The effect of BIS-guided sevoflurane anesthesia on postoperative nausea and vomiting in pediatric adenoidectomy: a prospective randomized controlled trial

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ABSTRACT

BACKGROUND: Postoperative nausea and vomiting (PONV) is a frequent complication in pediatric patients undergoing adenoidectomy. Bispectral index (BIS) monitoring, an electroencephalography-based method for assessing anesthetic depth, enables individualized sevoflurane titration and may reduce unnecessary exposure to volatile anesthetics.

OBJECTIVES: To determine whether BIS-guided sevoflurane anesthesia reduces PONV in children undergoing adenoidectomy.

DESIGN AND SETTING: Single-center, prospective, randomized, assessor-blinded trial conducted at University of Health Sciences, Kocaeli City Hospital, Kocaeli, Türkiye.

METHODS: Fifty-eight children aged 3–8 years (American Society of Anesthesiologists score I–II) undergoing elective adenoidectomy were randomized to BIS-guided anesthesia (n = 29) or standard care (n = 29). Both groups received sevoflurane anesthesia. The primary outcome was PONV within the first 24 postoperative hours. Secondary outcomes were emergence time, total sevoflurane consumption, remifentanil dose, and rescue antiemetic use.

RESULTS: PONV within 24 hours occurred less frequently in the BIS-guided group than in controls ($p = 0.015$), with the greatest between-group differences observed at 0–1 hour and 1–6 hours. Sevoflurane consumption and emergence time were lower in the BIS-guided group ($p < 0.05$). BIS-guided anesthesia was independently associated with lower odds of PONV (OR = 0.212; 95% CI: 0.067–0.675; $p = 0.009$).

CONCLUSIONS: BIS monitoring may be a useful strategy for optimizing anesthetic depth and reducing early PONV in pediatric patients.

CLINICAL TRIAL REGISTRATION: ClinicalTrials.gov (NCT07189845). Available at: https://clinicaltrials.gov/study/NCT07189845.

INTRODUCTION

Postoperative nausea and vomiting (PONV) is among the most common postoperative complications, with an overall incidence of approximately 30%.[1] In pediatric patients, particularly following otorhinolaryngologic surgeries, this incidence may reach as high as 73%.[2] Complications associated with PONV include dehydration, electrolyte imbalance, aspiration, and postoperative bleeding.[2] In addition, PONV is associated with lower patient satisfaction and prolonged length of stay in the post-anesthesia care unit (PACU).[1,3] Adenotonsillectomy and strabismus surgery have been reported to be the surgical procedures most frequently associated with PONV in children.[4,5] Other factors associated with the development of PONV include surgical duration exceeding 30 minutes, a positive family history, the use of inhalational anesthetics, nitrous oxide, and opioids.[4–7]

The pharmacological effects of general anesthetics in children vary according to age and body surface area,[8] which may lead to excessive or insufficient anesthetic doses.[8] During inhalational anesthesia, anesthetic depth is commonly monitored using the minimum alveolar concentration (MAC).[9] However, MAC-based monitoring may not accurately reflect the hypnotic component of anesthesia.[9] Monitoring anesthetic depth using the bispectral index (BIS) allows more precise and individualized titration of anesthetic agents.[10] BIS-guided anesthesia improves postoperative outcomes and reduces anesthetic drug consumption.[10,11]

OBJECTIVES

The aim of this study was to evaluate the effect of BIS-guided sevoflurane anesthesia on PONV in pediatric patients undergoing adenoidectomy. We hypothesized that BIS-guided sevoflurane anesthesia would reduce the incidence of PONV within the first 24 postoperative hours.

METHODS

Study design and ethics

This study was a single-center, prospective, randomized, assessor-blinded clinical trial conducted at University of Health Sciences, Kocaeli City Hospital, in accordance with the principles of the Declaration of Helsinki and Good Clinical Practice. The design, conduct, and reporting of the study complied with the CONSORT 2025 (Consolidated Standards of Reporting Trials) guidelines.[12]

The study protocol was approved by the Kocaeli University Clinical Research Ethics Committee (Approval No. KAEK/12.bI.06; date of approval: July 17, 2025). Written informed consent was obtained from the parents or legal guardians of all participants. The trial was prospectively registered in the ClinicalTrials.gov database on September 2, 2025 (ClinicalTrials.gov Identifier: NCT07189845).

Participants

Pediatric patients aged 3–8 years with American Society of Anesthesiologists (ASA) physical status I–II who were scheduled for elective adenoidectomy were included in the study. The exclusion criteria were a history of PONV, preoperative use of antiemetics, steroids, or sedative medications, acute upper respiratory tract infection, history of neurological or psychiatric disorders, body mass index below the 5th percentile or above the 95th percentile for age, and anatomical airway abnormalities.

Patient flow, randomization, and blinding

A total of 62 patients were assessed for eligibility. Four patients were excluded before randomization because intravenous access could not be established during induction or because deviation from the standard anesthesia induction protocol was required. These protocol deviations resulted in exclusion before randomization.

The remaining 58 patients were randomly assigned in a 1:1 ratio to two groups using a computer-generated block randomization method with a block size of four. Accordingly, 29 patients were allocated to the BIS-guided group and 29 patients to the control group. Group allocation was concealed using sequentially numbered, opaque, sealed envelopes prepared by an independent researcher not involved in the study process (**Figure 1**). Patients and investigators were blinded to group allocation. Blinding of the attending anesthesiologists was not feasible due to the nature of the BIS-guided anesthesia protocol, which may have introduced performance bias.

Anesthesia protocol

Patients were transferred to the operating room after intravenous access had been established, and anesthesia induction was initiated intravenously. Intravenous fentanyl (1 μg/kg) was administered for analgesia, and anesthesia induction was achieved with propofol (2 mg/kg). Rocuronium (0.6 mg/kg) was administered to facilitate neuromuscular blockade and tracheal intubation.

Following endotracheal intubation, anesthesia was maintained with sevoflurane in an air/oxygen mixture. Mechanical ventilation was applied in pressure-controlled ventilation mode, with tidal volumes set at 6–8 mL/kg, respiratory rate adjusted to maintain end-tidal CO2 between 35 and 40 mmHg, and fresh gas flow set at 2 L/min. Intraoperative analgesia was provided with a remifentanil infusion titrated according to hemodynamic responses.

In the BIS-guided group, the sevoflurane concentration was titrated during maintenance of anesthesia to maintain a BIS value between 45 and 60. If BIS values exceeded the target range (> 60), the sevoflurane concentration was increased incrementally, whereas values below the target range (< 45) prompted a gradual reduction in sevoflurane concentration.

In the control group, the sevoflurane concentration was adjusted according to standard clinical practice to maintain age-adjusted MAC values between 1 and 1.3 and to keep hemodynamic parameters (heart rate and blood pressure) within ± 20% of baseline values. When MAC or hemodynamic targets were exceeded, anesthetic depth was adjusted by modifying the sevoflurane concentration.

Measurement of anesthetic consumption

Total sevoflurane consumption (mL) during surgery was obtained from anesthesia machine records, and total remifentanil dose

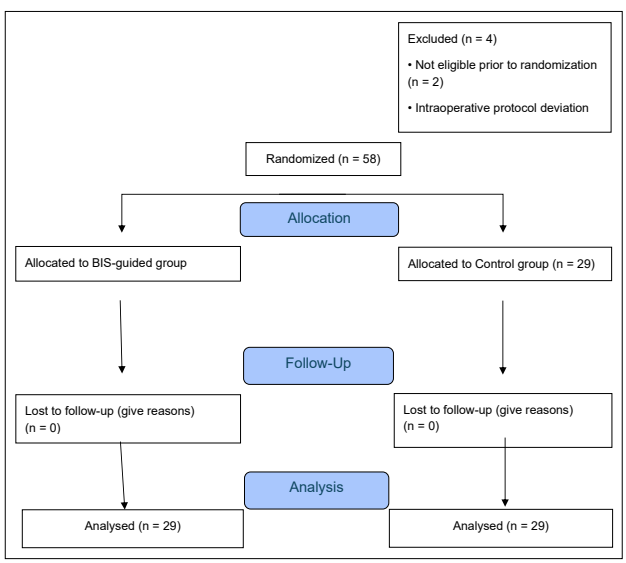

Figure 1. CONSORT flow diagram of patient enrollment and follow-up.

(μg/kg) was recorded from the infusion pump and anesthesia charts. These variables were analyzed as potential mediators of the effect of BIS-guided anesthesia on PONV.

Standard intraoperative monitoring included continuous assessment of heart rate, noninvasive blood pressure, peripheral oxygen saturation, end-tidal CO_2, and body temperature throughout the procedure. BIS monitoring was performed using a BIS Vista™ monitor (Medtronic, Minneapolis). Anesthesia was delivered using an anesthesia workstation (Aisys™ Carestation, GE Healthcare, Madison).

Emergence time

Emergence time was defined as the interval between discontinuation of sevoflurane at the end of surgery and eye opening in response to verbal commands. Neuromuscular blockade was reversed at the end of surgery with intravenous sugammadex (2 mg/kg). Emergence time was measured using a stopwatch and recorded in minutes. In cases where eye opening could not be assessed, limb movement or the onset of adequate spontaneous respiration was used as the emergence criterion.

Outcome measures

Primary outcome

The primary outcome was the incidence of PONV within the first 24 postoperative hours.

Secondary outcomes

Secondary outcomes included emergence time, total sevoflurane consumption, total remifentanil dose, and the requirement for antiemetic therapy within the first 24 postoperative hours.

Assessment of PONV

PONV was assessed at predefined time intervals after extubation. In the PACU, assessments were performed during the first 0–1 hour after extubation. On the ward, PONV assessments were conducted during the 1–6 hour, 6–12 hour, and 12–24 hour postoperative periods.

The severity of PONV was evaluated using a predefined four-point ordinal scoring system: score 0 indicated no nausea or vomiting; score 1 indicated mild nausea; score 2 indicated severe nausea or a single episode of vomiting; and score 3 indicated severe nausea accompanied by multiple episodes of vomiting or refractory PONV. Assessments were based on clinical observation and nursing reports.[13] Rescue antiemetic treatment was administered when patients experienced vomiting or when the PONV score was ≥ 2.

The time points were defined as follows: the first postoperative hour in the PACU (T1), 6 hours after extubation (T2), 12 hours after extubation (T3), and 24 hours after extubation (T4). Secondary outcomes included emergence time, total sevoflurane consumption, total remifentanil dose, and antiemetic use and timing. In younger children who were unable to report nausea verbally, PONV assessment was based on observable clinical signs such as retching, vomiting, increased salivation, feeding refusal, and behavioral distress, as well as nursing observations and parental reports.

Antiemetic use and timing

Rescue antiemetic treatments administered within the first 24 postoperative hours were recorded. Rescue antiemetic administration followed predefined criteria (vomiting or a PONV score ≥ 2). Ondansetron was used as the first-line rescue antiemetic at an intravenous dose of 0.1 mg/kg (maximum dose 4 mg), in accordance with institutional clinical practice. The type of rescue antiemetic agent, timing of administration, and total number of doses were obtained from anesthesia and nursing records. Outcomes were reported as the proportion of patients requiring rescue antiemetic therapy.

Sample size calculation

Sample size calculation was based on a previous randomized controlled study evaluating the effect of BIS-guided anesthesia on PONV incidence in children, which reported PONV rates of 53% in the control group and 17% in the BIS group. With a 95% confidence level ($\alpha = 0.05$) and 80% power ($1-\beta = 0.80$), a minimum of 52 patients was required. Considering a potential dropout rate of 10%, the target sample size was set at 58 patients.[14]

Statistical analysis

Statistical analyses were performed using IBM SPSS Statistics for Windows, version 27.0 (IBM Corp., Armonk, New York). Descriptive statistics were presented as mean ± standard deviation, median (minimum–maximum), and frequencies and percentages (n, %). Data distribution was assessed using the Kolmogorov–Smirnov test.

For normally distributed independent continuous variables, Student's t-test was used, and results are expressed as mean ± standard deviation. For non-normally distributed independent continuous variables, the Mann–Whitney U test was applied, and results are reported as median (minimum–maximum). Independent categorical variables were analyzed using Pearson's chi-square test with Yates' continuity correction, and categorical data are presented as frequencies and percentages. A p value < 0.05 was considered statistically significant.

To further evaluate the primary outcome of 24-hour PONV incidence, binary logistic regression analysis was performed to identify independent predictors of PONV. Initially, univariable logistic regression analyses were conducted for potential risk factors including age, height, weight, sex, patient group, total doses of propofol, rocuronium, fentanyl, and remifentanil, total sevoflurane consumption, mean BIS values, ASA scores, and duration

of surgery. Variables with a p value < 0.20 in univariable analysis were entered into the multiple model. The final model was determined using the backward likelihood ratio method, in which only patient group remained significant; results are presented in **Table 5**. A p value < 0.05 was considered statistically significant.[15]

To reduce the risk of type I error due to multiple comparisons for secondary outcomes, Bonferroni correction was applied, and statistical significance was set at p < 0.00625 (0.05/8). All randomized patients were analyzed in the groups to which they were originally assigned (intention-to-treat analysis).

RESULTS

A total of 58 patients were included in the study, and analyses compared the BIS-guided group (n = 29) with the control group (n = 29). Baseline demographic and clinical characteristics, including age, sex, body weight, height, and ASA physical status classification, are presented in **Table 1**. No significant differences were observed between the groups for these variables.

No statistically significant differences were observed between the groups in terms of duration of surgery, mean heart rate, end-tidal CO_2, mean arterial pressure, or total doses of propofol, rocuronium, and fentanyl (p > 0.05 for all). The mean BIS value was significantly higher in the BIS-guided group than in the control group (p < 0.001) (**Table 2**).

PONV within the first 24 postoperative hours was observed in 13 patients (44.8%) in the BIS-guided group and 23 patients (79.3%) in the control group. The difference between the groups was statistically significant (Relative risk [RR] = 0.565; 95% CI: 0.362–0.881; p = 0.015) (**Table 3**).

Time-interval analyses showed that, during the early postoperative period (0–1 hour and 1–6 hours), PONV incidence was significantly lower in the BIS-guided group than in the control group (for both intervals: RR = 0.294; 95% CI: 0.125–0.691; p = 0.003). No significant differences were observed between the groups during the later postoperative periods (6–12 hours and 12–24 hours) (p > 0.00625, Bonferroni-adjusted) (**Table 3**).

Emergence time was significantly shorter in the BIS-guided group than in the control group (p < 0.001). Total sevoflurane consumption was also significantly lower in the BIS-guided group (p < 0.001). Remifentanil consumption showed no significant difference between the groups (p = 0.726). Although the requirement for antiemetic therapy was lower in the BIS-guided group, the difference did not reach statistical significance after Bonferroni correction (p = 0.015) (**Table 4**).

In the multivariable logistic regression analysis, BIS-guided anesthesia was identified as an independent protective factor against the development of PONV (OR = 0.212; 95% CI: 0.067–0.675; p = 0.009) (**Table 5**).

Harms

No serious adverse events were observed during the study period.

DISCUSSION

This randomized controlled trial demonstrated that, compared with a non–BIS-guided approach, BIS-guided anesthesia

Table 1. Baseline characteristics

	BIS-guided group	Control group
Age (years)	5 (3–8)	6 (3–8)
Weight (kg)	19.3 ± 4.3	20 ± 3.9
Height (cm)	109 (92–130)	115 (90–130)
History of PONV	0 (0)	0 (0)
Sex		
Male	13 (44.8)	11 (37.9)
Female	16 (55.2)	18 (62.1)
ASA physical status		
ASA I	26 (89.7)	24 (82.8)
ASA II	3 (10.3)	5 (17.2)

Data are presented as mean ± standard deviation or median (minimum–maximum) for continuous variables and as number (%) for categorical variables. No statistical tests were performed for baseline characteristics.

Table 2. Periprocedural data

	BIS-guided group	Control group	p value*
Duration of surgery (min)	53.3 ± 4.7	53.6 ± 4.6	0.822[t]
SpO_2 (%)	99 (97–100)	98 (97–100)	0.048[m]
Heart rate (bpm)	110 (85–125)	110 (88–124)	0.75[m]
$ETCO_2$	36 (33–41)	38 (33–41)	0.106[m]
Mean arterial pressure (mmHg)	81 (72–92)	84 (73–92)	0.87[m]
Propofol dose (mg)	37.8 ± 8.8	40.5 ± 7.9	0.228[t]
Rocuronium dose (mg)	10 (5–15)	10 (9–16)	0.636[m]
Fentanyl dose (mcg)	20 (10–25)	20 (14–27)	0.132[m]
Mean BIS value	57 (48–60)	50 (40–54)	**< 0.001[m]***

Data are presented as number (%), mean ± standard deviation or median (minimum–maximum). [t] Student's t-test. [m] Mann–Whitney U test. * p value < 0.05 was considered statistically significant.

Table 3. Incidence of Postoperative Nausea and Vomiting (PONV) according to time intervals

	BIS-guided group	Control group	Relative Risk (95% CI)	p value*
0–1 h PONV	5 (17.2)	17 (58.6)	0.294 (0.125–0.691)	**0.003[y†]**
1–6 h PONV	5 (17.2)	17 (58.6)	0.294 (0.125–0.691)	**0.003[y†]**
6–12 h PONV	6 (20.7)	11 (37.9)	0.546 (0.233–1.278)	0.249[y]
12–24 h PONV	4 (13.8)	6 (20.7)	0.667 (0.21–2.118)	0.728[y]
24 h PONV	13 (44.8)	23 (79.3)	0.565 (0.362–0.881)	**0.015[y]***

Data are presented as number (%). Relative risks (RR) with 95% confidence intervals (CI) are reported. [y] Pearson's chi-squared test with Yates's continuity correction. * A p value < 0.05 was considered statistically significant for the primary outcome (24-hour PONV). [†] For secondary outcomes, Bonferroni correction was applied, and a p value < 0.00625 was considered statistically significant.

management was associated with a reduced incidence of PONV within the first 24 postoperative hours. This effect was particularly pronounced during the early postoperative period (0–1 hour and 0–6 hours). In the multivariable analysis, BIS-guided anesthesia was identified as an independent protective factor against the development of PONV. This finding corresponds to an absolute risk reduction of approximately 34.5%, suggesting a potentially clinically meaningful reduction in PONV.

PONV remains one of the most common postoperative adverse events in pediatric patients and is strongly associated with the use of inhalational anesthesia.[14] Apfel et al.[13] demonstrated that the association between inhalational anesthesia and PONV is especially prominent during the early postoperative period (0–2 hours).

Table 4. Secondary outcomes

	BIS-guided group	Control group	p value
Emergence time (min)	7 (5–9)	11 (7–14)	**< 0.001**[m]*
Sevoflurane consumption (mL)	20 (15–25)	26 (20–30)	**< 0.001**[m]*
Remifentanil consumption (μg/kg)	5.35 ± 0.6	5.30 ± 0.5	0.726[t]
Antiemetic use	4 (13.8)	22 (75.9)	0.015[y]

Data are presented as number (%) or median (minimum–maximum). [y] Pearson's chi-squared test with Yates's continuity correction. [m] Mann–Whitney U test. [t] Student's t-test. * For secondary outcomes, Bonferroni correction was applied, and a p value < 0.00625 (0.05/8) was considered statistically significant.

Previous studies on BIS-guided anesthesia in adult populations have reported a reduction in PONV incidence with BIS monitoring, likely due to more precise and controlled titration of inhalational anesthetics.[16,17] In contrast, a recent pediatric study reported that BIS-guided inhalational anesthesia did not significantly reduce PONV during the very early postoperative period (0–1 hour) but resulted in a marked reduction during the 1–24 hour period.[14]

Our findings are generally consistent with the published literature and further support the beneficial effect of BIS monitoring on PONV. Notably, unlike previous pediatric studies, our results show that BIS-guided anesthesia was also associated with a significant reduction in PONV during the immediate early postoperative period (0–1 hour). This difference may be attributable to variations in surgical type, anesthetic management protocols, and postoperative observation periods.

Liao et al.[18] reported no significant difference in PONV incidence between BIS-guided and non–BIS-guided sevoflurane anesthesia in patients undergoing ambulatory surgery. Although sevoflurane consumption was lower in the BIS-guided group, PONV rates were similar between groups. This discrepancy may be explained by the inclusion of ambulatory urological procedures and the limited postoperative follow-up period, which was limited to the first postoperative hour. In contrast, our study focused on patients undergoing adenoidectomy, a population known to be at higher risk for PONV, and included a longer postoperative observation period. Therefore, differences in surgical type and follow-up duration may account for the divergent findings. Taken together, the available evidence

Table 5. Logistic regression analysis for Postoperative Nausea and Vomiting (PONV)

	PONV		Total	Univariable		Multiple	
	No	Yes		OR (95% CI)	p	OR (95% CI)	p value
Groups							
BIS-guided group	16 (72.7)	13 (36.1)	29 (50)	0.212 (0.067 – 0.675)	0.009*	0.212 (0.067 – 0.675)	**0.009***
Control group	6 (27.3)	23 (63.9)	29 (50)	Reference			
Age (years)	5.1 ± 1.7	5.8 ± 1.6	5.5 ± 1.6	1.317 (0.939 – 1.849)	0.111	–	–
Height (cm)	110.4 ± 11.7	113.7 ± 10.5	112.4 ± 11	1.028 (0.978 – 1.08)	0.274	–	–
Weight (kg)	19.3 ± 4.2	19.9 ± 4.1	19.6 ± 4.1	1.036 (0.909 – 1.181)	0.595	–	–
Sex							
Male	7 (31.8)	17 (47.2)	24 (41.4)	1.917 (0.632 – 5.82)	0.251	–	–
Female	15 (68.2)	19 (52.8)	34 (58.6)	Reference			
ASA physical status							
ASA I	18 (81.8)	32 (88.9)	50 (86.2)	0.996 (0.887 – 1.119)	0.946	–	–
ASA II	4 (18.2)	4 (11.1)	8 (13.8)	Reference			
Propofol dose (mg)	38.3 ± 8.7	39.7 ± 8.4	39.2 ± 8.4	1.021 (0.958 – 1.088)	0.523	–	–
Rocuronium dose (mg)	10.9 ± 2.6	11.7 ± 2.4	11.4 ± 2.5	1.14 (0.915 – 1.42)	0.242	–	–
Fentanyl dose (μg)	18.1 ± 4.2	19.2 ± 4	18.8 ± 4.1	1.065 (0.933 – 1.217)	0.352	–	–
Sevoflurane consumption (mL)	21.7 ± 3.3	23.7 ± 3.5	22.9 ± 3.6	1.185 (1.005 – 1.397)	0.044*	–	–
Remifentanil dose (μg/kg)	5.36 ± 0.6	5.31 ± 0.6	5.33 ± 0.6	0.886 (0.366 – 2.231)	0.766	–	–
Mean BIS value	54.4 ± 4.8	52.4 ± 4	53.1 ± 4.4	0.893 (0.783 – 1.019)	0.094	–	–
Duration of surgery (min)	53.5 ± 5.4	53.4 ± 4.1	53.4 ± 4.6	0.996 (0.887 – 1.119)	0.946	–	–
Constant	–	–	–	–	–	1.765 (0–0)	**0.055***

Cox and Snell R Square = 0.122; Nagelkerke R Square = 0.166; Accuracy = 0.672. Data are presented as number (%) and mean ± standard deviation. * p < 0.05 was considered statistically significant.

suggests that the effect of BIS-guided anesthesia on PONV may vary according to surgical population, anesthetic protocol, postoperative observation duration, and the use of prophylactic antiemetics.

The incidence of PONV is proportional to both the duration and total dose of inhalational anesthetics administered.[19] In the present study, surgical durations were comparable between groups; however, total sevoflurane consumption was significantly lower in the BIS-guided group. Another notable finding was the significantly shorter emergence time in the BIS-guided group. These secondary outcomes are consistent with findings from previous meta-analyses and comparable studies, which have demonstrated that BIS-guided anesthesia can reduce anesthetic consumption and accelerate recovery.[8,9,16]

In a large cohort study, Portnoy et al.[5] evaluated the incidence of PONV, prophylactic strategies, and adherence to clinical guidelines in pediatric patients. The authors reported lower PONV rates than those commonly cited in the literature, largely attributable to the routine use of antiemetic prophylaxis. In our study, routine antiemetic prophylaxis was intentionally omitted to specifically evaluate the isolated effect of BIS-guided anesthesia on PONV. The observed PONV incidence was 44% in the BIS-guided group and 79% in the non–BIS-guided group. The relatively higher PONV incidence in the BIS-guided group compared with that in the study by Portnoy et al.[5] may be explained by the absence of routine pharmacological prophylaxis. Although the requirement for rescue antiemetic therapy was numerically lower in the BIS-guided group, this difference did not remain statistically significant after Bonferroni correction.[20] Nevertheless, the observed numerical reduction may still be clinically relevant and should be interpreted cautiously given the relatively small sample size.

Taken together, our findings and the published literature suggest that BIS-guided anesthesia may represent a valuable strategy for PONV prevention. The results of this study, obtained without routine antiemetic prophylaxis, show that BIS-guided sevoflurane anesthesia significantly reduces the incidence of PONV in pediatric patients undergoing adenoidectomy. BIS-guided anesthesia may therefore be considered a useful adjunctive strategy for reducing PONV in pediatric surgeries associated with a high risk of PONV. Future multicenter studies with larger sample sizes and standardized antiemetic prophylaxis protocols are warranted to further validate these findings.

Limitations

This study has certain limitations. First, it was conducted at a single center with a relatively small sample size, which may reduce statistical power and limit the generalizability of the findings to broader pediatric surgical populations. In particular, the relatively small sample size may have increased the risk of type II error for certain secondary outcomes, including rescue antiemetic use. Second, the study population was restricted to pediatric patients undergoing adenoidectomy; therefore, the results may not be applicable to other surgical procedures or broader pediatric age groups. Third, blinding of the attending anesthesiologists was not feasible because of the BIS-guided anesthesia protocol, which may have introduced performance bias. Fourth, the absence of routine antiemetic prophylaxis may limit the applicability of the findings to routine clinical practice, although this approach allowed clearer evaluation of the isolated effect of BIS-guided anesthesia on PONV. Finally, PONV assessment was based partly on clinical observation, nursing assessments, and parental reports, particularly in younger children unable to verbalize nausea reliably; therefore, some degree of subjective assessment bias and interobserver variability cannot be excluded.

CONCLUSIONS

This prospective randomized controlled trial demonstrated that BIS-guided sevoflurane anesthesia was associated with a reduced incidence of PONV within the first 24 postoperative hours in pediatric patients undergoing adenoidectomy. BIS monitoring was also associated with lower sevoflurane consumption and shorter emergence time. These findings suggest that BIS-guided anesthesia may help optimize anesthetic titration and improve early postoperative recovery in pediatric patients at high risk for PONV. However, larger multicenter studies are needed to confirm these findings and evaluate their applicability in routine clinical practice.

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