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Original Research Article

Evaluation of Hearing Outcomes in Cases of Otitis Media with Effusion in Preadolescents Treated with Adenoidectomy

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Abstract

Background and Aim: As a result of adenoid hypertrophy, Otitis Media with Effusion (OME) develops. But in youngsters, OME-related hearing loss frequently goes undetected. This results in a lack of attention, poor cognitive development, and poor academic achievement. The purpose of this study is to evaluate the prevalence and outcomes of adenoidectomy in instances of otitis media with effusion and hypertrophied adenoids in an Indian tertiary care setting.

Material and Methods: The otorhinolaryngology department at a tertiary care facility in India carried out the study over the course of a year. A total of 100 children with bilateral serous otitis media between the ages of 5 and 12 were included in the study. Pure tone audiometry and tympanometry were carried out both prior to surgery and on a regular basis after the adenoidectomy (along with tonsillectomy when indicated). It was assessed how much hearing results had improved on average.

Results: In our group, sore throats, nasal discharge, snoring or nasal obstruction, deafness, and ear fullness were the most frequent presenting complaints. At 15 days, 1 month, and 2 months after surgery, there was a statistically significant improvement in hearing as compared to the preoperative hearing levels.

Conclusion: Adenoidectomy, along with tonsillectomy when necessary, provides very good, long-lasting hearing improvement in children with hypertrophied adenoids and otitis media with effusion, and should always be considered in such patients in order to improve eustachian tube function and eliminate potential sources of infection. OME can be diagnosed non-invasively using tympanometry.

Keywords: Adenoidectomy, Pure tone audiometry, Otitis Media, Tympanometry.

Introduction

The accumulation of nonpurulent serous fluid in the middle ear is known as Otitis Media with Effusion (OME). Otitis medium with effusion may appear as a result of poor middle ear ventilation brought on by mechanical obstruction of the Eustachian tube aperture. Due to the condition's tendency to affect younger age groups and its

proximity to the enlarging lymphoid tissue at the nasopharyngeal end of the Eustachian tube, adenoid hypertrophy has been recognised as a cause of OME. Clinical symptoms of OME include autophony, dull aching discomfort, and hearing loss. While these minor alterations most frequently go unrecognised in childhood, these signs are frequently recognised early in adulthood. [1] In children with adenoid hypertrophy, mouth breathing, snoring, nasal blockage, and prolonged nasal discharge are common symptoms. These are frequently treated as upper respiratory infections by primary care doctors, who frequently neglect to refer patients to specialists and miss the ear findings. Children in underdeveloped nations like India are far less likely to seek medical attention for nose symptoms because they typically turn to folk cures. [2]

Clinical examination of the tympanic membrane and objective testing with pure tone and impedance audiometry can both be used to diagnose otitis media with effusion. The most accurate non-invasive test for otitis media with effusion is still a "B" type tympanogram. [3,4] According to a study by Garg S. *et al*., conductive hearing loss affects 10.3% of people of all ages. [5] Without mentioning the effects on children, a different Indian study that included adults and children found that 3% of cases of reversible deafness are caused by serous otitis media. [6]

The care of a youngster who is prone to otitis presents several difficulties. It has been established that rising antibiotic usage is connected to the emergence of antimicrobial resistance. [7] Myringotomy, adenoidectomy, and even tonsillectomy have historically been recommended as surgical treatments because they are more cost-effective than medicinal ones. [8] Eustachian tube dysfunction is the main pathogenic element in otitis media with effusion, which is the most common cause of hearing loss in children. These children benefit from adenoidectomy because it reduces nasal blockage, encourages mouth breathing, and enhances ET function. The purpose of this study is to evaluate the prevalence and outcomes of adenoidectomy in instances of otitis media with effusion and hypertrophied adenoids in an Indian tertiary care setting.

Material and Methods

The otorhinolaryngology department at a tertiary care facility in India carried out the study over the course of a year. A total of 100 children with bilateral serous otitis media between the ages of 5 and 12 were included in the study. A thorough ENT examination, otoscopy, pure tone audiometry, impedance audiometry, and X-rays of the nasopharynx and diagnostic nasal endoscopy were used to confirm the presence of serous otitis media (DNE). Patients with congenital deformities, such as cleft lip, Down syndrome, and craniofacial defects, as well as those who had acute suppurative otitis media, were excluded from the study.

The hearing thresholds of the two ears were evaluated using pure tone audiometry (PTA). It was calculated to take the average of air conduction at 500 Hz, 1000 Hz, 2000 Hz, and 4000 Hz. The pure tone audiometer used was an Elkon Giga. [7]

According to Clark's classification, hearing impairment was categorized as normal at 10-15 dB HL, minimal at 16-25 dB HL, mild at 26-40 dB HL, and moderate at 41-55 dB HL. [9] Tympanometry was performed on each child once the external auditory canal's patency was determined. Pressure readings between -400 and +200 daPa were taken using a 226dB probe tone. The generated graphs were labelled Type A for normal compliance, Type B for otitis media with effusion, Type C1 for reduced compliance, and Type C2 for early otitis media with effusion. The simplest type peaked/no-peaked classification was used to quantify results. [10]

For a maximum of three months, all patients were treated medically with intranasal steroids and antihistaminics before surgery was considered. Under general anaesthesia, adenoidectomy and tonsillectomy were carried out when appropriate. With care to avoid damaging the eustachian tube opening in the nasopharynx, the adenoids were shaved with an adenoid curette. Endoscopy was used to confirm total removal. The dissection and snare approach was used to remove the tonsils. Antibiotics, decongestants, and antihistamines were administered to all patients during the postoperative period. After a day, they were allowed to go home. All patients were monitored for one week following surgery to evaluate post-operative healing, and then PTA was performed at 15 days, 1 month, 3 months, and 6 months later to evaluate improvement in hearing. At the sixth month, impedance audiometry was also carried out to look for peaks. During this time, all respiratory infections in patients were treated appropriately.

Statistical Analysis

Microsoft Excel 2007 was used to compile and input the collected data, which was then exported to the data editor page of SPSS version 15 for analysis (SPSS Inc., Chicago, Illinois, USA). The level of significance and confidence level for each test were set at 5% and 95%, respectively.

Results

The study included 100 cases in total, of which 44% were female and 56% were male. The study's participants had an average age of 7.20 1.54 years, with 61% of them falling between the ages of 5-7, 23% between 8 and 10, and 16% between 11 and 12. In our sample, sore throats, nasal discharge, snoring or nasal blockage, deafness, and ear fullness were the most frequent presenting complaints. 80% of the patients had a dull amber-colored tympanic membrane upon otoscopic evaluation. 49% of patients had retracted tympanic membranes, and 11% had air bubbles. Eighty percent of the participants in the study connected tonsillar hypertrophy to recurring bouts of acute tonsillitis. The other 20% of our group got adenoidectomy alone, while these patients underwent adenotonsillectomy.

The various tympanometry curves that were seen in our study population prior to surgery and six months after surgery for the right and left ears individually are shown in Table 1 below. Approximately 25–30% of patients now achieve type A curves after surgery, while the proportion of patients with type B curves has decreased. Previously, there were primarily B type of curves and no cases with a normal type A curve. It's interesting to note that the percentage of patients with type C curves somewhat increased after surgery. However, it was not determined that this difference was statistically significant.

Table 2 shows the average airbone gap measured using pure tone audiometry in our research population's right and left ears individually, at various time intervals. The mean hearing improvement over the pre-operative baseline air-bone gap values is also shown in the table. When compared to preoperative hearing levels, it was shown that there was a statistically significant improvement in hearing at intervals of 15 days, 1 month, and 2 months after surgery.

Children who underwent adenoidectomy for otitis media with effusion and adenoid hypertrophy showed statistically significant improvements in their hearing and tympanometry.

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

Tympanometry curve	Pre-op n (%)	Post-op n (%)
Type A		
Right	0	30 (30)
Left	0	24 (24)
Type B		
Right	88 (88)	56 (56)
Left	84 (84)	58 (58)
Type C		
Right	12 (12)	14 (14)
Left	16 (16)	18 (18)

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		
15 days post op	8.23±5.10	0.02*
1 month post op	8.54±7.21	0.05*
2 months post op	8.05±6.22	0.001*

* indicates statistically significance at p≤0.05

Discussion

The buildup of serous fluid in the middle ear is known as otitis media with effusion (OME). OME develops into a chronic condition if it lasts for three months or more. OME typically occurs after an infection or inflammation of the adenoids, such as an upper respiratory tract infection caused by a virus, a subsequent bacterial infection, or a nasal allergy, and it causes the production of a cascade of inflammatory mediators.[11]

OME can cause hearing loss, which impairs social behaviour and slows down children's speech and language development.[12] OME in infants younger than 4 years old can result in an auditory sensitivity impairment. [13] Any deficit in auditory input causes the auditory cortex to develop improperly and causes other developmental defects during the formative years of the central auditory system's plasticity. [14]

Children in our study ranged in age from 5 to 12. The majority, with a mean age of 7.2 years, belonged to the age range of 5-7 years. This supports numerous studies in the literature that claim children between the ages of 5-7 are most frequently diagnosed with adenoid hypertrophy and concomitant otitis media with effusion. [15,16] Similar to our study, it has also been hypothesised that boys are more likely to develop otitis media with effusion because they have more childhood illnesses. [17] There is no discernible gender difference in the incidence of otitis media with effusion, according to a 1997 study by Paradise *et al*. [18]

In 80% of the youngsters, there were signs of concomitant tonsillitis, and in 38%, there were signs of associated sinusitis. In 1974, Koko noted that tonsillitis occurred in 5.8% of cases and sinusitis in 20.5% of SOM cases. [11] According to Clark's classification, the majority of the youngsters in our study had very modest hearing loss, with averages in the range of 15-20 dB. A modest to moderate

conductive hearing loss has also been shown in several investigations to occur in otitis media with effusion. [19-21] According to the findings of the study by Casselbrant ML *et al*, OME often affects children between the ages of 4 and 8 years, with ear block sensation or variable hearing loss being the most prevalent symptom. But in the majority of instances, this went unnoticed until parents noticed a delay in speech development, poor academic performance, or hearing loss. [22] The physiological process of hearing, which takes place in the middle ear, can account for this. There is only a slight to moderate hearing impairment due to the structural integrity of the tympanic membrane and the ossicles, even though fluid dampens the travelling sound wave in the form of vibrations of the ossicles.

The majority of the kids in our study had type B curves. According to Fria *et al*. in 1977, the use of this no peak/peak criteria results in 84% diagnostic predictability. In 1986, Maw found that in 29.8% of children, adenoidectomy alone did not result in peak/peak conversion. [23]

These findings were similar to those of the 100-child study by Bhat V *et al*., which found that 36% of the children had asymptomatic OME and that those with bilateral Type B tympanograms had severe conductive hearing loss. However, no comparison between adenoid size and hearing loss was made in their study. The advantage of an adenoidectomy may result from a decrease in the nasopharynx's bacterial reservoir and the relief of eustachian tube constriction at the nasopharyngeal end, which improves middle ear ventilation.

The tonsillectomy's positive effects might be attributable to a decrease in ascending infection. When OME returned following the insertion of a tympanostomy tube, Paradise and colleagues looked at the impact of adenoidectomy in two groups of kids. In both groups, the outcomes for the kids who had adenoidectomy were statistically superior to the kids in the control group for both follow-up years, with first-year differences being bigger than second-year differences. [18]

The most frequent operation in children for SOM is myringotomy with breathing tube placement. The ventilation tubes themselves have issues. Infection, tympanosclerosis, recurrent perforation, and medial displacement of the ventilation tube in the middle ear are among the complications that have been often mentioned in the literature. According to studies, tympanosclerosis can occur in up to 40% of cases and can result in a permanent perforation in up to 5% of patients. Otorrhea has been shown to occur in 5–18% of cases. [23-25]

The effects of a single Shephard tube linger for only 10 months, whereas an adenoidectomy has effects that extend for several years. [26] In certain investigations, myringotomy and fluid aspiration showed dry tap rates of up to 34%. [27] It has been demonstrated that there is a correlation between nasopharyngeal dimensions and the presence of otitis media with effusion. [28]

According to Wallace IF and colleagues' study, children with OME have language development defects. [29] Another study by Sano S *et al* [30] found that OME can harm the tympanic membrane as a result of the action of metabolites like prostaglandins when it goes undiagnosed for a longer time. So early OME detection is crucial.

The findings of the current study made it evident that children with adenoid hypertrophy should be evaluated for OME because a large number of these children had undiagnosed hearing loss, which could subsequently have a negative impact on their social and cognitive development. More reliable findings in a multicentric context would come from a bigger sample size. The study did not take into account the impact of

medicinal therapy, such as intranasal steroids, antihistaminics, or antibiotics.

Adenoid hypertrophy may result in OME, which can affect language and behavioural development by causing hearing loss. Adenoidectomy, along with tonsillectomy when necessary, provides very good, long-lasting hearing improvement in children with hypertrophied adenoids and otitis media with effusion, and should always be considered in such patients in order to improve eustachian tube function and eliminate potential sources of infection. OME can be diagnosed non-invasively using tympanometry. In order to avoid severe language and speech delays, it should be made necessary to screen all children with adenoid hypertrophy for the presence of middle ear fluid.

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