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Original Research Article

Impact of adenoidectomy on middle ear function in children between 5-12 years of age with chronic adenoiditis

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ABSTRACT

Background: Otitis media with effusion (OME) is an inflammatory disorder of the middle ear that is characterised by the presence of endotympanic fluid without any sign or symptom of acute ear infection, which may lead to hearing loss or long-term sequelae and have a negative impact on speech development and behaviour. Aim of the study was to determine the influence of adenoidectomy on middle ear function in children with chronic adenoiditis and to correlate degree of adenoid hypertrophy with middle ear function.
Methods: This cross-sectional study comprised 50 cases, who were 5-12 years of either sex presenting to ear, nose and throat outpatient department (ENT OPD) with grade 3, 4 adenoid hypertrophy. After detailed history and clinical examination, investigations such as pure tone audiogram, impedance audiometry, X-ray nasopharynx and diagnostic nasal endoscopy were carried out to confirm the diagnosis. All patients were posted for adenoidectomy by curettage. They were followed up at 1st, 3rd and 6th month for pure tone audiometry and impedance was done at 6th month of surgery.
Results: In this study, maximum number (82%) of cases belonged to more than 7 years age group. On otoscopy, dull, amber coloured tympanic membranes ™ was the most common finding in 78% of cases. 66% had adenoid hypertrophy grade three and 34% had adenoid hypertrophy grade four. Mean audiometry findings at preoperative, and one month and 3 months post-op intervals are 24.2, 13.28 and 12.2, and the p value is less than 0.0001, which is statistically significant.
Conclusions: It may be concluded, that adenoidectomy completely eliminates the effusion in the middle ear cavity and exhibits significant postoperative hearing improvement.

Keywords: Otitis media, Adenoidectomy, Pure tone audiometry

INTRODUCTION

The discovery of the adenoid has more impact in the history. Treatment of outward projections in the nasal and upper throat using trans-natal ligature would be the first explanation of adenoid surgeries done by Paul of Aegina in AD 640.[1] The first anatomical description of the pharyngeal tonsil was given by Schneider of Wittenberg.[2] The term pharyngeal tonsil was coined by the anatomist Luschka. After the invention of the indirect laryngoscopy mirror, the surgical procedure, posterior rhinoscopy was done by Czermak in the year 1858 which was one of major breakthrough in adenoid surgery. The source of the dysfunction of the tubal is caused by hypertrophic alterations around the tubal orifice.[3]

The characteristics of adenoid vegetation hypertrophy can be seen by snoring, mouth-breathing, typical facial expression, frequent middle-ear disorders, deafness, and alteration of voice.[4]

Various instruments have been developed for adenoid resection. The procedure was synonymous with severe bleeding, which was always a persuasive suspension of the surgery and had been accomplished by cold water irrigation or chemical cauterization.[5]

The observation of adenoids was made in the mid-1800s. As the adenoid is bloated and irritated, it induces otitis media, sinusitis, obstructive sleep disorders, and facial development disorders. As this has been a widespread problem, adenoidectomy has been one of the most commonly conducted surgeries in India. Adenoidectomy is one of the old surgical procedures practised very commonly in India. The key aim of surgery is to eliminate the source of congestion in the nasal airway and to remove potential respiratory contaminants from the nasopharyngeal pool. Microdebrider is a widely used power tool used in combination with an endoscope for adenoidectomy. Precautions can be taken to avoid problems in the success of adenoidectomy to avoid unexpected outcomes.[6,7]

Aim

Aim of the study was to determine the influence of adenoidectomy on middle ear function in children with chronic adenoiditis and to correlate degree of adenoid hypertrophy with middle ear function.

METHODS

This cross sectional study was conducted in department of ear, nose and throat (ENT), Aarupadai Veedu Medical College and Hospital, Puducherry in patients attending ENT outpatient department (OPD) with chronic adenoiditis from October 2018 to September 2020. Consecutive sampling method was used.

Inclusion criteria

Patients of age group between 5-12 years of either sex presenting to ENT OPD with grade 3, 4 adenoid hypertrophy.

Exclusion criteria

Patients with coagulation disorders, Patients with craniofacial abnormalities and cleft palate, Patients with chronic suppurative otitis media (CSOM) tubotympanic and atticoantral type, patients with upper respiratory infections, systemic disease, neuromuscular disorders.

Patients who presented to the ENT OPD with history suggestive of adenoid hypertrophy confirmed with X-ray nasopharynx lateral view and fitting in our inclusion and exclusion criteria, were subjected to routine blood investigations and impedance audiometry.

After obtaining informed consent and detailed ENT examination, patients selected for the study underwent adenoidectomy by curettage and were reviewed after 1 month and 3 month. Impedance audiometry was repeated at 1 and 3 month follow up visit.

Compare pre-op and 1 and 3 months postoperatively**,** all of the children underwent otolaryngological evaluation, including: pneumatic otoscopy and otomicroscopy to assess the consistency, colour, mobility, location, lightening and translucency of the tympanic membrane and to identify any symptoms of acute middle ear inflammation. Impaired otoscopy was characterised as the occurrence of tympanic membrane changes such as fibrotic scars, tympanosclerosis, variable opacity, irregular air-fluid levels, and retraction pockets. Tympanometry used to validate the middle ear effusion on the basis of the existence of type B tympanogram. Hearing tests (impedance audiometry), and diagnostic nasal endoscopy (DNE) were done.

Data are presented as mean, standard deviation, percentages and number of cases. Continuous data were correlated by Pearson correlation tests. Significance was defined by p values less than 0.05 using a two-tailed test. Data analysis was performed using IBM-statistical package for the social sciences (SPSS) version 21.0 (IBM-SPSS Science Inc., Chicago, IL).

RESULTS

Out of 50 patients, 9 patients were in the age group between 5-7 years, 41 patients in more than 7 years age group. Out of 50 patients, all the patients had a symptom of nasal obstruction/snoring, 38 patients had nasal discharge, 35 patients had hard of hearing, 10 patients had the fullness of the ear, 16 patients had a sore throat. In more than 7 years age group, 41 patients had nasal obstruction/snoring, 38 patients had nasal discharge, 29 patients had hard of hearing, 9 patients had the fullness of ear and 13 patients had sore throat. Out of 50 patients based on otoscopic findings of the tympanic membrane, 39 patients had dull, lustreless, amber-coloured, 29 patients had retraction, and 4 patients had air bubbles. In more than 7 years age group, 33 patients had dull, lustreless, amber-coloured, 26 patients had retraction, 29 patients had hard of hearing and 4 patients had air bubbles. Out of 50 patients, 1 patient had a lesion in choana, 15 patients had in multiple sites, 19 patients had in peritubaric region, and 2 patients had in nasopharynx superior part. In more than 7 years age group, 12 patients had a lesion in choana, 9 patients had a lesion in multiple sites, 18 patients had a lesion in peritubaric region and 2 patients had a lesion in the superior part of the nasopharynx.

Out of 50 patients, 33 patients had grade 3 adenoid hypertrophy and 17 patients had grade 4 adenoid hypertrophy. In more than 7 years age group, 30 patients had grade 3 adenoid hypertrophy and 11 patients had grade 4. Out of 50 patients, 12 patients had a low obstruction in X-ray, 34 patients had an intermediate obstacle in X-ray and 4 patients had a high block in X-ray. Out of 50

patients, based on radiological findings more than 7 years age group 9 patients had mild changes, 29 patients had moderate changes and 3 patient had severe changes. Out of 50 patients, 3 patients and complication and 47 patients had no difficulty. Based on mean audiometry preoperatively it is 24.2, in 1 month follow up it is 13.28 and in 3 months follow up it is 12.2.

Hearing improvement from preoperative to one month postoperatively in the age less than 7 years is 11.00, in the age group more than 7 years is 10.90. Preoperative to three months postoperatively in the age group in the age less than 7 years is 12.22, in the age group more than 7 years is 11.95.

Hearing improvement from preoperative to one month postoperatively in choana the mean value is 10.57, in multiple sites 11.27, in peritubaric region 11.05 and superior part of nasopharynx 9.50. Preoperative to three months postoperatively in choana the mean value is 11.57, in multiple locations 12.20, in peritubaric area 12.26 and the superior part of nasopharynx 11.00.

Hearing improvement from preoperative to one month postoperatively in grade 3 adenoid hypertrophy, the mean value is 11.24, and in grade 4 adenoid hypertrophy, the mean value is 10.29. Preoperative to three months postoperatively in grade 3 adenoid hypertrophy the mean value is 12.27, and in stage 4 adenoid hypertrophy the mean value is 11.47.

Based on hearing improvement from preoperative to one month postoperatively in mild radiological changes, the mean value is 10.83, moderate is 11.00 and in severe is 10.50. Preoperative to three months postoperatively in mild radiological changes the mean value is 12.67, the average is 11.65 and in the extreme is 13.00.

Table 1: Distribution of site with age group.

Age group	Site			
	Choana	Multiple site	Peritubaric region	The superior part of the nasopharynx
<7	2	6	1	0
>7	12	9	18	2

Table 2: Distribution of endoscopic grading with age group.

Age group	Endoscopic grading		Total
	Grade 3	Grade 4	
<7	3	6	9
>7	30	11	41
Total	33	17	50

Table 3: Distribution of radiological grading with age group.

Age group	Radiological grading			Total
	Mild	Moderate	Severe	
<7	3	5	1	9
>7	9	29	3	41
Total	12	34	4	50

Table 4: Comparison of pre and postoperative hearing improvement in age group.

Hearing improvement difference	Age group	N	Mean	Standard deviation	P value
Preoperative - 1 month postoperative difference	<7	9	11.00	4.44	0.952 Insignificant
	>7	41	10.90	4.32	
Preoperative - 3 months postoperative difference	<7	9	12.22	5.21	0.887 Insignificant
	>7	41	11.95	5.13	

Table 5: Comparison of pre and postoperative hearing improvement in site.

Hearing improvement difference	Site	N	Mean	Standard deviation	P value
Preoperative - 1-month postoperative difference	Choana	14	10.57	3.78	0.939
	Multiple site	15	11.27	3.45	

Continued.

Hearing improvement difference	Site	N	Mean	Standard deviation	P value
	Peritubaric region	19	11.05	5.19	
	The superior part of the nasopharynx	2	9.50	7.78	
Preoperative - 3 months postoperative difference	Choana	14	11.57	4.33	0.971
	Multiple sites	15	12.20	4.57	
	Peritubaric region	19	12.26	5.92	
	The superior part of the nasopharynx	2	11.00	9.90	

Table 6: Comparison of pre and postoperative hearing improvement in endoscopic grading.

Hearing improvement difference	Endoscopic grading	Mean	Standard deviation	P value
Preoperative - 1-month postoperative difference	Grade 3	11.24	4.73	0.466
	Grade 4	10.29	3.35	
Preoperative - 3 months postoperative difference	Grade 3	12.27	5.70	0.603
	Grade 4	11.47	3.76	

Table 7: Comparison of pre and postoperative hearing improvement in radiological grading.

Hearing improvement difference	Radiological grading	N	Mean	Standard deviation	P value
Preoperative - 1-month postoperative difference	Mild	12	10.83	4.71	0.974
	Moderate	34	11.00	4.32	
	Severe	4	10.50	3.87	
Preoperative - 3 months postoperative difference	Mild	12	12.67	5.73	0.777
	Moderate	34	11.65	5.06	
	Severe	4	13.00	4.24	

DISCUSSION

Adenoidectomy is accepted as the standard of care in conditions like obstructive sleep apnea syndrome and cardio-respiratory complications associated with severe chronic adenoid hypertrophy.[8] However, in less severe cases of chronic adenoiditis, non-surgical treatment could be tried. The effect of nasal steroid spray for chronic adenoiditis and allergic rhinitis has been proved by various randomized control trials.[9]

Brooks in his find out about confirmed 50% of the sufferers had been in the age team of 5-7 years.[10] Similar effects have been viewed in the find out about carried out by using Reddy.[11] The adenoid seems to be at its most prominent in the seven-year-old age group.[12]

In our study, there is moderate male preponderance when in contrast to females. Tos and Stangerup have proven that male kids have a greater incidence of SOM than woman due to male preponderance of childhood infection.[13] However, Paradise et al suggested no obvious gender primarily based distinction in the incidence of SOM.[14] Male teens have a greater incidence of childhood contamination as they are greater uncovered to allergic and infectious retailers in contrast to lady children.[15-17]

All sufferers had nasal obstruction/snoring accompanied with the aid of nasal discharge, Hard of listening to and fullness. Hard of listening to was once additionally the central grievance in the learning about performed utilizing Reddy. In the study by Georgalas et al the patients had mouth breathing, snoring, rhinorrhoea and cough.[18]

On otoscopy, dull, amber coloured TM used to be the frequent discovering viewed in 78% of cases. Retraction of TM used to be considered within fifty-eight percent. Air bubbles have been considered solely in 8%. In Syed et al, the common sign seen by otoscopic examination was dull eardrum (72.18%). The majority had web page of contamination in peritubaric area observed by using a couple of sites, choana and most desirable section of pharynx.[19]

66% had adenoid hypertrophy grade three and 34% had adenoid hypertrophy grade four. This report was similar to the study by Hibbert and Stell which also reported positive correlation between the degrees of AH and OME.[20] This shows that the increasing grades of adenoid hypertrophy are an important predictor in the establishment of OME in patients with adenoid hypertrophy. Majority had no complication put up operatively.

Mean audiometry preoperative, and one month complies with up and three months comply with-up are 24.2, 13.28 and 12.2, and the p-value is much less than 0.0001, which is statistically significant. Hearing enhancement in contrast between preoperative to one month and three months with age p value is 0.894 and 0.812, with gender 0.901 and 0.913, with the site is 0.939 and 0.971, with adenoid grading 0.466 and 0.603, with radiological grading is 0.974 and 0.777 which all are statistically insignificant.

In Fria et al, find out about the common listening to loss was once 24.5 dB.[21] OM motives average conductive listening to loss, the common loss being 27 dB.[22] In Glasgow research through Dempster and Mackenzie have proven 26 dB listening to loss.[23] According to Black et al, the imply dB obtain at seven weeks and six months are 4.5 and 3.5 dB respectively.[24]

Limitations

Larger sample size may give more details of the hearing improvement.

CONCLUSION

Adenoid hypertrophy, which may adversely affect hearing, predisposes children to middle ear pathology. One of the proposed causes for chronic middle ear pathology, such as otitis media with effusion and resulting hearing damage, is obstruction of the eustachian tube opening by hypertrophied adenoids. Adenoidectomy is a straightforward procedure that effectively relieves obstruction of the eustachian tube and eliminates the source of infection in children with adenoid hypertrophy. The study results conclude that adenoidectomy completely eliminates the effusion of the middle ear and exhibits significant postoperative hearing improvement.

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