ORIGINAL RESEARCH

To investigate the impact of adenoidectomy in cases of secretory otitis media in children

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Abstract
Aim: To investigate the impact of adenoidectomy in cases of secretory otitis media in children.
Material and methods: This prospective research was conducted at the Department of ENT. A total of 80 patients were examined, all of them were diagnosed with bilateral SOM based on otoscopy, pure tone audiometry (PTA), impedance audiometry, and verified adenoid hypertrophy using X-ray Nasopharynx and diagnostic nasal endoscopy (DNE). The research comprised patients between the ages of 4 and 14 who had chronic episodes of bilateral SOM with adenoid hypertrophy. The study documented symptoms such as nasal blockage, snoring, nasal discharge, hearing impairment, ear fullness, and sore throat. Tympanometry was performed on all children to verify the openness of the external auditory canal, and the presence of Stapedial reflux was documented.
Results: When taking into account concomitant morbidity, it was found that, 30 individuals (37.5%) experienced concurrent tonsillitis, whereas 16 members (20%) exhibited symptoms of sinusitis. Otoscopic findings of the tympanic membrane (TM) showed the dull, lustreless, amber colouredtympanic membrane was the most common finding 62(77.5%) followed by retraction 41(51.25%) and air bubbles 7(8.75%). Hearing improvement during the 1st month was 13.1dB, at the 3rd month was 13.3dB and at the 6th month was 12.8dB compared to preoperative findings (Table 5). As the p-value is 0.001, that is <5%, hearing improvement at 1st, 3rd, and 6th month was statistically significant.
Conclusion: SOM is a prevalent etiological factor contributing to auditory impairment in paediatric populations. The persistence of SOM may be attributed to inadequate therapy or factors such as adenoid hypertrophy, recurrent upper respiratory tract infections (URTIs), and sinusitis, which may lead to impaired functioning of the Eustachian tube (ET).
Keywords: SOM, ET, PTA, Otoscopic

Introduction

Secretory otitis media (SOM) is a prevalent medical condition that often occurs throughout childhood, impacting the middle ear and mastoid. The condition is distinguished by the release of endotympanic fluid in the absence of any discernible signs or symptoms of acute ear infection [1]. The condition described is the primary contributor to auditory impairment in young individuals, particularly in youngsters, with the highest occurrence seen around the age of two [2]. Extended or variable auditory impairment throughout early life may lead to enduring effects on the development of speech and language. The care of a youngster who is prone to otitis presents several complications [2]. Due to the reduced probability of spontaneous remission and the ineffectiveness of antibiotic treatment caused by antimicrobial resistance, surgical therapy is seen as a more effective approach in terms of both cost and efficacy for severe patients [3]. Throughout history, medical professionals have recommended various procedures such as myringotomy, adenoidectomy, tympanostomy tubes, and tonsillectomy [4]. The use of adenoidectomy as a therapy for SOM has been on the rise due to the substantial efficacy shown in recent research investigations [5]. The surgical operation known as adenoidectomy involves the removal of specific lymphoid tissue (adenoids) using either a

standard method or with the use of endoscopy. This allows for a more exact removal of the adenoids under direct observation, hence minimising the presence of any remaining tissue near the ostium of the Eustachian tubes [6]. Eustachian tube (ET) dysfunction is a prevalent observation in paediatric patients with otitis media. The use of adenoidectomy has seen a growing trend in the management of otitis media due to the substantial efficacy shown in recent research investigations. The historical justification for the excision of adenoids in children diagnosed with SOM has been attributed to their hypertrophy, which leads to nasal obstruction and subsequent mouth breathing. Another often cited reason for removal is the enhancement of ET function[7]. The primary aim of this research was to investigate the impact of adenoidectomy on patients diagnosed with SOM and hypertrophied adenoids. Additionally, the study aimed to evaluate the influence of adenoidectomy on hearing abilities via the use of pure tone and impedance audiometry.

Material and methods

This prospective research was conducted at the Department of ENT. A total of 80 patients were examined, all of them were diagnosed with bilateral SOM based on otoscopy, pure tone audiometry (PTA), impedance audiometry, and verified adenoid hypertrophy using X-ray Nasopharynx and diagnostic nasal endoscopy (DNE). The research comprised patients between the ages of 4 and 14 who had chronic episodes of bilateral SOM with adenoid hypertrophy. The research excluded patients diagnosed with acute or chronic suppurative otitis media (OM), persons who did not provide informed permission, and those with congenital deformities such as cleft palate, Down's syndrome, and craniofacial defects. A comprehensive history was obtained. A comprehensive evaluation of the ear, nose, throat, and systemic functions was conducted. The study documented symptoms such as nasal blockage, snoring, nasal discharge, hearing impairment, ear fullness, and sore throat. The otoscopic observations included the presence of a dull, lacklustre appearance, an amber-colored or retracted tympanic membrane, as well as the identification of air bubbles. These results were duly documented. The determination of the hearing threshold in both ears was conducted using pure tone audiometry (PTA). The mean values of air conduction at frequencies of 500, 1000, 2000, and 4000 Hz were recorded. The audiometer used in the study was the Elkon Giga 3, a device specifically designed for measuring pure tones. The categorization of hearing impairment was established according to Clark's classification [8].Tympanometry was performed on all children to verify the openness of the external auditory canal, and the presence of Stapedial reflux was documented. A probe tone with a frequency of 226 Hz was used, and a pressure range spanning from -400 to +200 daPa was measured. The acquired graphs were classified as type A, which represents normal compliance, type B, indicating the presence of OME, and type C1 and C2, indicating lower compliance or early stages of OME. The researchers used a basic peaked/no-peaked classification method to quantify the outcomes [9]. The lateral view of the nasopharynx. Adenoid enlargement was confirmed by the use of X-ray imaging and preoperative DNE. The topic of interest is the use of X-ray imaging techniques for the examination of the paranasal sinuses. The perspective of Waters was examined in individuals who had concomitant sinusitis. Additional preliminary inquiries were also conducted. Prior to undergoing surgery, all patients had medical management for a minimum duration of three months. A surgical procedure known as tonsillectomy was also scheduled. The surgical procedures were performed with general anaesthesia. The adenoids were surgically removed using an adenoid curette, ensuring caution was used to avoid any harm to the entrance of the Eustachian tube located in the nasopharynx.The confirmation of complete removal was established by the use of an endoscopic procedure. The surgical procedure of tonsillectomy was performed with the dissection and snare technique. Following the surgical procedure, all patients received a postoperative treatment regimen consisting of antibiotics, decongestants, and antihistamines. The individuals were released from the facility within a span of 24 hours. The patients were subjected to follow-up evaluations at one week, as well as at the first, third, and sixth month post-surgery, during which Pure Tone Audiometry (PTA) was conducted to evaluate the extent of hearing improvement. Impedance audiometry was conducted during the sixth month to assess the presence of the peak. All respiratory infections that occurred within this time frame were expeditiously addressed.

Statistical Analysis

The statistical analysis was conducted using SPSS software version 25.0 and MS Excel-2010. This study used descriptive statistical measures, including the mean, standard deviation, and percentages. The study used an independent sample t-test to determine the statistical significance of the observed differences in pure tone audiometry data before and after the surgical intervention.

Results

This research examined a cohort of 80 individuals diagnosed with adenoid hypertrophy and SOM. The prevalence of secretory otitis media (OM) was found to be greatest at 62.5% among children aged 4-8 years, as shown in Table 1. The mean age of secretory OM was 8.01±1.58 years. In terms of gender distribution, 46 individuals (56%) identified as men, while 34 individuals (42.5%) identified as females. This resulted in a male-to-female ratio of 1.35:1.

Table1: Gender and age distribution

Gender	Number	Percentage
Male	46	57.5
Female	34	42.5
Age		
4 – 8	50	62.5
8 – 12	18	22.5
12– 14	12	15

In this investigation, all 80 patients (100%) had symptoms of nasal blockage and snoring. The subsequent symptoms include nasal discharge in 65 individuals (81.25%), hearing impairment in 54 individuals (67.5%), sore throat in 30 individuals (37.5%), and a feeling of ear fullness in 20 individuals (25%) (Table 2). When taking into account concomitant morbidity, it was found that 30 individuals (37.5%) experienced concurrent tonsillitis, whereas 16 members (20%) exhibited symptoms of sinusitis.

Table2: Symptoms

Symptoms	Number	Percentage
Nasal obstn/ snoring	80	100
Nasal discharge	65	81.25
Hard of hearing	54	67.5
Fullness of ear	20	25
Sore throat	30	37.5

Otoscopic findings of the tympanic membrane (TM) showed the dull, lustreless, amber color was the most common 62(77.5%) common finding followed by retraction 41(51.25%) and air bubbles 7(8.75%) (Table 3).

Table 3: Otoscopic findings of the tympanic membrane

TM appearance	Number	Percentage
Dull, lustreless, amber-colored	62	77.5
Retraction	41	51.25
Air bubbles	7	8.75

Impedance audiometry findings showed that all patients had B type curve in either of the ears and stapedial reflex was absent in all the cases. Ear examination revealed that 12(15%) were classified as peak and 68(85%) as no peak category (Table 4). In the treatment modality, adenoidectomy alone was conducted in 50(62.5%) cases and Adenoidectomy (Ad) cum tonsillectomy (T) in 30 (37.5%) cases.

Table4: Impedance audiometry findings

Graph type	Number	Percentage
Peak	12	15
No peak	68	85
Total	80	100

Hearing improvement during the 1st month was 13.1dB, at the 3rd month was 13.3dB and at the 6th month was 12.8dB compared to preoperative findings (Table 5). As the p-value is 0.001, that is <5%, hearing improvement at 1st, 3rd, and 6th month was statistically significant (Table 5).

Table5: Hearing improvement in dB from preoperative findings among the study members.

Duration in months	dB	p-value
1st	13.1	0.001
3rd	13.3	0.001
6th	12.8	0.001

Discussion

The prevalence of secretory otitis media (OM) was found to be greatest at 62.5% in the age range of 4-8 years. The mean age of secretory OM was 8.01±1.58 years. In a research conducted by Brooks et al. [10], it was shown that 50% of the participants were between the age range of 5 to 7 years. The Reddy et al research [11] reported comparable findings. The current investigation exhibited a higher proportion of male participants. Tos and Stangerup conducted a study that revealed a higher prevalence of SOM in male children compared to female children. This disparity was attributed to the greater occurrence of childhood infections in males [12]. Nevertheless, Paradise et al. [13] showed that there is no discernible disparity between genders in terms of the occurrence of SOM. The findings of this research indicate that 37.5% of the children had symptoms consistent with tonsillitis, whereas 20% displayed symptoms indicative of sinusitis. According to Koko's findings, a study revealed that 20.5% of instances involving SOM had

symptoms associated with sinusitis, whereas 5.8% exhibited symptoms associated with tonsillitis [14]. The elevated prevalence of tonsillitis seen in the current research may be ascribed to suboptimal sanitary living circumstances, mostly due to a majority of the children being from a low socioeconomic background. The presence of adenoid enlargement resulted in nasal blockage and snoring in all of the individuals. The prevalent manifestation associated with auditory impairment was the condition of being hard of hearing, which was often accompanied by a sensation of fullness in the ear. The research done by Reddy et al [11] also identified hearing impairment as a significant complaint. In 77.50% of patients, a frequent observation during otoscopy was the presence of a dull and lustreless amber-colored TM. A retraction of the tympanic membrane, abbreviated as TM, specifically referred to as malleus, was seen in 51.25% of cases. Air bubbles were seen in a mere 8.75% of patients, namely in instances of serous otitis media. The majority of the participants in the current research had a low degree of hearing impairment, as per Clark's categorization. On average, their hearing loss was measured at 24.95dB. According to a research done by Fiellau Nikolajsen et al [15], the average degree of hearing loss was measured at 23 decibels. In accordance with the findings of Fria TJ et al., the average hearing loss seen in their research was 24.5dB, which aligns with the results obtained in the current investigation [16]. In a research conducted by Schilder, Zielhais, and Venden Brook et al. (year), the average hearing loss was found to be 20 dB [17]. Additionally, Dempster and Mackenzie et al. (year) reported a hearing loss of 26 dB [18]. Impedance audiometry has been extensively used for the purpose of screening for SOM. According to Fiellau-Nickolajsen's categorization in 1983, as proposed by the author. In this investigation, a middle ear pressure below 100mm H2O was deemed to be abnormal. Renvall et al. [19] argue that the stapedial reflex is too sensitive to be used as a screening measure in the diagnosis of SOM. In the current investigation, the majority of youngsters exhibited type B curves, whereas the stapedial reflex was shown to be negative in all cases. The resolution of SOM was evaluated using a no peak / peak conversion method. In their study,Fria et al. found that the use of the no-peak/peak criteria resulted in achieving a diagnostic predictability rate of 84% [20]. In their study, Maw et al. found that adenoidectomy as a standalone procedure resulted in no peak/peak conversion in around 29.8% of the children [21]. In the current investigation, it was observed that 32.5% of children did not exhibit a peak/peak conversion at the age of 6 months. Nevertheless, a range of improvements in middle ear pressure was reported in the remaining individuals. Bluestone conducted a study whereby it was discovered that the function of the Eustachian tube showed improvement after adenoidectomy [22]. According to Maw's findings in 1983, adenoidectomy was shown to have a significant therapeutic impact in reducing effusion in 36-46% of patients characterised by resistant SOM [23]. The potential advantage of adenoidectomy may stem from the decrease in the bacterial reservoir inside the nasopharynx, as well as the alleviation of blockage at the nasopharyngeal end of the eustachian tube, resulting in improved ventilation of the middle ear. The potential positive impact of tonsillectomy may be attributed to the mitigation of ascending infection. According to Coyle et al's findings, adenoidectomy is an effective intervention for addressing medically resistant chronic SOM. They suggest that it should be prioritised as the first surgical treatment option [24]. 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 adenoidectomies children were statistically better than for the control children for both follow-up years, with greater differences in the first than the second year [25]. 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 the unoperated ear was recorded. The difference between the two surgical groups and control groups was significant, but the difference between the adenotonsillectomy and adenoidectomy group was not [26]. Myringotomy with ventilation tube insertion for SOM is the commonest procedure in children. The ventilation tube has its complications. Complication includes infection, tympanosclerosis, persistent perforation, and medial displacement of a ventilation tube in the middle ear. Talman et al. reported otorrhea in 6.6% [27] while Hern et al. reported in 18% cases [28]. Riley et al. noted tympanosclerosis in 40% and perforation in 4.3% of the ears [29]. A single shepherd tube alone gives a short-lived effect of 10 months whereas adenoidectomy produces a significantly longer-lasting effect for several years [30]. Myringotomy and aspiration of fluid in some studies showed a dry tap rate up to 34% [31]. Relationships between nasopharyngeal dimensions and the presence of OM with effusion have been shown [32]. In the present investigation, adenoidectomy was conducted in all patients, and tonsillectomy was done when deemed necessary based on the reason. Regular postoperative follow-up was conducted for all patients. Subsequent audiometry examinations revealed a noteworthy amelioration in auditory perception and a decrease in the disparity between the thresholds of air and bone conduction. The average difference in decibels between A and B was found to be 11.95dB, 11.75dB, and 12.25dB during the 1st, 3rd, and 6th month, respectively. Statistical significance was seen in the hearing improvement at

these successive months compared to the preoperative data, as determined by the use of a sample t-test. The decrease in the A-B gap between the first and third months was about equivalent. However, there was an increase in the A-B gap between the third and sixth months, which may be related to the occurrence of recurrent upper respiratory tract infections. These infections can lead to recurrent effusion in some instances around the six-month mark.

Conclusion

SOM is a prevalent etiological factor contributing to auditory impairment in paediatric populations. The persistence of SOM may be attributed to inadequate therapy or factors such as adenoid hypertrophy, recurrent upper respiratory tract infections (URTIs), and sinusitis, which may lead to impaired functioning of the Eustachian tube (ET). Surgical intervention is often recommended in instances when spontaneous resolution does not occur or when medicinal therapy proves ineffective in resolving the effusion and it continues. The surgical procedure known as adenoidectomy, performed on paediatric patients with hypertrophied adenoids and SOM, not only alleviates blockage of the Eustachian tube (ET), but also eliminates the underlying infection.

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