Tympanostomy tubes for children with acute otitis media

Justin L. Griffiths MD Ran D. Goldman MD FRCPC

Abstract

Question A 30-month-old patient in our clinic has had 4 episodes of acute otitis media (AOM) in the past 6 months. Should I refer the child and family to an ear, nose, and throat surgeon to consider tympanostomy tube placement, or should we continue medical management with antibiotics?

Answer Acute otitis media is common among children in Canada, particularly those younger than 3 years of age. Recurrent AOM (3 or more episodes of AOM in a 6-month period or 4 or more episodes of AOM in a 12-month period) is also common in this age group. Routine immunization of infants and children in Canada with pneumococcal conjugate vaccines (initially the 7-valent PCV7 and more recently the 13-valent PCV13) considerably reduced the overall incidence of AOM. Tympanostomy tube placement decreases the incidence of AOM compared with medical management. However, the procedure is no longer superior to medical management after a 2-year period. Both tympanostomy tube placement and medical management are valid options for children with recurrent AOM, and shared decision making with caregivers is recommended.

Les tubes de tympanotomie chez les enfants souffrant d'une otite moyenne aiguë

Résumé

Question Un patient de 30 mois à notre clinique a connu 4 épisodes d'otite moyenne aiguë (OMA) au cours des 6 derniers mois. Faudrait-il que je demande une consultation en otorhinolaryngologie afin d'envisager l'insertion d'un tube de tympanotomie ou vaut-il mieux continuer avec une prise en charge médicale par antibiotiques?

Réponse L'otite moyenne aiguë est commune chez les enfants au Canada, surtout chez ceux de moins de 5 ans. L'otite moyenne aiguë récurrente (3 épisodes d'OMA ou plus durant une période de 6 mois ou 4 épisodes ou plus d'OMA durant une période de 12 mois) est aussi courante dans ce groupe d'âge. L'immunisation systématique des nourrissons et des enfants avec un vaccin antipneumococcique conjugué (initialement le 7-valent PCV7 et plus récemment le 13-valent PCV13) a réduit considérablement l'incidence globale de l'OMA. L'insertion d'un tube de tympanotomie diminue l'incidence de l'OMA par rapport à la prise en charge médicale. Par ailleurs, l'intervention perd cette supériorité en comparaison de la prise en charge médicale après une période de 2 ans. L'insertion d'un tube de tympanotomie et la prise en charge médicale sont toutes 2 des options valables pour les enfants souffrant d'une OMA récurrente, et il est recommandé de prendre une décision conjointement avec les parents.

Acute otitis media (AOM), the most common condition for which antimicrobial agents are prescribed in childhood,[1] is caused by acute inflammation of the mucosa of the middle ear from a viral or bacterial infection.[2] It is generally preceded by a viral upper respiratory tract infection, which leads to eustachian tube dysfunction with middle ear effusion (MEE) and lack of proper fluid drainage.[2] Children, and particularly those younger than 3 years of age, are predisposed to AOM owing to a higher incidence of viral infections than in adults, as well as children's shorter and more horizontal eustachian tubes.[2]

Signs and symptoms of AOM include fever, cough, rhinitis, poor appetite, and vomiting.[3] Otalgia is the most common presenting symptom and may be present in 50% to 60% of children with AOM.[4] Otoscopic examination is required for accurate diagnosis. A bulging tympanic membrane (TM) is the most consistent sign and helps differentiate AOM from otitis media with effusion (OME).[3] Acute otitis media can be diagnosed if there is MEE with signs of middle ear inflammation on otoscopic examination, such as moderate to severe TM bulging, new onset otorrhea not caused by otitis externa, or mild bulging of the TM associated with recent onset of otalgia (less than 48 hours) or erythema.[1,2]

Recurrent AOM

Recurrent AOM is defined as the occurrence of 3 or more episodes of AOM in a 6-month period or the occurrence of 4 or more episodes of AOM in a 12-month period that includes at least 1 episode in the preceding 6 months.[1] These episodes should be well documented as separate

acute infections.[1] Risk factors for recurrent AOM include craniofacial malformations, early onset of AOM (before 6 months of age), family history of recurrent AOM, day-care attendance, low socioeconomic status, and passive smoking.[3] Breastfeeding is protective.[3] Children with recurrent AOM are at higher risk of developing OME, as well as hearing loss–related developmental outcomes,[5] and they have poor quality of life owing to frequent episodes of ear pain, general illness, sleepless nights, and time lost from day care or school.[6]

A population-based birth cohort with more than 50,000 children born in southwestern British Columbia in 1999 to 2000 reported almost half (48.6%) of children had 1 or more episodes of AOM by age 3 years, and 7.8% met the definition for recurrent AOM.[7] The 7-valent pneumococcal conjugate vaccine (PCV7) became available in 2001 and has been associated with a 6% to 7% reduction in overall incidence of AOM.[3] The 13-valent PCV13, available since 2011, has been associated with further reductions in AOM.[3]

Management options for children with recurrent AOM include observation with episodic antimicrobial therapy, antibiotic prophylaxis, and myringotomy with tympanostomy tube (TT) insertion.[8]

Myringotomy with TT insertion

Myringotomy with TT insertion is the most frequently performed ambulatory pediatric surgery in North America and is indicated for recurrent AOM with MEE as well as for chronic OME and for patients with structural TM anomalies.[9] Tympanostomy tubes allow drainage of middle ear fluid, thus reducing the potential for infection by viruses and bacteria.[3] In the United States, almost 700,000 such procedures are performed every year, and 6.8% of the population had TTs placed before the age of 3.[10] The most common short-term complication of TT insertion is otorrhea, for which topical antibiotic ear drops should be prescribed.[11] Longer-term complications of TTs include persisting perforation of the TM, which can lead to conductive hearing loss and increased risks of infection, as well as myringosclerosis (calcification of the TM), which may cause mild hearing loss.[12]

Recommendations[12] and clinical practice guidelines, such as those from the American Academy of Otolaryngology–Head and Neck Surgery, suggest TT surgery should be avoided in children with recurrent AOM if they do not have MEE in either ear at the time of assessment.[11] The Canadian Society of Otolaryngology–Head and Neck Surgery recommends TT surgery for patients with 6 or more episodes of AOM in a year or 4 or more episodes in 6 months.[13]

Tympanostomy tube surgery or not?

The decision to perform TT surgery for patients with recurrent AOM is a controversial one. Benefits include the commonplace observation of increased AOM-free periods after surgery and avoidance of systemic antimicrobial treatment, while drawbacks include the cost of the surgery, complications associated with anesthesia in young children, refractory tube otorrhea, and structural TM sequelae.[11]

Since the introduction of PCV7 and PCV13 there have been 3 main studies comparing the efficacy of TT insertion versus observation with episodic antimicrobial therapy among children with recurrent AOM.[14-16] A retrospective matched cohort study among more than 13,000 children younger than 5 years of age with recurrent AOM reported that the TT group had a lower 1-year incidence of episodes of AOM (1.96 vs 2.18, respectively; $P<.001$) and fewer oral antibiotic prescriptions (1.52 vs 1.67; $P<.001$).[14] However, at the 2-year follow-up, the difference between the TT group and the medically managed group was no longer significant for episodes of AOM (1.69 vs 1.66; $P=.384$) or number of oral antibiotic prescriptions (0.91 vs 0.87; $P=.09$).[14]

A Finnish randomized controlled trial among 300 children 10 to 24 months of age with recurrent AOM showed intervention failure (defined as 2 or more episodes of AOM in 2 months, 3 or more episodes in 6 months, or persistent effusion for 2 months) was lower in the TT group than in the observation group (21% vs 34%, respectively; 95% CI -25% to -1%; $P=.04$).[15] The TT group also had a lower 1-year incidence rate of AOM (1.15 vs 1.70; difference of -0.55, 95% CI -0.93 to -0.17).

A more recent US randomized controlled trial among 250 children 6 to 35 months of age with recurrent AOM found no significant difference in the rate of episodes of AOM during a 2-year period in the intention-to-treat analysis (mean of 1.5 episodes, risk ratio 0.97; 95% CI 0.84 to 1.12; $P=.66$).[16] The time to first occurrence of AOM was longer in the TT group than in the observation group (4.34 months vs 2.33 months; hazard ratio=0.68, 95% CI 0.52 to 0.90). Children in the TT group had higher mean (SD) days per year with tube otorrhea (7.96 [1.10] vs 2.83 [0.78] days) but had fewer mean (SD) days per year with other otitis-related symptoms (2.00 [0.29] vs 8.33 [0.59] days). The TT group also received shorter mean (SD) oral antibiotic treatment (8.76 [0.94] vs 12.92 [0.90] days); however, there was no evidence of increased antimicrobial resistance among the isolates obtained from children in the observation group. The results of these 3 studies are generally consistent in that benefit of TT surgery is seen in the first year after surgery, but this benefit disappeared by the end of the second year.

There is a substantial role for shared decision making with caregivers regarding whether to proceed with or to decline TT insertion.[17] In a Canadian prospective cohort study of 51 parents of children younger than 6 years of age with recurrent AOM who underwent consultation for TT placement versus watchful waiting, parental decisional conflict and decisional regret scores were higher for the watchful waiting group than for the surgical group.[17] The authors postulated that parents may have

felt more insecure about an unclear course of watchful waiting versus a more certain course of surgery, which led to these results.[17] Parents who perceived themselves to be more involved in the decision-making process also had lower levels of decisional conflict.[17] Recent interest in office-based TT placement without general anesthesia has been welcomed by caregivers but currently lacks the support of most otolaryngologists.[18]

Conclusion

Tympanostomy tube insertion and observation with episodic antimicrobial treatment are both valid options for the management of children with recurrent AOM. Studies show decreased incidence of AOM in the first year after TT insertion. However, TT insertion is not superior to medical management in reducing the incidence of AOM 2 years after surgery.

Competing interests
None declared

Correspondence
Dr Ran D. Goldman; e-mail **rgoldman@cw.bc.ca**

References

1. Lieberthal AS, Carroll AE, Chonmaitree T, Ganiats TG, Hoberman A, Jackson MA, et al. The diagnosis and management of acute otitis media. *Pediatrics* 2013;131(3):e964-99. Epub 2013 Feb 25. Erratum in: *Pediatrics* 2014;133(2):346.
2. Le Saux N, Robinson JL; Canadian Paediatric Society, Infectious Diseases and Immunization Committee. Management of acute otitis media in children six months of age and older. *Paediatr Child Health* 2016;21(1):39-50.
3. Schilder AGM, Chonmaitree T, Cripps AW, Rosenfeld RM, Casselbrant ML, Haggard MP, et al. Otitis media. *Nat Rev Dis Primers* 2016;2(1):16063.
4. Rothman R, Owens T, Simel DL. Does this child have acute otitis media? *JAMA* 2003;290(12):1633-40.
5. Bennett KE, Haggard MP, Silva PA, Stewart IA. Behaviour and developmental effects of otitis media with effusion into the teens. *Arch Dis Child* 2001;85(2):91-5.
6. Brouwer CNM, Schilder AGM, van Stel HF, Rovers MM, Veenhoven RH, Grobbee DE, et al. Reliability and validity of functional health status and health-related quality of life questionnaires in children with recurrent acute otitis media. *Qual Life Res* 2007;16(8):1357-73. Epub 2007 Aug 1.
7. Macintyre EA, Karr CJ, Koehoorn M, Demers P, Tamburic L, Lencar C, et al. Otitis media incidence and risk factors in a population-based birth cohort. *Paediatr Child Health* 2010;15(7):437-42.
8. Granath A. Recurrent acute otitis media: what are the options for treatment and prevention? *Curr Otorhinolaryngol Rep* 2017;5(2):93-100. Epub 2017 May 9.
9. Rosenfeld RM. Tympanostomy tube controversies and issues: state-of-the-art review. *Ear Nose Throat J* 2020;99(1 Suppl):15S-21S. Epub 2020 Apr 13.
10. Rettig E, Tunkel DE. Contemporary concepts in management of acute otitis media in children. *Otolaryngol Clin North Am* 2014;47(5):651-72. Epub 2014 Aug 1.
11. Rosenfeld RM, Schwartz SR, Pynnonen MA, Tunkel DE, Hussey HM, Fichera JS, et al. Clinical practice guideline: tympanostomy tubes in children. *Otolaryngol Head Neck Surg* 2013;149(1 Suppl):S1-35.
12. Venekamp RP, Mick P, Schilder AG, Nunez DA. Grommets (ventilation tubes) for recurrent acute otitis media in children. *Cochrane Database Syst Rev* 2018;5(5):CD012017.
13. *Myringotomy and tubes.* Elora, ON: Canadian Society of Otolaryngology–Head and Neck Surgery. Available from: **https://www.entcanada.org/learning/general-public/public-information-sheets-2/ears/myringotomy-tubes/**. Accessed 2022 Mar 24.
14. Raol N, Sharma M, Boss EF, Jiang W, Scott JW, Learn P, et al. Tympanostomy tube placement vs medical management for recurrent acute otitis media in TRICARE-insured children. *Otolaryngol Head Neck Surg* 2017;157(5):867-73. Epub 2017 May 23.
15. Kujala T, Alho OP, Luotonen J, Kristo A, Uhari M, Renko M, et al. Tympanostomy with and without adenoidectomy for the prevention of recurrences of acute otitis media: a randomized controlled trial. *Pediatr infect Dis J* 2012;31(6):565-9.
16. Hoberman A, Preciado D, Paradise JL, Chi DH, Haralam M, Block SL, et al. Tympanostomy tubes or medical management for recurrent acute otitis media. *N Engl J Med* 2021;384(19):1789-99. Epub 2021 May 13.
17. Hong P, Maguire E, Purcell M, Ritchie KC, Chorney J. Decision-making quality in parents considering adenotonsillectomy or tympanostomy tube insertion for their children. *JAMA Otolaryngol Head Neck Surg* 2017;143(3):260-6.
18. Schild SD, Rosenfeld RM. Otolaryngologists' attitudes toward in-office pediatric tympanostomy tube placement without general anesthesia. *Ann Otol Rhinol Laryngol* 2022;131(1):101-7. Epub 2021 Apr 23.

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