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The importance of obstructive sleep apnea score and end-tidal CO_2 level in adolescent children who underwent oropharyngeal surgery

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Abstract

Aim: Children with obstructive sleep apnea have an increased postoperative risk of adverse respiratory events. In our study, we calculated Obstructive Sleep Apnea Scores using the modified STOP-Bang questionnaire in children undergoing oropharyngeal surgery. The groups determined according to this score were compared in terms of mask ventilation levels in the intraoperative period, postoperative complications and postoperative $ETCO_2$ levels.

Materials and Methods: A total of 90 patients, aged 7-15 years, who will undergo oropharyngeal surgery, classified as ASA I-II, and who have undergone a modified STOP-Bang questionnaire at the preoperative examination, were included in the study. Obstructive sleep apnea score (OSAs) was determined according to the modified STOP-Bang questionnaire, and the patients were divided into 3 groups as low, medium, and high-risk. Difficult mask ventilation level was noted in the intraoperative period. At the end of the operation, end-tidal carbon dioxide concentration ($ETCO_2$) values at 0, 3, 5, 10, and 15 minutes after the patient was extubated and whether the patient had spasms were recorded.

Results: Among the 8 parameters in the modified STOP-Bang questionnaire, it was found that there was a significant difference between the groups for the other 6 parameters except for snoring and learning disability. Diffucult mask ventilation increased significantly from Group I to Group III. There is a significant difference between Group I and II, Group II and III, and Group I and Group III ($p= 0.001$). Although there were small differences within the groups and between the measurements of $ETCO_2$ at different minutes, these differences were not statistically significant ($p \geq 0.05$).

Conclusion: In conclusion, associations between the results of the modified STOP-Bang questionnaire and the level of intervention required for difficult mask ventilation, this information could serve as a useful indicator for a higher level of care in the perioperative period for future patients.

Introduction

Obstructive sleep apnea syndrome (OSAS) is a syndrome that is characterized by recurrent partial or complete upper respiratory tract obstructions resulting in hypoxia/reoxygenation and breathlessness during sleep [1]. Obstructive sleep apnea syndrome defines prolonged partial upper respiratory tract obstruction and intermittent complete obstruction, which can be seen in all childhood age groups from the neonatal period to the adolescent age group, and disrupts the normal breathing pattern during sleep [2]. OSAS prevalence reaches its peak value in 2 different age groups. The first peak is seen in children aged 2 to 8 years; here the adenoid tissue is larger than in other ages and causes upper obstruction. The second peak prevalence is seen in weight gain in adolescence [3]. Its prevalence is reported to be 1-3% [4]. Children with adenotonsillar hypertrophy constitute an important risk group. Along with this, other risk factors include upper respiratory tract anatomical stenosis, craniofacial malformations, neuromuscular muscle disease, decreased airway tone, obesity, and prematurity [4].

OSAS may cause perioperative and postanesthetic complications. The STOP-Bang is a questionnaire used to investigate OSAS in preoperative evaluation. According to the results of the STOP-Bang questionnaire, the ob-

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structive sleep apnea score (OSAs) determines the level of OSAS. Adolescent modification of STOP-Bang (teen STOP-Bang) was validated previous study [5]. High OSA scores provide preparation for perioperative and postoperative complications [6-9]. End-tidal CO_2 ($ETCO_2$) level measurement in the monitoring performed to reduce postoperative complications is a noninvasive monitoring method that has been on the agenda in recent years.

In various studies, we found that the specificity of the STOP-Bang questionnaire was lower than its sensitivity [10-13]. Ignoring its low specificity, the STOP-Bang questionnaire, whose sensitivity was found to be between 95-100% in all tests, is recommended as an appropriate screening test for OSAS [9].

In our study, we aimed to reveal the importance of the modified STOP-Bang questionnaire adapted for adolescent children to predict intraoperative and postoperative complications that may develop with difficult mask ventilation level and its relationship with postoperative $ETCO_2$ level.

Main points

- The majority of pediatric oropharyngeal surgery indications are for respiratory obstruction, and pediatric patients have a high incidence of severe OSAS associated with hypoxemia during sleep.

- There is strong evidence that pediatric patients with OSAS have a higher incidence of post-obstructive pulmonary edema, airway obstruction, and respiratory failure after oropharyngeal surgery compared to other patient groups

- The modified Stop-bang questionnaire is a fast, cost-effective and easy method to predict the degree of difficult mask ventilation in adolescent children at risk for OSAS.

- End-tidal CO_2 monitoring is an accessible and cost-effective method to identify children with OSAS who will experience respiratory depression following oropharyngeal surgery in the postoperative care unit.

Materials and Methods

Our study was performed at the Department of Otorhinolaryngology, Head and Neck Surgery, Anesthesiology and Reanimation between December 2019 and December 2020, after the approval of the Non-Invasive Clinical Research Ethics Committee of the Namık Kemal University Faculty of Medicine (2019.188.10.09). All procedures comply with the ethical standards (institutional and national) of the responsible committee for human experiments and the 1975 Declaration of Helsinki was renewed in 2008. Additional informed consent was obtained from all patients whose data is included in this article. Patients aged 7 to 15 years, who would undergo oropharyngeal surgery and who were in the American Society of Anesthesiologists (ASA) I-II classification, were included in our study. Patients under 7 years of age and over 15 years of age, patients with ASA III and above, those with symptomatic cardiopulmonary disease, those with neuromuscular disease, patients who had recurrent oropharyngeal surgery, syndromic patients (Down Syndrome, Turner Syndrome, Pierre Robin Syndrome, etc.), patients who had undergone craniofacial surgery, patients with craniofacial malformations, patients who had undergone lung lobectomy/pneumonectomy and those who did not want to participate in the study were excluded from it.

During the preoperative evaluation, the patients' names and surnames, ages, genders, ASA classifications, the name of the planned operation, and the answers given by the relatives of the patients to the modified STOP-Bang questionnaire were recorded in the patient follow-up form (Table 1). To obtain blood pressure, firstly, the arm circumference of the patients was measured, and then the appropriate size blood pressure cuff was selected. Blood pressure was measured 3 times at 5-minute intervals. The average of the 2nd and 3rd measurements was noted. The height and weight of the patients were measured, and body mass indexes (BMI) were calculated. The measurement of the neck circumference was taken from the level of the cricothyroid ligament, and the patient was recorded on the follow-up form. Before the operation, all patients underwent routine physical examination after preparation for anesthesia. The modified STOP-Bang questionnaire was filled out for all patients who were divided into 3 groups: low, moderate, and high OSAs (Table 1).

The difficult mask ventilation level was set as outlined below.

In children with normal facial anatomy aged 7 years and older, effective mask ventilation was performed. The proper mask ventilation technique for all children is to hold the mask over the mouth and nose with the thumb and forefinger while the middle finger is placed on the bony portion of the mandible. Difficult mask ventilation during general anesthesia is almost always because of some form of intrinsic airway obstruction. In older children, large tonsils or adenoid tissue are usually responsible. When upper airway obstruction occurs, the practitioner should choose a corrective maneuver to relieve the obstruction before more advanced airway instrumentation techniques. The first is chin lift, which stretches and tightens the soft tissue structures along the length of the upper airway and results in an increase in the anteroposterior dimensions of the upper airway. If chin lift is not effective, the next maneuver is jaw thrust, which primarily alleviates obstruction caused by the epiglottis protruding posteriorly into the airway. The third maneuver, which is usually done simultaneously with the first two, was the application of continuous positive airway pressure (CPAP), which distends all the soft tissues of the pharynx and larynx. If all of the above maneuvers (which, in the aggregate, should not take more than about 30–45 seconds to perform) did not result in an unobstructed upper airway, the next steps included oral or nasal airway insertion, supraglottic airway (SGA) insertion, or tracheal intubation.

Routine monitoring (Dräger Primus®) was applied to patients who were taken to the operating room: three-wire electrocardiography (ECG), non-invasive blood pressure monitoring, which provides the measurement of SpO_2, systolic blood pressure (SBP), and diastolic blood pressure (DBP). Routine induction drugs (3 mg/kg propofol intravenously, 1 mcg/kg fentanyl intravenously, 0.6 mg/kg rocuronium intravenously) were administered for general anesthesia to those patients who came from the ward by intravenous route. To provide sufficient muscle relaxation for endotracheal intubation after induction, 120 seconds were awaited, and during this period, 100% O_2 was ventilated with mask ventilation. Patients with adequate muscle relaxation were intubated. The degree of mask ventilation difficulty was then recorded (Table 2) [14]. It was ensured that the mask ventilation and intubation practitioner was an anesthesia doctor with more than 2 years of anesthesia experience. $ETCO_2$ levels of the patients were monitored with the Medtronic CapnosteamTM 35 Portable Respiratory Monitor PM35MN with MicrosteamTM $ETCO_2$ and NellcorTM SpO_2 device and recorded on the follow-up form at the 10^{th} and 15^{th} minutes.

Whether the patient went into laryngospasm after deep extubation was noted on the patient follow-up form. The 10^{th} and 15^{th} minute $ETCO_2$ values of the patients who went into laryngospasm in the operating room were also recorded before they were transferred to the recovery unit.

A total of 90 patients with OSAs low (n=30) Group I, moderate (n=30) Group II, and high (n=30) Group III according to the modified STOP-Bang questionnaire were included in the study. The parameters we follow are the patient's height, weight, BMI, and, during the operation, the ECG, SpO_2, SBP, DBP, and difficult mask ventilation levels were measured. After extubation, the zero-minute, 3^{rd}-minute, 5^{th}-minute, 10^{th}-minute, and 15^{th}-minute $ETCO_2$ values were checked and recorded.

Statistical analysis

The data obtained in our study were subjected to statistical analysis. SPSS (Statistics Package for Social Sciences) software version 25.0 was used for analysis. Frequency analysis was used where necessary in the analysis of the data, and the results were presented as numbers (n) and percentages (%). In the analyses made with measurements, mean±standard deviation, additionally the smallest, largest, and median values are presented where necessary. Whether the data was normally distributed or not was evaluated by Kolmogorov-Smirnov and Shapiro-Wilk tests. Independent-sample t-test was used for comparison between two groups for normally distributed data, and the Kruskal-Wallis test was used for non-normally distributed variables. In all analyses, the statistical significance level for the p-value was accepted to be <0.05.

Results

Of the 90 patients examined in our study, 51 (56.7%) were male and 39 (43.7%) were female, with a mean age of 10.4±2.6 years. There was no statistically significant difference between the groups in terms of ASA score (p≥0.05) (Table 3).

There was no significant difference between the groups in terms of the type of surgery (p=0.587; p=0.140; p=0.131). There was no significant difference between the groups in terms of the presence of snoring (p=0.067). There is a significant difference between Group III and Group II and Group I in terms of fatigue (p<0.001). Apnea was present in 61 (67.8%) out of 90 patients. Significantly higher apnea development was found in Groups II and III (p: 0.002) (Table 3).

While moving from Group I to Group III, the probability of high blood pressure in patients increased significantly (p=0.002). It was found that, as OSAs increased in terms of BMI height, this probability also increased (p=0.006). It was determined that the learning disability was present only in 9 (10%) out of 90 patients, where 5 of them were in Group III, and 4 of them were in Group II. Although, remarkably, there were no patients in Group I, and the difference between the groups was not statistically significant (p=0.075). Neck circumference was found to be wide in 30 (66.7%) out of 90 patients. It was determined that these patients were more common in Group III (23/30) (Table 3).

Neck circumference width was detected in only 6 patients in Group II and only in 1 patient in Group I. The difference between the groups was statistically significant (p<0.001). Gender, the last parameter of the STOP-Bang questionnaire, was found to be 14 male patients in Group I, 9 male patients in Group II, and 28 out of 30 patients in Group III were male. Here, a statistically significant difference was found in Group III (p <0.001). To summarize, among the 8 parameters in the STOP-Bang questionnaire, there was a significant difference between the groups for the other 6 parameters except for snoring and learning disability (Table 3).

When the difficulty level of mask ventilation was evaluated, 31 (34.4%) of 90 patients were Grade 1 (ventilation

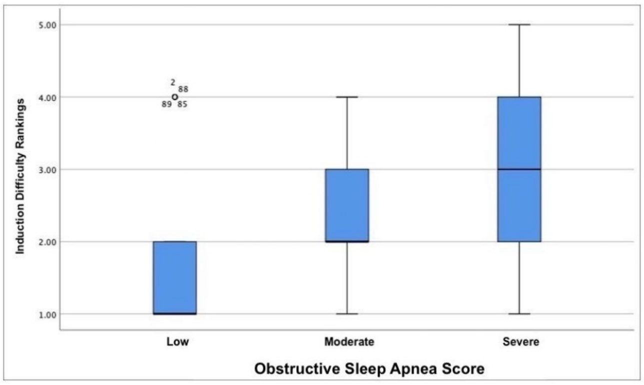

Figure 1. Distribution of difficult mask ventilation levels between groups.

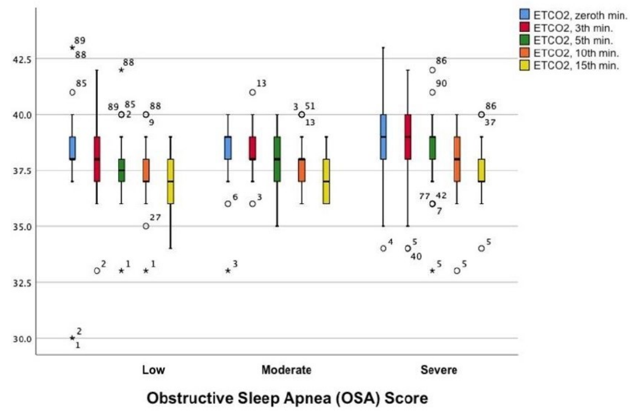

Figure 2. Distribution of $ETCO_2$ values.

Table 1. Obstructive Sleep Apnea Score (OSAs) Evaluation by Modified STOP-BANG Questionnaire.

S-Snore	How often does your child snore loudly?
T-Tired	Is your child sleepy during the daytime?
O-Observed	Does your child stop breathe during sleep?
P-Pressure	Systolic or diastolic blood pressure greater than or equal to 95^{th} percentile for height and age.
B-BMI $\geq$ %95	BMI greater than 95^{th} percentile for age.
A-Academic problems	Does your child have learning problems?
N- Neck	Neck circumference greater than 95^{th} percentile for age, and male Gender.
G-Gender	Male
Low Risk of OSAs	Yes to 0-2 questions
Intermediate Risk of OSAs	Yes to 3-4 questions
High Risk OSAs OR	Yes to 5-8 questions
High Risk of OSAs	Yes to 2 or more of 4 STOP questions + male gender.
High Risk OSAs	Yes to 2 or more of 4 STOP questions + BMI $\geq$95 percentile for age.
High Risk OSAs	Yes to 2 or more of 4 STOP questions + neck circumference $\geq$95 percentile for age.

Table 2. The difficult mask ventilation rankings.

Grade	Intervention
1	Easy ventilation with mask
2	Jaw thrust requirement
3	Positive airway pressure
4	Oral/nasal airway requirement
5	Oral/nasal airway and Positive airway pressure requirement
6	Emergent intubation

with mask), 28 (31.1%) were Grade 2 (jaw thrust), and 11 (12.2%) were Grade 3 (positive airway pressure), 18 (20%) as grade 4 (oral/nasal airway) and finally 2 patients (2.2%) as Grade5 (oral/nasal airway and positive airway pressure).

When the mask ventilation difficulty level in the groups was examined, it was seen that the mask ventilation difficulty of 18 patients in Group I was Grade 1, 7 of them were Grade 2, and 5 were Grade 4. There were no patients in Group I with grade 3, 5, and 6. While half of the patients in Group II were in grade 2, the patients with grade 5 and 6 were not present in this group either. In Group III, 6 patients were in grade 1 and 2, 5 patients were in Grade 3, 11 patients were in Grade 4, and 2 patients were in Grade 5. Accordingly, the mean mask ventilation difficulty level of the patients in Group I was 1(1-4); it was 2(1-4) in Group II and 3(1-5) in Group III. The mask ventilation difficulty level increased significantly from Group I to Group III. There was a significant difference between Groups ($p= 0.001$).

According to the STOP-Bang questionnaire, it was determined that, as OSAs increased, the the mask ventilation difficulty also increased in direct proportion (Table 4) (Figure 1).

In our study, the relationship between OSAs and postoperative $ETCO_2$ levels was also investigated. $ETCO_2$ values were measured at zero, three, five, ten and fifteen minutes. Accordingly, for Group I patients, the mean $ETCO_2$ value was 38.17±0.48 at the zero minute, 37.93±0.31 at the third minute, 37.7±0.3 at the fifth minute, 37.33±0.25 at the tenth minute, and 37.03±0.18 at the fifteenth minute. For Group II patients, these values were determined to be 38.4±0.26, 38.33±0.18, 38±0.21, 37.73±0.2, and 37.13±0.18, respectively. For Group III, they were determined to be of 38.9±0.33, 38.43±0.36, 38.4±0.31, 37.9±0.29, and 37.47±0.22, respectively. Although there were small differences within the groups and between the measurements of $ETCO_2$ at different minutes, these differences were not statistically significant ($p\geq0.05$) (Table 4) (Figure 2).

When we compared the development of spasms between the groups, spasms developed in 8 (8.9%) out of 90 patients: 5 of these patients were in Group III, 2 of them were in Group II, and only 1 patient was in Group I. There was no significant difference between the groups in terms of spasm development probability ($p=0.168$) (Table 4).

Discussion

The modified Stop-bang questionnaire is a fast, cost-effective and easy method to predict the degree of difficult mask ventilation in adolescent children at risk for OSAS. In our study, the mask ventilation difficulty level increased significantly from Group I to Group III. According to the STOP-Bang questionnaire, it was determined that, as OSAs increased, the mask ventilation difficulty also increased in direct proportion.

The main purpose of anesthesia is sedation, analgesia, and amnesia and maintaining good cardiorespiratory parameters by cardiorespiratory support or maintaining autonomic reflexes. When faced with a difficult airway, human life is put at great risk. One of the unpredictable causes of the difficult airway is OSAS. Today, with the increase in obesity, we encounter OSAS more frequently in childhood. In our study, we have aimed to investigate whether there is a correlation between OSAs, which we evaluated in the preoperative anesthesia examination, and difficult mask ventilation and postoperative $ETCO_2$ level.

Nagappa et al. [12] confirmed the high performance of the STOP-Bang questionnaire for OSAS screening in the sleep clinic and surgical population in their systematic review and meta-analysis in adults. They found that the higher the STOP-Bang score is, the higher the probability

Table 3. Comparison of demographic data (Age, Body mass index, Gender, ASA), Types of Surgery and Modified STOP-Bang questionnaire parameters according to groups.

		Group I (n=30)	Group II (n=30)	Group III (n=30)	p-value
Age		9.60	10.90	11.70	0.566
BMI (kg/m^2) $\geq$ 95th percentile for age		1(3.3%)	4 (13.3%)	10 (33.3%)	**0.006***
Male (n=51)		14 (46.6%)	9 (30%)	28 (93.3%)	**<0.001***
Female (n=39)		16 (53.3%)	21(70%)	2 (6.6%)	**<0.001***
ASA I		24 (80%)	26 (86.6%)	26 (86.6%)	0.713
ASA II		6 (20%)	4 (13.3%)	4 (13.3%)	0.721
Adenoidectomy		17 (56.6%)	13 (43.3%)	15 (50%)	0.587
Tonsillectomy		6 (20%)	4 (13.3%)	1 (3.3%)	0.140
Adenotonsillectomy		7 (23.3%)	13 (43.3%)	14 (46.6%)	0.131
Snoring	No	10 (33.3%)	3 (10%)	5 (16.7%)	0.067
	Yes	20 (66.7%)	27 (90%)	25 (83.3%)	
Tiredness	No	27 (90%)	14 (46.7%)	13 (43.3%)	**<0.001***
	Yes	3 (10%)	16 (53.3%)	17 (56.7%)	
Apnea	No	17 (56.7%)	6 (20%)	6 (20%)	**0.002***
	Yes	13 (43.3%)	24 (80%)	24 (80%)	
Blood Pressure Elevation	No	26 (86.7%)	20 (66.7%)	13 (43.3%)	**0.002***
	Yes	4 (13.3%)	10 (33.3%)	17 (56.7%)	
Learning Problems	No	30 (100%)	26 (86.7%)	25 (83.3%)	0.075
	Yes	0 (0%)	4 (13.3%)	5 (16.7%)	
Neck circumference $\geq$ 95th percentile	No	29 (96.7%)	24 (80%)	7 (23.3%)	**<0.001***
	Yes	1 (3.3%)	6 (20%)	23 (76.7%)	
Male Gender	No	16 (53.3%)	21 (70%)	2 (6.7%)	**<0.001***
	Yes	14 (46.7%)	9 (30%)	28 (93.3%)	

BMI: Body mass index; ASA: American Society of Anesthesiologists; *p<0.05.

Table 4. Comparison and evaluation of difficult mask ventilation, $ETCO_2$ levels and spasm development according to groups.

		Group I (n=30)	Group II (n=30)	Group III (n=30)	Total (n=90)	p-value
Difficult mask ventilation level median(min-max)		1(1-4)	2(1-4)	3(1-5)	2(1-5)	**0.001***
Difficult mask ventilation grade(n)		Grade 1:18 Grade 2:7 Grade 4:5	Grade 1:7 Grade 2:15 Grade 3:6 Grade 4:2	Grade 1:6 Grade 2:6 Grade 3:5 Grade 4:11 Grade 5:2	Grade1:31 Grade 2:28 Grade 3:11 Grade 4:18 Grade 5:2	**0.001ß**
$ETCO_2$ 0. Min.		38.17±0.48	38.4±0.26	38.9±0.33	38.4±0.35	$\geq 0.05^{\alpha}$
$ETCO_2$ 3. Min		37.93±0.31	38.33±0.18	38.43±0.36	38.2±0.28	
$ETCO_2$ 5. Min		37.7±0.3	38±0.21	38.4±0.31	38.±0.27	
$ETCO_2$ 10. Min		37.33±0.25	37.73±0.2	37.9±0.29	36.6±0.24	
$ETCO_2$ 15. Min		37.03±0.18	37.13±0.18	37.47±0.22	37.21±0.19	
Spasm Development	No	29 (96.7%)	28 (93.3%)	25 (83.3%)	82(91.1%)	0.168ß
	Yes	1 (3.3%)	2 (6.7%)	5 (16.7%)	8 (8.9%)	

Kruskal-Wallis test *p<0.05; Chi-square test, ßp<0.05;Student's t-test $^{\alpha}$ p<0.05.

of moderate to severe OSAS. When we look at the literature, there are few studies on the STOP-Bang questionnaire in children. Combs et al. [15] in their population-based cohort study, in which they developed the modified STOP-Bang questionnaire and included 312 children aged 9-17, concluded that adolescents showed better accuracy of the modified STOP-Bang questionnaire than children who did not reach puberty. Lubna et al. [16] confirmed the usability of the modified STOP-Bang questionnaire for OSAS risk in Indian adolescents aged 10-19 years. In our study, the participants were between the ages of 7 and 15 (mean age 10.4±2.6 years), and a correlation was found between the modified STOP-Bang questionnaire and OSAS in pre-adolescent children.

Khan et al. [17] found a relationship between OSAS and hypertension and the degree of obesity in their retrospective cohort study on 501 patients aged 13-21 years. Dong et al. [18] found that overweight and obesity are important risk factors for OSAS in both adults and children.

Katz et al. [19] divided 245 children aged from 6 to 17 into two groups as below 12 years old and above and compared the percentile values of gender, neck circumference, BMI and waist circumference among these groups with the participants who performed PSG. In male participants over 12 years of age, the neck circumference percentile value of ≥95 was found to be statistically significant in OSAs. In both groups, men have higher OSAs. BMI ≥95 percentile value was found to be borderline significant in children under 12 years of age. In our study, neck circumference and height were found to be correlated with ≥95th percentile values, and male gender and high OSAs. Similarly, in our study, BMI and neck circumference were statistically significantly higher in patients with high OSAs risk in Group 3.

Spilsbury et al. [20] examined the incidence, remission, and predictability of OSAS from middle childhood to late adolescence in their population-based cohort study involving 490 participants. They concluded that the children who have undergone tonsillectomy or adenoidectomy should be monitored for OSA symptoms and signs, probably because they have additional risk factors for OSA.

Tests and measurements that can predict difficult airways are important in patients with obstructive sleep apnea syndrome. In this study, similar to other studies, we found that we could predict difficult airway ventilation with the STOP-Bang score. In the study conducted by Acer et al. [21] with 227 patients, it was concluded that the Mallampati and Cormeck-Lehane tests alone were insufficient to predict difficult intubation in anesthesia, so it would be beneficial to combine Cormeck-Lehane and neck circumference. Brodsky et al. [22] reported that a neck circumference greater than 42 cm may indicate difficult intubation.

While evaluating childhood OSAS, Dayyat et al. [23] classified their PSG patients into two groups, as type 1 and 2 according to their clinical characteristics. OSAS findings of type 1 patients were associated with large adenoid/tonsillar, while type 2 was associated with obesity and systemic findings. They concluded that the severity of OSAS was proportional to the degree of obesity. In our study, children who underwent oropharyngeal surgery were included in the study, and obese children were found to be at high risk for OSAS.

Plunkett et al. [24] included 10 patients with unpredictable difficult airway in the operating room for 2 years. After the postoperative discharge, the patients underwent PSG overnight. They concluded that the severity of OSAS increased as the masking difficulty also increased, and they pointed out that this might be a precursor of undiagnosed OSA. In our study, similar to this study, we found a correlation between OSAs determined by the modified STOP-Bang questionnaire and difficulty in masking in children.

In their study, Paruthi et al., determined the role of $ETCO_2$ monitoring during PSG in children with OSAS and investigated the correlation of $ETCO_2$ with other OSAS measures and changes in cognition and behavior after adenotonsillectomy. Increased levels of AHI severity were associated with an increased risk of hypoventilation, although the correlation was modest, and the finding of elevations in $ETCO_2$ levels in African American children revealed the potential that this information could help better characterize OSAS differences among child subgroups [25]. In clinical practice, $ETCO_2$ can be expected to provide different information from other measures in a small proportion of children.

Limitations

The current study includes several limitations. First of all, our study is a small single-center study. we could not compare PSG results with our current data in pediatric patients. However, we think that the modified STOP-Bang questionnaire and OSAs are useful in terms of predictability of difficult mask ventilation since it is not possible to perform PSG in every center during preoperative anesthesia in the pediatric age group.

Conclusion

As a result, studies with the modified STOP-Bang questionnaire are few in the literature, and we believe that the modified STOP-Bang questionnaire in children in preoperative examination in anesthesia outpatient clinics should be applied to predict the degree of difficult mask ventilation. Although it was not statistically significant in our study, we recommend $ETCO_2$ monitoring in the postoperative follow-up. We think that measuring $ETCO_2$, especially during prolonged follow-up periods, should be beneficial in terms of the effectiveness of oropharyngeal surgery in treating OSAS.

Ethical approval

Ethical approval was received for this study from Namık Kemal University Faculty of Medicine Non-Interventional Clinical Research Ethics Committee (2019.188.10.09).

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