

Pediatric otitis media with effusion: current surgical approach

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ABSTRACT

Serous otitis media, which can be defined as fluid accumulation in the middle ear cavity, is one of the common conditions in school-age children. There is hearing loss that begins without causing acute pain and without symptoms. It is also a silent problem associated with school failure and attention deficit disorder. Diagnosis is usually made when hearing loss is noticed at home or at school and during the check-ups of children with adenoid vegetation complaints. Approximately 90% of preschool children experience EOM, with an average of 4 episodes per year. There are 3 main factors in the etiology of EOM; impaired ventilation of the middle ear, infection and inflammation. Treatment of EOM is a combination of observation, medical and surgical therapies. The goals of treatment are to clear the middle ear fluid and restore normal middle ear pressure and hearing. In surgical treatment, myringotomy and tympanostomy tube placement are the main approaches. Shepard Grommet type temporary tube application is the most commonly used material. The current version of the "Tympanostomy Tubes in Children" guideline published by the American Academy of Otolaryngology-Head and Neck Surgery Foundation (AAO-HNSF) in 2013 was renewed in 2022. The purpose of this mini review is to evaluate the indications for surgical treatment of EOM-tympanostomy tube application with this guideline.

Keywords: Serous otitis media, otitis media with effusion, surgical approach in otitis media

INTRODUCTION

Otitis media with effusion (EOM), also called serous otitis media, is defined as the presence of fluid in the middle ear without signs of acute infection.¹ EOM is a very common childhood disease. Up to 90% of preschool children experience EOM, with an average of 4 episodes per year.² Generally, EOM has its first peak around the age of 2 years, with a second peak at the age of 5-6 years, and EOM has been observed in one in 8 children in this age group.^{3,4}

ETIOLOGY

There are 3 main factors in the etiology of otitis media with effusion (EOM); impaired ventilation of the middle ear, infection and inflammation.²⁻⁵

Middle Ear Ventilation Disorder

The Eustachian tube plays an important role in the ventilation of the middle ear. Eustachian tubes of children have an angle of 10 degrees with respect to the horizontal plane, while this angle increases to 45 degrees in adults. The length is shorter in children compared to adults and the mouth of the Eustachian tube may be blocked due to adenoid hypertrophy or adenoiditis in children, causing otitis media. For these reasons, Eustachian tube dysfunction is more common in children.²⁻⁴

Infection

EOM often occurs after acute otitis media (AOM), but conditions such as upper respiratory tract infections (URTI), rhinosinusitis, adenoiditis, etc. can cause edema and lymphoid hyperplasia in the nasopharynx, leading to the formation of EOM. Frequent viral URIs may alter the bacterial colony of the nasopharynx by causing an increase in nasopharyngeal secretions.²⁻⁴

Inflammation

Neurogenic inflammation has been thought to play an important role in the multifactorial etiology of EOM. In studies, increased levels of Substance P and increased levels of Vasoactive Intestinal Peptide have been observed in effusion samples obtained from the middle ear in patients with EOM compared to other body fluids.³ Some publications have also shown that children with allergic rhinitis have EOM more frequently than the normal population.⁴ It has also been associated with pepsin substance in the theory related to gastroesophageal reflux.⁵

In general, EOM is a self-resolving condition and careful observation is the preferred strategy, except in children with hearing impairment, developmental delay and certain conditions (such as cleft palate) that need to be addressed.

Recurrent episodes may occur in approximately 40-50% of children. There is usually a tendency for improvement within 4-6 weeks. Some children develop chronic EOM, defined as EOM lasting 3 months or longer. Eustachian tube dysfunction, which rarely results in EOM, persists for years and may cause retraction pockets in the tympanic membrane, ossicular chain erosion, tympanic membrane perforation or cholesteatoma.⁶

RISK FACTORS

- Pacifier use
- Tobacco use by parents
- Low socioeconomic status
- Premature birth
- Gastroesophageal reflux disease
- History of allergy

To reduce the risk, breastfeeding can be encouraged, chewing gum can be recommended, and bottle feeding on the back should be avoided.⁷

CLINICAL FINDINGS AND DIAGNOSIS

Acute EOM refers to a period of less than 3 weeks and chronic EOM refers to a period of more than 3 months. The period between 3 weeks and 3 months can be defined as subacute EOM. Recurrent EOM is defined as 3 or more episodes within 6 months or 4 or more episodes per year. EOM can be found in routine screening of asymptomatic children. Hearing loss as a symptom is rare in children. It is often detected when children are brought to the doctor because their parents suspect hearing loss. It is one of the causes to be considered in cases of poor school performance, learning difficulties and delayed speech. EOM can also have negative effects on balance. In children, it can cause clumsiness and an increased tendency to bump into things.⁸

The child with EOM is evaluated using otoscopy, audiometry and tympanometry. Otoscopic images may show opacification of the tympanic membrane, inability to see the Pultizer light triangle, bulging of the membrane and air fluid level behind the membrane (Figure 1). Radial vascularity can be observed on the tympanic membrane.^{8,9}



Figure 1. Otoscopic image of EOM

Tympanometry is used to measure the tympanic membrane compliance by placing a probe in the external auditory canal and sending sound waves into the canal. In EOM, the fluid in the middle ear absorbs sound and causes the formation of a straight line. This finding is also seen when the tympanic membrane is perforated and is called type B tympanogram. Type A is seen with normal ear ventilation, while type C indicates negative middle ear pressure caused by eustachian tube dysfunction (Figure 2).^{4,9,10}

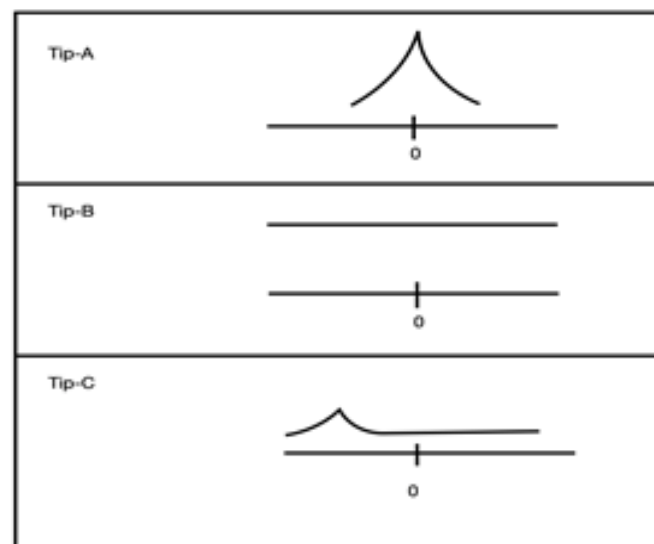


Figure 2. View of tympanogram results

EOM causes an average hearing loss of 20-28 dB. Although it rarely exceeds 50 dB, in 20% it is above 35 dB and these hearing losses are conductive.⁹ EOM, which has a fluctuating course, is very common in children under 2 years of age. Left untreated, it can cause membrane changes such as tympanosclerosis, attic retraction pocket, atelectasis, and atrophy of the tympanic membrane.^{4,8-10}

TREATMENT

Treatment of EOM is a combination of observation, medical and surgical therapies. The goals of treatment are to clear middle ear fluid and restore normal middle ear pressure and hearing. It has been observed that 50% of children with close follow-up return to normal after 3 months.

Medical Treatment

The first step in medical treatment of EOM due to AOM is antibiotics and the duration of treatment is 10 days. If treatment is not successful, there is no benefit in extending the duration or changing antibiotic groups. It is not useful to give antibiotics to patients who are asymptomatic during viral infections and progress subclinically. The antibiotherapy to be started is amoxicillin or amoxicillin-clavunate.¹¹

Although oral glucocorticoids may accelerate short-term resolution of EOM, improvement in hearing and functional status has not been proven. Intranasal glucocorticoids are not recommended unless necessary for the treatment of underlying allergy/chronic rhinitis.¹⁰ Antihistamines and decongestants are also not recommended.¹¹ There is no evidence that autoventilation alone is effective in treatment and should not be recommended for children with active nasal discharge.¹²

Surgical Treatment

Myringotomy and tympanostomy tube placement are the main approaches in surgical treatment. Over time, myringotomy alone has been shown to be ineffective and is no longer practiced in most clinics. There are some methods that provide middle ear ventilation such as balloon dilatation method for Eustachian tube dysfunction. However, the most effective and easiest way is tympanostomy tube placement. The type of tube that can be applied is decided according to the patient's clinic. Shepard Grommet type temporary tube is the most commonly used material. It is the most commonly applied material in children with otitis media with effusion who will remain in routine follow-up, and is disposed of in the external auditory canal with foreign body reaction within 6-12 months. T-type tympanostomy tubes are long-term-permanent type tubes. They are used in patients with persistent effusion, chronic otitis media or nasopharyngeal cancer patients (Figure 3).^{4,10-16}

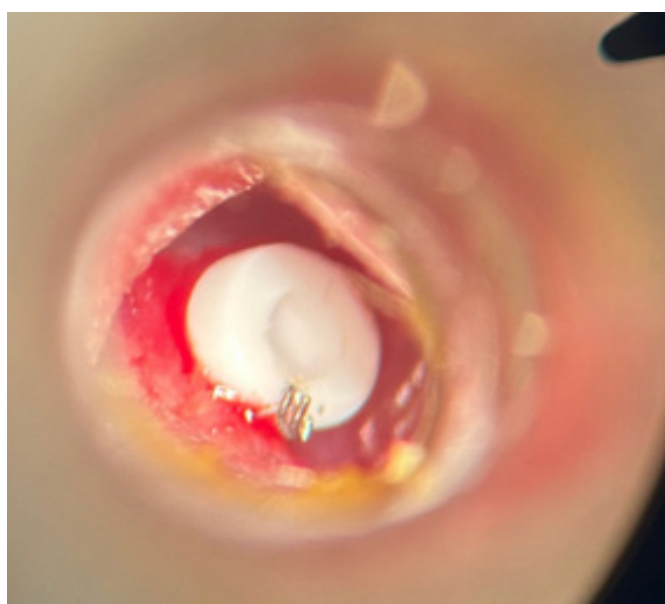


Figure 3. Shepard Grommet ventilation tube application-microscopic view

Tympanostomy tube placement: Tympanostomy tube placement is the most common outpatient surgery performed in children. In 2006, a study conducted in the United States showed that 667,000 children under 15 years of age underwent tympanostomy tube placement, accounting for 20% of all surgical interventions in this age group.¹³ Another study showed that this number of tympanostomy tube surgeries decreased by 30% due to the effect of pneumococcal vaccination.¹⁴⁻¹⁸ We know that *Streptococcus pneumoniae* is the most common causative agent of bacterial rhinosinusitis and acute otitis. This agent is also isolated from serous otitis media.

The clinical practice guideline for tympanostomy tubes to be applied in pediatric patients was published in 2022 by Rosenfeld et al.¹⁸ as an updated version of the "Tympanostomy Tubes in Children" guideline published in 2013 by the American Academy of Otolaryngology-Head and Neck Surgery Foundation (AAO-HNSF). The guideline was written by reviewing 6 major clinical practice guidelines, 18 systematic reviews and 27 randomized controlled trials.¹⁵⁻¹⁷

If we summarize the articles of the guideline^{4,10-16}

1. In short-term EOM, a tube should not be placed in children with a single episode less than 3 months from the date of onset or, if the onset date is unknown, from the date of diagnosis.
2. If EOM persists for 3 months or more, or if the child is a candidate for tubing, a hearing evaluation should be obtained. Hearing test values up to 15 decibels are considered normal.
3. Bilateral tympanostomy tubes are recommended for children with documented hearing loss and bilateral chronic EOM.
4. Children with unilateral or bilateral chronic EOM who otherwise have symptoms that are wholly or partially attributable to EOM may have a tympanostomy tube. These symptoms include balance problems, school failure, ear discomfort, behavioral problems or poor quality of life.
5. Children with chronic EOM who do not have a tympanostomy tube should be re-evaluated at 3-6 month intervals until the effusion has disappeared and hearing loss indicates structural abnormalities of the tympanic membrane or middle ear.
6. Children with recurrent AOM without middle ear effusion should not be intubated.
7. Bilateral tubing is recommended in children with recurrent AOM in the presence of middle ear effusion, even in the presence of unilateral findings.
8. In children with EOM, tubing may be performed when a type-B tympanogram or documented effusion is expected to last longer than 3 months.
9. Long-term tubes (T-tube) are not recommended for children who meet the criteria for tube placement unless there is a specific reason based on the expectation of long-term middle ear ventilation.
10. Adenoidectomy may be performed in addition to tube placement in children with symptoms directly related to adenoid hypertrophy or in children over 4 years of age.
11. In the preoperative period, clinicians should educate the children's caregivers about tube function, follow-up schedule and detection of complications.
12. Antibiotic ear drops should not be routinely prescribed after tympanostomy tube placement.
13. The child's ears should be examined within 3 months of tube insertion and families should be informed about the need for routine follow-up until the tubes are removed.

The group of children at risk in the guidelines:

- Permanent hearing loss independent of EOM
- Suspected or proven speech and language development disorder
- Autism spectrum disorder
- Syndromes or craniofacial disorders involving cognitive speech or language delays
- Uncorrectable visual impairment or blindness
- Cleft palate independent of concomitant syndromes



- Developmental delay
- Mental retardation, attention deficit/hyperactivity disorder, learning disabilities

CONCLUSION

Hearing loss as a symptom in children is rare, but if hearing loss is present, one of the most common causes is serous otitis media. Serous otitis media is most often detected when children are taken to the doctor because parents suspect hearing loss. Serous otitis media is one of the reasons that should be kept in mind in cases of low school performance, learning difficulties and speech delay. A large patient population is also diagnosed during hearing screenings conducted in schools. Treatment ; consists of a combination of observation, medical, and surgical treatments; The aim is to clear middle ear fluid and restore normal middle ear pressure and hearing. Early diagnosis and treatment is important.

ETHICAL DECLARATIONS

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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