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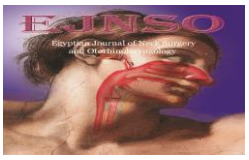

The effect of Adenotonsillectomy on asthma control in preschool children with obstructive sleep apnea

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Abstract:

Background: Asthma is a common cause of wheezing episodes in children.

Objectives: The work aimed to evaluate adenoidectomy or adenotonsillectomy in children having obstructive sleep apnea (OSA) associated with bronchial asthma.

Patients and Methods: This was a prospective interventional study. Fifty consecutive children, aged 3 to 5 years with recurrent wheezy chest associated with OSA caused by adenotonsillar diseases were recruited from the outpatient clinic or inpatient ward of the Allergy, Immunology and Rheumatology unit, Children's Hospital, Assiut University and from Otorhinolaryngology department, Assiut University Hospital.

R**esults:** There was a significant improvement in the asthma control level during the follow-up of the patients after adenoidectomy or adenotonsillectomy. In the current study preoperatively, it was found that most male patients had uncontrolled symptoms while most female patients had partially controlled asthma with significant differences between both sexes.

Conclusion: Adenotonsillectomy in children with obstructive sleep apnea associated with bronchial asthma may be helpful in controlling the asthma symptoms among those children

Keywords: Adenotonsillectomy , Asthma , preschool children

Introduction

The likelihood that young children who wheeze will develop asthma is unknown, but wheezing is still one of the primary signs of asthma. Those with multiple trigger wheeze are more likely to have asthma when compared to young children with episodic (viral) wheeze. The relationship between wheezing and colds or other triggers like cigarette smoke or allergens, as well as atopic characteristics and family history, are all asthma risk factors. [1-2]

The primary cause of adenoid hypertrophy is recurrent infection, which is clinically manifested by snoring at night, nasal obstruction, mouth breathing, recurrent sinusitis, auditory tube dysfunction, otitis media, decreased sense of smell and taste, speech difficulties, changes in facial growth and behavioral development,

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and/or more serious problems like obstructive sleep apnea syndrome (OSASA).[3-4]

The current study evaluated the value of adenoidectomy or adenotonsillectomy in children having OSA and asthma on the level of asthma control in children aged 3-5 years.

Patients and methods:

A cross sectional study was performed on fifty consecutive children aged 3 to 5 years with recurrent wheezy chest and adenoid hypertrophy.

Children were recruited from the outpatient clinic or inpatient ward of Allergy, Immunology and Rheumatology unit, Children's Hospital, Assiut University and from the Otorhinolaryngology department at Assiut University Hospital.

Inclusion criteria

1. Age at enrolment 3-5 years
2. Both sexes
3. Children with OSA

Exclusion criteria:

1. Children <3years or >5 years.
2. Other causes of OSAS than adenotonsillar disease
3. Patients unfit for surgery

Methodology

All patients were subjected to:

1. Comprehensive history taking which was obtained from the patient caregiver including:
   - Personal and clinical characteristics of the recurrent wheezy episodes (wheezing, cough, difficult breathing)
   - Questions to assess level of asthma control in children 5 years and younger as stated in (**GINA 2021**) [1] in the past 4 weeks
2. Comprehensive general otolaryngology and chest examination.
3. Lateral view x-ray was done for patients to show soft tissue shadow for adenoid.
4. Endoscopic examination of the nose to confirm the diagnosis of adenoids and exclude other causes of obstruction.
5. Preoperative fitness
6. Peri-operative anesthetic preparation

Operative Intervention:

Under general anesthesia, and after administration via an oral endotracheal tube, all patients underwent adenotonsillectomy operation

Follow up:

After a period of six month and again after one year, the 50 children came back to the hospital and were subjected to history taking to assess level of asthma control and comprehensive general otolaryngology and chest examination.

We examined the asthma outcomes before and after AT in order to test the effect of surgery in improving asthma symptoms.

Statistical analysis:

Data was collected and analyzed by using SPSS (Statistical Package for the Social Science, version 20, IBM, and Armonk, New York).

Continuous data was expressed in the form of mean ± SD while nominal data was expressed in the form of frequency (percentage).*Chi*²-test was used to compare the nominal data of different groups in the study. The level of confidence was kept at 95% hence a P value <0.05 indicated a significant association.

Results

The mean age of the enrolled patients was 4.12 ± 0.66 years with range between 3 and 5 years. The majority

(72%) of patients were males while 14 (28%) patients were females.

Table (1): Baseline data of enrolled patients

Demographic data	N= 50
Age (years) Mean ± SD Range (years)	4.12 ± 0.66 3-5
Sex Male Female	 36 (72%) 14 (28%)

Data expressed as frequency (percentage), mean ± SD, range

Table (2): Type of operation among enrolled patients

Type of operation	N= 50
Adenoidectomy	10 (20%)
Adenotonsillectomy	40 (80%)

Data expressed as frequency (percentage)

Table 3 shows significant improvement in the asthma control level during follow up of the patients after adenoidectomy or adenotonsillectomy.

Six-months after operation, 24 (48%) patients had well controlled asthma and only 8 (16%) patients had uncontrolled symptoms. There were 18 (36%) patients had partially controlled asthma.

Table 4 shows that only two patients had uncontrolled asthma while majority (72%) of patients had well controlled symptoms after one year follow up.

Table 5 shows no significant difference was found between two groups (those underwent AT versus those underwent adenoidectomy) as regard the level of asthma control after 6th month or one year follow up.

Table (3): Preoperative and 6 months follow up asthma control among studied patients

Asthma control	**Preoperative**	**After 6 months**	***P* value**
Well controlled Partial controlled Uncontrolled	0 14 (28%) 36 (72%)	24 (48%) 18 (36%) 8 (16%)	< 0.001

Data expressed frequency (percentage). *P* value was significant if < 0.05

Table (4): Preoperative and follow up asthma control among studied patients

Asthma control	**Preoperative**	**After 6 months**	**After one year**	***P* value**
Well controlled	0	24(48%)	36(72%)	<0.001
Partially controlled	14(28%)	18(36%)	12(24%)	
Uncontrolled	36(72%)	8(16%)	2(4%)	

Data expressed frequency (percentage). *P* value was significant if < 0.05

Table (5): Asthma controlled based on type of operation

	Adenotonsillectomy (n= 40)	**Adenoidectomy (n= 10)**	***P* value**
6th month postoperative			
Well controlled	20 (50%)	4 (40%)	
Partially controlled	15 (37.5%)	3 (30%)	0.40
Uncontrolled	5 (12.5%)	3 (30%)	
One year postoperative			
Well controlled	30 (75%)	6 (60%)	
Partially controlled	8 (20%)	4 (40%)	0.35
Uncontrolled	2 (5%)	0	

Data expressed frequency (percentage). *P* value was significant if < 0.05

Discussion :

There is debate over whether or not AT has a positive impact on regulating pediatric respiratory illness symptoms. This prospective study concluded better value of AT on pediatric asthma control.

In the current study, the age of the chosen cases ranged between 3-5 years with mean SD 4.12 ± 0.66. The bulks (72%) of patients were males while 14 (28%) patients were females.

In line with the current study, **Mitchell & Kelly et al. (2004)** investigated the effects of AT on kids with recurrent wheezy chest and found that these kids who receive AT significantly improve their quality of life and respiratory distress index over the course of several months following surgery. 35 kids were included in their study, with 76% of them being boys and a mean age of 5.1(Range 3-7 years).[5]

Within the current study preoperatively, it had been found that majority (88.9%) of male patients had uncontrolled symptoms while majority (71.4%) of female patients had partially controlled asthma with significant differences between both sexes (p< 0.001).

In concordance with this study, **Postma DS 2007**, studied the relation between sex and asthma and located that boys have greater AHR to methacholine during childhood, and girls having greater hyperresponsiveness to methacholine at same point in adolescence. [6]

According to this study, which reflects the pattern of asthma incidence and prevalence, boys had a higher prevalence of inflammatory cells in induced sputum, which is consistent with the higher prevalence of asthma in boys as children. This also explains why boys at this age who are exposed to their parents' cigarette smoke have higher peripheral blood eosinophil counts. [6]

A previous study stated that despite receiving similar medical care and having similar baseline pulmonary function to their male counterparts, asthmatic women have a lower quality of life and use more healthcare resources. [7]

In our study, Supported the present results, we found significant improvement in the asthma control during follow up of those patients after operation. Preoperative all patients were either partially controlled (28%) or uncontrolled (72%) and none of them was well controlled. Six-months after operation, 24 (48%) patients had well controlled asthma, 18 (36%) patients had partially controlled asthma and only 8 (16%) patients had uncontrolled symptoms.

One year later, only two patients had uncontrolled asthma while majority (72%) of patients had well controlled symptoms. The other 12 (24%) patients

had partially controlled asthma. **Busino et al.2010** found similar effects. [8]

Also, **Piessens P et al. 2012** concluded that the employment of pulmonary medications significantly decreased with 32% in the year after surgery with p value < 0.001. [9]

Also, the symptoms and medication use of 27 children with asthma who had been previously diagnosed by a pediatrician with recurrent adenotonsillitis were compared preoperatively in a prospective study conducted by **Puranik V. and El-Sheikh A. in 2005.** [10]

On a larger scale, **Bhattacharjee et al 2014** [11] and **Kheirandish- Gozal et al.2009** had the same effects. [12]

As a result, the impact of tonsillectomy has been disregarded. On the other hand, **Mattila PS. et al. 2003** showed that early-life adenoidectomy may contribute to the subsequently developing asthma in children. They focused on the risk of asthma after adenoidectomy, not AT. [13]

The tonsil provides lymphocytes that can identify and combat pathogenic organisms, which makes it an essential part of the mucosal-associated lymphoid tissue (MALT) at the opening of the respiratory system. For instance, when exposed to foreign antigens, these immature B lymphocytes start to differentiate into plasma cells, which produce antibodies. Adenoidectomy may not have as significant an effect on early-life immune function as the surgical removal of the entire palatine and nasopharyngeal tonsils from their enclosing tissues occurs during AT. [13]

Conclusion:

Based on the following study, adenoidectomy or adenotonsillectomy could have significant improvement in the asthma control level during follow up of the patients with OSAS.

Conflict of interest: There is no conflict of interest*.*

Ethical considerations: An informed written consent was obtained from all participants and their parents in case of child patient. The study earned the ethical approval from the Medical Ethical and The Medical scientific Committees of Assiut university Faculty of medicine (Approval no. NCT03842618).

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