae*, *M. catarrhalis*
2. Other agents: *P. aeruginosa*, alpha streptococci and anaerobic bacteria.

**CLINICAL FEATURES**

1. Hearing loss: the median conductive hearing loss is 25 dB, which is the equivalent of putting plugs in ears.
2. Other symptoms: sleep disturbances, vertigo or imbalance.
3. Infants with prolonged duration of middle ear effusion during the first 3 years of life may have decreased scores in tests of speech, language, and cognitive abilities at 7 years of age.

**Complications**

1. The most significant complication is conductive hearing loss.
2. Retracted tympanic membrane → retraction pocket → cholesteatoma
3. Tympanosclerosis
   → whitish plaques in the tympanic membrane
   → associated with frequent episodes of AOM and OME
   → deposits may envelop the ossicles and result in hearing loss.
**DIAGNOSIS**

1. Gold standard of the diagnosis → pneumatic otoscopy.
   Tympanometry and acoustic reflectometry are used as adjuncts to support the diagnosis.

2. Pneumatic otoscope:
   - Color: gray or translucent
   - Position: Neutral or retracted position.
   - Pneumatic otoscopy: sensitivity: 94% (95% CI, 91-96%)
     specificity: 80% (95% CI, 75-86%)

3. Tympanometry and acoustic reflectometry: available as hand-held instruments for portability and ease of use, adjunctive techniques when the presence of middle ear fluid is difficult to determine based upon otoscopic examination.
   - Tympanogram: sensitivity: 81%
     specificity: 74%

**EVALUATION**

1. A hearing evaluation in children in whom OME has persisted for at least 3 months or in whom language delay, learning problems, or a significant hearing loss (≥21 dB) is suspected. The type of testing performed depends upon the age and cooperation of the patient.

2. Speech and language evaluation also should be conducted in children with OME for ≥3 months duration and in whom hearing loss (≥21 dB) is detected.
3. At-risk children:
   a) hearing loss independent of OME
   b) suspected or diagnosed speech and language delay
   c) Autism disorders
   d) Craniofacial disorders
   e) Developmental delay
   f) Uncorrectable visual impairment.

**MANAGEMENT**

1. The AAP/AAFP/AAOHNS clinical practice guideline serves as the basis for current management of patients with prolonged (≥3 months) OME. This guideline applies to all children between 2 months ~ 12 years of age.


3. Not at risk children, the management strategy:

   - Children with hearing loss ≤20 dB and without speech, language, or developmental problems, can be managed with watchful waiting.

   - Children with hearing loss 21~39 dB can be managed with watchful waiting or referred for surgery.

   - Children with hearing loss ≥40 dB should be referred for surgery.
(A) Watchful waiting

1. Children who have OME and are not at risk for speech, language, or learning problems and whose associated hearing loss is $\leq 20$ dB be managed with watchful waiting for 3 months from the onset of the effusion (or the diagnosis if the date of onset is not known).

2. This recommendation is based upon the high likelihood of spontaneous resolution. $75\sim90\%$ of residual OME after an AOM episode resolves spontaneously by 3 months.

3. OME after untreated AOM: $59\%$ resolution by 1 month & $74\%$ resolution by 3 months.
   - OME with unknown duration: $28\%$ resolution by 3 months, (tympanogram: B to A) $42\%$ resolution by 6 months
   - OME with unknown duration: $56\%$ resolution by 3 months, (tympanogram: B to non-B) $72\%$ resolution by 6 months
   - $87\%$ resolution by 1 year

4. Chronic OME: $26\%$ resolution by 6 months and $33\%$ resolution by 1 year.

5. Evaluation and hearing test should be repeated every 3~6 months until the effusion has resolved.

6. Watchful waiting also is an option for children with mild conductive hearing loss ($21\sim39$ dB) whose parents prefer to avoid or postpone surgery. Repeat hearing tests should be performed in 3~6 months.
(B) Pharmacotherapy

**Antibiotics**

1. Antibiotics: A small improvement following a course of an antibiotic has been described (Pooled 1325 children yield a rate difference of 22.8%).
2. Two meta-analyses suggest improved clearance of the effusion within the first month after treatment but frequent relapses of MEE and no benefit beyond the first month.
3. The AAP/AAFP/AAOHNS clinical practice guideline offers the option of providing a single 10~14 days course of antibiotics (typically amoxillin).
4. There is no known benefit for resolution of the middle ear fluid from a longer course of antibiotics and prolonged or repeated courses of antibiotics are not recommended.
5. Adverse effect: rashes, vomiting, diarrhea, allergic reactions, alteration of nasopharyngeal flora, development of bacterial resistance

**Antihistamines and decongestants**

1. Two randomized, double-blind trials in 553 and 518 infants and children found that antihistamines plus decongestants did not improve the resolution of effusions.
2. Patients receiving antihistamines and decongestants may have symptomatic improvement of nasal congestion but also may have more side effects than those receiving placebo.
3. In addition, the use of antihistamines may prolong the duration of MEE.
4. Adverse effect: insomnia, hyperactivity, drowsiness, behavioral change and blood pressure variability
Corticosteroids

1. A systematic review summarized the existing data as favoring corticosteroids for the short- but not long-term resolution of effusions.

2. A randomized double-blind trial in 144 children between the ages of 1 and 9 years with persisting effusion for at least 2 months compared 4 regimens: amoxicillin for 14 or 28 days, amoxicillin plus prednisolone for 14 days, and amoxicillin plus oral prednisolone for 14 days with an additional 14 days of amoxicillin alone.

3. Patients receiving prednisolone were significantly more likely to be free of effusion at 2 weeks but not at 4 weeks regardless of whether amoxicillin was continued for the extra 14 days. At 4 months, effusion had recurred in 68.4% of children receiving corticosteroids and 69.2% of those receiving antibiotics alone.

4. Adverse effect: behavioral change, increase appetite, weight gain, adrenal suppression, fatal varicella infection, avascular necrosis of the femoral head

Autoinflation

1. Autoinflation refers to the process of opening the E-tube by raising intranasal pressure (eg, by forced exhalation with closed mouth and nose, blowing up a balloon through each nostril, or using a purpose-manufactured nasal balloon).

2. Published studies of this intervention, none of which were blinded, have yielded conflicting results.
3. A meta-analysis of 6 studies comparing any form of autoinflation to no autoinflation in patients with OME found improvement in the composite measure of tympanogram or audiometry at more than 1 month (relative risk of improvement 2.2, 95% CI 1.7-2.8).

4. A systematic review of 3 studies of treatment of OME with a nasal balloon found that autoinflation improved MEE by tympanometric and audiometric criteria within 2 weeks to 3 months compared to no treatment (OR=3.5, 95% CI 2.0-6.1).

5. No adverse effects were reported with autoinflation. However, some children may find this technique difficult. In one trial, 12% of children (3~12 y/o) were unable to use the balloon.

(C)SURGICAL MANAGEMENT

1. Tympanostomy tubes:
   a) Restoring the health of middle ear mucosa
   b) Improving hearing loss (mean 6~12 dB)
   c) Maintaining an air-filled middle ear space

2. Tympanostomy tube: duration average 12~14 months
   Laser assisted myringotomy: several weeks

3. Although children who received tympanostomy tubes spent less time with effusion during the first post-operative year, improvements in hearing loss were diminished over time:
   - Children treated with tympanostomy tubes spent 32% (95% CI 17~48%) less time with MEE during the first year of follow-up.
• Hearing levels were improved in children treated with tympanostomy tubes (mean hearing levels improved by 9 dB (95% CI 4-14 dB) after the first 6 months and by 6 dB (95% CI 3-9 dB) after 12 months).

4. These results are inconsistent with the parental and clinical observation that the effects of tympanostomy tubes are beneficial and often dramatic, with a rapid increase in speech following insertion, as well as improvements in the quality of life for these children.

5. Indications for tympanostomy tubes:
   • Children with hearing loss ≥40 dB
   • Children have structural damage to the tympanic membrane or middle ear
   • Children who have OME of ≥3 months duration with persistent hearing loss (≥21 dB) or other signs or symptoms
   • Children with recurrent or persistent OME who are at risk of speech, language, or learning problems, regardless of hearing status (early referral [within 3 months] is recommended)

5. Investigators used a questionnaire to follow 123 children who had bilateral myringotomy and placement of tympanostomy tubes with or without adenoidectomy.
   → 60% decrease in total ear symptom scores respectively at 1 and 6 months, as well as a decrease in parental worry about ear problems at both time points.
(D)Adenoidectomy and tonsillectomy

1. Adenoidectomy should not be performed as the initial procedure in children with persistent OME without a distinct indication for the adenoidectomy other than OME (e.g., nasal obstruction, chronic adenoiditis, chronic sinusitis).

2. Approximately 20~50% of children have OME relapse after tube extrusion may require additional surgery. Adenoidectomy confers a 50% reduction in the need for future operation. Recommends adenoidectomy when repeat surgery for OME is necessary.

3. Although there appears to be some benefit to adenoidectomy in children older than 4 years with OME, the additional surgical and anesthetic risks outweigh the short-term benefits.

   Adenoidectomy: 0.2~0.5% hemorrhage rate, 2% transient VPI

4. Tonsillectomy does not appear to improve the outcome for OME and is generally not advised unless there are other indications for removal.

   (Hemorrhage rate: 2%)
REFERENCES


