



OTITIS MEDIA WITH EFFUSION: RECURRENCE AFTER TYMPANOSTOMY TUBE EXTRUSION

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ABSTRACT

Objective: Investigations were conducted on the prevalence of recurrent otitis media with effusion (OME) among kids following tympanostomy tube extrusion, as well as the association among relapse and tube retention period. The association among the recurrence rate and the tube insertion age at the beginning was investigated as well.

Methods: Ninety-one children (169 ears) in a retrospective study involving individuals who underwent tympanostomy tube insertion were examined. Children's ears were separated into three categories based on how long their tympanostomy tubes remained in place. Category A: fewer than six months of tympanostomy tube retention. Category B: six to twelve months of tympanostomy tube retention. Category C: retention period of tympanostomy tubes for a year or longer

Results: A study involving 168 ears from 90 children (39.6% female, 58.2% male) was conducted to evaluate the outcomes of tympanostomy tube insertion. The mean age for the first tube implantation was 8.43 ± 2.25 years, with a monitoring period ranging from 7 to 77 months (median 24.43 ± 15.69 months). The average tube retention period was 9.76 ± 5.44 months. In 93.41% of cases, adenotonsillectomy or adenoidectomy was performed alongside tube insertion. Post-extrusion, recurrent otitis media with effusion (OME) occurred in 21% of ears. Recurrence rates varied by extrusion time: <6 months (37.45%), 7-13 months (18.47%), and ≥ 13 months (10.01%), with significant differences between the groups ($p = 0.03$, $p = 0.0023$). Gender-specific recurrence rates were 10.1% for males and 12% for females, showing no significant difference ($p = 0.398$). Age group analysis revealed no significant difference in recurrence between preschoolers (4.4%) and school-age children (16.3%) ($p = 0.237$).

Conclusion: Following tympanostomy tube the extrusion process children should have routine follow-ups to ensure that OME doesn't reoccur. The recurrence rate increased with the length of the tympanostomy tube retention period. The tubes that have the smallest likelihood of complications and recurring are the best choice for treating OME. To determine the correlation between the occurrence of OME and the ideal period of tube stay in the tympanic membrane, more research is required. As a result, additional research including bigger series is required to examine the relationship between various tympanostomy tubes and recurrence rates following tube extrusion.

Keywords: Otitis Media, Middle Ear Effusion, Tympanostomy Tube Extrusion, Recurrence

INTRODUCTION

The most prevalent illness among kids is otitis media with effusion (OME).¹ In a lack of acute inflammation, it is defined by a recurrent serous or mucous like middle ear effusion.² The pathophysiology of OME is recognized to involve bacterial infections and Eustachian tube malfunctioning; however, the specific mechanism underlying OME remains to be fully understood. Children affected by this condition may experience either permanent or temporarily congenital loss of hearing, impaired development of speech, along with educational difficulties. ³ Usually, after three months, it goes away on its own.

When a chronic effusion is present, standard medical care for OME is required; a variety of antimicrobial agents, medications for congestion, and antihistamines are employed. In comparison to a placebo, antihistamines and congestion medications did not significantly improve patient outcomes in multiple studies.⁴ OME is prevalent in children between the ages of four and six months.⁵ More than fifty percent of infants exhibit OME throughout the initial year after birth. Approximately thirty percent to forty percent of children experience OME again, and between five and ten percent of episodes linger for a year or more. However, numerous instances end on their own within three months.⁶ Only careful surveillance, medication, and surgeries are used as OME therapies.⁷

When middle ear effusion is not adequately treated medically, tympanostomy tube placement often becomes necessary.⁸ One of the most frequent surgical operations on children that calls for a general anaesthesia is this particular one. The most common problems following tympanostomy tube insertion include otorrhea, granulation tissue, perforation, sclerotic alterations in the tympanic membrane, and cholesteatoma.^{9,10} Considering the epidemiological studies, pathophysiology, the diagnosis, and management of OME as well as its consequences and aftereffects, there are a plethora of clinical studies and research investigations accessible. On the other hand, there aren't plenty of findings on OME relapse following tympanostomy tube extrusion.

The purpose of this research sought to find out the frequency of relapse following tympanostomy tube extrusion and the correlation among recurrence and tube retention duration among kids who received tympanostomy tube insertion for chronic OME. The purpose of the research was to determine whether kids who have recurrent OME have different gender distributions. Furthermore, the association between the original age of tube implantation and relapse was examined.

MATERIALS AND METHODS

Retrospective research was conducted on kids diagnosed with chronic OME who had tympanostomy tube insertions at the Hayatabad Medical Complex between April 27, 2019, and October 27, 2019. Before surgery, an audiologic test involving tympanometry and audiometry was performed in order to diagnose chronic OME. A type B tympanogram, enhanced vascularization, any retractions, dullness or opalescence of the tympanic membrane, fluid levels, or air bubbles were among the findings that were deemed diagnostic for OME following an otomicroscopic assessment. When OME persisted for longer than three months, it was considered chronic OME, and these individuals had surgery. Control of these treated cases was requested to ascertain whether relapse was present or not.

Each participant underwent otomicroscopic examinations as well as tympanometric and audiometric assessments. Exclusion criteria involved two individuals with craniofacial defects like as Down's syndrome and cleft palate, ten individuals that received myringotomy alone rather than tympanostomy tube insertion, and seven patients that were not eligible to participate for controls. The investigation did not include thirteen individuals whose tympanostomy tubes remained in place. Records were kept of the patients' original tube insertion age, sex, surgical procedures performed, amount of time till tube extrusion, monitoring period, and occurrence or non-occurrence of relapse.

Based on the duration of tympanostomy tube retention, children's ears were split into three distinct categories. Category A: fewer than six months was the tympanostomy tube retention period. Category B: an extension of the tympanostomy tube's retention period from six to twelve months. Category C: Tympanostomy tube retention for a minimum of a year. In addition, the frequency of recurrence of individuals who had their tubes inserted prior the age of six (preschoolers) and those who had them

inserted after the age of six (schoolchildren) were also compared. It was also determined how sex and rate of recurrence related.

SPSS 19 was used for every statistical test as well as data assessment. The findings were expressed as a percentage or as mean + standard deviation. The chi-square test was used to assess the categories' incidences of relapse. Age and gender were risk variables for results of the study that were determined using binary logistic regression analysis. A p-value of less than 0.05 was considered significant.

RESULTS

168 ears from 90 children were included in the study. 36 of these kids (39.6%) were female, and 53 (58.2%) were male (Table 1). In 12 patients (13.38%), unilateral tympanostomy tube insertion was done. The range of ages for the first tube implantation was 4–17 years old (mean age = 8.43 ± 2.25 years). After the tube was inserted, there was a 7–77 month monitoring period (median 24.43 ± 15.69 months). For Shepard grommet tympanostomy tubes, the average tube retention period was 9.76 ± 5.44 months, with a range of 1 to 24 months. In 85 additional cases (93.41%), adenotonsillectomy or adenoidectomy was done during the tube placement procedure. Eight (8.96%) individuals who undergone a prior adenoidectomy and showed no signs of adenoid hypertrophy at the initial evaluation received only the tympanostomy tube inserted (Table 1).

Following tube extrusion, repeated OME was noted in 38 ears (21.0%) out of twenty individuals. The extrusion time in the first category A (52 ears) was less than six months. In 63 ears, the extrusion time ranged from 0 to 12 months, while in 54 ears, it was 12 months or longer. The frequency of recurrence rate decreased with increasing tympanostomy tube extrusion time. Category A had greater recurrence rates (37.45%) than Category B (18.47%) and category C (10.01%), according to the statistical analysis of the three groups. The rates of recurrence differed statistically significantly between category A and category B and between category A and C ($p = 0.03$, $p = 0.0023$, respectively) (Table 2).

When the rates of recurrence by sex were evaluated, the rates for men and women were 10.1% and 12%, respectively, with a statistically insignificant difference (odds ratio: 0.68; 95% confidence interval: 0.3–1.7; $p = 0.398$) (Table 3). Four patients (4.4%) in the preschoolers age group and fifteen patients (16.3%) in the school age group had OME relapse. The frequency of recurrence of both of these groups did not differ significantly once more (odds ratio: 2.52; 95% confidence interval: 0.69–6.56; $p = 0.237$) (Table 3).

Table 1: Study Population and Procedures

Category	Value
Total ears included in the study	168
Total children included in the study	90
Female children	36 (39.6%)
Male children	53 (58.2%)
Unilateral tympanostomy tube insertion	12 patients (13.38%)
Age range for first tube implantation	4–17 years
Mean age for first tube implantation	8.43 ± 2.25 years
Monitoring period after tube insertion	7–77 months (median 24.43 ± 15.69 months)
Average tube retention period	9.76 ± 5.44 months (range: 2 to 28 months)
Adenotonsillectomy/adenoidectomy during tube placement	85 cases (93.41%)
Only tympanostomy tube insertion (no adenoid hypertrophy)	8 individuals (8.96%)

Table 2: Tube Extrusion and Recurrence Rates

Category	Value
Repeated OME after tube extrusion	38 ears (21.0%) out of 20 individuals
Extrusion time less than 6 months (Category A)	52 ears

Extrusion time 7 to 13 months (Category B)	63 ears
Extrusion time 13 months or longer (Category C)	54 ears
Recurrence rate in Category A	37.45%
Recurrence rate in Category B	18.47%
Recurrence rate in Category C	10.01%
Statistical significance between Category A and B	p = 0.03
Statistical significance between Category A and C	p = 0.0023

Table 3: Recurrence Rates by Sex and Age Group

Category	Value
Recurrence rate for males	10.1%
Recurrence rate for females	12%
Statistical significance of recurrence rates by sex	p = 0.398
OME relapse in preschoolers age group	4 patients (4.4%)
OME relapse in school age group	15 patients (16.3%)
Statistical significance of recurrence rates by age group	p = 0.237

DISCUSSION

One of the most common surgical treatments for kids is myringotomy with tympanostomy tube insertion, which is carried out when medical therapy fails or when the middle ear effusion does not resolve on its own.¹¹ Despite the fact that this surgery is frequently carried out, opinions on the ideal kind of tubes to use, when to remove the tubes, how long to leave them in position, and the outcome of adenoidectomy are all disputed. There were several tympanostomy tubes used. “Shepard, Armstrong, Shah, Sheey, Reuter Bobbin, Donaldson, and Paparella type I” are examples of short-term tubes; Paparella type II, Butterfly, Per-Lee, and Goode T-tubes are examples of long-term tubes.¹² In comparison with short-term tubes, long-term tubes are more likely to experience tympanostomy tube-related problems like cholesteatoma, chronic perforation, and otorrhea. But with short-term tubes, OME relapse following tympanostomy tube extrusion is more common.¹³

According to earlier research, the following factors increase the risk of chronic OME: ear diseases in a family member's immune system function, preschool attendance, adenoidectomy and/or tonsillectomy, exposure to second hand smoke, and anomalies of the craniofacial region. Birth features (birth weight, birth length, and gestational age) were not found to be statistically significantly correlated with the recurrence of OME.¹⁴ As in numerous other research, men in the study had a higher likelihood than female patients of having a tympanostomy tube inserted.¹⁵ Gender was not associated with an increased likelihood of repeat tube inserting. Nonetheless, adenoidectomy was found to lessen the requirement for additional tympanostomy tube insertion in two investigations.^{16,17} Rosenfeld RM and colleagues advised adenoidectomy for kids with recurring OME following tympanostomy tube extrusion.¹⁸ If Valtonen and colleagues reinserted the tympanostomy tubes, they conducted an adenoidectomy.¹⁹ Due to a lack of individuals who undergone breathing tube insertion without adenoidectomy, we were unable to investigate the relationship between rate of recurrence and adenoidectomy.

The likelihood of an OME recurrence is unrelated to the age at surgery. Furthermore, it was discovered that children's OME recurrence rate was higher between the ages of 2 and 5 than it was between 7 and 8 years. Kalcioğlu MT and colleagues discovered that in younger patients at the time of first tympanostomy tube implantation, the likelihood of undergoing second tube insertion owing to recurrent OME increased considerably.²⁰ According to another investigation, the chance of needing more tympanostomy tube insertions rose if the kid was under 18 months old when the first tube was inserted.¹⁹ According to our data, the recurrence rate of OME following tube extrusion did not vary significantly by age. However, since no kids under the age of three were included in this research, the results might alter in a broader sample with participants who are young. Valtonen and colleagues¹⁹ found that 53.2% of ears with OME underwent repeated tympanostomy tube implantation. Within a

minimal monitoring of 2 years following their initial procedure, one in five children needed reinsertion, according to Shareef and colleagues.²¹ The mean length of intubation and the rate of OME relapse were examined for three distinct types of tubes “Shepard grommet, Good-T tube, and Paparella type II”.²² It was discovered that the mean functional durations for Shepard were 5.9 months, the Good-T tube was 10.7 months, and the Paparella type II was 15.1 months.

Compared to the other two tubes, Shepard grommets had greater rates of recurrence.²³ T-tubes were employed in the medical therapy of children with OME.²⁴ They discovered that the tubes had been kept for a full twenty-month span. 4.9% of ears required reinsertion because the effusion had recurred.²⁵ After the first tympanostomy tube insertion, a study found that the single tube insertion group experienced lengthier mean intubation periods compared to the triple tube insertion group.²⁶ The average duration of the tubes' placement in the current study was roughly 8.5 months. 20.7% of ears experienced recurrences following the extrusion of Shepard tubes. When our three categories were compared, it became clear that individuals whose tympanostomy tube extrusion duration was shorter than six months had the greatest recurrence rates. We found that the more time that the tympanostomy tubes were left in place, the lower the relapse rates.

CONCLUSION

When tympanostomy tubes are extruded, parents' kids with OME ought to be made aware of the potential for effusion recurrence and the necessity of re-insertion of the tubes. It's also important to highlight the risks associated with tubes. Following the extrusion of tympanostomy tubes, kids should undergo routine follow-up to ensure that OME doesn't reoccur. A tube type with the lowest incidence of complications and recurrence is optimal for treating OME. The relation among the incidence of OME recurrence and the ideal length of tympanostomy tube retention requires more research. As a result, additional research including bigger series is required to examine the relationship between various tympanostomy tubes and frequency of recurrence following tube extrusion.

REFERENCES

1. Saad K, Abdelmoghny A, Abdel-Raheem YF, Gad EF, Elhoufey A. Prevalence and associated risk factors of recurrent otitis media with effusion in children in Upper Egypt. *World Journal of Otorhinolaryngology-Head and Neck Surgery*. 2021 Oct 1;7(04):280-4.
2. Altıntaş M, Bayar Muluk N, Peng KA. What Is the Significance of Rhinitis in Otitis Media with Effusion?. *Challenges in Rhinology*. 2021:159-68.
3. Brown TH. Childhood hearing impairment. *Paediatrics and Child health*. 2020 Jan 1;30(1):6-13.
4. Feng Y, Meng YP, Dong YY, Qiu CY, Cheng L. Management of allergic rhinitis with leukotriene receptor antagonists versus selective H1-antihistamines: a meta-analysis of current evidence. *Allergy, Asthma & Clinical Immunology*. 2021 Dec;17:1-2.
5. Satoh C, Toizumi M, Nguyen HA, Hara M, Bui MX, Iwasaki C, Takegata M, Kitamura N, Suzuki M, Hashizume M, Dang DA. Prevalence and characteristics of children with otitis media with effusion in Vietnam. *Vaccine*. 2021 May 6;39(19):2613-9.
6. Al-Salim S, Tempero RM, Johnson H, Merchant GR. Audiologic profiles of children with otitis media with effusion. *Ear and hearing*. 2021 Sep 1;42(5):1195-207.
7. Arumugam K. Managing paediatric otitis media with effusion: systematic review. *Int J Acad Med Pharm*. 2023;5(4):1131-5.
8. Rosenfeld RM, Tunkel DE, Schwartz SR, Anne S, Bishop CE, Chelius DC, Hackell J, Hunter LL, Keppel KL, Kim AH, Kim TW. Clinical practice guideline: tympanostomy tubes in children (update). *Otolaryngology–Head and Neck Surgery*. 2022 Feb;166:S1-55.
9. Nagar RR, Deshmukh PT. An overview of the tympanostomy tube. *Cureus*. 2022 Oct;14(10).
10. Al Sheeyab HA, Belkhair HA, Assanousi AA. Complications of ventilation tube insertion in otitis media with effusion.
11. Sanudin SH, Hashim ND, Abdullah A. Clinical Review of Myringotomy and Tympanostomy Tube Insertion among Pediatric Patients at Ukm Medical Centre. *International Medical Journal*. 2020 Jun 1;27(3).

12. Pauna HF, Monsanto RC, Oyama LA, Chornobay AP, Salvi K, Sasaki LT, Paparella MM. Post-Tympanostomy Tube Otorrhea and Other Complications. In *Textbook of Otitis Media: The Basics and Beyond* 2023 Dec 30 (pp. 223-231). Cham: Springer International Publishing.
13. Stanton E, Kondra K, Brahme I, Lasky S, Munabi NC, Jimenez C, Jacob L, Urata MM, Hammoudeh JA, Magee III WP. Tympanostomy Tubes: Are They Necessary? A Systematic Review on Implementation in Cleft Care. *The Cleft Palate Craniofacial Journal*. 2023 Apr;60(4):430-45.
14. de Sousa FA, Castro AD, Machado AS, Pinto AN, Coutinho MB, e Sousa CA. Anthropometry: A clue for Otorhinolaryngology surgical indications in children. *International Journal of Pediatric Otorhinolaryngology*. 2020 Dec 1;139:110421.
15. Hancock S, Allen P, Faria J, Vandjelovic N, Benoit MM. Adenoidectomy may decrease the need for a third set of tympanostomy tubes in children. *International Journal of Pediatric Otorhinolaryngology*. 2022 Jun 1;157:111130.
16. Goel AN, Omorogbe A, Hackett A, Rothschild MA, Londino III AV. Risk factors for multiple tympanostomy tube placements in children: systematic review and meta-analysis. *The Laryngoscope*. 2021 Jul;131(7):E2363-70.
17. El Begermi MA, El Begermi MM, Kassamy H. The effect of endoscopic peritubal adenoidectomy vs myringotomy with ventilation tubes insertion in management of otitis media with effusion in children. *Egyptian Journal of Ear, Nose, Throat and Allied Sciences*. 2022 Jan 1;23(23):1-0.
18. Rosenfeld RM, Tunkel DE, Schwartz SR, Anne S, Bishop CE, Chelius DC, Hackell J, Hunter LL, Keppel KL, Kim AH, Kim TW. Clinical practice guideline: tympanostomy tubes in children (update). *Otolaryngology—Head and Neck Surgery*. 2022 Feb;166:S1-55.
19. Valtonen HJ, Qvarnberg YH, Nuutinen J. Otological and audiological outcomes five years after tympanostomy in early childhood. *The Laryngoscope*. 2002 Apr;112(4):669-75.
20. Kalcioğlu MT, Cokkeser Y, Kizilay A, Ozturan O. Follow-up of 366 ears after tympanostomy tube insertion: why is it draining?. *Otolaryngology—Head and Neck Surgery*. 2003 Apr;128(4):560-4.
21. Shareef A, Langenfeld T, Hill M, Vachhrajani S, Elluru R. Efficacy of tympanostomy tube placement with adjuvant adenoidectomy in children less than 4 years of age. *International Journal of Pediatric Otorhinolaryngology*. 2024 Jan 1;176:111823.
22. Otsuka S, Imai R, Kamakura T, Nishimura H, Osaki Y, Furukawa M, Yasui T, Yamashita M, Nakamura M, Iwamoto Y, Kanazu K. How long do tympanostomy ventilation tubes last in pediatric patients with otitis media with effusion or adhesion? A study using Kaplan-Meier survival analysis. *International Journal of Pediatric Otorhinolaryngology*. 2022 Aug 1;159:111210.
23. Riad HA, Shady EF, Elnems MG, Ahmed RM, Eldsouky SM. Early Extrusion of Grommet Tubes and its Impact on Eustachian Tubes of Children. *The Egyptian Journal of Hospital Medicine (January 2024)*. 2024 Jan 1;94:42-6.
24. Norhafizah S, Salina H, Goh BS. Prevalence of allergic rhinitis in children with otitis media with effusion. *Eur Ann Allergy Clin Immunol*. 2020 May 5;52(3):121-30.
25. Yaman H, Yilmaz S, Guclu E, Subasi B, Alkan N, Ozturk O. Otitis media with effusion: recurrence after tympanostomy tube extrusion. *International journal of pediatric otorhinolaryngology*. 2010 Mar 1;74(3):271-4.
26. Ferlito S, Cocuzza S, Grillo C, La Mantia I, Gulino A, Galletti B, Coco S, Renna C, Cipolla F, Di Luca M, Maniaci A. Complications and sequelae following tympanostomy tube placement in children with effusion otitis media: Single center experience and review of literature. *Acta Medica Mediterranea*. 2020 Jan 1;36(3):1905-12.