Section: ENT

Research

A STUDY ON IMPROVEMENT IN MIDDLE EAR FUNCTION POST ADENOIDECTOMY IN PATIENTS WITH ADENOID HYPERTROPHY

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Abstract

Background: Adenoid hypertrophy (AH) is one of the most frequent paediatric disorders that can arise with or without an acute or persistent adenoidal infection and could be managed by many surgical techniques. However, the grounds for surgical intervention and the choice of operation remain contentious, and recommendations vary worldwide. **Aim:** The study aims to examine middle ear function following adenoidectomy by comparing tympanometry before surgery and a 6-month post-op study. **Materials and Methods:** The study comprised 40 AH with OME patients (age 5 - 15) diagnosed through clinical examination, tests such as x-ray nasopharynx, diagnostic nasal endoscopy, pure tone audiometry, and tympanometry. Repeat pure tone audiometry and tympanometry was performed after one week, one month, and three months. **Result:** OME was present predominantly among, and most patients had mild to moderate hearing loss, with a mean audiometric hearing loss of 27.9 dB. Tympanograms in 57.5% of ears revealed type B curves. Following surgery, an audiometric evaluation revealed that the mean hearing gain significantly increased from 5.3dB at week 1 to 5.45 dB at week 3. At a three-month follow-up, only 14 ears had a B-type curve, and 36 ears had a C-type curve, which was statistically significant. Regardless of the preoperative grade AH, the improvement in Tympanometry curve types and hearing gain postoperatively was statistically significant. **Conclusion:** Children with hypertrophied adenoids and OME can benefit from adenoidectomy to eliminate middle ear effusion and improve their hearing.

INTRODUCTION

Adenoid hypertrophy (AH) is the adenoid's abnormal growth (hypertrophy) and is one of the most prevalent diseases in children. Adenoids are quite little at birth, gradually get larger throughout the first four years of life due to an increase in immunological activity, and reach their largest size between the ages of 2 and 7 years.[1] Nasal blockage, mouth breathing, snoring, recurrent earaches and hearing loss, anterior and posterior nasal discharge, cough, and speech impairments are all indications of AH. Most otolaryngologists believe these symptoms are caused by straightforward adenoidal enlargement. However, rather than their actual size, the adenoids' size to the nasopharynx can be significant.[2] Even if larger adenoids may not physically block the back of the nose, they can restrict airflow sufficiently to make nasal breathing unpleasant, and inhalation occurs instead of mouth breathing. Adenoids can also restrict the nasal airway sufficiently to influence the voice without completely halting nasal airflow.[3] Chronically infected Adenoids serve as a reservoir for upper respiratory tract infection. Chronic adenoiditis can cause oedema and occlusion of the nasopharyngeal end of the eustachian tube, which can result in eustachian tube dysfunction, recurrent acute otitis media, chronic otitis media, and otitis media with effusion (OME).[4] OME is a buildup of mucoid or serous fluid inside the cleft of the middle ear (ME). According to the research, impaired eustachian tube function is a significant component in the etiopathology of OME. Several investigations in children have proven the existence of a relationship between OME and AH, assuming that AH causes a blockage of the eustachian tube (ET) orifice at the torus tuberous level; moreover, recurrent infections of the adenoids may produce inflammation of the ET, resulting in functional impairment.[5] This

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explains why adenoidectomy is effective regardless of the degree of blockage. However, the reasons for surgical intervention and operation selection remain contentious, and recommendations vary by country. The advantages of involvement must exceed the disadvantages.[6] Due to the challenges in examining this disorder, a detailed examination of ETD is rarely commonly undertaken in clinical practice. The tympanogram is one of the elements that shows if an effusion is present in the ME, although it only provides indirect information about the ET's functioning. Introduction of the tubomanometry (TMM) test, there has been a surge in interest in the diagnosis and therapy of ETD in recent years. This rather basic evaluation provides information about the ET's patency and dynamic capabilities.[7] So this study is an attempt to examine middle ear function following adenoidectomy by comparing tympanometry before and after surgery.

Aim

The study aims to investigate the relationship between adenoid size and disease progression, assess the improvement in ME function after adenoidectomy by observing changes in the TMM taken before and after surgery in patients with AH and ETD, and investigate the age group most commonly affected.

MATERIALS AND METHODS

This prospective observational study was conducted at the Department of ENT, Government Rajaji Hospital, Madurai Medical College, for 6 months.

Forty patients presented with features of AH with coexisting OME, both clinically and using other investigations, were included. In addition, those with AH associated with OME who did not respond to medical treatment and underwent adenoidectomy are included. Children aged 5- 15 years, of both gender displaying adenoids >50% obstruction in the airway in lateral view observed through X Ray Nasopharynx and those with Type C and Type B tympanogram with less than 30 dB conductive hearing loss were included in the study. In addition, the study excluded participants whose guardians or parents do not want to consent or those with craniofacial anomalies, adhesive otitis media, acute/chronic otitis media, and children with delayed speech and language development. Information was elicited using data from a standardised proforma after receiving signed informed permission and consent. Every patient underwent a thorough ear, nose, and throat (ENT) examination, including an attentive anterior rhinoscopic and otoendoscopic examination. In addition, all individuals receiving adenoidectomy had their middle ears evaluated. All patients also had diagnostic nasal endoscopy, and their grades were determined using the Clemens and McMurray endoscopic scoring method.

Grade	Description
I	Adenoid tissue filling 1/3rd of a vertical portion of choanae
II	Adenoid tissue filling 1/3rd to 2/3rd of choanae
III	From 2/3rd to nearly complete obstruction of the choanae
IV	Complete choanal obstruction

Pure tone audiometry was used to estimate the hearing threshold in both ears. According to Clark's categorization, hearing impairment was categorised as normal (10-15 dB HL), minimal (16-25 dB HL), mild (26-40 dB HL) or moderate (41-55 db HL). In addition, all children underwent tympanometry to confirm the health of their external auditory canals. Otoscopy was performed before tympanometry to inspect the tympanic membrane and ensure that no foreign objects or earwax are blocking the canal. The graphs obtained were recorded as Normal Compliance (Type A), OME (Type B), Reduced compliance or early stages of OME (Type C).

X-ray Nasopharynx: A preoperative DNE and lateral view were performed to confirm adenoid hypertrophy. Further fundamental examinations were carried out as listed in the proforma to determine the patient's readiness for surgery. In addition, all patients undergo radiological assessment utilising CT paranasal sinuses to validate the results of the diagnostic nasal endoscopy. One day before surgery, preoperative tests were completed, including tympanometry, Pure Tone Audiometry (PTA), and Diagnostic Nasal Endoscopy (DNE). Surgery was scheduled for those who weren't responding to medicinal treatment. As stated, pertinent investigations were conducted. We obtained informed and prior written consent. Under general anaesthesia, adenoidectomy was performed on all patients. With care to avoid damaging the ET aperture in the nasopharynx, the adenoids were shaved with an adenoid curette. Endoscopy was used to confirm total removal. Following surgery, antibiotics, decongestants, and antihistamines were administered to all patients. After 24 hours, they were allowed to go home. Following surgery, repeat PTA and tympanometry were performed on all patients to check for hearing improvement and peaks at 1 week, 1 month and 3 months. Outcome variable - the percentage of children with OME and AH whose middle ear function has improved following adenoid surgery. Descriptive and inferential statistical analysis was carried out. Student t-test (two-tailed, dependent) was used to determine the significance of study parameters on continuous scales within each group. In addition, an analysis of variance (ANOVA) was performed to determine the significance of study parameters between three or more patient groups.

RESULTS

Our study included 40 patients with adenoids with OME who presented to our outpatient department

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during the study period. Our study included children aged 5-15 years. Most patients were 5-10 years old, and the mean age was 7.65 years. There was a male preponderance when compared to females [Table 1].

Table 1: Demography data of the patients

		Number	%
Gender	Male	24	60
	Female	16	40
Age	5-10	32	80
	11 – 15	8	20
Mean age		7.65 ± 2.741	

All patients had nasal obstruction/snoring. The common symptom related to the ear was hard of hearing, followed by aural fullness.

Table 2: Symptoms and signs/ TM appearance and AH grading

		Number	%
Symptoms	Snoring or nasal Obstruction	40	100
	Aural fullness	20	50
	Hearing loss	30	75
TM appearance	Dull, amber	35	87.5
	Retraction	24	60
	Air bubbles	8	20
	X-ray nasopharynx	40	100
Diagnostic Nasal Endoscopy - Adenoid hypertrophy grading	Grade 1	2	5
	Grade 2	20	50

On otoscopy, dull, amber-coloured TM was the common finding in 87.5% of cases. Retraction of TM was seen in 60 %. Air bubbles were seen only in 20%. Diagnostic nasal endoscopy showed grade 2 hypertrophy in 50%, grade 3 in 45% and grade 1 in only 5% of patients and grade 4 in none of the patients studied [Table 2].

Pre and post-op TMM curve distribution: A type Tympanometry curve was seen in none of the ears preoperatively, which changed to 16, 22 and 30 ears in 1st week, 1st month and 3rd month. B type curve was seen in most preoperatively (46 ears), which decreased to 18, 18, and 14 ears in the 1st week, 1st month, and 3rd month. C type curve was seen in 34 ears which increased to 46 ears in 1st week, then reduced to 40 ears, and further to 36 ears in 1st month & 3rd month. The change in curve types was statistically significant [Figure 1].

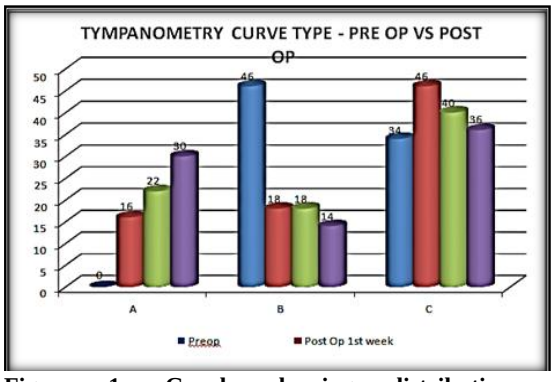

Figure 1: Graph showing distribution of Tympanometry Curve types preop v/s post-op

Out of the 80 ears, the hearing loss was minimal (16 – 25dB) only in 17 ears preoperatively, but post-surgery 69, 68 and 70 ears at 1st week, 1st month, and 3rd month had minimal hearing loss. Mild hearing loss was seen in most ears (63) preoperatively, but post-surgery, only 11, 12, and 10 ears in 1st week, 1st month and 3rd months had minimal hearing loss. The improvement in a hearing was found to be statistically significant (Figure 2).

According to Clark's classification, most of the children in our study had mild hearing loss, and the average was 27.9 dB. Mean hearing gain at 1st week, 1st month, and 3rd-month post-op were 5.3, 5.15 and 5.45, which were statistically significant [Table 3].

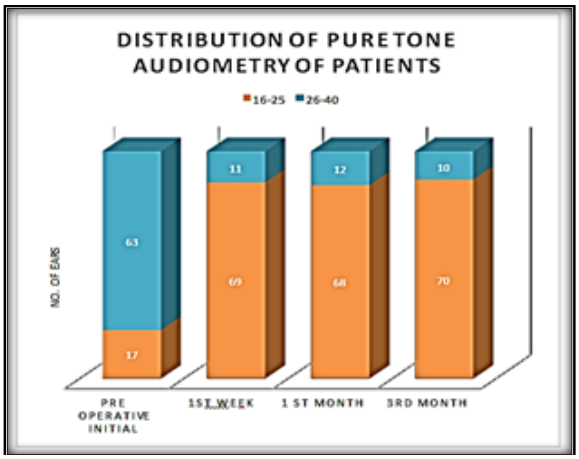

Figure 2: Distribution of Pure Tone Audiometry

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Table 3: Correlation of Curve type with an adenoid size of patients

	Grade I (4 ears)			Grade II(50 ears)			Grade III (46 ears)		
	A	B	C	A	B	C	A	B	C
Preoperative									
Preoperative Initial (n=80 EARS)	-	1	3	-	21	19	-	24	12
Postoperative									
1st week (n=80 EARS)	1	0	3	11	5	24	4	13	19
1st month (n=80 EARS)	1	0	3	14	5	21	7	12	17
3rd month (n=80 EARS)	2	0	2	16	4	20	12	10	14

The hearing gain postoperatively at 1st week, 1st month and 3rd month was statistically significant irrespective of preoperative grading of adenoid hypertrophy. The difference in audiometric reading in different grades of adenoid hypertrophy preoperatively and at 1st week, 1st month and 3rd months are statistically insignificant [Figure 3].

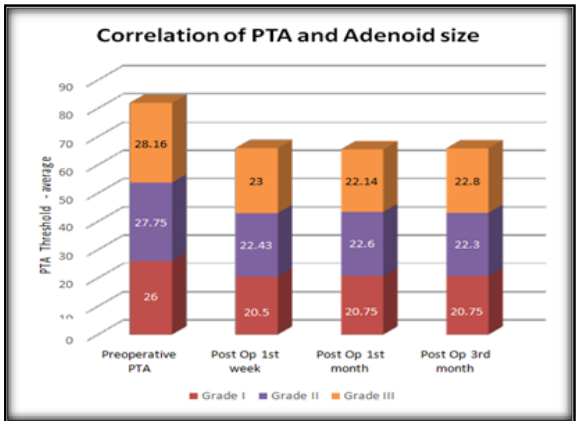

Figure 3: Correlation of PTA with adenoid size

DISCUSSION

One well-known risk factor for ETD and OME in children is the probable occlusion of the ET orifice by hypertrophic adenoid tissue.[8] Treatment with antibiotics, decongestants, and antiallergic medications should be used to treat children with recurrent or chronic OM, adenoiditis, chronic adenoid infection, and hypertrophy caused by infection or allergy. However, children whose symptoms greatly continue or worsen and who do not respond to medical therapy must have surgery. Adenoidectomy is being utilized for treating OME more often now that recent research has established its efficacy.[9] The effectiveness of adenoidectomy alone in improving middle ear function was examined in a prospective trial of 40 instances of AH with accompanying OME. Under general anaesthesia, adenoidectomy was performed on all patients. Children between the ages of 5 and 15 were a part of our study. The average age was 7.65 years, and the majority was in the 5 to 10 age range. Similar to our findings, a prospective descriptive cohort study by Khayat et al. revealed that AH was most common in children between the ages of 5 and 10.6. According to prior research by Brook, the adenoid appears most in the seven-year-old age range.10 Compared to females, our study has a little male preponderance. Earlier, multiple researchers claimed that there was probably a male predominance in AH patients.[6,11,12] This may be explained by the fact that male children are exposed to illnesses at a higher rate than female youngsters.[6] All of the patients snored or had a nasal blockage. Another typical symptom was difficulty hearing, which was followed by fullness. The main issue in the study by Bahadir et al. also heard impairment.[13] In 87.5% of instances, a dull, amber-coloured TM was the most frequent finding on otoscopy. In 60% of cases, TM was retractable. Only 20% of the time did air bubbles appear. Tympanometry is frequently utilized in OME screening. In our investigation, a middle ear pressure of less than 100 mm H2O was regarded as following abnormal Fiellau- Nickolajsens' categorization from 1983. The majority of the children in our research had type B curves. None of the ears had a type of Tympanometry curve before surgery. A change in curve type was used to measure SOM resolution. Thirty ears had an A-type curve during the third month's follow-up, 14 ears had a B-type curve, and 36 ears had a C-type curve. It was discovered that the shift in curve types was statistically significant. In this study, type B tympanograms were more prevalent than type C. This indicates that middle ear effusion, more frequently linked with significant hearing impairment in patients with AH, occurs more than ET dysfunction.[14] Nwosu et al. reported a Type B curve's dominance as well.[5] According to Clark's categorization, most of the kids in our research had mild hearing loss, with an average hearing loss of 27.9 dB. The average hearing loss in the research by Santhosh et al. was 24.5 dB.[15] OM produces a mild 27 dB average loss in conductive hearing as reported earlier by Lupo et al.[16] In our study, the mean hearing gain in the first week, first month, and third month following surgery was 5.3, 5.14, and 5.45, respectively. These values were statistically significant. The mean dB gain at 7 weeks and 6 months, respectively, is 4.5 and 3.5 dB, according to Sharma et al.[17] No relationship between the outcome and the various preoperative grading of adenoid hypertrophy was seen in our study. This was in line with the research that reviewed a retrospective case series published by Shatz.[18] Regardless of the AH grade at the time of surgery, the improvement in tympanogram and hearing gain was statistically significant. Preoperatively and in the first week, first month, and third months after

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surgery, the differences in audiometric readings in the various grades of adenoid hypertrophy were statistically negligible. Children with larger vs smaller adenoids experienced the same risk of effusion recurrence, and adenoidectomy had no adenoid-size-dependent effects. This followed Aman et al., who studied the changes in steady-state auditory response and tympanometry post adenotonsillectomy in otitis media with effusion.[19] All patients had postoperative monitoring regularly. Following treatment, there was a statistically significant improvement in the tympanogram and hearing. Adenoidectomy should be the primary option when choosing a surgical course of treatment, according to research by Coyle and Halder et al.[20,21] This operation is beneficial for treating persistent OME resistant to medicinal treatment. Thus, the data are consistent with the claim that adenoidectomy improves OME's natural course.

CONCLUSION

OME causes hearing loss in children of paediatric age. As a result, it is important to address this illness as soon as possible because it is a major social sickness. Adenoidectomy effectively avoids hearing loss in children with hypertrophied adenoids at an early stage of the disease. According to our research, the average age at which OME with AH occurs is 7.65 years. There is a little male preponderance in the condition's prevalence. The preoperative grading of adenoid hypertrophy used in our study did not affect the outcome. The postoperative hearing gain was statistically significant regardless of the AH grade at the time of surgery. The improvement in hearing and tympanogram following adenoidectomy was statistically significant in the first week, first month, and third month. Our study's findings indicate that adenoidectomy is a quick and efficient method for treating Otitis Media with Effusion (OME) and improving hearing after surgery in hypertrophied adenoids.

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