

## Otitis Media with Effusion: An Update

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### Summary

Otitis media with effusion (OME) is a very common condition seen in children, and is the commonest cause of hearing loss in an infant. It is also a fairly common condition encountered by the family practitioner, and often the family practitioner is the first doctor the parents bring the child to. Otitis media with effusion is a simple condition but, if left undiagnosed or untreated, can lead to preventable long-term consequences. Hence, a high index of suspicion is necessary, early and accurate diagnosis, prompt treatment, with close follow-up is of essence. The epidemiology, aetiological factors, clinical presentations, diagnosis, various medical and surgical options, cost-effectiveness of therapy and the impact of OME on the child's development are discussed.

**Key Words:** Otitis media with effusion, Hearing loss, Treatment

### Introduction

Otitis media with effusion (glue ear, secretory otitis media, serous otitis media) is a common condition in children. Ten percent of infants have otitis media with effusion by 3 months of age. The peak incidence is between 6 to 15 months of age. It is the commonest cause of decreased hearing in infants<sup>1</sup> and parents may not be able to detect the hearing loss in the child. It has been noted that parents are not reliable in detecting mild hearing loss in their children<sup>2</sup>. Treatment of OME is both medical and surgical. Complications include acute otitis media, atelectasis of the ear drum, hearing loss, development and speech delay. In order to prevent avoidable complications, it is important for the family practitioner to have a high index of

suspicion. Early and accurate diagnosis, prompt therapy, and close follow up is essential.

### Epidemiology

Studies done in Malaysia, report an overall prevalence rate of 13.8% of OME in preschool children aged between 5 and 6 years old<sup>3</sup>, while the prevalence rate in primary school children was 7.26%<sup>4</sup>. There are no studies done in Singapore on the incidence or prevalence of otitis media with effusion.

Its incidence in 3 year-old children, estimated by Nikolajsen<sup>5</sup>, is in the order of 42%. This increases in the winter season. In children 2 to 7 years age,

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it is believed to be in the order of 10-30%<sup>6</sup>. Zielhuis et al believed that there is two peak prevalence, initially 20% at 2 years-old and later at the age of 5 years<sup>7</sup>. Tympanometric studies showed incidence rates of 50% in 5-7 year age group in the United Kingdom<sup>8</sup>, 30% in Danish children 2-4 years<sup>9</sup>, and 26% in Danish 7 years<sup>10</sup>. Zielhuis and Van der Broek (1986)<sup>11</sup> showed an incidence of 39% in 2 years in winter compared to 24% in the summer, and noted 21% being bilateral. The rates vary considerably, depending on diagnostic criteria (clinical examination and tympanometry being the minimum standard), institutional or non-institutional care and whether the assessment is made during summer or winter season. Generally, there is an improvement rate of 50% in 3 months of the disease<sup>11</sup>. Most episodes are short lived and 50% resolve by 3 months, less than 5% lasts beyond one year<sup>11</sup>.

### Definitions

Otitis media with effusion (OME) is the presence of fluid (serous or mucoid) in the middle ear cavity, without signs or symptoms of acute inflammation. Most would agree that acute otitis media is less than 3 weeks, chronic otitis media being more than 3 months and subacute otitis media between 3 weeks to 3 months.

### Aetiology

The three main causes are eustachian tube dysfunction, middle ear gas composition and nasopharyngeal disproportion. Eustachian tube dysfunction is the most important factor. In children the eustachian tube is shorter and is predisposed to reflux. Its lumen being smaller, is more vulnerable to obstruction by inflamed mucosa (secondary to allergy or infection). It lies more horizontally in infants with decreased efficiency in drainage of secretion. In addition, the cartilage is more compliant and collapses readily with negative pressure. The eustachian

tube achieves adult stiffness at about 6 years of age. Children with anatomical defects such as cleft palate or craniofacial disorders have a higher incidence of OME. Lokman et al reported an incidence of OME, as high as 57.6% in patients with cleft palate<sup>12</sup>.

It is believed that with an increase in the vascularity of the middle ear cleft due to inflammation, there is an increase in gas diffusion into the blood, resulting in a decreased pressure in the middle ear cleft. Negative pressure in the middle ear cavity in turn results in serous fluid accumulation in the middle ear and retraction of the tympanic membrane.

Nasopharyngeal disproportion is also an important factor in the pathogenesis of OME. Jeans et al<sup>13</sup> showed the growth of the adenoids outstrips that of the nasopharynx between the age of 3 and 5 years of life with a reduction in the nasopharyngeal airway. The nasopharynx beyond 5 years of life starts to grow faster, while the adenoid size remain relatively unchanged. Children with Trisomy 21 have an increase in the basal angle of the skull in relation to the cranial cavity resulting in a nasopharyngeal disproportion and eustachian tube dysfunction.

### Clinical Presentation

Children with OME usually present with poor respond to command, nonattentiveness, speech or language delay. Occasionally, the child may complain of otalgia or ear blockage. OME may be incidentally noted by the family practitioner on clinical examination.

Brody and Rosenfeld<sup>14</sup> evaluated 115 children with OME based on clinical examination, tympanometry, and audiological investigation (visual reinforcement audiology, play audiology and pure tone audiology). He found that parents could not reliably perceive the child with mild

hearing loss (i.e. less than 20dB hearing loss). They used the HL-7 (Hearing Loss Survey), in which there are seven questions for the parents to answer. The conclusion was that family practitioners cannot rely on parental perceptions to guide selective audiology.

Stewart et al<sup>15</sup> surveyed 93 parents of children with OME (diagnosed by clinical examination, tympanometry and audiology) and found no correlation between parental perception of their child's hearing level and actual audiometric thresholds.

### Diagnosis

It is important for the family practitioner to have a high index of suspicion. Any child less than six years of age, with frequent upper respiratory tract infections, previously thought to have "learning problems", "inattentive", "insular" or with some form of speech or language delay must be suspected of having otitis media with effusion. Clinical examination may occasionally reveal an adenoid facies and adenotonsillar hypertrophy. Oscopic findings may show a retracted tympanic membrane with fluid in the middle ear cavity.

Investigations may reveal a flat tympanogram. Audiometric investigation may show a decreased hearing on the side involved with an average air-bone gap of less than 30dB. The gold standard for diagnosis is a myringotomy with aspiration of the middle ear fluid.

### Complications of OME

Generally, most cases of OME run an indolent, self-limiting course. Occasionally, untreated cases can lead to avoidable complications. Hence, diagnosis must be accurate, early and treatment prompt.

OME can lead to acute and chronic otitis media. Complications of acute and chronic otitis media can be classified as intracranial and extracranial. Extracranial complications are mainly hearing loss which is usually conductive in nature. Sensorineural hearing loss may occur secondary to acute otitis media with spread of infection through the round window. Perforation of the tympanic membrane, tympanosclerosis, atelectasis of the ear drum are well documented. Other rarer complications include mastoiditis, facial nerve paralysis, petrositis and labyrinthitis. Intracranial complications are usually devastating and difficult to treat. They result from direct spread, thrombophlebitis or haematogenous dissemination. They include meningitis, extradural and subdural abscesses, and lateral sinus thrombosis.

One must not forget the common but significant complication of reduced hearing loss with loss of sensory auditory input resulting in speech delay, developmental delay and decreased language skill.

### Treatment Options

Similar to most other medical conditions, treatment options for OME are diverse and ranges from expectant therapy to surgical intervention. Most otolaryngologists would treat a child with OME at first presentation with a 7 to 10 day course of oral antibiotics (amoxicillin, erythromycin or a cephalosporin). At the Department of Otorhinolaryngology in the National University of Singapore Hospital, we use a 10 day course of oral amoxicillin for infants and a seven day course for children above one year of age. Oral antihistamines and topical nasal ephedrine are not recommended. Rosenfeld and Post<sup>16</sup> did a meta-analysis of antibiotics used in the treatment of OME. They found that there was significant clinical and statistical cure rates in the use of antibiotics for the treatment of OME,

compared with the group which was not treated with antibiotics. Mandel<sup>17</sup> also showed benefit in the use of antibiotics compared with the use of a placebo in the treatment of children with OME. However, there was no difference in resolution rates of OME between the use of erythromycin, amoxicillin or cefaclor.

Other drugs have been used in the treatment of OME, like oral steroids, NSAIDs (non-steroidal anti-inflammatory drugs), mucolytics and prostaglandin inhibitors. These are controversial, and generally have not been shown to be of benefit.

Close follow-up and monitoring of the child's progress is of utmost importance. Should there be doubt as to the progression of the disease, or should the condition worsen, one must not hesitate to obtain an otolaryngology consult.

### Surgical Options

Treatment of OME must primarily be treatment of the underlying aetiology and predisposing factors. This will include treatment of an acute episode of upper respiratory tract infection, allergic rhinitis, eustachian tube dysfunction or adenoid hypertrophy. Surgical options are considered when medical therapy has failed. Surgical management includes tympanostomy tube insertion with or without adenoidectomy. Most otolaryngologists would, in general, advise insertion of a tympanostomy tube for children with a failed trial of medical therapy, i.e. OME not resolving or not showing any signs of improvement, or cases with complications. McIsaac<sup>18</sup> et al surveyed 138 otolaryngologists to assess their indications for tympanostomy tube insertion for OME. He found that there were a few main indications that the 138 otolaryngologists concurred with, mainly persistent OME with a lack of improvement after 3 months of optimal medical therapy, past history

of recurrent OME with at least 3 or more months per episode of otitis media, more than 7 episodes of OME in 6 months, bilateral conductive hearing loss of more than 20dB, and a persistently abnormal tympanic membrane. Handler<sup>19</sup> described similar indications, i.e., persistent OME unresponsive to 6-12 weeks of medical therapy, recurrent OME (3 times in 6 months or 4 times in 12 months) despite medical therapy, and complications of acute or chronic otitis media like meningitis, mastoiditis and brain abscess.

G.A Gates et al (1987)<sup>20</sup> studied the effect of adenoidectomy and tympanostomy tube insertion in the treatment of OME. He randomised 578 children aged 4 to 8 years with OME (diagnosis based on pneumatoscopic and tympanometric findings) into 4 treatment groups and followed them up for a mean period of 2 years. All these children had previously been given medical therapy consisting of an oral antibiotic and nasal decongestant for 2 weeks with no resolution. The four treatment groups consisted of one group with tympanostomy tube insertion only, another with adenoidectomy alone, the third group with both adenoidectomy and tympanostomy tube insertion, and the last group as control with no treatment. These four treatment groups were also stratified according to their age, sex, ethnic group, socioeconomic status and skin test sensitivity. They found that the control group with no treatment had the poorest audiologic results. The group with both adenoidectomy and tympanostomy tube insertion had the lowest post-treatment morbidity in terms of hearing acuity in the most affected ear.

Hence, most would consider adenoidectomy and tympanostomy tube insertion at the same operative sitting, especially if the adenoids were grossly enlarged. There is currently no evidence that tonsillectomy has any beneficial effects to OME.

### **Role of Hearing Aids in OME**

Are there any other options for treating OME? Jardine and Griffiths<sup>21</sup> studied the acceptance of hearing aids in 39 children, 4 to 11 years of age, with OME. There were 28 ITE (in the ear) and 11 BTE (behind the ear). They all used bilateral hearing aids, and were followed up for 6 months. Seventy-nine per cent of these children used more than 7 hours per day. There was subjective improvement observed by the parents, and the average aided thresholds were 17dB (10-30dB) at the speech frequencies. There were no significant problems with the social stigma with children less than 7 years old, but some children more than 7 years old reported social problems.

### **Effect of OME on Language Skill and Development**

Klausen et al<sup>22</sup> did a retrospective review on 38 children aged 8-10 years, 19 children with OME and 19 children with normal ears. The average hearing loss was 12dB bilaterally. The OME group had persistently lower articulation test and sound discrimination tests (using the Illinois test of psycholinguistic abilities, test for articulation, Boston naming test and the dichotic listening tests). Maws and Wilks<sup>23</sup> studied a randomised perspective group of 186 children between 1-4 years, with bilateral OME (diagnosis based on clinical examination and tympanometry) and followed up at 6, 9 and 18 months. They randomised these children into two groups, the first group was given early surgery at the time of diagnosis, and the other group was assigned watchful waiting. The children was stratified according to their birth weight, gestational age, breast fed status, maternal smoking habits, maternal qualifications and childhood allergies. Using the Griffiths mental development scale, Reynell expressive language and verbal

comprehension test, pure tone audiometry, automated McCormick toy tests, they found that at 9 months, there was significant difference in expressive language and verbal comprehension scores between the two groups. The watchful wait group was 3.24 months developmentally behind the early surgery group.

### **Cost Considerations**

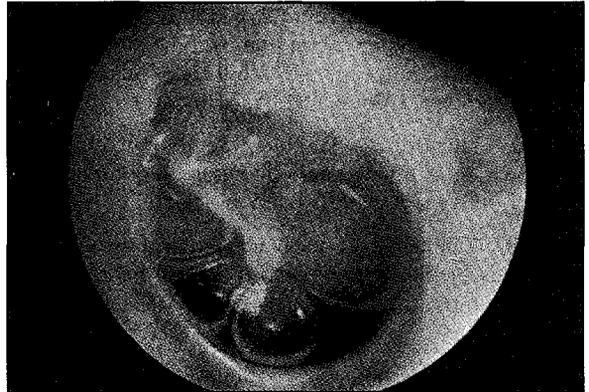
G.A Gates<sup>24</sup> assessed the cost-effectiveness of the treatment of OME in the United States of America, and found that OME costs \$5 billion annually. Medical therapy costs two-thirds of the money spent on OME treatment. He found that on average each OME case receives 1.5 courses of antimicrobial therapy, 2.5 physician visits, \$1 per day of amoxicillin, \$35 per hospital visit, indirect cost of \$133 per half day of work loss by the parent, and \$10 for travel. Combining acute and chronic OME treatment, the cost results in an average of \$5 billion per year.

### **Conclusion**

OME is frequent in children. It is the commonest cause of hearing loss in infants. Its causes are discussed and reviewed. Early and accurate diagnosis is crucial in its management. Delay in treatment and lack of close follow up can lead to complications. Prompt medical treatment is essential at first presentation of uncomplicated OME. Surgical intervention is indicated if OME is unresponsive to medical therapy or failed watchful waiting. This should preferably include an adenoidectomy, if the adenoids are hypertrophied in a child more than 4 years. Hearing loss in young children will affect their sound discrimination, speech articulation, language skill and development.



**Fig 1. Otoscopic appearance of otitis media with effusion showing a fluid level medial to the tympanic membrane.**



**Fig 2. Otoscopic appearance of otitis media with effusion showing bubbles within the middle ear cavity.**



**Fig 3. Otoscopic appearance of an atelectatic tympanic membrane.**

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## Otitis Media with Effusion: An Update

### CME Multiple Choice Questions

1. The peak incidence of otitis media with effusion (OME) in children is
  - A. 6 to 15 months of age
  - B. 24 to 36 months of age
  - C. 37 to 48 months of age
  - D. 2 to 4 years of age
  - E. 4 to 6 years of age
2. The commonest cause of hearing loss in an infant
  - A. congenital ear atresia
  - B. ear wax
  - C. tympanic membrane perforation
  - D. otitis media with effusion
  - E. congenital sensorineural hearing loss
3. It is believed that the eustachian tube achieves adult "stiffness" by
  - A. 4 years of age
  - B. 6 years of age
  - C. 8 years of age
  - D. 10 years of age
  - E. none of the above
4. Treatment of a child with OME at first presentation is
  - A. 3 days of amoxicillin
  - B. 3 days of prednisolone only
  - C. myringotomy and ventilation tube insertion
  - D. 7 to 10 days of amoxicillin
  - E. hearing aid prescription
5. It is found that children with untreated OME will on average have
  - A. no hearing by 6 years of age
  - B. about 3.24 months development delay
  - C. about 12 months developmental delay
  - D. severe sensorineural hearing loss by 8 years of age
  - E. none of the above