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Leading Symptoms of Adenoids Differ Between Adults and Children

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SUMMARY

This study aimed to define the symptoms of adenoid hypertrophy in adults and children to facilitate earlier diagnosis in adults.

This observational cross-sectional study compared clinical features of adenoid hypertrophy in adults (97 patients ≥ 14 years, study group) and children (64 patients < 14 years, control group). Data were collected using otoscopy, rhinoscopy, oropharyngoscopy, and fiber-endoscopy.

Fifteen throat, nasal, otologic, or neurological symptoms were reported, with a mean duration of 12 months. Headache was the leading symptom in adults (25% vs 2% in children), while nasal obstruction predominated in children (31% vs. 17% in adults). Adenoidectomy effectively resolved the main symptom in both groups (70% of adults, 80% of children; $P = 0.069$), with no significant difference in recurrence ($P = 0.629$). Recurrence correlated positively with adenoid size ($P = 0.035$).

Whereas nasal obstruction was the primary symptom of adenoid hypertrophy in children, headache was most common in adults and can be effectively treated with adenoidectomy. Delayed diagnosis of adenoid hypertrophy in adults, sometimes for years, emphasizes the importance of recognizing headache as a key symptom in adults. Early identification and treatment may prevent serious complications, including infection dissemination, pulmonary hypertension, and cor pulmonale.

KEYWORDS

Adenoids; *Hypertrophy*; *Adults*; *Headache*; *Symptoms*; *Children*

Introduction

Adenoids are part of Waldeyer's tonsillar ring. During childhood, they occupy different proportions of the nasopharynx, and, depending on their size, can interfere with Eustachian tube clearance and nasal breathing.[1,2] They are composed of three types of epithelia — ciliated pseudostratified columnar, stratified squamous, and transitional epithelium — and the ratio of the mentioned tissues changes in different pathological circumstances, such as acute and chronic inflammation, colonization by biofilm, and allergy.[1,2]

Adenoids often enlarge and the symptoms of adenoid hypertrophy differ considerably among patients, as they cause breathing, hearing, and speaking disorders.[3,4] In most cases, adenoid hypertrophy is a pediatric problem, with the main symptoms in children being nasal obstruction and snoring.[3,4] Adenoid hypertrophy progresses to around 10 years of age, and atrophy occurs by the age of 16 years.[3,4]

On the other hand, in adults, adenoid enlargement is associated with atmospheric pollution, human immunodeficiency virus (HIV) infection, and smoking.[5-7] Although large adenoids are increasingly found in the adult population,[7] it is not known whether adults and children present with the exact same symptoms, since adenoid symptomatology in adult patients has not been investigated. Moreover, we have seen in our everyday practice that, by the moment an ear, nose, and throat (ENT) specialist establishes the diagnosis of adenoid hypertrophy in an adult patient, the patient had already seen several different specialists over a long period of time, and performed (neuro)radiological scanning.

Therefore, this study aimed to define the symptoms of adenoid hypertrophy in adult patients, because of which adult patients were referred to an ENT specialist. We also investigated the duration of the symptoms before a definite diagnosis of adenoid hypertrophy was made.

Methods

This observational cross-sectional study included 97 patients aged over 14 years (adult, study group), treated from January 1, 2013 to December 31, 2019, who had enlarged adenoids removed in County Hospital Varaždin, Croatia. The pediatric (control) group comprised 64 patients aged under 14 years in whom adenoids were removed between January 1, 2015 and December 31, 2019.

The age cut-off was set at 14 years of age. This cut-off was based on the fact that the influence of adenoids on nasal patency is reduced in those aged over 14 years, due to theadenoid involution and the general growth of the epipharynx.[8]

The diagnosis of adenoid hypertrophy was made by an ENT specialist, on the basis of clinical examination, nasal fiber endoscopy or radiological examination. For each patient in whom the adenoidectomy was indicated upon ENT examination, we recorded the duration of the leading symptoms, as well as otoscopic, rhinoscopic, oropharyngoscopic, post-rhinoscopy, and fiber endoscopy findings.

Our exclusion criteria were other or additional differential diagnoses (such as sinusitis) and additional concurrent ENT surgical procedures (e.g., functional endoscopic sinus surgery, nasal septoplasty, conchoplasty).

Ethics

This study was approved by the Ethics committee of Varaždin General Hospital (No. 02/1-91/111-2022), and it was performed in accordance with the Declaration of Helsinki.

It was registered with the Clinical Trial Registry clinicaltrials.gov (registration date September 5, 2023; Clinical Trial Number: NCT06041074).

All patients signed a consent form for using data collected during the course of their diagnostic and treating process; and another consent form for publication.

Table 1. Symptoms of adult (≥ 14 years) and pediatric patients (< 14 years) in cases of adenoid hypertrophy

Symptoms		Patients, N (%)		*P*
		Adult	Pediatric	
As an individual symptom	Headache	24 (24.8)	1 (1.6)	
	Snoring	4 (4.1)	10 (15.6)	
	Halitosis	1 (1.0)	0	
	Nasal obstruction	16 (16.5)	20 (31.2)	
	Runny nose	5 (5.2)	4 (6.3)	
	Cough	1 (1.0)	2 (3.1)	
	Frequent throat infections	20 (20.6)	8 (12.5)	
	Poor hearing or deafness	17 (17.5)	11 (17.2)	0.001
	Change in voice tone or rhinolalia	3 (3.1)	2 (3.1)	
	Frequent ear infection	2 (2.1)	4 (6.3)	
	Tinnitus	0	0	
	Feeling of a lump in the throat	0	2 (3.1)	
	Epistaxis	1 (1.0)	0	
	Dizziness	3 (3.1)	0	
	Anosmia or hyposmia	0	0	
Category of symptoms	Throat*	31 (32.0)	26 (40.6)	
	Nose†	20 (20.6)	22 (34.4)	
	Ear‡	19 (19.6)	15 (23.4)	< 0.001
	Neurological§	27 (27.8)	1 (1.6)	
Resolution of main symptom	Yes	68 (70.1)	51 (79.7)	
	No	9 (9.3)	0	
	Improvement	19 (19.6)	13	0.069
	Unknown	1 (1.0)	0	
Recurrence	Yes	18 (18.6)	14 (21.9)	0.629
	No	79 (81.4)	50 (78.1)	

* Snoring, halitosis, cough, frequent throat infection, feeling of a lump in the throat; † Rhinolalia or change in voice tone, runny nose, nasal obstruction, epistaxis, anosmia or hyposmia; ‡ Poor hearing or deafness, frequent ear infections, tinnitus; § Headache, dizziness

Statistical analysis

The patients' demographic and clinical features were examined using descriptive statistics (median, range, and interquartile range (IQR) because of non-normal distribution), and the normality of distribution of continuous numerical variables was tested using the D'Agostino–Pearson test. Continuous variables were analyzed using the Mann–Whitney U test, and categorical variables were analyzed with the χ^2 test. The frequencies of individual leading symptoms between the two groups were compared using a comparison of proportions. The correlation between the size of adenoids and their recurrence was analyzed with rank correlation.

All statistical analyses were performed using MedCalc, version 20.305 (MedCalc Software, Ostend, Belgium). *P* values under 0.05 were considered statistically significant.

Results

The age of the patients in the study and control group differed ($P < 0.001$): in the study group, the median age was 18 years (range of 14–71, IQR = 16), while the median age in the control group was 5 years (range of 3–12, IQR = 3). There were more female patients in the study group (60%) than in the control group (33%), $P = 0.001$.

Leading symptoms and type of referral to an ENT specialist

A total of 15 different symptoms were reported by patients at first contact with an ENT specialist (Table 1). The median duration of symptoms in both groups was 12 months, $P = 0.913$ (adult group (range, IQR):0–72, 24; pediatric group: 4–24, 4.5).

There was a statistically significant difference regarding the leading symptom for which the patients were referred. In the adult group, the most common leading symptom was headache, reported in 25% of the cases, but it was a leading symptom in only of 2% of children ($P < 0.001$). In contrast, the most common leading symptom in the pediatric group was nasal obstruction (31% of the cases, compared to 17% in the study group, $P = 0.025$). Frequent throat infection episodes were the reason for referral in 21% of the adult group and in 13% of the pediatric group ($P = 0.216$), while poor hearing was found to be equally distributed (18% in the study group vs 17% in the control group, $P = 0.867$).

When the leading symptoms were categorized according to the organs or organ systems affected (nose, throat, ear, and neurological symptoms that included headache), the frequency of leading symptoms differed as well ($P < 0.001$). The main difference was found regarding neurological symptoms, which were present in 28% of the adults and only 1.6% of the children ($P < 0.001$).

Almost three quarters of patients in both groups were referred to an ENT specialist by a primary healthcare practitioner (Table 2). However, we found significant differences when we analyzed the type of secondary healthcare specialist referring patients to an ENT specialist ($P = 0.005$): while 90% of the pediatric patients were referred by pulmonologists, almost a half of the adults (58%) were referred by neurologists due to a headache.

ENT findings, diagnosis, and postoperative course

Otoscopic findings were abnormal in 61% of the patients in the pediatric group, compared to 39% of the patients in the adult group ($P = 0.015$) (Table 2). The biggest difference was the (non-)existence of nasal septum deviation: it was found in one third of the adult patients, compared to only

Table 2. Patient characteristics

Characteristic		Patients, N (%)		*P*
		≥ 14 years	< 14 years	
Sex	Male	39 (40.2)	43 (67.2)	0.008
	Female	58 (59.7)	21 (32.8)	
Referred by	Primary healthcare	73 (75.3)	46 (71.8)	0.634
	Secondary healthcare	24 (24.7)	18 (28.1)	
	Neurologist or neuro-pediatrician	14 (14.4)	2 (3.1)	0.005
	Pulmonologist or pediatric pulmonologist	8 (8.3)	16 (25)	
	Ophthalmologist	1 (1)	0	
	Neurosurgeon	1 (1)	0	
Otoscopic findings	Normal	59 (60.8)	25 (39.1)	0.015
	Chronic otitis media*	37 (38.2)	39 (60.9)	
	Ear drum perforation	1 (1)	0	
Rhinoscopy findings	No deviation	63 (64.9)	63 (98.4)	< 0.001
	Septal deviation	34 (35.1)	1 (1.6)	
Previous tonsillectomy	Yes	26 (26.8)	0	< 0.001
	No	71 (73.2)	64 (100)	

1% of the pediatric patients ($P < 0.001$). In the pediatric group, none of the patients had previously undergone tonsillectomy, while 27% of the adult group had ($P < 0.001$).

The size of the adenoids was graded according to the choanal area occupied by adenoid tissue, as found by endoscopic examination (Table 2). There was no information on adenoid size in 15% of the cases in the adult group and 42% of the cases in the pediatric group.

The main difference between the groups was the fact that 2/3 of the choanal area were occupied by adenoid tissue more frequently in children (76%) than in adults (43%). However, adenoid size was not associated with the symptoms ($P = 0.324$).

Neuroradiological investigation (computed tomography or magnetic resonance imaging) prior to ENT referral was done in almost 30% of the adults, compared to only one child in the pediatric group ($P = 0.001$) (Table 2).

There were differences in the way in which the diagnosis of a hypertrophic adenoid was established ($P = 0.001$): it was done by fiber endoscopy in 39% of the adults and in 17% of the children, while a clinical diagnosis was made in 54% of the adults and 83% of the children.

Table 2. [continued]

Characteristic		Patients, N (%)		*P*
		≥ 14 years	< 14 years	
Post-rhinoscopy/ fiber endoscopy findings	Adenoids occupy 1/3 of choana	31 (37.8)	3 (8.1)	< 0.001
	Adenoids occupy 2/3 of choana	35 (42.7)	28 (75.7)	
	Adenoids obturate choana	16 (19.5)	6 (16.2)	
Previous radiological examination*	MSCT†	20 (20.1)	0	0.001
	Nuclear magnetic resonance	9 (9.8)	1 (1.6)	
	X-ray	16 (16.5)	0	
	None	68 (70.1)	63 (98.4)	
Diagnosis based on	Nasal fiber endoscopy	38 (39.2)	11 (17.2)	0.001
	Clinical examination	52 (53.6)	53 (82.8)	
	Radiological examination	7 (7.2)	0	
Histopathological diagnosis (postoperative)	Adenoids	28 (28.9)	0	< 0.001
	Tumor	1 (1.0)	0	
	Polyps	2 (2.1)	0	
	Tornwald's cyst	1 (1.0)	0	
	Not performed	65 (67.0)	64 (100)	

MSCT = multi-sliced computed tomography; * Ear drum pulled in, type B tympanogram; † Previous radiological examination done before presentation to ENT specialist

Postoperatively, the patients were monitored for a similar period of time in both groups (P = 0.653); the median was 1.5 months (range 0–72, IQR 7.5) in the adult group, and 1.3 months (range 0.5–36, IQR 13.5) in the control group.

There were no differences in outcomes between the two groups (P = 0.069). The leading symptom resolved in 70% of the adult group and 80% of the pediatric group, and was improved in 20% of the adult group and 20% of the pediatric group. In 9% of the adult patients, the main symptom did not resolve, while there were no such cases in the pediatric group. However, the statistics on this issue were not complete, as there were no data for 1 pediatric patient.

Recurrence was found in 19% of the adults and 22% of the children (P = 0.629). Recidivism was positively correlated with adenoid size before operation (P = 0.035, ρ = 0.194, 95% CI 0.014 to 0.362). Recidivism was not associated with age in general (P = 0.976, ρ = –0.002, 95% CI –0.157 to 0.153), nor was it associated with age in either of the groups (adults: P = 0.193, ρ = –0.134, 95% CI –0.326 to 0.068; children: P = 0.562, ρ = 0.074, 95% CI –0.175 to 0.314).

Discussion

In this study, we investigated the differences in the symptoms of adenoid hypertrophy between adult and pediatric patients, and found several clear differences.

The main difference was the leading symptom: in the pediatric population, the leading symptom was nasal obstruction, and in adult patients it was headache. Even though headache was previously mentioned as one of the symptoms of adenoid hypertrophy both in children and adults,[4,11,12] the presence of differences in the occurrence of headache between adults and children has never been investigated. Although Yildirim et al. studied the differences in adenoid hypertrophy symptoms between adults and children,[4] they did not record the incidence of headache, but only a higher incidence of snoring as a leading symptom in children compared to adults. In addition, in their study, the age cut-off was set at 20 years of age, while we decided to set the age cut-off at 14 years, because of the reduced influence of adenoids on nasal patency in people older than 14 years (due to adenoid involution and the general growth of the epipharynx).[8]

In addition to delaying relief of the leading symptom, and thereby significantly reducing quality of life through persistent headache as a chronic pain syndrome (which is described to be associated with somatoform disorders),[13] delayed recognition of adenoid hypertrophy in adults may contribute to prolonged diagnostic pathways. Because adenoid hypertrophy is traditionally regarded as a pediatric condition and its symptoms in adults are less well recognized, it is often not considered in the differential diagnosis of chronic headache. These findings suggest that adenoid hypertrophy may be under-recognized in adults, contributing to a delayed or missed diagnosis. Consequently, adult patients may undergo repeated consultations with different specialists and additional diagnostic investigations before being referred to an otorhinolaryngologist. Furthermore, headache may represent an important presenting symptom of adenoid hypertrophy in adults, in contrast to the predominance of nasal obstruction in children. Therefore, adenoid hypertrophy should be considered among the potential causes of persistent or unexplained headaches, particularly when accompanied by upper airway symptoms. Earlier recognition may shorten the time to a definitive diagnosis and treatment, reduce unnecessary investigations, and improve patient outcomes.

Headaches related to adenoid hypertrophy are attributed to a chronic inflammatory process in the adenoids and an obstruction of the nasopharynx, which increases the pressure in nasal airways and air spaces (sinuses).[9] In addition, the higher prevalence of septal deviation in adults may contribute to some symptoms, including headache, and this potential confounding effect should be considered when interpreting findings. Namely, since adenoids are primary sites of microbial colonization in the upper airways, chronically inflamed, enlarged adenoids serve as a residential site for microbes, and several studies have confirmed changes in the microbiota of enlarged adenoids.[14-17] This microbiological imbalance and mechanical obstruction of enlarged adenoids can lead to: 1) chronic middle ear infections; 2) glue ear (accumulated mucus in Eustachian tubes impeding the movement of hearing bones in the middle ear due to the impaired mucus drainage caused by enlarged adenoids); 3) sinusitis; 4) chest infections caused by microbes including Pneumoccoci spreading through the surface of the respiratory epithelium;[16] and 5) morning vomiting due a large amount of pus swallowed during the night.[17-19] Indeed, in our study, 34% of all patients had recurrent infections, while 35% had impaired hearing.

Another health hazard associated with enlarged pharyngeal lymphatic tissue including adenoids is pulmonary hypertension, since enlarged adenotonsillar tissue is often associated with obstructive sleep apnea. Namely, both in children and adults, long-term intermittent or continuous chronic upper way obstruction and consequent

obstructive hypoventilation lead to pulmonary vasoconstriction (due to hypoxemia and respiratory acidosis), atrial electromechanical delay, pulmonary hypertension, and cor pulmonale as an end-result,[20-33] which might even lead to congestive heart failure.[21] Fortunately, in the case of enlarged pharyngeal lymphatic tissue, both pulmonary hypertension and cor pulmonale are reversible upon the relief of airway obstruction by means of adenoidectomy and/or tonsillectomy.[20-33] Therefore, the association of enlarged pharyngeal lymphatic tissue and the subsequent cardiopulmonary pathology underlines the importance of an early recognition of symptoms associated with enlarged adenoids in adults, such as headache, to shorten the time to definitive treatment. That way, the remodeling of pulmonary vessels and the right side of the heart could begin as early as possible.

The fact that, in our study, some adult patients had symptoms as long as three years before coming to an ENT specialist who established a definitive diagnosis, highlights just how important it is to be aware of the fact that symptoms of enlarged adenoids in adults — the most prominent one being headache – differ from those in children.

Limitations

The first limitation of this study was its retrospective nature. It would be interesting if this study were prospective; that way we could have collected socioeconomic data enabling us to investigate the causes of the uneven distribution of sexes between adult and pediatric patients with adenoid hypertrophy, and the reasons why there were more female adult patients in our study compared to a study done by Rasheedi et al. (60% vs 42%, respectively).[34] A prospective study design, especially if the study were multicenter, would have also enabled us to collect more detailed data on symptoms and investigate other possible factors contributing to the recurrence of adenoid hypertrophy.

The second limitation was the relatively young age of the adult study group, with a median age of 18 years. Although patients up to 71 years of age were included, the findings may primarily reflect the clinical presentation of adolescents and young adults. Therefore, caution is warranted when extrapolating these results to older adult populations, and further studies focusing on middle-aged and elderly patients are needed.

Furthermore, symptom assessment was based on information recorded in routine clinical documentation rather than on standardized symptom or quality-of-life questionnaires, which was the third limitation. As a result, the severity and characteristics of individual symptoms, particularly headache, could not be assessed in greater detail. In addition, potential confounding factors associated with headache were not systematically evaluated. Future prospective studies using standardized assessment tools could provide a more comprehensive evaluation of symptom burden and headache characteristics in patients with adenoid hypertrophy.

The fourth limitation was the presence of significant differences in concomitant findings and medical history between the adult and pediatric groups. Septal deviation was substantially more common in adults, and a considerable proportion of adults had undergone previous tonsillectomy. These factors may have influenced symptoms such as nasal obstruction, recurrent throat infections, and potentially headache, and should therefore be considered when interpreting differences between the groups. However, all patients underwent a specialist ENT evaluation before surgery, and patients requiring additional concurrent procedures, such as septoplasty, conchoplasty, or functional endoscopic sinus surgery, were excluded from the study. Furthermore, most patients experienced a complete resolution or improvement of their leading symptom following adenoidectomy. Although the retrospective design of the study did not allow definitive conclusions regarding causality to

be made, our findings support the clinical relevance of adenoid hypertrophy in the observed symptomatology.

Finally, the fifth limitation was related to differences in the diagnostic approach between adults and children. Fiber endoscopy was used more frequently in adults, whereas diagnosis in children was more frequently based on clinical examinations. This likely reflected routine clinical practice, where adenoid hypertrophy in children is often recognized on the basis of characteristic symptoms and findings, while adults require a more extensive evaluation because of a broader range of differential diagnoses, including septal deviation, nasal polyps, and nasopharyngeal tumors. Consequently, adenoid size was not consistently documented in all pediatric patients, as grading was primarily based on endoscopic findings. The substantial proportion of missing data on adenoid size in children should therefore be considered when interpreting the analyses involving adenoid size and recurrence.

Conclusion

This study revealed that headache was the main symptom associated with the presence of enlarged adenoids in patients aged over 14 years. Moreover, the fact that some of our adult patients had symptoms for as long as 3 years before an ENT specialist established the diagnosis, and wandered between different specialists before being referred to an ENT specialist emphasizes the importance of an early recognition of headache as the leading symptom of adenoid hypertrophy in adults. By having this in mind, adult patients could be referred to an ENT specialist earlier, so possible complications (such as infection dissemination, pulmonary hypertension, and cor pulmonale) could be avoided, which would also reduce the financial burden of both patients and the healthcare system, and raise the patients' quality of life.

CONFLICT OF INTEREST STATEMENT The authors declare no conflict of interest.

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SAŽETAK

Vodeći simpomi adenoida se razlikuju kod odraslih u odnosu na djecu

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Cilj ove studije bio je definirati simptome hipertrofije adenoida u odraslih i djece kako bi se olakšala njihova ranija dijagnoza u odraslih.

U ovoj opservacijskoj presječnoj studiji uspoređivane su kliničke značajke hipertrofije adenoida u odraslih (97 pacijenata ≥ 14 godina, ispitivana skupina) i djece (64 pacijenta < 14 godina, kontrolna skupina). Podaci su prikupljeni otoskopijom, rinoskopijom, orofaringoskopijom i fiberendoskopijom.

Zabilježeno je petnaest grlobolja, nosnih, otoloških ili neuroloških simptoma s prosječnim trajanjem od 12 mjeseci. Glavobolja je bila vodeći simptom u odraslih (25 % naspram 2 % u djece), dok je nazalna opstrukcija prevladavala u djece (31 % naspram 17 % u odraslih). Adenoidektomija je učinkovito riješila glavni simptom u obje skupine (70 % odraslih, 80 % djece; $P = 0,069$), bez značajne razlike u recidiviranju ($P = 0,629$). Recidiv je pozitivno korelirao s veličinom adenoida ($P = 0,035$).

Dok je nazalna opstrukcija primarni simptom hipertrofije adenoida kod djece, glavobolja je najčešća kod odraslih i može se učinkovito liječiti adenoidektomijom. Odgođena dijagnoza hipertrofije adenoida u odraslih, ponekad i godinama, naglašava važnost prepoznavanja glavobolje kao ključnog simptoma kod odraslih. Rana identifikacija i liječenje mogu spriječiti ozbiljne komplikacije, uključujući širenje infekcije, plućnu hipertenziju i plućno srce (cor pulmonale).

KLJUČNE RIJEČI

Adenoidi; Hipertrofija; Odrasli; Glavobolja; Simptomi; Djeca