

Pediatric otitis media with effusion: a comparative study of effective treatment

Abstract

Introduction: Otitis media with effusion (OME) is one of the most common diagnoses in children. Adenoidectomy +/- Myringotomy +/- Tympanostomy tubes are daily procedures in our practice to treat such condition.

Objectives: Primary aim: to examine efficacy of different surgical treatment modalities in different pediatric age groups, secondary aim: to see whether patient's age can be considered as a predicting factor affecting surgical option selection, and to compare rate of tubes reinsertion in different surgical modalities.

Methods: Retrospective, cross-sectional analysis of consecutive children with otitis media with effusion (OME), had As +/- M +/- TT, from May, 2010 till August, 2013. By using electronic database and patient's charts, all patients younger than 18 years of age and had a minimal follow up of 12 months were included in our study. We excluded children with acute recurrent or adhesive OM, and cholesteatoma. Collected Data includes demographics, symptoms at presentation, age at initial and repeated MTT, and duration till tubes extruded.

Results: Total 303 cases included. Three groups identified based on performed surgery. 50.2% of children had As + MTT, those were children average 7.7 years of age, and they were younger than the group that had MTT alone by two years (p-value = 6.097x10⁻⁵), and had TT reinsertion rate of 15%. In comparison, MTT group had a reinsertion rate was 18.2%, and As + M with no tubes cases were average of 5.7 years of age at time of first procedure, and were younger than those who had M alone by almost 5 years (p-value = 5.535x10⁻¹⁷). As + M group had the highest recurrence rate among all studies group (22%). In all the groups and regardless of the surgical modalities, reinsertion rate was related to early tubes extrusion.

Conclusion: This is the first and only study carried out in Arabian Peninsula, addressed efficacy of different surgical procedures in treatment of OME, and highlights the possibility of utilizing patient's age at presentation as predicting for the most effective surgical options selected. When taking into consideration known risk factors, reoperation can be avoided in some cases.

Keywords: pediatric otitis media, otitis media with effusion, myringotomy, myringotomy and tympanostomy tubes insertion, acute otitis media

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Abbreviations: OME, otitis media with effusion; AOM, acute otitis media; VTI, ventilation tube insertion; MTT, myringotomy and tympanostomy tubes insertion; M + As, myringotomy with adenoidectomy; As, adenoidectomy

Introduction

Otitis media with effusion (OME) is one of the most common diagnoses in all Otolaryngology, Head and Neck Surgery clinics. It is defined as infection with fluid accumulation in the middle ear, without fever, otorrhea or otalgia.¹ When plotted against age, it has a bimodal frequency distribution, with the number of cases peaking at 2 and 5 years of age,¹⁻⁵ and in about 40-70% of preschool children.⁶⁻⁸ OME has been correlated with immaturation of the anatomic and physiologic structures of eustachian tube (ET) and the immune system.⁴ Presentation of OME after acute otitis media (AOM) is almost universal.⁹ Recurrent AOM is defined as four or more episodes in one year or three or more episodes in six months. Trial of medical treatment starts for about three months, and surgical option are saved for failed medically treated group, in form of myringotomy and ventilation tube insertion (VTI) with or without adenoidectomy (As).¹⁰⁻¹¹ Persistence rate of OME is 40% at 30days and 10% at 90days after onset of effusion.^{5,7,9}

Objective

The objective of this study is firstly to examine the efficacy of different surgical procedures namely; myringotomy and tympanostomy tubes insertion (MTT), adenoidectomy with (MTT + As), myringotomy alone (M), and myringotomy with adenoidectomy (M + As), secondly, to determine the risk factors that are specific to patients underwent each surgical procedure, and finally to compare the rate of repeated procedure of myringotomy +/- tympanostomy tube placement in each procedure separately.

Methods and materials

This study was retrospective, cross sectional analysis of consecutive surgical cases of myringotomies and tympanostomy tube insertion (MTT), adenoidectomy with tympanostomy tubes insertion (As + MTT), myringotomy alone (M), and myringotomy with adenoidectomy (M + As) for otitis media with effusion (OME) during the period between May, 2010 and August, 2013. The data was collected from electronic surgical database (MedicaPlus) and patient medical records. The study subjects included children, up to 18years of age, who underwent myringotomy under general anesthesia for with persistent OME who did not respond to 3months

trial of medical therapy or watchful waiting and met the indications criteria for tympanostomy tubes insertion. The study groups were either patients who had MTT alone or with adenoidectomy, and those who had M alone with or without adenoidectomy under GA in our advanced secondary hospital and had a minimum of one year follow up after the surgical procedure. Children with acute otitis media, recurrent acute otitis media, adhesive otitis media, or cholesteatoma were excluded from the analysis. In addition to that, those who lost follow up and those who had their operations modified in the same day of OR because the ear effusion resolved clinically were also among the excluded patients. Patient demographics, and age at the initial and repeat MTT were done and the duration till tube extruded. Descriptive statistics was used to interpret the results as well as inferential statistics, using SPSS-21, t-Test, Two-Sample Assuming Equal Variances used to measure p-value between MTT & As + MTT, and M & As +M separately.

Results

Total of 336 consecutive lists of children who underwent general anesthesia, and received bilateral myringotomy alone or as along with other surgical procedures. Only 303 children (90%) met our inclusion criteria and were included in this study. Out of those 303 patients, about 90% that is 270 medical records could be traced and reviewed. There were 186 boys and 84 girls that is 68.9% and 31.1%, respectively, that is about 2.2:1. More than half of the patients 63.7%, 178 patients, had myringotomy with tympanostomy tubes insertion alone or in combination with adenoidectomy. The total children who were included in our study was divided into four groups according to the surgical procedures performed (Table 1): Myringotomy with tympanostomy tube insertion (MTT) (21.5%);

1. Myringotomy with tympanostomy tube insertion and adenoidectomy (MTT + As) (69.6 %);
2. Myringotomy alone with no tympanostomy tubes insertion (M) (2.6%);
3. Myringotomy and adenoidectomy with no tympanostomy tube insertion (M + As) (6.3%).

For simplicity in comparing our groups, we divided them into two major ones with subdivisions, the first group includes 246 patients underwent myringotomy and tympanostomy tubes insertion, with or without adenoidectomy (MTT & MTT + As). The second group includes 24 patients who had myringotomy alone, with no tympanostomy, tubes insertion, with or without adenoidectomy (M & M + As). The study sample thus classified into four groups according to the performed surgical modalities; MTT, MTT + As, M, and M + As Table 2 A common observation in all four groups of patients included in our study that there is male predominance. Average age of patients at surgical intervention was ranging from 5.66years in M + As group to 10.43years in M group of patients. Initial age of presentation to our hospital was as young as 4years of age in children who had myringotomy with no tympanostomy tubes insertion, alone or in combination with adenoidectomy, and as high as 12years in pediatric patients who had tympanostomy tube insertion along with adenoidectomy. The mean follow up period was low in patients had myringotomy alone, and those patients were followed up in our clinic for 8months in average, while those patients who had adenoidectomy with tympanostomy tube insertion were followed up for about two years in our ENT clinic. Snoring, decrease hearing, mouth breathing and sleep disorder breathing were the main symptoms in all patients ranging in severity. In this study, our patients did not experienced

speech delay except for the ones underwent myringotomy they had up to 100% of delay in their speech.

Of the 270 cases included in our study, and by comparing age of children at their first procedure, those who had As + MTT had average 7.7years of age, and they were younger than the group that had MTT alone by two years (p-value = 6.097x10-5) as shown in Table 3, and had TT reinsertion rate of 15%. In comparison, MTT group had a reinsertion rate was 18.2%, and As + M with no tubes cases were average of 5.7years of age at time of first procedure, and were younger than those who had M alone by almost 5years (p-value = 5.535x10-17) as demonstrated in Table 4. In regards to the rate of tubes reinsertion, about 70% of children, had MTT + As, and had tympanostomy tubes reinsertion rate of 15%. In comparison, rate of tubes reinsertion in group had MTT with no adenoidectomy was 18.2%, with the higher reinsertion rate was in As + M with no tubes cases (22%). In all studied groups, reinsertion rate was related to early tubes extrusion.

Table 2 Number of the patients required tympanostomy tube reinsertion, with percentage, in relation to the performed surgical procedure

Performed Procedure (No. of patients)	No. of patients Needed TT Re-insertion (%)
MTT + As (188 pts.)	29(15.4%)
MTT (58 pts.)	11(18.9%)
M + As (17 pts.)	1 (5.9%)
M (7 pts.)	0 (0%)

MTT: Myringotomy and Tympanostomy Tubes insertion; As+ MTT: Myringotomy and Tympanostomy with Adenoidectomy; M: Myringotomy; As+ M: Myringotomy with Adenoidectomy

Table 3 Statistical analysis using TWO-Sample Assuming Equal Variances and comparing two groups; Variable 1 is the study group who had myringotomy and tubes insertion (MTT), and Variable 2 is those who had adenoidectomy with myringotomy and tubes insertion (As + MTT)

	Variable 1	Variable 2
Mean	10.14286	7.710843
Variance	14.47899	5.890979
Observations	35	83
Pooled Variance	8.408155	
Hypothesized Mean Difference	0	
Df	116	
t Stat	4.161479	
P(T<=t) one-tail	3.05E-05	
t Critical one-tail	1.658096	
P(T<=t) two-tail	6.10E-05	
t Critical two-tail	1.980626	

Discussion

Otitis media with effusion is known to be the most common cause of hearing loss in children about 25 dB.^{12,13} Recurrent AOM is defined as 3 episodes in 6months or 4 in 12months.¹² OME is characterized by a high rate of spontaneous recovery but also by a high rate of recurrence.^{1,14} Otitis media with effusion has a resolution rates with or without medical treatment about 22-30 % to 70% and 90 %, at 1, 2 and 3 months respectively.^{6,15-17} In previous studies showed multiple factors contributes in recurrent OME as attending day cares,

secondary household smoker, GERD and craniofacial anomalies.^{3,10} Myringotomy with tympanostomy tube insertion with or without adenoidectomy is performed after failed medical treatment.^{10,11,18} Although myringotomy with tympanostomy tubes is a common procedure, there is no reported effective length of tube stay, time to remove the tube, nor guidelines in adding adenoidectomy at time of surgery.¹ Multiple minor complications were noticed regarding this common surgery as otorrhea and persistence perforation or major as far as cholesteatoma.^{10-14,18,19} Some children will continue having acute episodes of ear infections despite parent education about risk factors. Myringotomy and placement of ventilation tubes, adenoidectomy, or both are management options for those children. For most children the goal is to prevent recurrence cases and prevent further complications.¹² Different management modalities still remains a physician judgment and patient's situation, and advised to discuss the relative pros and cons of various treatment options with the parents. Antimicrobial treatment has high rates of short-term resolution.^{20,21} The rationale for performing adenoidectomy in the treatment of persistent otitis media with effusion in addition to myringotomy and tympanostomy tubes insertion includes the reduction of nasal obstruction, improve eustachian tube function, and removal of chronic nidus of infection from nasopharynx.^{2,15-17,22,23}

Table 4 Statistical analysis using TWO-Sample Assuming Equal Variances and comparing two groups; Variable 1 is the study group who had myringotomy alone with no tubes insertion (M), and Variable 2 is those who had adenoidectomy with myringotomy with no tubes insertion (As + M)

	Variable 1	Variable 2
Mean	10.43333	5.662651
Variance	9.909195	3.397003
Observations	30	83
Pooled Variance	5.098386	
Hypothesized Mean Difference	0	
df	111	
t Stat	9.918012	
P(T<=t) one-tail	2.77E-17	
t Critical one-tail	1.658697	
P(T<=t) two-tail	5.54E-17	
t Critical two-tail	1.981567	

In our study, the age of the patient at the first surgical procedure found to be significant among the patients who had adenoidectomy versus those who did not had adenoidectomy in both myringotomy group and myringotomy with tympanostomy tubes groups as demonstrated by low p-values, Thus age of patients at their first surgical procedure can be taken as predicting factor affecting the physician choice of the surgical options. The younger patients were those who had adenoidectomy and myringotomy alone with no tubes insertion followed by those who had adenoidectomy and myringotomy with tympanostomy tubes insertion (5.66years & 7.71years respectively), while the older children were those who had myringotomy alone followed by those who had myringotomy with tympanostomy tubes insertion (10.43years & 10.14year respectively).

Limitations of our study includes being retrospective, where the patient risk factors could not be controlled, in addition to this small number of cases make the statistical power low.

Conclusion

Otitis media with effusion is the most common cause of hearing loss in children. Many surgical modalities are available but still choice remains based on a physician judgment and patient's situation.

This study addressed efficacy of different surgical procedures in treatment of OME, and highlight the possibility of utilizing patient's age at presentation as predicting for the most effective surgical options selected. When taking into consideration known risk factors, reoperation can be avoided in some cases.

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Conflicts of interest

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