

Original Research Article

Assessment of hearing outcomes in pre-adolescent cases of otitis media with effusion treated with adenoidectomy

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ABSTRACT

Background: Otitis media with effusion is one of the most common presenting features in children coming to the otorhinolaryngology outpatient with a variety of medical and surgical treatment modalities being offered. This study aims to evaluate post-adenoidectomy hearing outcomes in cases of otitis media with effusion in an attempt to provide long term benefits.

Methods: It is a prospective study of 50 pre-adolescent cases in a tertiary care hospital. Pure tone audiometry and tympanometry was performed pre-operatively as well as at regular follow up intervals after adenoidectomy (along with tonsillectomy when indicated). The mean improvement in hearing outcomes was evaluated.

Results: The mean hearing improvement when compared to baseline pre-op air-bone gap values were 8.4 ± 6.35 , 8.6 ± 6.39 , 8.1 ± 6.99 at 15th day, 1 month and 2 months post op respectively. There was also a significant shift of tympanometry curves from types B and C pre-op to types A and B 6 months post-op.

Conclusions: Adenoidectomy, along with tonsillectomy when indicated, in children with hypertrophied adenoids as well as otitis media with effusion offers very good, long-standing hearing improvement and should always be considered in such patients so as to improve eustachian tube function and eradicate possible source of infection.

Keywords: Paediatric otorhinolaryngology, Otitis media with effusion, Adenoidectomy, Serous otitis media

INTRODUCTION

Otitis media with effusion is one of the most common medical problems seen in childhood. It is the leading cause for office visits, a common reason for prescribing antibiotics and the most frequent reason that children undergo surgery.^{1,2} There are many challenges in the management of an otitis-prone child. Increasing antibiotic consumption has been shown to be related to the emerging phenomenon of antimicrobial resistance.³

Surgical therapy is more cost effective than medical and historically, myringotomy with or without tympanostomy tube placement, adenoidectomy and even tonsillectomy has been advocated.⁴ The leading cause for hearing loss in

children is otitis media with effusion, eustachian tube dysfunction being the primary pathological factor. Adenoidectomy is beneficial in these children as it relieves nasal obstruction, mouth breathing and improves ET function. This study aims at assessing the incidence and effect of adenoidectomy in cases of otitis media with effusion along with hypertrophied adenoids in a tertiary care set up in India.

METHODS

The study was conducted by the department of otorhinolaryngology at a tertiary care set-up in India between November 2020 to April 2021. A total of fifty cases (both male and female children between the age

group of 5-12 years who were diagnosed to have bilateral serous otitis media were taken into the study. Presence of serous otitis media was confirmed by a detailed ENT examination, otoscopy, pure tone audiometry, impedance audiometry and adenoid hypertrophy was confirmed by X-ray nasopharynx and diagnostic nasal endoscopy (DNE). Patients with acute suppurative otitis media and those with congenital deformity-cleft lip, Down syndrome and craniofacial anomalies were excluded from the study.

Pure tone audiometry (PTA) was used to assess the hearing threshold of both ears. The average of air conduction at 500 Hz, 1000 Hz, 2000 Hz and 4000 Hz was taken. Elkon Giga 3 was the pure tone audiometer used.

Hearing impairment was classified as per Clark's classification- normal: 10-15 dB HL; minimal: 16-25 dB HL; mild: 26-40 dB HL; and moderate: 41-55 dB HL.⁵

Tympanometry was done in all children after confirming the patency of external auditory canal. 226dB probe tone was used and pressure range between -400 to +200 daPa were recorded. The graphs obtained were noted as: Type A- normal compliance, type B-OME, type C1 and type C2-suggestive of reduced compliance or early stages of otitis media with effusion.

The simplest type peaked/no-peaked classification was used to quantify results.⁶

All patients were managed medically with intranasal steroids and antihistaminics for a maximum of 3 months after which surgery was considered. Adenoidectomy and when indication were present, tonsillectomy was performed under general anaesthesia.

Adenoids were shaved with adenoid curette taking care not to injure the eustachian tube opening in the nasopharynx. Complete removal was confirmed with endoscopy. Tonsillectomy was done with dissection and snare method. During the postoperative period all patients were treated with antibiotics, decongestants and antihistamines. They were discharged after 24 hours.

All patients were followed up after one week to assess post-operative healing and then at 15th day, 1st, 3rd and 6th month after surgery, PTA was done to assess improvement in hearing at 15th day post op, 1 month post op and 2 months post op. Impedance audiometry was also done at 6th month to see for occurrence of peak. Patients with any respiratory infection during this period were managed accordingly.

Data was tabulated on Microsoft excel and statistical analysis was done using the SPSS software version 22 (IBM SPSS Statistics, Somers NY, USA). Categorical data was represented in the form of frequencies and proportions. Chi square test or Fischer's Exact test was

used as test of significance for qualitative data. Continuous data was represented as mean and standard deviation. ANOVA was used as the test of significance to identify the mean difference between more than two quantitative variables. Pre and post op PTA and tympanometry results were compared. $P < 0.05$ was considered as statistically significant.

RESULTS

A total of 50 cases were included in the study, out of which 56% were male and 44% were female. The mean age of the study population was 7.52 ± 2.41 years with 60% of the patients between 5-7 years, 22% of the patients between 8-10 years and 18% of the patients between 11-12 years. The most common presenting complaints in our cohort were sore throat (78%), nasal discharge (66%), snoring/nasal obstruction (50%), deafness (40%) and ear fullness (24%). On otoscopic examination, 78% had a dull amber coloured tympanic membrane. Retraction of tympanic membrane was seen in 50% and air bubbles were seen in 10%. It was noted that 78% of the study population had associated tonsillar hypertrophy with recurrent attacks of acute tonsillitis. These patients underwent adenotonsillectomy while the remaining 22% of our cohort underwent adenoidectomy alone.

Table 1 depicts the different tympanometry curves that were observed in our study population in pre op and 6 months post-op period for the right and left ears separately. There was a shift from predominantly B type of curve and no cases with a normal type A curve in pre-op period to around 25-30% patients achieving type A curve post-surgery and a reduction in the number of patients with type B curve. Interestingly, there was a slight increase in the number of patients with type C curve in the post-op period. However, this change was not found to be statistically significant.

Table 1: Pre and post op tympanometry among the study population.

Tympanometry curve	Pre-op, n (%)	Post-op, n (%)
Type A		
Right	0	15 (30)
Left	0	12 (24)
Type B		
Right	44 (88)	28 (56)
Left	42 (84)	29 (58)
Type C		
Right	6 (12)	7 (14)
Left	8 (16)	9 (18)

Table 2 depicts the pure tone audiometry average air-bone gap obtained in right and left ears separately among our study population at various time intervals. The table also depicts the mean hearing improvement when compared to baseline pre-operative air-bone gap values.

It was noted that there was a statistically significant improvement in hearing at 15 days post-op, 1 month post op and 2 months post op intervals as compared to the pre-operative hearing levels.

Table 2: Average air-bone gap at various time intervals and the mean hearing improvement.

Air bone gap average (in dB)			Mean hearing improvement (Compared to pre-op values)	P value
Pre-op	Right	16.3	----	
	Left	24.4		
15 days post op	Right	12.3	8.4±6.35	<0.001
	Left	11.6		
1 month post op	Right	12	8.6±6.39	<0.001
	Left	11.5		
2 months post op	Right	12.2	8.1±6.99	<0.001
	Left	12.3		

Therefore, our study saw a statistically significant improvement in both hearing as well as tympanometry in children with otitis media with effusion as well as adenoid hypertrophy who underwent adenoidectomy.

DISCUSSION

A prospective study of fifty cases of otitis media with effusion with adenoid hypertrophy was done to assess the effect of adenoidectomy alone in improvement of hearing.

Our study included children aged 5-12 years. Majority were in the age group of 5-7 years with a mean age of 7.5 years. This goes in hand with other studies in literature which confer that the common age group for adenoid hypertrophy with associated otitis media with effusion is 5-7 years.^{7,8}

Like in our study, it has also been postulated by others that there is a male preponderance to otitis media with effusion due to higher rates of childhood infections in males.⁹ In 1997 Paradise et al reported that there is no apparent gender-based difference in the incidence of otitis media with effusion.¹⁰

The 78% of children presented with features of associated tonsillitis and 38% with associated sinusitis. Koko in 1974 reported that 20.5% cases with SOM had features of sinusitis and 5.8% had tonsillitis.¹¹ The higher incidence of tonsillitis in our study can be attributed to poor hygienic living conditions as most of children belonged to low socioeconomic status.

Most of children in our study had very mild hearing loss according to Clark's classification with averages in the range of 15-20 dB. Several studies in literature have also

demonstrated a mild to moderate conductive hearing loss in otitis media with effusion.¹²⁻¹⁵

This can be explained by the physiological mechanism of hearing that occurs in the middle ear. While the presence of fluid dampens the travelling sound wave in the form of vibrations of the ossicles, there is only mild to moderate impairment in hearing as the structural integrity of the tympanic membrane and the ossicles.

Impedance audiometry plays a major role in the screening for otitis media with effusion. According to Renvall et al stapedial reflex is considered too sensitive to be used as a screening test in the diagnosis of SOM.¹⁶

In our study, most children had type B curve. Fria et al in 1977 reported that 84% diagnostic predictability can be attained by using this no peak/peak criteria.¹⁷ Maw in 1986 observed that adenoidectomy alone produced no peak/peak conversion in 29.8% of children.¹⁸ Bluestone in 1976 observed that Eustachian tube function improved after adenoidectomy.¹⁹ Maw in 1983 reported that adenoidectomy had a significant therapeutic effect in resolving the effusion in 36-46% of cases of resistant SOM.²⁰

The benefit of adenoidectomy could be due to reduction of the bacterial reservoir of the nasopharynx and it also relieves obstruction of the nasopharyngeal end of eustachian tube leading to better ventilation of the middle ear. The beneficial effect of tonsillectomy could be due to reduction of ascending infection. Coyle et al also concluded that adenoidectomy is a useful procedure for correction of medically resistant chronic SOM and should be considered as the first line procedure when surgical treatment is chosen.²¹

Paradise and others examined the effect of adenoidectomy in two groups of children with OME recurring after tympanostomy tube placement. In both the groups, the outcome for the children who underwent adenoidectomy were statistically better than for the control children for both follow up years, with greater differences in first than the second year.²² Maw randomly assigned 103 children from 2-12 years of age with bilateral OME to one of 3 groups: adenotonsillectomy (n=34), adenoidectomy (n=36) or neither (n=33). At surgery, one ear was randomly assigned to receive a tympanostomy tube. At 3, 6, 9 and 12 months, the clearance of effusion in unoperated ear was recorded. The difference between the two surgical groups and control groups was significant, but the difference between adenotonsillectomy and adenoidectomy group was not.²⁰

Myringotomy with ventilation tube insertion for SOM is the commonest procedure in children. The ventilation tube have their own problems. Complications that have been commonly reported in literature include infection, tympanosclerosis, persistent perforation and medial displacement of ventilation tube in middle ear. Studies

have reported otorrhea in 5-18% of the cases^{23,24} and incidence of tympanosclerosis as high as 40% with permanent perforation in up to 5% of the patients.²⁵ A single Shephard tube alone gives a short-lived effect of 10 months whereas adenoidectomy produces a significantly longer lasting effect for several years.²⁶ Myringotomy and aspiration of fluid in some studies has shown dry tap rate up to 34%.²⁷ Relationship between nasopharyngeal dimensions and the presence of otitis media with effusion has been shown.²⁸ Adenoidectomy in children having hypertrophied adenoids with serous otitis media, not only relieves eustachian tube obstruction but also removes source of infection. This helps in the clearance of middle ear effusion and thus improvement in hearing postoperatively.

Based on these observations we performed adenoidectomy in all patients and tonsillectomy when indication was present. During follow up, audiometry showed that there was significant improvement in hearing and reduction in A-B gap.

While our study helps in furthering the pre-existing literature on these common paediatric ENT disorders, it is not without shortcomings of its own. A larger sample size in a multicentric setting would offer more concrete results. The effect of medical management in terms of intranasal steroids, antihistaminic or antibiotics were not considered in the study. Other contributing factors such as allergic rhinitis, deviated nasal septum etc were also not taken into consideration in our inclusion and exclusion criteria. Nevertheless, this study hopes to contribute in clinical decision making in such cases.

CONCLUSION

Adenoidectomy, along with tonsillectomy when indicated, in children with hypertrophied adenoids as well as otitis media with effusion offers very good, long-standing hearing improvement and should always be considered in such patients so as to improve eustachian tube function and eradicate possible source of infection.

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REFERENCES

1. Teele DW, Klein JO, Rosner B, Bratton L, Fisch GR, Mathieu OR, et al. Middle ear disease and the practice of pediatrics. Burden during the first five years of life. JAMA. 1983;249(8):1026-9.
2. Derkay CS. Pediatric otolaryngology procedures in the United States: 1977-1987. Int J Pediatr Otorhinolaryngol. 1993;25(1):1-12.
3. Cristino JM. Correlation between consumption of antimicrobials in humans and development of resistance in bacteria. Int J Antimicrob Agents. 1999;12(3):199-202.
4. Gates GA. Acute otitis media and otitis media with effusion. In: Cummings CW, Flint PW, Haughey BH, Robbins KT, Thomas JR, Harker LA, et al eds. Pediatric Otolaryngology: Head and Neck Surgery. 4th ed. USA: Mosby; 2005: 4445-468.
5. Clark JG. Uses and abuses of hearing loss classification. Asha. 1981;23:493-500.
6. Browning G. Otitis media with effusion, Scott-Brown's Otolaryngology. 7th ed. Great Britain, Arnold. 2008;3105-25.
7. Brooks D. School screening for MEE. Ann Otol Rhinol Laryngol. 1976;85(12):223-9.
8. Reddy VG. Secretory otitis media. Indian J otol. 1998;4(4);157-60.
9. Stangerup T. Secretory otitis and pneumatization of the mastoid process: sexual differences in the size of the mastoid air cell system. Am J Otolaryngol. 1985;6:199-205.
10. Paradise JL, Rockette HE, Colborn K. OM in 2253 Pittsburgh-area infants: Prevalence and risk factors during the first 2 years of life. Pediatr. 1997;99:318.
11. Kokko E, Palva T. Clinical results and complications of tympanostomy. Ann Otol Rhinol Laryngol. 1979.
12. Maw AR. Otitis media with effusion. Adams DA, C Innamond MJ, Scott Brown's paediatric Otolaryngology 6th ed. Oxford: Butterworth Heinemann; 1997: 671-677.
13. Fria TJ, Cantekin EI, Eichler JA. Hearing acuity of children with otitis media with effusion. Arch Otolaryngol. 1985;111(1):10-6.
14. Schilder AG, Zielhuis GA, Broek P. The otological profile of a cohort of Dutch 7.5-8-year-olds. Clin Otolaryngol. 1993;18:48-54.
15. Dempster JH, Kenzie K. Tympanometry in detection of hearing impairments associated with OME. Clin Otolaryngol. 1991;16:157-9.
16. Renvall U, Holmquist J. Tympanometry revealing middle ear pathology. Ann Otol Rhinol Laryngol. 1979;88:209-15.
17. Maw AR. Secretory Otitis Media. In Ludman H, Wright T editors. Diseases of the ear. 6th ed. London: Arnold; 2006: 361-373.
18. Maw AR and Herod F. Otoscope impedance and audiometric findings in glue ear treated by adenoidectomy and tonsillectomy. A prospective randomized study. Lancet; I 1986; 1399-1402.
19. Bluestone CD, Beery QC. Concepts on the pathogenesis of MEE. Ann Otol Rhinol Laryngol. 1976;85(25):182-6.
20. Maw AR. Chronic otitis media with effusion (glue ear) and adenotonsillectomy: a prospective randomized control study. BMJ. 1983;127:1586-8.
21. Coyle PC, Croxford R, MC Isaac W, Feldman W, Friedberg J. The role of Adjuvant adenoidectomy and tonsillectomy in the out of the insertion of tympanostomy tube. N Engl J Med. 2004;344:1188-95.

22. Paradise A. Efficacy of adenoidectomy for recurrent OM in children previously treated with tympanostomy tube placement. *J Am Med Asso*. 1990;263:2066-73.
23. Talmon Y, Gadman H, Samet A, Gilbey P, Letichevsky V. Ventilation with self-manufactured polyethylene T tubes for the treatment of children with middle ear effusion. *J Laryngol Otol*. 2001;115:699-703.
24. Hern JD, Hasnie A, Shah NS, A long term review of the shah pavement tube. *J Laryngol Otol*. 1995;109:277-80.
25. Riley DN, Herberger S, Mc Bride G, Law K. Myringotomy and ventilation tube Insertion. *J Laryngol Otol*. 1997;111:257-61.
26. Maw AR and Bawden R. A long-term study of spontaneous resolution of severe chronic glue ear in children and the effect of adenoidectomy, tonsillectomy and ventilation tubes. *BMJ*. 1993;306:756-60.
27. Black NA, Sanderson CFB, Freeland AB, Vessey MP. A randomized controlled trial of surgery for glue ear. *BMJ*. 1990;300:1551-6.
28. Maw AR. Lateral cephalometric analysis of children with OME: A comparison with age and sex matched controls. *J Laryngol Otol*. 1991;105:71-7.

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