International Journal of Pediatric Otorhinolaryngology 105 (2018) 36–39

Contents lists available at ScienceDirect

International Journal of Pediatric Otorhinolaryngology

journal homepage: www.elsevier.com/locate/ijporl

Pre- and post-operative evaluation of the frequency of nocturnal enuresis and Modified Pediatric Epworth Scale in pediatric obstructive sleep apnea patients☆

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ARTICLE INFO

Keywords:
Adenotonsillectomy
Pediatric
Obstructive sleep apnea
Nocturnal enuresis
Modified pediatric Epworth scale

ABSTRACT

Objective: To investigate the beneficial effect of adenotonsillectomy (AT) on nocturnal enuresis (NE) in children with adenotonsillar hypertrophy and evaluate the Modified Pediatric Epworth Scale (MPES).

Methods: This was a prospective study comparing preoperative and postoperative evaluation of the frequency of NE and MPES in pediatric obstructive sleep apnea (OSA). A questionnaire on NE history was prepared based on the Turkish Enuresis Guidelines. NE histories were evaluated pre- and postoperatively on the first month and third month, respectively. MPES questions were asked to the parents of all the OSA patients pre- and post-operatively, and scores were noted.

Results: Eighty-four (84) pediatric OSA patients were involved in the study. Preoperatively, 19 patients (27%) complained about nocturnal enuresis. After the surgery, 52% of the patients with NE had complete resolution of NE ($p < 0.001$). Postoperatively, the average Epworth scores of both groups significantly decreased ($p < 0.001$).

Conclusion: There is a strong correlation between OSA and NE. In the present study, enuresis in pediatric OSA patients significantly decreased after surgery. Also, Epworth scores decreased significantly after surgery. In children with nocturnal enuresis, the presence of OSA symptoms should be questioned.

1. Introduction

Nocturnal enuresis (NE) and obstructive sleep apnea (OSA) are common problems during childhood [1]. Involuntarily unsuitable wetting at night for children over 5 years old who do not have an acquired or congenital central nervous system defect is defined as NE [2].

Pediatric OSA prevalence is 1–4% in the general population. The most common cause is adenotonsillar hypertrophy, and the peak age for both conditions is 3–7 years [3].

Pediatric OSA patients have mild symptoms, and the most common are daytime sleepiness, irritability, hyperactivity, behavioral problems, personality changes, poor school performance, morning headaches, failure to thrive, and enuresis, respectively. Also, hypercapnia and hypoxemia can be seen [4]. There is an association between sleep-disordered breathing and enuresis in children [5]. Also, the prevalence of NE in children with OSA is reported to be approximately 50% [3].

Adenotonsillectomy (AT) is well accepted in the literature to have excellent results in resolving apnea symptoms; however, not much has been written about the effectiveness of adenotonsillectomy on the resolution of the symptom of enuresis [3].

The aim of this study is to investigate the beneficial effect of AT on NE in children with adenotonsillar hypertrophy and evaluate the Modified Pediatric Epworth Scale (MPES).

1.1. Material-method

This study was conducted from January 2015 to January 2016 in Sisli Hamidiye Etfal Training and Research Hospital, İstanbul. Eighty-four (84) pediatric OSA patients 5–16 years of age (6.71 ± 2.51 SD) who had not undergone AT were involved in the study. Of the patients, 19 complained of nocturnal enuresis, and 63 patients did not have any history of NE.

Inclusion criteria for the study were the diagnosis of OSA, adenotonsillar hypertrophy, and appropriate indication for adenotonsillectomy surgery. Patients who had secondary enuresis, urological anomalies and/or bladder instability, urinary tract infection, known

☆ Study was carried at Sisli Hamidiye Etfal Training and Research Hospital in Istanbul.

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https://doi.org/10.1016/j.ijporl.2017.11.033
Received 1 June 2017; Received in revised form 27 November 2017; Accepted 29 November 2017
Available online 05 December 2017
0165-5876/

Table 1
Gradation of tonsillar enlargement.

Grade	Definition	Description
0	Not visible	Tonsils do not reach tonsillar pillars
1+	Less than 25%	Tonsils fill less than 25% of the transverse oropharyngeal space measured between the anterior tonsillar pillars
2+	25%–49%	Tonsils fill less than 50% of the transverse oropharyngeal space
3+	50%–74%	Tonsils fill less than 75% of the transverse oropharyngeal space
4+	75% or more	Tonsils fill 75% or more than the transverse oropharyngeal space

genetic or craniofacial anomalies, or patients with a neurological abnormality or mental retardation were excluded from the study. The presence of any cause of nasal obstruction, other than adenotonsillar hypertrophy, was also an exclusion criterion.

Routine otolaryngology examination was performed, and, if indicated, imaging techniques were used. BMI (body mass index) is assessed by age and gender for children. In children, BMI ratio is considered as normal at a range 15.5–24.9. BMI ratios of children in this study were in the normal range. Adenoid hypertrophy was confirmed with flexible endoscopic examination, and it was defined as at least 50% obstruction at the choanae.

Tonsillar hypertrophy size was classified into four grades by direct visualization (Table 1) [6]. Severe hypertrophy was defined as Grade 3 or above. In the study, all children had Grade 4 tonsillar hypertrophy, and adenoid hypertrophy with at least 50% choanal obstruction was found upon examination with flexible endoscopy.

Polysomnography examination for pediatric OSA patients is not available in our clinic. Indications for AT for OSA were assessed according to American Academy of Otolaryngology Head and Neck Surgery (AAO-HNS) guidelines [6]. All the patients underwent AT under general anesthesia. No complications were observed postoperatively.

During the investigation, patients were asked MPES questions and about OSA-related symptoms. The modified Epworth scale was established for assessment of daytime sleepiness in pediatric patients [4]. MPES questions were asked to the parents of all the OSA patients pre- and postoperatively, and scores were noted.

A questionnaire on NE history was prepared based on the Turkish Enuresis Guidelines [7]. Questions about NE included, 'How many times is she or he bedwetting at night per week?'' and "How many times does she or he wet during the day?" NE histories were evaluated pre- and postoperatively on the first month and third month, respectively.

1.2. Statistical analysis

SPSS 15.0 for Windows was used for statistical analysis. Descriptive statistics, numbers and percentages for categorical variables and numerical variables for the mean were given as standard deviation. Quantitative variables, which cannot ensure the normal distribution, were compared using Mann-Whitney *U* test conditions. The difference of the dependent variable digital group analysis cannot provide the normal distribution condition, so Friedman variance analysis was used for multiple groups and Wilcoxon test was used for two groups. Chi-square analysis was utilized to study the rates in the groups. A p-value of < 0.05 was considered statistically significant.

2. Results

Preoperatively, 19 patients (27%) complained about nocturnal enuresis and had incontinence during the day. Two patients had urinary incontinence only during the day, and 63 patients (75%) didn't have any history of NE.

Table 2
Statistical distribution of patients.

	1st group	2nd group	p
	N = 19	N = 65	
	Mean ± SD	Mean ± SD	
Age	6.9 ± 2.6	6.8 ± 2.6	0.796
Body Mass Index(BMI)	19.6 ± 5.3	20.1 ± 5.1	0.484

Table 3
Statistical results of Modified Pediatric Epworth Scale (MPES).

		1st group	2nd group	p
		N = 19	N = 65	
Epworth Score	Preoperative	3.37 ± 2.79	3.51 ± 2.54	0.670
	Postoperative	0.74 ± 0.99	1.54 ± 1.80	0.121
	Gap Mean ± SD	2.63 ± 2.59	1.97 ± 1.9	0.482
	%95 CI	(1.39–2.88)	(1.50–2.44)	
	Effect size dz	1.07	0.87	
	p	< 0.001	< 0.001	

No statistically significant difference existed between averages of age and BMI of the patients with NE (first group) and the patients without NE (second group) (Table 2).

Postoperatively, the average Epworth scores of both groups significantly decreased (1st group; %95 CI (1.39–2.88), $p < 0.001$, 2nd group; %95 CI (1.50–2.44), $p < 0.001$) (Table 3).

Postoperatively, night bedwetting incidence of all patients dropped significantly ($p < 0.001$). The difference between the first and third month in the postoperative period and the preoperative period was statistically significant (postop1st mth – preop; %95 CI (0.23–0.72) $p < 0.001$, postop 3rd mth – preop; %95 CI (0.28–0.77), $p < 0.001$). No statistically significant difference existed between the first month and third month postoperatively (%95 CI (−0.06-0.16), $p = 0.024$) (Table 4).

Daytime bedwetting occurrences dropped significantly after surgery ($p = 0.001$). The difference between the first and third month in the postoperative period and the preoperative period was statistically significant (postop1st mth – preop; %95 CI (1.32–3.68) $p = 0.007$, postop 3rd mth – preop; %95 CI (1.82–4.18) $p = 0.005$). No statistically significant difference existed between the first month and third month postoperatively (%95 CI (−0.39-1.39), $p = 0.109$) (Table 5).

No statistically significant relationship existed between Epworth score and the number of enuresis (Table 6).

No statistically significant difference existed in average Epworth scores in resolved or unresolved NE patients postoperatively in the first and third month (Table 7).

3. Discussion

Obstructive sleep apnea frequency in children was reported as 1–4%, but upper airway resistance and snoring, symptoms of OSA, were reported as high as 27%. OSA is more common in boys [1,8]. Predisposing factors for OSA include adenotonsillar hypertrophy, neuromuscular disorders, craniofacial abnormalities associated with macroglossia, retrognathia or maxillary hypoplasia, and obesity [1].

Sleeping difficulties and snoring are the most common symptoms of OSA in children. In adults, OSA criteria are mostly accompanied by obesity and other systemic diseases. On the other hand the most common cause of pediatric OSA is adenotonsillar hypertrophy, and the peak age for both is 3–7 years [1]. Therefore, BMI is assessed, and the ratios of children in this study were in normal range, 19.6 ± 5.3 in the