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ORIGINAL ARTICLE
ORİJİNAL ARAŞTIRMA

The Effect of Obesity on Emergence Agitation in Children Undergoing General Anesthesia

Çocuklarda Obezitenin Postoperatif Derlenme Ajitasyonuna Etkisi

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ABSTRACT

Aim: Although the factors affecting emergence agitation (EA) have been examined in the literature, the literature evaluating the effect of obesity on postoperative EA in children is limited. In this study, we aimed to evaluate whether obesity has an effect on postoperative EA.

Material and Method: The medical records of patients aged 2-14 years, with ASA I-II physical status and undergoing elective surgery were reviewed (November 2018 and November 2022). Patients who underwent emergency surgery or who used an anesthetic agent other than sevoflurane for the maintenance of anesthesia were excluded from the study. Patients will be divided into 3 groups according to their body mass index; Group 1; Normal (5th to 85% percentile), Group 2; Overweight (85-95% percentile), Group 3; Obese (95th percentile and above). Emergence agitation was assessed by anesthesiologists using the Watcha scale.

Results: 567 patients were included in the study and EA occurred in 115 (20.3%) of them. Of the patients, 428 were considered normal, 64 were overweight and 75 were obese. When demographic data were compared, there was no statistical difference between the groups. EA incidence was statistically higher in Group II (28.1%) and Group III (29.3%)compared to Group I (17.5%) (p=0.006).

Conclusion: We are of the opinion that both overweight and obesity increase the incidence of EA in children undergoing general anesthesia, but prospective further studies are also required.

Keywords: Emergence agitation, general anesthesia, pediatric

ÖZ

Amaç: Literatürde derlenme ajitasyonuna etki eden faktörler incelenmiş olmakla beraber çocuklarda obezitenin postoperatif derlenme ajitasyonuna etkisinin değerlendirildiği literatür bilgisi kısıtlıdır. Bu çalışmada obezitenin postoperatif derlenme ajitasyonuna etkisinin olup olmadığını değerlendirmeyi amaçladık.

Gereç ve Yöntem: 2-14 yaş arasında, ASA I-II fiziksel statusa sahip, Kasım 2018 ve Kasım 2022 tarihleri arasında elektif cerrahi geçiren hastaların kayıtları incelendi. Acil cerrahi geçiren veya anestezi idamesinde sevofluran dışında bir anestezik ajan kullanılan hastalar çalışma dışında bırakıldı. Hastalar vücut kitle indekslerine göre 3 gruba ayrıldı: Grup 1; Normal (%5 ila %85 persentil), Grup 2; Fazla kilolu (%85-95 persentil), Grup 3; Obez (95. persentil ve üzeri). Derlenme ajitasyonu bir anestezist tarafından Watcha skalası ile değerlendirildi.

Bulgular: Çalışmaya 567 hasta dahil oldu ve bunların 115'inde (%20.3) derlenme ajitasyonu meydana geldi. Hastaların 428'i normal, 64'ü fazla kilolu ve 75'i obez olarak değerlendirildi. Demografik veriler karşılaştırıldığında gruplar arasında istatistiksel oalrak herhangi bir fark yoktu. Derlenme ajitasyonu insidansı Grup II (%28,1) ve Grup III'te (%29,3) Grup I'e (%17.5) göre istatistiksel olarak daha yüksekti (p=0,006).

Sonuç: Genel anestezi uygulanan çocuklarda hem fazla kilolu olmanın hem de obezitenin derlenme ajitasyonu insidansını arttırdığı görülmüştür ancak prospektif çalışmalara da ihtiyaç vardır.

Anahtar Kelimeler: Derlenme ajitasyonu, genel anestezi, pediatrik

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INTRODUCTION

Childhood obesity has become a global health problem today (1,2). According to World Health Organization (WHO) data, it is estimated that 378 million children worldwide are overweight or obese (3). While obesity directly affects health services, it is indirectly associated with bad social and economic outcomes (4). The incidence of comorbidities that increase the perioperative risk, such as hypertension, type 2 diabetes mellitus, asthma, obstructive sleep apnea, fatty liver and gastroesophageal reflux disease, is higher in obese children compared to non-obese children (5-9). Obesity not only causes physical problems, but also causes an increase in the incidence of depression and is associated with a decrease in quality of life (10,11). Both adult and pediatric obese patients are becoming an important part of the surgical population and their postoperative management is difficult compared to non-obese patients (12).

Emergence agitation (EA) was first reported in the early 1960s and genellikle çocuklarda genel anesteziden recovery sırasında görülür (13). Emergence agitation defined as "a disturbance in a child's awareness of and attention to his or her environment with disorientation and perceptual alterations, including hypersensitivity to stimuli and hyperactive motor behavior in the immediate post anesthesia period " (14). Emergence agitation presents challenges for healthcare professionals and an unpleasant experience for parents. The incidence of EA varies greatly in the literature [reaching as high as 80% (15)]. However, EA is thought to be very common and closely related to the use of sevoflurane and desflurane in pediatric anesthesia (16).

Although many studies have examined the factors affecting EA, studies evaluating the effect of obesity on postoperative EA in children are limited. In this study, we aimed to evaluate whether obesity has an effect on postoperative EA.

MATERIAL AND METHOD

This study was approved by the Institutional Ethics Committee and was conducted in accordance with the Declaration of Helsinki and EQUATOR guidelines. The requirement for written informed consent from patients and their parents was waived in this study because this is a retrospective observational study and the data were analyzed anonymously.

Medical records of the Selcuk University Medical Faculty Hospital between November 2018 and November 2022 were retrospectively reviewed. Pediatric patients (2-14 years old) with American Society of Anesthesiologists physical status (ASA PS) 1 or 2 who had undergone elective surgery under sevofluran general anesthesia were enrolled in this study.

The exclusion criteria were as follows: Under 2 years of age, over 14 years of age, American Society of Anesthesiologists Physical Status Classification System (ASA PS) of 3 or more, born prematurely, children who were intubated before induction of anesthesia or whose extubation was not planned after surgery, emergency cases, general anesthesia with an anesthetic agent other than sevoflurane.

Patients will be divided into 3 groups according to their body mass index; Group I; Normal (5th to 85% percentile), Group II; Overweight (85-95% percentile), Group III; Obese (95th percentile and above).

Anesthesia induction was performed in all patients as standard of institution: Face mask inhalation induction with sevoflurane 8% in oxygen and then intravenous (i.v.) catheter was placed. Intravenous rocuronium 0.6 mg/kg was given to facilitate tracheal intubation. Anesthesia was maintained using sevoflurane in an oxygen/air mixture and remifentanil (0.25 mc/kg/min). Paracetamol (10 mg/kg) were given i.v. to attenuate postoperative pain. Sevoflurane and remifentanil infusion was stopped near the end of the surgery. Sugammadex (2 mg/kg) was used for neuromuscular recovery in all patients. Following tracheal extubation, patients were cared for in the postanesthesia care unit (PACU).

Data obtained from medical records included data for age, sex, height, weight, body mass index (BMI), ASA PS, general anesthetic agents, anesthesia time, airway device, PACU stay time, incidence of occurrence agitation and pain. Emergence agitation was assessed by anesthesiologists using the Watcha scale as follows: 1, asleep or calm; 2, crying, but can be consoled; 3, crying, cannot be consoled; and 4, agitated and thrashing around (17). According to the Watcha scale, children who are 3 or 4 were accepted as emergence agitation. In the PACU, the criteria for discharge (which included consciousness, normal vital signs, no pain, and no nausea or vomiting) were the same for all patients. All patients discharged from the PACU according to the customary guidelines practiced in the institution. For measuring pain, FLACC scale (18) was used in PACU.

Statistical Analysis

Statistical analyses were performed with SPSS 21.0 software (SPSS Institute, Chicago, IL, USA). The Kolmogorov-Smirnov test was used to determine whether continuous variables followed a normal distribution. Parametric data were tested with Student's t test or the Mann–Whitney test and presented as means with standard deviation (SD) or medians with interquartile range (IQR). Categorical data were analyzed with the two-tailed Pearson's Chi-square test and are given as numbers and percentages. A P-value <0.05 was considered statistically significant.

RESULTS

In the medical records of Selcuk University Medical Faculty Hospital, it was determined that 1107 pediatric patients were operated between November 2018 and November 2022. The demographic and clinical characteristics of the patients are summarized in **Table 1**. Of these, only 567 met the inclusion criteria of the current study. Of all patients, 64% were male and 82.7% had ASA PS I. The median (IQR) age of the patients included in the study was 5.5 (3-9). The median (IQR) value of anesthesia time and PACU stay time was 60 (45-90) and 23 (18-25) min, respectively. Emergence agitation occurred in 115 children (20.3%).

Table 1. Demographic and clinical characteristics of the patients (n=567).

Categories	Values
Age, years	5.5 (3-9)
Gender, female/male	363 (64%)/204 (36%)
ASA PS, I/II	469 (82.7%)/98 (17.3%)
Anesthesia time, min	60 (45-90)
Airway device, ETT/SG	263 (46.4%)/304 (53.6%)
PACU stay time, min	23 (18-25)
FLACC score	2 (0-5)
Emergence agitation, n (%)	115 (20.3%)

ASA PS: American Society of Anesthesiologists Physical Status Classification System, ETT: endotracheal tube, SG: supraglottic, PACU: postanesthesia care unit. Data are presented median (IQR) or n (%).

As a result of the data obtained from the medical records, the patients were divided into 3 groups according to their body mass index: Group I; Normal (5th to 85% percentile) (n=428) , Group II; Overweight (85-95% percentile) (n=64) , Group III; Obese (95th percentile and above) (n=75). 11.2% of the patients included in the present study were overweight and 13.2% were obese.

Comparison of demographic and clinical characteristics of the groups is summarized in **Table 2**. There were no significant differences between the 3 groups regarding age, gender, ASA PS, anesthesia time, airway device used, PACU stay time and FLACC score (p=0.057, p=0.578, p=0.356, p=0.202, p= 0.756, p=0.107, and p=0.629, respectively). Emergence agitation incidence was statistically higher in Group II (28.1%) and Group III (29.3%) compared to Group I (17.5%) (p=0.006).

DISCUSSION

In this retrospective study, which included 567 patients aged 2-14 years, we found that obesity increased the incidence of agitation in pediatric patients undergoing general anesthesia.

Childhood obesity is associated with an increased risk of many comorbidities, particularly pulmonary, metabolic, orthopedic disorders and cardiovascular (19,20). Medical care of obese children can present challenges for all clinicians, including anesthetists. Although the care of adult patients in the perioperative period has been extensively studied, trials on this subject in obese children are limited. Various studies have reported that adverse events such as difficult mask ventilation, difficult airway, difficult laryngoscopy, laryngospasm, and oxygen desaturation are more common in obese children (21,22). There are still unclear areas about obesity in pediatric patients. Considering the adult literature, it is obvious that there is an inadequacy in the literature for pediatric patients.

In a study conducted with pediatric patients undergoing procedural sedation, it was reported that obesity caused an increase in the frequency of respiratory adverse events and a delay in recovery (23). In a study evaluating the effect of obesity degree on PACU discharge times in a pediatric patient group, it was reported that although PACU stay time was prolonged in both moderately and severely obese children who were operated on with general anesthesia compared to non-obese children, however, stated the degree of obesity had no effect. (24). In the present study, it was determined that obesity did not have any effect on PACU stay time.

Although the peroperative effects of obesity in pediatric patients have been evaluated in different studies, trials evaluating its effect on EA are limited. EA is a well-defined psychological and physical phenomenon that can be exhibited by children recovering from general anesthesia. EA is often described as: 1-Disorder of receptivity (abnormal reception of auditory or visual cues – child is inconsolable even by familiar voices or toys), 2-Disorder of perceptivity (heightened perception of stimuli and hyperactive motor behavior) (25). Although

Table 2. Comparison of demographic and clinical characteristics of the groups.

	Group In=428	Group IIn=64	Group IIIn=75	p
Age, years	6 (3-10)	4.5 (2-9)	6 (3-8)	0.057
Gender, female/male	277 (64.7%)/151(35.3%)	42 (65.6%)/22 (34.4%)	44 (58.7)/31 (41.3)	0.578
ASA PS, I/II	350 (81.8%)/78 (18.2%)	57 (89.1%)/7 (10.9%)	62 (82.7%)/13 (17.3%)	0.356
Anesthesia time, min	60 (45-90)	60 (45-85)	50 (35-78)	0.202
Airway device, ETT/SG	202 (47.2%)/226 (52.8%)	29 (45.3%)/35 (54.7%)	32 (42.7%)/43 (57.3)	0.756
PACU stay time, min	23 (18-25)	35 (28-38)	30 (25-35)	0.107
FLACC score	2 (0-5)	1.5 (0-5)	2 (0-4)	0.629
Emergence agitation, n(%)	75 (17.5%)	18 (28.1%)	22 (29.3%)	0.006

ASA PS: American Society of Anesthesiologists Physical Status Classification System, ETT: endotracheal tube, SG: supraglottic, PACU: postanesthesia care unit. Data are presented median (IQR) or n (%).

EA is usually short-lived, if it is prolonged, it causes a bad experience for both health professionals and parents in the postoperative period (26,27).

The effect of severe obesity on EA after pediatric ambulatory surgery was evaluated in a prospective, cross-sectional study by Reynolds et al (28). In this study severe obesity described as a risk factors for Emergence Agitation in pediatric ambulatory surgery. Unlike our study, this study included children between the ages of 4 and 17.In addition, the association of EA with PACU stay time was also evaluated in this study. Unlike our results, it was determined that PACU stay time was longer in patients with EA. Also, EA was documented in 66 (6.1%) patients. In our study, the incidence of EA was 20.3%.

While studies evaluating the effect of obesity on EA in pediatric patients are limited, this situation has been discussed more extensively in studies conducted in adult obese patients. Studies in adult patients have also shown that obesity is a risk factor for EA (29,30).

CONCLUSION

We are of the opinion that both overweight and obesity increase the incidence of EA in children undergoing general anesthesia, but prospective further studies are also required.

ETHICAL DECLARATIONS

Ethics Committee Approval: This study was conducted by ethics committee approval obtained from Selçuk University Faculty of Medicine (Approval number: 2022/532).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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