



COMPARATIVE EVALUATION OF ADENOIDECTOMY AND MYRINGOTOMY WITH OR WITHOUT VENTILATION TUBE PLACEMENT IN THE TREATMENT OF OTITIS MEDIA WITH EFFUSION

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ABSTRACT

BACKGROUND :- OME is accumulation of non-purulent fluid in the middle ear cleft. 30-40% of children have recurrent episodes and 5-10% of cases last for more than 1 year. The primary site of pathology for OME is Eustachian tube and Adenoid hypertrophy is an important etiological factor attributed for its development. The surgical treatment of OME involves various combinations of adenoidectomy, myringotomy and ventilation tube placement. Myringotomy with aspiration of fluid has the direct aim of improving hearing and preventing organization of the secretion.

METHODS :- The study was carried out in the department of ENT and HNS SMHS hospital of GMC Srinagar J&K India, a tertiary care institute in the period 2014–2017. Patients in the age group of 4-8 years diagnosed with Bilateral OME and fulfilling the inclusion criteria were allocated to undergo Adenoidectomy with or without tonsillectomy with Myringotomy and Ventilation Tube placement in one ear and Myringotomy without ventilation tube placement in the other ear in the same surgical setting. The ears in which myringotomy and grommet insertion was done, was labelled as A+M+T ear and the ear in which only myringotomy was done was labelled as A+M ear

RESULTS :- A total of 30 patients in the age group of 4 to 8 years were included in the study. Out of which 25 (83.3%) belonged to 6-8 year age group. The mean age of patients was 6.6 year. The average preoperative AC threshold in A+M ear was 33.69 ± 9.24 dB and in A+M+T ear was 37.14 ± 10.39 (p=.710) with mean difference of -3.45 and standard error difference of 2.54. The average AC threshold at 6 months in A+M ear was 16.82 ± 4.85 dB, and in A+M+T ear was 16.50 ± 2.66 (p=.080) with mean difference of .32 and standard error difference of 1.02. At 6 month follow up, 23 (76.6%) A+M ears had type A, 2 (6.6%) had type B, and 5 (16.6%) A+M ears had a type C tympanogram.

CONCLUSION:- Adenoidectomy with Myringotomy is as effective as adenoidectomy with ventilation tube Placement. High definition microscope/endoscope ensures complete aspiration of middle ear fluid and adenoidectomy clears obstruction

KEYWORDS : Otitis media with effusion, Myringotomy, Grommet, adenoidectomy, childhood deafness

INTRODUCTION

Otitis media with effusion (OME) is an accumulation of non-purulent fluid in the middle ear cleft usually resulting from alteration of mucociliary clearance within the cleft associated with a negative middle ear pressure. OME is a common otological problem among infants and young children and is the leading cause for conductive hearing loss in this population.^{1,2} The pathogenesis of otitis media is multifactorial and includes infection, impaired Eustachian tube function, immature immune status, and allergy.³ Adenoid hypertrophy is an important etiological factor attributed for the development of OME in paediatric age group. Hypertrophic adenoids block the posterior choanae, interfering with nasal airflow and Eustachian tube drainage.^{3,4,5} Diagnosis is aided by otoscopy, pneumatic otoscopy, audiometry and tympanometry. Though tympanocentesis remains the gold standard, otoscopy and pneumatic otoscopy are the best non-invasive and fairly accurate ways of diagnosing OME.⁶ The treatment modalities of OME range from watchful waiting to medical management up to 3 months.^{7,8} Neither the indications for surgical therapy nor the types and numbers of procedures are uniform. Surgery involves various combinations of myringotomy, ventilation tube placement, and adenoidectomy.^{10,11,12} Myringotomy with aspiration of mucus has the direct aim of improving hearing and preventing atrophy of the drum, organization of the secretion, and adhesive changes. Insertion of a ventilation tube (grommet) abolishes the negative pressure in the middle ear for a long period of time, and sustains ventilation of the middle ear. The benefits of ventilation tubes is marred by blockade of tube, early extrusion, post-operative otorrhea with a reported incidence ranging from 10% to 15%. Ventilation tubes are also associated with higher incidence of tympanosclerosis, ear drum retraction and atrophy of the tympanic membrane.^{13,14} Ventilation tubes offer a short term improvement in children with OME. The magnitude of benefit is modest and diminishes after 6 months. The paucity of their benefit, their permanent damaging effects and indiscriminate usage has prompted the surgeons to rethink about their overall benefits and proper identification of the patients for their usage and identify less

harmful alternatives^{11, 15}. We undertook this study to determine whether myringotomy is as effective as ventilation tubes in patients undergoing adjunctive adenoidectomy.

MATERIAL AND METHODS

The study was carried out in the department of ENT and HNS SMHS hospital of GMC Srinagar J&K India, a tertiary care institute in the period 2014–2017. Patients of Otitis Media with Effusion (OME) with adenoid hypertrophy with or without chronic tonsillitis not responding to medical management (for three months) aged 4 to 8 years with a bilateral hearing loss of 20 dB or more and with type B tympanogram were included in the study. A standardized history was obtained for each child and the findings of a standard ear, nose and throat examination were recorded along with pure tone and impedance audiometry. Patients were excluded from the study group if one of the following conditions were present: previous myringotomy with or without insertion of ventilation tubes, previous adenoidectomy or tonsillectomy, history of ear surgery, cleft palate, Down syndrome, congenital malformations of the ear, cholesteatoma or chronic mastoiditis, perforation of the tympanic membrane, conductive hearing loss attributed to destructive changes in the middle ear, sensorineural hearing loss. Informed consent was given to the parents of those patients who fulfilled the entry criteria and upon signature these children were enrolled into the study. The protocol of the study was approved by the hospital Ethical Committee. Patients in the age group of 4-8 years diagnosed with Bilateral OME and fulfilling the inclusion criteria were then allocated to undergo Adenoidectomy with or without tonsillectomy with Myringotomy and Ventilation Tube placement in one ear and Myringotomy without ventilation tube placement in the other ear in the same surgical setting. *The ears in which myringotomy and grommet insertion was done, was labelled as A+M+T ear and the ear in which only myringotomy was done was labelled as A+M ear.*

Diagnosis of OME was established on the basis of History, findings on otoscopy, pure tone and impedance audiometry. Standard

tympanometry (using a 226 Hz probe tone) was performed and tympanograms were categorized using the Jerger (1972) classification. Type B tympanograms and findings of fluid levels or bubbles on otoscopic examination validated the diagnosis Adenoid enlargement was assessed on x-ray soft tissue nasopharynx using c-Kurein classification and c-Fujoka classification. The grading of tonsillar enlargement was done according to the Brodsky grading scale. A pre-operative Fibreoptic Rhino Nasopharyngoscopy was done to note the size of adenoids and classified according to Climens et al classification

Follow-Up

Patients were regularly followed up at least for a period of 1 year. Otoscopic examination, turning fork tests, pure tone audiograms, and impedance audiometry (in A+M ear) was recorded postoperatively at 2 weeks, 1 month 3 months, and 6 months.

Surgical Procedures

Each patient underwent a single surgical operation, which was performed under general anesthesia, since both adenoidectomy and myringotomy/tube insertion were carried out at one time Adenoidectomy was performed using electrocautery, curette and St. Clair-Thomsen forceps and tonsillectomy wherever required by dissection and snare method whereas myringotomy consisted of wide incision in the antero- inferior portion of pars tens followed by aspiration of the effusion. Tympanostomy tubes were inserted in the antero-inferior portion of pars tensa after a myringotomy incision was made in this location and aspiration of the effusion was assured. All of the inserted ventilation tubes were Shephards grommets.

STATISTICAL ANALYSIS:

Data was entered in a Microsoft Excel spread sheet. Continuous variables was summarized as Mean ± SD or Median ± interquartile range, as appropriate. Categorical variables were summarized as percentages. The different groups were analyzed using impaired t-test for continuous variables, Man-Whitney U-test for discrete variables and Chi -square test for categorical variables. Within a group, differences were analyzed using a repeated measures ANOVA plus a post hoc test (Bonferroni) for continuous variables, Friedman test for discrete variables, and a Cochran Q for binary categorical variables. A p -value of <0.05 was taken as significant

RESULTS

A total of 30 patients were included in the study. Out of which 25 (83.3%) belonged to 6-8 year age group. The mean age of patients was 6.6 year. In our study 16 (53.3%) children were boys and 14 (46.7%) children were girls. The male to female ratio was 1.1:1. On fiber-optic rhinonasopharyngoscopy and examination of post nasal space under anesthesia obstructive adenoid enlargement was seen in all 30 (100%) patients. On myringotomy the character of fluid aspirated was noted. It was thick mucoid in 16 (53.3%) ears in the A+M group as well as in 16 (53.3%) in A+M+T group. It was serous and adequate in 12(40.0%) ears in A+M group and in 14 (46.6%) ears in A+M+T group. Minimal serous fluid was observed in 2 (6.6%) ears in the A+M group. No purulent fluid was aspirated from any of the ears. The mean preoperative hearing thresholds on pure tone audiometry (PTA) at d 250 Hz, 500 Hz, 1000 Hz, 2000Hz, 4000Hz and 6000Hz frequencies were recorded in each ear and the average AC threshold of all frequencies was calculated preoperatively and at 1 month, 3 month and 6 month follow up. **The average preoperative AC threshold in A+M ear was 33.69±9.24 dB and in A+M+T ear was 37.14 ±10.39 (p= .710) with mean difference of -3.45 and standard error difference of 2.54. The average AC threshold at 1 month in A+M ear was 24.59±7.70 dB, and in A+M+ T ear was 25.40±9.33 (p= .949) with mean difference of -.81 and standard error difference of 2.28. The average AC threshold at 3 months in A+M ear was 20.66±5.89 dB and in A+M+T ear was 22.64±9.49 (p= .390) with mean difference of -1.98 and standard error difference of 2.15. The average AC threshold at 6 months in A+M**

ear was 16.82±4.85 dB, and in A+M+T ear was 16.50±2.66 (p=.080) with mean difference of .32 and standard error difference of 1.02. The average change in AC conduction threshold with respect to pre-operative AC threshold was calculated in each ear at 1 month, 3 month and 6 month. The average gain in AC threshold at 1 month with reference to preoperative AC threshold in A+M ear was 9.38±5.59 and in A+M+T ear was 12.01±7.36 with a p value of .461. The mean difference calculated between the A+M ears and A+M+T ear was -2.62, and standard error difference of 1.74. The average gain in AC threshold at 3 month with reference to preoperative AC threshold in A+M ear 13.43±8.14 dB and in A+M+T ear was 15.23±8.17 dB with a p value of .833. The mean difference calculated between the A+M ears and A+M+T ear was -1.79 and standard error difference of 2.22. The average gain in AC threshold at 6 months with reference to preoperative AC threshold in A+M ear dB 15.93±8.45 and in A+M+T ear was 19.33±7.95 dB with a p value of .837. The mean difference calculated between the A+M ears and A+M+T ear was .92 and standard error difference of 2.15. The status of grommet was checked on every follow up. At 2 week follow up 29 (96.6%) grommets were patent, and only 1 (3.3%) was blocked. At one month 26(86.6%) grommets were patent and in place and 4 (13.3%) grommets were blocked. At 3 months, 24 (80%) grommets were patent, and 6 (20%) were blocked. At 6 months follow up 17 (56.6%) were patent, 6 (20%) were blocked and 7 (23.3%) had extruded. At 9 months follow up of 12 patients, 5 (41.6%) grommets were patent, 4 (33.3%) grommets were blocked and in 3 (25%) patients the grommet had extruded. each patient was followed up with impedance audiometry at 1 month, 3 months and 6 months in the A+M ear. Pre operatively 28 (93.3%) A+M chosen ears had type B and 2 (6.6%) had type C tympanogram. At 1 month follow up 14 (46.6%) A+M ears converted to a type A tympanogram, 8 persisted with a type B and 8 (26.6%) had type C. At 3 month follow-up 19 (63.3%) A+M ears had type A, 4 (13.3%) had type B, and 7 (23.3%) had type C tympanogram. At 6 month follow up, 23 (76.6%) A+M ears had type A, 2 (6.6%) had type B, and 5 (16.6%) A+M ears had a type C tympanogram.

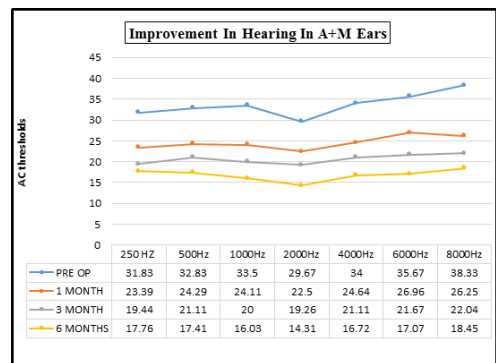


Fig. 1 :- Improvement in Hearing in A+M ear

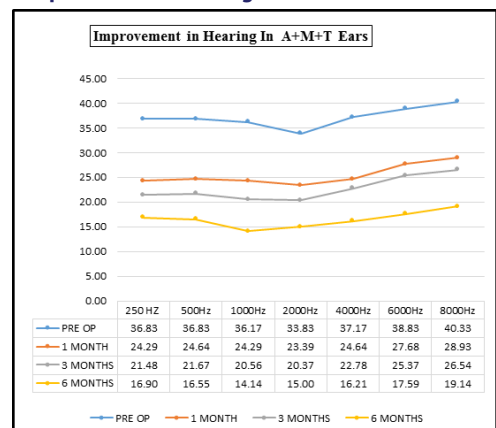


Table 1: Comparative Evaluation Of Hearing

Type of ear	Average pre-operative AC threshold in dB (n=30)	Average post-op AC threshold at 1 month in dB (n=30)	Average post-op AC threshold at 3 months in dB (n=30)	Average post-op AC threshold at 6 month in dB (n=30)	Change in AC threshold w.r.t pre-op at 1 month	Change in AC threshold w.r.t pre-op at 3 months	Change in AC threshold w.r.t pre-op at 6 months	
A+M ear (±SD)	33.69± 9.24	24.59± 7.70	20.66± 5.89	16.82± 4.85	9.38± 5.59	13.43± 8.14	15.93± 8.45	
A+M+T ear (±SD)	37.14 ±10.39	25.40± 9.33	22.64± 9.49	16.50± 2.66	12.01± 7.36	15.23± 8.17	19.33± 7.95	
P value	.710	.949	.390	.080	.461	.833	.837	
95% confidence interval	Lower limit	-8.53	-5.40	-6.29	-1.74	-6.13	-6.25	-7.71
	Upper limit	1.63	3.76	2.33	2.38	.87	2.65	.92
Mean difference	-3.45	-.81	-1.98	.32	-2.62	-1.79	-3.39	
Standard error difference	2.54	2.28	2.15	1.02	1.74	2.22	2.15	

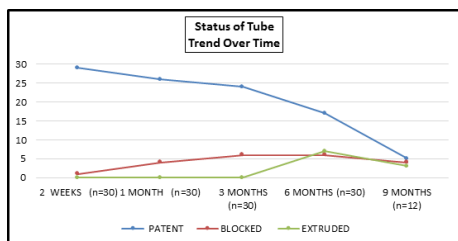


Fig 3:- Status of Ventilation Tube over time

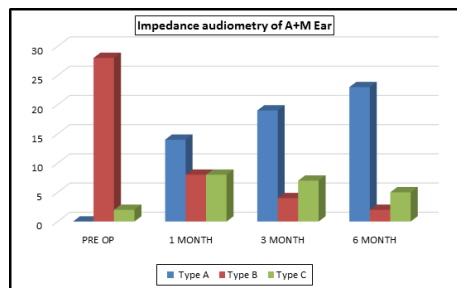


Fig 4:- Impedance Audiometry in A+M ear

DISCUSSION

A total of 30 patients were included in the study out of which 25 (83, 3%) patients belonged to 6-8 year age group. The mean age recorded was 6.6 years. The mean age of our study group patients is comparable to other studies done by M Shishegar(2007)⁷, D. Popova(2010)², and I M Valastos(2011)¹⁶. On myringotomy the character of fluid aspirated was noted. It was thick mucoid in 16 (53.3%) ears in the A+M group as well as in 16 (53.3%) in A+M+T group. It was serous and adequate in 12(40.0%) ears in A+M group and in 14 (46.6%) ears in A+M+T group. Minimal serous fluid was observed in 2(6.6%) ears in the A+M group. No purulent fluid was aspirated from any of the ears. **Gates GA et al (1985)**¹⁷ found out that at the time of surgery, effusion was present in 73% of ears, which was mucoid in 74%, purulent in 9%, serous in 15%. **George A. Gates et al (1987)**¹⁸ found out that effusion was found at operation in 73% of the cases. It was mucoid in 73%, serous in 16% and purulent in 10. **M Shishegar, H Hoghoghi (2007)**⁷ found out that contents of middle ear fluid were serous in 33%, mucoid in 58% and purulent in 9% and no fluid in 20% in the A+M+T group and 33% serous, 58% mucoid, 9% purulent and 20% no fluid in the A+M+T group.

The mean preoperative hearing thresholds on pure tone audiometry (PTA) at different frequencies were recorded in each ear. The mean average **Pre Op AC threshold in the A+M and A+T+M ear** at all frequencies was 33.69 dB and 37.14 dB respectively. In our study, the difference in the hearing between A+M and A+M+T at each frequency was less than 5 dB and is statistically not significant. **S. S. To, A. L. Pahor, P. E. Robin (1984)**¹⁹ Undertook a prospective study of unilateral grommets for bilateral secretory otitis media in 54 children who had failed to respond to medical measures and

were treated with adenoideotomy and insertion of 1 grommet on a side chosen at random and myringotomy in another ear. In the grommet ear the mean pre op hearing was 33.7 dB while on the other ear the findings were 33.3 dB. **M Shishegar, H Hoghoghi (2007)**⁷ compared effect of adenoideotomy and myringotomy with and without tube placement on short term hearing status of children with otitis media with effusion in 30 children. The preoperative Mean pure tone averages was 25.1dB for (A+M) group and 26.3 dB in A+M+T. Mean ear difference was 1.15dB±3.25 SD. **Per Caye Thomson et al (2008)**²⁰ did bilateral myringotomy and insertion of a ventilation tube on the **right** side only in OME patients. The mean pre-operative hearing in the right, tubed ears(A+M+T) was 28.8 dB and 26 dB in left, myringotomy ear (A+M). The difference between ears was not significant. **D. Popova, S. Varbanova, T.M Popov (2010)**² did comparison between myringotomy and tympanostomy tubes in combination with adenoideotomy in children with otitis media with effusion. The pure tone audiometry tests at entry showed hearing loss of 31.4db±6.4SD in A+T group and 32.3db ± 6.5 SD in A+M group which was statistically insignificant. **IM Vlastos et al (Dec 2010)**¹⁶ compared adenoideotomy, myringotomy and grommet with adenoideotomy with myringotomy only in patients with obstructive sleep apnoea and OME. The mean hearing loss in AT ear was 31.2 dB ±3.9 SD and the mean hearing in AM ear was 32.7 ± 2.6SD.

The average change in AC conduction threshold with respect to pre-operative AC threshold was calculated in each ear at 1 month, 3 month and 6 month. The average gain in AC threshold at 1 month w.r.t preoperative AC threshold in A+M ear was 9.38±5.59 and in A+M+T ear was 12.01±7.36 with a p value of .461.. The average gain in AC threshold at 3 month w.r.t preoperative AC threshold in A+M ear 13.43±8.14 dB and in A+M+T ear was 15.23±8.17 dB with a p value of .833.. The average gain in AC threshold at 6 months w.r.t preoperative AC threshold in A+M ear dB 15.93±8.45and in A+M+T ear was 19.33±7.95 dB with a p value of 0.837 . **S. S. To, A. L. Pahor, P. E. Robin (1984)**¹⁹ found out that in the grommet ear the mean pre op hearing was 33.7 dB, at 3 months it was 17.1 dB, and at 12 months it was 17.6dB. While on the other ear the findings were 33.3 dB preoperatively, 21.4 dB at 3 months, and 19.0 dB at 12 months. Both sides improved and remained significantly improved at 12 months (P < 0.001). At 3 months, the side with the grommet improved significantly more than the other side (P < 0.05) but at 12 months there was no significant difference between the 2 sides (P > 0.1). They further found that 39 ears became better by >6dB on the grommet side while 37 became better on myringotomy alone. In study done by Shishegar the preoperative Mean pure tone averages was 25.1dB for ADMX group and 26.3 dB in ADTT. Mean ear difference was 1.15dB±3.25 SD. The improvement in air bone gap for ADMX group was 16.4db during the first month and 16.25db after 6 months. For ADTT group this improvement was 17.47db at first month and 17.62db at six months. The difference was not statistically significant. In a similar study, **Per Caye Thomson et al (2008)**²⁰ found out the mean pre-operative hearing in the right, tubed ears was 28.8 dB and 26 dB in left, myringotomy ear. The difference was not significant. At 3 months the hearing improved on

both sides. The improvement was greater on tubed ears with PTA average of 16.9 dB gain as compared to 10.2 dB gain in myringotomy only ear. The average hearing on right tubed ear at 3 months was 11.9 dB as compared to 15.8 dB in myringotomy ear. The difference was not significant. However, this difference had levelled out at the first follow up at 3 years. A continuous bilateral improvement occurred over time which revealed no significant differences between ears. **D . Popova, S, Varbanova, T. M Popov(2010)²**, noted in their study that the pure tone audiometry tests at entry showed hearing loss of $31.4\text{dB} \pm 6.4\text{SD}$ in A+T group and $32.3\text{dB} \pm 6.5\text{SD}$ in A+M group which was statistically insignificant. The first post-operative visit 1 month after surgery showed a major reduction of hearing loss in both groups (14.1 in A+T and 13.9 in A+M group), and difference was not statistically significant. Results from other two audiometry tests during follow up period preserved the tendency of reduction of the mean hearing loss in both groups. 8.0dB (6th month), and 6.3dB in (12th month) in A+T group and 7.6dB (6th month), 5.5dB (12th month) in the A+M group, again with no statistically significant difference. **Dr H. S Satish, Dr Sarojamma, Dr Anjankumar (2013)²¹** found out that in their patients Post-operative audiometric assessment showed mean hearing gain of at 3rd and 6th month of 5.32 and 4.09dB respectively. In our study the mean AC threshold at 1 month was slightly more than as is observed by above quoted studies. The discrepancy can be explained by presence of high average AC thresholds preoperatively in our study, recording of AC thresholds instead of AB gap and calculation of average of 7 frequencies from 250Hz to 8000 Hz was taken in our study as compared to fewer frequencies utilized by above quoted studies. In our study, there was a progressive improvement in hearing at 1 month, 3 month and 6 month which is comparable to above studies. The gradual improvement in hearing can be also explained by persistence of some effusion in the middle ear cleft even after aspiration, edematous middle ear cleft, a delay in returning of Eustachian tube function, presence of a myringotomy incision and a grommet within the tympanic membrane, which can in itself result in a loss of 10-15 dB

CONCLUSION

With this study we conclude that in patients of otitis media with effusion with adenoid enlargement undergoing myringotomy and adjuvant adenoidectomy, the postoperative hearing threshold was comparable between ears with myringotomy only (A+M) and myringotomy with ventilation tube placement (A+M+T). The use of high definition Microscope and/or Endoscope ensure complete aspiration of middle ear fluid, with adjuvant adenoidectomy clearing the Eustachian tube obstruction, thus reducing the effect and need of a ventilation tube within the tympanic membrane.

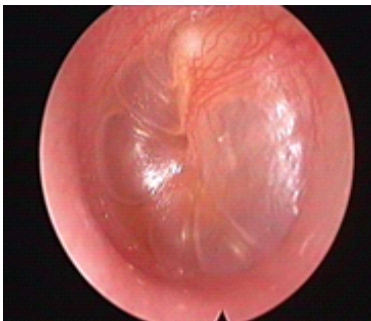


Fig 6:- parachute appearance of tympanic membrane

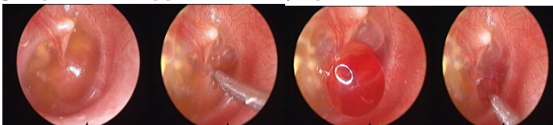


Fig 7:- Myringotomy in an A+M ear



Fig 8:- Myringotomy with grommet placement in an A+M+T ear

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